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D4.1

Report on Financing Schemes, Legal and Regulatory Aspects, and Technical Measures

D4.1 – Financing Schemes, Legal and Regulatory Aspects, and Technical Measures

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About

Making our homes and buildings more energy efficient is crucial in the transition to a low-carbon future. An estimated 75% of the EU building stock is energy inefficient. The renovation of public and private buildings is an essential action and prioritised in the European Green Deal. The goal of the HORIS project is to improve the energy efficiency of residential buildings and reduce energy poverty.

HORIS will create a digital one-stop-shop (OSS) with the aim of empowering homeowners during the renovation process. Homeowners face several key barriers when deciding to retrofit, such as uncertainty and lack of trust about reported energy savings. They must also choose a home renovation professional and navigate the complexities of the financial process.

The OSS will help homeowners make decisions to improve energy efficiency; renewable energy solutions and identify support to reduce energy poverty. The Green Menu will simplify the home renovation process – by providing homeowners with relevant and credible information and helping them identify the best and most sustainable options. The HORIS project will build on the success of established tools like the ‘Self Scan’ developed by De Groene Grachten. By offering financial, legal and technical solutions, HORIS will facilitate a smooth customer journey, offering homeowners support on finding renovation professionals and guidance about financial schemes.

The project will engage with small and medium sized stakeholders, including local and regional public authorities and non-profit organisations and establish a network of approved home renovation service providers. Initially, the OSS will be set up in Italy, Spain and Portugal with the ambition of replicating in additional countries if needed.

Project partners

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Abbreviations

ARU	<i>Área de Reabilitação Urbana</i> (Urban Rehabilitation Area)
DGEG	<i>Direção Geral de Energia e Geologia</i> (Directorate-General for Energy and Geology)
EIB	European Investment Bank
FNRE	<i>Fundo Nacional de Reabilitação do Edificado</i> (National Fund for Buildings Rehabilitation)
IHRU	<i>Instituto da Habitação e da Reabilitação Urbana</i> (Institute for Housing and Urban Rehabilitation)
IMI	<i>Imposto Municipal sobre as Transmissões Onerosas de Imóveis</i> (Municipal Tax on Onerous Property Transfers)
IMT	<i>Imposto Municipal sobre Imóveis</i> (Municipal Property Tax)
IPSS	<i>Instituições Pariculares de Solidariedade Social</i> (Social Solidarity Institutions)
IRC	<i>Imposto sobre o Rendimento de Pessoas Coletivas</i> (Corporate Income Tax)
IRS	<i>Imposto sobre o Rendimento de Pessoas Singulares</i> (Personal Income Tax)
NRAU	<i>Novo Regime de Arrendamento Urbano</i> (New Lease Urban Regime)

Executive Summary

This Work Package was focused on gathering information related to financing, legal and regulatory frameworks, and technical solutions to support the creation of a one-stop-shop platform for integrated home renovation services in Portugal, Spain, and Italy.

The first chapter detailed a database of public and private financing schemes available for home renovation and energy efficiency solutions in each country. This database includes a variety of financing formats, such as soft loans, grants, tax incentives, and targeted bank loans. For Portugal, the analysis identified eleven public, three private, and three local financing schemes. In Italy, two public and two private schemes and one innovative financing solution were identified. Similarly, twenty-one public and six private financing options were identified for Spain.

The second chapter included mapping the legal and regulatory environment for home renovation in each country. This information was collected for various types of interventions, such as space heating and cooling systems, domestic hot water preparation systems, ventilation systems, replacement of household appliances, water efficiency measures, the installation of solar photovoltaic systems and solar thermal collectors, lighting, building automation and control systems, e-mobility and home charging stations, green infrastructure, lifting installations, energy certification, construction, mediation of works, maintenance and inspection of technical systems, and electrical installations. The relevant legislation was identified for each of these interventions, along with key considerations that homeowners need to be aware of.

Finally, the project identified and categorized technical solutions for home renovation in the analyzed countries. These solutions were divided into four categories: Tips, Measures, Key Measures, and Points of Attention. They were further organized into eight intervention areas, including quick wins, insulation and ventilation, heating and cooling systems, hot water, electrical appliances, lighting, renewable energy generation, and water-saving. The impact of these measures was assessed using data provided by homeowners through the platform's self-scan feature or based on typical household consumption profiles and reference technology values.

In summary, this deliverable compile extensive financing, regulatory, and technical information related to home renovation. This information forms a crucial repository designed to assist citizens in making informed decisions about home improvements and feed into the development of digital one-stop shops in the project's next phase.

1. INTRODUCTION

Buildings in the European Union account for 40% of final energy consumption and 36% of energy-related greenhouse gas emissions, with 75% of these buildings still being energy-inefficient (EC, 2024). To address this, the Renovation Wave strategy outlines an action plan with targeted regulatory, financial, and support measures to at least double the annual energy renovation rate by 2030 and achieve deep renovations in 35 million building units (EC, 2022). However, the current renovation rate remains low at just 1% (EC, 2024). Homeowners face several challenges when renovating their homes, such as a lack of knowledge about energy efficiency measures and insufficient financing (Bertone et al., 2018; Bertoldi et al., 2020). To overcome these barriers and enhance renovation rates and energy efficiency in the residential sector, solutions like one-stop shops (OSS) are crucial.

HORIS aims to support homeowners by creating a digital OSS. This platform will serve as a comprehensive repository of solutions tailored to different home typologies, addressing homeowners' needs, technical measures, financing options, and relevant legal and administrative procedures. It will provide detailed information on necessary building renovations, suitable materials, associated costs, and potential CO₂ emissions reductions, all tailored to national contexts and representative building types.

This deliverable reflects the work of Work Package 4, which focuses on gathering key information (financing, legal and regulatory frameworks, and technical solutions) to develop the one-stop-shop platform for integrated home renovation services in Portugal, Spain, and Italy. The main objectives include building a comprehensive database of public and private financing schemes for home renovation and energy efficiency solutions in each country, mapping the legal and regulatory environment to identify key steps and bottlenecks in the renovation process, and compiling detailed technical solutions to define optimized renovation packages.

The deliverable is organized into five chapters, each representing a specific task within Work Package 4. Chapter 2, related to Task 4.1, identifies public and private financing schemes for home renovation in each country. The outcome was a detailed database of financing options in Portugal, Spain, and Italy, which will be integrated into the one-stop-shop platform. Public financing schemes, including soft loans, grants, and tax incentives, were documented. Private financing schemes, such as targeted bank loans, were also detailed. Innovative financing methods, such as crowdfunding and local financing schemes, were also identified.

Chapter 3 covers the work of Task 4.2, which examines the legal and regulatory framework for home renovation in Portugal, Spain, and Italy. This analysis includes a review of national policies, legislation, and requirements, followed by the identification of key steps and bottlenecks in specific renovation interventions.

Finally, Chapter 4 presents the findings of Task 4.3, which focuses on gathering technical solutions for home renovation in the three countries. The renovation packages include various typologies such as quick wins, insulation (passive measures), heating and cooling systems, hot water,

electrical appliances, lighting, renewable energy generation, and water-saving measures. The measures were detailed in different categories related to their level of detail, tips, key measures, points of attention, and innovation. Each measure includes a description, advantages and disadvantages, and applicable regulations. Key measures will also feature calculation tools to estimate investment costs and savings. The identified measures were tailored to each country's specific factors, such as climate, building characteristics, and cultural norms.

2. PUBLIC AND PRIVATE FINANCING SCHEMES

This chapter aimed to collect information regarding the financing schemes for Italy, Portugal, and Spain. Several financing schemes were included, namely public, private, and innovative and emerging financing methods. Regarding the public financing schemes, soft loans, grants, tax incentives, and others were identified. Financing schemes promoted by private entities were also identified, namely targeted bank loans. Lastly, crowdfunding schemes were identified as innovative and emergent methods of financing. When present, relevant financing schemes at the local level were also identified.

To facilitate homeowners' understanding of each financing scheme and its aim and content, each method of financing identified has the identification of the provider or organization behind the scheme, a description, the conditions to apply for financing, the amount given by each scheme, and a link to where the homeowner will find all the relevant information regarding the financing scheme.

2.1 ITALY

In Italy, two public financing schemes, mainly tax reduction schemes, are currently operating. Other financing schemes, namely private bank loans and crowdfunding, were also identified.

2.1.1 PUBLIC FINANCING SCHEMES

Ecobonus

Provided by: State

Description: These are tax deductions (Cartapatti & Oneta, 2024a; Agenzia Entrate, 2023) to be used in the tax return for expenses incurred for the renovation of houses and condominiums, which involves an energy requalification set by the State and certified by qualified technicians.

Amount: The following deduction percentages remain in place only until the end of 2024 and the amount to be recovered in the tax return is divided into 10 annual installments of the same amount.

-  65% deduction: for energy requalification interventions on existing buildings. The maximum deductible expense varies based on the type of intervention carried out.
-  70% deduction: for condominium interventions that concern the building envelope with an incidence greater than 25% of the gross dispersing surface of the building itself. Maximum spending limit of 40,000 euros per residential unit comprising the condominium.
-  75% deduction: if the intervention is aimed at improving the summer and winter energy performance of the condominium, achieving at least the average quality referred to in the Ministerial Decree of 26 June 2015. Maximum spending limit of 40,000 euros per unit housing component of the condominium.
-  Starting from 2025, the deduction should be 36% for interventions on single residential units or condominiums for a maximum expense of 48,000 euros.

Details:

- *Energy requalification interventions of entire buildings.* The maximum amount of expenditure deductible at 65% is 153,846.15 euros.
- *Interventions on the building envelope.* The maximum amount of expenditure deductible at 65% is 92,307.69 euros.
- *Solar panels.* The maximum amount of expenditure deductible at 65% is 92,307.69 euros. In case of access to the Thermal Account and Thermal Account 2.0, the deduction is not due.
- *Winter heating systems.* The maximum amount of expenditure deductible at 65% is 46,153.84 euros. Interventions to replace air conditioning systems, with systems equipped with air or water condensing boilers with an efficiency at least equal to the product class A required by EU regulation no. 811/2013 are 50% deductible, with a maximum deductible expense of 60,000 euros. Lower class condensing boilers are excluded from the deduction.
- *Awnings.* The deduction is for 50% of the expense, the maximum deductible amount of which is 120,000 euros.
- *Systems equipped with heat generators powered by combustible biomass.* The deduction is for 50% of the expense, the maximum deductible amount of which is 60,000 euros. In case of access to the Thermal Account and Thermal Account 2.0, the deduction is not due.
- *Purchase of micro - cogenerators.* The maximum amount of deductible expense is 153,846.15 euros.
- *Installation of multimedia devices.* The maximum expense deductible at 65% is 15,000 euros.
- *Ecobonus and earthquake bonus.* If the intervention carried out, in addition to the characteristics just seen, also allows the reduction of the seismic risk of the building, the deduction becomes 80% if the intervention allows the passage to a lower seismic class, if the passage is of two classes the deduction is entitled to 85% of the expenditure incurred. In this case the building must belong to seismic zones 1, 2 or 3. The maximum spending limit admitted to the deduction is 136,000 euros multiplied by the number of units that make up the building and is divided into 10 annual installments of the same amount.
- *Replacement of fixtures.* The deduction is 50% on a maximum eligible expense of 120,000 euros.

Conditions

-  The building subject to intervention must be existing;
-  Payments must be made via SEPA bank transfer containing the tax code of the person obtaining the deduction and the person receiving the payment;
-  The invoices must contain the data of all the people who benefit from the deduction and for works with a total amount exceeding 70 thousand euros they must report the national collective labor agreement used by the company for the workers employed in the renovation.
-  Before starting the works it is necessary to submit a communication to the ASL (local health authority) with the information relating to the intervention and obtain the administrative authorizations relating to the type of intervention carried out;

- 🏠 For condominium interventions, it is the administrator who is responsible for preparing and maintaining the necessary documentation by sending each condominium owner a certification with the amount of the expense incurred and deductible;
- 🏠 Certification by a qualified technician of compliance with the average costs of the materials used
- 🏠 Within 90 days of completing the work, the following must be sent electronically to ENEA (National Agency for new technologies, energy and sustainable economic development):
 - Copy of the building's energy performance certificate;
 - The descriptive sheet on a government model of the interventions carried out
 - The benefit is available to resident and non-resident subjects with any type of income. Beneficiaries include natural persons, including practitioners of the arts and professions, public and private bodies that do not carry out commercial activities, simple companies, professional associations and individuals who earn business income (natural persons, partnerships, joint-stock companies).

To take advantage of the deduction you must own or hold the property based on a suitable title:

- 🏠 owners and naked owners;
- 🏠 holders of a real right of enjoyment such as usufruct, use, residence or surface;
- 🏠 lessees or borrowers (subject to the consent of the legitimate owner);
- 🏠 members of divided and undivided cooperatives;
- 🏠 individual entrepreneurs and entities producing income in an associated form (simple partnerships, general partnerships, limited partnerships and equivalent entities, family businesses) for properties not included among capital goods or goods;
- 🏠 Independent institutes for public housing, however, named, for expenses incurred for interventions carried out on properties they own, used for public residential construction.

Details:

- 🏠 *Energy requalification interventions of entire buildings.* The intervention is defined according to the result that it must achieve in terms of reducing the annual primary energy requirement for winter air conditioning. The savings index must be calculated with reference to the energy needs of the entire building and not that of the individual real estate units that compose it.
- 🏠 *Interventions on the building envelope.* Simply renovating the walls is not sufficient if they already comply with the required thermal transmittance indices, but it is necessary that these indices are further reduced following the works. Reference is made to the limit values reported in table 1 of Annex E to the ministerial decree of 6 August 2020.
- 🏠 *Solar panels.* The panels must present a quality certification compliant with standards issued by an accredited laboratory. The EN 12975 and EN 12976 standards implemented by a national certifying body of a member country of the European Union or Switzerland are equated with UNI EN 12975 or UNI EN 12976. Furthermore, the minimum warranty period for solar panels must be five years for panels and boilers (including heat pump boilers) and two years for accessories and technical components.
- 🏠 *Winter heating systems.* Interventions for the complete or partial replacement of existing air conditioning systems with systems equipped with:
 - air or water condensing boilers with an efficiency at least equal to the product class A envisaged by EU regulation no. 811/2013 and simultaneous

installation of advanced thermoregulation systems, belonging to classes V, VI or VIII of the Commission communication 2014/C 207/02;

- hybrid appliances, consisting of an integrated heat pump with condensing boiler, assembled in the factory and expressly designed by the manufacturer to work in combination with each other. The ratio between the nominal useful thermal power of the heat pump and the nominal useful thermal power of the boiler must be less than or equal to 0.5;
- high efficiency heat pumps, low enthalpy geothermal systems and contextual fine-tuning of the distribution system created.

 **Awnings.** Expenses incurred for the purchase and installation of solar shading and mobile blackout technical closures, permanently mounted on the building envelope or its components, are deductible. They can be installed inside, outside or integrated into the glass surface. The screens:

- they must protect a glass surface and be applied inside, outside or integrated into it;
- they must not be freely mountable and dismountable by the user;
- they can be in combinations with windows or autonomous (projecting);
- they must be mobile;
- they must be "technical" shielding;
- for blackout closures (shutters, Venetian blinds, roller shutters, etc.), all guidelines are considered valid;
- for screens not combined with glass (awnings, Venetian blinds, roller blinds, arm awnings), those with a north, north-east and north-west orientation are excluded;
- they must have a value of the total solar transmission factor coupled to the type of glass of the protected glass surface less than or equal to 0.35 evaluated with reference to type C glass according to the UNI EN 14501 standard.

 **Systems equipped with heat generators powered by combustible biomass.** The heat generator must belong to one of the following categories with relative reference standard:

- Biomass boilers with power lower than 500 kW, UNI EN 303-5
- Biomass boilers with power equal to or greater than 500 kW, -
- Domestic biomass boilers that also heat the installation room with power lower than 50kW, UNI EN 12809
- Solid fuel stoves, UNI EN 13240
- pellet-fueled domestic heating appliances with power lower than 50 kW, UNI EN 14785
- Thermo kitchens, UNI EN 12815
- Solid fuel inserts, UNI EN 13229
- Slow heat release appliances powered by solid fuels, UNI EN 15250
- Pellet burners for small heating boilers, UNI EN 15270
- The system must also possess the following requirements:
 - a minimum nominal useful yield of no less than 85% (based on point 1 of Annex 2 of Legislative Decree no. 28 of 2011);
 - the environmental certification referred to in ministerial decree 7 November 2017, n. 186, published in the Official Journal of 18 December 2017, n. 294, implementing the art. 290, paragraph 4, of Legislative Decree

no. 152 of 2006, based on point 1 of Annex 2 of Legislative Decree no. 28 of 2011;

- compliance with local regulations for the generator and biomass;
- compliance with UNI EN ISO 17225-2 standards for pellets, UNI EN ISO 17225-4 for wood chips and UNI EN ISO 17225-5 for wood.

- Furthermore, for interventions with a start date of works starting from 6 October 2020, the generators powered by combustible biomass must comply with the requirements set out in Annex G to the Ministerial Decree. 6 August 2020 and the overall thermal power of the new generators installed cannot exceed the power of the replaced generators by more than 10%, unless the increase is motivated by the dimensional verification of the heating system carried out in accordance with the UNI 12831 standard. In the case of single-family heat generators for the production of domestic hot water and winter air conditioning, nominal powers of up to 35kW are permitted. Each type of generator (wood-burning fireplaces, wood-burning stoves, biomass boilers, pellet stoves and thermo-fireplaces...) must have the specific certifications required by Enea.

 *Purchase of micro - cogenerators.* To benefit from the deduction, the interventions must lead to primary energy savings (PES), as defined in Annex III of the decree of the Minister of Economic Development of 4 August 2011, published in the Official Gazette no. 218 of 19 September 2011, equal to at least 20%.

 *Common areas of the condominium with increased deduction.* The intervention must concern the common parts of buildings delimiting the volume heated towards the outside and/or the unheated rooms and/or the ground and affect more than 25% of the dispersing surface. It must be configured as a replacement or modification of already existing elements (and not as a new construction under expansion). For the initial and final thermal transmittance values, reference is made to the Ministerial Decree of 6 August 2020.

 *Installation of multimedia devices.* Multimedia systems must have technology that is at least in class B of the EN 15232 standard.

 *Replacement of fixtures.* Replacements of fixtures are deductible, including accessory structures that influence heat dispersion (shutters or shutters), or which are structurally merged (boxes incorporated into the frame of the fixture). The windows and doors must delimit a volume heated towards the outside or unheated spaces and the intervention must be configured as the replacement of existing elements or parts thereof (not as a new installation). Simply replacing the fixtures is not sufficient if they already comply with the required thermal transmittance indices, but it is necessary that these indices are further reduced following the works.

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 <https://www.altroconsumo.it/730/trucchi-per-risparmiare-730/spese-casa/riqualificazioni-energetiche/informazioni>

 <https://www.agenziaentrate.gov.it/portale/schede/agevolazioni/detrazione-riqualificazione-energetica-55-2016/cosa-riqualificazione-55-2016>

House Bonus

Provided by: State

Description: These are tax deductions (Cartapatti & Oneta, 2024b; Agenzia Entrate, 2024) to be used in the tax return for expenses incurred for the extraordinary renovation of houses and condominiums and the latter also in the case of ordinary renovations.

Amount: 50% of the expenditure incurred until the end of 2024 is recovered, for a maximum of 96,000 euros of intervention on a single property and the amount to be recovered in the tax return is divided into 10 annual installments of the same amount.

Starting from January 2025 the deduction should drop to 36% for a maximum expense of 48,000 euros.

Conditions

-  The building subject to intervention must be existing;
-  Payments must be made via SEPA bank transfer containing the tax code of the person obtaining the deduction and the person receiving the payment;
-  The invoices must contain the data of all the people who benefit from the deduction and for works with a total amount exceeding 70 thousand euros they must report the national collective labor agreement used by the company for the workers employed in the renovation.
-  Before starting work, a communication must be submitted to the ASL (local health authority) with information relating to the intervention and, based on the type of intervention, the relevant administrative authorizations are required;
-  For condominium interventions, it is the administrator who is responsible for preparing and maintaining the necessary documentation by sending each condominium owner a certification with the amount of the expense incurred and deductible;
-  Certification by a qualified technician of compliance with the average costs of the materials used
-  Exclusively for works that enable energy savings in the property, within 90 days of completion of the works the following must be sent electronically to ENEA (National Agency for new technologies, energy and sustainable economic development):
 - Copy of the building's energy performance certificate;
 - The descriptive sheet on a government model of the interventions carried out
 - The benefit is available to resident and non-resident subjects with any type of income. The beneficiaries include natural persons, including those who work in the arts and professions for properties that do not fall under capital goods or goods.
-  To take advantage of the deduction you must own or hold the property based on a suitable title:
 - owners and naked owners;
 - holders of a real right of enjoyment such as usufruct, use, residence or surface;
 - lessees or borrowers (subject to the consent of the legitimate owner);
 - members of divided and undivided cooperatives;
 - individual entrepreneurs and entities producing income in an associated form (simple partnerships, general partnerships, limited partnerships and equivalent entities, family businesses) for properties not included among capital goods or goods;

Details:

-  *Maintenance of buildings.* Maintenance interventions are distinguished between ordinary and extraordinary. Ordinary maintenance is deductible only if it concerns common parts of the condominium and consists of repair, renovation and replacement works of building finishes and those necessary to integrate or maintain the efficiency of existing technological systems. Extraordinary maintenance interventions are deductible both for individual homes and for the common areas of condominiums and concern the works and modifications necessary to renew and replace parts, including structural ones, of the buildings, or to create and integrate sanitation and technological services, always which do not alter the volumes and surfaces of the individual real estate units and do not involve changes to the intended use. These are innovative interventions that respect the existing property.
-  *Elimination of architectural barriers.*
-  *Maintenance of buildings.* To be eligible for assistance, the interventions must have the technical characteristics required by the sector law (DM 236 of 1989).
-  *Restoration, conservative rehabilitation and renovation.* Included in this typology are interventions aimed at conserving the property and ensuring its functionality by means of a set of works which, respecting its typological, formal and structural elements, allow uses compatible with it.
-  *Prevention of illicit acts carried out by third parties.*
-  *Maintenance of buildings.* By “illicit acts” we mean those that are criminally illicit (for example, theft, assault, kidnapping and any other crime the commission of which involves the violation of legally protected rights). The deduction is applicable only to expenses incurred to carry out interventions on properties. The contract stipulated with a security company is not deductible.
-  *Photovoltaic systems.* This involves the installation of photovoltaic systems, including supply and installation of the system complete with all its components and professional services. To be deductible, the system must be installed to meet the energy needs of the home (i.e. for domestic use, lighting, powering electrical appliances...) and therefore placed directly at the service of the home. The photovoltaic system also includes any energy storage systems installed after a pre-existing photovoltaic system and any necessary adjustments.
-  *Energy saving.* They are facilitated:
 - insulation works on the building envelope that allow a containment of the energy requirements necessary for air conditioning by at least 10%, provided they are carried out with the technical rules set out in table A attached to law 9 January 1991, n. 10;
 - insulation works for distribution networks of heat transfer fluids;
 - air conditioning and/or domestic hot water production systems that use flat solar panels;
 - systems that use heat pumps for room air conditioning and/or domestic hot water production;
 - heat generators which, in steady state conditions, have an efficiency, measured using the direct method, of no less than 90%;
 - heat generators that use transformation products of organic and inorganic waste or plant products as an energy source, provided that, when fully

operational, they have an efficiency, measured by the direct method, of no less than 70;

- equipment for the combined production of electricity and heat provided that the overall fuel use factor is not less than 70;
- equipment for automatic regulation of the air temperature inside the individual real estate units or individual rooms, provided, in the latter case, applied to at least 70% of the rooms constituting the real estate unit;
- individual accounting equipment for the thermal energy supplied to individual property units;
- legitimately deliberate transformation of centralized heating systems into single-family gas systems for air conditioning and the production of domestic hot water, provided that said transformation results in energy savings of no less than 20% and provided that the single-family systems are equipped with a automatic temperature regulation system and a heat generator with an efficiency, measured using the direct method, of no less than 90%. Houses located in the areas identified by the regions and autonomous provinces of Trento and Bolzano are excluded, pursuant to art. 6 of law 9 January 1991, n. 10, as sites for the construction of district heating systems and networks;
- replacement of electric water heaters with fuel-powered water heaters;
- light sources with an efficiency greater than or equal to 50 Lumen/Watt, within the maximum annual limit of one light source per room of the real estate unit.

-  Works aimed at promoting mobility inside and outside the home
-  Building cabling
-  Containment of noise pollution
-  Prevention of home accidents
-  Bringing buildings up to standard
-  Asbestos remediation
-  Replacement of generator set

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-  <https://www.altroconsumo.it/730/trucchi-per-risparmiare-730/spese-casa/ristrutturazioni-edilizie/informazioni>
-  <https://www.agenziaentrate.gov.it/portale/web/guest/schede/agevolazioni/dettristredil36/schinfodettristredil36>

2.1.2 PRIVATE FINANCING SCHEMES

"Green" loans

Provided by: Main national credit institutions (banks and financial companies)

Description: Green loans, or sustainable financing (ALTROCONSUMO, n.d._a), are financial products designed to support projects and initiatives to finance the redevelopment of existing homes. This type of loan is intended to incentivize and facilitate investments in clean technologies, energy efficiency, renewable energy, sustainable resource management, greenhouse gas emissions reduction, and sustainable development projects.

The funded projects must meet specific sustainability criteria and have a verifiable environmental impact. Often, this requires evaluation or certification by independent third parties to confirm that the project aligns with the standards required to grant the loan.

Green loans offer better financing terms than traditional loans, such as lower interest rates or more flexible payment conditions, to further encourage investments in sustainable projects.

Amount: The amount ranges from one thousand euros to 75 thousand euros.

Conditions: Green loans are provided to fund projects to enhance energy efficiency. Examples of improvement measures include installing high-efficiency windows and doors; upgrading, maintaining, or repairing HVAC (heating, ventilation, and air conditioning) systems that utilize high-efficiency technologies; integrating tools and devices for monitoring, regulating, and optimizing building energy performance; implementing renewable energy technologies like photovoltaic systems; establishing electric vehicle charging stations; and conducting thermal insulation work for building structures.

The release of funds depends not only on evaluating applicants' creditworthiness but also on the submission of project-related documentation, including cost estimates.

The economic terms associated with these offerings typically have monthly deadlines and are subject to renewal at the end of each calendar month. Banks may adjust or withdraw their offers based on evolving market conditions and macroeconomic factors. Presently, green loan packages feature interest rates aligned with top market offers, and the loan duration spans the standard range of 12 to 120 months.

Overall, the approval process by the banks does not entail simplifications compared to standard loan requests.

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<https://www.altroconsumo.it/soldi/prestiti-personali>

“Green” mortgage

Provided by: Main credit institutions operating in Italian territory (Banks)

Description: Green mortgage offers (ALTROCONSUMO, n.d._b) are designed to finance the refurbishment of existing homes or the purchase of new properties with high energy efficiency. The goal is to fund the renovation of Italy's real estate heritage; thus they are available for the purchase or renovation of all private dwellings on Italian territory (houses, apartments, etc.). Some banks provide a free energy certification service when the mortgage is aimed at renovating the property with an improvement in energy class.

The advantages of a green mortgage, compared to a standard mortgage, can include both lower interest rates and the provision of higher amounts. The specific conditions, requirements, and benefits of a green mortgage can vary depending on the lending institution and the macroeconomic situation (level of interest rates, economic growth, tax incentives, inflation, trends in national credit demand, etc.).

To access a green offer in the context of a renovation mortgage, it is essential to demonstrate an improvement in the energy efficiency of the property being renovated. This means that the renovation must lead to a tangible increase in the home's energy performance, equivalent to at least one energy class. In the case of mortgages for purchasing, on the other hand, the property must already have an energy class of level B or higher. This requirement emphasizes the commitment to sustainability and energy efficiency. However, even if the renovation project does not aim to achieve a higher energy class, interested parties still can access standard renovation mortgages that offer flexibility for various needs and property projects.

Amount: The amount can range from 40,000 euro to 500,000 euro. The amount disbursed cannot exceed 80% of the property's value or the purchase price. Those aged under 36 can apply for a mortgage covering 100% of the property's value.

Conditions: The mortgage can be granted for the following purposes: purchase of the first/second home; purchase and renovation; renovation; construction; mortgage refinancing. The mortgage application for renovation must be submitted by providing the project and cost estimates. The better economic conditions linked to these offers generally have a monthly expiration at the end of the month. Banks can update or withdraw their offers based on new market conditions and the macroeconomic situation. Currently, the offers for green mortgages provide an interest rate that is 0.5% lower than standard mortgages. The mortgage term is the standard one (from 5 to 30 years).

The Energy Performance Certificate (APE) is the document through which the energy class of the property is certified and is necessary to identify the financing as Green and access the better conditions compared to the offer available for standard mortgages. The approval of the application is subject to the evaluation of the creditworthiness of the applicants. Overall, the banks approval procedure does not involve facilitations compared to standard mortgage requests and the required guarantees are standard.

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<https://www.altroconsumo.it/soldi/mutui>

2.1.3 OTHER FINANCING SCHEMES

Crowdfunding schemes

It is possible to finance home energy implementation projects through crowdfunding operations carried out via authorized platforms that operate in this sector (in Italy, for example; ener2crownd, 2023; has already been active in this kind of projects). Every aspect of the energy requalification interventions can be financed, including, for example, insulation, charging stations, storage systems, photovoltaic panels, fixtures, solar shading and replacement of winter air conditioning systems. The loan may entail periodic repayment of only interest with the repayment of the capital at the last installment or a French amortization, that is capital + interest on each instalment. Participation in this type of project can be made starting from a popular amount of about 100 euros. In the past, several interventions of this type have already been carried out in Italy on the so-called 110% bonus for home requalification. The duration of loans via crowdfunding was generally between 9 months and 24 months and saw collections for each project between 100,000 and 150,000 euros, as well as the participation of a variable number of investors (often between 100 and 200).

2.2 PORTUGAL

In Portugal, seventeen financing schemes for home renovation were identified: eleven public financing schemes, three private financing schemes and three financing schemes promoted by municipalities in Portugal. Five of the financing schemes identified were targeted at vulnerable households. Additionally, two financing schemes that are currently closed but with a potential of opening again were identified.

2.2.1 PUBLIC FINANCING SCHEMES

Tax Benefits - Municipal Taxes and Fees

Provided by: Minister of the Environment and Climate Action

Description: In Portugal, there is currently a comprehensive set of tax benefits focused on urban rehabilitation (Tax and Customs Authority, n.d.-a). Additionally, some municipalities may have specific tax benefits for buildings rehabilitation and energy efficiency. An Urban Rehabilitation Area (known as *Área de Reabilitação Urbana* or ARU) designates a geographically defined zone that warrants an integrated intervention due to the inadequacy, deterioration, or obsolescence of its buildings and infrastructure. The delineation of an ARU is the responsibility of the municipal assembly and leads to the application of specialized tax benefits.

Amount: Not applicable

Conditions: The following benefits are applicable to urban buildings, or autonomous fractions, built more than 30 years ago or located in ARUs, which are subject to rehabilitation and in which the respective state of conservation is at least two levels above that previously assigned and has at least a good level, while meeting specified criteria related energy efficiency and thermal quality:

-  A three-year exemption from Municipal Property Tax (*Imposto Municipal de Imóveis* (IMI)) for rehabilitated buildings, starting from the year of project completion. This exemption may be extended, upon the owner's request, for an additional five years for properties designated for permanent housing rental or personal permanent residence;
-  Exemption from Municipal Tax on Onerous Property Transfers (*Imposto Municipal sobre as Transmissões Onerosas de Imóveis* (IMT)) when purchasing urban buildings for restoration, provided that the renovation work initiates within three years;
-  Exemption from IMT on the first transfer following the rehabilitation intervention on buildings to be used for permanent rental housing or, when located in an ARU, also for own permanent housing;
-  50% reduction in the fees associated with evaluating the building's state of conservation.

These benefits are implemented through a refund of the amount paid by the taxpayer, with the relevant tax office refunding the amount paid by the taxpayer. This occurs after the municipal authorities have notified the taxpayer that the rehabilitation work has been completed and the urban planning certificate and energy certificate have been issued.

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<https://www.portaldahabitacao.pt/reabilitacao1>

Tax Benefits – Personal Income Tax Exemptions and Deductions

Provided by

Republic of Portugal

Description: In Portugal, there are also incentives related to Personal Income Tax (Known as *Imposto sobre o rendimento das Pessoas Singulares* or IRS) and Corporate Income Tax (Known as *Imposto sobre o Rendimento das Pessoas Coletivas* or IRC) (Housing Portal, n.d.-a). The New Urban Lease Regime (*Novo Regime de Arrendamento Urbano* (NRAU)) revised the framework for urban leases and introduced a range of measures that aimed to boost the rental market.

Amount: Not applicable

Conditions: Property income obtained within the framework of municipal programs offering affordable rental housing is exempt from the IRS and IRC for the duration of the respective contracts. The following benefits apply to properties located in ARU or rented out in accordance with the NRAU, provided they are undergoing renovation, their condition is improved by at least two levels or attain a minimum 'good' level is attributed, and the cost of the renovation works corresponds to at least 25% of the value of the property and it is intended for rental:

-  Owners can deduct 30% of the rehabilitation expenses from their IRS up to a limit of €500. The costs must be adequately documented and depend on prior certification by the ARU management body or the municipal arbitration commission;
-  Capital gains earned by IRS taxpayers from the first sale following the intervention are taxed at an autonomous rate of 5%;
-  Property income (rental income) earned by IRS taxpayers is taxed at a rate of 5% when it is solely derived from rental activities.

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<https://www.portaldahabitacao.pt/web/guest/reabilitacao1>

Tax Benefits - Vat At A Reduced Rate Of 6%

Provided by: Republic of Portugal

Description: In Portugal, the reduced value-added tax (VAT) rate is applicable to all renovation work on residential properties, regardless of their location. This rate also applies to all rehabilitation work carried out in ARU (Housing Portal, n.d.-b). The 2022, 2023 and 2024 state budgets also include a VAT reduction for solar collectors, photovoltaic panels, biomass boilers and heat pumps.

Amount: Not applicable

Conditions: This reduction is applicable to the following operations:

-  Contracts for improvement, remodeling, renovation, restoration, repair, or conservation of properties or autonomous parts, provided they are allocated for housing purposes;
-  Contracts carried out in properties located in Urban Rehabilitation Areas (ARUs) or within the scope of operations of recognized public interest;
-  Contracts directly commissioned by the Institute of Housing and Urban Rehabilitation (IHRU) or under programs financially supported by the IHRU.

The reduced rate does not cover incorporated materials in the operations, unless their value does not exceed 20% of the total value of the contract. If the materials exceed 20%, the reduced VAT rate applies to the service portion (labor), and the standard rate applies to the materials if the invoice is issued separately. This benefit does not require any specific procedure; it is sufficient that the contract qualifies as rehabilitation under the conditions mentioned above.

Furthermore, the reduced VAT rate is applied to the acquisition and installation of solar collectors and photovoltaic panels as biomass heaters with a nominal heat output not exceeding 50 kW and solid biomass boilers not exceeding 500 kW. This includes those integrated into mixed systems comprising a solid fuel boiler, supplementary heaters, temperature control devices, and solar devices. The condition for this reduced rate for the heaters and boilers is that these systems must possess an EU energy label from one of the top two energy efficiency classes and meet eco-design requirements (Tax and Customs Authority, n.d.-b).

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https://info.portaldasfinancas.gov.pt/pt/informacao_fiscal/codigos_tributarios/civa_rep/Pages/c-iva-listas.aspx

1.º Direito – Programa de Apoio ao Acesso à Habitação (1º Direito Program - Support Program For Housing Accessibility)

Provided by: HRU – Instituto da Habitação e da Reabilitação Urbana

Description: The 1º Direito program (Housing Portal, n.d.-c) aims to support the promotion of housing solutions for individuals living in undignified housing conditions and without the financial means to access suitable housing. The support is aimed at households facing insolvency of any family member or the property owner where the household resides; when they have to vacate the house due to reasons related to domestic violence, non-renewal of the lease agreement, overcrowding, insecurity, or unhealthiness. The program primarily focuses on a promotion of building rehabilitation and rentals, favouring the rehabilitation of existing structures over new construction. Emphasis is placed on promoting interventions, equipment, technologies, and processes that enhance energy and water efficiency.

Amount: Financial support can be granted in the form of non-refundable financial contributions and interest rate subsidies on loans. In either case, the maximum limit is the reference value established for each housing solution. The maximum contribution for rehabilitation is set at 50% of eligible expenses, and loans can have a maximum term of 30 years.

Conditions: This support extends to both households seeking adequate housing and entities involved in housing solutions, including municipalities, public organizations, third-sector entities, residents' associations, housing and construction cooperatives, as well as property owners in deteriorated areas. The 1º Direito Program specifically aids households facing poor living conditions and those with an average monthly income below 1 743.04€. Applications for this program are submitted to the municipality, which assesses each case individually and forwards the applications to the IHRU for the final decision on whether to grant support. The solutions envisaged for rehabilitation include:

-  Own housing by the household (self-improvement);
-  Public housing for rent;
-  Buildings in run-down urban areas.
-  Eligible expenses include:
 -  Contract price;
 -  Accessibility and environmental sustainability solutions;
 -  Projects, supervision and safety on site;
 -  Notarial and registration acts.

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Programa Porta De Entrada (Entry Door Program)

Provided by: IHRU – Instituto da habitação e da Reabilitação Urbana

Description: The *Porta de Entrada* program (Housing Portal, n.d.-d) is directed at individuals or households facing urgent housing needs due to the temporary or permanent loss of their primary residence or the imminent risk of such displacement resulting from unforeseeable or extraordinary circumstances. This assistance program offers full or partial reimbursement of expenses associated with housing reconstruction or restoration. Regarding the contribution for the acquisition and rehabilitation of real estate, this corresponds to the purchase price or the total value of the investment that is considered by IHRU, for the purpose of financing, minus 180 times the amount equivalent to 25% of the person or household's average monthly income.

Amount: The reimbursement for acquisition and rehabilitation of a dwelling corresponds to the purchase price or the total value of the investment that is considered by IHRU, for the purpose of financing, deduced by 180 times the value corresponding to 25 % of the average monthly income of the person or household. Additionally, for interventions, the contribution may never exceed the amount of the lowest budget among the three budgets that must be requested for this purpose.

Conditions: Applications for the *Porta de Entrada* program must be submitted to the municipality and/or Autonomous Region. These local authorities oversee the corresponding procedures and, upon receiving a favourable recommendation, forward the applications to IHRU. The submission should include the housing proposal and/or housing solution along with all the necessary documentation and information required for the evaluation of the applications and the initiation of support arrangements. Support under this program is granted to individuals or households who satisfy the following criteria:

-  Demonstrating an urgent need for housing;
-  Lacking a suitable alternative housing option;
-  Facing immediate financial constraints. In such cases, individuals or households with assets valued below the limit established by the relevant legislation at the time of the unforeseeable or extraordinary event are eligible.

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Rehabilitate To Rent - Affordable Housing

Provided by: IHRU – Instituto da habitação e da Reabilitação Urbana

Description: The aim of the Rehabilitate to Rent - Affordable Housing program (Housing Portal, n.d.-e) is to provide loans at more favorable conditions than those available on the market to finance operations to rehabilitate a building or portion of a building. This program is exclusively designed for properties where most dwellings are intended for affordable rentals as part of the

Affordable Rental Program. The energy certificate and the level of comfort are bonus factors in the rent calculation formula.

Amount: Under this program, loans can cover up to 90% of the total project cost. The interest rate is determined based on the project's characteristics and the promoter's profile, with options for both fixed and variable interest rates. A grace period for the capital repayment corresponds to the duration of the works plus an additional period of up to 9 months. The maximum repayment period for the loan is 15 years.

Conditions: Individuals or entities, whether public or private, including condominium administrations, who promote an operation and demonstrate that they hold rights and powers over the property are eligible to apply for this program. Applications are submitted through the Housing Portal using a specific electronic form and the necessary data and documents. Prospective promoters can use a simulator on the Housing Portal to assess all the costs associated with managing and maintaining a building, as well as its rehabilitation, to determine the feasibility and sustainability of their investment. Once the application has been approved, a loan agreement will be signed. The beneficiary has to maintain the lease at the rent regime defined by the program until the end of the loan repayment corresponding to that fraction.

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<https://www.portaldahabitacao.pt/o-que-e-rpa-ha>

Residential Condominiums Support Program - Currently Close

Provided by: Fundo Ambiental/ Republic of Portugal – Minister of Environment and Climate Action

Description: The purpose of the Residential Condominium Support Program (Minister of the Environment and Climate Action, n.d.-a) is to provide funding for enhancing the thermal insulation of building facades, roofs, and floors. This initiative directly contributes to improving the thermal comfort of residential structures, reducing energy costs, and revitalizing the existing housing stock.

Amount: Each beneficiary is limited to a maximum total support of 150 000 euros. The financing rates and maximum eligible expenses vary depending on the type of intervention applied for. Additionally, the program offers support for technical assistance (400€ per application) and energy certification (125€ per autonomous housing unit). The program is intended for condominiums in multi-family housing buildings, under horizontal or vertical ownership, located throughout Portugal. In order to qualify for the incentive, documentation related to the property and the applicant must be submitted on a platform provided by Fundo Ambiental.

Conditions: The interventions must ensure that the building's common areas are entirely insulated, including roofs, walls, or floors surrounding these shared spaces. Applications must include expenses for technical oversight conducted by a qualified expert from the Energy Certification System or another competent technical auditor to demonstrate compliance with the intervention requirements. These technicians should be registered on the *Casa Eficiente 2020* Portal or the *CasaA+*

Portal. The program will be open until December 28, 2023, or until the date on which it is foreseeable that the allocation is reached.

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Programa De Apoio a Edifícios Mais Sustentáveis (More Sustainable Buildings Support Program) – Currently Closed

Provided by: Fundo Ambiental/ Republic of Portugal – Minister of Environment and Climate Action

Description: The More Sustainable Buildings Support Program aims to finance measures to promote rehabilitation, decarbonization, energy efficiency, water efficiency, and the circular economy, helping to improve the energy and environmental performance of buildings. Three calls have been launched in this program between 2021 and 2023. The analysis of applications for the 3rd Call, which took place in 2023, is still ongoing, and the allocation for this call is €30 million (Minister of the Environment and Climate Action, n.d.-b).

Amount: The financing rates and maximum eligible expenses vary depending on the type of intervention, and each beneficiary is limited to a maximum incentive of 7 500€. In the most recent call (2023), higher financing rates were applied to promote the geographical diversification of investments, the implementation of measures in multi-family buildings, and the implementation of passive measures (thermal rehabilitation of opaque and glazed envelopes).

Conditions: The program targets individuals who can demonstrate the right to execute the interventions on the property. This type of financing works as a reimbursement, where the beneficiary must carry out the intervention and meet all the criteria detailed in the program regulation. The deadline for submitting applications to the 3rd Call of this Program was October 31, 2023

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Vale Eficiência II (Efficiency Voucher)

Provided by: Fundo Ambiental/ Republic of Portugal – Minister of Environment and Climate Action

DescriptionThe Efficiency Voucher (Minister of Environment and Climate Action, n.d.-c) is a financing scheme to support economically vulnerable families by improving their living conditions and dwelling energy efficiency: The Program supports projects such as window replacement, domestic hot water systems, space heating and cooling systems, and the implementation of photovoltaic systems or other technologies to produce renewable energy.

Amount: Each beneficiary can receive a maximum of three Efficiency Vouchers, each one on the value of 1 300€+VAT. Each Efficiency Voucher is valid until September 30, 2025.

Conditions: The program is aimed at individuals who own or rent the home they live in and who are beneficiaries of the Social Electricity Tariff or other types of minimum social benefits, as defined in the program's regulations, such as unemployment benefits and old age pensions, among others. Beneficiaries who benefit from this type of support can apply independently on the platform provided by the Environmental Fund or use an Administrative Facilitator, who will help them submit their application and answer any questions they may have about the program. If the application is classified as eligible, the beneficiary will be assigned a technical facilitator, who will identify and select the most suitable intervention types for the residential building, select suppliers and collect quotes for the intervention types identified. Subsequently, the quotes will be presented to the beneficiary and the beneficiary, and the technical facilitator must jointly choose the most favourable supplier, based on the criteria of the most economical value and the earliest date for the supplier to start the intervention. Once the supplier has been selected, the selected interventions will begin in the beneficiary's home and the value of the interventions is paid directly by the environmental fund to the suppliers. The types of intervention in this program follow a hierarchical order that considers their potential to promote energy efficiency in homes. Therefore, interventions classified as level 1 will be prioritized, and so on, according to the following classification:

-  Level 1: High efficiency windows, with an energy label classification of "A" or higher;
-  Level 2: Domestic hot water systems, with energy label classification "A" or higher;
-  Level 3: Space heating and cooling systems, that use renewable energy with energy label classification "A" or higher; or Installation of photovoltaic systems or other renewable energy source equipment to produce electricity for self-consumption, in the case of single-family buildings.

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<https://www.fundoambiental.pt/apoios-prr/c13-eficiencia-energetica-em-edificios/06c13-io1-programa-vale-eficiencia-ii.aspx>

Fundo Nacional De Reabilitação Do Edificado (FNRE) (National Fund For Buildings Rehabilitation)

Provided by: Fundiestamo, Sociedade Gestora de Organismos de Investimento Coletivo, SA

Description: The FNRE (Fundiestamo, n.d.) is a special real estate investment fund, privately subscribed and with indefinite duration. Its main objective is to carry out rehabilitation projects to promote rental, especially housing rental, with the aim of the regeneration and repopulation of urban centers, and to increase, in the medium and long term, the valorization of the investment. Its activity began in April 2019, seeking to:

-  Promote more accessible renting;

-  Rehabilitate vacant properties;
-  Rehabilitation with advantages for owners;
-  Rehabilitation without bureaucracy and delays;
-  Rehabilitation with flexibility, confidence, and quality.

Amount: It is planned to set up several sub-funds, each with autonomous assets and a duration of 10 years, which may be extended. The sub-funds can be set up at different times, whenever there is a group of properties with an overall investment volume that justifies it. These sub-funds are flexible in terms of location, composition, time, and are financially profitable (with a net return of at least 4%).

Conditions: In the initial phase, public entities from central and local administration, as well as third-sector entities, can participate. In a later phase, the opening for participation is expected to extend to other entities, both public and private, including individuals. Participation is achieved through contributions, involving the delivery of real estate for rehabilitation, as well as monetary contributions. In return, participants receive participation units in proportion to their investment. For a property to be included in the FNRE, the financial viability of the investment must be verified. The occupancy rate for permanent or student housing at affordable rents must be at least 51%. Rehabilitated areas not designated for housing may be allocated for other purposes, with a preference, when possible, for traditional commerce. The FNRE is subject to the general norms and regulations related to real estate investment funds and is supervised by the Securities Market Commission.

Read More

<https://www.portaldahabitacao.pt/fundo-nacional-para-a-reabilitacao-do-edificado>

Apoio à concretização de Comunidades de Energia Renovável e Autoconsumo Coletivo [Support for the creation of Renewable Energy Communities and Collective Self-Consumption]

Provided by: Fundo Ambiental/ Republic of Portugal – Minister of Environment and Climate Action

Description: The aim of this scheme is to fund measures that encourage the production of electricity from renewable sources under the Renewable Energy Communities and Collective Self-consumption scheme in Portugal (Minister of Environment and Climate Action, n.d.-d). The goal is to support interventions that lead, on average, to at least a 30% reduction in primary energy consumption in the buildings benefited, and increase self-consumption and/or Renewable Energy Communities capacity in the residential, central public administration and services sectors by at least 93 MW.

Conditions: The beneficiaries of this scheme are renewable energy communities, self-consumers or self-consumption management entities, under the Portuguese legislation.

Amount: This support provides 70% of eligible expenses for buildings in the private residential sector, with a limit of 200 000 euros per UPAC with storage or a limit of 500,000 euros for Renewable Energy Communities and Collective Self-consumption.

Read More

<https://www.fundoambiental.pt/apoios-prr/c13-eficiencia-energetica-em-edificios/c13-i01-02-03-apoio-a-concretizacao-de-comunidades-de-energia-renovavel-e-autoconsumo-coletivo2.aspx>

2.2.2 PRIVATE FINANCING SCHEMES

Energy Efficiency Bank UCI/European Investment Bank

Provided by: UCI BANK/European Bank of Investment (BEI)

Description: The protocol established between UCI and BEI for Energy Efficiency aims to support investment projects ranging from the rehabilitation of existing buildings to the construction of Nearly Zero-Energy Buildings (UCI, n.d.).

Amount: Financing is carried out through housing credit solutions that encourage the purchase of energetically efficient homes and the execution of works for housing rehabilitation and real estate development.

Conditions: UCI offers four different financing options: personal loans for condominium renovations; personal loans for property renovations; mortgage loans for properties with energy performance certificate with classes A+ or A; and mortgage loans for the purchase and renovation of properties.

Read More

<https://www.eib.org/en/press/all/2020-128-eib-and-union-de-credit-inmobiliarios-join-forces-to-boost-energy-efficiency-projects-in-spain-and-portugal>

Casa + Eficiente - Caixa Geral De Depósitos (More Efficient House)

Provided by: Caixa Geral de Depósitos

Description: Housing credit solution offered to *Caixa Geral de Depósitos* customers seeking financing for acquiring properties with a valid Energy Performance Certificate classified as A+, A, or B (CGD, n.d.). This solution aims to acquire properties for permanent residence, secondary residence, rental housing, and investment purposes.

Amount: Not specified

Conditions: Spread reduction up to 0.15% and waiver of Contract Formalization Commission (€195 + Stamp Duty).

Read More

<https://www.cgd.pt/Particulares/Em-Campanha/Pages/Vantagem-Imoveis-Energeticamente-Eficientes.aspx>

Personal loans provided by banks

Provided by: Several Banks

Description: Currently, some banks offer personal loans for energy efficiency projects with more attractive conditions than purposeless personal loans. These loans are intended for energy and water efficiency, renewable energies in primary or secondary residences, or rental properties. The conditions vary among different banks, and below (table 1), the conditions of some banks are summarized.

Amount

Table 1: Loans for energy efficiency in several Portuguese banks.

Institution	Name of the loan	Amount	Interest Rate	Read More
(Based on a loan of 2500€ paid in 36 months)				
Banco CTT	Crédito para energias renováveis	Minimum: 1 000€ Maximum: 50 000€	7.1% EIR	https://www.bancoctt.pt/o-seu-credito/credito-energias-renovaveis
ACTIVOBank	Crédito Pessoal + Energia	Minimum: 1 000€ Maximum: 75 000€	6% EIR	https://www.activobank.pt/energias-renovaveis#/simulator
Banco Montepio	Crédito energias renováveis	Minimum: 2 000€ Maximum: 10 000€	5.9% EIR	https://www.bancomontepio.pt/particulares/credito/credito-energias-renovaveis
Cetelem	Crédito Pessoal Eficiência Energética	Minimum: 2 500€	7.1%	https://www.cetelem.pt/creditos/energias-renovaveis

		Maximum: 75 000€		
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2.2.3 SUBNATIONAL FINANCING SCHEMES

Braga – Municipal Program to Tackle Energy Poverty

Provided by: Bragahabitat/ Municipality of Braga

Description: This program is intended for families experiencing economic and financial hardship and potentially experiencing energy poverty residing in the municipality of Braga (BragaHabitat, n.d.). The program will be available until the end of 2024 or until the allocated funds are exhausted.

Amount: A voucher will be assigned to each beneficiary, valid for six months from its issuance date, losing its value upon expiration. Projects eligible for funding under this program include the replacement of inefficient windows with efficient ones, application or replacement of thermal insulation in the building's envelope and roofing, as well as the replacement of entrance doors, installation of heating and/or ambient cooling systems and domestic hot water or installation of photovoltaic panels and other renewable energy production equipment for self-consumption.

Conditions: To qualify for this support, applicants must not own another property for housing, benefit from social electricity tariffs, and the property targeted for interventions must have low energy performance. Tenants are also eligible. The support includes a technical visit from the monitoring committee of the program to propose the most suitable proposals for the applicant's housing. After the visit, applicants must collect quotes from program-affiliated suppliers and a list managed by the Braga Business Association and formalize the application.

Read More

<https://www.bragahabit.com/eficiencia-energetica>

Cascais – Fundo Verde Famílias (Green Fund Families)

Provided by: Municipality of Cascais

Description: The *Fundo Verde Famílias* program is a financing scheme for families residing in the municipality of Cascais, supporting interventions that aim energy efficiency in their dwellings. These interventions include the replacement of windows, application of insulation, replacement of entrance doors, and the installation of heating and ambient cooling equipment, domestic hot water production systems, renewable energy production systems for self-consumption, and household appliances such as refrigerators, washing machines, dishwashers, electric ovens, and induction cooktops.

Amount: Each beneficiary can only submit one application (which may cover one or more types of interventions), and the maximum incentive is €10,000. The co-financing rates and limits vary

according to the type of intervention, with interventions like insulation benefiting from higher co-financing rates and limits.

Conditions: The funding will depend on the IRS bracket in which the family falls: beneficiaries in the 1st-4th IRS tier will enjoy higher co-financing rates and proximity support from the IPSS (Social Solidarity Institutions) in their residential parishes for the application process and interaction with suppliers. For beneficiaries in the remaining tier, co-financing rates are lower, and the funding will operate as reimbursement, where families must submit applications using suppliers specified in the regulations and subsequently fill out the application at designated form.

Read More: <https://www.cascais.pt/anexo/regulamento-do-fundo-verde-de-apoio-familias>

2.3 SPAIN

In Spain, most of the financing scheme identified are public, reflecting the different regions of Spain. Additionally, six private financing schemes has also been identified.

2.3.1 PUBLIC FINANCING SCHEMES

TAX REDUCTIONS

Provided by: Government of Spain

Description : In Spain there are incentives related to personal income tax (IRPF : Impuesto sobre la Renta de Personas Físicas) for different type of actions :

- Tax reductions for works to reduce heating and cooling demand.
- Tax deduction for works to improve the consumption of non-renewable primary energy.
- Tax deduction for energy rehabilitation works.

Amount :

Reduce heating and cooling demand :

The deduction is based on the amounts paid for the works (enabling the dwelling's heating and cooling demand to be reduced by at least 7%) carried out from 6 October 2021 to 31 December 2024, with a maximum of €5,000. The deduction percentage is 20%.

Improve the consumption of non-renewable primary energy :

The basis for the deduction is the amounts paid for the works (which allow a reduction of at least 30% in the nonrenewable primary energy consumption indicator or achieve an improvement in the energy rating of the dwelling to obtain an energy class "A" or "B", on the same rating scale) carried out from 6 October 2021 to 31 December 2024 with a maximum of €7,500. The deduction percentage is 40%.

Energy rehabilitation works :

When the certificate has been issued in the tax period:

The amounts paid from 6 October 2021 until the end of the tax period with a maximum of €5,000.

Where the certificate was issued in a previous tax period: The amounts paid in the year with a maximum of €5,000.

The amounts paid but not deducted because they exceed the maximum annual base may be deducted, with the same limit (€5,000), in the following four tax years, and in no case may the accumulated base of the deduction exceed €15,000.

When the work is carried out by a community of owners, the basis of the deduction for each owner will be determined by the result of applying the coefficient of participation corresponding to each of the owners to the amounts paid by the community.

The deduction percentage is 60%.

Conditions :

Improve the consumption of non-renewable primary energy : ζ

The deduction cannot be applied to the part of the work carried out on parking spaces, storage rooms, gardens, parks, swimming pools and sports facilities and other similar elements, nor to the part of the home that is affected by an economic activity.

Tax deduction for energy rehabilitation works;

Tax Period to applying the deduction : In 2021, 2022, 2023, 2024 and 2025 being necessary to be able to apply the deduction that the energy efficiency certificate issued after the works (which allow a reduction of at least 30% in the non-renewable primary energy consumption indicator or, achieve an improvement in the energy rating of the dwelling to obtain an energy class "A" or "B", on the same rating scale) has been issued.

Read more:

Common rules for tax deductions

<https://sede.agenciatributaria.gob.es/Sede/vivienda-otros-inmuebles/deducciones-obras-mejora-eficienciaenergetica-viviendas/normas-comunes-deducciones.html>

Tax deduction for works to reduce heating and cooling demand.

<https://sede.agenciatributaria.gob.es/Sede/vivienda-otros-inmuebles/deducciones-obras-mejora-eficienciaenergetica-viviendas/deduccion-obras-reduccion-demanda-calefaccion-refrigeracion.html>

Tax deduction for works to improve the consumption of non-renewable primary energy

<https://sede.agenciatributaria.gob.es/Sede/vivienda-otros-inmuebles/deducciones-obras-mejora-eficienciaenergetica-viviendas/deduccion-obras-mejora-consumo-energia-renovable.html>

Tax deduction for energy rehabilitation works;

<https://sede.agenciatributaria.gob.es/Sede/vivienda-otros-inmuebles/deducciones-obras-mejora-eficienciaenergetica-viviendas/deduccion-obras-rehabilitacion-energetica.html>

Public call for grants to promote self-consumption installations with or without electrical storage using renewable energy sources, as well as thermal renewable energy systems.

Provided by: The Government of the Balearic Islands

Description: Public call for subsidies to promote self-consumption installations with or without electrical storage using renewable energy sources, as well as for thermal renewables (Balearic Islands Government, 2024):

-  Incentive Program 1: Implementation of self-consumption facilities with or without electrical storage, using renewable energy sources.
-  Incentive Program 2: Implementation of new thermal facilities (hydrothermal and/or aerothermal) for heating and/or domestic hot water in homes.

Amount: The calculation of eligible costs and aid for each program shall be calculated as follows:

A. Individual action under Incentive Program 1

-  For photovoltaic installations, the total subsidy shall be obtained according to the following expression:
 - $\text{Aid} = 600 (\text{€/kWp}) \times \text{installed generation capacity in kWp}$
-  For micro-wind installations, the total subsidy shall be obtained according to the following expression:
 - $\text{Aid} = 2,900 (\text{€/kW}) \times \text{installed generation capacity in kW}$
-  For storage installations, the total subsidy shall be obtained according to the following expression:
 - $\text{Total Subsidy} = 400 (\text{€/kWh}) \times \text{storage capacity in kWh}$

B. Individual action under Incentive Program 2

-  For renewable generation installations using hydrothermal or aerothermal systems:
 - $\text{Subsidy} = 1,600 (\text{€/kWt}) \times \text{thermal capacity of the generation installation in kWt}$, with a maximum of 9,000 euros per dwelling.

C. Combined actions under Programs 1 and 2

-  For combined actions under Program 1 and Program 2, the total subsidy shall be as follows:
 - $\text{Total Subsidy} = 1.2 \cdot (\text{Individual aid under Program 1} + \text{Individual aid under Program 2})$

Conditions:

-  Actions located within the territorial scope of the Balearic Islands and meeting the conditions established by this call shall be eligible for subsidies.
-  Actions must be carried out from June 16, 2022, until the deadline set by the granting resolution. This deadline cannot be later than July 31, 2025.

- For each technology (photovoltaic, wind, or thermal renewables), only one subsidy application per location or linked to the same consumption or consumptions may be submitted.

Read More

<https://www.caib.es/govern/sac/fitxa.do?codi=5996026&coduo=3184&lang=es>

Grants for appliance renewal

Provided by: Junta de Galicia

Description: Regulation of subsidies for the renewal of household appliances in homes located in Galicia by individuals who meet the requirements and conditions established in the provisions of this resolution (Xunta de Galicia, 2024).

Amount: The following table (table 2) establishes the maximum aid per appliance depending on its type. A beneficiary can only receive aid for the renewal of a single appliance of each type, including a maximum of two appliances per beneficiary. Maximum Amounts (€/appliance)

Table 2: Amount supported by type of appliance

	General Consumer	Vulnerable Consumer	Severely Vulnerable
Refrigerator and refrigerator-freezer with energy rating A, B, C, or D	150	300	450
Freezer with energy rating A, B, C, or D	150	300	450
Washing machine A or B (*)	100	200	300
Dishwasher A, B, or C	100	200	300
Induction hob (only induction technology)	100	200	300

(*) Includes washer-dryers as long as they have an A or B washing classification.

Conditions

- Individuals who carry out any of the actions established in Article 3 of these regulatory bases in a dwelling located in the Autonomous Community of Galicia may be beneficiaries of the grants. To be a beneficiary, you must process your application through one of the collaborating entities listed on the Inega website, www.inega.gal.

-  Individuals who meet any of the circumstances provided for in points 2 and 3 of Article 10 of Law 9/2007, of June 13, on subsidies in Galicia, cannot be beneficiaries.
-  The requirements to obtain the status of beneficiary must be met no later than the deadline for submitting applications.

Read More

https://sede.xunta.gal/detalle-procedemento?langId=es_ES&codtram=IN414C

https://www.xunta.gal/dog/Publicados/2024/20240112/AnuncioG0474-221223-0001_es.html

Subsidies for actions to improve energy efficiency in homes in the Region of Murcia

Provided by: Region de Murcia

Description: Call for subsidies, within the territorial scope of the Region of Murcia, aimed at financing actions or works to improve energy efficiency in single-family homes or those belonging to multi-family buildings (Autonomous Community of the Region of Murcia, 2022a). Investments in thermal generators using fossil fuel will not be eligible for subsidies.

Amount: The amount of the subsidy will be 40% of the eligible investment per dwelling (amount of the action), in accordance with the thresholds set forth in Article 13.2 of the Call for Subsidies Order.

Conditions: In the cost of the action, expenses of professionals' fees, project drafting, necessary technical reports and certificates, administrative processing fees, and other similar overhead costs may be included, provided they are adequately justified. However, costs of licenses, fees, taxes, or levies are excluded. Nevertheless, VAT or equivalent indirect tax may be considered eligible provided it cannot be fully or partially recovered or compensated.

The right to receive the subsidies may be assigned to the agents or managers of the rehabilitation as well as to the financial entities that have financed the implementation of the action, in accordance with the terms specified in the call for subsidies.

Date: June 17, 2022 to July 31, 2025

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[https://sede.carm.es/web/pagina?IDCONTENIDO=3783&IDTIPO=240&RASTRO=c\\$m40288](https://sede.carm.es/web/pagina?IDCONTENIDO=3783&IDTIPO=240&RASTRO=c$m40288)

[https://sede.carm.es/web/pagina?IDCONTENIDO=3783&IDTIPO=240&RASTRO=c\\$m40288](https://sede.carm.es/web/pagina?IDCONTENIDO=3783&IDTIPO=240&RASTRO=c$m40288)

Subsides for actions to improve energy efficiency in homes in the Region of Murcia

Provided by: Region of Murcia

Description: Call for simple competition, within the territorial scope of the Region of Murcia, for subsidies aimed at promoting the implementation and generalization of the Building Logbook for

existing buildings, including single-family homes, for residential buildings owned by public or private entities; as well as the drafting of technical projects for the comprehensive rehabilitation of these buildings, both in urban and rural areas (Autonomous Community of the Region of Murcia, 2022b).

Amount: For the preparation of the Building Logbook:

-  1st) In the case of single-family homes and multi-family buildings with up to 20 dwellings: 700 euros plus an amount of 60 euros per dwelling.
-  2nd) In the case of multi-family buildings with more than 20 dwellings: 1,100 euros plus an amount of 40 euros per dwelling, with a maximum subsidy amount of 3,500 euros.

If the Technical Building Inspection, Building Evaluation Report, or similar document is not available, the subsidy may be increased by up to 50%.

For comprehensive rehabilitation projects:

-  1st) In the case of single-family homes and multi-family buildings with up to 20 dwellings: 4,000 euros plus an amount of 700 euros per dwelling.
-  2nd) In the case of multi-family buildings with more than 20 dwellings: 12,000 euros plus an amount of 300 euros per dwelling, with a maximum subsidy amount of 30,000 euros.

Conditions: The amount of the subsidy may not exceed, under any circumstances, the total cost of the action, excluding taxes. However, VAT or equivalent indirect tax may be considered eligible provided it cannot be fully or partially recovered or compensated.

[Date: June 7, 2022, to July 31, 2024]

Read More

[https://sede.carm.es/web/pagina?IDCONTENIDO=3781&IDTIPO=240&RASTRO=c\\$m40288](https://sede.carm.es/web/pagina?IDCONTENIDO=3781&IDTIPO=240&RASTRO=c$m40288)

Subsidies for the preparation of the Building Book and the drafting of projects for the rehabilitation of existing buildings

Provided by: Region of Murcia

Description: Simple competition call within the territorial scope of the Region of Murcia for Subsidies aimed at promoting the implementation and generalization of the Existing Building Book, including single-family homes, for residential buildings owned publicly or privately; as well as the drafting of technical projects for the comprehensive rehabilitation of these buildings, in both urban and rural areas (Autonomous Community of the Region of Murcia, 2022c).

Amount: The amount of the Subside will be 40% of the eligible investment per dwelling (amount of the action), in accordance with the thresholds set out in Article 13.2 of the Call for Aid Order

Conditions

The cost of the action may include, provided they are duly justified, the fees of the participating professionals, the drafting of projects, necessary technical reports and certificates, expenses derived from administrative procedures, and other similar general expenses, excluding the costs of licenses, fees, taxes, or tributes. However, VAT or the equivalent indirect tax may be considered eligible as long as it is not subject to total or partial recovery or compensation.

The right to receive the subsidy may be assigned to rehabilitation agents or managers as well as to financial entities that have financed the implementation of the action under the terms set out in the call for aid.

06/17/2022 to 07/31/2024

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[https://sede.carm.es/web/pagina?IDCONTENIDO=3781&IDTIPO=240&RASTRO=c\\$m40288](https://sede.carm.es/web/pagina?IDCONTENIDO=3781&IDTIPO=240&RASTRO=c$m40288)

PROGRAM PREE 5000: Energy Rehabilitation Actions in Existing Buildings in Municipalities Facing Demographic Challenges under the Recovery, Transformation, and Resilience Plan in Extremadura.

Provided by: Autonomous Community of Extremadura

Description: Actions will fall under one of the following options based on their scope (Junta de Extremadura, 2021):

-  Option A: Incentives for interventions in entire existing buildings.
-  Option B: Incentives for interventions in one or several premises within the same building, considered individually or parts of an existing building.

Under each option, actions will be classified into one or more of the following typologies:

-  Typology 1: Improvement of energy efficiency in the thermal envelope.
-  Typology 2: Improvement of energy efficiency and use of renewable energies in heating, air conditioning, refrigeration, ventilation, and domestic hot water installations.
 - Subtypology 2.1: Replacement of conventional energy with solar thermal energy.
 - Subtypology 2.2: Replacement of conventional energy with geothermal energy.
 - Subtypology 2.3: Replacement of conventional energy with biomass in thermal installations.
 - Subtypology 2.4: Improvement of energy efficiency of generation systems not included in subtypologies 2.1 to 2.3.
 - Subtypology 2.5: Improvement of energy efficiency in subsystems for distribution, regulation, control, and emission of thermal installations.
-  Typology 3: Improvement of energy efficiency in lighting installations.

Amount: The amount of the grant will be the sum of the base grant and any additional grant that may apply.

Base Subside:

-  For Typology 1 (interventions in entire buildings):
 - Improvement of energy efficiency in the thermal envelope: 50%.
 - Improvement of energy efficiency in thermal installations: 40%.
 - Improvement of energy efficiency in lighting installations: 20%.
-  For Typology 2 (interventions in part of buildings):
 - Improvement of energy efficiency in the thermal envelope: 40%.
 - Improvement of energy efficiency in thermal installations: 30%.
 - Improvement of energy efficiency in lighting installations: 20%.

Additional Subside:

-  Based on energy efficiency criteria:
 - Improvement of energy efficiency in the thermal envelope:
 - Achievement of final rating A: 10%
 - Achievement of final rating B: 5%
 - Increase of 2 or more rating letters: 5%
 - Improvement of energy efficiency in thermal installations:
 - Achievement of final rating A: 10%
 - Achievement of final rating B: 5%
 - Improvement of energy efficiency in lighting installations:
 - Achievement of final rating A: 10%
 - Achievement of final rating B: 5%
-  Based on integrated action criteria (percentage on eligible cost):
 - Improvement of energy efficiency in thermal installations:
 - Replacement of conventional energy with solar thermal energy: 20%
 - Replacement of conventional energy with biomass in thermal installations: 15%
 - Improvement of energy efficiency of generation systems not included in subtypologies 2.1 to 2.3: 5%

- Improvement of energy efficiency in subsystems for distribution, regulation, control, and emission of thermal installations: 5%
- Improvement of energy efficiency in lighting installations: 5%.

These grants are intended to support energy efficiency improvements and the integration of renewable energy sources in existing buildings within Extremadura.

Conditions: The beneficiaries of this action may be:

-  Natural persons or legal entities of private nature who are owners of the buildings.
-  Owners who collectively own buildings that meet the requirements of Article 396 of the Civil Code and have not granted the constitutive title of Horizontal Property.
-  Companies operating, leasing, or having concessions for buildings.
-  Energy service companies or energy service providers.
-  Municipalities, local entities, minor local entities, municipal associations, and provincial councils.
-  Renewable energy communities and citizen energy communities.

Read More

<http://industriaextremadura.juntaex.es/kamino/index.php/ayudas-y-subvenciones-menu-superior/1146-root/contenidos/subvenciones/14102-listado-de-ayudas-y-subvenciones-29>

Incentive Programs for the implementation of the Thermal Renewable Energy installations in various sectors of the economy, within the framework of the recovery, transformation, and resilience plan in Extremadura

Provided by: Autonomous Community of Extremadura

Description: Incentives for the implementation of thermal renewable energy installations in the industrial, agricultural, services, and other sectors of the economy, including the residential sector (Junta de Extremadura, 2022).

Eligible Actions:

All actions aimed at implementing new renewable thermal installations, expansions, and replacements of existing production systems that supply any of the following applications or a combination thereof are eligible. These applications include, but are not limited to:

-  Thermal applications for the production of cold and/or heat in buildings: domestic hot water, heating, refrigeration, pool heating, either directly or through district heating and/or cooling microgrids.

Amount: The subsidy will be the sum of the base grant and any additional grant that may apply.

Base Subside

The base Subside will be a percentage of the eligible cost.

-  45% for small enterprises; 40% for medium enterprises; 35% for large enterprises.

Additional Subside

The base Subside will be increased by 5 percentage points when the action is carried out in municipalities facing demographic challenges. These include municipalities with up to 5,000 inhabitants and non-urban municipalities with up to 20,000 inhabitants where all their individual population entities are up to 5,000 inhabitants.

Conditions: Beneficiaries eligible if they engage in economic activities by offering goods or services in the market include:

-  Individuals (self-employed professionals).
-  Legal entities.
-  Any entity within the institutional public sector of any public administration, as well as private law entities or non-profit private organizations.
-  Groups, associations, consortia, or any other form of collaboration involving any of the entities listed above, with or without legal personality.

Read More

<http://industriaextremadura.juntaex.es/kamino/index.php/ayudas-y-subvenciones-menusuperior/1146-root/contenidos/subvenciones/14106-listado-de-ayudas-y-subvenciones-30>

Subvention for actions supporting electric mobility (MOVES III)

Provided by: Autonomous Community of Extremadura

Description: This scheme include two different programs (Extremadura Empresarial, 2024):

-  Program 1 (Incentive Program for the promotion of electric vehicle acquisition): Acquisition of plug-in electric and fuel cell vehicles. Purchases of vehicles in categories M2, M3, N2, and N3 are not eligible for subsidies.
-  Program 2 (Support Program for the deployment of charging infrastructure): Implementation of electric vehicle charging infrastructure.

Amount: For Incentive Program 1 (Electric Vehicle Acquisition):

-  The amount of the grant varies depending on the type of electric vehicle to be acquired and whether the old vehicle is scrapped. The subsidy can range from €1,100 to €7,000.

For Incentive Program 2 (Deployment of Electric Vehicle Charging Infrastructure):

-  The grant will be 70% of the eligible cost for self-employed professionals, individuals without professional activity, homeowner communities, local entities, or institutional public sector entities that do not offer goods and/or services in the market. This grant can reach up to 80% of the eligible cost for actions carried out in municipalities with fewer than 5,000 inhabitants, provided they do not exceed the limits established in the call for proposals.

Conditions: For Incentive Program 2: Implementation of electric vehicle charging infrastructure, eligible costs include:

-  Civil works.
-  Project, engineering costs, and construction management.
-  The total maximum amount allowed for the above items will be 7% of the investment considered eligible in the civil works section of the investment project submitted, plus the installations included in the project.
-  The cost of the charging infrastructure itself.
-  Installation or upgrade of any electrical components, including transformers.
-  Connection works to the distribution network.

Read More

<https://www.extremaduraempresarial.es/ayuda/subvenciones-para-actuaciones-de-apoyo-a-la-movilidad-electrica-moves-iii/>

Subsides for Thermal Renewable Energy Installations

Provided by: Autonomous Community of Castilla-La Mancha

Description: Program 1: Incentive Program for the implementation of thermal renewable energy installations in the industrial, agricultural, services, and other sectors of the economy, including the residential sector (Government of Castilla-la Mancha, 2021).

Eligible Actions: This includes all actions aimed at implementing new renewable thermal installations, expansions, and replacements of existing production systems that supply any of the following applications, or a combination thereof, as indicated below:

 Thermal applications for the production of cold and/or heat in buildings: domestic hot water, heating, refrigeration, pool heating, either directly or through district heating and/or cooling microgrids.



Amount

Table 3: Amount of subsidy by eligible actions

Elegible Actions	Maximum eligible unit cost (Ceum) ((€/kW)	Unit cost of the reference installation (Cuf) ((€/kW)	Maximum subsidized cost ((€/kW)	eligible cost (Csum)
Geothermal or hydrothermal installations	2.130	130	2.000	
Aerothermal installations	1.130	130	1.000	
Solar thermal installation	1.070	0	1.070	
Biomass combustion chamber	100	50	50	
Biomass boilers and local heating appliances	500	70	430	
Development of new distribution pipeline networks and exchange substations or expansion of existing ones for new or existing generation plants	450	0	450	

Conditions: The installations carried out must comply, where applicable, with the requirements established in the Regulation of Thermal Installations in Buildings (RITE), approved by Royal Decree 1027/2007, of July 20, and Royal Decree 178/2021, of March 23, which updates it, as well as any other regulations applicable to them. Projects investing in installations whose main equipment is not new or has had previous use will not be eligible for aid. Main equipment refers to the production equipment that defines the renewable energy technology.

Installations using heat pumps must achieve a seasonal performance factor (SPF) greater than 2.5 for heating applications.

Read More

<https://www.castillalamancha.es/gobierno/desarrollosostenible/estructura/dgtranene/actuaciones/ayudas-instalaciones-de-energ%C3%AD-renovables-t%C3%A9rmicas#relacionados>

Non-repayable Subsidies and Qualified Loans with Interest Subsidies for Individuals for Specific Accessibility Components, and Qualified Loans for Comprehensive and Efficient Community Rehabilitation Works.

Provided by: EUSKADI / PAIS VASCO

Description: Qualified Loans for Comprehensive and Efficient Community Rehabilitation Works (Basque Country Department of Territorial Planning, Housing and Transport, 2021). Non-repayable Grants and Qualified Loans with Interest Subsidies for Individuals for Specific Accessibility Components

Amount: Based on family income and the type of work to be carried out, the non-repayable grants vary from 45% to 75%.

Conditions: Both the application for Qualified Loans for comprehensive and efficient community rehabilitation works, and the application for non-repayable grants and qualified loans with interest subsidies for individuals for specific accessibility components, can be submitted once the project receives technical approval from the Housing, Land, and Architecture Directorate

Read More

<https://www.euskadi.eus/servicios/0048214/web01-tramite/es/>

<https://www.euskadi.eus/web01-bopv/es/bopv2/datos/2021/09/2104690a.pdf>

Subsidies and Qualified Loans for COMMUNITY WORKS (LINE 2) under the financial measures program for eligible actions in the rehabilitation of housing, buildings, accessibility, and energy efficiency.

Provided by: EUSKADI / PAIS VASCO

Description: Supporting the rehabilitation of community-owned properties to improve habitability, enable access for people with disabilities, and reduce energy consumption (Basque Country Government, 2021).

Supported Actions:

-  Structural and constructive adaptation of buildings and improvement of habitability conditions in residential and commercial premises.
-  Adaptation of housing units and their access to current regulations for individuals with physical disabilities.
-  Thermal envelope interventions for energy savings.

-  General finishing adjustments of buildings and housing units according to principles of good construction practices.

Amount: Conservation, Safety, and Habitability Works:

-  Isolated Rehabilitation: 40% of the eligible budget, with a maximum of the lesser of €2,500 per dwelling or €25,000 per building entrance.
-  Integrated Rehabilitation: 50% of the eligible budget, with a maximum of the lesser of €3,000 per dwelling or €30,000 per building entrance.

Energy Efficiency Improvement:

-  Achieving at least a 30% reduction in CO₂ emissions and reaching energy efficiency rating D: up to 40% of eligible budget, capped at €50,000.
-  Achieving a 50% reduction in CO₂ emissions and reaching energy efficiency rating C: up to 50% of eligible budget, capped at €65,000.

Conditions: Individuals or entities meeting any conditions specified in paragraphs 2 and 3 of Article 13 of Law 38/2003 of November 17, General Subsidies Act, or applicable regulations replacing it, cannot access financial measures or qualify as beneficiaries.

Individuals or legal entities penalized criminally or administratively with the loss of eligibility for subsidies or public assistance, or subject to legal prohibitions that disqualify them, including those resulting from sex discrimination as per the Sixth Final Provision of Law 4/2005, of February 18, for Gender Equality, also cannot access these measures.

Financial measures for rehabilitation are available to individuals or legal entities, whether public or private, joint ownership communities, or other forms of economic or separate asset entities without legal personality, holding ownership, leasing, usufruct, or any other title granting enjoyment rights over the properties to be rehabilitated.

Owners of buildings must have completed the Technical Building Inspection (ITE) before formalizing their application, with registration at the respective Municipality, regardless of the building's age.

Read More

<https://www.euskadi.eus/rehabilitacion-comunidad/web01-tramite/es/>

Program for Subsidies in Energy Efficiency Investments, Renewable Energies, and Efficient Mobility

Provided by: EUSKADI / PAIS VASCO / ENTE VASCO DE LA ENERGÍA

Description: The Subside program aims to promote actions that encourage the potential use of renewable energies in residential buildings, as well as energy savings and efficiency in the

distribution subsector within the service sector (Basque Country Energy Entity, 2024a). It also focuses on energy savings, efficiency, and the use of renewable energies in facilities and buildings, rationalizing energy consumption, and reducing dependence on petroleum in transportation and mobility of individuals across various sectors in the Autonomous Community of Euskadi.

-  Subprogram 5 Subsidies - Feasibility studies for the implementation of renewable energies in residential community properties

Amount: The subsidy amount to be awarded will be a percentage of eligible costs. For this line, 80% of eligible costs is established.

The maximum amount of the Subside will be €600 plus €40 per dwelling, with the total Subside not exceeding €3,000.

Conditions: Subprogram 5 Subsidies: Feasibility Studies for Implementing Renewable Energies in Residential Community Properties.

-  Feasibility studies for implementing renewable energies in the residential sector through the renovation of communal heating generation rooms using natural gas and/or diesel C.

The subsidies received by beneficiaries under Subprogram 5 actions will be incompatible with other subsidies or aids that may be granted for the same purpose from any national, European Union, or international public or private administrations or entities.

Read More

<https://www.eve.eus/Programa-de-ayudas/2020/Programa-de-ayudas-a-inversiones-en-eficiencia-ene.aspx>

<https://www.euskadi.eus/bopv2/datos/2024/05/2402271a.pdf>

Improvement of Accessibility to and within Housing 2023

Provided by: Autonomous Community of the Canary Islands

Description: Rehabilitation of Homes to Improve Accessibility and Modernize Interior Installations in (Government of Canarias, 2019):

-  Detached or row-grouped single-family homes, whether urban or rural.
-  Homes located in residential collective buildings.

Amount: The beneficiaries will receive a grant covering fifty percent (50%) of the eligible cost of the intervention, with a maximum amount per dwelling of €6,000.

Conditions: The homes must serve as the habitual residence of their owners or tenants at the time of applying for the aid. This circumstance must be evidenced through a certification or registration certificate.

For accessibility interventions, it must be demonstrated that at least one member of the household is a person with a disability or over 65 years of age.

Read More

<https://sede.gobiernodecanarias.org/sede/tramites/5976>

Subside for the Compilation of the Existing Building Book for Rehabilitation and the Preparation of Rehabilitation Project Designs

Provided by: Autonomous Community of the Canary Islands

Description: The purpose of this program is to promote the implementation and widespread adoption of the Existing Building Book for rehabilitation (Intituto Canario de la Vivienda, n.d.). It offers a subsidy to cover part of the professional fees for its issuance, as well as for the development of comprehensive building rehabilitation projects within established limits. The goal is to stimulate significant and high-quality energy rehabilitation demand in buildings, in line with European objectives, and to boost activity in this sector in the medium and long term.

Amount



Subsidy Maximum Amount for Existing Building Books for Rehabilitation:

- For single-family homes and multi-family buildings with up to 20 units: €700, plus €60 per dwelling.
- For multi-family buildings with more than 20 units: €1,100, plus €40 per dwelling, with a maximum subsidy of €3,500.
- If there is no Technical Building Inspection (ITE), Building Assessment Report, or similar document available, the grant may increase by up to 50%.



Maximum Subsidy Amount for Comprehensive Building Rehabilitation Technical Projects:

- For single-family homes and multi-family buildings with up to 20 units: €4,000, plus €700 per dwelling.
- For multi-family buildings with more than 20 units: €12,000, plus €300 per dwelling, with a maximum subsidy of €30,000.

Conditions: Recipients eligible for this program include:

- Owners or usufructuaries of single-family homes, whether detached or row-grouped, and existing residential collective housing buildings, whether they are individuals or have legal personality of a private or public nature.

- Communities of property owners, or groupings of property owners established in accordance with Article 5 of Law 49/1960, of July 21, on Horizontal Property.
- Owners who, collectively, own buildings meeting the requirements established by Article 396 of the Civil Code and have not established the horizontal property regime.

Read More

<https://sede.gobiernodecanarias.org/sede/tramites/7251>

https://www.gobiernodecanarias.org/vivienda/destacados/Reha_libro_Edif_V2.html

Subsidies for the Use of Renewable Energies and for Energy Saving and Efficiency Actions in the Principality of Asturias for the year 2024.

Provided by: Principality of Asturias

Description: Promotion of Renewable Energy Use (Agencia de Ciencia, Competitividad Empresarial e Innovación Asturiana, 2024):

-  Use of biomass as fuel for thermal energy production: private companies and self-employed individuals, individuals, non-profit entities, and property communities.
-  Geothermal systems for thermal energy production (heat and/or cold): private companies and self-employed individuals, individuals, non-profit entities, and property communities.

Section 2. Promotion of Energy Savings and Efficiency:

-  2.2. Measures in the building sector: private companies, self-employed individuals, non-profit entities, and property communities.
-  2.8. Installation of alternative fuel refueling stations accessible to the public: private companies legally accredited and registered for the supply of fuel activities as determined by applicable regulations.

Amount: For the use of biomass as fuel for thermal energy production:

-  The subsidy amount will be up to 30% of the eligible expenses, and will not exceed the maximum amount of aid established in each call.

For geothermal systems for thermal energy production (heat and/or cold):

-  The subsidy amount will be up to 25% of the eligible expenses and will not exceed the maximum amount established in each call.

Conditions: Use of Biomass as Fuel for Thermal Energy Production - The installation of new boilers using biomass as fuel will be subsidized, provided they meet one of the following conditions:

-  Automatic boilers with a minimum efficiency of 85% maintained at both full load and partial load of 30%.
-  Automatic boilers in low-temperature (condensing) installations with a minimum efficiency of 95% maintained at both full load and partial load of 30%.
-  Non-automatic boilers with a minimum efficiency of 75% at full load.

For existing biomass boilers, the following will be subsidized:

-  Installation of fuel feeding and storage systems.
-  Replacement or expansion of existing fuel feeding and storage systems to enable the use of a different type of biomass.

Geothermal Systems for Thermal Energy Production (Heating and/or Cooling):

-  New installations, as well as the renovation or expansion of existing ones, utilizing heat pump systems for geothermal exchange in thermal energy production (heating and/or cooling) will be subsidized. Horizontal or vertical capture systems, as well as open or closed loop exchange systems, are eligible.

Read More

https://www.idepa.es/detalle-ayuda/-/asset_publisher/EorU9gEBOv3g/content/ayuda-no-idepa-subsenciones-para-el-uso-de-energias-renovables

<https://sede.asturias.es/bopa/2024/04/11/2024-02985.pdf>

Program for Subsidies to Investments in Energy Efficiency, Renewable Energies, and Efficient Mobility

Provided by: BASQUE COUNTRY

Description: The subsidies program aims to promote actions that seek to encourage the potential use of renewable energies in residential buildings, as well as savings, energy efficiency in the distribution subsector within the service sector, savings, and energy efficiency and use of renewable energies in facilities and buildings, rationalization of energy consumption, and reduction of oil dependency in transportation and mobility of people in various sectors of the Autonomous Community of Euskadi (Basque Country Energy Entity, 2024b).

Subprogram 5 – Feasibility Studies for the Implementation of Renewable Energies in Residential Homeowners' Communities.

Amount: The amount of subsidy to be granted will be a percentage of the eligible costs. For this Line, 80% of the eligible costs is established. The maximum amount of the subsidy will be 600 euros plus 40 euros per dwelling, without the result exceeding 3,000 euros in subsidy.

Conditions: The subsidy to be received by beneficiaries for the actions of Subprograms 1, 4, and 5 will be incompatible with other grants or aid that may be granted for the same purpose, coming

from any administrations or public or private entities, national, European Union, or international organizations. In any case, regardless of the availability of the budget, the deadline for submitting aid applications will be October 31, 2024, even if there is budget available in the call.

The subsidized actions must be executed and invoiced no later than December 31, 2024.

Read More

<https://www.eve.eus/Programa-de-ayudas/2020/Programa-de-ayudas-a-inversiones-en-eficiencia-ene.aspx>

<https://www.euskadi.eus/bopv2/datos/2024/05/2402271a.pdf>

Subsidies for Improving Energy Efficiency in Homes

Provided by: Junta de Castilla La Mancha

Description: Program 3: Subside for Improving Energy Efficiency in Residential Buildings. The aid consists of financing actions or works to improve energy efficiency in predominantly residential buildings, particularly concerning the building envelope in collective residential buildings (Government of Castilla-la Mancha, 2024). Actions that involve improving energy efficiency and, additionally, accessibility and conservation improvements can be subsidized as long as they meet the energy-saving criteria.

Through the subsidized actions, a reduction of at least 30 percent in non-renewable energy consumption, as indicated by energy certification, must be achieved. Additionally, in buildings with C, D, and E certifications, a reduction in the overall annual energy demand for heating and cooling of at least 35 percent in climate zones D and E and 25 percent in climate zone C must be achieved for single-family homes or the building as applicable.

Program 4: Subsidies are available for actions carried out in single-family homes or apartments within multi-family buildings, where a reduction of at least seven percent in the overall annual energy demand for heating and cooling or a reduction of at least 30 percent in non-renewable primary energy consumption is achieved. Actions to modify or replace constructive elements of the thermal envelope to meet the limit values for thermal transmittance and air permeability are also eligible for subsidies.

Amount: Program 3: The amount of aid will depend on the energy savings achieved, reaching up to 80 percent of the action's cost with a maximum of 26,750 euros. Additionally, homeowners in a building undergoing rehabilitation who are in a situation of economic vulnerability may receive specific and additional aid of up to 100 percent of the cost. The application period for subsidies will start on Friday, May 24, and end on August 30, 2024.

Program 4: The amount of aid will be 40 percent of the cost of the subsidized action, with a total maximum limit of 3,000 euros. The application period for subsidies will start on Friday, May 24, and end on August 30, 2024.

Conditions: Through the subsidized actions, a reduction of at least 30 percent in non-renewable energy consumption, as indicated by energy certification, must be achieved. Additionally, in buildings with C, D, and E certifications, a reduction in the overall annual energy demand for heating and cooling of at least 35 percent in climate zones D and E and 25 percent in climate zone C must be achieved for single-family homes or the building as applicable.

Read More

<https://www.castillalamancha.es/actualidad/notasdeprensa/el-gobierno-regional-aprueba-una-nueva-convocatoria-de-ayudas-por-valor-de-165-millones-de-euros>

<https://www.jccm.es/sede/tramite/LSN>

Granting of Subsidies for Energy Savings and Efficient Use through the Implementation of the Aragon 2024 Renewal Plan for Household Appliances and Heat, Cold, and Hot Water Production Equipment

Provided by: Government of Aragon

Description: Subsidies for the acquisition of new appliances and equipment, with the following categories, replacing less efficient or more polluting ones (Government of Aragon, 2024):

-  High-efficiency household appliances with the following minimum performance:
 - Refrigerator and fridge-freezer, category D or higher.
 - Freezer, category D or higher.
 - Washing machine, category C or higher.
 - Dishwasher, category D or higher.
 - Full induction cooktops.
 - Oven, energy class A+ or higher.
-  Individual air conditioning units with energy classification A+ or higher in cooling and at least A in heating, requiring installation, and operating in cold or cold/heat mode with a nominal cooling capacity of 12 kW or less.
-  Condensing sealed boilers for individual use, either heating only or mixed, with energy classification A or higher, using natural gas or LPG, with a maximum power of 70 kW and low NOx emissions (Class 6 or higher).

Amount: The individualized amount of the subsidy to be granted will be a fixed amount per type of appliance or equipment, to be deducted from the purchase price.

These amounts are specified in Article 7, point 4 of the Call Order.

The amount of aid shall not exceed 25% of the cost of the corresponding appliances or equipment (excluding VAT). Additionally, the amount of the subsidy shall not exceed the acquisition cost of the appliance, even when combined with other subsidies, aids, incomes, or resources. The subsidies will be per type of appliance or equipment and will be compatible with each other.

Conditions:

- Beneficiaries of the subsidy will be individuals who purchase household appliances and heat, cold, and hot water production equipment. These individuals will apply for aid through retailers or installation companies affiliated with the "Aragon 2024 Renewal Plan."
- Beneficiaries will receive the subsidy through the application of the corresponding discount on the purchase price.
- Subsidy is only available to acquire one appliance or equipment of each indicated type, replacing another with lower energy efficiency and/or more polluting. Additionally, the collection location of the replaced appliance or equipment and the delivery/installation location of the new appliance or equipment must be within the Autonomous Community of Aragon.
- The replaced appliance cannot be reused and must be managed as waste, which must be accredited under the terms specified in Article 11 of the Call Order.

Read More

<https://www.aragon.es/-/plan-renove-aragon-2024-1>

Appliance Renewal Plan to Promote Energy Savings**Provided by**

Government of La Rioja

Description

Individuals or private legal entities who purchase an appliance specified in this Order from any retail establishment participating in the Appliance Renewal Plan are eligible for subsidy through a corresponding discount applied to the purchase price (Government of La Rioja, 2021). Eligible appliances include:

-  Refrigerator or fridge-freezer with an energy efficiency class of D or higher
-  Freezer with an energy efficiency class of E or higher
-  Washing machine with an energy efficiency class of C or higher
-  Washer-dryer with an energy efficiency class of E or higher
-  Dishwasher with an energy efficiency class of E or higher
-  Dryer with an energy efficiency class of A++ or higher

-  Oven with an energy efficiency class of A+ or higher
-  Induction cooktops
-  Extractor hoods with an energy efficiency class of A+ to A+++

Amount: The subsidy consists of a 25% discount on the purchase price of the appliance (including VAT) provided by the participating establishment, up to a maximum of 150 euros per appliance.

Conditions: Subsidized actions include the acquisition of energy-efficient appliances within any of the categories established in the corresponding call. To qualify for the aid, the following conditions must be met in addition to purchasing one of the specified appliances:

-  The appliance must replace another appliance of the same type with lower energy efficiency within the validity period established in the call.
-  The appliance must be purchased from a retail establishment located within the territory of the Autonomous Community of La Rioja that has joined the Plan.
-  The appliance must be delivered and/or installed in a residence located in any municipality of La Rioja.
-  The replaced appliance must be managed as waste, as accredited according to the provisions of this Order.

Read More

<https://www.larioja.org/industria-energia/es/renove-electrodomesticos-2024>

https://ias1.larioja.org/cex/sistemas/GenericoServlet?servlet=cex.sistemas.dyn.portal.ImgServletSis&code=oumCvWlgBUF6lChv9ZDgP_hXhSM_FmcHifhNqDxY1-DApHyqPVxRsoD-HWoE2YV6LEXZYSr1AOHO%0AB6uARfgu8FARoTjX1_rwS13w34QVisg%3D

Subside program for building-level Rehabilitation actions

Provided by: Community of Madrid

Description

The Subsidy program for building-level rehabilitation actions is focused on improving the energy efficiency of multi-family residential buildings and single-family homes (Comunidad de Madrid, 2021).

Amount

The Subsidy covers 40%, 65%, and 80% of the costs of the actions, with maximum amounts per dwelling of €6,300, €11,600, and €18,800, respectively, depending on the savings in non-renewable primary energy resulting from these improvements.

This aid will be increased if asbestos elements are removed, up to a maximum of €1,000 per dwelling or €12,000 per building.

Conditions

The following entities are eligible to receive the aid, in accordance with the specific criteria for each program under the "final recipients of the aid":

-  Owner or usufructuary (individual or legal entity) of an isolated or row single-family home, or buildings of collective residential typology (Programs 3, 4, and 5)
-  Community of Property Owners or Group of Communities of Property Owners (Article 5 of Law 49/1960) (Programs 3 and 5)
-  Grouped Owners (Article 396 of the Civil Code) (Programs 3 and 5)
-  Operating company, lessee, or concessionaire of a building (Program 3)
-  Cooperative societies (Article 396 of the Civil Code) (Programs 3 and 5)

Read More

<https://www.comunidad.madrid/servicios/vivienda/ayudas-actuaciones-rehabilitacion-energetica-edificios-residenciales-viviendas-prtr#panel-313810>

2.3.2 PRIVATE FINANCING SCHEMES

Prestamo Verde (Energy Efficiency loan by Santander Bank)

Provided by

Banco Santander

Description

This is a loan for householders' communities wishing to finance reforms or energy efficiency improvements in their buildings, with the aim of achieving savings in their utility bills and also making a positive contribution to the environment.

Amount

-  The amount will be the lesser of:
 - 30,000 euros per housing.
 - The amount of the total budget (VAT included) minus the amount of aid already received (if applicable) for the same refurbishment project through any Public Aid Program.
-  Repayment period: up to 10 years, including the grace period.
-  Capital grace period:

- 1 year grace period in these cases:
 - If the execution of the refurbishment project lasts more than 9 months.
 - If the rehabilitation is financed over a period of more than 4 years.
- Monthly amortisation:
 - During the grace period, payment of monthly interest instalments.
 - During the amortisation period, payment of constant monthly instalments of capital and interest (French amortisation system).
 - Payment of instalments coinciding with the day on which the loan is formalised.

 Interest rate: fixed annual nominal interest rate 4.75% (APR 4.85%⁽²⁾).

 No fees:

- Opening commission: 0%.
- Early cancellation fee: 0%, to facilitate the repayment of the loan in the event that the homeowners' association obtains a subsidy or aid from public funds.

Read More

<https://www.bancosantander.es/santander-sostenible/prestamo-verde-eficiencia-energetica-comunidadpropietarios>

Green loan by Bankinter

Provided by

BANKINTER

Description

Loan for both small one-off refurbishments and for more important refurbishments involving a larger investment (Bankinter, n.d.).

Amount

From 4,000 to 30,000 euros and with a repayment period of between 24 and 120 months. During this period, the loan will be paid in monthly instalments.

The financial conditions of the loan (T.I.N. and T.A.E.) may vary depending on the customer's credit profile and the application process chosen by the customer. The financial conditions finally applied will be those determined at the time of contracting the loan. Amount to be requested from €4,000

to €30,000, for a minimum term of 24 months up to 120 months. For amounts between €4,000 and €8,000 the maximum term is 60 months, for amounts between €8,000 and €30,000 the maximum term is 120 months. Constant instalment repayment system. No arrangement fee.

Read More

<https://www.bankinterconsumerfinance.com/financiacion/prestamos/prestamo-reforma>

Green Loan by BBVA bank

Provided by

BBVA

Description

The main requirement for the approval of BBVA's Energy Efficiency Loan is that the funds provided by the institution must be used exclusively for sustainable purposes, as detailed below (BBVA, n.d.). In this regard, BBVA has defined a series of sustainable projects that can be covered with this loan. Interested individuals will need to provide BBVA with a budget or proforma invoice with the amount and details justifying its purpose.

-  Acquisition of A++ or A+++ rated appliances (former labeling between A+++ and D) and A or B (new labeling between A and G).
-  Installation of heating and hot water systems, using condensing or biomass boilers and A++ or A+++ heat pumps (former labeling between A+++ and D) and A or B (new labeling between A and G).
-  LED lighting.
-  Automation of on/off systems.
-  Presence detection for lighting connection.
-  Facade insulation and window replacement.
-  Solar panels for self-consumption.
-  Bicycles (with or without a motor) and electric scooters.
-  Installation of charging points for electric vehicles.
-  Acquisition of electric or hybrid vehicles with emissions equal to or less than 75 g CO₂/km.

Amount

This loan can provide you with an amount ranging from a minimum of 3,000 euros to a maximum of 75,000 euros, adapting to the financial needs of your projects and renovations (towards a more sustainable home) or those related to ecological mobility.

You will also have a repayment period of two to eight years

Read More

<https://www.bbva.es/finanzas-vistazo/ef/prestamos/asi-es-el-nuevo-prestamo-eficiencia-energetica-bbva.html>

Green loan by KUTXABANK

Provided by: KUTXABANK

Description: The Kutxabank Energy Efficiency Loan allows you to obtain financing in two different modalities, fixed and variable. In both cases, you can have a grace period of up to two years (Kutxabank, n.d.).

Actions that can be included:

-  Green Technologies
-  Lighting
-  Air Conditioning
-  Facade Renovation
-  Thermal Insulation

Amount: In the case of the fixed modality, the homeowner can obtain a financing period of up to 10 years with an interest rate of 6.50% (6.70% APR).

In the case of the variable modality, this can be up to 15 years, and the interest rate will be Euribor + 1.99%.

Read More

<https://clientes.kutxabank.es/es/prestamos/eficiencia-energetica.html>

Green Loan by Caixa Bank

Provided by: CAIXA BANK

Description: It is a line subscribed between the EIB (European Investment Bank) and CaixaBank, aimed at facilitating financing for Property Communities for investment in projects to improve Energy Efficiency and Renewable Energy measures (CaixaBank, n.d.).

This line is guaranteed by the EIB under the EU Program (LIFE-"PF4EE" PRIVATE FINANCE FOR ENERGY EFFICIENCY).

The beneficiaries must be Property Communities located in Spain that make investments in projects improving energy efficiency and renewable energy.

Measures related to building renovation (excluding financing for these measures in new buildings):

-  Renovation of the building's cladding insulation.
-  Replacement of windows or doors.
-  Replacement of old boilers with high-efficiency boilers for space/DHW heating.
-  Replacement of old heating systems with geothermal, air, or water heat pumps.
-  Smart meters for existing buildings.

-  Replacement of old air conditioning systems with energy-efficient ones (split units).
-  Replacement of old light bulbs with efficient ones.
-  Energy recovery systems for waste.
-  Replacement of old heating systems with cogeneration systems.
-  Fixed or mobile external sun protection systems.
-  On-site renewable energy production for self-consumption in existing buildings (excluding financing for these measures in new buildings):
-  Solar thermal systems for space heating or for space heating and cooling.
-  Replacement of solar thermal systems for domestic water.
-  Renewable energy projects: solar photovoltaic projects will be eligible if more than 50% of the produced electricity is for self-consumption.
-  Biomass or biogas systems.
-  Solar thermal systems for domestic water.

Amount

Maximum financing amount

80% of the project cost with a limit of €500,000.

Standard loan: 2 to 8 years with no capital grace period.

Loan by disbursements: 2 to 8 years with the option to include up to 12 months of principal grace period without exceeding the maximum loan duration of 8 years.

Read More

<https://www.caixabank.es/empresa/negocios/comunidades-propietarios/prestamo-sostenible-bei.html>

Green loan by UNICAJA BANCO

Provided by: UNICAJA BANCO

Description: The eligible actions for financing are as follows (Unicaja, n.d.):

-  Improvement of the energy efficiency of the thermal envelope.
-  Improvement of energy efficiency and the use of renewable energy in thermal facilities for heating, air conditioning, cooling, ventilation, and domestic hot water.
-  Improvement of the energy efficiency of lighting installations.

Amount: Finance up to 100% of the renovation, with no limit

Pay it in convenient installments for up to 10 years

The Property Community has up to 10 years to repay the loan, with the option of a 6-month capital grace period.

Read More

<https://www.unicajabanco.es/es/empresas-y-autonomos/financiacion/a-medio-largo-plazo/prestamo-rehabilitacion-energetica-comunidades-de-propietarios>

3. LEGAL AND REGULATORY FRAMEWORK

The present chapter explores the legal and regulatory frameworks of Italy, Portugal, and Spain. National-scale policies, legislation, and requirements and, when relevant, regional and municipal regulatory requirements related to energy renovation-related measures.

-  Licensing process for home renovation in each country, with identification of key steps and bottlenecks;

3.1 ITALY

3.1.1 SPACE HEATING AND/OR COOLING SYSTEMS

This intervention typology includes measures in space heating and cooling systems, through the optimization of existing systems or their replacement by high-efficiency systems. Table 4 summarizes the regulations applicable to these interventions. The following requirements may be applicable to space heating and cooling:

General requirements:

- Outdoor units must be installed in such a way as not to cause visual or acoustic disturbance to neighbours. It is important to consider optimal placement that avoids obstructing the view or creating excessive noise.
- Particularly relevant for historic buildings or buildings located in historic city centers, the installation must not compromise the aesthetics of the building.
- The installation must not damage the view of other condominiums, carefully positioning drains and motors.
- Municipal regulations may impose specific restrictions, such as the prohibition of installing outdoor units on façades visible from the street or the obligation to use colours that harmonize with the aesthetics of the building. These standards are often stricter in areas of particular historical or artistic value.
- Consulting with an expert in HVAC (heating, ventilation, and air conditioning) systems can provide additional information on how to implement these solutions effectively, ensuring that the installation complies with all local and condominium normative.
- Since they are included in the group of equipment containing fluorinated gases , they can only be installed by a professional who has a certificate for the management of this type of gas and who works in an installation company authorized to carry out installations of appliances with this type of gas.
- Request a technical certification (“asseverazione”), drawn up by a qualified technician, certifying compliance with the specific technical requirements and technical data sheets of the installed systems;
- The national and local regulations in force on urban planning, construction, energy efficiency and safety (systems, environment, work) must be respected.

Authorization from the condominium (in common parts):

- The installation of an air conditioning must still comply with the Condominium Regulations and certain regulations that safeguard both the aesthetics and the common quiet.
- The installation of air conditioning in a condominium must respect the architectural decorum of the building and legal distances, avoid dripping water, noise and heat emissions in neighbours' homes.
- **External units:** consider the possible impact on the decor of the entire condominium. To mitigate the overall impact on the decor, you can paint the entire system with the colours of the condominium facade.
- In the absence of other suitable places and always in compliance with the municipal and condominium regulations, the individual condominium owner can install the air conditioner on the common roof if this is not already intended for another use. In these cases, it is necessary to make a preventive communication to the condominium administrator and provide a technical report.
- Normally, it is not necessary to make a request to the condominium or obtain the consent of the assembly for the installation of the air conditioner, however, if the air conditioner has an external element, it is advisable, before starting the work, to send a written or email communication to the condominium administrator.
- Declaration of consent of the owner for the execution of the works, in case these are carried out by the owner of the building;
- Distances must be respected: If you want to place the external unit on a wall where there are direct or oblique views, it must stop at least three meters below the window threshold. The pipes must respect the distance of at least one meter, however, according to a minority interpretation, these distances do not have to be respected if the air conditioners are removable and small in size.

Special rules on majorities in condominiums (first and second call):

- Adoption of thermoregulation and heat metering systems for the centralized heating system and consequent distribution of heating costs based on the consumption actually recorded:
 - Number of votes in favor (Condomini totali/interv.): 50% + 1 attendees;
 - Value of votes in favour (Millesimi): at least 500/1000 (1/2).

Responsible for the system:

- In general, the person responsible for the heating system is the owner of the system. However, there are the following special situations:
 - In the case of rented buildings, the tenant is responsible.
 - In the case of centralized systems, the condominium manager is responsible.
 - In the case of buildings owned by persons other than natural persons, the responsible party is the owner or managing director.
- It is mandatory for the customer and/or owner of the system to submit the declaration of conformity or that of compliance whenever he requests a new supply (or an upgrade of the existing one) of water, gas, electricity, as well as the certificate of occupancy for a given environment. (Decree no. 37 of 22 January 2008)

- Maintenance of the systems: The owner of the plant has the obligation to maintain the same.

Waste Electrical and Electronic Equipment:

- Household WEEE is divided into five groups (*Decree No. 40 of 20 February 2023*):
 - Group 1 - Equipment for exchanging temperatures with fluids (Refrigerators; freezers; appliances automatically dispensing cold products; air conditioners, dehumidifiers, heat pumps; oil-filled radiators; other equipment for exchanging temperatures with fluids other than water; tumble dryers.
- Citizens have several ways to start a correct disposal: they can personally take the WEEE to a municipal collection center (the so-called ecological island) or, if the Municipality carries out the service, ask for it to be collected at home. But you can also hand over the WEEE to the physical or online seller from whom you purchased the new appliance (so-called "one-for-one collection"). All this is free of charge, because citizens already pay a contribution for disposal. (Maggioni & Chiozzotto, 2024)
- By law, the take-back of WEEE may be refused under certain special conditions, for example if the appliance may pose a health risk to the personnel in charge of the collection.

Warranty (Product):

- Legal guarantee of conformity: For new goods, the duration of the legal guarantee is two years and starts from the delivery of the goods. It covers any lack of conformity of the goods both with respect to the functionality requirements and with respect to what was promised by the seller or by the advertising of the product and guarantees the defects existing at the time of delivery, i.e. the original defects that manifest themselves within 24 months of delivery. For second-hand goods, the seller and the buyer may agree to provide for a shorter period of liability but, in any case, not less than one year.
- In any case, the consumer has 26 months from the delivery of the goods to assert his rights.
- Commercial guarantee: The commercial or conventional warranty is in addition to the guarantee of conformity, and is recognized by the Consumer Code Legislative Decree 206/05 in art. 135d as the undertaking by the manufacturer or seller to reimburse the price paid, replace, repair, or otherwise intervene on the goods, if they do not correspond to the characteristics or other requirements that are not related to conformity set out in the warranty declaration or in the related advertising. The commercial guarantee is not mandatory, as is the case with the legal guarantee, but it is optional. The duration is variable and can range from 6 months to 10 or more years from the time of purchase of the goods and the duration is decided by the manufacturer or seller who grants the warranty.
- The conventional warranty statement must be provided to the consumer in writing on a durable medium and in Italian at the latest at the time of delivery of the goods.

Systems:

- Check that the materials/equipment are CE marked.
- Check the energy label and prefer, whenever possible, higher class equipment:

- For local space heaters, ratings go from G (least efficient) to A++ (most efficient). (Regulation: Labelling regulation for local space heaters (EU) 2015/1186)
- Air conditioners, ratings go from D to A+++ (Regulation (EU) No 626/2011 of 4 May 2011).
- Space or water heater comes with an energy label showing its energy efficiency class. For individual products, ratings go from G (least efficient) to A++ (most efficient). It is also possible to buy a combination of technologies, such as a boiler with a solar hot water storage tank, in order to reach an A+++ energy efficiency rating (Regulation (EU) 811/2013 of 18 February 2013 and Regulation (EU) 812/2013 of 18 February 2013).
- Solid fuel boilers with a rated heat output of 70 kW or less are labelled on an energy efficiency scale ranging from A+++ (most efficient) to D (least efficient). (Energy Labelling Regulation EU 2015/1187).

Table 4: Italian and EU regulations applied to space heating and/or cooling systems.

Applicable legislation	
Decree no. 256 of 23 June 2022	Minimum environmental criteria for the assignment of the design service of building interventions, for the assignment of works for building interventions and for the joint assignment of design and works for building interventions.
Interministerial Decree of 26 June 2015	Adaptation of national guidelines for the energy certification of buildings.
Decree of 8 November 2019	Approval of the technical regulation of fire prevention for the design, construction and operation of plants for the production of heat fuelled by gaseous fuels.
Legislative Decree no. 163 of 05/12/2019	Penalties for infringement of the provisions of Regulation (EU) No 517/2014 on fluorinated greenhouse gases and repealing Regulation (EC) No 842/2006.
D.P.R. 16/11/2018, n. 146	Regulation implementing Regulation (EU) No 517/2014 on fluorinated greenhouse gases and repealing Regulation (EC) No 842/2006.
Regulation (EU) No 517/2014 of the European Parliament and of the Council of 16 April 2014	On fluorinated greenhouse gases and repealing Regulation (EC) No 842/2006.
Regulation (EU) 2024/573 of the European Parliament and of the Council of 7 February 2024	On fluorinated greenhouse gases, amending Directive (EU) 2019/1937 and repealing Regulation (EU) No 517/2014.
Commission Regulation (EC) No 1516/2007 of 19 December 2007	Establishing, pursuant to Regulation (EC) No 842/2006 of the European Parliament and of the Council, standard leakage checking requirements for stationary refrigeration, air conditioning and heat pump equipment containing certain fluorinated greenhouse gases.

Decree of the President of the Republic no. 74 of 16 April 2013	Regulation defining the general criteria for the operation, operation, control, maintenance and inspection of heating systems for the winter and summer air conditioning of buildings and for the preparation of hot water for sanitary uses, in accordance with article 4, paragraph 1, letters a) and c), of the legislative decree of 19 August 2005, n. 192.
Decree-Law no. 63 of 4 June 2013	Urgent provisions for the transposition of Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings for the definition of infringement procedures initiated by the European Commission, as well as other provisions on social cohesion.
Decree 22 November 2012	Amendment of the Decree of 26 June 2009 on 'National guidelines for the energy certification of buildings'.
Ministerial Decree of 10 February 2014	Which introduces and defines the new model of system booklet for air conditioning and the energy efficiency control report.
Decree no. 37 of 22 January 2008	Regulation concerning the implementation of Article 11- quaterdecies, paragraph 13, letter a) of Law no. 248 of 2 December 2005, reorganizing the provisions on the installation of systems inside buildings.
Legislative Decree No. 311 of 29 December 2006	Corrective and supplementary provisions to Legislative Decree no. 192 of 19 August 2005 implementing Directive 2002/91/EC on the energy performance of buildings.
Legislative Decree no. 192 of 19 August 2005	Implementation of Directive 2002/91/EC on the energy performance of buildings.
Legislative Decree no. 93 of 25 February 2000	Implementation of Directive 97/23/EC on pressure equipment.
Decree of the President of the Republic No 412 of 26 August 1993	Regulation laying down rules for the design, installation, operation and maintenance of heating systems in buildings for the purpose of containing energy consumption, in implementation of art. 4, paragraph 4, of Law no. 10 of 9 January 1991.
Law no. 10 of 9 January 1991	Rules for the implementation of the National Energy Plan on the rational use of energy, energy saving and the development of renewable energy sources.
Ministerial Decree of 1 December 1975	Safety instructions for appliances containing hot liquids under pressure.
UNI 10339:1995	Aeraulic systems for well-being purposes.
CEI 64-8 standard	Electrical installations with a rated voltage not exceeding 1 000 V alternating current and 1 500 V direct current.
UNI EN 303-5:2023	Heating boilers - Part 5: Heating boilers for solid fuels, manually and automatically stoked, nominal heat output of up to 500 kW - Terminology, requirements, testing and marking.
UNI EN 12809:2004	Stand-alone domestic solid fuel boilers - Rated heat output not exceeding 50 kW - Requirements and test methods.
UNI EN 13240:2001	Roomheaters fired by solid fuel - Requirements and test methods.

UNI EN 12815:2006	Residential cookers fired by solid fuel - Requirements and test methods.
UNI EN 13229:2001	Inset appliances including open fires fired by solid fuels - Requirements and test methods.
UNI EN 15250:2007	Slow-release heat appliances powered by solid fuels - Requirements and test methods.
UNI EN 15270:2008	Pellet burners for small heating boilers - Definitions, requirements, test methods, marking.
UNI EN 14785:2006	Household heating appliances fuelled by wood pellets - Requirements and test methods.

3.1.2 DOMESTIC HOT WATER (DHW) PREPARATION SYSTEMS

This intervention typology includes interventions in domestic hot water production systems, through the optimization of existing systems or their replacement by high-efficiency systems. Table 5 summarizes the regulation applicable for these interventions. The following requirements are applicable to domestic hot water preparation systems:

General requirements:

- Request a technical certification (“asseverazione”), drawn up by a qualified technician, certifying compliance with the specific technical requirements and technical data sheets of the installed systems;
- The national and local regulations in force on urban planning, construction, energy efficiency and safety (systems, environment, work) must be respected.

Responsible for the system:

- In general, the person responsible for the domestic hot water production system is the owner of the system. However, there are the following special situations:
 - In the case of rented buildings, the tenant is responsible.
 - In the case of centralized systems, the condominium manager is responsible.
 - In the case of buildings owned by persons other than natural persons, the responsible party is the owner or managing director.
- It is mandatory for the customer and/or owner of the system to submit the declaration of conformity or that of compliance whenever he requests a new supply (or an upgrade of the existing one) of water, gas, electricity, as well as the certificate of occupancy for a given environment. (Decree no. 37 of 22 January 2008)
- Maintenance of the systems: The owner of the plant has the obligation to maintain the same.

Waste Electrical and Electronic Equipment:

- Household WEEE is divided into five groups (Decree No. 40 of 20 February 2023):
 - Group 1 - Equipment for exchanging temperatures with fluids (Refrigerators; freezers; appliances automatically dispensing cold products; air conditioners, dehumidifiers, heat pumps; oil-filled radiators; other equipment for exchanging temperatures with fluids other than water; tumble dryers.
- Citizens have several ways to start a correct disposal: they can personally take the WEEE to a municipal collection center (the so-called ecological island) or, if the

Municipality carries out the service, ask for it to be collected at home. But you can also hand over the WEEE to the physical or online seller from whom you purchased the new appliance (so-called "one-for-one collection"). All this is free of charge, because citizens already pay a contribution for disposal. (Maggioni & Chiozzotto, 2024)

- By law, the take-back of WEEE may be refused under certain special conditions, for example if the appliance may pose a health risk to the personnel in charge of the collection.

Warranty (Product):

- Legal guarantee of conformity: For new goods, the duration of the legal guarantee is two years and starts from the delivery of the goods. It covers any lack of conformity of the goods both with respect to the functionality requirements and with respect to what was promised by the seller or by the advertising of the product and guarantees the defects existing at the time of delivery, i.e. the original defects that manifest themselves within 24 months of delivery. For second-hand goods, the seller and the buyer may agree to provide for a shorter period of liability but, in any case, not less than one year.
- In any case, the consumer has 26 months from the delivery of the goods to assert his rights.
- Commercial guarantee: The commercial or conventional warranty is in addition to the guarantee of conformity, and is recognized by the Consumer Code Legislative Decree 206/05 in art. 135d as the undertaking by the manufacturer or seller to reimburse the price paid, replace, repair, or otherwise intervene on the goods, if they do not correspond to the characteristics or other requirements that are not related to conformity set out in the warranty declaration or in the related advertising. The commercial guarantee is not mandatory, as is the case with the legal guarantee, but it is optional. The duration is variable and can range from 6 months to 10 or more years from the time of purchase of the goods and the duration is decided by the manufacturer or seller who grants the warranty.
- The conventional warranty statement must be provided to the consumer in writing on a durable medium and in Italian at the latest at the time of delivery of the goods.

Systems:

- Check that the materials/equipment are CE marked.
- Check the energy label and prefer, whenever possible, higher class equipment:
 - Space or water heater comes with an energy label showing its energy efficiency class. For individual products, ratings go from G (least efficient) to A++ (most efficient). It is also possible to buy a combination of technologies, such as a boiler with a solar hot water storage tank, in order to reach an A+++ energy efficiency rating (Regulation (EU) 811/2013 of 18 February 2013 and Regulation (EU) 812/2013 of 18 February 2013);
 - Solid fuel boilers with a rated heat output of 70 kW or less are labelled on an energy efficiency scale ranging from A+++ (most efficient) to D (least efficient). (Energy Labelling Regulation EU 2015/1187).

Table 5: Italian regulations applied to domestic hot water (DHW) preparation systems.

Applicable Laws

Interministerial Decree of 26 June 2015	Adaptation of national guidelines for the energy certification of buildings.
Legislative Decree no. 163 of 05/12/2019	Penalties for infringement of the provisions of Regulation (EU) No 517/2014 on fluorinated greenhouse gases and repealing Regulation (EC) No 842/2006.
D.P.R. 16/11/2018, n. 146	Regulation implementing Regulation (EU) No 517/2014 on fluorinated greenhouse gases and repealing Regulation (EC) No 842/2006.
Decree of 8 November 2019	Approval of the technical regulation of fire prevention for the design, construction and operation of plants for the production of heat fuelled by gaseous fuels. (19A07240).
Legislative Decree no. 163 of 05/12/2019	Penalties for infringement of the provisions of Regulation (EU) No 517/2014 on fluorinated greenhouse gases and repealing Regulation (EC) No 842/2006.
D.P.R. 16/11/2018, n. 146	Regulation implementing Regulation (EU) No 517/2014 on fluorinated greenhouse gases and repealing Regulation (EC) No 842/2006.
Regulation (EU) No 517/2014 of the European Parliament and of the Council of 16 April 2014	On fluorinated greenhouse gases and repealing Regulation (EC) No 842/2006.
Regulation (EU) 2024/573 of the European Parliament and of the Council of 7 February 2024	On fluorinated greenhouse gases, amending Directive (EU) 2019/1937 and repealing Regulation (EU) No 517/2014.
Decree of the President of the Republic no. 74 of 16 April 2013	Regulation defining the general criteria for the operation, operation, control, maintenance and inspection of heating systems for the winter and summer air conditioning of buildings and for the preparation of hot water for sanitary uses, in accordance with article 4, paragraph 1, letters a) and c), of the legislative decree of 19 August 2005, n. 192.
Ministerial Decree of 10 February 2014	Which introduces and defines the new model of system booklet for air conditioning and the energy efficiency control report.
Decree no. 37 of 22 January 2008	Regulation concerning the implementation of Article 11-quaterdecies, paragraph 13, letter a) of Law no. 248 of 2 December 2005, reorganizing the provisions on the installation of systems inside buildings.
Legislative Decree no. 192 of 19 August 2005	Implementation of Directive 2002/91/EC on the energy performance of buildings.
Decree of the President of the Republic No 412 of 26 August 1993	Regulation laying down rules for the design, installation, operation and maintenance of heating systems in buildings for the purpose of containing energy consumption, in implementation of art. 4, paragraph 4, of Law no. 10 of 9 January 1991.
CEI 64-8 standard	Electrical installations with a rated voltage not exceeding 1 000 V alternating current and 1 500 V direct current.
Commission Regulation (EC) No 1516/2007 of 19 December 2007	Establishing, pursuant to Regulation (EC) No 842/2006 of the European Parliament and of the Council, standard leakage checking requirements for stationary refrigeration, air conditioning and heat pump equipment containing certain fluorinated greenhouse gases.

Council Directive	On efficiency requirements for new hot-water boilers fired with liquid or gaseous fuels.
92/42/EEC of 21 May 1992	

3.1.3 VENTILATION SYSTEMS

This intervention typology includes measures in ventilation systems, namely, in improving natural ventilation conditions by installing self-regulating ventilation grilles and enhancing mechanical ventilation conditions through the installation of efficient fans, variable speed drives on motors, heat recovery ventilation installation, and replacement and insulation of ventilation ducts. Table 6 summarizes the regulation applicable for these interventions. The following requirements are applicable to ventilation systems:

General requirements:

- UNI 10339:1995 Standard: This specification regulates the "Aeraulic systems for the purpose of well-being", outlining general information, classification and requirements. It is crucial that outdoor models and units comply with this regulation to ensure a regulated and safe place on the market.
- Outdoor units must be installed in such a way as not to cause visual or acoustic disturbance to neighbours. It is important to consider optimal placement that avoids obstructing the view or creating excessive noise.
- Particularly relevant for historic buildings or buildings located in historic city centers, the installation must not compromise the aesthetics of the building.
- The installation must not damage the view of other condominiums, carefully positioning drains and motors.
- Municipal regulations may impose specific restrictions, such as the prohibition of installing outdoor units on façades visible from the street or the obligation to use colours that harmonize with the aesthetics of the building. These standards are often stricter in areas of particular historical or artistic value.
- Consulting with an expert in HVAC (heating, ventilation, and air conditioning) systems can provide additional information on how to implement these solutions effectively, ensuring that the installation complies with all local and condominium codes.
- Request a technical certification ("asseverazione"), drawn up by a qualified technician, certifying compliance with the specific technical requirements and technical data sheets of the installed systems;
- The national and local regulations in force on urban planning, construction, energy efficiency and safety (systems, environment, work) must be respected.

Authorization from the condominium (external units):

- The installation of a ventilation system must still comply with the Condominium Regulations and certain regulations that safeguard both the aesthetics and the common quiet.
- External units: consider the possible impact on the decor of the entire condominium. To mitigate the overall impact on the decor, you can paint the entire system with the colours of the condominium facade.
- Normally, it is not necessary to make a request to the condominium or obtain the consent of the assembly for the installation of the equipment, however, if the air

conditioner has an external element, it is advisable, before starting the work, to send a written or email communication to the condominium administrator.

- Declaration of consent of the owner for the execution of the works, in case these are carried out by the owner of the building;

Responsible for the system:

- In general, the person responsible for the ventilation system is the owner of the system. However, there are the following special situations:
 - In the case of rented buildings, the tenant is responsible.
 - In the case of centralized systems, the condominium manager is responsible.
 - In the case of buildings owned by persons other than natural persons, the responsible party is the owner or managing director.
- It is mandatory for the customer and/or owner of the system to submit the declaration of conformity or that of compliance whenever he requests a new supply (or an upgrade of the existing one) of water, gas, electricity, as well as the certificate of occupancy for a given environment. (Decree no. 37 of 22 January 2008)
- Maintenance of the systems: The owner of the plant has the obligation to maintain the same.

Waste Electrical and Electronic Equipment:

- Household WEEE is divided into five groups (Decree No. 40 of 20 February 2023):
 - Group 1 - Equipment for exchanging temperatures with fluids (Refrigerators; freezers; appliances automatically dispensing cold products; air conditioners, dehumidifiers, heat pumps; oil-filled radiators; other equipment for exchanging temperatures with fluids other than water; tumble dryers.
- Citizens have several ways to start a correct disposal: they can personally take the WEEE to a municipal collection center (the so-called ecological island) or, if the Municipality carries out the service, ask for it to be collected at home. But you can also hand over the WEEE to the physical or online seller from whom you purchased the new appliance (so-called "one-for-one collection"). All this is free of charge, because citizens already pay a contribution for disposal. (Maggioni & Chiozzotto, 2024)
- By law, the take-back of WEEE may be refused under certain special conditions, for example if the appliance may pose a health risk to the personnel in charge of the collection.

Warranty (Product):

- Legal guarantee of conformity: For new goods, the duration of the legal guarantee is two years and starts from the delivery of the goods. It covers any lack of conformity of the goods both with respect to the functionality requirements and with respect to what was promised by the seller or by the advertising of the product and guarantees the defects existing at the time of delivery, i.e. the original defects that manifest themselves within 24 months of delivery. For second-hand goods, the seller and the buyer may agree to provide for a shorter period of liability but, in any case, not less than one year.
- In any case, the consumer has 26 months from the delivery of the goods to assert his rights.

- Commercial guarantee: The commercial or conventional warranty is in addition to the guarantee of conformity, and is recognized by the Consumer Code Legislative Decree 206/05 in art. 135d as the undertaking by the manufacturer or seller to reimburse the price paid, replace, repair, or otherwise intervene on the goods, if they do not correspond to the characteristics or other requirements that are not related to conformity set out in the warranty declaration or in the related advertising. The commercial guarantee is not mandatory, as is the case with the legal guarantee, but it is optional. The duration is variable and can range from 6 months to 10 or more years from the time of purchase of the goods and the duration is decided by the manufacturer or seller who grants the warranty.
- The conventional warranty statement must be provided to the consumer in writing on a durable medium and in Italian at the latest at the time of delivery of the goods.

Systems:

- Check that the materials/equipment are CE marked.
- Check the energy label and prefer, whenever possible, higher class equipment:
 - Residential ventilation units must display a label indicating their energy efficiency on a scale from A+ (most efficient) to G (least efficient). These ratings consider: specific power input (SPI), thermal efficiency of heat recovery, type of ventilation control and other factors.

Table 6: Italian regulations and standards applied to ventilation systems.

Applicable Laws	
Decree no. 37 of January 2008	Regulation concerning the implementation of Article 11-quaterdecies, paragraph 13, letter a) of Law no. 248 of 2 December 2005, reorganizing the provisions on the installation of systems inside buildings.
Decree no. 256 of 23 June 2022	Minimum environmental criteria for the assignment of the design service of building interventions, for the assignment of works for building interventions and for the joint assignment of design and works for building interventions.
Interministerial Decree of 26 June 2015	Adaptation of national guidelines for the energy certification of buildings.
UNI 10339	Aeraulic systems for well-being purposes. Generalities, classification and requirements. Rules for RFQ, bidding, ordering, and supply.
CEI 64-8 standard	Electrical installations with a rated voltage not exceeding 1 000 V alternating current and 1 500 V direct current.

3.1.4 MAINTENANCE AND INSPECTION OF TECHNICAL SYSTEMS

This type of intervention includes the maintenance and inspection of the following technical systems:

- Ventilation systems;
- Air conditioning systems;
- Hot water preparation systems;

Table 7 summarizes the regulation applicable for these interventions. The following requirements are applicable to these systems:

Responsible for the system:

- In general, the person responsible for the systems is the owner of the system. However, there are the following special situations:
 - In the case of rented buildings, the tenant is responsible.
 - In the case of centralized systems, the condominium manager is responsible.
 - In the case of buildings owned by persons other than natural persons, the responsible party is the owner or managing director.
- It is mandatory for the customer and/or owner of the system to submit the declaration of conformity or that of compliance whenever he requests a new supply (or an upgrade of the existing one) of water, gas, electricity, as well as the certificate of occupancy for a given environment. (Decree no. 37 of 22 January 2008).
- Maintenance of the systems: The owner of the plant has the obligation to maintain the same.

Table 7: Italian regulations applied to maintenance and inspection of technical systems

Applicable legislation	
Decree no. 256 of 23 June 2022	Minimum environmental criteria for the assignment of the design service of building interventions, for the assignment of works for building interventions and for the joint assignment of design and works for building interventions.
Interministerial Decree of 26 June 2015	Adaptation of national guidelines for the energy certification of buildings.
Decree of 8 November 2019	Approval of the technical regulation of fire prevention for the design, construction and operation of plants for the production of heat fuelled by gaseous fuels.
Decree of the President of the Republic no. 74 of 16 April 2013	Regulation defining the general criteria for the operation, operation, control, maintenance and inspection of heating systems for the winter and summer air conditioning of buildings and for the preparation of hot water for sanitary uses, in accordance with article 4, paragraph 1, letters a) and c), of the legislative decree of 19 August 2005, n. 192.
Ministerial Decree of 10 February 2014	Which introduces and defines the new model of system booklet for air conditioning and the energy efficiency control report.
Decree of the President of the Republic No 412 of 26 August 1993	Regulation laying down rules for the design, installation, operation and maintenance of heating systems in buildings for the purpose of containing energy consumption, in implementation of art. 4, paragraph 4, of Law no. 10 of 9 January 1991.
Ministerial Decree of 1 December 1975	Safety instructions for appliances containing hot liquids under pressure.
UNI 10339:1995	Aeraulic systems for well-being purposes.
CEI 64-8 standard	Electrical installations with a rated voltage not exceeding 1 000 V alternating current and 1 500 V direct current.

UNI EN 303-5:2023	Heating boilers - Part 5: Heating boilers for solid fuels, manually and automatically stoked, nominal heat output of up to 500 kW - Terminology, requirements, testing and marking.
UNI EN 12809:2004	Stand-alone domestic solid fuel boilers - Rated heat output not exceeding 50 kW - Requirements and test methods.
UNI EN 13240:2001	Roomheaters fired by solid fuel - Requirements and test methods.
UNI EN 12815:2006	Residential cookers fired by solid fuel - Requirements and test methods.
UNI EN 13229:2001	Inset appliances including open fires fired by solid fuels - Requirements and test methods.
UNI EN 15250:2007	Slow-release heat appliances powered by solid fuels - Requirements and test methods.
UNI EN 15270:2008	Pellet burners for small heating boilers - Definitions, requirements, test methods, marking.
UNI EN 14785:2006	Household heating appliances fuelled by wood pellets - Requirements and test methods.

3.1.5 REPLACEMENT OF HOUSEHOLD APPLIANCES

This intervention typology includes measures in household appliances, including the replacement with models that have higher energy and water efficiency, where applicable. This includes refrigerators, freezers, combined units, washing machines, dishwashers, washer-dryers, and electric ovens. Table 6 summarizes the regulation applicable for these interventions. The following requirements are applicable to household appliances:

Waste Electrical and Electronic Equipment:

- Household WEEE is divided into five groups (Decree No. 40 of 20 February 2023):
 - Group 1 - Equipment for exchanging temperatures with fluids (Refrigerators; freezers; appliances automatically dispensing cold products; air conditioners, dehumidifiers, heat pumps; oil-filled radiators; other equipment for exchanging temperatures with fluids other than water; tumble dryers.
 - Group 2 - Other Great Whites (Washing machines; dishwashers; cooking appliances, electric stoves, electric hot plates.)
- Citizens have several ways to start a correct disposal: they can personally take the WEEE to a municipal collection center (the so-called ecological island) or, if the Municipality carries out the service, ask for it to be collected at home. But you can also hand over the WEEE to the physical or online seller from whom you purchased the new appliance (so-called "one-for-one collection"). All this is free of charge, because citizens already pay a contribution for disposal. (Maggioni & Chiozzotto, 2024)
- By law, the take-back of WEEE may be refused under certain special conditions, for example if the appliance may pose a health risk to the personnel in charge of the collection.

Warranty (Product):

- Legal guarantee of conformity:** For new goods, the duration of the legal guarantee is two years and starts from the delivery of the goods. It covers any lack of conformity of the goods both with respect to the functionality requirements and with respect to what was promised by the seller or by the advertising of the product and guarantees

the defects existing at the time of delivery, i.e. the original defects that manifest themselves within 24 months of delivery. For second-hand goods, the seller and the buyer may agree to provide for a shorter period of liability but, in any case, not less than one year.

- In any case, the consumer has 26 months from the delivery of the goods to assert his rights.
- **Commercial guarantee:** The commercial or conventional warranty is in addition to the guarantee of conformity, and is recognized by the Consumer Code Legislative Decree 206/05 in art. 135d as the undertaking by the manufacturer or seller to reimburse the price paid, replace, repair, or otherwise intervene on the goods, if they do not correspond to the characteristics or other requirements that are not related to conformity set out in the warranty declaration or in the related advertising. The commercial guarantee is not mandatory, as is the case with the legal guarantee, but it is optional. The duration is variable and can range from 6 months to 10 or more years from the time of purchase of the goods and the duration is decided by the manufacturer or seller who grants the warranty.
- The conventional warranty statement must be provided to the consumer in writing on a durable medium and in Italian at the latest at the time of delivery of the goods.

Systems:

- Check that the materials/equipment are CE marked.
- Check the energy label and prefer, whenever possible, higher class equipment:
 - The EU energy labels for household fridges and freezers use, washing machines and dishwashers, washer dryers, tumble dryers and displays, as of 1 March 2021, a scale from A (most efficient) to G (least efficient).
 - New cooking appliances come with an energy label showing their energy efficiency class. These range from A+++ to D for range hoods and ovens.

Table 6: Italian and EU regulations applied to household appliances.

Applicable Laws	
Legislative Decree no. 163 of 05/12/2019	Penalties for infringement of the provisions of Regulation (EU) No 517/2014 on fluorinated greenhouse gases and repealing Regulation (EC) No 842/2006.
D.P.R. 16/11/2018, n. 146	Regulation implementing Regulation (EU) No 517/2014 on fluorinated greenhouse gases and repealing Regulation (EC) No 842/2006.
Regulation (EC) n° 1516/2007 de la Comisión, de 19 de diciembre de 2007	Por el que se establecen, de conformidad con el Reglamento (EC) n° 842/2006 del Parlamento Europeo y del Consejo, requisitos de control de fugas estándar para los equipos fijos de refrigeración, aires acondicionado y bombas de calor que contengan determinados gases fluorados de efecto invernadero.
CEI 64-8 standard	Electrical installations with a rated voltage not exceeding 1 000 V alternating current and 1 500 V direct current.
Regulation (EU) 2019/2016	Regulation on energy labelling for fridges and freezers.
Regulation (EU) 2019/2019	Regulation on ecodesign requirements for fridges.
Regulation (EU) 2019/2014	Regulation on energy labelling for household washing machines and washer-dryers.
Regulation (EU) 2019/2017	Regulation on energy labelling for dishwashers.

Regulation (EU) 2019/2023	Regulation on ecodesign requirements for household washing machines and washer-dryers.
Regulation (EU) C/2023/2534	Regulation on energy labelling of household tumble dryers.
Regulation (EU) C/2023/7671	Regulation on ecodesign requirements for household tumble dryers.
Regulation (EU) 65/2014	Regulation on energy labelling for domestic ovens and range hoods (EU) 65/2014.
Regulation (EU) 66/2014	Regulation on ecodesign requirements for domestic ovens and range hoods (EU) 66/2014.
Regulation (EU) 2019/2022	Regulation on ecodesign requirements for dishwashers.

3.1.6 INTERVENTIONS AIMED AT WATER EFFICIENCY

This intervention typology includes measures in residential buildings, namely:

- Installation and maintenance of rainwater harvesting systems (e.g., for the irrigation of green areas and washing of common spaces);
- Use of more efficient irrigation methods in urban buildings, including installation of systems and equipment (e.g., drip irrigation methods and at times of lower evaporation and sensors for irrigation interruption and optimization), as well as more efficient solutions in the filling and maintenance of swimming pools;
- Installation of high-efficiency devices in terms of water saving (e.g., taps, showers, flushing cisterns, flow meters, pressure reducers and flow regulators);
- Installation of water consumption management systems, in order to account for and manage consumption, promoting water efficiency (e.g., installation of telemetry in the meter, home automation and installation of digital commands).

Table 7 summarizes the regulation applicable for these interventions. The following requirements are applicable to interventions aimed at water efficiency:

General requirements:

- Must comply with the Civile Code, Condominium Regulations and certain regulations that safeguard both the aesthetics and the common quiet.

Obligations of the client and the owner:

- It is mandatory for the customer and/or owner of the system to submit the declaration of conformity or that of compliance whenever he requests a new supply (or an upgrade of the existing one) of water, gas, electricity, as well as the certificate of occupancy for a given environment. (Decree no. 37 of 22 January 2008)
- Maintenance of the systems: The owner of the plant has the obligation to maintain the same.

Warranty (Product):

- Legal guarantee of conformity: For new goods, the duration of the legal guarantee is two years and starts from the delivery of the goods. It covers any lack of conformity of the goods both with respect to the functionality requirements and with respect to what was promised by the seller or by the advertising of the product and guarantees the defects existing at the time of delivery, i.e. the original defects that manifest themselves within 24 months of delivery. For second-hand goods, the seller and the buyer may agree to provide for a shorter period of liability but, in any case, not less than one year.

- In any case, the consumer has 26 months from the delivery of the goods to assert his rights.
- **Commercial guarantee:** The commercial or conventional warranty is in addition to the guarantee of conformity, and is recognized by the Consumer Code Legislative Decree 206/05 in art. 135d as the undertaking by the manufacturer or seller to reimburse the price paid, replace, repair, or otherwise intervene on the goods, if they do not correspond to the characteristics or other requirements that are not related to conformity set out in the warranty declaration or in the related advertising. The commercial guarantee is not mandatory, as is the case with the legal guarantee, but it is optional. The duration is variable and can range from 6 months to 10 or more years from the time of purchase of the goods and the duration is decided by the manufacturer or seller who grants the warranty.
- The conventional warranty statement must be provided to the consumer in writing on a durable medium and in Italian at the latest at the time of delivery of the goods.

Table 7: Italian regulations applied to interventions aimed water efficiency.

Applicable Laws	
Decree no. 37 of 22 January 2008	Regulation concerning the implementation of Article 11-quaterdecies, paragraph 13, letter a) of Law no. 248 of 2 December 2005, reorganizing the provisions on the installation of systems inside buildings.
CEI 64-8 standard	Electrical installations with a rated voltage not exceeding 1 000 V alternating current and 1 500 V direct current.
UNI/TS 11445:2012	Plants for the collection and use of rainwater for uses other than human consumption - Design, installation and maintenance
Decree of the President of the Republic no. 380 of 6 June 2001	Republication of the text of the Decree of the President of the Republic no. 380 of 6 June 2001, containing: "Consolidated text of the legislative and regulatory provisions on construction. (Text A)", accompanied by the relevant notes. (Decree published in the Ordinary Supplement No. 239/L to the Official Gazette - General Series - No. 245 of 20 October 2001).
Legislative Decree no. 152 of 3 April 2006	Environmental regulations.

3.1.7 SOLAR ENERGY

This intervention typology includes measures in residential buildings, namely:

- Installation of electricity production systems for self-consumption from renewable energy sources (e.g., installation of photovoltaic solar panels);
- Installation of renewable energy systems for the production of domestic hot water (e.g., installation of solar collectors for heating sanitary water).

Table 8 summarizes the regulation applicable for these interventions. The following requirements are applicable to solar photovoltaic systems and solar collector systems:

General requirements:

- Make sure to ask for a qualified and, where relevant, certified installer.

- The installation of the system must be carried out in accordance with the installation manuals of the main components.
- Check the existence of an electrical inspection report.
- For shared housing, verify if other tenants/homeowners agree with the necessary works.
- Verify if the area is influenced by fire safety norms.
- Check if and which subsidies are available, and if electrical upgrades are covered.
- Check if any legal permission by interested subjects is required to install.
- Ask and keep carefully the documentation provided by the installer, related to the equipment, its installation and legalisation and respect the maintenance plan.
- Consult an electrician if you observe any electrical problem such as overheating of the cables, deterioration of components, regular blowing of fuses, etc.
- The solar thermal collectors and boilers used must be guaranteed for at least 5 years.
- Electrical and electronic accessories and components must be guaranteed for at least 2 years.
- The national and local regulations in force on urban planning, construction, energy efficiency and safety (installations, environment, work) must be respected.
- Request a technical certification (“asseverazione”), drawn up by a qualified technician, certifying compliance with the specific technical requirements, and a technical data sheet of the manifolds/panels installed;
- Request a Declaration of Conformity pursuant to Ministerial Decree 37/08;

Authorization from the condominium:

Centralized photovoltaic system

- It's important to communicate the intention to install the photovoltaic system during a condominium meeting and to inform all condominiums transparently and clearly about the proposal and its potential impacts (a written proposal must be submitted to the administrator).
- The administrator is required to convene the assembly within thirty days (30 days) of the request, even by a single condominium owner interested. If he does not, he commits a serious irregularity that could lead to judicial revocation of his mandate.
- The installation of photovoltaic panels in common areas of the condominium is considered an "innovation" (Civil Code - ART. 1120. Innovations) that requires resolutions of the condominium assembly approved with a number of votes that represent the majority of those present and at least half (50%) of the value of the building. This consent must be expressed in a formal and documented manner.
- The costs of the entire expense will be divided among those who voted in favour of installing the photovoltaic system in the condominium.
- Declaration of consent of the owner for the execution of the works, in case these are carried out by the owner of the building;

Private Photovoltaic System

- **Install photovoltaic panels in common areas of the condominium:** A written proposal must be submitted to the condominium administrator who will convene the condominium meeting within 30 days. The consent of the condominium assembly is required (at least 50% of the tenants present).
- **Install photovoltaic panels on the single apartment:** The installation of a photovoltaic system for example on a balcony, does not required special permits. It is

sufficient to send a preliminary communication to the competent Municipality to start the works.

Restrictions and building permits required (D.P.R. 31/2017):

- Before proceeding with the installation of a photovoltaic system, it is also of primary importance to verify that the chosen building is not subject to environmental, historical or landscape constraints that may prohibit changes to its structure.
- If the building or area is subject to landscape constraints and you cannot take advantage of special concessions, it is essential to obtain landscape authorization. The procedure involves sending the request to the public body, which forwards the application to the Superintendence. The latter issues a mandatory and binding opinion within 45 days.
- Interventions excluded from landscape authorization: Annex A of D.P.R. 31/2017: A.6. *installation of solar panels (thermal or photovoltaic) serving individual buildings, where placed on flat roofs and in such a way as not to be visible from external public spaces; installation of solar panels (thermal or photovoltaic) serving individual buildings, as long as they are integrated into the configuration of the roofs, or placed in adherence to the roofs of buildings with the same inclination and orientation as the pitch of the buildings, pursuant to art. 7-bis of Legislative Decree no. 28 of 3 March 2011, not falling within those referred to in art. 136(1)(b) and (c) of Legislative Decree no. 42 of 22 January 2004;*
- Simplified landscape authorization - Annex B of Presidential Decree 31/2017:
 - volume increases within 10% of the original volume, in compliance with existing characteristics;
 - construction or modification of external openings or roof windows on listed properties, in compliance with the pre-existing characteristics;
 - façade modifications with the construction or reconfiguration of openings, cornices, railings;
 - interventions on external finishes with plastering, painting or coatings;
 - construction, modification or closure of balconies or terraces;
 - construction or substantial modification of external stairs;
 - anti-seismic interventions or for energy containment with morpho-typological innovations or in pre-existing materials;
 - interventions to overcome architectural barriers, such as ramps or external lifts visible from the public space.

Obligations of the client and the owner (Decree no. 37 of 22 January 2008):

- It is mandatory for the customer and/or owner of the system to submit the declaration of conformity or that of compliance whenever he requests a new supply (or an upgrade of the existing one) of water, gas, electricity, as well as the certificate of occupancy for a given environment.
- Maintenance of the systems: The owner of the plant has the obligation to maintain the same.

Waste Electrical and Electronic Equipment:

- Household WEEE is divided into five groups (Decree No. 40 of 20 February 2023):
 - Group 4 - Section A "photovoltaic panels"
- Citizens have several ways to start a correct disposal: they can personally take the WEEE to a municipal collection center (the so-called ecological island) or, if the Municipality carries out the service, ask for it to be collected at home. But you can also hand over the WEEE to the physical or online seller from whom you purchased the new

appliance (so-called "one-for-one collection"). All this is free of charge, because citizens already pay a contribution for disposal. (Maggioni & Chiozzotto, 2024)

- By law, the take-back of WEEE may be refused under certain special conditions, for example if the appliance may pose a health risk to the personnel in charge of the collection.

Renewable Energy Communities (Comunità energetiche rinnovabili (CER):

The statutes or articles of association of the duly constituted REC must have the following essential elements:

- the prevailing social object of the community is to provide environmental, economic or social benefits at community level to its members or associates or to the local areas in which it operates, and not to obtain financial gain;
- the members or partners exercising powers of control may only be natural persons, small or medium-sized enterprises, associations with legal personality under private law, territorial bodies or local authorities, including, pursuant to Article 31, paragraph 1, letter b) of Legislative Decree. 199/21, municipal administrations, research and training bodies, religious bodies, third sector and environmental protection bodies as well as local administrations contained in the list of public administrations disseminated by the National Institute of Statistics (hereinafter also: ISTAT) in accordance with the provisions of Article 1, paragraph 3, of Law No. 196 of 31 December 2009, located in the territory of the same municipalities in which the production facilities owned by the community are located;
- the community is autonomous and has an open and voluntary participation (provided that the companies are PMI and that the participation in the renewable energy community is not the main commercial and/or industrial activity);
- the participation of members or associates in the community provides for the preservation of end-customer rights, including the right to choose their own seller, and that it is possible for them to leave the configuration at any time, without prejudice, in the case of early withdrawal, to any fair and proportionate compensation agreed for the sharing of the investments made;
- a delegated party has been identified as the person responsible for allocating the shared electricity.
- any amount of the premium tariff in excess of that determined by applying the threshold value of shared energy expressed as a percentage referred to in Annex 1 of the CACER Ministerial Decree will be allocated only to consumers other than businesses and/or used for social purposes with repercussions on the territories where the sharing plants are located.

Table 8: Italian and EU regulations applied to solar photovoltaic systems and solar thermal collectors.

Applicable Laws	
Decree no. 37 of 22 January 2008	Regulation concerning the implementation of Article 11-quaterdecies, paragraph 13, letter a) of Law no. 248 of 2 December 2005, reorganizing the provisions on the installation of systems inside buildings.

CEI 64-8 standard	Electrical installations with a rated voltage not exceeding 1 000 V alternating current and 1 500 V direct current.
CEI 82-25 standard	Guide to the design, construction and management of photovoltaic generation systems.
Standard CEI EN 62446-1	Photovoltaic systems - Requirements for testing, documentation and maintenance.
Standard CEI EN 62446-2	Grid-Connected Systems – Maintenance of Photovoltaic Systems.
Decree of the President of the Republic no. 380 of 6 June 2001	Republication of the text of the Decree of the President of the Republic no. 380 of 6 June 2001, containing: "Consolidated text of the legislative and regulatory provisions on construction. (Text A)", accompanied by the relevant notes. (Decree published in the Ordinary Supplement No. 239/L to the Official Gazette - General Series - No. 245 of 20 October 2001).
Decree of 19 May 2015	Approval of the single model for the construction, connection and operation of small photovoltaic systems integrated on the roofs of buildings. (15A03977).
Legislative Decree no. 28 of 3 March 2011	Implementation of Directive 2009/28/EC on the promotion of the use of energy from renewable sources, amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC. (11G0067).
Decree-Law no. 77 of 31 May 2021	Governance of the National Recovery and Resilience Plan and first measures to strengthen administrative structures and accelerate and streamline procedures. (21G00087).
Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018	Promotion of the use of energy from renewable sources.
Decree of the President of the Republic no. 380 of 6 June 2001	Republication of the text of the Decree of the President of the Republic no. 380 of 6 June 2001, containing: "Consolidated text of the legislative and regulatory provisions on construction. (Text A)", accompanied by the relevant notes. (Decree published in the Ordinary Supplement No. 239/L to the Official Gazette - General Series - No. 245 of 20 October 2001).
Decree-Law no. 162 of 30 December 2019	Urgent provisions on the extension of legislative deadlines, the organization of public administrations, as well as technological innovation.
Law no. 8 of 28 February 2020	Conversion into law, with amendments, of Decree-Law No. 162 of 30 December 2019, containing urgent provisions on the extension of legislative deadlines, the organisation of public administrations, as well as technological innovation.
Legislative Decree no. 199 of 8 November 2021	Implementation of Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources.
UNI EN 12975:2022	Solar Collectors - General Requirements.
UNI EN 12976-1:2022	Solar thermal installations and their components - Prefabricated installations - Part 1: General requirements.

UNI EN 12976-2:2019	Solar thermal installations and their components - Prefabricated installations - Part 2: Test methods.
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3.1.8 LIGHTING SYSTEMS

This intervention typology includes measures in residential buildings, namely:

- Promotion of energy efficiency in lighting, indoor or outdoor (e.g., replacement by efficient lamps and high-performance ballasts, use of motion detectors in common areas, systems that improve the use of natural lighting, and control systems).

Table 9 summarizes the regulation applicable for these interventions. The following requirements are applicable to lighting systems:

General requirements:

- Request a technical certification (“asseverazione”), drawn up by a qualified technician, certifying compliance with the specific technical requirements and technical data sheets of the installed systems;
- In addition, the national and local regulations in force on urban planning, construction, energy efficiency and safety (systems, environment, work) must be respected.
- Declaration of consent of the owner for the execution of the works, in case these are carried out by the owner of the building;

Authorization from the condominium (in common areas):

- In the case of interventions on the common parts of the condominium, a resolution of the condominium assembly will be required to approve the execution of the works and the table of distribution of the millesimal expenses;
- The administrator is required to convene the assembly within thirty days (30 days) of the request, even by a single condominium owner interested. If he does not, he commits a serious irregularity that could lead to judicial revocation of his mandate.
- The installation of an electrical system in common areas is considered an “innovation” that requires resolutions (in the first call) of the condominium assembly approved with a number of votes that represent the majority of those present and at least half (1/2) of the value of the building. (Codice Civile art. 1120 and 1136)
- The first call meeting is valid only if condominium owners representing at least 2/3 of the value of the building and the majority of condominium owners participate (constitutive quorum); furthermore, the resolutions are valid only if they are approved with a number of votes that represents the majority of those present and at least half of the value of the building (deliberative quorum);
- If the first call it is not possible to deliberate due to lack of quorum (if the first call does not reach the minimum majorities), the second call meeting is valid if there is the intervention of a number of condominium owners representing at least one third of the value of the entire building and one third of the participants in the condominium (constitutive quorum); for the approval of the resolutions, however, a majority of those present with a number of votes representing at least one third of the value of the condominium owners' building is sufficient (deliberative quorum).
- The second meeting must be held on a day following the first and, in any case, no later than ten days after it.

- Declaration of consent of the owner for the execution of the works, in case these are carried out by the owner of the building.

Waste Electrical and Electronic Equipment:

- Household WEEE is divided into five groups (Decree No. 40 of 20 February 2023):
 - Group 5 - Light sources (Fluorescent tubes; compact fluorescent lamps; fluorescent lamps; high-density discharge lamps, including high-pressure sodium vapour lamps and metal halide lamps, low-pressure sodium vapour lamps; LED.
- Citizens have several ways to start a correct disposal: they can personally take the WEEE to a municipal collection center (the so-called ecological island) or, if the Municipality carries out the service, ask for it to be collected at home. But you can also hand over the WEEE to the physical or online seller from whom you purchased the new appliance (so-called "one-for-one collection"). All this is free of charge, because citizens already pay a contribution for disposal. (Maggioni & Chiozzotto, 2024)
- By law, the take-back of WEEE may be refused under certain special conditions, for example if the appliance may pose a health risk to the personnel in charge of the collection.

Systems:

- Check the energy label and prefer, whenever possible, higher class equipment.
 - Lighting products include light sources, such as light bulbs (halogen, compact fluorescent, etc.) or LED modules/lamps. Also include control gears (e.g. ballasts, electronic components, drivers), i.e. the devices needed to connect light sources to the electrical mains. Energy labelling and ecodesign do not apply to lamps or luminaires- the new labels use a scale from A (most efficient) to G (least efficient).

Table 9: Italian regulations for lighting systems.

Applicable Laws	
Decree no. 37 of 22 January 2008	Regulation concerning the implementation of Article 11-quaterdecies, paragraph 13, letter a) of Law no. 248 of 2 December 2005, reorganizing the provisions on the installation of systems inside buildings.
CEI 64-8 standard	Electrical installations with a rated voltage not exceeding 1 000 V alternating current and 1 500 V direct current.
UNI/TS 11826:2021	Light and Lighting - Residential domestic indoor lighting with artificial light.
UNI EN 12464-1:2021	Light and Illumination - Workplace Lighting - Part 1: Indoor Workplaces.

3.1.9 BUILDING AUTOMATION AND CONTROL SYSTEMS

This intervention typology includes measures in residential buildings, namely:

- Installation of energy consumption management systems, in order to monitor and manage energy consumption, thus generating reduction and enabling the transfer of

consumption between tariff periods (e.g., home automation and installation of digital commands);

Table 10 summarizes the regulation applicable for these interventions. The following requirements are applicable to Building automation and control systems:

Intervention:

- For Building Automation systems, installed together with or independently of the replacement of winter air conditioning systems, the technology belongs at least to class B of the EN 15232 standard;
- Request a technical certification (“asseverazione”), drawn up by a qualified technician, certifying compliance with the specific technical requirements and technical data sheets of the installed systems;
- In addition, the national and local regulations in force on urban planning, construction, energy efficiency and safety (systems, environment, work) must be respected.

Authorization from the condominium (in common areas):

- In the case of interventions on the common parts of the condominium, a resolution of the condominium assembly will be required to approve the execution of the works and the table of distribution of the millesimal expenses;
- The administrator is required to convene the assembly within thirty days (30 days) of the request, even by a single condominium owner interested. If he does not, he commits a serious irregularity that could lead to judicial revocation of his mandate.
- The installation of building automation in common areas is considered an “innovation” that requires resolutions (in the first call) of the condominium assembly approved with a number of votes that represent the majority of those present and at least half (1/2) of the value of the building. (Codice Civile art. 1120 and 1136)
- The first call meeting is valid only if condominium owners representing at least 2/3 of the value of the building and the majority of condominium owners participate (constitutive quorum); furthermore, the resolutions are valid only if they are approved with a number of votes that represents the majority of those present and at least half (1/2) of the value of the building (deliberative quorum);
- If the first call it is not possible to deliberate due to lack of quorum (if the first call does not reach the minimum majorities), the second call meeting is valid if there is the intervention of a number of condominium owners representing at least one third of the value of the entire building and one third of the participants in the condominium (constitutive quorum); for the approval of the resolutions, however, a majority of those present with a number of votes representing at least one third (1/3) of the value of the condominium owners' building is sufficient (deliberative quorum).
- The second meeting must be held on a day following the first and, in any case, no later than ten days after it.
- Declaration of consent of the owner for the execution of the works, in case these are carried out by the owner of the building;

Obligations of the client and the owner (Decree no. 37 of 22 January 2008):

- It is mandatory for the customer and/or owner of the system to submit the declaration of conformity or that of compliance whenever he requests a new supply

(or an upgrade of the existing one) of water, gas, electricity, as well as the certificate of occupancy for a given environment.

- Maintenance of the systems: The owner of the plant has the obligation to maintain the same.

Table 10: Italian regulations applied to building automation and control systems.

Applicable Laws	
Decree no. 37 of 22 January 2008	Regulation concerning the implementation of Article 11-quaterdecies, paragraph 13, letter a) of Law no. 248 of 2 December 2005, reorganizing the provisions on the installation of systems inside buildings.
CEI 64-8 standard	Electrical installations with a rated voltage not exceeding 1 000 V alternating current and 1 500 V direct current.
UNI EN 15232-1:2017	Energy performance of buildings - Part 1: Impact of automation, control and technical management of buildings.
EN ISO 52120-1:2022	Energy performance of buildings - Contribution of building automation, controls and building management - Part 1: General framework and procedures (ISO 52120-1:2021, Corrected version 2022-09).

3.1.10 E-MOBILITY - INSTALLATION OF A HOME CHARGING STATION

This intervention typology includes measures in residential buildings, namely:

- Installation of electric vehicle charging points, as long as they are located within the perimeter of the private property (e.g., acquisition and installation of a charger and the respective connection to the local electricity grid).

Table 11 summarizes the regulation applicable for these interventions. The following requirements are applicable to this type of intervention:

General requirements:

- Make sure to ask for a qualified and, where relevant, certified installer.
- Check with local authorities if a permit is required.
- Check the existence of an electrical inspection report.
- Check whether the available power reserve of the electrical installation is sufficient to supply the intended car charger;
- For shared housing, verify if other tenants/homeowners agree with the necessary works.
- Verify if the area is influenced by fire safety norms.
- Check if and which subsidies are available, and if electrical upgrades are covered.
- Check if any legal permission by interested subjects is required to install.
- Declare the installation to all relevant counterparties (landlord, condominium administrator, the local fire brigade, the insurance company).
- Ask and keep carefully the documentation provided by the installer, related to the equipment, its installation and legalisation and respect the maintenance plan.

- Never store any combustible materials (Paper, cardboard, paint, wood...) near the electrical board and the charging point.
- Consult an electrician if you observe any electrical problem such as overheating of the cables, deterioration of components, regular blowing of fuses, etc.

Authorization from the condominium:

Private Charging:

Case 1 - Connection to an existing condominium pod or to a new condominium pod:

- Private charging of electric cars at a privately owned garage or parking space within a condominium, which are not electrically connected to the home (private POD), can be carried out by connecting the charging devices to:
 - Existing condominium POD, which already supplies the common utilities;
 - New condominium POD dedicated to the charging service, which operates in parallel with the POD for common users.
- The condominium or group of condominiums concerned, once they have obtained the authorization from the condominium assembly, have the freedom to proceed with the installation of a charging device inside their own garage or parking space. The installation requires resolutions (in the first or second call) of the condominium assembly approved with a number of votes that represent the majority of those present and at least half (1/2) of the value of the building. (Codice Civile art. 1120 and 1136).
 - Majorities (first and second call):
 - Number of votes in favor (Condomini totali/interv.): 50% + 1 attendees;
 - Value of votes in favour (Millesimi): at least 500/1000 (1/2).
- The costs of installing the charging infrastructure, on the other hand, may be:
 - at the expense of the entire condominium, where the installation has been approved by the assembly, thus becoming the system of common property.
 - to be paid only by the interested parties, so as not to burden more the condominiums not interested in the service, if the decision of the assembly concerns a group of condominiums. The right of redemption is considered valid for the condominiums who intend to use the system later, i.e. it is possible that the investment is made only by the condominiums concerned with the possibility for the others to access later by paying the share of the investment.
- The administrator will be in charge of collecting requests from the residents and convening the assembly dedicated to the topic. During the meeting, the administrator can decide to promote this solution to verify whether the conditions exist to be able to implement the project.

Case 2 - Connecting to the Home Pod:

- Charging with infrastructures connected to one's "domestic" POD, if technically feasible, allows the consumer to have access to the most convenient electricity tariff (resident domestic tariff), i.e. the one normally applied to electricity used in private homes
- The condominium has the freedom to proceed with the installation of a charging device inside their own garage or parking space.
- If the installation requires work on the common parts, the interested party has the possibility to proceed provided that:
 - (a) does not alter its intended use and does not prevent other participants from using it in the same way in accordance with their rights. To this end, he may make the necessary modifications at his own expense for the better

enjoyment of the property. If the condominium has evaluated/is considering the possibility of creating a centralized system dedicated to the charging of electric vehicles for all parking spaces, it will be necessary to promptly evaluate the interventions concerning the common parts.

- (b) does not cause damage to the common areas or cause damage to the stability, safety or architectural decorum of the building.
- The condominium owner is always required to give prior notice to the administrator, who in turn reports to the meeting and to produce and deliver to him – at his own expense and with the support of a specialized company – a detailed technical project drawn up by a qualified professional in the cases provided for by Ministerial Decree 37/08, including a system greater than 6kW and connection to a fire emergency release.
- The condominium administrator, after having carried out all the necessary security checks, will establish the amount of the related expenses for the installation and presentation of a new update SCIA, if necessary, in accordance with the Guidelines issued by the Ministry of the Interior.
- It will then convene the assembly to report in the event that the installation requires or not changes to common parts of the condominium, which must take place in full compliance with the provisions of art. 1102 of the Civil Code (such as the installation of new cables to ensure a greater flow rate or interventions on the condominium meter panel, etc.).

Case 3- Connecting to a new home pod:

- In the event that the garage/parking space is not connected to a condominium supply, and it is not possible to take advantage of the domestic connection, we proceed with the request for the installation of a meter in the name of the condominium and dedicated to the individual garage/parking space;
- Obligations of the condominium: The same procedure follows, and the same considerations apply as in the example of Case 2.

Condominium Charging:

Installation of charging infrastructure in common parts of the condominium and shared charging point(s):

- If the condominium or group of condominiums concerned does not have a garage or private parking space, but instead has the availability of a common space (parking or courtyard), it can be requested to allocate one or more parking spaces in the common area exclusively for charging electric vehicles, installing the necessary charging stations.
- The condominium or group of condominiums must follow the same procedure as in Case 1 and make a request to the condominium administrator to convene the meeting to deliberate on the installation of the charging infrastructure, indicating the specific content of the request and the methods of execution of the proposed interventions.
- The director will be required to convene the meeting within thirty days of the request to present the technical project.
- The Assembly, once the request has been examined, will have to express its own resolution.
- For the approval of the necessary works in the condominium area, the majorities provided for by art. 1136, first, second and third paragraphs of the Italian Civil Code, are required, both in the first and in the second call. (i.e. a smaller majority than required

by Article 1120, paragraph 1 of the Civil Code for the approval of innovations in general, i.e. a number of votes representing the majority of those present and at least one third of the value of the building is sufficient on second call).

- In the event of failure of the assembly to agree within 3 months of the written request, the condominium or group of condominiums may proceed with the installation of the electric vehicle charging infrastructure at its own expense and expense, provided that the new system does not alter the use of the common areas and does not prevent the other condominiums from using it in the same way according to their right, nor is it detrimental to the stability, safety or decorum of the building¹⁶.
- Since this is an innovation, it will be necessary to set up the special fund pursuant to Article 1135 of the Italian Civil Code.

Provided by a Third Party:

- In addition to the classic models, there is also a new way of developing the private access infrastructure where it is also possible to enter into an agreement with a third-party operator, which takes charge - at no cost to the condominium - of the construction from scratch of a common infrastructure, which includes the request for a POD dedicated to the power supply of charging devices and the construction of a centralized electrical system, also this one dedicated.
- As soon as the agreement between the condominium and the operator is signed, the simple request of the condominium will be enough for the latter to work on the adaptation of the infrastructure and the installation of the single charging point for the use of the condominium. Once the purchase or rental of the charging point has been made, the tenant will then be required to pay a monthly fee that will allow him to have access to the common infrastructure built by the operator, as well as insurance, maintenance and technical assistance services on the system. However, the right of each condominium to be able to resort to private charging via domestic POD (new or pre-existing) through the installation of a private electrical system, independent of the common infrastructure built by the operator, remains unaffected; In any case, this system should be installed in compliance with the rights of the other condominiums that have adhered to the operator's offer at the meeting and should not interfere with it.
- It is sufficient for the condominium to approve the stipulation of an agreement with the operator in the assembly for the solution to be implemented and become available to the individual condominiums. The administrator therefore only has the obligation to obtain the condominium authorization.
- The management of the infrastructure, its maintenance, as well as the allocation of the cost of the electricity consumed are then the responsibility of the operator himself and therefore the administrator has no charges whatsoever for the operation of the plant.

Electric charging station:

- The location of the station must be chosen on the basis of technical evaluations by an expert regarding the route of the cables, the distance from the dedicated meter, the area actually available for installation.
- Contact professionals for design and installation;
- In the case of interventions on the common parts of the condominium, a resolution of the condominium assembly will be required to approve the execution of the works and the table of distribution of the millesimal expenses;

- Declaration of consent of the owner for the execution of the works, in case these are carried out by the owner of the building;
- In addition, the national and local regulations in force on urban planning, construction, energy efficiency and safety (installations, environment, work) must be respected.

Obligations of the client and the owner (Decree no. 37 of 22 January 2008):

- It is mandatory for the customer and/or owner of the plant to submit the declaration of conformity or that of compliance whenever he requests a new supply (or an upgrade of the existing one) of water, gas, electricity, as well as the certificate of occupancy for a given environment.
- Maintenance of the systems: The owner of the plant has the obligation to maintain the same;

Building permit:

Building permit required for the construction of the charging system:

Residential buildings:

- For newly constructed residential buildings with at least 10 residential units for a number of parking spaces and garages not less than 20 percent of the total ones. - **Permesso di costruire/SCIA super** alternatively, for the building intervention, with within the same qualifications, the declarations, attestations, asseverations relating to the charging systems.
- For "first level" building renovation interventions, in accordance with the detailed building provisions set out in the regulation itself, which can be:
 - **"Heavy" building renovation:** interventions that lead to the modification of the building parameters of the volume and overall surface, of the elevation, of the shape, etc., and that affect more than 50% of the external dispersing surface and the possible renovation of the winter and/or summer heating system. - **Permesso di costruire/SCIA super** alternatively, for the building intervention, with within the same qualifications, the declarations, attestations, asseverations relating to the charging systems.
 - **"Light" building renovation:** interventions that do NOT lead to the modification of the building parameters of the volume and overall surface, of the elevation, etc., and that affect more than 50% of the external dispersing surface and the possible renovation of the winter and/or summer heating system. - **SCIA ordinaria**, for construction work, with within it, the declarations, attestations, asseverations relating to charging systems.
- Certified Notification of Commencement of Activity (SCIA): The owner of the property must submit the SCIA and must do so at the *Sportello Unico Edilizia* of the relevant municipality.
- The construction of charging points in buildings and private areas, including those open for public use, remains a free activity, not subject to authorisation or SCIA, if the following requirements and conditions specified below are met:
 - The charging point does not require a new connection to the electricity distribution network or a modification of the existing one;
 - The charging point complies with current technical and safety standards;
 - The installation of the charging point is carried out by a qualified person and in compliance with electrical safety regulations;
 - The installer must issue a certificate of conformity of the system and its operation with electrical safety standards.

Warranty for construction work:

- After the sentence 22553/2015 of the Supreme Court, the duration of the warranty was also extended to cases of renovation, repair or maintenance of pre-existing buildings or significant parts thereof. The 10-year (10-year) procurement guarantee also applies to renovations, and not just to the actual construction of buildings. In fact, the manufacturer/contractor's warranty pursuant to Article 1669 of the Civil Code ("Ruin and defects of immovable property") is also triggered in the case of repairs and modifications after construction, in the case of works intended by their nature to be long-lasting.
- For all renovation and maintenance work, such as:
 - Waterproofing works;
 - works for the renovation of the roof;
 - maintenance of the electrical system;
 - works involving the condominium;
 - asphalt works.

Table 11: Italian regulations applied to electric mobility.

Applicable Laws	
Law no. 134 of 7 August 2012	Conversion into law, with amendments, of Decree-Law No. 83 of 22 June 2012, containing urgent measures for the growth of the country.
Decree no. 37 of 22 January 2008	Regulation concerning the implementation of Article 11-quaterdecies, paragraph 13, letter a) of Law no. 248 of 2 December 2005, reorganizing the provisions on the installation of systems inside buildings.
Decree of the Ministry of Infrastructure Transport of 13 December 2017	Identification of declarations, attestations, asseverations, as well as technical documents to be submitted in support of the certified notification of commencement of activity for the construction of electric vehicle charging infrastructures.
Legislative Decree no. 257 of 16 December 2016	Guidelines for the implementation of Directive 2014/94/EU of the European Parliament and of the Council of 22 October 2014 on the deployment of alternative fuels infrastructure.
PNIRE	National infrastructure plan for the charging of electricity-powered vehicles of 30 June 2016.
Law no. 120 of 11 September 2020	Conversion into law, with amendments, of Decree-Law No. 76 of 16 July 2020, containing urgent measures for simplification and digital innovation.
Decree of the President of the Republic no. 380 of 6A) June 2001	Consolidated text of the laws and regulations on construction. (Text of the Republic no. 380 of 6A)
Directive 2014/94/EU of the European Parliament and of the Council of 22 October 2014	On the deployment of alternative fuels infrastructure.

3.1.11 LIFTING INSTALLATIONS

This intervention typology includes measures in residential buildings for the installation and maintenance of lifting installations. Table 12 summarizes the regulation applicable for this installation. The following requirements are applicable for this intervention:

Authorization from the condominium:

Special rules on majorities in condominiums (first and second call):

- Works and interventions to eliminate architectural barriers (Lift):
 - Number of votes in favor (Condomini totali/interv.): 50% + 1 attendees;
 - Value of votes in favour (Millesimi): at least 500/1000 (1/2).
- Installation of a lift for the purpose of improving or making the use of the common property more comfortable and which does not cause harm to the stability or safety of the building:
 - Number of votes in favor (Condomini totali/interv.): 50% + 1 attendees;
 - Value of votes in favour (Millesimi): at least 667/1000 (2/3).
- Installation of a lift that may alter the decorum, making some parts unusable for use or enjoyment even by a single condominium owner (for example : lift outside a building of notable architectural value; lift to be built in the stairwell with cutting of the steps or significant restriction of the entrance area in such a way as to prevent the use or enjoyment of said common parts even by a single condominium owner):
 - Number of votes in favor (Condomini totali/interv.): total condominiums;
 - Value of votes in favour (Millesimi): at least 1000/1000 (100%).
- Installation of a lift that may alter the decorum, making some parts unusable for use or enjoyment even by a single condominium owner (for example : lift outside a building of notable architectural value; lift to be built in the stairwell with cutting of the steps or significant restriction of the entrance area in such a way as to prevent the use or enjoyment of said common parts even by a single condominium owner):
 - Number of votes in favor (Condomini totali/interv.): total condominiums;
 - Value of votes in favour (Millesimi): at least 1000/1000 (100%).
- Civil Code: ART. 1124. Maintenance and Replacement of Stairs and Elevators - Stairs and elevators are maintained and replaced by the owners of the real estate units they serve. The related expenditure is divided among them, half according to the value of the individual building units and the other half exclusively in proportion to the height of each floor above the ground.
- All condominiums, including residents on the ground floor and owners of shops with independent access, are required to contribute to the expenses for the maintenance and replacement of elevators, as they are common parts of the building.

Table 12: Italian regulations applied to lifts.

Applicable Laws	
Decree no. 37 of 22 January 2008	Regulation concerning the implementation of Article 11-quaterdecies, paragraph 13, letter a) of Law no. 248 of 2 December 2005, reorganizing the provisions on the installation of systems inside buildings.
CEI 64-8 standard	Electrical installations with a rated voltage not exceeding 1 000 V alternating current and 1 500 V direct current.
Decree of the President of the Republic no. 23 of 10 January 2017	Regulation concerning amendments to the Decree of the President of the Republic no. 162 of 30 April 1999 for the implementation of Directive 2014/33/EU on lifts and safety components of lifts as well as for the operation of lifts. (17G00031)
Decree of the President of the Republic No 547 of 27 April 1955	Regulations for the prevention of accidents at work.

3.1.12 INSTALLATION OF GREEN INFRASTRUCTURE

This intervention typology includes measures in residential buildings for the implementation of green infrastructure (e.g. green roofs and facades) that promote the incorporation of biomaterials, recycled materials, natural-based solutions, green facades and roofs and architectural solutions bioclimatic. Table 13 synthesizes the regulations for the installation of green infrastructure. The following requirements are applicable for this intervention:

General requirements:

- Preliminary analysis to verify the admissibility of the intervention considering urban planning tools, technical standards, local regulations and any environmental and landscape constraints at regional and national level.
- The technical-structural analysis is the determining factor for a feasibility study of the intervention. The floor must have sufficient capacity characteristics to withstand the new overload in total safety. If it is a flat roof, it is likely that it has been designed with thermal insulation, waterproofing of the extrados and an adequate water canalization system.

Authorization from the condominium:

- Any interventions carried out on the condominium facade must be respectful of the architectural decorum of the building and with the consent of the other condominium owners. The architectural decorum of a building is a common good, which must be protected and preserved even in the case of interventions for energy improvement (Cassazione ordinanza n. 17920/2023).
- In the case of interventions on the common parts of the condominium, a resolution of the condominium assembly will be required to approve the execution of the works and the table of distribution of the millesimal expenses;
- The installation of a green facade or roof requires resolutions of the condominium assembly.

General rules of majorities (article 1136 of the Civil Code):

- The first call meeting is valid only if condominium owners representing at least 2/3 of the value of the building and the majority of condominium owners participate (**constitutive quorum**); furthermore, the resolutions are valid only if they are approved with a number of votes that represents the majority of those present and at least half (1/2) of the value of the building (**deliberative quorum**);
- If the first call it is not possible to deliberate due to lack of quorum (if the first call does not reach the minimum majorities), the second call meeting is valid if there is the intervention of a number of condominium owners representing at least one third of the value of the entire building and one third of the participants in the condominium (**constitutive quorum**); for the approval of the resolutions, however, a majority of those present with a number of votes representing at least one third (1/3) of the value of the condominium owners' building is sufficient (**deliberative quorum**).
- The second meeting must be held on a day following the first and, in any case, no later than ten days after it.
- Declaration of consent of the owner for the execution of the works, in case these are carried out by the owner of the building.

Special rules of majorities:

- If it is considered an innovation work (**first and second call**):
 - Number of votes in favor (Condomini totali/interv.): 50% + 1 attendees;
 - Value of votes in favour (Millesimi): at least 500/1000 (1/2).

Restrictions and building permits required (D.P.R. 31/2017):

- If the building or area is subject to landscape constraints and you cannot take advantage of special concessions, it is essential to obtain landscape authorization. The procedure involves sending the request to the public body, which forwards the application to the Superintendence. The latter issues a mandatory and binding opinion within 45 days.
- *Simplified landscape authorization: Annex B of Presidential Decree 31/2017:*
 - volume increases within 10% of the original volume, in compliance with existing characteristics;
 - construction or modification of external openings or roof windows on listed properties, in compliance with the pre-existing characteristics;
 - façade modifications with the construction or reconfiguration of openings, cornices, railings;
 - interventions on external finishes with plastering, painting or coatings;
 - construction, modification or closure of balconies or terraces;
 - construction or substantial modification of external stairs;
 - anti-seismic interventions or for energy containment with morpho-typological innovations or in pre-existing materials;
 - interventions to overcome architectural barriers, such as ramps or external lifts visible from the public space.

Warranty for construction work:

- After the sentence 22553/2015 of the Supreme Court, the duration of the warranty was also extended to cases of renovation, repair or maintenance of pre-existing buildings or significant parts thereof. The 10-year (10-year) procurement guarantee also applies to renovations, and not just to the actual construction of buildings. In fact, the manufacturer/contractor's warranty pursuant to Article 1669 of the Civil Code ("Ruin

and defects of immovable property") is also triggered in the case of repairs and modifications after construction, in the case of works intended by their nature to be long-lasting.

- For all renovation and maintenance work, such as:
 - Waterproofing works;
 - works for the renovation of the roof;
 - maintenance of the electrical system;
 - works involving the condominium;
 - asphalt works.

Table 13: Italian regulations applied to green infrastructure

Applicable Laws	
Decree of the President of the Republic no. 380 of 6 June 2001	Republication of the text of the Decree of the President of the Republic no. 380 of 6 June 2001, containing: "Consolidated text of the legislative and regulatory provisions on construction. (Text A)", accompanied by the relevant notes. (Decree published in the Ordinary Supplement No. 239/L to the Official Gazette - General Series - No. 245 of 20 October 2001).
Decree of 23 June 2022	Minimum environmental criteria for the assignment of the design service of building interventions, for the assignment of works for building interventions and for the joint assignment of design and works for building interventions.
Legislative Decree no. 222 of 25 November 2016	Identification of procedures subject to authorisation, certified notification of commencement of activity (SCIA), silent consent and communication and definition of the administrative regimes applicable to certain activities and procedures, pursuant to Article 5 of Law no. 124 of 7 August 2015.
D.M. 2 March 2018	Approval of the glossary containing the non-exhaustive list of the main building works that can be carried out under the free building activity regime, pursuant to Article 1, paragraph 2, of Legislative Decree no. 222 of 25 November 2016.
Interministerial Decree of 26 June 2015	Adaptation of national guidelines for the energy certification of buildings.
Legislative Decree No. 36 of 31 March 2023	Public Procurement Code implementing Article 1 of Law No. 78 of 21 June 2022 delegating the Government to public contracts.
Law no. 10 of 9 January 1991	Rules for the implementation of the National Energy Plan on the rational use of energy, energy saving and the development of renewable energy sources.
Legislative Decree no. 192 of 19 August 2005	Implementation of Directive 2002/91/EC on the energy performance of buildings.
Decree of 26 June 2009	National guidelines for the energy certification of buildings. (09A07900).
UNI 11235:2015	Criteria for design, execution, testing and maintenance of roof garden

ASTM E2777-20	Standard Guide for Vegetative (Green) Roof Systems.
Legislative Decree no. 81 of 9 April 2008	Implementation of Article 1 of Law No. 123 of 3 August 2007 on the protection of health and safety in the workplace.
D.M. 3 August 2015	Fire Prevention Code.
D.P.R. 151/2011	Fire Prevention Regulations.
D.P.C.M. 5 December 1997	Standards of acoustic requirements.
NTC 2018	Technical Standards for Construction
Circular no. 7/2019	Updating of technical construction standards.

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- FLL "Green Roof Guidelines - Guidelines for the Planning, Construction and Maintenance of Green Roof (2008)"

3.1.13 OPAQUE ENVELOPE

This intervention typology includes measures in the opaque envelope of buildings, exterior or interior, with the aim of reinforcing thermal insulation (e.g., application of thermal insulation, on walls, roofs, floors). Table 14 summarizes the regulations applicable for opaque envelope interventions. The following requirements are applicable for this intervention:

General requirements:

- The intervention must be the subject of a specific project and it is therefore necessary to contact a professional qualified for this purpose before carrying out the work;
- If it is decided to proceed with thermal insulation works (also called "insulation") it is necessary to carry out an energy audit of the building, to assess the state of the structure, the actual degree of insulation, and evaluate the necessary interventions.
- The relevant national and local regulations in force on urban planning, construction, energy efficiency and safety (installations, environment, labour) must be complied with.
- Ask for the technical data sheets and technical information of the proposed solutions and verify that all the materials meet your needs and that they have the CE marking with the relevant declarations of performance (DoP).
- Request a technical certification ("asseverazione"), drawn up by a qualified technician, certifying compliance with the specific technical requirements.

Authorization from the condominium (in common parts):

- The installation of a thermal coat (external envelope of the building) or other similar interventions carried out on the condominium facade must be respectful of the architectural decorum of the building and with the consent of the other condominium owners. The architectural decorum of a building is a common good, which must be protected and preserved even in the case of interventions for energy improvement (Cassazione ordinanza n. 17920/2023).
- The administrator is required to convene the assembly within thirty days (30 days) of the request, even by a single condominium owner interested. If he does not, he commits a serious irregularity that could lead to judicial revocation of his mandate.

- The installation of a thermal coat is requires resolutions of the condominium assembly .

General rules of majorities (article 1136 of the Civil Code)

- The first call meeting is valid only if condominium owners representing at least 2/3 of the value of the building and the majority of condominium owners participate (**constitutive quorum**); furthermore, the resolutions are valid only if they are approved with a number of votes that represents the majority of those present and at least half (1/2) of the value of the building (**deliberative quorum**);
- If the first call it is not possible to deliberate due to lack of quorum (if the first call does not reach the minimum majorities), the second call meeting is valid if there is the intervention of a number of condominium owners representing at least one third of the value of the entire building and one third of the participants in the condominium (**constitutive quorum**); for the approval of the resolutions, however, a majority of those present with a number of votes representing at least one third (1/3) of the value of the condominium owners' building is sufficient (**deliberative quorum**).
- The second meeting must be held on a day following the first and, in any case, no later than ten days after it.

Special rules of majorities:

- If it is considered an innovation work (**first and second call**):
 - *Number of votes in favor (Condomini totali/interv.): 50% + 1 attendees;*
 - *Value of votes in favour (Millesimi): at least 500/1000 (1/2).*
- As an exception to the general rule, in the event that the condominium uses the tax deductions referred to in art. 119 of the Relaunch Decree (the superbonus) to install the thermal coat, the resolution of the assembly is valid if approved with a number of votes that represent the majority of those present and at least one third of the value of the building (regardless of whether it is the first or second call).
- In the case of balconies, represent extensions of the usable surface of the home and which, therefore, must be considered private parts. In this case, the condominium cannot approve work to be carried out within the housing unit owned exclusively by a single condominium owner. It is needed the specific approval from the owner condominium.
- Declaration of consent of the owner for the execution of the works, in case these are carried out by the owner of the building;

Restrictions and building permits required (D.P.R. 31/2017):

- If the building or area is subject to landscape constraints and you cannot take advantage of special concessions, it is essential to obtain landscape authorization. The procedure involves sending the request to the public body, which forwards the application to the Superintendence. The latter issues a mandatory and binding opinion within 45 days.
- *Simplified landscape authorization: Annex B of Presidential Decree 31/2017:*
 - *volume increases within 10% of the original volume, in compliance with existing characteristics;*
 - *construction or modification of external openings or roof windows on listed properties, in compliance with the pre-existing characteristics;*

- *façade modifications with the construction or reconfiguration of openings, cornices, railings;*
- *interventions on external finishes with plastering, painting or coatings;*
- *construction, modification or closure of balconies or terraces;*
- *construction or substantial modification of external stairs;*
- *anti-seismic interventions or for energy containment with morpho-typological innovations or in pre-existing materials;*
- *interventions to overcome architectural barriers, such as ramps or external lifts visible from the public space.*

Warranty for construction work:

- After the sentence [22553/2015 of the Supreme Court](#), the duration of the warranty was also extended to cases of renovation, repair or maintenance of pre-existing buildings or significant parts thereof. The 10-year (10-year) procurement guarantee also applies to renovations, and not just to the actual construction of buildings. In fact, the manufacturer/contractor's warranty pursuant to Article 1669 of the Civil Code ("Ruin and defects of immovable property") is also triggered in the case of repairs and modifications after construction, in the case of works intended by their nature to be long-lasting.
- For all renovation and maintenance work, such as:
 - Waterproofing works;
 - works for the renovation of the roof;
 - maintenance of the electrical system;
 - works involving the condominium;
 - asphalt works.

Table 14: Italian regulations applied to building opaque envelope.

Applicable Laws	
Decree of the President of the Republic no. 380 of 6 June 2001	Republication of the text of the Decree of the President of the Republic no. 380 of 6 June 2001, containing: "Consolidated text of the legislative and regulatory provisions on construction. (Text A)", accompanied by the relevant notes. (Decree published in the Ordinary Supplement No. 239/L to the Official Gazette - General Series - No. 245 of 20 October 2001).
Decree No. 256 of 23 June 2022	Minimum environmental criteria for the assignment of the design service of building interventions, for the assignment of works for building interventions and for the joint assignment of design and works for building interventions.
Interministerial Decree of 26 June 2015 *	Application of energy performance calculation methodologies and definition of minimum building requirements and requirements.
Interministerial Decree of 26 June 2015 *	Adaptation of national guidelines for the energy certification of buildings.
Legislative Decree no. 222 of 25 November 2016	Identification of procedures subject to authorisation, certified notification of commencement of activity (SCIA), silent consent and communication and definition of the administrative regimes

	applicable to certain activities and procedures, pursuant to Article 5 of Law no. 124 of 7 August 2015.
D.M. 2 March 2018	Approval of the glossary containing the non-exhaustive list of the main building works that can be carried out under the free building activity regime, pursuant to Article 1, paragraph 2, of Legislative Decree no. 222 of 25 November 2016.
Legislative Decree No. 36 of 31 March 2023	Public Procurement Code implementing Article 1 of Law No. 78 of 21 June 2022 delegating the Government to public contracts.
Law no. 10 of 9 January 1991	Rules for the implementation of the National Energy Plan on the rational use of energy, energy saving and the development of renewable energy sources.
Legislative Decree no. 192 of 19 August 2005	Implementation of Directive 2002/91/EC on the energy performance of buildings.
Decree of 26 June 2009	National guidelines for the energy certification of buildings. (09A07900).
Legislative Decree no. 81 of 9 April 2008	Implementation of Article 1 of Law No. 123 of 3 August 2007 on the protection of health and safety in the workplace.
D.M. 3 August 2015	Fire Prevention Code.
D.P.R. 151/2011	Fire Prevention Regulations.
D.P.C.M. 5 December 1997	Standards of acoustic requirements.
NTC 2018	Technical Standards for Construction
Standard UNI 11715:2018	Design and installation of thermal insulation
Circular no. 7/2019	Updating of technical construction standards

*the regions of Lombardy, Emilia Romagna and Valle D'Aosta and the autonomous province of Trento have implemented the Interministerial Decrees of 26 June 2015 with their own regional legislation consistent with the national framework but with some modifications. The project must refer to the regional arrangements.

3.1.14 GLAZED ENVELOPE

This intervention typology includes measures in the glazed envelope of the buildings and their shading devices (e.g., replacement of single-glazed frames with efficient windows, installation of exterior sun protections). Table 15 summarizes the regulations applicable to these interventions. The following requirements are applicable for this intervention:

General requirements:

- The main parameter to consider is of course thermal and acoustic insulation: windows and doors must avoid the formation of thermal bridges, which are the main cause of heat loss and therefore of considerable energy expenditure, causing high consumption for heating and air conditioning of the rooms themselves.
- From an acoustic point of view, even windows and doors can have a certification that determines their good insulation performance. The standard that regulates this certification is UNI-EN 12207. If a window is defined as class 3 or 4, it means that it will have a high insulating power.

- Solar shading must have a value of the total solar transmission factor coupled to the type of glass of the protected glass surface less than or equal to 0.35 evaluated with reference to type C glass according to the UNI EN 14501 standard.
- The relevant national and local regulations in force on urban planning, construction, energy efficiency and safety (installations, environment, labour) must be complied with.
- It is important to contact qualified installers, specialized in installation and who also give a check to the insertion of the counterframe in the masonry and/or floor.
- Ask for the technical data sheets and technical information of the proposed solutions and verify that all the materials meet your needs and that they have CE marking with relative declarations of performance (DoP);
- Request a technical certification (“asseverazione”), drawn up by a qualified technician, certifying compliance with the specific technical requirements.

Condominium rules:

- The condominium that intends to replace its fixtures, perhaps replacing them with others of a different colour, will have to consider the condominium architectural decorum. The general rule is to keep the colours similar to the original for the outside and the shapes of the identical frames.
- The individual condominium owner cannot carry out works that cause damage to the common parts or determine a prejudice to the stability, safety or architectural decorum of the building. In any case he is required to provide prior notice to the administrator who, in turn, communicates it to the assembly.
- Awnings: Those who live in a condominium must take into account the condominium rules when choosing and installing blinds, since affects the facade. It is necessary to conform as much as possible to the colours and models that are already installed in the building to respect its "architectural decorum". In the absence of regulations or consolidated use in terms of colours and models, it will be appropriate to ask the opinion of the assembly. This opinion is not mandatory by law but serves to avoid unpleasant arguments with other condominium members.
- Notify the rest of the residents of the start of the work. It would be advisable to post a sheet on the usual notice board that keeps everyone informed of the work.

Table 15: Italian regulations applied to building glazed envelope.

Applicable Laws	
Decree of the President of the Republic no. 380 of 6 June 2001	Republication of the text of the Decree of the President of the Republic no. 380 of 6 June 2001, containing: "Consolidated text of the legislative and regulatory provisions on construction. (Text A)", accompanied by the relevant notes. (Decree published in the Ordinary Supplement No. 239/L to the Official Gazette - General Series - No. 245 of 20 October 2001).
Decree No. 256 of 23 June 2022	Minimum environmental criteria for the assignment of the design service of building interventions, for the assignment of works for building interventions and for the joint assignment of design and works for building interventions.

Interministerial Decree of 26 June 2015	Application of energy performance calculation methodologies and definition of minimum building requirements and requirements.
Interministerial Decree of 26 June 2015	Adaptation of national guidelines for the energy certification of buildings.
Law no. 10 of 9 January 1991	Rules for the implementation of the National Energy Plan on the rational use of energy, energy saving and the development of renewable energy sources.
Legislative Decree no. 192 of 19 August 2005	Implementation of Directive 2002/91/EC on the energy performance of buildings.
Decree of 26 June 2009	National guidelines for the energy certification of buildings. (09A07900).
Legislative Decree no. 81 of 9 April 2008	Implementation of Article 1 of Law No. 123 of 3 August 2007 on the protection of health and safety in the workplace.
D.P.C.M. 5 December 1997	Standards of acoustic requirements.
NTC 2018	Technical Standards for Construction.
Standard UNI EN 14501:2021	Blinds and shutters - Thermal and visual comfort - Performance characteristics and classification.
Standard UNI EN 12207:2017	Windows and doors - Air permeability – Classification.

3.1.15 CONSTRUCTION

It includes new works, repairs, extensions and renovations, and on-site construction of prefabricated buildings and structures. Activities such as plumbing, installation of heating and air conditioning systems, antennas, alarm systems and other electrical installations, automatic fire sprinkler systems, elevators and escalators, and insulation work (thermal, sound and humidity) are included:

-  Demolition and land preparation;
-  Electrical, plumbing and other installations on construction sites;
-  Plumbing, heating and air conditioning system installations;
-  Other facilities at construction sites;
-  Building finishing;
-  Carpentry installation;
-  Floor and wall cladding;
-  Painting and glazing;
-  Other specialized construction activities;
-  Roof construction.

Table 16 summarizes the regulations applicable to these interventions. The following requirements are applicable for this intervention:

General requirements:

- The intervention must be the subject of a specific project, so it is advisable to contact a professional qualified for this purpose before carrying out the work;
- In addition, the relevant national and local regulations in force on urban planning, construction, energy efficiency and safety (installations, environment, labour) must be complied with.
- It is important to contact qualified installers, specialized in installation and who also give a check to the insertion of the counterframe in the masonry and/or floor.

- Ask for the technical data sheets and technical information of the proposed solutions and verify that all the materials meet your needs and that they have CE marking with relative declarations of performance (DoP);
- Request a technical certification (“asseverazione”), drawn up by a qualified technician, certifying compliance with the specific technical requirements.

Authorization from the condominium (in common parts):

- According to Articles 1120 and 1136 of the Italian Civil Code, significant modifications to common areas, like some of the constructions activities above, are considered “innovations” and must be approved by the condominium assembly.

General rules of majorities (article 1136 of the Civil Code)

- The first call meeting is valid only if condominium owners representing at least 2/3 of the value of the building and the majority of condominium owners participate (constitutive quorum); furthermore, the resolutions are valid only if they are approved with a number of votes that represents the majority of those present and at least half (1/2) of the value of the building (deliberative quorum);
- If the first call it is not possible to deliberate due to lack of quorum (if the first call does not reach the minimum majorities), the second call meeting is valid if there is the intervention of a number of condominium owners representing at least one third of the value of the entire building and one third of the participants in the condominium (constitutive quorum); for the approval of the resolutions, however, a majority of those present with a number of votes representing at least one third (1/3) of the value of the condominium owners' building is sufficient (deliberative quorum).
- The second meeting must be held on a day following the first and, in any case, no later than ten days after it.

Examples of majorities for innovations or works (**first and second call**):

- 1) Works and interventions aimed at improving the safety and healthiness of buildings and installations; 2) works and interventions planned to eliminate architectural barriers, to contain the energy consumption of buildings, to create parking lots intended to serve the real estate units or the building, as well as for the production of energy through the use of cogeneration plants, wind, solar or otherwise renewable sources by the condominium or third parties who obtain, for a fee, a real or personal right to enjoy the flat roof or other suitable common surface; 3) installation of centralized systems for radio and television reception and for access to any other type of information flow (with the exception of systems that do not involve modifications capable of altering the purpose of the common property and preventing other condominium owners from using it according to their rights):
 - Number of votes in favor (Condomini totali/interv.): 50% + 1 attendees;
 - Value of votes in favour (Millesimi): at least 500/1000 (1/2).

Examples of majorities for reconstruction of the building (**first and second call**):

- Reconstruction of the building in case of loss of less than 3/4 of its value:
 - Number of votes in favor (Condomini totali/interv.): 50% + 1 attendees;
 - Value of votes in favour (Millesimi): at least 500/1000 (1/2).
- Reconstruction of the building in case of loss of more than 3/4 of its value:
 - Number of votes in favor (Condomini totali/interv.): total condominiums;
 - Value of votes in favour (Millesimi): at least 1000/1000 (100%).

- The individual condominium owner cannot carry out works that cause damage to the common parts or determine a prejudice to the stability, safety or architectural decorum of the building. In any case he is required to provide prior notice to the administrator who, in turn, communicates it to the assembly.
- Declaration of consent of the owner for the execution of the works, in case these are carried out by the owner of the building;
- Notify the rest of the residents of the start of the work. It would be advisable to post a sheet on the usual notice board that keeps everyone informed of the work.
- Painting and glazing: It is necessary to conform as much as possible to the colours and models that are already installed in the building to respect its "architectural decorum". In the absence of regulations or consolidated use in terms of colours and models, it will be appropriate to ask the opinion of the assembly. This opinion is not mandatory by law but serves to avoid unpleasant arguments with other condominium members.

The "innovations" mentioned in Article 1120 of the Italian Civil Code refer to any works or modifications introduced in the common areas of a condominium that significantly alter their structure or use. These innovations typically aim to improve the functionality, aesthetics, or efficiency of the building. (example: installation of elevators; electrical and heating system, thermal insulation, etc.)

Civil Code - ART. 1120. Innovations:

- *The condominiums, with the majority indicated by the fifth paragraph of article 1136 ("...must be approved by the assembly with a number of votes representing the majority of those present and at least two-thirds (2/3) of the value of the entire building"), may order all innovations aimed at the improvement or more comfortable use or greater efficiency of common things.*
- *The condominiums, with the majority indicated by the second paragraph of Article 1136 ("Resolutions approved with a number of votes representing the majority of those present and at least half of the value of the building are valid"), may order innovations that, in compliance with the sector regulations, have as their object (innovazioni agevolate):*
 - *works and interventions aimed at improving the safety and healthiness of buildings and systems.*
 - *the planned works and interventions to eliminate architectural barriers, to contain the energy consumption of buildings and to create parking spaces intended to serve the real estate units or the building, as well as for the production of energy through the use of cogeneration plants, wind, solar or other renewable sources by the condominium or by third parties who obtain, for a fee, a real or personal right to use the roof terrace or other suitable common area;*
 - *the installation of centralized systems for radio and television reception and for access to any other type of information flow, including by satellite or cable, and the related connections up to the branch for individual users, with the exception of systems that do not involve changes capable of altering the purpose of the common property and preventing other condominiums owners from using it according to their rights.*
- *The administrator is required to convene the shareholders' assembly within thirty days (30 days) of the request of even a single condominium owner interested in the adoption of the resolutions referred to in the previous paragraph. The request must*

contain an indication of the specific content and methods of execution of the proposed interventions. In the absence of this, the administrator must immediately invite the proposing condominium owner to provide the necessary additions.

- Innovations that may harm the stability or safety of the building, that alter its architectural decoration or that make certain parts of it unusable for the use or enjoyment of even a single condominium are prohibited.

Condominium innovations that do not involve all condominium owners

Civil Code - Art. 1123. Allocation of expenses:

- The expenses necessary for the maintenance and enjoyment of the common parts of the building, for the provision of services in the common interest and for the innovations approved by the majority shall be borne by the co-owners in proportion to the value of the property of each, unless otherwise agreed. In the case of things intended to serve the condominiums to a different extent, the costs are distributed in proportion to the use that each person can make of them.

Condominium innovations prohibited

These are those identified by the fourth paragraph of art. 1120 of the Civil Code , namely:

- innovations that may jeopardise the stability or safety of the building;
- innovations that alter its architectural decor;
- innovations that make certain common parts of the building unusable for the use or enjoyment of even a single condominium owner.

Civil Code - Art. 1125. Maintenance and Reconstruction of Ceilings, Vaults and Floors:

- The costs for the maintenance and reconstruction of the ceilings, vaults and floors are borne in equal parts by the owners of the two floors above, the owner of the upper floor being responsible for the covering of the floor and the owner of the lower floor being responsible for the plaster, staining and decoration of the ceiling.

Restrictions and building permits required (Decree of the President of the Republic 6 June 2001, no. 380):

- The **building permit (permesso di costruire)** is issued to the owner of the property or to whoever is entitled to apply for it (*new construction interventions; urban renewal; building renovation that involves an increase in the number of building units, changes in volume, shape, elevations or surfaces, or that, limited to buildings included in homogeneous zones A, involve changes in the intended use*).
- The application for the issuance of the building permit must be submitted to the one-stop shop (*Sportello unico*) accompanied by a certificate concerning the title of legitimacy, by the design documents required by the building regulations, and when the conditions are met, as well as by a self-certification about the compliance of the project with the health and hygiene standards in the event that the project concerns residential building interventions or the verification of such compliance does not involve technical-discretionary assessments.
- The owner of the property or whoever is entitled to submit **the report of commencement of activity (denuncia di inizio attività)**, at least thirty days before the actual start of the works, shall submit the report to the one-stop shop, accompanied by a detailed report signed by a qualified designer and the appropriate design drawings, which certifies the compliance of the works to be carried out with the urban planning instruments adopted or approved and with the building regulations as well as compliance with safety and health and hygiene regulations.

- The holder of the building permit or the person who submitted the report of commencement of activity, or their successors or assignees, are required to request the issuance of the **certificate of occupancy (*certificato di agibilità*)** (The certificate of occupancy certifies the existence of the conditions of safety, hygiene, health, energy saving of the buildings and the systems installed in them, assessed in accordance with the provisions of current legislation).
- If the building or area is subject to landscape constraints and you cannot take advantage of special concessions, it is essential to obtain **landscape authorization**. The procedure involves sending the request to the public body, which forwards the application to the Superintendence. The latter issues a mandatory and binding opinion within 45 days.
- *Simplified landscape authorization: Annex B of Presidential Decree 31/2017:*
 - volume increases within 10% of the original volume, in compliance with existing characteristics;
 - construction or modification of external openings or roof windows on listed properties, in compliance with the pre-existing characteristics;
 - façade modifications with the construction or reconfiguration of openings, cornices, railings;
 - interventions on external finishes with plastering, painting or coatings;
 - construction, modification or closure of balconies or terraces;
 - construction or substantial modification of external stairs;
 - anti-seismic interventions or for energy containment with morpho-typological innovations or in pre-existing materials;
 - interventions to overcome architectural barriers, such as ramps or external lifts visible from the public space.

Warranty for construction work:

- After the sentence 22553/2015 of the Supreme Court, the duration of the warranty was also extended to cases of renovation, repair or maintenance of pre-existing buildings or significant parts thereof. The 10-year (10-year) procurement guarantee also applies to renovations, and not just to the actual construction of buildings. In fact, the manufacturer/contractor's warranty pursuant to Article 1669 of the Civil Code ("Ruin and defects of immovable property") is also triggered in the case of repairs and modifications after construction, in the case of works intended by their nature to be long-lasting.
- For all renovation and maintenance work, such as:
 - Waterproofing works;
 - works for the renovation of the roof;
 - maintenance of the electrical system;
 - works involving the condominium;
 - asphalt works.

Table 16: Italian regulations applied to construction.

Applicable Laws	
Decree of the President of the Republic no. 380 of 6 June 2001	Republication of the text of the Decree of the President of the Republic no. 380 of 6 June 2001, containing: "Consolidated text of the legislative and regulatory provisions on construction. (Text A)", accompanied by the relevant notes. (Decree published in the Ordinary Supplement No. 239/L to the Official Gazette - General Series - No. 245 of 20 October 2001).
Decree of 23 June 2022	Minimum environmental criteria for the assignment of the design service of building interventions, for the assignment of works for building interventions and for the joint assignment of design and works for building interventions.
Decree of the President of the Republic 13 February 2017, n. 31	Regulation identifying the interventions excluded from the landscape authorization or subjected to a simplified authorization procedure.
Legislative Decree no. 222 of 25 November 2016	Identification of procedures subject to authorisation, certified notification of commencement of activity (SCIA), silent consent and communication and definition of the administrative regimes applicable to certain activities and procedures, pursuant to Article 5 of Law no. 124 of 7 August 2015.
D.M. 2 March 2018	Approval of the glossary containing the non-exhaustive list of the main building works that can be carried out under the free building activity regime, pursuant to Article 1, paragraph 2, of Legislative Decree no. 222 of 25 November 2016.
Interministerial Decree of 26 June 2015	Adaptation of national guidelines for the energy certification of buildings.
Legislative Decree No. 36 of 31 March 2023	Public Procurement Code implementing Article 1 of Law No. 78 of 21 June 2022 delegating the Government to public contracts.
Law no. 10 of 9 January 1991	Rules for the implementation of the National Energy Plan on the rational use of energy, energy saving and the development of renewable energy sources.
Ministry of the Environment Circular no. 5205 of 15 July 2005	Indications for operations in the construction, road and environmental sectors, pursuant to Ministerial Decree no. 203 of 8 May 2003
Legislative Decree no. 192 of 19 August 2005	Implementation of Directive 2002/91/EC on the energy performance of buildings.
Decree of 26 June 2009	National guidelines for the energy certification of buildings. (09A07900).
Legislative Decree no. 81 of 9 April 2008	Implementation of Article 1 of Law No. 123 of 3 August 2007 on the protection of health and safety in the workplace.
D.M. 3 August 2015	Fire Prevention Code.
D.P.R. 151/2011	Fire Prevention Regulations.
D.P.C.M. 5 December 1997	Standards of acoustic requirements.

NTC 2018	Technical Standards for Construction
Circular no. 7/2019	Updating of technical construction standards

3.1.16 ENERGY CERTIFICATION

This intervention typology includes the emission of the energy certificate, a document that assesses the energy performance of a building on a scale of 10 energy classes, from G (very inefficient) to A4 (very efficient), issued by qualified experts. The Energy Performance Certificate or *Attestato di Prestazione Energetica* (APE, or also, commonly, “certificato energetico”) is a document that certifies the energy performance and energy class of a building and indicates the most cost-effective improvements. Through the APE, the citizen learns about characteristics such as the energy requirements of the building or building unit, the energy quality of the building, carbon dioxide emissions and the use of renewable energy sources, which affect the running costs and environmental impact of the building and is guided towards an informed choice in the case of purchase, rental or renovation (refurbishment or upgrading).

Table 17 summarizes the applicable legislation applicable for energy performance certificates. The following requirements are applicable for this intervention:

Energy performance certificate:

- The obligation of the **APE (*Attestato di Prestazione Energetica*)** energy certification is linked to different situations. Here's when it's generally required:
 - Sale or Rental of a Building: Energy certification is mandatory when selling or renting an entire building or a single real estate unit. The APE must be drawn up before the publication of the sale or rental announcement and must be made available to buyers or tenants.
 - New Construction: New buildings must be energy certified before occupancy.
 - Renovation or Redevelopment: In some cases, especially if the renovation is significant, it may be required.
 - Request for Incentives: To access certain tax or financial incentives related to energy efficiency, APE certification may be required.
- The APE must be drawn up by a qualified technician, such as an engineer or architect, and must be registered with the appropriate regional authority. Regulations may vary slightly regionally, so it's a good idea to check the specific regulations in your region.

Special rules of majorities (**first and second call**):

- Interventions aimed at limiting energy consumption identified through an energy certification certificate or energy diagnosis carried out by a qualified technician:
 - Number of votes in favor (Condomini totali/interv.): 50% + 1 attendees;
 - Value of votes in favour (Millesimi): at least 334/1000.

Table 17: Italian regulations applied to energy certification of buildings.

Leggi applicabili	
Legislative Decree No 192 of 19 August 2005	Implementation of Directive 2002/91/EC on the energy performance of buildings.
Law No. 90 of 3 August 2013	Conversion into law, with amendments, of Decree-Law No. 63 of 4 June 2013, containing urgent provisions for the implementation of Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings for the settlement of infringement proceedings initiated by the European Commission, as well as other provisions on social cohesion
Decree 26 June 2009	National guidelines for the energy certification of buildings. (09A07900).
Interministerial Decree 26 June 2015	Application of energy performance calculation methodologies and definition of prescriptions and minimum requirements for buildings.

3.1.17 General regulations

In this section, general regulations related with home renovations is presented, summarized in Table 18, 19, 20, 21, 22 and 23.

Table 18: Applicable legislation – Civil and building code.

Legislation	
Legislative Decree no. 36 of 31 March 2023	Public Procurement Code implementing Article 1 of Law No. 78 of 21 June 2022 delegating the Government to public contracts.
Royal Decree No. 262 of 16 March 1942	Approval of the text of the Civil Code.
Decree of the President of the Republic no. 31 of 13 February 2017	Regulation on the identification of interventions excluded from the landscape authorisation or subject to a simplified authorisation procedure.
Legislative Decree no. 42 of 22 January 2004	Code of Cultural Heritage and Landscape, pursuant to Article 10 of Law No. 137 of 6 July 2002.

Table 19: Applicable legislation – Labour Code.

Legislation	
Constitution	Constitution of the Italian Republic.
Legislative Decree no. 151 of 14 September 2015	Provisions for the rationalisation and simplification of procedures and obligations for citizens and businesses and other provisions on

	employment relationships and equal opportunities, in implementation of Law no. 183 of 10 December 2014.
Legislative Decree no. 22 of 4 March 2015	Provisions for the reorganisation of the legislation on social safety nets in the event of involuntary unemployment and the relocation of unemployed workers, in implementation of Law no. 183 of 10 December 2014.
Legislative Decree no. 23 of 4 March 2015	Provisions on open-ended employment contracts with increasing protections, in implementation of Law No. 183 of 10 December 2014.
Presidential Decree No. 137 of 7 August 2012	Regulation on the reform of professional regulations, pursuant to Article 3, paragraph 5, of Decree-Law No 138 of 13 August 2011, converted, with amendments, by Law No 148 of 14 September 2011.
Legislative Decree no. 66 of 8 April 2003	Implementation of Directives 93/104/EC and 2000/34/EC concerning certain aspects of the organisation of working time.
Legislative Decree no. 198 of 11 April 2006	Code of equal opportunities between men and women, in accordance with Article 6 of Law No. 246 of 28 November 2005.
Legislative Decree no. 81 of 15 June 2015	Organic regulation of employment contracts and revision of the legislation on duties, pursuant to Article 1, paragraph 7, of Law no. 183 of 10 December 2014.
Legislative Decree no. 151 of 26 March 2001	Consolidated text of the legislative provisions on the protection and support of maternity and paternity, pursuant to Article 15 of Law no. 53 of 8 March 2000.
Law no. 183 of 10 December 2014	Delegations to the Government in the field of reform of social safety nets, employment services and active policies, as well as in the reorganization of the discipline of labour relations and inspection activities and the protection and reconciliation of care, life and work needs.
Law No 300 of 20 May 1970	Norms on the protection of the freedom and dignity of workers, trade union freedom and trade union activity, in the workplace and rules on employment.
Law no. 92 of 28 June 2012	Provisions on labour market reform with a view to growth.

Table 20: Applicable legislation – Occupational health and safety.

Legislation	
Legislative Decree no. 81 of 9 April 2008	Implementation of Article 1 of Law No. 123 of 3 August 2007 on the protection of health and safety in the workplace.
Legislative Decree no. 106 of 3 August 2009	Supplementary and corrective provisions of Legislative Decree no. 81 of 9 April 2008 on the protection of health and safety in the workplace.
Legislative Decree no. 151 of 14 September 2015	Provisions for the rationalisation and simplification of procedures and obligations for citizens and businesses and other provisions on employment relationships and equal opportunities, in implementation of Law no. 183 of 10 December 2014.
Decree 3 August 2015	Approval of technical standards for fire prevention, pursuant to Article 15 of Legislative Decree no. 139 of 8 March 2006.

Decree 2 September 2021 Criteria for the management of workplaces in operation and in emergencies and characteristics of the specific fire prevention and protection service, pursuant to Article 46, paragraph 3, letter a), point 4 and letter b) of Legislative Decree no. 81 of 9 April 2008.

Table 21: Applicable legislation – Electrical installations.

Legislation	
Legislative Decree of 9 April 2008	Implementation of Article 1 of Law No. 123 of 3 August 2007 on the protection of health and safety in the workplace.
Decree of the Minister of Labour and Social Policies of 4 February 2011	Definition of the criteria for the issuance of authorisations referred to in Article 82, paragraph 2), letters c), of Legislative Decree no. 81 of 9 April 2008.
Legislative Decree No. 475 of 4 December 1992	Implementation of Council Directive 89/686/EEC of 21 December 1989 on the approximation of the laws of the Member States relating to personal protective equipment, as amended by Legislative Decree No. 10 of 2 January 1997 on the implementation of Directives 93/68/EEC, 93/95/EEC and 96/58/EC on personal protective equipment. The d.lgs. 475/92 has been superseded by Regulation (EU) 2016/425 of the European Parliament and of the Council of 9 March 2016 on personal protective equipment and repealing Council Directive 89/686/EEC.
Decree of the Ministers of Health, Labour and Social Policies, for the Civil Service, and of Productive Activities of 15 July 2003, no. 38	Regulation containing provisions on company first aid, in implementation of Article 15, paragraph 3, of Legislative Decree no. 626 of 19 September 1994.
Decree no. 37 of 22 January 2008	Regulation concerning the implementation of Article 11-quaterdecies, paragraph 13, letter a) of Law no. 248 of 2 December 2005, reorganizing the provisions on the installation of systems inside buildings.
Presidential Decree no. 462 of 22 October 2001	Regulation simplifying the procedure for reporting installations and protective devices against atmospheric discharges, earthing devices of electrical installations and dangerous electrical installations.
CEI 0-2 standard	Guide for the definition of the project documentation of electrical systems.
CEI 0-3 standard	Guide to Law 46/90 for the compilation of the declaration of conformity and related attachments.
CEI 0-4/1 standard	Normative and non-normative CEI documents. Part 1: Types, definitions, and procedures.
CEI 0-5 standard	EC Declaration of Conformity. Guide to the application of the New Approach Directives and the Low Voltage Directive.
CEI 64-8 standard	Electrical installations with a rated voltage not exceeding 1 000 V alternating current and 1 500 V direct current.

CEI 11-27 standard	Work on electrical systems.
CEI 11-15 standard	Live work on category II and III alternating current electrical systems.

Table 22: Applicable legislation – Management of WEEE (Waste Electrical and Electronic Equipment).

Legislation	
Legislative Decree no. 49 of 14 March 2014	Implementation of Directive 2012/19/EU on waste electrical and electronic equipment (WEEE).
Ministerial Decree no. 185 of 25 September 2007	It establishes the management bodies of the WEEE system.
Ministerial Decree no. 65 of 8 March 2010	It defines simplified ways for the management of WEEE collected by distribution.
Decree no. 121 of 31 May 2016	It defines the modalities for the management of the very small WEEE collected by distribution.
Decree no. 40 of 20 February 2023	Updates the WEEE groupings indicated in Annex 1 of Decree no. 185 of 25 September 2007.

Table 23: Applicable legislation – Construction and Demolition Waste (C&D).

Legislation	
Decree no. 152 of 27 September 2022	Regulation governing the cessation of the status of waste of inert construction and demolition waste and other inert waste of mineral origin, pursuant to Article 184-ter, paragraph 2, of Legislative Decree no. 152 of 3 April 2006.
Ministerial Decree of 5 February 1998	Identification of non-hazardous waste subject to simplified recovery procedures pursuant to Articles 31 and 33 of Legislative Decree No. 22 of 5 February 1997.

3.2 PORTUGAL

3.2.1 SPACE HEATING AND/OR COOLING SYSTEMS

This intervention typology includes measures in space heating and cooling systems, through the optimization of existing systems or their replacement by high-efficiency systems. Table 24 summarizes the regulations applicable to these interventions. The following requirements may be applicable to space heating and cooling:

-  In the case of dwellings in a horizontal fraction, the installation of the outdoor unit of air conditioning or the exhaust pipe may be considered to modify the architectural line or the aesthetic arrangement of the building. Therefore, the installation will require the authorization of two-thirds of the owners of the building (Article 1422° of the civil code);
-  In many places, including historic areas, the outdoor unit of the air conditioning is not allowed to be visible from the street;
-  A permit from the municipality to install exhaust pipes may be required. This may be applicable to biomass boilers and portable air conditioning.

Table 24: Portuguese regulations applied to space heating and/or cooling systems

Applicable legislation

Decree-Law no. 101-D/2020, of 7 December	It establishes the requirements for buildings to improve their energy performance and regulates the Energy Certification Scheme for Buildings, transposing Directive (EU) 2018/844 and partially Directive (EU) 2019/944.
Ordinance no. 138-I/2021, of 1 July	It regulates the minimum energy performance requirements for building envelopes and technical systems and their application depending on the type of use and specific technical characteristics.
Order no. 6476-H/2021, of 1 July	Approves the Manual of the Energy Certification System for Buildings (SCE).
Decree-Law no. 102/2021, of 19 November	Establishes the requirements for access and exercise of the activity of the technicians of the Energy Certification System for Buildings.
Decree-Law No. 152-D/2017, of 11 December (Electrical and Electronic Waste Management (WEEE))	It unifies the regime for the management of specific waste streams subject to the principle of extended producer responsibility.
Decree-Law No. 102-D/2020, of 10 December	Approves the general regime for waste management, the legal regime for the landfill of waste and amends the regime for the

(Electrical and Electronic Waste Management (WEEE))	management of specific waste streams, transposing Directives (EU) 2018/849, 2018/850, 2018/851 and 2018/852.
Implementing Regulation (EU) 2015/2067 of 17 November 2015	Establishes, in accordance with Regulation (EU) No ⁵¹⁷ /2014 of the European Parliament and of the Council, the minimum requirements and conditions for the mutual recognition of the certification of natural persons in respect of stationary refrigeration equipment, stationary air-conditioning equipment, stationary heat pumps and refrigeration units of refrigerated trucks and trailers containing fluorinated greenhouse gases and for the certification of undertakings in relation to stationary refrigeration equipment; stationary air conditioning equipment and stationary heat pumps containing fluorinated greenhouse gases.
Regulation (CE) No 1516/2007 of 19 December 2007	It lays down, in accordance with Regulation (CE) No 842/2006 of the European Parliament and of the Council, standard provisions for the detection of leaks in fixed refrigeration, air conditioning and heat pump equipment containing certain fluorinated greenhouse gases.
Council Directive 92/42/EEC of 21 May 1992	On performance requirements for new hot water boilers fuelled with liquid or gaseous fuels
Decree-Law no. 136/94, of 20 May	It transposes into national law Council Directive No. 92/42/EEC of 21 May establishing the performance requirements of new hot water boilers (fueled with liquid or gaseous fuels).

3.2.2 DOMESTIC HOT WATER (DHW) PREPARATION SYSTEMS

This intervention typology includes interventions in domestic hot water production systems, through the optimization of existing systems or their replacement by high-efficiency systems. Table 25 summarizes the regulation applicable for these interventions. The following requirements are applicable to domestic hot water preparation systems:

-  In the case of dwellings in a horizontal fraction, the installation of the outdoor unit of a heat pump and the exhaust pipe of boilers may be considered to modify the architectural line or the aesthetic arrangement of the building. Therefore, the installation will require the authorization of two thirds of the owners of the building (Article 1422° of the civil code). This may also be applicable for the installation of heating systems using solar energy in roofs;
-  In many places, including historic areas, the outdoor unit of heat pump is not allowed to be visible from the street;
-  In many places, including historic areas, a municipality permit may be required for the installation of heating systems using solar energy.

Table 25: Portuguese regulations applied to domestic hot water (DHW) preparation systems.

Applicable legislation

Decree-Law no. 101-D/2020, of 7 December	It establishes the requirements for buildings to improve their energy performance and regulates the Energy Certification Scheme for Buildings, transposing Directive (EU) 2018/844 and partially Directive (EU) 2019/944.
Ordinance no. 138-I/2021, of 1 July	It regulates the minimum energy performance requirements for building envelopes and technical systems and their application depending on the type of use and specific technical characteristics.
Order no. 6476-H/2021, of 1 July	Approves the Manual of the Energy Certification System for Buildings (SCE)
Decree-Law no. 102/2021, of 19 November	Establishes the requirements for access and exercise of the activity of the technicians of the Energy Certification System for Buildings.
Decree-Law No. 152-D/2017, of 11 December (Electrical and Electronic Waste Management (WEEE))	It unifies the regime for the management of specific waste streams subject to the principle of extended producer responsibility.
Decree-Law No. 102-D/2020, of 10 December (Electrical and Electronic Waste Management (WEEE))	Approves the general regime for waste management, the legal regime for the landfill of waste and amends the regime for the management of specific waste streams, transposing Directives (EU) 2018/849, 2018/850, 2018/851 and 2018/852.
Decree-Law No. 145/2017, of 30 November (handling of fluorinated gases)	It ensures the implementation of Regulation (EU) No 517/2014 on fluorinated greenhouse gases in the national legal order.
Implementing Regulation (EU) 2015/2067 of 17 November 2015	Establishes, in accordance with Regulation (EU) No ⁵¹⁷ /2014 of the European Parliament and of the Council, the minimum requirements and conditions for the mutual recognition of the certification of natural persons in respect of stationary refrigeration equipment, stationary air-conditioning equipment, stationary heat pumps and refrigeration units of refrigerated trucks and trailers containing fluorinated greenhouse gases and for the certification of undertakings in relation to stationary refrigeration equipment; stationary air-conditioning equipment and stationary heat pumps containing fluorinated greenhouse gases

Regulation (CE) No 1516/2007 of 19 December 2007	It lays down, in accordance with Regulation (CE) No 842/2006 of the European Parliament and of the Council, standard provisions for the detection of leaks in fixed refrigeration, air conditioning and heat pump equipment containing certain fluorinated greenhouse gases.
Council Directive 92/42/EEC of 21 May 1992	On performance requirements for new hot water boilers fuelled with liquid or gaseous fuels
Decree-Law no. 136/94, of 20 May	It transposes into national law Council Directive No. 92/42/EEC of 21 May establishing the performance requirements of new hot water boilers (fuelled with liquid or gaseous fuels).

3.2.3 VENTILATION SYSTEMS

This intervention typology includes measures in ventilation systems, namely, in improving natural ventilation conditions by installing self-regulating ventilation grilles and enhancing mechanical ventilation conditions through the installation of efficient fans, variable speed drives on motors, heat recovery ventilation installation, and replacement and insulation of ventilation ducts. Table 26 summarizes the regulation applicable for these interventions. The following requirements are applicable to ventilation systems:

-  You may need to apply for a permit from the municipality for grilles that are visible from the outside.

Table 26: Portuguese regulations and standards applied to ventilation systems.

Applicable legislation and standards

Decree-Law no. 101-D/2020, of 7 December	It establishes the requirements for buildings to improve their energy performance and regulates the Energy Certification Scheme for Buildings, transposing Directive (EU) 2018/844 and partially Directive (EU) 2019/944.
Ordinance no. 138-I/2021, of 1 July	It regulates the minimum energy performance requirements for building envelopes and technical systems and their application depending on the type of use and specific technical characteristics.
Order no. 6476-H/2021, of 1 July	Approves the Manual of the Energy Certification System for Buildings (SCE)
Decree-Law no. 102/2021, of 19 November	Establishes the requirements for access and exercise of the activity of the technicians of the Energy Certification System for Buildings.
Decree-Law No. 152-D/2017, of 11 December (Electrical and Electronic	It unifies the regime for the management of specific waste streams subject to the principle of extended producer responsibility.

Waste Management (WEEE))	
Decree-Law No. 102-D/2020, of 10 December (Electrical and Electronic Waste Management (WEEE))	Approves the general regime for waste management, the legal regime for the landfill of waste and amends the regime for the management of specific waste streams, transposing Directives (EU) 2018/849, 2018/850, 2018/851 and 2018/852.
Decree-Law No. 145/2017, of 30 November (handling of fluorinated gases)	It ensures the implementation of Regulation (EU) No 517/2014 on fluorinated greenhouse gases in the national legal order.
Implementing Regulation (EU) 2015/2067 of 17 November 2015	Establishes, in accordance with Regulation (EU) No ⁵¹⁷ /2014 of the European Parliament and of the Council, the minimum requirements and conditions for the mutual recognition of the certification of natural persons in respect of stationary refrigeration equipment, stationary air-conditioning equipment, stationary heat pumps and refrigeration units of refrigerated trucks and trailers containing fluorinated greenhouse gases and for the certification of undertakings in relation to stationary refrigeration equipment; stationary air conditioning equipment and stationary heat pumps containing fluorinated greenhouse gases.
EN 13141 Standard	Ventilation for buildings - Performance testing of components/products for residential ventilation.
EN 16798	Energy performance of buildings - Ventilation for buildings.
Portuguese Standard NP EN 12097 2015	Building ventilation: duct networks: component requirements to facilitate the maintenance of duct networks / Portuguese Institute for Quality

3.2.4 REPLACEMENT OF HOUSEHOLD APPLIANCES

This intervention typology includes measures in household appliances, including the replacement with models that have higher energy and water efficiency, where applicable. This includes refrigerators, freezers, combined units, washing machines, dishwashers, washer-dryers, and electric ovens. Table 27 summarizes the regulation applicable for these interventions.

Table 27: Portuguese and EU regulations applied to household appliances.

Applicable legislation

Decree-Law No. 152-D/2017, of 11 December (Electrical and Electronic	It unifies the regime for the management of specific waste streams subject to the principle of extended producer responsibility.
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Waste Management (WEEE))	
Decree-Law No. 102-D/2020, of 10 December (Electrical and Electronic Waste Management (WEEE))	Approves the general regime for waste management, the legal regime for the landfill of waste and amends the regime for the management of specific waste streams, transposing Directives (EU) 2018/849, 2018/850, 2018/851 and 2018/852.
Decree-Law no. 79/2013, of 11 June	It lays down rules on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE), transposing Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011.
Decree-Law no. 23/2023, of April 5	It transposes delegated (EU) directives on the use of hazardous substances in electrical and electronic equipment.
Decree-Law No. 145/2017, of 30 November (handling of fluorinated gases)	It ensures the implementation of Regulation (EU) No 517/2014 on fluorinated greenhouse gases in the national legal order.
Implementing Regulation (EU) 2015/2067 of 17 November 2015	Establishes, in accordance with Regulation (EU) No ⁵¹⁷ /2014 of the European Parliament and of the Council, the minimum requirements and conditions for the mutual recognition of the certification of natural persons in respect of stationary refrigeration equipment, stationary air-conditioning equipment, stationary heat pumps and refrigeration units of refrigerated trucks and trailers containing fluorinated greenhouse gases and for the certification of undertakings in relation to stationary refrigeration equipment; stationary air-conditioning equipment and stationary heat pumps containing fluorinated greenhouse gases
Regulation (EC) No 1516/2007 of 19 December 2007	It lays down, in accordance with Regulation (EC) No 842/2006 of the European Parliament and of the Council, standard provisions for the detection of leaks in fixed refrigeration, air conditioning and heat pump equipment containing certain fluorinated greenhouse gases.
Regulation (EU) 2019/2016	Regulation on energy labelling for fridges and freezers.
Regulation (EU) 2019/2019	Regulation on ecodesign requirements for fridges.
Regulation (EU) 2019/2014	Regulation on energy labelling for household washing machines and washer-dryers.
Regulation (EU) 2019/2023	Regulation on ecodesign requirements for household washing machines and washer-dryers.

Regulation (EU) C/2023/4741	Regulation on energy labelling of household tumble dryers.
Regulation (EU) C/2023/7671	Regulation on ecodesign requirements for household tumble dryers.
Regulation (EU) 65/2014	Regulation on energy labelling for domestic ovens and range hoods (EU) 65/2014.
Regulation (EU) 66/2014	Regulation on ecodesign requirements for domestic ovens and range hoods (EU) 66/2014.
Regulation (EU) 2019/2017	Regulation on energy labelling for dishwashers.
Regulation (EU) 2019/2022	Regulation on ecodesign requirements for dishwashers.

Note: For this intervention it's also applicable the legislation for electrical installations.

3.2.5 INTERVENTIONS AIMED AT WATER EFFICIENCY

This intervention typology includes measures in residential buildings, namely:

- Installation of rainwater harvesting systems (e.g., for the irrigation of green areas and washing of common spaces);
- Use of more efficient irrigation methods in urban buildings, including installation of systems and equipment (e.g., drip irrigation methods and at times of lower evaporation and sensors for irrigation interruption and optimization), as well as more efficient solutions in the filling and maintenance of swimming pools;
- Installation of high-efficiency devices in terms of water saving (e.g., taps, showers, flushing cisterns, flow meters, pressure reducers and flow regulators);
- Installation of water consumption management systems, in order to account for and manage consumption, promoting water efficiency (e.g., installation of telemetry in the meter, home automation and installation of digital commands).

Table 28 summarizes the regulation applicable for these interventions.

Table 28: Portuguese regulations applied to water efficiency and quality

Applicable legislation – Water Quality and Distribution

Regulatory Decree No. 23/95, of 23 August (General Regulation of Public and Building Water Distribution and	Approves the General Regulation of Public and Building Water Distribution and Wastewater Drainage Systems.
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Wastewater Drainage Systems)	
Declaration of Rectification No. 153/95	Regulatory Decree No. 23/95 of the Ministry of Public Works, Transport and Communications, which approves the General Regulation of Public and Building Water Distribution and Wastewater Drainage Systems, published in the Official Gazette, No. 194, of 23 August 1995, has been rectified.
Decree-Law No. 194/2009, of 20 August	Establishes the legal framework for municipal services of public water supply, wastewater sanitation and urban waste management.
Law no. 12/2014, of 6 March	Makes the second amendment to Decree-Law No. 194/2009, of 20 August, which establishes the legal regime of municipal services of public water supply, urban wastewater sanitation and urban waste management, modifying the billing and administrative offence regimes.
Ordinance No. 762/2002, of 1 July (Regulation on Safety, Hygiene and Health at Work)	Approves the Regulation on Safety, Hygiene and Health at Work in the Operation of Public Water Distribution and Wastewater Drainage Systems.
Decree-Law No. 103/2010, of 24 September	It establishes environmental quality standards in the field of water policy and transposes Directive 2008/105/EC of the European Parliament and of the Council of 16 December and partially Directive 2009/90/EC of the Commission of 31 July.
Ordinance no. 255/2023, of August 7 (technical project)	Approves the mandatory content of the execution project, as well as the procedures and standards to be adopted in the preparation and phasing of public works projects, called "Instructions for the preparation of works projects", and the classification of works by categories.
Decree-Law no. 236/98, of 1 August	It establishes quality standards, criteria and objectives in order to protect the aquatic environment and improve the quality of water according to its main uses. Repeals Decree-Law no. 74/90, of 7 March.
CNQ Directive No. 23/93	The quality of public swimming pools. National Quality Council (IPQ) – May 1993
Decree-Law No. 306/2007, of 27 August	Establishes the regime for the quality of water intended for human consumption, revising Decree-Law No. 243/2001, of 5 September, which transposed into national law Directive No. 98/83/EC, of the Council, of 3 November.

Decree-Law no. 152/2017, of 27 August	Makes the second amendment to Decree-Law No. 306/2007, of 27 August, as amended by Decree-Law No. 92/2010, of 26 July, which establishes the regime for the quality of water for human consumption, with the aim of protecting human health from the harmful effects resulting from the possible contamination of such water and ensuring the universal availability of salubrious water, clean and balanced in its composition.
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3.2.6 INSTALLATION OF SOLAR PHOTOVOLTAIC SYSTEMS AND SOLAR THERMAL COLLECTORS

This intervention typology includes measures in residential buildings, namely:

- Installation of electricity production systems for self-consumption from renewable energy sources (e.g., installation of photovoltaic solar panels);
- Installation of renewable energy systems for the production of domestic hot water (e.g., installation of solar collectors for heating sanitary water).

Table 29 summarizes the regulation applicable for these interventions. The following requirements are applicable to solar photovoltaic systems and solar thermal systems:

-  A permit from the municipality may be required;
-  In historic areas, it is often not allowed to install solar panels on the roof;
-  Systems with a power output of less than 350W do not require prior notification, systems with a power output of more than 350W but less than 30kW must be notified to the Directorate-General of Energy and Geology (DGEG), systems with a power output of more than 30kW require registration with the DGEG and obtaining an operating certificate;
-  The solar panels must not be more than 1 meter above the highest part of the roof.

Table 29: Portuguese and EU regulations applied to solar photovoltaic systems and solar thermal collectors

Applicable legislation – Self-Consumption Production Units (UPAC) and Solar Thermal System

Decree-Law no. 101-D/2020, of 7 December	It establishes the requirements for buildings to improve their energy performance and regulates the Energy Certification Scheme for Buildings, transposing Directive (EU) 2018/844 and partially Directive (EU) 2019/944.
Ordinance no. 138-I/2021, of 1 July	It regulates the minimum energy performance requirements for building envelopes and technical systems and their application depending on the type of use and specific technical characteristics.

Decree-Law no. 102/2021, of 19 November	Establishes the requirements for access and exercise of the activity of the technicians of the Energy Certification System for Buildings.
Ordinance no. 14/2015, of 23 January	Defines the procedure for submitting a mere prior notification of the operation of production units for self-consumption, as well as for obtaining a prior control title in the context of production for self-consumption or small production for total injection into the public service electricity network of the electricity produced, and determines the amount of the fees provided for in Decree-Law No. 153/2014, of 20 October
Decree-Law no. 15/2022, of January 14	Establishes the organization and operation of the National Electricity System, transposing Directive (EU) 2019/944 and Directive (EU) 2018/2001.
Regional Legislative Decree No. 1/2021/M	Adapts to the Autonomous Region of Madeira Decree-Law no. 162/2019, of 25 October, which approves the legal regime applicable to the self-consumption of renewable energy.
Regulation no. 815/2023, of 27 July	Approves the Regulation on Self-Consumption in the Electricity Sector and repeals Regulation no. 373/2021, of 5 May
Order no. 4/2020, of 3 February	Inspection and Certification Regulation (RIC)
Directive no. 12/2022, of 19 May	Approves the general conditions of the contracts for the use of the networks for self-consumption through the RESP.
Decree-Law no. 102-D/2020, of 10 December	Approves the general regime for waste management, the legal regime for the landfill of waste and amends the regime for the management of specific waste streams, transposing Directives (EU) 2018/849, 2018/850, 2018/851 and 2018/852.
Regulation (EU) 811/2013	Energy labelling for solar devices for space heaters
Regulation (EU) 812/2013	Energy labelling for solar devices for water heaters
Regulation (EU) 813/2013	Ecodesign regulation for solar devices for space heaters
Regulation (EU) 814/2013	Ecodesign regulation for solar devices for water heaters

Note: For this intervention it's also applicable the legislation for **electrical installations**.

Technical Guidance

 ADENE Guide II, DGEG (Individual self-consumption - photovoltaic solar system)

3.2.7 LIGHTING

This intervention typology includes measures in residential buildings, namely:

- a) Promotion of energy efficiency in lighting, indoor or outdoor, as long as it is located within the perimeter of the private property (e.g., replacement by efficient lamps and high-performance ballasts, use of motion detectors in common areas, systems that improve the use of natural lighting, and control systems).

Tables 30 and 31 summarize the regulation applicable for these interventions.

Table 30: Portuguese regulations applied to electrical installations

Applicable legislation – Electrical Installations

Decree-Law no. 96/2017, of 10 August	Establishes the regime for private electrical installations.
Law no. 61/2018, of 21 August	First amendment, by parliamentary appreciation, to Decree-Law No. 96/2017, of 10 August, which establishes the regime of private electrical installations.
Regional Legislative Decree No. 4/2019/M	Adapts Decree-Law No. 96/2017, of 10 August, as amended by Law No. 61/2018, of 21 August, establishes the discipline of private service electrical installations powered by the public service electricity network (RESP) of the Autonomous Region of Madeira (RAM), on average, high or low voltage, and installations with their own production, of a temporary or itinerant nature, and defines the system of control, supervision and regulation of the activities associated with them.
Regional Legislative Decree No. 29/2019/A	Establishes the legal licensing regime to which private service electrical installations in the Autonomous Region of the Azores are subject.
Decree-Law No. 72/2020, of 22 September (Requirements for Access and Exercise of the Activity of Entities and Professionals Responsible for Electrical Installations)	Extends the validity of the transitional rules regarding access to the profession of installation and maintenance technician of buildings and systems and the exercise of functions as a responsible technician or as an inspector of electrical installations of private service.
Law No. 14/2015, of 16 February (Requirements for Access and Exercise of the Activity of Entities and Professionals Responsible for Electrical Installations)	Establishes the requirements for access and exercise of the activity of entities and professionals responsible for electrical installations, conforming them to the discipline of Law No. 9/2009, of 4 March, and Decree-Law No. 92/2010, of 26 July, which transposed Directives No. 2005/36/EC, of 7 September, on the recognition of professional qualifications, and 2006/123/EC, of 12 December on services in the internal market.

Ordinance No. 949-A/2006, of 11 September (Technical Rules for Low Voltage Electrical Installations)	Technical rules for low voltage electrical installations – RTIEBT.
Ordinance No. 252/2015, of 19 August (Technical Rules for Low Voltage Electrical Installations)	Amends Ordinance No. 949-A/2006, of 11 September, which approved the Technical Rules for Low Voltage Electrical Installations (RTIEBT), under the terms provided for in article 2 of Decree-Law No. 226/2005, of 28 December, by adding section 722 to part 7 of the RTIEBT - Technical Rules for Low Voltage Electrical Installations.
Decree-Law No. 226/2005, of 28 December (Technical Rules for Low Voltage Electrical Installations)	It provides for the technical rules applicable to low-voltage electrical installations that constitute the regulation on the safety of the use of electricity and the safety regulation for collective installations of buildings and entrances, which were approved by Decree-Law no. 740/74, of 26 December.
Decree-Law No. 26852, of 30 July (Regulation of Licenses for Electrical Installations)	Approves the regulation of licenses for electrical installations - ISDS
Decree-Law No. 101/2007, of 2 April (Regulation of Licenses for Electrical Installations)	Simplifies the licensing of electrical installations, both public and private, by amending Decree-Laws No. 26852 of 30 July 1936, 517/80, of 31 October and 272/92 of 3 December.
Decree-Law no. 740/74, of 26 December	Approves the Safety Regulations for Installations for the Use of Electricity and for Collective Installations of Buildings and Entrances.
Decree-Law no. 348/93, of 1 October	It transposes into national law Council Directive 89/656/EEC of 30 November on the minimum safety and health requirements for the use of personal protective equipment by workers at work.

Table 31: Portuguese and regulations for lighting systems and equipment

Normative Context – Lighting

Regulation (EU) 2019/2015	Energy labelling regulation for lighting products include light sources, such as light bulbs (halogen, compact fluorescent, etc.) or LED modules/lamps. Also include control gears (e.g. ballasts, electronic components, drivers), i.e. the devices needed to connect light sources to the electrical mains.
Regulation (EU) 2019/2020	Regulation for ecodesign requirements for light sources and separate control gears.
IEC 60529 Standard	Establishes protection levels (IP) for enclosures of electrical and electronic equipment in relation to the ingress of solid bodies and the penetration of water.
EN 60669-1	Switches for household and similar fixed-electrical installations - Part 1: General requirements.
EN 60669-2-1	Switches for household and similar fixed electrical installations - Part 2-1: Particular requirements - Electronic control devices.

3.2.8 BUILDING AUTOMATION AND CONTROL SYSTEMS

This intervention typology includes measures in residential buildings, namely:

- a) Installation of energy consumption management systems, in order to monitor and manage energy consumption, thus generating reduction and enabling the transfer of consumption between tariff periods (e.g., home automation and installation of digital commands);

Tables 32 and 33 summarizes the regulation applicable for these interventions.

Table 32: Portuguese regulations applied to building automation and control systems

Applicable legislation and standards

Decree-Law no. 101-D/2020, of 7 December	It establishes the requirements for buildings to improve their energy performance and regulates the Energy Certification Scheme for Buildings, transposing Directive (EU) 2018/844 and partially Directive (EU) 2019/944.
Ordinance no. 138-I/2021, of 1 July	It regulates the minimum energy performance requirements for building envelopes and technical systems and their application depending on the type of use and specific technical characteristics.
Ordinance no. 255/2023, of August 7 (Project of centralized management systems)	Approves the mandatory content of the execution project, as well as the procedures and standards to be adopted in the preparation and phasing of public works projects, called "Instructions for the preparation of works projects", and the classification of works by categories.

Order no. 6476-H/2021	Approves the Manual of the Energy Certification System for Buildings (SCE)
Decree-Law no. 102-D/2020, of 10 December	Approves the general regime for waste management, the legal regime for the landfill of waste and amends the regime for the management of specific waste streams, transposing Directives (EU) 2018/849, 2018/850, 2018/851 and 2018/852.
Standard EN ISO 5120-1:2022	Energy performance of buildings – Contribution of building automation, controls and building management – Part 1: General framework and procedures
EN 50090	Home and Building Electronic Systems (HBES)
EN 60669-2-1	Switches for household and similar fixed electrical installations - Part 2-1: Particular requirements - Electronic control devices

Table 33: Portuguese regulations and standards applied to telecommunications infrastructure

Applicable legislation and standards - Telecommunications infrastructure

Decree-Law No. 123/2009, of 21 May (Legal Regime for the Construction, Access and Installation of Electronic Communications Networks and Infrastructures)	Establishes the regime applicable to the construction of infrastructures suitable for the accommodation of electronic communications networks, the installation of electronic communications networks and the construction of telecommunications infrastructures in allotments, urbanizations, groups of buildings and buildings.
Law no. 47/2013, of 10 July	Makes the second amendment to Decree-Law No. 123/2009, of 21 May, which defines the legal regime for the construction, access and installation of electronic communications networks and infrastructures.
Decree-Law no. 95/2019, of 18 July	Establishes the regime applicable to the rehabilitation of buildings or autonomous fractions.
Decree-Law no. 92/2017, of 31 July	It reinforces measures to reduce the cost of deploying high-speed electronic communications networks by transposing Directive 2014/61/EU.
Law no. 47/2013, of 10 July	Makes the second amendment to Decree-Law No. 123/2009, of 21 May, which defines the legal regime for the construction, access and installation of electronic communications networks and infrastructures.

Regulation EU No. 305/2011, of 9 March	It lays down harmonised conditions for the marketing of construction products and repeals Council Directive 89/106/EEC Text with EEA relevance.
Decree-Law No. 130/2013, of 10 September	It ensures the implementation in the domestic legal order of the obligations arising from Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC of 21 December 1988.
EN 13501	European fire classification of construction products
EN 50173 Series	Planning - general cabling requirements applicable to the various types of buildings.
EN 50174-1 Series	Design - requirements for wiring, piping, quality, operation, maintenance, and associated documentation
EN 50174-2 Series	Installation - Requirements
EN 50174-1 Series	Operation - maintenance of connectivity and transmission requirements
EN 50346 Series	Tests - wiring tests after installation
EN 50310 Series	Earth - requirements for connections and associated systems

Note: For this intervention it's also applicable the legislation for electrical installations.

3.2.9 E-MOBILITY - INSTALLATION OF A HOME CHARGING STATION

This intervention typology includes measures in residential buildings, namely:

- a) Installation of electric vehicle charging points, as long as they are located within the perimeter of the private property (e.g., acquisition and installation of a charger and the respective connection to the local electricity grid).

The following requirements are applicable to this type of intervention:



A permit from the municipality may be required for the installation of a charging station.

Table 34 summarizes the regulation applicable for these interventions.

Table 34: Portuguese regulations applied to electric mobility.

Applicable legislation – Electric Mobility

Ordinance no. 138-I/2021, of 1 July (Energy Performance – Minimum Requirements)	It regulates the minimum energy performance requirements for building envelopes and technical systems and their application depending on the type of use and specific technical characteristics.
Decree-Law No. 39/2010, of 26 April (Legal Regime of Electric Mobility)	It establishes the legal framework for electric mobility, applicable to the organisation, access and exercise of activities related to electric mobility, as well as the rules for the creation of a pilot electric mobility network.
Decree-Law No. 90/2014, of 11 June (Legal Regime of Electric Mobility)	Makes the third amendment to Decree-Law No. 39/2010, of 26 April, which establishes the legal framework for electric mobility, applicable to the organisation, access and exercise of activities related to electric mobility, as well as the rules for the creation of a pilot electric mobility network.
Regional Legislative Decree No. 5/2017/M (Legal Regime of Electric Mobility – Autonomous Region of Madeira)	Adapts to the Autonomous Region of Madeira Decree-Law No. 39/2010, of 26 April, as amended by Decree-Law No. 90/2014, of 11 June, which regulates the organisation, access and exercise of electric mobility activities and establishes an electric mobility network.
Ordinance No. 241/2015, of August 12 (Exercise of the Activity of Operation of Charging Points)	It establishes the technical requirements to which the granting of a license is subject for the exercise of the activity of operating charging points of the electric mobility network.
Ordinance no. 240/2015, of 12 August	Sets the amount of fees due for the issuance of electricity trading licences for electric mobility and for the operation of charging points.
Ordinance No. 231/2016, of 29 August (Compulsory Civil Liability Insurance)	Establishes the coverage, conditions, and minimum capital of the compulsory civil liability insurance for damages caused in the exercise of electricity trading activities for electric mobility and the operation of charging points for electric mobility, and repeals Ordinance No. 173/2011, of 28 April.
Ordinance No. 220/2016, of 10 August (Electric Vehicle Charging Facilities in Buildings and other Urban Operations)	It lays down the minimum powers and technical rules to be met by electric vehicle charging installations in buildings and other urban operations.
Ordinance no. 222/2016, of 11 August	Establishes the terms applicable to the licenses for private use of the public domain, for the installation of electric vehicle battery charging points in a public place of public access in the public domain.

Note: For this intervention it's also applicable the legislation for **electrical installations**.

The following technical guidance may also be applicable:

-  Technical Guide to Electrical Installations for Powering Electric Vehicles" of DGEG (DGEG, 2023)
-  DGEG Order No. 24/2019: Establishes the procedures for certification/inspection of electric vehicle charging points (PCVE) connected to the electric mobility network. It also establishes the models resulting from the acts of inspection and inspection of the PCVE (DGEG, 2019)
-  DGEG Order No. 27/2017: Establishes the models for the accountability of the installation entities and the technicians responsible for the design, execution, or operation of private service electrical installations. (DGEG, 2017a)
-  DGEG Order No. 26/2017: Establishes the constituent elements of the simplified project. The simplified project aims to represent the electrical installation to verify compliance with the applicable safety regulatory provisions by the licensing, inspecting, inspectors or responsible technicians. (DGEG, 2017b)
-  DGEG Order No. 28/2018: Establishes the model of the term of responsibility applicable to the installation entities and responsible technicians, within the scope of the articulation with the RJEU for acts related to electrical installations of private service in cases that do not require an electrical project. (DGEG, 2018)

3.2.10 INSTALLATION OF GREEN INFRASTRUCTURE

This intervention typology includes measures in residential buildings for the implementation of green infrastructure (e.g. green roofs and facades) that promote the incorporation of biomaterials, recycled materials, natural-based solutions, green facades and roofs and architectural solutions bioclimatic. Table 35 synthesizes the regulations for the installation of green infrastructure. The following requirements are applicable for this intervention:

-  A permit from the municipality may be required;
-  This intervention may not be applicable for historic areas.

Table 35: Portuguese regulations applied to construction

Applicable legislation – Construction

Law No. 41/2015, of 3 June (Legal Regime for Entry and Permanence in the Construction Activity)	Establishes the legal regime applicable to the exercise of the construction activity, and repeals Decree-Law no. 12/2004, of 9 January.
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Law No. 31/2009, of 3 July	Approves the legal regime that establishes the professional qualification required of technicians responsible for the preparation and subscription of projects, for the supervision of works and for the management of works, which is not subject to special legislation, and the duties applicable to them, and repeals Decree no. 73/73, of 28 February.
Law No. 25/2018, of June 14 (Legal Regime for Entry and Permanence in the Construction Activity)	Proceeds to the second amendment of Law No. 31/2009, of 3 July, which approves the legal regime that establishes the professional qualification required of technicians responsible for the preparation and subscription of projects, for the supervision of works and for the management of works, which is not subject to special legislation, and the duties applicable to them, and to the first amendment to Law No. 41/2015, of 3 June, which establishes the legal regime applicable to the exercise of the construction activity.
Ordinance no. 255/2023, of August 7	Approves the mandatory content of the execution project, as well as the procedures and standards to be adopted in the preparation and phasing of public works projects, called "Instructions for the preparation of works projects", and the classification of works by categories.
Ordinance No. 274/2011, of 26 September (Construction Companies - Economic and Financial Capacity Indicators and Respective Reference Values)	Defines the indicators of general liquidity and financial autonomy with a view to access and permanence in the construction activity of companies in the sector and sets the respective reference values and repeals Ordinance No. 971/2009, of 27 August.
Ordinance No. 1308/2005, of 20 December (Minimum Staff of Companies Holding Permits)	Amends Ordinance No. 16/2004, of 10 January, which establishes the minimum staff of companies classified for the exercise of construction activity.
Ordinance no. 261-A/2015, of 27 August	Establishes the licensing fees, certificates, permits, and other administrative procedures related to the construction activity, and repeals Ordinance No. 15/2004, of 10 January.
Ordinance no. 212/2022, of 23 August	Updates the values of the classes of the permits.
Ordinance No. 959/2009, of 21 August	Approves the tender specifications for public works contracts and repeals Ordinance No. 104/2001 of 21 February.

Regulation EU No. 305/2011, of 9 March	It lays down harmonised conditions for the marketing of construction products and repeals Council Directive 89/106/EEC Text with EEA relevance.
Decree-Law No. 130/2013, of 10 September	It ensures the implementation in the domestic legal order of the obligations arising from Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC of 21 December 1988.
Decree-Law no. 41821, of 11 August	Approves the Civil Construction Work Safety Regulation - RSTCC.
Decree-Law No. 273/2003, of 29 October	Revises the regulation of safety and health conditions at work in temporary or mobile construction sites, contained in Decree-Law No. 155/95, of 1 July, maintaining the minimum requirements for safety and health at work established by Council Directive No. 92/57/EEC, of 24 June.

The following technical guidelines are also applicable for this intervention:

-  Technical Guide for the Design, Construction and Maintenance of Green Roofs: Technical guide adapted to the Portuguese climate, carried out by the National Association of Green Roofs, in partnership with the Order of Engineers - central region. (ANCV, 2024)
-  FLL "Green Roof Guidelines - Guidelines for the Planning, Construction and Maintenance of Green Roof (2008)" (ANCV, 2024)

3.2.11 LIFTING INSTALLATIONS

This intervention typology includes measures in residential buildings for the installation and maintenance of lifting installations. Table 36 summarizes the regulation applicable for this installation.

Table 36: Portuguese regulations applied to lifts.

Applicable legislation - Lifts

Decree-Law no. 101-D/2020, of 7 December	It establishes the requirements for buildings to improve their energy performance and regulates the Energy Certification Scheme for Buildings, transposing Directive (EU) 2018/844 and partially Directive (EU) 2019/944.
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Ordinance no. 138-I/2021, of 1 July	It regulates the minimum energy performance requirements for building envelopes and technical systems and their application depending on the type of use and specific technical characteristics.
Order no. 6476-H/2021	Approves the Manual of the Energy Certification System for Buildings (SCE).
Directive 2014/33/EU of the European Parliament and of the Council of 26 February 2014	On the harmonisation of the laws of the Member States relating to lifts and safety components for lifts.
Decree-Law no. 58/2017, of 9 June	It lays down the requirements for the design, manufacture and placing on the market of lifts and safety components for lifts, transposing Directive 2014/33/EU.
Law No. 65/2013, of 27 August (Maintenance and Inspection of Lifting Facilities)	Approves the requirements for access to and exercise of the activities of lifting installation maintenance companies and lifting installation inspection entities, and their professionals, in accordance with the discipline of Law No. 9/2009, of 4 March, and Decree-Law No. 92/2010, of 26 July, which transposed Directives No. 2005/36/EC, on the recognition of professional qualifications and 2006/123/EC on services in the internal market.
Decree-Law No. 320/2002, of 28 December (Maintenance and Inspection of Lifting Facilities)	It establishes the maintenance and inspection regime for lifts, freight lifts, escalators and moving walks, after they are put into service, as well as the conditions for access to maintenance and inspection activities.
Regional Legislative Decree No. 7/2016/M (Maintenance and Inspection of Lifting Facilities)	Approves the new maintenance and inspection regime for lifts, freight lifts, escalators and moving walks, after their entry into service, as well as the conditions for access to maintenance activities.
Regional Legislative Decree No. 4/2012/A (Maintenance and Inspection of Lifting Facilities)	Establishes the legal regime for the licensing, installation and operation of lifts, freight lifts, mechanical stairs, moving walks and similar equipment.
Order No. 8892/2015, of 11 August	It defines the classification methodology to be adopted for lifts, moving walks and escalators to be installed in commercial and service buildings in order to assess compliance with the minimum energy efficiency requirements indicated in Table I.31 "Minimum

	efficiency requirements for lifts, according to VDI 4707" of that Annex.
Decree-Law No. 103/2008, of 24 June (Rules Relating to the Marketing and Commissioning of Machinery and Its Accessories)	Establishes the rules on the placing on the market and putting into service of machinery and its accessories, transposing into national law Directive 2006/42/EC of the European Parliament and of the Council of 17 May on machinery and amending Directive 95/16/EC of the European Parliament and of the Council of 29 June, on the approximation of the laws of the Member States relating to lifts.

3.2.12 OPAQUE ENVELOPE

This intervention typology includes measures in the opaque envelope of buildings, exterior or interior, with the aim of reinforcing thermal insulation (e.g., application of thermal insulation, on walls, roofs, floors). Table 37 summarizes the regulations applicable for opaque envelope interventions. The following requirements are applicable for this intervention:

-  In interventions in historic areas, a permit from the municipality may be required;
-  The aesthetic of façades in historic areas should not be altered;
-  In older buildings, this intervention may need to include materials that are compatible with the existing ones.

Table 37: Portuguese regulations and standards applied to building opaque envelope

Applicable legislation and standards

Decree-Law no. 101-D/2020, of 7 December (Energy requirements)	It establishes the requirements for buildings to improve their energy performance and regulates the Energy Certification Scheme for Buildings, transposing Directive (EU) 2018/844 and partially Directive (EU) 2019/944.
Ordinance no. 138-I/2021, of 1 July (Energy requirements)	It regulates the minimum energy performance requirements for building envelopes and technical systems and their application depending on the type of use and specific technical characteristics.
Regulation (EU) No 305/2011	Construction Products Regulation.
Decree-Law No. 130/2013, of 10 September	It ensures the implementation in the domestic legal order of the obligations arising from Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC of 21 December 1988.

EN 13501-1:2018	Classification of reaction to fire for building products, including products incorporated in building elements
Standard NP EN 14351:2006+A2:2019	CE marking of windows and doors.

The following technical guidance are also applicable for this type of interventions:

-  APFAC “Manual ETICS” (APFAC, 2018)
-  ITE 50 - Coefficients of Thermal Transmission of Building Envelope Elements (Santos & Matias, 2006)
-  ADENE Technical Guide - Roof Insulation (ADENE, 2016a)
-  ADENE Technical Guide - Wall Insulation (ADENE, 2016b)

3.2.13 GLAZED ENVELOPE

This intervention typology includes measures in the glazed envelope of the buildings and their shading devices (e.g., replacement of single-glazed frames with efficient windows, installation of exterior sun protections). Table 38 summarizes the regulations applicable to these interventions. The following requirements are applicable for this intervention:

-  In interventions in historic areas, a permit from the municipality may be required;
-  The aesthetic of façades in historic areas should not be altered;
-  In older buildings, this intervention may need to include materials that are compatible with the existing ones;
-  In the case of dwellings in a horizontal fraction, if this intervention modifies the architectural line or the aesthetic arrangement of the building, it will require the authorization of two thirds of the owners of the building (Article 1422° of the civil code);

Table 38: Portuguese regulations and standards applied to building glazed envelope

Applicable legislation and standards

Decree-Law no. 101-D/2020, of 7 December (Energy requirements)	It establishes the requirements for buildings to improve their energy performance and regulates the Energy Certification Scheme for Buildings, transposing Directive (EU) 2018/844 and partially Directive (EU) 2019/944.
Ordinance no. 138-I/2021, of 1 July (Energy requirements)	It regulates the minimum energy performance requirements for building envelopes and technical systems and their application depending on the type of use and specific technical characteristics.

Regulation (EU) No 305/2011	Construction Products Regulation.
Decree-Law No. 130/2013, of 10 September	It ensures the implementation in the domestic legal order of the obligations arising from Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC of 21 December 1988.
Standard NP EN 14351:2006+A2:2019	CE marking of windows and doors.

The following technical guidance is also applicable for glazed areas:

 Technical Guide to Efficient Windows (CLASSE+) (CLASSE+, n.d.)

3.2.14 ENERGY CERTIFICATION

This intervention typology includes the emission of the energy certificate, a document that assesses the energy efficiency of a house on a scale from F (very inefficient) to A+ (very efficient), issued by independent Qualified Experts. It contains information about your home's features like window insulation, ventilation, air conditioning, and hot water production, and their impact on energy consumption, and it suggests improvement measures that can be implemented to reduce consumption, enhance comfort, and health. Also provides the access to tax benefits and specific financing, when available. Table 39 summarizes the applicable legislation applicable for energy performance certificates.

Table 39: Portuguese regulations applied to energy certification of buildings.

Applicable legislation – Energy Certification of Buildings

Decree-Law no. 101-D/2020, of 7 December	It establishes the requirements for buildings to improve their energy performance and regulates the Energy Certification Scheme for Buildings, transposing Directive (EU) 2018/844 and partially Directive (EU) 2019/944.
Decree-Law no. 102/2021, of 19 November (Exercise of the activity of SCE technicians)	Establishes the requirements for access and exercise of the activity of the technicians of the Energy Certification System for Buildings.
Order no. 6476-A/2021, of 1 July (Energy Certificates - Mandatory Content)	Determines the remaining mandatory content of energy certificates, pursuant to the provisions of paragraph 4 of article 20 of Decree-Law no. 101-D/2020, of 7 December.

Order (extract) no. 9017/2021, of 10 September	Amendment to Order No. 6476-A/2021, which determines the remaining mandatory content of energy certificates, pursuant to the provisions of paragraph 4 of article 20 of Decree-Law No. 101-D/2020, of 7 December.
Order no. 6476-B/2021, of 1 July (Methodologies Applicable to Quality Verification Processes)	Approves the selection criteria and methodologies applicable to the processes for verifying the quality of the information produced within the scope of the Energy Certification System for Buildings (SCE).
Order (extract) no. 9067/2021	Amendment to Order No. 6476-B/2021, which approves the selection criteria and methodologies applicable to the processes for verifying the quality of the information produced within the scope of the Energy Certification System for Buildings (SCE).
Ordinance no. 138-H/2021, of 1 July	It regulates the activities of technicians and the competences of the managing entity of the Energy Certification System for Buildings and sets the values for the registration of energy certificates.

3.2.15 CONSTRUCTION AND MEDIATION OF WORKS

Construction in residential buildings includes the following types of interventions, where companies require the respective public works contractor certificates (“certificado de empreiteiro de obras públicas”), in accordance with Law no. Ordinance No. 41/2015, of June 3:

- a) Masonry, plastering, and stonework;
- b) Plasters, paintings, and other coatings;
- c) Carpentry;
- d) Work on non-structural profiles;
- e) Plumbing and ducts in buildings;
- f) Installations without specific qualification;
- g) Restoration of historical-artistic real estate;
- h) Pavements;
- i) Landscaping;
- j) Low-voltage electrical installations for use;
- k) Telecommunications infrastructures;
- l) Fire extinguishing, security, and detection systems;
- m) Heating, ventilation, air conditioning, and refrigeration;

- n) Gas distribution networks, installations, and gas appliances;
- o) Centralized technical management;
- p) Demolitions;
- q) Earthmoving;
- r) Reinforcement for reinforced concrete;
- s) Formwork;
- t) Waterproofing and insulation.

Table 40 summarises the regulation applicable to construction.

Table 40: Portuguese regulations applied to construction

Applicable legislation – Construction

Law No. 41/2015, of 3 June (Legal Regime for Entry and Permanence in the Construction Activity)	Establishes the legal regime applicable to the exercise of the construction activity, and repeals Decree-Law no. 12/2004, of 9 January.
Law No. 31/2009, of 3 July	Approves the legal regime that establishes the professional qualification required of technicians responsible for the preparation and subscription of projects, for the supervision of works and for the management of works, which is not subject to special legislation, and the duties applicable to them, and repeals Decree no. 73/73, of 28 February.
Law No. 25/2018, of June 14 (Legal Regime for Entry and Permanence in the Construction Activity)	Proceeds to the second amendment of Law No. 31/2009, of 3 July, which approves the legal regime that establishes the professional qualification required of technicians responsible for the preparation and subscription of projects, for the supervision of works and for the management of works, which is not subject to special legislation, and the duties applicable to them, and to the first amendment to Law No. 41/2015, of 3 June, which establishes the legal regime applicable to the exercise of the construction activity.
Ordinance no. 255/2023, of August 7 (Public Works - Mandatory Content of the Program and the Execution Project, Instructions for the Preparation of Projects,	Approves the mandatory content of the execution project, as well as the procedures and standards to be adopted in the preparation and phasing of public works projects, called "Instructions for the preparation of works projects", and the classification of works by categories.

and Classification by Categories)	
Ordinance No. 959/2009, of 21 August (Tender specifications form for public works contracts)	Approves the tender specifications for public works contracts and repeals Ordinance No. 104/2001 of 21 February.
Ordinance No. 274/2011, of 26 September (Construction Companies - Economic and Financial Capacity Indicators and Respective Reference Values)	Defines the indicators of general liquidity and financial autonomy with a view to access and permanence in the construction activity of companies in the sector and sets the respective reference values and repeals Ordinance No. 971/2009, of 27 August.
Ordinance No. 1308/2005, of 20 December (Minimum Staff of Companies Holding Permits)	Amends Ordinance No. 16/2004, of 10 January, which establishes the minimum staff of companies classified for the exercise of construction activity.
Ordinance no. 261-A/2015, of 27 August	Establishes the licensing fees, certificates, permits, and other administrative procedures related to the construction activity, and repeals Ordinance No. 15/2004, of 10 January.
Ordinance no. 212/2022, of 23 August	Updates the values of the classes of the permits.
Decree-Law No. 6/2004, of 6 January (Regime for the Revision of Prices of Public Works and Private Works Contracts and for the Acquisition of Goods and Services)	Establishes the regime for the revision of prices for public works and private works contracts and for the acquisition of goods and services.
Decree-Law no. 73/2021, of 18 August	Amends the regime for the revision of prices for public works and private works contracts and for the acquisition of goods and services.
Regulation EU No. 305/2011, of 9 March	It lays down harmonised conditions for the marketing of construction products and repeals Council Directive 89/106/EEC Text with EEA relevance.
Decree-Law No. 130/2013, of 10 September	It ensures the implementation in the domestic legal order of the obligations arising from Regulation (EU) No 305/2011 of the

	European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC of 21 December 1988.
Decree-Law no. 41821, of 11 August	Approves the Civil Construction Work Safety Regulation - RSTCC.
Decree-Law No. 273/2003, of 29 October	Revises the regulation of safety and health conditions at work in temporary or mobile construction sites, contained in Decree-Law No. 155/95, of 1 July, maintaining the minimum requirements for safety and health at work established by Council Directive No. 92/57/EEC, of 24 June.

The following municipal regulation is also applicable to this intervention:

-  Resolution No. 263/AML/2014, published in the 2nd supplement of the Municipal Bulletin No. 1079, of 23 October: Regulation of the Public Roads Occupation with Construction Sites. (Municipality of Lisbon, 2014)

The mediation of works (table 19) is a service contracted by the client for the selection of a more suitable partner/company, ensuring the quality of the service for the desired construction intervention. It acts as an intermediary/third party between the client and the partner, facilitating the selection of the best budget for the client's needs. In Portugal, the mediation law is Law No. 29/2013 of April 19.

Table 41: Portuguese regulation applied to the activity of mediation

Applicable legislation – Mediation of works

Law no. 29/2013, of 19 April	It establishes the general principles applicable to mediation carried out in Portugal, as well as the legal regimes of civil and commercial mediation, mediators, and public mediation.
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3.2.16 MAINTENANCE AND INSPECTION OF TECHNICAL SYSTEMS

This type of intervention (table 42) includes the maintenance and inspection of the following technical systems, which, according to Order No. 138-I/2021, of July 1, residential buildings must comply with performance, adequate sizing, correct installation, adjustment, and proper control:

- a) Ventilation systems;
- b) Air conditioning systems;
- c) Hot water preparation systems;

- d) Electricity production systems;
- e) Lift installations;
- f) Electric vehicle charging infrastructure.

Table 42: Portuguese regulations applied to maintenance and inspection of technical systems

Applicable legislation – Maintenance and inspection of technical systems

Ordinance no. 138-I/2021, of 1 July	It regulates the minimum energy performance requirements for building envelopes and technical systems and their application depending on the type of use and specific technical characteristics.
Decree-Law no. 102/2021, of 19 November (Exercise of the activity of SCE technicians)	Establishes the requirements for access and exercise of the activity of the technicians of the Energy Certification System for Buildings.
Order no. 6476-C/2021, of 1 July	Approves the conditions relating to the maintenance of technical systems installed in buildings, the frequency, and conditions for carrying out the periodic inspection of technical systems and the format of the report.
Declaration of Rectification no. 611/2021, of 8 September	Corrigendum to Order no. 6476-C/2021, of 29 June, published in the Official Gazette, 2nd series, no. 126, of 1 July 2021.
Ordinance no. 138-H/2021, of 1 July	It regulates the activities of technicians and the competences of the managing entity of the Energy Certification System for Buildings and sets the values for the registration of energy certificates.

3.2.17 ELECTRICAL INSTALLATIONS

In this section, regulations related with electric installation is presented, summarized in Table 43.

Table 43: Portuguese regulations applied to electrical installations

Applicable legislation – Electrical Installations

Decree-Law no. 96/2017, of 10 August	Establishes the regime for private electrical installations.
Law no. 61/2018, of 21 August	First amendment, by parliamentary appreciation, to Decree-Law No. 96/2017, of 10 August, which establishes the regime of private electrical installations.

Regional Legislative Decree No. 4/2019/M	Adapts Decree-Law No. 96/2017, of 10 August, as amended by Law No. 61/2018, of 21 August, establishes the discipline of private service electrical installations powered by the public service electricity network (RESP) of the Autonomous Region of Madeira (RAM), on average, high or low voltage, and installations with their own production, of a temporary or itinerant nature, and defines the system of control, supervision and regulation of the activities associated with them.
Regional Legislative Decree No. 29/2019/A	Establishes the legal licensing regime to which private service electrical installations in the Autonomous Region of the Azores are subject.
Decree-Law No. 72/2020, of 22 September (Requirements for Access and Exercise of the Activity of Entities and Professionals Responsible for Electrical Installations)	Extends the validity of the transitional rules regarding access to the profession of installation and maintenance technician of buildings and systems and the exercise of functions as a responsible technician or as an inspector of electrical installations of private service.
Law No. 14/2015, of 16 February (Requirements for Access and Exercise of the Activity of Entities and Professionals Responsible for Electrical Installations)	Establishes the requirements for access and exercise of the activity of entities and professionals responsible for electrical installations, conforming them to the discipline of Law No. 9/2009, of 4 March, and Decree-Law No. 92/2010, of 26 July, which transposed Directives No. 2005/36/EC, of 7 September, on the recognition of professional qualifications, and 2006/123/EC, of 12 December on services in the internal market.
Ordinance No. 949-A/2006, of 11 September (Technical Rules for Low Voltage Electrical Installations)	Technical rules for low voltage electrical installations – RTIEBT.
Ordinance No. 252/2015, of 19 August (Technical Rules for Low Voltage Electrical Installations)	Amends Ordinance No. 949-A/2006, of 11 September, which approved the Technical Rules for Low Voltage Electrical Installations (RTIEBT), under the terms provided for in article 2 of Decree-Law No. 226/2005, of 28 December, by adding section 722 to part 7 of the RTIEBT - Technical Rules for Low Voltage Electrical Installations.
Decree-Law No. 226/2005, of 28 December (Technical Rules for Low	It provides for the technical rules applicable to low-voltage electrical installations that constitute the regulation on the safety of the use of electricity and the safety regulation for collective

Voltage Electrical Installations)	installations of buildings and entrances, which were approved by Decree-Law no. 740/74, of 26 December.
Decree-Law No. 26852, of 30 July (Regulation of Licenses for Electrical Installations)	Approves the regulation of licenses for electrical installations - ISDS
Decree-Law No. 101/2007, of 2 April (Regulation of Licenses for Electrical Installations)	Simplifies the licensing of electrical installations, both public and private, by amending Decree-Laws No. 26852 of 30 July 1936, 517/80, of 31 October and 272/92 of 3 December.
Decree-Law no. 740/74, of 26 December	Approves the Safety Regulations for Installations for the Use of Electricity and for Collective Installations of Buildings and Entrances.
Decree-Law no. 348/93, of 1 October	It transposes into national law Council Directive 89/656/EEC of 30 November on the minimum safety and health requirements for the use of personal protective equipment by workers at work.

3.2.18 GENERAL REGULATIONS

In this section, general regulations related with home renovations is presented, summarized in Table 44, 45, 46, 47, 48 and 49.

Applicable legislation – Portuguese Classification of Economic Activities

-  **Decree-Law No. 381/2007, of 14 November:** Approves the Portuguese Classification of Economic Activities, Revision 3.
-  **Decree-Law No. 247-B/2008, of 30 December:** It creates and regulates the company card and the Information System of the Portuguese Classification of Economic Activities (SICAE).

Applicable legislation – Labour Code

-  **Law No. 7/2009, of 12 February:** Approves the revision of the Labor Code.
-  **Law No. 105/2009, of 14 September:** Regulates and amends the Labour Code and makes the first amendment to Law No. 4/2008, of 7 February.

Applicable legislation – Civil Code

-  **Decree-Law No. 47344, of 25 November:** Approves the Civil Code and regulates its application - Repeals, as of the date of entry into force of the new Civil Code, all civil legislation relating to the matters it covers.

 **Decree-Law no. 268/94, of 25 October:** Establishes regulatory standards for the horizontal property regime.

 **Law no. 8/2022, of January 10:** Revises the horizontal property regime, amending the Civil Code, Decree-Law no. 268/94, of 25 October, and the Notary Code.

Applicable legislation – Service activities

 **Decree-Law No. 92/2010, of 26 July:** It establishes the principles and rules necessary to simplify the free access and exercise of service activities and transposes Directive 2006/123/EC of the European Parliament and of the Council of 12 December.

Applicable legislation – Public Procurement Code

 **Decree-Law No. 18/2008, of 29 January:** Approves the Public Procurement Code, which establishes the discipline applicable to public procurement and the substantive regime for public contracts that have the nature of an administrative contract.

Applicable legislation – Value Added Tax Code

 **Decree-Law No. 102/2008, of 20 June:** Using the legislative authorisation granted by article 91 of Law no. 67-A/2007, of 31 December, it amends and republishes the Value Added Tax Code, approved by Decree-Law no. 394-B/84, of 26 December, and the VAT Regime on Intra-Community Transactions, approved by Decree-Law no. 290/92, of 28 December.

Applicable legislation – Consumer rights

 **Decree-Law no. 84/2021, of 18 October:** It regulates consumer rights in the purchase and sale of digital goods, content, and services, transposing Directives (EU) 2019/771 and (EU) 2019/770.

Table 44: Portuguese regulations for Professional Qualification

Applicable legislation – Legal Regime Establishing Professional Qualification

Law No. 41/2015, of 3 June (Legal Regime for Entry and Permanence in the Construction Activity)	Establishes the legal regime applicable to the exercise of the construction activity, and repeals Decree-Law no. 12/2004, of 9 January.
Law No. 31/2009, of 3 July	Approves the legal regime that establishes the professional qualification required of technicians responsible for the preparation and subscription of projects, for the supervision of works and for the management of works, which is not subject to special legislation, and the duties applicable to them, and repeals Decree no. 73/73, of 28 February.

Law no. 25/2018, of 14 June	Proceeds to the second amendment of Law No. 31/2009, of 3 July, which approves the legal regime that establishes the professional qualification required of technicians responsible for the preparation and subscription of projects, for the supervision of works and for the management of works, which is not subject to special legislation, and the duties applicable to them, and to the first amendment to Law No. 41/2015, of 3 June, which establishes the legal regime applicable to the exercise of the construction activity.
Decree-Law no. 292/95, of 14 November	Establishes the official qualification for the preparation of urbanization plans, detailed plans, and projects for subdivision operations.
Law No. 14/2015, of 16 February (Requirements for Access and Exercise of the Activity of Entities and Professionals Responsible for Electrical Installations)	Establishes the requirements for access and exercise of the activity of entities and professionals responsible for electrical installations, conforming them to the discipline of Law No. 9/2009, of 4 March, and Decree-Law No. 92/2010, of 26 July, which transposed Directives No. 2005/36/EC, of 7 September, on the recognition of professional qualifications, and 2006/123/EC, of 12 December on services in the internal market.
Decree-Law no. 72/2020, of 22 September	Extends the validity of the transitional rules regarding access to the profession of installation and maintenance technician of buildings and systems and the exercise of functions as a responsible technician or as an inspector of electrical installations of private service.
Ordinance No. 228/2012, of 3 August (Energy sector)	First amendment to Ordinance No. 48/2012, of 27 February, which specifies the regulated professions covered in the energy sector and designates the respective competent authority to carry out the recognition of professional qualifications.
Ordinance no. 48/2012, of 27 February	It specifies the regulated professions covered in the energy sector and designates the respective competent authority to carry out the recognition of professional qualifications.
Law No. 15/2015, of 16 February (Exercise of the Activity of Entities and Professionals working in the area of combustible gases, fuels, and other petroleum products)	Establishes the requirements for access to and exercise of the activity of entities and professionals working in the area of combustible gases, fuels and other petroleum products, in accordance with the discipline of Law No. 9/2009, of 4 March, and Decree-Law No. 92/2010, of 26 July, which transposed Directives No. 2005/36/EC, of 7 September, on the recognition of professional qualifications, and 2006/123/EC, of 12 December, on services in the internal market, and makes the fifth amendment to Decree-Law No. 267/2002, of 26 November.

Ordinance no. 192/2019, of 25 June	Approves the specific certification requirements of training entities to provide adequate training to obtain the professional qualification of gas technician, installer of gas installations and gas distribution networks and branches, installer of gas appliances and fusion steel welder in the gas area.
Ordinance No. 96/2012, of 5 April (Public Works, Transport and Communications)	It specifies the regulated professions covered by the public works, transport and communications sectors and designates the respective competent authorities to carry out the recognition of professional qualifications, under the terms of Law No. 9/2009, of 4 March.
Law No. 9/2009, of 4 March	It transposes into national law Directive 2005/36/EC of the European Parliament and of the Council of 7 September on the recognition of professional qualifications and Council Directive 2006/100/EC of 20 November 2006 adapting certain directives in the area of the free movement of persons by virtue of the accession of Bulgaria and Romania

Table 45: Portuguese regulations for Safety, Hygiene and Health at Work

Applicable legislation – Safety, Hygiene and Health at Work

Law No. 102/2009, of 10 September (Legal Regime for the Promotion of Safety and Health at Work)	Legal regime for the promotion of safety and health at work.
Law no. 42/2012, of 28 August	Approves the regimes for access to and exercise of the professions of senior occupational safety technician and occupational safety technician.
Ordinance No. 384/2012, of 26 November	First amendment to Ordinance No. 55/2012, of 9 March, which specifies the regulated professions covered in the area of employment and designates the respective competent authority to proceed with the recognition of professional qualifications, under the terms of Law No. 9/2009, of 4 March.
Decree-Law No. 159/99 of 11 May (Occupational Accident Insurance)	Regulates occupational accident insurance for self-employed workers.
Ordinance No. 987/93 of 6 October (Workplaces)	It lays down the minimum safety and health requirements in the workplace.

Decree-Law No. 348/93, of 1 October (Workplaces)	It transposes into national law Council Directive 89/656/EEC of 30 November on the minimum safety and health requirements for the use of personal protective equipment by workers at work.
Decree-Law No. 347/93, of 1 October (Workplaces)	It transposes into national law Council Directive 89/654/EEC of 30 November 20 on the minimum safety and health requirements at work.
Decree-Law No. 330/93, of 25 September (Workplaces)	It transposes into national law Directive No. 90/269/EEC of 29 May on the minimum safety and health requirements for manual handling of loads.
Law no. 113/99, of 3 August (Workplaces)	It develops and implements the general regime of labour offences, through the typification and classification of the administrative offences corresponding to the violation of specific legislation on safety, hygiene, and health at work in certain sectors of activities or to certain occupational risks.
Decree-Law no. 243/86, of 20 August	Approves the General Regulation of Health and Safety at Work in Commercial, Office and Service Establishments.
Decree-Law 362/93 of 15 October (Accidents at work)	It regulates statistical information on accidents at work and occupational diseases.
Decree-Law No. 9/2007, of 17 January	Approves the General Noise Regulation and repeals the legal regime on noise pollution, approved by Decree-Law No. 292/2000, of 14 November.
Decree-Law No. 182/2006, of 6 September	It transposes into national law Directive 2003/10/EC of the European Parliament and of the Council of 6 February 2003 on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (noise).
Decree-Law No. 46/2006, of 24 February	It transposes into national law Directive 2002/44/EC of the European Parliament and of the Council of 25 June 2002 on the minimum requirements for the protection of the health and safety of workers in the event of exposure to risks arising from physical agents (vibrations).
Decree-Law No. 273/2003, of 29 October (Safety in civil construction)	Revises the regulation of safety and health conditions at work in temporary or mobile construction sites, contained in Decree-Law No. 155/95, maintaining the occupational safety and health requirements established by Council Directive No. 92/57/EEC of 24 June.

Decree-Law No. 41821 of 11 August 1958 (Safety in civil construction)	Approves the Construction Work Safety Regulation.
Decree-Law No. 141/95, of 14 June (Safety signs)	It lays down the minimum requirements for occupational health and safety signs.
Ordinance No. 1456-A/95 of 11 December (Safety Signalling)	It regulates the minimum requirements for the placement and use of occupational safety and health signs. Repeals Ordinance no. 434/83, of 15 April.

Table 46: Portuguese regulations for fire safety in buildings

Applicable legislation – Fire Safety

Decree-Law No. 220/2008, of 12 November	Establishes the legal framework for fire safety in buildings.
Law no. 123/2019, of 18 October	Third amendment to Decree-Law No. 220/2008, of 12 November, which establishes the legal framework for fire safety in buildings.
Regional Legislative Decree No. 6/2015/A	Establishes the legal regime for fire safety in buildings in the Autonomous Region of the Azores.
Regional Legislative Decree No. 11/2010/M	Adapts to the Autonomous Region of Madeira Decree-Law No. 220/2008, of 12 November, which establishes the legal regime for fire safety in buildings.
Ordinance No. 1532/2008, of 29 December	Approves the Technical Regulation for Fire Safety in Buildings (SCIE).
Ordinance no. 135/2020, of 2 June	Amendment to the Technical Regulation on Fire Safety in Buildings (SCIE), approved by Ordinance No. 1532/2008, of 29 December.
Decree-Law No. 95/2019, of July 18 (Rehabilitation Operations in Buildings)	Establishes the regime applicable to the rehabilitation of buildings or autonomous fractions.
Order no. 11832/2021, of November 30	Recognition of the technical capacity of the technicians responsible for the commercialization, installation or maintenance of SCIE equipment and systems.

Table 47: Portuguese regulations applied to waste management

Applicable legislation – Waste Management

Decree-Law no. 102-D/2020, of 10 December	Approves the general regime for waste management, the legal regime for the landfill of waste and amends the regime for the management of specific waste streams, transposing Directives (EU) 2018/849, 2018/850, 2018/851 and 2018/852.
Law no. 52/2021, of 10 August	Amendment, by parliamentary appreciation, to Decree-Law No. 102-D/2020, of 10 December, which approves the general regime of waste management, the legal regime for the disposal of waste in landfills and amends the regime for the management of specific waste streams, transposing Directives (EU) 2018/849, 2018/850, 2018/851 and 2018/852.
Decree-Law no. 152-D/2017, of 11 December	It unifies the regime for the management of specific waste streams subject to the principle of extended producer responsibility by transposing Directives 2015/720/EU, 2016/774/EU and 2017/2096/EU.
Decree-Law No. 79/2013, of 11 June (Management of Waste Electrical and Electronic Equipment (WEEE))	It lays down rules on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE), transposing Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011.
Decree-Law no. 23/2023, of April 5	It transposes delegated (EU) directives on the use of hazardous substances in electrical and electronic equipment.

Table 48: Portuguese regulations applied to urban operations and buildings

Applicable legislation – Urbanization and Building

Ordinance No. 216-E/2008, of 3 March (Licensing Permit)	It sets out all the elements that must be used in the applications for the issuance of permits for the use of the various urban operations and repeals Ordinance No. 1105/2001, of 18 September.
Ordinance No. 235/2013, of 24 July (Statistical Elements Referring to Urban Operations)	Identifies the statistical elements related to urban operations that must be sent by the City Councils to the National Institute of Statistics, I.P. and repeals Ordinance No. 1111/2001, of 19 September.
Ordinance No. 228/2015, of 3 August (Models of permits and notices of publicity of urban operations)	Models of permits and notices of publicity of urban operations.
Decree-Law no. 555/99, of 16 December	Legal Regime of Urbanization and Building (RJUE).

Decree-Law no. 121/2018, of 28 December	Amends the Legal Regime of Urbanization and Building.
Regional Legislative Decree No. 17/2011/M	Amends Regional Legislative Decree No. 37/2006/M, of 18 August, which adapts to the Autonomous Region of Madeira Decree-Law No. 555/99, of 16 December, which establishes the legal regime for urbanization and building.
Ordinance No. 113/2015, of 22 April (Requests for Prior Information, Licensing and Authorization)	Identifies the instructive elements of the procedures provided for in the Legal Regime of Urbanization and Building and repeals Ordinance No. 232/2008, of 11 March.
Decree-Law No. 38382 of 7 August 1951	Approves the General Regulation of Urban Buildings.
Decree-Law No. 50/2008, of 19 March	Proceeds to the 16th amendment to Decree-Law No. 38 382, of August 7, 1951, which establishes the General Regulation of Urban Buildings.

Table 49: Portuguese and EU regulations for CE marking of products.

Applicable legislation – CE marking

Regulation (EC) No 765/2008 of the European Parliament and of the Council of 9 July 2008	It lays down the requirements for accreditation and market surveillance relating to the marketing of products, and repeals Regulation (EEC) No ³³⁹ /93.
Decree-Law no. 23/2011, of 11 February	It ensures the fulfilment of the obligations arising from Regulation (EC) No 765/2008 of the European Parliament and of the Council of 9 July 2008 establishing the requirements for accreditation and market surveillance relating to the marketing of products.
Regulation (EU) 2016 /425 of the European Parliament and of the Council of 9 March 2016	on personal protective equipment and repealing Council Directive 89/686/EEC.
Decree-Law no. 118/2019, of 21 August	It ensures the implementation in the domestic legal order of the obligations arising from Regulation (EU) 2016/425 on personal protective equipment.

Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009

On the establishment of a framework for the setting of ecodesign requirements for energy-related products.

3.3 SPAIN

3.3.1 SPACE HEATING AND/OR COOLING SYSTEMS

This intervention typology includes measures in space heating and cooling systems, through the optimization of existing systems or their replacement by high-efficiency systems. Table 50 summarizes the regulations applicable to these interventions. The following requirements may be applicable to space heating and cooling:

Authorization from the condominium:

If you are going to put the outdoor unit on the facade or roof or other outdoor area, you must consider your neighbourhood community (Law 49/1960, of 21 July, on horizontal property). There can be two cases:

- If the installation is regulated in the statutes of your community, you have to attend to what you can use: some statutes authorize the land, but only in certain places, such as roofs;
- If the statutes do not specify it, you need the unanimous agreement of the neighbours. In the event that other owners have already installed it, it will be difficult for them to object, but it is better to consult at least with the president. If you were the pioneer in installing the air, you must obtain that approval before starting to install.

Permit from municipality:

- The installation must comply with the requirements of the agreement with its municipal ordinance, which only addresses the points of maintaining the aesthetics of the building, respecting the uniformity of the facades (it would be forbidden to install it in protected buildings) and that does not generate much noise, not exceeding the value of acoustic contamination (limit of 55 dB).

Equipment Collection:

- Distributors must provide for the free collection of old replaced equipment when a new one is purchased, whether the new one is delivered to a point of sale or to the consumer's own home (WEEE: waste electrical and electronic equipment, its materials, components, consumables, and sub-assemblies);
- In the case of WEEE that contain mercury, lead, phosphorus or cadmium or substances that deplete the ozone layer, special conditions are established for its collection, transportation, and storage. (Royal Decree 110/2015, of February 20, on waste electrical and electronic equipment)

Equipment:

- Check that the materials/equipment carry the CE marking.
- Check the energy label and prefer, whenever possible, higher class equipment:
 - For local space heaters, ratings go from G (least efficient) to A++ (most efficient). (Regulation: Labelling regulation for local space heaters (EU) 2015/1186)
 - Air conditioners, ratings go from D to A+++ (Regulation (EU) No 626/2011 of 4 May 2011).

- Space or water heater comes with an energy label showing its energy efficiency class. For individual products, ratings go from G (least efficient) to A++ (most efficient). It is also possible to buy a combination of technologies, such as a boiler with a solar hot water storage tank, in order to reach an A+++ energy efficiency rating (Regulation (EU) 811/2013 of 18 February 2013 and Regulation (EU) 812/2013 of 18 February 2013).
- Solid fuel boilers with a rated heat output of 70 kW or less are labelled on an energy efficiency scale ranging from A+++ (most efficient) to D (least efficient). (Energy Labelling Regulation EU 2015/1187)

Table 50: Spanish regulations applied to space heating and/or cooling systems.

Applicable legislation

Royal Decree 178/2021, of 23 March	Amending Royal Decree 1027/2007, of July 20, 2007, approving the Regulation on Thermal Installations in Buildings.
Royal Decree 1027/2007 of 20 July 2007	Approving the Regulation on Thermal Installations in Buildings.
Royal Decree 1390/2011, of 14 October	Regulating the indication by labelling and standard product information of the Consumption of energy and other resources by energy-related products.
Royal Decree 187/2011 of 18 February 2011	On the setting of eco-design requirements for energy-related products.
Royal Decree 314/2006 of 17 March 2006	Approving the Technical Building Code.
Commission Regulation (EU) 2015/1185 of 24 April 2015	For the development of the Directive 2009/125/EC of the European Parliament and of the Council on the ecological design requirements applicable to the apparatuses of local heating of solid fuel.
Implementing Regulation (EU) 2015/2067 of 17 November 2015	Establishes, in accordance with Regulation (EU) n° 517/2014 of the European Parliament and of the Council, the minimum requirements and conditions for the mutual recognition of the certification of natural persons in respect of stationary refrigeration equipment, stationary air-conditioning equipment, stationary heat pumps and refrigeration units of refrigerated trucks and trailers containing fluorinated greenhouse gases and for the certification of undertakings in relation to stationary refrigeration equipment; stationary air conditioning equipment and stationary heat pumps containing fluorinated greenhouse gases.
Regulation (EC) No 1516/2007 of 19 December 2007	It lays down, in accordance with Regulation (EC) No 842/2006 of the European Parliament and of the Council, standard provisions for the detection of leaks in fixed refrigeration, air conditioning and heat pump equipment containing certain fluorinated greenhouse gases.
Council Directive 92/42/EEC of 21 May 1992	On performance requirements for new hot water boilers fuelled with liquid or gaseous fuels.

UNE-EN 14511-1:2023	Air conditioners, liquid coolers and heat pumps for the heating and cooling of locals and process coolers with electrically driven compressors. Part 1: Terminations and definitions.
UNE-EN 14511-2:2023	Air conditioners, liquid coolers and heat pumps for the heating and cooling of locals and process coolers with electrically driven compressors. Part 2: Testing conditions.
UNE-EN 14511-3:2023	Air conditioners, liquid coolers and heat pumps for the heating and cooling of locals and process coolers with electrically driven compressors. Part 3: Testing methods.
UNE-EN 14511-4:2023	Air conditioners, liquid coolers and heat pumps for the heating and cooling of locals and process coolers with electrically driven compressors. Part 4: Requirements.

3.3.2 DOMESTIC HOT WATER (DHW) PREPARATION SYSTEMS

This intervention typology includes interventions in domestic hot water production systems, through the optimization of existing systems or their replacement by high-efficiency systems. Table 51 summarizes the regulation applicable for these interventions. The following requirements are applicable to domestic hot water preparation systems:

Authorization from the condominium:

If you are going to put the outdoor unit on the facade or roof or other outdoor area, you must consider your neighbourhood community. (Law 49/1960, of 21 July, on horizontal property). There can be two cases:

- If the installation is regulated in the statutes of your community, you have to attend to what you can use: some statutes authorize the land, but only in certain places, such as roofs;
- If the statutes do not specify it, you need the unanimous agreement of the neighbours. In the event that other owners have already installed it, it will be difficult for them to object, but it is better to consult at least with the president. If you were the pioneer in installing the air, you must obtain that approval before starting to install.

Permit from municipality:

- The installation must comply with the requirements of the agreement with its municipal ordinance, which only addresses the points of maintaining the aesthetics of the building, respecting the uniformity of the facades (it would be forbidden to install it in protected buildings) and that does not generate much noise, not exceeding the value of acoustic contamination (limit of 55 dB).

Equipment Collection:

- Distributors must provide for the free collection of old replaced equipment when a new one is purchased, whether the new one is delivered to a point of sale or to the consumer's own home (WEEE: waste electrical and electronic equipment, its materials, components, consumables, and sub-assemblies);

- In the case of WEEE that contain mercury, lead, phosphorus or cadmium or substances that deplete the ozone layer, special conditions are established for its collection, transportation, and storage. (Royal Decree 110/2015, of February 20, on waste electrical and electronic equipment)

Equipment:

- Check that the materials/equipment carry the CE marking.
- Check the energy label and prefer, whenever possible, higher class equipment:
 - Space or water heater comes with an energy label showing its energy efficiency class. For individual products, ratings go from G (least efficient) to A++ (most efficient). It is also possible to buy a combination of technologies, such as a boiler with a solar hot water storage tank, in order to reach an A+++ energy efficiency rating (Regulation (EU) 811/2013 of 18 February 2013 and Regulation (EU) 812/2013 of 18 February 2013);
 - Solid fuel boilers with a rated heat output of 70 kW or less are labelled on an energy efficiency scale ranging from A+++ (most efficient) to D (least efficient). (Energy Labelling Regulation EU 2015/1187)

Table 51: Spanish regulations applied to domestic hot water (DHW) preparation systems.

Applicable legislation

Royal Decree 178/2021, of 23 March	Amending Royal Decree 1027/2007, of July 20, 2007, approving the Regulation on Thermal Installations in Buildings.
Royal Decree 1027/2007 of 20 July 2007	Approving the Regulation on Thermal Installations in Buildings.
Royal Decree 1390/2011, of 14 October	Regulating the indication by labelling and standard product information of the consumption of energy and other resources by energy-related products.
Royal Decree 187/2011 of 18 February 2011	On the setting of eco-design requirements for energy-related products.
Royal Decree 487/2022, of 21 June 2022	Laying down health requirements for the prevention and control of Legionellosis.
Royal Decree 3/2023, of 10 January 2023	Laying down the technical and sanitary criteria for the quality of drinking water, its control and supply.
Royal Decree 314/2006 of 17 March 2006	Approving the Technical Building Code.
Standard UNE-EN 12831-3 - Energy efficiency of buildings	Method for the calculation of the design heat load. Part 3: Heat load of domestic hot water systems and demand characterization. Modules M8-2, M8-3.
Implementing Regulation (EU) 2015/2067 of 17 November 2015	Establishes, in accordance with Regulation (EU) No ⁵¹⁷ /2014 of the European Parliament and of the Council, the minimum requirements and conditions for the mutual recognition of the certification of natural persons in respect of stationary refrigeration equipment, stationary air-conditioning equipment, stationary heat pumps and refrigeration units of refrigerated

	trucks and trailers containing fluorinated greenhouse gases and for the certification of undertakings in relation to stationary refrigeration equipment; stationary air-conditioning equipment and stationary heat pumps containing fluorinated greenhouse gases
Regulation (EC) No 1516/2007 of 19 December 2007	It lays down, in accordance with Regulation (EC) No 842/2006 of the European Parliament and of the Council, standard provisions for the detection of leaks in fixed refrigeration, air conditioning and heat pump equipment containing certain fluorinated greenhouse gases.
Council Directive 92/42/EEC of 21 May 1992	On performance requirements for new hot water boilers fuelled with liquid or gaseous fuels

Technical Guidance:

- HS 4 Suministro de Agua del Código Técnico de la Edificación. (Minister of Housing And Urban Agenda, 2022)

3.3.3 VENTILATION SYSTEM

This intervention typology includes measures in ventilation systems, namely, in improving natural ventilation conditions by installing self-regulating ventilation grilles and enhancing mechanical ventilation conditions through the installation of efficient fans, variable speed drives on motors, heat recovery ventilation installation, and replacement and insulation of ventilation ducts. Table 52 summarizes the regulation applicable for these interventions. The following requirements are applicable to ventilation systems:

Authorization from the condominium:

If you are going to put the outdoor unit on the facade or roof or other outdoor area, you must consider your neighbourhood community. (Law 49/1960, of 21 July, on horizontal property). There can be two cases:

- If the installation is regulated in the statutes of your community, you have to attend to what you can use: some statutes authorize the land, but only in certain places, such as roofs;
- If the statutes do not specify it, you need the unanimous agreement of the neighbours. In the event that other owners have already installed it, it will be difficult for them to object, but it is better to consult at least with the president. If you were the pioneer in installing the air, you must obtain that approval before starting to install.

Permit from municipality:

- The installation must comply with the requirements of the agreement with its municipal ordinance, which only addresses the points of maintaining the aesthetics of the building, respecting the uniformity of the facades (it would be forbidden to install it in protected

buildings) and that does not generate much noise, not exceeding the value of acoustic contamination (limit of 55 dB).

Equipment Collection:

- Distributors must provide for the free collection of old replaced equipment when a new one is purchased, whether the new one is delivered to a point of sale or to the consumer's own home (WEEE: waste electrical and electronic equipment, its materials, components, consumables, and sub-assemblies);
- In the case of WEEE that contain mercury, lead, phosphorus or cadmium or substances that deplete the ozone layer, special conditions are established for its collection, transportation, and storage. (Royal Decree 110/2015, of February 20, on waste electrical and electronic equipment)

Equipment:

- Check that the materials/equipment carry the CE marking.
- Check the energy label and prefer, whenever possible, higher class equipment:
 - Residential ventilation units must display a label indicating their energy efficiency on a scale from A+ (most efficient) to G (least efficient). These ratings consider: specific power input (SPI), thermal efficiency of heat recovery, type of ventilation control and other factors.

Table 52: Spanish regulations and standards applied to ventilation systems.

Applicable legislation

Royal Decree 178/2021, of 23 March	Amending Royal Decree 1027/2007, of July 20, 2007, approving the Regulation on Thermal Installations in Buildings.
Royal Decree 1027/2007 of 20 July 2007	Approving the Regulation on Thermal Installations in Buildings.
Royal Decree 1390/2011, of 14 October	Regulating the indication by labelling and standard product information of the consumption of energy and other resources by energy-related products.
Royal Decree 187/2011 of 18 February 2011	On the setting of eco-design requirements for energy-related products.
Royal Decree 314/2006 of 17 March 2006	Approving the Technical Building Code.

3.3.4 REPLACEMENT OF HOUSEHOLD APPLIANCES

This intervention typology includes measures in household appliances, including the replacement with models that have higher energy and water efficiency, where applicable. This includes refrigerators, freezers, combined units, washing machines, dishwashers, washer-dryers, and electric ovens. Table 52 summarizes the regulation applicable for these interventions. The following requirements are applicable to household appliances:

Equipment Collection:

- Distributors must provide for the free collection of old replaced equipment when a new one is purchased, whether the new one is delivered to a point of sale or to the consumer's own home (WEEE: waste electrical and electronic equipment, its materials, components, consumables, and sub-assemblies);
- In the case of WEEE that contain mercury, lead, phosphorus or cadmium or substances that deplete the ozone layer, special conditions are established for its collection, transportation, and storage. (Royal Decree 110/2015, of February 20, on waste electrical and electronic equipment).

Equipment:

- Check that the materials/equipment carry the CE marking.
- Check the energy label and prefer, whenever possible, higher class equipment:
 - The EU energy labels for household fridges and freezers use, washing machines and dishwashers, washer dryers, tumble dryers and displays, as of 1 March 2021, a scale from A (most efficient) to G (least efficient).
 - New cooking appliances come with an energy label showing their energy efficiency class. These range from A+++ to D for range hoods and ovens. For ovens, these ratings are based on their energy efficiency.

Table 53: Spanish and EU regulations applied to household appliances.

Applicable legislation

Royal Decree 187/2011 of 18 February 2011	On the setting of eco-design requirements for energy-related products.
Royal Decree 552/2019, of 27 September	Approving the Safety Regulations for Refrigeration Installations and their supplementary technical instructions.
Regulation (EU) 2019/2016	Regulation on energy labelling for fridges and freezers.
Regulation (EU) 2019/2019	Regulation on ecodesign requirements for fridges.
Regulation (EU) 2019/2014	Regulation on energy labelling for household washing machines and washer-dryers.
Regulation (EU) 2019/2023	Regulation on ecodesign requirements for household washing machines and washer-dryers.
Regulation (EU) C/2023/4741	Regulation on energy labelling of household tumble dryers.
Regulation (EU) C/2023/7671	Regulation on ecodesign requirements for household tumble dryers.
Regulation (EU) 65/2014	Regulation on energy labelling for domestic ovens and range hoods (EU) 65/2014.
Regulation (EU) 66/2014	Regulation on ecodesign requirements for domestic ovens and range hoods (EU) 66/2014.

Regulation 2019/2017	(EU)	Regulation on energy labelling for dishwashers.
Regulation 2019/2022	(EU)	Regulation on ecodesign requirements for dishwashers.

3.3.5 INTERVENTIONS AIMED WATER EFFICIENCY

This intervention typology includes measures in residential buildings, namely:

- b. Installation of rainwater harvesting systems (e.g., for the irrigation of green areas and washing of common spaces);
- c. Use of more efficient irrigation methods in urban buildings, including installation of systems and equipment (e.g., drip irrigation methods and at times of lower evaporation and sensors for irrigation interruption and optimization), as well as more efficient solutions in the filling and maintenance of swimming pools;
- d. Installation of high-efficiency devices in terms of water saving (e.g., taps, showers, flushing cisterns, flow meters, pressure reducers and flow regulators);
- e. Installation of water consumption management systems, in order to account for and manage consumption, promoting water efficiency (e.g., installation of telemetry in the meter, home automation and installation of digital commands).

Table 54 summarizes the regulation applicable for these interventions. The following requirements are applicable to interventions aimed at water efficiency:

Authorization from the condominium:

- A qualified majority of 60% or **3/5 fifths of owners** and participation fees will be necessary to improve the energy or water efficiency of the building (reuse of water for irrigation).
- The installation of common or private systems, for the use of renewable energies, or of the infrastructures necessary to access new collective energy supplies, may be agreed, at the request of any owner, by **one third** of the members of the community who represent, in turn, one third of the participation quotas and if the amount does not exceed 12 monthly payments, a **simple majority** is sufficient:
 - The carrying out of works or actions that contribute to the improvement of energy efficiency that can be accredited through the building's energy performance certificate or the implementation of renewable energy sources for common use, including, where appropriate, the modification of the building envelope, as well as the application for aid and subsidies, loans or any type of financing by the community of owners to public or private entities for the execution of such works or actions will require the favourable vote of the simple majority of the owners, who, in turn, represent the simple majority of the participation quotas, provided that their amount passed on annually, after deducting the subsidies or public aid and applying the financing where appropriate, does not exceed the amount of twelve ordinary monthly payments of common expenses

Table 54: Spanish regulations applied to water efficiency and quality.

Applicable legislation

Royal Decree 178/2021, of 23 March	Amending Royal Decree 1027/2007, of July 20, 2007, approving the Regulation on Thermal Installations in Buildings.
Royal Decree 1027/2007 of 20 July 2007	Approving the Regulation on Thermal Installations in Buildings.
Royal Decree 1390/2011, of 14 October	Regulating the indication by labelling and standard product information of the consumption of energy and other resources by energy-related products.
Royal Decree 187/2011 of 18 February 2011	On the setting of eco-design requirements for energy-related products.
Royal Decree 314/2006 of 17 March 2006	Approving the Technical Building Code.
Royal Decree 3/2023, of 10 January 2023	Laying down the technical and sanitary criteria for the quality of drinking water, its control and supply.
Royal Decree 487/2022, of 21 June 2022	Laying down health requirements for the prevention and control of legionellosis.
Royal Decree 742/2013 of 27 September 2013	Laying down technical and sanitary criteria for swimming pools.
Royal Decree 1054/2002 of 11 October 2002	Regulating the evaluation process for the registration, authorization and placing on the market of biocidal products.
Royal Decree 830/2010 of 25 June 2010	Laying down the rules governing training for biocidal product treatment.
Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006	Concerning the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC.

Technical Guidance

- Guía Técnica de aprovechamiento de aguas pluviales en edificios (Aqua España, 2016).

3.3.6 SOLAR ENERGY

This intervention typology includes measures in residential buildings, namely:

- a) Installation of electricity production systems for self-consumption from renewable energy sources (e.g., installation of photovoltaic solar panels);

- b) Installation of renewable energy systems for the production of domestic hot water (e.g., installation of solar collectors for heating sanitary water).

Table 54 summarizes the regulation applicable for these interventions. The following requirements are applicable to solar photovoltaic systems and solar thermal systems:

Authorization from the condominium:

For **common use** installations. If the installation is going to cover the needs of the building, it is required:

- The favourable vote of the simple majority of the owners, who also represent the simple majority of the participation fees, provided that the cost of the installation passed on annually does not exceed the amount of 12 ordinary monthly payments of common expenses. The cost is calculated once subsidies or public aid have been deducted and financing, if any, has been applied.
- To calculate this majority, those of absent owners who, after having received the call, have not gone to the meeting, but have been informed after the decision and have not objected within a period of 30 minutes, are counted as votes in favor. days.
- Owners who vote against cannot participate in the installation later, so they will have to continue paying their common electricity costs.
- The cost of these works and the loans or financing to carry them out are considered general expenses and are distributed according to the usual rules.

For **private use** facilities. If the system has a private use (this is the case if the energy is intended for homes and not all neighbours participate), the majority is not so strict, since it only requires:

- The favourable vote of one third of the community members who represent, in turn, one third of the participation fees. In this case, owners who vote against cannot be charged any costs for installation, adaptation of common infrastructure or maintenance of the system.
- The costs of conservation and maintenance of the new infrastructure will be considered a common element. Any aspect of the self-consumption installation that is not explicitly regulated must have approval from the owners' board.

Permit from municipality:

- The installation must comply with the requirements of the agreement with its municipal ordinance, which only addresses the points of maintaining the aesthetics of the building, respecting the uniformity of the facades (it would be forbidden to install it in protected buildings) and that does not generate much noise, not exceeding the value of acoustic contamination (limit of 55 dB).
- Any modification of the exterior structure, the façade of the building must be communicated to the Municipality.

Production and management of construction and demolition waste:

- Include in the work execution project a construction and demolition waste management study, written by a competent technician.

- Minor construction and home repair work: The waste and debris generated in these works are considered domestic waste and have the legal consideration of municipal waste, the regulation of its control of production and management, as well as its surveillance, inspection, and sanction, is the competence of the local administrations according to the regulation in their municipal ordinances (Royal Decree 105/2008 of February 1).

Installation of the photovoltaic panel:

- Make sure that the house has the minimum requirements to install a photovoltaic system for self-consumption: correct solar orientation, areas without shadows, or with short periods of radiation, and the proximity between the place of production and the place of consumption.
- Check that your consumption profile is aligned with the production profile, so that consumption takes place at the same time as production. If not, consider installing batteries to store this energy;
- It is important to always request at least 3 estimates from specialized companies and have them do a study of the roof. The study has to indicate what amount of energy will be produced (energy potential), the project budget, how much of that energy can be used for self-consumption and how much will be poured into the grid and what is the expected economic return;
- Once installed, be sure to ask for the manuals and warranty statements for the components and explanations of the system's operation;
- Self-consumption facilities WITHOUT surpluses are exempt from carrying out the process of access and connection to the electrical energy transportation and distribution networks. Also exempt are self-consumption installations WITH surplus power equal to or less than 15 kW that are located on urbanized land that has the facilities and services required by urban planning legislation. (Royal Decree 1183/2020, of December 29);
- The rest of the self-consumption installations WITH surpluses, as long as they have a power equal to or less than 100 kW, will have to carry out the procedure of access and connection to the electrical energy transport and distribution networks. (Royal Decree 1183/2020, of December 29);
- It may require prior administrative authorization for construction or operation. (P<100 kW in Low voltage, connected directly to a voltage network no higher than 1 kV, whether distribution or to the internal network of a consumer, they do not need to request administrative authorization). (Law 24/2013, of December 26)
- The self-consumption installation connected to low voltage networks will have an Electrical Installation Certificate (CIE) signed by an authorized installation company and duly completed by the competent body of the autonomous community, which will ensure that it has been carried out in based on what is established in the REBT. (Law 24/2013, of December 26)
- If the installation has a power greater than 10 kW, it must have a technical project signed by a competent technician. Lower power installations (up to 10 kW) are only required to have a Technical Design Report (MTD) according to the format of the autonomous community, signed by the authorized installation company.

- All self-consumption facilities must be registered in the Administrative Registry of Self-consumption, which is the responsibility of the General Directorate of Energy Policy and Mines of the Ministry for the Ecological Transition and the Demographic Challenge. (Royal Decree 244/2019, of April 5);
- Buildings or constructions that are protected due to their inherent characteristics will require a specific study to analyse the conditions under which they could host a self-consumption facility, but in no case can the limitations of protection of historical heritage affect buildings lacking such protection. (Law 16/1985 on Spanish Historical Heritage).

Renewable Energy Communities (Collective Self-Consumption)

Authorization from the condominium:

For **common use** installations. If the installation is going to cover the needs of the building, it is required:

- The favourable vote of the simple majority of the owners, who also represent the simple majority of the participation fees, provided that the cost of the installation passed on annually does not exceed the amount of 12 ordinary monthly payments of common expenses. The cost is calculated once subsidies or public aid have been deducted and financing, if any, has been applied.
- To calculate this majority, those of absent owners who, after having received the call, have not gone to the meeting, but have been informed after the decision and have not objected within a period of 30 minutes, are counted as votes in favour days.
- Owners who vote against cannot participate in the installation later, so they will have to continue paying their common electricity costs.
- The cost of these works and the loans or financing to carry them out are considered general expenses and are distributed according to the usual rules.

For **private use** facilities. If the system has a private use (this is the case if the energy is intended for homes and not all neighbours participate), the majority is not so strict, since it only requires:

- The favourable vote of one third of the community members who represent, in turn, one third of the participation fees. In this case, owners who vote against cannot be charged any costs for installation, adaptation of common infrastructure or maintenance of the system.
- The costs of conservation and maintenance of the new infrastructure will be considered a common element. Any aspect of the self-consumption installation that is not explicitly regulated must have approval from the owners' board.

Permit from municipality:

- The installation must comply with the requirements of the agreement with its municipal ordinance, which only addresses the points of maintaining the aesthetics of the building, respecting the uniformity of the facades (it would be forbidden to install it in protected buildings) and that does not generate much noise, not exceeding the value of acoustic contamination (limit of 55 dB).

- Any modification of the exterior structure, the façade of the building must be communicated to the Municipality.

Production and management of construction and demolition waste:

- Include in the work execution project a construction and demolition waste management study, written by a competent technician.
- Minor construction and home repair work: The waste and debris generated in these works are considered domestic waste and have the legal consideration of municipal waste, the regulation of its control of production and management, as well as its surveillance, inspection, and sanction, is the competence of the local administrations according to the regulation in their municipal ordinances (Royal Decree 105/2008 of February 1).

Collective self-consumption:

- It is important to always request at least 3 estimates from specialized companies and have them do a study of the roof. The study must indicate how much energy will be produced (energy potential), the project budget, how much of that energy can be used for self-consumption and how much will be fed into the grid, and what the expected economic return is.
- To calculate total consumption, all participants must provide information on their annual consumption, in addition to the electricity consumption of the community itself.
- It is necessary to distribute how the installation is going to be paid for and how the energy it produces is going to be distributed. In the minutes of the meeting of the community of owners, both the economic participation agreement and the distribution of energy between the participants must be recorded.
- If the installation is going to operate with surplus compensation, the electricity marketer must be notified, the compensation conditions agreed upon, and registration in the self-consumption registry.

Table 55: Spanish and EU regulations applied to solar photovoltaic systems and solar thermal collectors.

Applicable legislation

Law 24/2013, of 26 December	Of the Electricity Sector
Royal Decree 842/2002 of 2 August 2002	Approving the Electrotechnical Regulations for Low Voltage.
Royal Decree 1955/2000 of 1 December 2000	Regulating the transmission, distribution, commercialization, supply, and authorization procedures for electrical energy installations.
Royal Decree 244/2019, of 5 April 2019	Regulating the administrative, technical, and economic conditions for the self-consumption of electricity.
Royal Decree-Law 15/2018, of 5 October 2018	Of urgent measures for the energy transition and consumer protection.

Royal Decree 1110/2007 of 24 August 2007	Approving the unified regulation of metering points of the electricity system.
Royal Decree 1699/2011 of 18 November 2011	Regulating the connection to the grid of small electrical energy production facilities.
Royal Decree 1183/2020, of 29 December 2020	Access and connection to the electricity transmission and distribution networks.
Royal Decree 178/2021, of 23 March	Amending Royal Decree 1027/2007, of July 20, 2007, approving the Regulation on Thermal Installations in Buildings.
Royal Decree 1027/2007 of 20 July 2007	Approving the Regulation on Thermal Installations in Buildings.
Royal Decree 314/2006 of 17 March 2006	Approving the Technical Building Code.
Directive 2018/2001 of the European Parliament and the Council of 11 December 2018	Relative to the promotion of the use of energy from renewable sources.

Technical Guidance

- Documento Básico HE Ahorro de Energía del Código Técnico de la Edificación (Minister of Housing And Urban Agenda, 2022).:
 - HE5 Generación mínima de energía eléctrica procedente de fuentes renovables;
 - HE4 Contribución mínima de energía renovable para cubrir la demanda de agua caliente sanitaria;
 - HEo Limitación del consumo energético.

3.3.7 LIGHTING

This intervention typology includes measures in residential buildings, namely:

- a) Promotion of energy efficiency in lighting, indoor or outdoor, as long as it is located within the perimeter of the private property (e.g., replacement by efficient lamps and high-performance ballasts, use of motion detectors in common areas, systems that improve the use of natural lighting, and control systems).

Table 56 summarizes the regulation applicable for these interventions. The following requirements are applicable to lighting systems:

Equipment Collection:

- Distributors must provide for the free collection of old replaced equipment when a new one is purchased, whether the new one is delivered to a point of sale or to the consumer's

own home (WEEE: waste electrical and electronic equipment, its materials, components, consumables, and sub-assemblies);

- In the case of WEEE that contain mercury, lead, phosphorus or cadmium or substances that deplete the ozone layer, special conditions are established for its collection, transportation, and storage. (Royal Decree 110/2015, of February 20, on waste electrical and electronic equipment) - Lamps containing mercury.

Equipment:

- Check that the materials/equipment carry the CE marking.
- Check the energy label and prefer, whenever possible, higher class equipment:
 - Lighting products include light sources, such as light bulbs (halogen, compact fluorescent, etc.) or LED modules/lamps. Also include control gears (e.g. ballasts, electronic components, drivers), i.e. the devices needed to connect light sources to the electrical mains. Energy labelling and ecodesign do not apply to lamps or luminaires- the new labels use a scale from A (most efficient) to G (least efficient).

Table 56: Spanish and regulations for lighting systems and equipment.

Applicable legislation

Royal Decree 842/2002 of 2 August 2002	Approving the Electrotechnical Regulations for Low Voltage.
Royal Decree 1890/2008 of 14 November 2008	Approving the Regulation on energy efficiency in outdoor lighting installations and its complementary technical instructions EA-01 to EA-07.
Royal Decree 314/2006 of 17 March 2006	Approving the Technical Building Code.

Technical Guidance

- Documento Básico HE Ahorro de Energía del Código Técnico de la Edificación (HE3 Condiciones de las instalaciones de iluminación) (Minister of Housing And Urban Agenda, 2022)

3.3.8 BUILDING AUTOMATION AND CONTROL SYSTEMS

This intervention typology includes measures in residential buildings, namely:

-  Installation of energy consumption management systems, in order to monitor and manage energy consumption, thus generating reduction and enabling the transfer of consumption between tariff periods (e.g., home automation and installation of digital commands);

Table 57 summarizes the regulation applicable for these interventions. The following requirements are applicable to building automation and control systems.

Equipment Collection:

- Distributors must provide for the free collection of old replaced equipment when a new one is purchased, whether the new one is delivered to a point of sale or to the consumer's own home (WEEE: waste electrical and electronic equipment, its materials, components, consumables, and sub-assemblies. (Royal Decree 110/2015, of February 20, on waste electrical and electronic equipment)

System installation:

- For the installation of home automation, you need a Project or Technical Report in accordance with the provisions of the ITC-BT-04;
- After commissioning the installation, you must receive a user manual with instructions for the correct use and maintenance of the installation.

Table 57: Spanish regulations applied to building automation and control systems.

Applicable legislation

Royal Decree 842/2002 of 2 August 2002	Approving the Electrotechnical Regulations for Low Voltage.
Royal Decree 346/2011 of 11 March 2011	Approving the Regulation on common telecommunications infrastructures for access to telecommunications services inside buildings.
Royal Decree 314/2006 of 17 March 2006	Approving the Technical Building Code.
EA 0026:2006 - Installations of home automation systems	General Installation and Evaluation Requirements.
UNE-EN ISO 52120-1:2022	Energy efficiency of buildings. Contribution of automation, control, and management of buildings. Part 1: General framework and procedures.

Technical Guidance

- Cómo ahorrar energía instalando domótica en su vivienda. Gane en confort y seguridad, CEDOM, 2008, en colaboración con el Instituto para la Diversificación y Ahorro de la Energía, IDEA (CEDOM, 2008)

3.3.9 E-MOBILITY – INSTALLATION OF HOME CHARGING STATION

This intervention typology includes measures in residential buildings, namely:

- a) Installation of electric vehicle charging points, as long as they are located within the perimeter of the private property (e.g., acquisition and installation of a charger and the respective connection to the local electricity grid).

Table 58 summarizes the regulation applicable for these interventions. The following requirements are applicable to this type of intervention:

Authorization from the condominium:

- If installing a common charging system with its corresponding meter, it must be approved by 3/5 of the total owners and quotas (Art. 17.5 of the law on horizontal property speaks of the charging of electric vehicles).
- The installation of common or private systems, for the use of renewable energies, or of the infrastructures necessary to access new collective energy supplies, may be agreed, at the request of any owner, by **one third** of the members of the community who represent, in turn, one third of the participation quotas and if the amount does not exceed 12 monthly payments, a **simple majority** is sufficient:
 - o The carrying out of works or actions that contribute to the improvement of energy efficiency that can be accredited through the building's energy performance certificate or the implementation of renewable energy sources for common use, including, where appropriate, the modification of the building envelope, as well as the application for aid and subsidies, loans or any type of financing by the community of owners to public or private entities for the execution of such works or actions will require the favourable vote of the simple majority of the owners, who, in turn, represent the simple majority of the participation quotas, provided that their amount passed on annually, after deducting the subsidies or public aid and applying the financing where appropriate, does not exceed the amount of twelve ordinary monthly payments of common expenses.
- The installation of an electric vehicle charging point for private use in the building's parking lot, provided that it is located in an individual parking space, will only require prior communication to the community. The cost of said installation and the corresponding electricity consumption will be assumed entirely by the person or parties directly interested in it. (Law 49/1960, of July 21, on horizontal property).

Permit from municipality:

- In order to carry out works and/or constructions, it is usually necessary to carry out a prior communication, responsible declaration or urban licensing granted by the local administration, which is the general rule that will be recognized in the municipal ordinances.
- The installation must comply with the requirements of the agreement with its municipal ordinance, which only addresses the points of maintaining the aesthetics of the building, respecting the uniformity of the facades (it would be forbidden to install it in protected buildings) and that does not generate much noise, not exceeding the value of acoustic contamination (limit of 55 dB).

Production and management of construction and demolition waste:

- Include in the work execution project a construction and demolition waste management study, written by a competent technician.

- Minor construction and home repair work: The waste and debris generated in these works are considered domestic waste and have the legal consideration of municipal waste, the regulation of its control of production and management, as well as its surveillance, inspection, and sanction, is the competence of the local administrations according to the regulation in their municipal ordinances (Royal Decree 105/2008 of February 1).

Construction guarantees:

- The different entities involved in the building process will be liable to the owners and third-party purchasers of the homes for a series of material damages caused to the building, within the indicated deadlines (from the date of reception of the work, without reserves or since their correction):
 - For 10 years, of material damage caused to the building by defects or defects that affect the foundation, supports, beams, slabs, load-bearing walls, or other structural elements, and that directly compromise the mechanical resistance and building stability.
 - For 3 years, of material damage caused to the building by defects or defects in the construction elements or facilities that cause non-compliance with habitability requirements (hygiene, health, and environmental protection; protection against noise; savings energy and thermal insulation; and other functional aspects of the construction elements or facilities).
 - For 1 year, payable to the construction entity, for material damages due to defects or execution defects that affect elements of completion or finishing of the works.

Table 58: Spanish regulations applied to electric mobility.

Applicable legislation

Royal Decree 842/2002 of 2 August 2002	Approving the Electrotechnical Regulations for Low Voltage.
Royal Decree 1053/2014 of 12 December 2014	Approving a new Complementary Technical Instruction (ITC) BT 52 "Special purpose installations. Infrastructure for recharging electric vehicles", of the Low Voltage Electrotechnical Regulation, approved by Royal Decree 842/2002, of 2 August, and amending other complementary technical instructions thereof.
Royal Decree-Law 29/2021, of 21 December 2021	Adopting urgent energy measures to promote electric mobility, self-consumption, and the deployment of renewable energies.
Royal Decree 184/2022, of 8 March	Regulating the provision of energy recharging services for electric vehicles.
Royal Decree 450/2022, of 14 June 2022	Amending the Technical Building Code, approved by Royal Decree 314/2006, of 17 March.

Technical Guidance

- Documento Básico HE Ahorro de Energía del Código Técnico de la Edificación (HE6 Dotaciones mínimas para la infraestructura de recarga de vehículos eléctricos) (Minister of Housing And Urban Agenda, 2022)

3.3.10 INSTALLATION OF GREEN INFRASTRUCTURE

This intervention typology includes measures in residential buildings for the implementation of green infrastructure (e.g. green roofs and facades). Table 59 synthesizes the regulations for the installation of green infrastructure. The following requirements are applicable for this intervention:

Authorization from the condominium:

- A qualified majority of 60% or **3/5 fifths** of owners and participation fees will be necessary to improve the energy or water efficiency of the building. (Law 49/1960, of July 21, on horizontal property).
- The installation of common or private systems, for the use of renewable energies, or of the infrastructures necessary to access new collective energy supplies, may be agreed, at the request of any owner, by **one third** of the members of the community who represent, in turn, one third of the participation quotas and if the amount does not exceed 12 monthly payments, a **simple majority** is sufficient:
 - The carrying out of works or actions that contribute to the improvement of energy efficiency that can be accredited through the building's energy performance certificate or the implementation of renewable energy sources for common use, including, where appropriate, the modification of the building envelope, as well as the application for aid and subsidies, loans or any type of financing by the community of owners to public or private entities for the execution of such works or actions will require the favourable vote of the simple majority of the owners, who, in turn, represent the simple majority of the participation quotas, provided that their amount passed on annually, after deducting the subsidies or public aid and applying the financing where appropriate, does not exceed the amount of twelve ordinary monthly payments of common expenses.

Permit from municipality:

- The installation must comply with the requirements of the agreement with its municipal ordinance, which only addresses the points of maintaining the aesthetics of the building, respecting the uniformity of the facades (it would be forbidden to install it in protected buildings) and that does not generate much noise, not exceeding the value of acoustic contamination (limit of 55 dB).
- Any modification of the exterior structure, the façade of the building must be communicated to the Municipality.

Production and management of construction and demolition waste:

- Include in the work execution project a construction and demolition waste management study, written by a competent technician.

- Minor construction and home repair work: The waste and debris generated in these works are considered domestic waste and have the legal consideration of municipal waste, the regulation of its control of production and management, as well as its surveillance, inspection, and sanction, is the competence of the local administrations according to the regulation in their municipal ordinances (Royal Decree 105/2008 of February 1).

Construction guarantees:

The different entities involved in the building process will be liable to the owners and third-party purchasers of the homes for a series of material damages caused to the building, within the indicated deadlines (from the date of reception of the work, without reserves or since their correction) (Ley 38/1999, de 5 de noviembre):

- For 10 years, of material damage caused to the building by defects or defects that affect the foundation, supports, beams, slabs, load-bearing walls, or other structural elements, and that directly compromise the mechanical resistance and building stability.
- For 3 years, of material damage caused to the building by defects or defects in the construction elements or facilities that cause non-compliance with habitability requirements (hygiene, health, and environmental protection; protection against noise; savings energy and thermal insulation; and other functional aspects of the construction elements or facilities).
- For 1 year, payable to the construction entity, for material damages due to defects or execution defects that affect elements of completion or finishing of the works.

Table 59: Spanish regulations applied to installation of green infrastructure.

Applicable legislation

Royal Decree 314/2006 of 17 March 2006	Approving the Technical Building Code.
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3.3.11 LIFTING INSTALLATIONS

This intervention typology includes measures in residential buildings for the installation and maintenance of lifting installations. Table 60 summarizes the regulation applicable for this installation. The following requirements are applicable for this intervention:

Authorization from the condominium:

- By absolute majority we refer to the favourable vote of the majority of all the owners (not only those who attend the Meeting) who in turn represent the majority of the total community fees. It is required to install the elevator and other works to remove architectural barriers, forcing everyone to pay for them without limitation of expense and even if they imply the modification of the constitutive title or the statutes. If this majority is not reached, it is also possible to impose accessibility works, but within cost limits.

Table 60: Spanish regulations applied to lifts.

Applicable legislation

Royal Decree 88/2013 of 8 February 2013	Approving the Complementary Technical Instruction AEM 1 "Lifts" of the Regulation on lifting and handling equipment, approved by Royal Decree 2291/1985 of 8 November 1985.
Royal Decree 842/2002 of 2 August 2002	Approving the Electrotechnical Regulations for Low Voltage.
Royal Decree 2291/1985 of 8 November 1985	Approving the Regulations on Lifting and Handling Equipment.

3.3.12 Thermal envelope (opaque and glazed envelope)

This intervention typology includes measures in the **opaque envelope** of buildings, exterior or interior, with the aim of reinforcing thermal insulation (e.g., application of thermal insulation, on walls, roofs, floors). Includes also measures in the **glazed envelope** of the buildings and their shading devices (e.g., replacement of single-glazed frames with efficient windows, installation of exterior sun protections).

Table 61 summarizes the regulations applicable for opaque and glazed envelope interventions. The following requirements are applicable for this intervention:

Authorization from the condominium:

- A qualified majority of 60% or **3/5 fifths** of owners and participation fees will be necessary to improve the energy or water efficiency of the building. (Law 49/1960, of July 21, on horizontal property).
- The installation of common or private systems, for the use of renewable energies, or of the infrastructures necessary to access new collective energy supplies, may be agreed, at the request of any owner, by **one third** of the members of the community who represent, in turn, one third of the participation quotas and if the amount does not exceed 12 monthly payments, a **simple majority** is sufficient:
 - The carrying out of works or actions that contribute to the improvement of energy efficiency that can be accredited through the building's energy performance certificate or the implementation of renewable energy sources for common use, including, where appropriate, the modification of the building envelope, as well as the application for aid and subsidies, loans or any type of financing by the community of owners to public or private entities for the execution of such works or actions will require the favourable vote of the simple majority of the owners, who, in turn, represent the simple majority of the participation quotas, provided that their amount passed on annually, after deducting the subsidies or public aid and applying the financing where appropriate, does not exceed the amount of twelve ordinary monthly payments of common expenses.

Permit from municipality:

- To carry out works and/or constructions, it is usually necessary to make a prior communication, responsible declaration or planning license granted by the local

administration, whose general regime is usually included in municipal ordinances. In general terms, municipalities establish three types of procedures for these authorizations:

- Construction license.
 - Responsible declaration of work. It is normally intended for those actions that are technically simple and that do not require structural elements, and that do not involve alteration of the volume, the main use of the facilities and services in common use or the number of homes and premises, nor do they affect the exterior composition, the structure or the conditions of habitability or safety.
 - Communication prior to the execution of work. Normally small actions and/or reforms.
- All painting work that occurs inside the home or local does not require a building permit.
 - If you want to paint the façade of your house, and if this house is not attached or is not an apartment in a building, you will need to request a building permit so that the City Council can verify that the colours and techniques used they are within local laws and regulations.
 - If you want to paint the façade of a building, in addition to having to request a building permit from the City Council, you will also need permission from the neighbourhood community. The reason for this is that the facade of the building does not belong only to you, but it belongs to all the tenants or owners who live in the building. This assumption of having to request a permit from the community of neighbours is mandatory according to the Horizontal Property Law.
 - Any modification to the exterior structure, roof or façade of the building must be communicated to the City Council.

Installation of thermal insulation:

- The intervention in the environment must be the subject of a specific project, so it is recommended to contact a qualified professional for this purpose before carrying out the works;
- Request the technical sheets and technical information of the proposed solutions and check that all materials meet your requirements and are CE marked.

Production and management of construction and demolition waste:

- Include in the work execution project a construction and demolition waste management study, written by a competent technician.
- Minor construction and home repair work: The waste and debris generated in these works are considered domestic waste and have the legal consideration of municipal waste, the regulation of its control of production and management, as well as its surveillance, inspection, and sanction, is the competence of the local administrations according to the regulation in their municipal ordinances (Royal Decree 105/2008 of February 1).

Construction guarantees:

The different entities involved in the building process will be liable to the owners and third-party purchasers of the homes for a series of material damages caused to the building, within the indicated deadlines (from the date of reception of the work, without reserves or since their correction) (Law 38/1999, November 5):

- For 10 years, of material damage caused to the building by defects or defects that affect the foundation, supports, beams, slabs, load-bearing walls, or other structural elements, and that directly compromise the mechanical resistance and building stability.
- For 3 years, of material damage caused to the building by defects or defects in the construction elements or facilities that cause non-compliance with habitability requirements (hygiene, health, and environmental protection; protection against noise; savings energy and thermal insulation; and other functional aspects of the construction elements or facilities).
- For 1 year, payable to the construction entity, for material damages due to defects or execution defects that affect elements of completion or finishing of the works.

Table 61: Spanish regulations and standards applied to building opaque and glazed envelope.

Applicable legislation

Royal Decree 314/2006 of 17 March 2006	Approving the Technical Building Code.
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Technical Guidance

- Documento Básico HE Ahorro de Energía del Código Técnico de la Edificación (HE1 Condiciones para el control de la demanda energética)
- Documentos Básicos HS (DB_HS (Habitabilidad y Salubridad), DB-HR (Protección contra el ruido); DB-SUA (Seguridad de utilización y accesibilidad)) (Minister of Housing And Urban Agenda. (2022))

3.3.13 MAINTENANCE AND INSPECTION OF TECHNICAL SYSTEMS

This type of intervention (Table 62) includes the maintenance and inspection of the following technical systems, which, according to Royal Decree 178/2021, of March 23, intend to meet the demand for thermal well-being and hygiene to achieve rational use of energy.

- a) Ventilation systems;
- b) Heating and cooling systems;
- c) Hot water preparation systems;

Table 62: Spanish regulations applied to maintenance and inspection of technical systems.

Applicable legislation

Royal Decree 178/2021, of March 23	Amending Royal Decree 1027/2007, of July 20, approving the Regulation on Thermal Installations in Buildings.
Royal Decree 1027/2007 of July 20	Approving the Regulation on Thermal Installations in Buildings.

Royal Decree 1390/2011, of October 14	Regulating the indication by labelling and standard product information of the Consumption of energy and other resources by energy-related products.
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3.3.14 CONSTRUCTION

Table 63 summarises the regulation applicable to construction. The following requirements are applicable for this intervention:

Authorization from the condominium:

- A qualified majority of 60% or **3/5 fifths** of owners and participation fees will be necessary:
 - or to improve the energy or water efficiency of the building;
 - or that involve the alteration of the structure or fabric of the building or common things;
- The installation of common or private systems, for the use of renewable energies, or of the infrastructures necessary to access new collective energy supplies, may be agreed, at the request of any owner, by **one third** of the members of the community who represent, in turn, one third of the participation quotas and if the amount does not exceed 12 monthly payments, a **simple majority** is sufficient:
 - The carrying out of works or actions that contribute to the improvement of energy efficiency that can be accredited through the building's energy performance certificate or the implementation of renewable energy sources for common use, including, where appropriate, the modification of the building envelope, as well as the application for aid and subsidies, loans or any type of financing by the community of owners to public or private entities for the execution of such works or actions will require the favourable vote of the simple majority of the owners, who, in turn, represent the simple majority of the participation quotas, provided that their amount passed on annually, after deducting the subsidies or public aid and applying the financing where appropriate, does not exceed the amount of twelve ordinary monthly payments of common expenses.
- It can be agreed upon, at the request of any owner, by 33% or one third of the community members who represent, in turn, 33% or one third of the participation fees (Law 49/1960 of July 21):
 - or the installation of common infrastructures to access telecommunications services, for example, television and radio broadcasting, whether digital, satellite or cable, as well as basic telephone services.
 - or the installation of infrastructure necessary to take advantage of renewable energies. For example, placing solar panels, modules, or panels on the roofs of buildings.

Permit/License:

- To carry out works and/or constructions, it is usually necessary to make a prior communication, responsible declaration or planning license granted by the local administration, whose general regime is usually included in municipal ordinances. In general terms, municipalities establish three types of procedures for these authorizations:

- Construction license.
- Responsible declaration of work. It is normally intended for those actions that are technically simple and that do not require structural elements, and that do not involve alteration of the volume, the main use of the facilities and services in common use or the number of homes and premises, nor do they affect the exterior composition, the structure or the conditions of habitability or safety.
- Communication prior to the execution of work. Normally small actions and/or reforms.

Production and management of construction and demolition waste:

- Include in the work execution project a construction and demolition waste management study, written by a competent technician.
- Minor construction and home repair work: The waste and debris generated in these works are considered domestic waste and have the legal consideration of municipal waste, the regulation of its control of production and management, as well as its surveillance, inspection, and sanction, is the competence of the local administrations according to the regulation in their municipal ordinances (Royal Decree 105/2008 of February 1).

Construction guarantees:

- The different entities involved in the building process will be liable to the owners and third-party purchasers of the homes for a series of material damages caused to the building, within the indicated deadlines (from the date of reception of the work, without reserves or since their correction) (Law 38/1999 of November 5):
 - For 10 years, of material damage caused to the building by defects or defects that affect the foundation, supports, beams, slabs, load-bearing walls, or other structural elements, and that directly compromise the mechanical resistance and building stability.
 - For 3 years, of material damage caused to the building by defects or defects in the construction elements or facilities that cause non-compliance with habitability requirements (hygiene, health, and environmental protection; protection against noise; savings energy and thermal insulation; and other functional aspects of the construction elements or facilities).
 - For 1 year, payable to the construction entity, for material damages due to defects or execution defects that affect elements of completion or finishing of the works.

Table 63: Spanish regulations applied to construction.

Applicable legislation

Royal Decree 470/2021, of June 29	Approving the Structural Code.
Royal Decree 314/2006 of March 17	Approving the Technical Building Code.
Royal Decree 1109/2007 of August 24	Implementing Law 32/2006, of October 18, regulating subcontracting in the Construction Sector.

Law 32/2006, of 18 October	Regulator of subcontracting in the Construction Sector.
Royal Decree 171/2004 of 30 January 2004	Implementing Article 24 of Law 31/1995, on the coordination of business activities.
Decree 462/1971 of March 11	Laying down rules on the drafting of projects and the management of building works.
Royal Decree 1627/1997 of October 24	Laying down minimum health and safety requirements on construction sites.
Royal Decree 1630/1992 of 29 December 1992	Laying down provisions for the free movement of construction products.
Law 38/1999, of November 5	Building Ordinance.
Law 31/1995 of 8 November 1995	Occupational Risk Prevention.
Royal Decree 39/1997 of 17 January 1997	Approving the Regulations on Preventive Services.
Law 16/1985, of June 25	From Spanish Historical Heritage.
UNE-ISO 20887:2023	Sustainability in buildings and civil engineering works. Design for disassembly and adaptability. Principles, requirements, and guidelines.

3.3.15 ELECTRICAL INSTALLATIONS

Table 64: Spanish regulations applied to electrical installations.

Applicable legislation

Royal Decree 842/2002, of 2 August	By which the electrotechnical regulation for low voltage is approved.
Royal Decree 337/2014, of 9 May	By which the Regulation on technical conditions and safety guarantees in High Voltage Electrical Installations (RIAT) and its Complementary Technical Instructions ITCRAT 01 to 23 are approved.
Royal Decree 1110/2007, of 24 August	By which the unified regulation of measurement points of the electrical system is approved.

3.3.16 ENERGY CERTIFICATION

The energy efficiency certificate for buildings, also called the energy label, indicate the consumption and emissions of a property, assigning them a label that goes on a scale from A to G depending on its characteristics and equipment. The energy label of a building is used to evaluate and compare the energy expenditure that a property will have over time and thus make better decisions when renting or buying. Table 43 summarizes the

applicable legislation applicable for energy performance certificates. The following requirements are applicable for this intervention:

Energy Certification:

- The building energy efficiency certificate, also called energy label, is mandatory for purchase and rental of the building.

It applies to buildings or parts of buildings in which renovations or extensions are carried out that meet any of the following assumptions (Royal Decree 390/2021, of 1 June):

- Replacement, installation, or renovation of thermal installations such that the implementation or modification of a thermal installations project is required, in accordance with the provisions of article 15 of the Regulation of Thermal Installations in Buildings, approved by the Royal Decree 1027/2007, of July 20.
- Intervention in more than 25% of the total surface of the final thermal envelope of the building.
- Extension in which the surface or built volume of the unit or units of use on which the intervention is carried out is increased by more than 10%, when the total extended useful area exceeds 50 m².
- Regarding obtaining the energy efficiency certificate, the person responsible for commissioning its completion and maintaining the documentation is the owner of the building or part of the building (or the developer if it is a new construction).
- Once the certificate has been obtained, there is an obligation to present it to the registry of the corresponding autonomous community (then it will go to a centralized registry). When entrusting it to a technician, make sure that they carry out this procedure - it is done electronically - because the responsibility lies with the owner.
- The energy efficiency certificate will have a maximum validity of ten years, except when the energy rating is G, whose maximum validity will be five years.
- The owner of the building will be responsible for renewing or updating the energy efficiency certificate in accordance with the conditions established by the competent body of the autonomous community.

Table 65: Spanish regulations applied to energy certification of buildings.

Applicable legislation

Royal Decree 88/2013 of 8 February 2013	Approving the Complementary Technical Instruction AEM 1 "Lifts" of the Regulation on lifting and handling equipment, approved by Royal Decree 2291/1985 of 8 November 1985.
Royal Decree 842/2002 of 2 August 2002	Approving the Electrotechnical Regulations for Low Voltage.
Royal Decree 2291/1985 of 8 November 1985	Approving the Regulations on Lifting and Handling Equipment.

3.3.17 GENERAL REGULATIONS

In this section, general regulations related with home renovations is presented, summarized in Table 66, 67, 68, 69, 70, 71, 72 and 73.

Table 66: Spanish regulations for qualification of installation companies and maintenance companies.

Applicable legislation

Law 21/1992 of July 16 on Industry	This act has the following objectives: a) to establish the basic rules for the organization of industrial activities by the public administrations. B) to establish the means and procedures for coordinating the industrial competences of these administrations, and c) to regulate the actions of the state administration in relation to the industrial sector
Royal Decree 1560/1992, of 18 December 1992	Approving the National Classification of Economic Activities (CNAE-93).
Royal Decree 475/2007, of 13 April	Approving the National Classification of Economic Activities 2009 (CNAE-2009)
Royal Decree 115/2017, of February 17	Regulating the marketing and handling of fluorinated gases and equipment based on them, as well as the certification of the professionals who use them and establishing the technical requirements for installations carrying out activities that emit fluorinated gases.
Law 39/2015, of October 1	Of the common administrative procedure of public administrations.
Law 4/1999 of January 13	Amending law 30/1992, of November 26, on the legal regime of public administrations and common administrative procedure.
Royal Decree 801/2022, of October 4	Regulating the direct award of a grant to the official chamber of commerce, industry, services and navigation of Spain to carry out actions aimed at guaranteeing information, advice and support for citizens who are likely to take part in the procedure for accreditation of professional competencies regulated in Royal decree 1224/2009, of July 17, on the recognition of professional competencies acquired through work experience, within the framework of the recovery, transformation and resilience plan.
Royal Decree 659/2023, of July 18	Which develops the organisation of the vocational training system.
Royal Decree 2200/1995 of December 28	Approving the regulation on infrastructure for industrial quality and safety.
Royal Decree of August 22 of 1885	Publishing the commercial code.
Law 17/2009, of November 23	On free access to and exercise of service activities.

Royal Decree 1109/2007 of August 24	By which law 32/2006, of October 18, regulating subcontracting in the construction sector, is developed.
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Table 67: Spanish regulations for Governing the CNCP and the Vocational Training System.

Applicable legislation

Royal Decree 1128/2003 of September 5	Regulating the National Catalogue of Professional Qualifications.
Royal Decree 1416/2005 of November 25	Amending Royal Decree 1128/2003, of September 5, which regulates the National Catalogue of Professional Qualifications.
Royal Decree 817/2014 of September 26	Establishing the specific aspects of the Professional Qualifications for whose modification, approval procedure and effects article 7.3 of Organic Law 5/2002, of June 19, on Qualifications and Vocational Training is applicable.
Royal Decree 659/2023, of 18 July 2023	Developing the organisation of the Vocational Training System.

Table 68: Spanish regulations for Labour and Social Security Code.

Applicable legislation

Royal Legislative Decree 2/2015, of October 23	Approving the revised text of the Workers' Statute Law.
Royal Decree 1659/1998 of July 24	Implementing Article 8(5) of the Law on the Workers' Statute with regard to informing workers of the essential elements of the employment contract.
Law 3/2023, of February 28	Employment Department.
Royal Decree 84/1996 of January 26	Approving the General Regulations on the registration of companies and affiliation, registration, deregistration, and variations of workers' details in the social Security system.
Royal Decree-Law 32/2021, of December 28	Of urgent measures for labour reform, the guarantee of employment stability and the transformation of the labour market.
Law 50/1980 of October 8	Of Insurance Contract.
Resolution of December 18 of 2015	Of the Directorate-General of Insurance and Pension Funds, which specifies the content of the Register of compulsory insurance, the procedure, and the specifications of the information to be sent to the Directorate-General of Insurance and Pension Funds.
Law 23/2015, of July 21	Regulator of the Labour and Social Security Inspection System.

Law 9/2017, of Novembre 8	On Public Sector Contracts, by which the Directives of the European Parliament and of the Council 2014/23/EU and 2014/24/EU, of February 26, 2014, are transposed into the Spanish legal system.
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Table 69: Spanish regulations for Civil Code and Horizontal Property and Building

Applicable legislation

Law 49/1960, of 21 July	About horizontal property.
Royal Decree of 24 July 1889	By which the Civil Code is published.
Law 38/1999, of Novembre 5	Building Planning (LOE).

Table 70: Spanish regulations for prevention of occupational risks.

Applicable legislation

Law 31/1995 of November 8	Prevention of Occupational Risks
Royal Decree 39/1997 of January 17	Approving the Regulations on Preventive Services
Royal Decree 664/1997 of May 12	On the protection of workers from the risks related to exposure to biological agents at work.
Royal Decree 374/2001 of April 6	On the protection of the health and safety of workers against risks related to chemical agents at work.
Royal Decree 487/1997 of April 14	On minimum health and safety requirements for the manual handling of loads involving risks to workers, in particular back and lumbar risks.
Royal Decree 330/2009 of March 13	Amending Royal Decree 1311/2005 of November 4 on the protection of the health and safety of workers against risks arising or likely to arise from exposure to mechanical vibrations.
Royal Decree 286/2006 of March 10	On the protection of the health and safety of workers against the risks related to exposure to noise.
Royal Decree 396/2006 of March 31	Laying down the minimum health and safety requirements for work involving the risk of exposure to asbestos.
Royal Decree 486/1997 of April 14	Laying down minimum safety and health requirements in the workplace.

Table 71: Spanish legislation on Electrical Appliances.

Applicable legislation

Royal Decree 993/2022, of November 29	Adopting control measures for the importation of electrical and electronic equipment, batteries, and accumulators from third countries.
Royal Decree 27/2021, of January 19	Amending Royal Decree 106/2008 of February 1 on batteries and accumulators and the environmental management of their waste, and Royal Decree 110/2015 of February 20 on waste electrical and electronic equipment.
Royal Decree 710/2015, of July 24	Amending Royal Decree 106/2008 of February 1 on batteries and accumulators and the environmental management of their waste.
Royal Decree 110/2015 of February 20	On waste electrical and electronic equipment.
Royal Decree 106/2008 of February 1	On batteries and accumulators and the environmental management of their waste.

Table 72: Spanish regulation for Construction and Demolition Waste

Applicable legislation

Order APM/1007/2017, of October 10	On general rules for the recovery of excavated natural materials for use in backfill operations and works other than those in which they were generated.
Royal Decree 105/2008 of February 1	Regulating the production and management of construction and demolition waste.

Table 73: Spanish regulations for Waste Shipment.

Applicable legislation

Royal Decree 553/2020, of June 2	Which regulates the shipment of waste within the territory of the State.
Decision 2000/532/EC	By which a list of waste is established.

4. TECHNICAL SOLUTIONS FOR HOME RENOVATION

This chapter focuses on the technical solutions available through the HORIS One-Stop-Shop platform for home renovation. It details the technical measures included in the platform and briefly outlines the methodology used for calculating energy consumption and assessing the impact of various measures.

The technical component of HORIS's One-Stop-Shop essentially has two parts. Firstly, there is a public section of the platform available for consultation by any citizen, without the need for registration, in the three languages the website will support: Portuguese, Italian and Spanish. This section contains a series of technical measures, organized by area of intervention, with estimates of the respective impact in average.

Moreover, HORIS platform includes a feature called "self-scan". Through this tool, any citizen interested in renovating their home, making minor interventions, and/or integration of renewable energy can fill out a brief questionnaire about their dwelling. Based on the answers provided, specific technical measures tailored to the described situation will be presented, with more precise and realistic impact estimates.

To support both services, an algorithm has been developed that is part of the algorithm integrated into the one-stop-shop. This algorithm will allow not only simple impact estimates of some measures presented in the public section of the platform but also more accurate impact estimates for the measures proposed through the self-scan. Developing this algorithm involved a detailed survey of the buildings' technical characteristics, climatic conditions (such as solar irradiance, heating and cooling degree days, among others), and photovoltaic potential for each NUTS-3 region in the three countries, something that will be detailed further in the report.

Thus, the aim of this algorithm is to allow for individuals to diagnose their current situation, and receive recommendations on the best technical solutions for the described scenario, calculating the impacts of each proposed measure. In order to support individuals that do not want to fill in the more detailed questionnaire, a rough estimate of the impacts of several measures is available in the platform (without requiring any registration). These estimates are based on typical household consumption profiles and technologies reference values. The simplified estimates are the ones presented in this report in the technical data sheets of each measure.

This chapter presents the set of technical measures that will be included in the public section of the One-Stop-Shop, aiming to improve the thermal performance of buildings, enhance energy efficiency, and increase the thermal comfort of occupants, thereby contributing to the reduction of energy poverty. The proposed measures include comprehensive building renovations as well as more accessible, cost-effective, and easy-to-implement solutions, creating a repository of information to help citizens make informed decisions about home improvements.

4.1 LIST OF MEASURES

This subsection provides a summary of all the measures, categorized by type (quick wins, insulation & ventilation, heating and cooling systems, hot water, electrical appliances, lighting, renewable energy generation, and water-saving), and sector (e.g., seams, roof insulation). These measures are also organized by their applicability to each country, as most measures are relevant across Italy, Portugal, and Spain due to their similar contexts.

The measures listed in this section were initially derived from existing platforms, namely the Green Menu and *Menu de Renovação Verde*, which were developed within the scope of previous works (from the Groene de Grachten and Sequeira & Gouveia, 2022). For HORIS project, this list has been reviewed and adapted to fit the realities of Italy and Spain, as well as the current context of Portugal. This adaptation process involved updating descriptions, ensuring compliance with local regulations, tailoring recommendations to address the unique characteristics and needs of each country, and adjusting impact figures such as reduction in final energy consumption and emissions.

Tables 74 to 78 present measures by typology: Quick Wins, Insulation & Ventilation, Electricity, Climatization, and Water & Green.

The measures are classified into different types for practical reasons:

-  **Tips:** Quick measures that do not require upfront investment or have very limited costs, are simple and practical to execute, and can lead to significant savings;
-  **Measures:** Standard measures that involve a moderate level of intervention and investment. Each measure includes a representative picture, a short description, advantages and disadvantages, and applicable regulations;
-  **Key Measures:** Measures that have a significant impact on reducing energy consumption or increasing thermal comfort, making them essential for home application. Key measures also include a simplified calculation tool to estimate investment and savings when relevant;
-  **Points of Attention:** Tips that highlight potential issues or areas that need careful considerations to prevent negative outcomes, such as addressing underlying problems before implementing certain measures;
-  **Innovation:** Advanced or emerging technologies that offer new solutions for energy efficiency and renewable energy generation. These measures often involve higher costs and/or complexity but can provide significant benefits and are suitable for forward-thinking applications.

Table 74: Insulation & Ventilation measures by sector, type, and country.

Quick Wins	Type	PT	ES	IT
Energy management system	Tip	x	x	x
Replace energy guzzlers	Tip	x	x	x
Turn devices off completely	Tip	x	x	x
Tips for heating	Tip	x	x	x
Tips for cooling	Tip	x	x	x

Regulating heating equipment	Tip	x	x	x
Hydronic balancing of radiators	Tip	x	x	x
Thick curtains and shutters	Tip	x	x	x
Radiator foil	Tip	x	x	x
Radiator fan	Tip	x	x	x
LED lamps	Tip	x	x	x
Window insulation	Tip	x	x	x
Shower timer	Tip	x	x	x
Flow restrictor	Tip	x	x	x
Water-saving shower head	Tip	x	x	x
Water-saving toilet	Tip	x	x	x
Rain barrel	Tip	x	x	x
Insulate heating pipes	Tip	x	x	x

Table 75: Insulation & Ventilation measures by sector, type, and country.

Insulation & Ventilation	Type	PT	ES	IT
Seams				
Draught exclusion window frames	Measure	x	x	x
Draught exclusion doors	Measure	x	x	x
Seam sealing	Measure	x	x	x
Replacement of Exterior Doors	Measure	x	x	x
Door closers	Tip	x	x	x
Draught lobby	Tip	x	x	x
Roof insulation				
Sloped roof exterior insulation	Key Measure	x	x	x
Sloped roof interior insulation	Measure	x	x	x
Flat roof exterior insulation	Key Measure	x	x	x
Insulating the attic floor	Measure	x	x	x
Combine with a green roof	Tip	x	x	x
Reflecting foil	Tip	x	x	x
Cooling roof covering	Tip	x	x	x
Floor insulation				
Ground floor underside insulation	Measure	x	x	x
Ground floor topside insulation	Measure	x	x	x
Soil insulation	Measure	x	x	x
Floor replacement	Measure	x	x	x
Façade insulation				
Exterior wall insulation	Key Measure	x	x	x
Interior wall insulation	Key Measure	x	x	x

Insulate thick walls from 40 cm	Measure	x	x	x
Insulating with a timber frame construction	Measure	x	x	x
Cavity wall insulation	Measure	x	x	x
Moisture problems	Point of attention	x	x	x
Moisture-regulating paint	Measure	x	x	x
LSF construction system	Measure	x	x	x
Heat loss through the façade	Tip	x	x	x
Windows				
Secondary windows (inside)	Measure	x	x	x
Secondary windows (outside)	Measure	x	x	x
Thin double glazing	Key Measure	x	x	x
Vacuum glass	Measure	x	x	x
Insulated glass	Measure	x	x	x
Triple glazing	Measure	x	x	x
Solar blinds	Key Measure	x	x	x
Replacement of windows	Tip	x	x	x
Smart windows	Tip	x	x	x
Solar shading	Tip	x	x	x
Insulating window film	Tip	x	x	x
Ventilation				
Ventilation grilles (natural ventilation)	Measure	x	x	x
Natural and mechanical ventilation	Measure	x	x	x
Balanced ventilation	Measure	x	x	x
Demand-driven ventilation	Measure	x	x	x
Decentralized ventilation with heat recovery	Tip	x	x	x
Clean filters	Point of attention	x	x	x

Table 76: Electricity measures by sector, type, and country.

Electricity	Type	PT	ES	IT
Generating electricity				
Solar panels	Key Measure	x	x	x
Solar panels for an owners' association and Renewable energy communities	Tip	x	x	x
Thin-film solar panels	Measure	x	x	x
Green energy contract	Measure	x	x	x
Energy cooperative: Remote solar and wind	Measure	x	x	x
Small wind turbine	Measure	x	x	x
Field setup solar panels	Tip	x	x	-

Inverter	Tip	x	x	x
Optimisers	Tip	x	x	x
Solar tile	Innovation	x	x	x
Power window	Innovation	x	x	x
Monitoring and storage				
Energy consumption manager	Measure	x	x	x
Battery	Measure	x	x	x
Electric car charging station	Measure	x	x	x
Power cutters	Tip	x	x	x
Lighting				
LED lamps	Key Measure	x	x	x
Sensors for lighting	Measure	x	x	x
Solar Light Tube	Measure	x	x	x
Natural light	Tip	x	x	x
Work light	Tip	x	x	x
Cooking				
Electric stove	Measure	x	x	x
Efficient oven usage	Tip	x	x	x
Efficient pots	Tip	x	x	x
Gas stove flames	Tip	x	x	x
Home Appliances				
Replace energy guzzlers	Tip	x	x	x
Washing machine	Measure	x	x	x
Dishwasher	Measure	x	x	x
Efficient refrigerator and freezer	Key Measure	x	x	x
Refrigerator and freezer	Tip	x	x	x
Standby usages	Measure	x	x	x
Elevators	Tip	x	x	x

Table 77: Climatization measures by sector, type, and country.

Climatization	Type	PT	ES	IT
General				
Orientation of Windows According to Climate	Key Measure	x	x	x
Shading Systems	Tip	x	x	x
Space heating				
Air heat pump	Key Measure	x	x	x
Hybrid heat pump	Key Measure	x	x	x

Ground source heat pump	Key Measure	x	x	x
Ground-coupled heat exchanger	Key Measure	x	x	x
District heating	Measure	-	-	x
Condensing boiler	Key Measure	x	x	x
Pellet boiler	Key Measure	x	x	x
Fireplace with heat recovery	Key Measure	x	x	x
Electric boiler	Key Measure	x	x	x
Smart meter	Measure	x	x	x
Setpoint and night-time reduction	Measure	x	x	x
Heating System Maintenance	Measure	x	x	x
Air-conditioning single	Key Measure	x	x	x
Air-conditioning multi	Key Measure	x	x	x
Movable air-conditioning	Innovation	x	x	x
Cooling temperature	Tip	x	x	x
Air-conditioning maintenance	Point of attention	x	x	x
Ceiling fans	Tip	x	x	x
Heat emission				
Underfloor heating	Key Measure	x	x	x
Wall and ceiling heating	Measure	x	x	x
Low-temperature heating	Key Measure	x	x	x
Infrared heating	Key Measure	x	x	x
Insulate heating-pipes	Measure	x	x	x
Zone control	Measure	x	x	x
Replace radiators with convectors	Key Measure	x	x	x
Hydronic balancing	Tip	x	x	x
Heating curve optimization	Tip	x	x	x
Hot water				
Solar boiler	Key Measure	x	x	x
Heat pump boiler	Key Measure	x	x	x
Continuous flow heater	Key Measure	x	x	x
Booster heat pump	Measure	-	x	-
Biomass boiler	Key Measure	x	x	x
Efficient gas-heater	Key Measure	x	x	x
Gas-powered condense boiler	Key Measure	x	x	x
Insulate boiler	Measure	x	x	x
Shower tray or drain heat recovery	Key Measure	x	x	-
Shower pipe heat recovery	Key Measure	x	x	-
Hot fill white goods	Measure	x	x	x

Solar thermal roof	Tip	x	x	x
Water temperature	Measure	x	x	x
Water Heating System Maintenance	Measure	x	x	x
Non-visible solar collectors	Tip	x	x	x

Table 78: Water and green measures by sector, type, and country.

Water and green	Type	PT	ES	IT
Green environment				
Green roof	Measure	x	x	x
Façade garden	Tip	x	x	x
Around the building				
Rain barrel	Measure	x	x	x
Rainproof outdoor area	Tip	x	x	x
Green parking lot	Tip	x	x	x
Filtration circulation pump	Tip	x	x	x
Helophyte filter	Tip	x	x	x
Water use				
Thermostatic faucet and efficient shower head	Measure	x	x	x
Regular Replacement of Faucets and Showerheads	Tip	x	x	x
Water-saving toilet	Measure	x	x	x
Water reuse	Tip	x	x	x
Shower timer	Tip	x	x	x
Flow restrictor	Tip	x	x	x
Heat recovery in the shower	Tip	x	x	x
Fix water leaks	Tip	x	x	x

4.2 METHODOLOGY FOR IMPACT ASSESSMENT

The impact assessment for each measure and key measure (tips, points of attention, and innovation do not include estimates for impact) was obtained, as mentioned earlier, through the algorithm developed in the scope of this project as well as desk research and energy statistics for the three countries considered. These estimates were calculated assuming reference conditions for both building characteristics and household profiles, resulting in average values or ranges for the impact of the different measures. However, due to the specific nature of some measures, it was not possible to provide rough estimates for all the referred measures.

For the public-facing section of the platform, most measures used constants already embedded within the platform to generate impact estimates. However, for more complex ones, related to space heating, cooling, and domestic hot water (DHW), the developed algorithm was applied to simulate results for an average scenario. For space heating and cooling, the simulation accounted

for the average number of heating months in each country and a representative climatic zone. For DHW, the results were estimated using simulations based on varying numbers of household occupants. In the case of photovoltaic energy, a typical electricity consumption was assumed for a household of three people.

The estimates presented here were obtained by assuming reference conditions (both in terms of building characteristics and household profile), achieving average values or intervals for the impact of the different measures. Moreover, due to the specificities of certain measures, it was not possible to provide rough estimates of the impacts for all the referred measures.

4.2.1 Modelling the impact of technical measures in final energy consumption and GHG emissions

In order to quantify the impacts of implementing different renovation measures, in a simplified but reasonably accurate manner, an algorithm was developed to estimate a dwelling's final energy use and respective emissions based on: physical characteristics of the building, location, technical systems and household energy profile. The idea is to use the self-scan to characterize the baseline situation, and based on that information, estimate the associated annual needs for heating, cooling, and domestic hot water for each dwelling, and estimate the energy produced through renewable energy sources for self-consumption (where applicable).

Based on this information, the algorithm developed and integrated into the one-stop-shop will suggest a set of technical solutions suitable for the described situation. The citizen will be able to understand the impact of each measure and of the complete renovation package (energy, economic, comfort, and emissions impact), and can choose, for example, the measure with the greatest impact, the easiest to implement, or proceed with the proposed set of measures with the support of professionals available on the platform. This process will be further detailed in Deliverable 3.4 of the Design of Renovation Packages by Home Typology.

The algorithm results from the simplification of complex building energy modelling, to ensure a balance between the robustness of the results and the energy literacy level required to the user. As such, the model considers different building typologies, representing different buildings physical characteristics, which vary according to the following factors:

-  **Country:** Portugal, Italy, and Spain;
-  **Construction period;**
-  **Dwelling type:** single-family and multi-family houses;
-  **Number of exposed facades:** ranging from 1 to 4;
-  **Location of the apartment (only for multi-family buildings):** ground floor, intermediate floor, or top floor;
-  **Climatic zone:** based on information gathered at the NUTS 3 level in all three countries.

This methodology based on typologies allows for the consideration of different physical characteristics (as insulation of the envelope, presence of thermal bridges, etc.), without requiring a detailed description of the constructive solution from the platform user.

The construction periods considered, shown in Table 79, vary from country to country, and were chosen according to the technical characteristics of the buildings, highly dependent on applicable

legislation over the years. For the most recent year, the technical characteristics used for the thermal characterization of the buildings considered the applicable legislation (after 2007 for Portugal, after 2010 for Italy, and after 2006 for Spain). For older buildings, where there were no specific requirements, we considered surveys conducted through articles or strategic documents. Specifically, for Portugal, we used information from ITE50 by Pina dos Santos & Matias (2023); for Italy, we referred to Carnieletto et al. (2021); and for Spain, we consulted the ERESEE - Long-Term Strategy for Energy Rehabilitation in the Building Sector in Spain (MITMA, 2020). Additionally, for Italy and Spain, we also used the *TABULA WebTool* (2017) for validation and confirmation of the data used.

Table 79: Construction periods considered by country.

Country	Construction period
Portugal	Pre 1960
	1961-1990
	1991-2006
	2007-2013
	2014-2015
	Post 2015
Italy	Pre 1945
	1946-1980
	1981-2005
	2006-2015
	2016-2018
	Post 2018
Spain	Pre 1979
	1980-2005
	2006-2013
	2014-2019
	Post 2019

The methodology for calculating the energy consumption per dwelling involved a detailed assessment of the primary energy balance, considering various factors that contribute to the overall energy performance. This process ensures that the energy needs for heating, cooling, domestic hot water (DHW), and mechanical ventilation are accurately determined, along with the contributions from renewable energy sources used for self-consumption.

Energy consumption associated with electrical appliances was not considered in the model. Instead, the impact of measures implying the substitution of older appliances, and lighting, was estimated separately, as these do not depend on the physical characteristics of the buildings. These impacts were estimated based on the technological evolution of the appliances (efficiency improvements over time) and the utilization rate (in hours per year).

Primary Energy Balance

The primary energy balance was calculated by evaluating the annual nominal energy needs for different energy uses within residential buildings. These uses include space heating, space cooling, DHW, and mechanical ventilation. The balance was based on maintaining specific indoor temperatures — 18 °C during the heating season and 25 °C during the cooling season. This calculation provides a comprehensive overview of the building's energy performance and identifies areas where energy efficiency can be improved.

Energy Needs for Space Heating, Space Cooling and DHW

-  **Annual Nominal Energy Needs for Space Heating:** The energy needs for heating refer to the energy necessary to maintain the indoor temperature at 18 °C throughout the heating season. This involves considering the heat transfer through the building envelope, ventilation heat losses, and useful heat gains (including solar gains through windows and internal heat gains). The methodology follows the EN ISO 13790:2008 standard, which includes:
 - Seasonal calculation of heating needs with adaptations allowed by the standard.
 - Treating each building or fraction as a single zone with uniform indoor conditions.
 - Considering steady-state phenomena integrated over the heating season.
-  **Annual Nominal Energy Needs for Space Cooling:** Similarly, the energy needs for cooling refer to the energy required to maintain the indoor temperature at 25 °C during the cooling season. This calculation accounts for heat transfer through the building envelope, ventilation heat gains, and thermal gains (which include solar gains through windows and opaque elements and internal heat gains). The methodology ensures that the cooling energy needs are accurately determined to prevent overheating and maintain occupant comfort.
-  **Annual Nominal Energy Needs for DHW:** The energy needs for DHW were calculated based on the average daily reference consumption, the temperature difference between ambient water and hot water, and the number of days of DHW consumption in a year. This ensures that the DHW energy needs are tailored to the specific usage patterns of the building's occupants.

Renewable Energy Contributions

Renewable energy systems play a crucial role in reducing the building's reliance on non-renewable energy sources. The methodology incorporates the contributions from renewable energy systems for self-consumption, varying based on the type of system and energy source.

-  **Solar Thermal Systems:** The energy produced by solar thermal systems for self-consumption was calculated based on the average annual solar radiation incident on a horizontal surface and the collector area. This calculation ensures that the potential of solar energy is fully utilized for both space heating and DHW purposes.
-  **Solar Photovoltaic (PV) Systems:** The contribution of energy from PV systems for self-consumption was evaluated based on the total electricity produced, considering a typical household of three people. The renewable energy production values present in this report

and available in the public section of the platform were obtained using the global tilted irradiation at the optimum angle provided by the (*Global Solar Atlas*, 2024).

Efficiency of Energy Production Systems

The annual nominal energy consumption of the systems producing useful energy for heating, cooling, and DHW was determined based on the reference efficiency of these systems in residential buildings, as specified in Table 99 of the SCE Manual (DGEG & ADENE, 2021). The efficiency is further adjusted for depreciation due to age, as outlined in Table 76 of the same document, ensuring that the calculations reflect the performance of the energy systems over time.

Thermal Comfort Improvement Measures

In addition to the technical aspects of energy efficiency, the impact of renovation measures on thermal comfort was also assessed, using a simplified rating system. A scale from 1 to 5 stars was used to evaluate the improvements, although most measures result in ratings between 1 and 3 stars. These ratings were determined based on qualitative criteria such as the initial state of the systems and the expected comfort gains after implementing each measure.

These comfort ratings were designed to provide homeowners with an intuitive understanding of the potential improvements in indoor thermal conditions. Although not grounded in a specific formula, the ratings offer a relative comparison of how different measures contribute to enhancing thermal comfort, assisting users in making more informed decisions when selecting renovation measures.

Investment and Savings Estimation

To provide a comprehensive analysis of the renovation measures, general estimations of the investment costs and expected savings were carried out.

For the investment assessment, we used a brief market consultation for some measures and considered estimates based on the necessary capacity of equipment (e.g., refrigerators, washing machines or the required heating or cooling area, as well as the number of occupants for estimating DHW needs).

Regarding savings, energy savings were estimated for each measure, and financial savings were calculated based on electricity prices in each country — using domestic sector electricity prices from the second half of 2023 (Eurostat, 2024).

Similarly, the reduction in greenhouse gas (GHG) emissions was estimated by applying the energy savings to the average emission factors over the past three years for each country. These emission factors were sourced from the Joint Research Centre (Bastos et al., 2024), ensuring reliable, country-specific estimations of GHG reductions.

4.3 DETAILED TECHNICAL SHEETS

In this section, detailed technical sheets for each measure are provided. These sheets include:



Short Description: A concise explanation of the measure (in English, Portuguese, Italian and Spanish);

-  **Applicable typology:** Indication if the measure is applicable to single houses, condominium households, and energy-poor households;
-  **Advantages:** A list of benefits of the measure (in English, Portuguese, Italian and Spanish);
-  **Points of attention:** A list of potential problems that may occur and that need to be taken care of (in English, Portuguese, Italian and Spanish);
-  **Impact Assessment:** Potential for energy savings, greenhouse gas emissions reductions, thermal comfort improvement, local renewable energy generation and investment and savings estimate (for Portugal, Italy and Spain).

4.3.1 QUICK WINS

Measure title: Energy management system

PT: Monitorização e gestão do consumo de energia

IT: Sistema di gestione dell'energia

SP: Sistema de gestión energética

Measure description	EN	When do I consume a lot of energy and with which devices? An energy consumption manager will make this transparent for you. This makes saving energy easier and more fun, because the effect is immediately visible. Systems vary from a screen on the wall to websites and apps. You will often see energy consumption decrease in real-time if, for example, you turn down the heating or turn off the lights. In some cases, you need to have a smart meter. With an energy-consumption-manager, you can save in average 5 to 10% on your total energy consumption.
	PT	Quando consumo mais energia e com que equipamentos? Um sistema de monitorização e/ou de consumos de energia tornará tudo isto mais transparente para si. Isto torna a poupança de energia mais fácil e mais prática, uma vez que o efeito é imediatamente visível. Os sistemas podem variar desde um ecrã na parede até sites e apps. Muitas vezes, poderá ver reduções no consumo de energia em tempo real se, por exemplo, desligar o aquecimento ou apagar as luzes. Em alguns casos, é necessário ter um contador inteligente. Com um gestor de consumos de energia, pode poupar 5% a 10% no seu consumo total de energia.
	IT	Quando consumo molta energia e con quali dispositivi? Un gestore del consumo energetico renderà questo trasparente per te. Questo rende il risparmio energetico più facile e divertente, perché l'effetto è immediatamente visibile. I sistemi variano da uno schermo sulla parete a siti web e app. Spesso vedrai il consumo energetico diminuire in tempo reale se, ad esempio, abbassi il riscaldamento o spegni le luci. In alcuni casi, è necessario avere un contatore intelligente. Con un gestore del consumo energetico, puoi risparmiare dal 5 al 10% sul tuo consumo energetico totale.
	SP	¿Cuándo consumo mucha energía y con qué dispositivos? Un gestor del consumo energético hará esto transparente para ti. Esto hace que ahorrar energía sea más fácil y divertido, porque el efecto es inmediatamente visible. Los sistemas varían desde una pantalla en la pared hasta sitios web y aplicaciones. A menudo verás el consumo

		energético disminuir en tiempo real si, por ejemplo, bajas la calefacción o apagas las luces. En algunos casos, necesitas tener un medidor inteligente. Con un gestor del consumo energético, puedes ahorrar entre un 5 y un 10% de tu consumo energético total.
Applicable typology	Single-family houses, condominium households and energy-poor households	

Measure title: Replace energy guzzlers

PT: Substituir equipamentos ineficientes

IT: Sostituire i dispositivi energivori

SP: Reemplazar aparatos de alto consumo

Measure description	EN	Old appliances are often energy (and water) guzzlers. By replacing these appliances with newer ones labeled A or B, you can quickly save over 50 euros per appliance per year! Therefore, replace all old appliances (with more than 15 years) with new energy-efficient ones. In addition, there may be a number of large consumers in your household which you can consciously deal with or reconsider the need for.
	PT	Os eletrodomésticos antigos são frequentemente grandes consumidores de energia (e de água). Ao substituir esses eletrodomésticos por um eletrodoméstico recente, com a etiqueta A e B, consegue poupar rapidamente mais de 50 euros por equipamento e por ano! Por este motivo, deve substituir os eletrodomésticos antigos (mais de 15 anos) por novos equipamentos energeticamente eficientes. Além disso, podem existir vários equipamentos na sua casa com consumos de energia demasiado altos, cujo propósito deve ser equacionado e cuja utilidade pode ser repensada.
	IT	Gli elettrodomestici vecchi sono spesso grandi consumatori di energia (e acqua). Sostituendo questi elettrodomestici con quelli nuovi classificati A o B, puoi risparmiare rapidamente oltre €50 per elettrodomestico all'anno! Pertanto, sostituisci tutti gli elettrodomestici vecchi (con più di 15 anni) con nuovi elettrodomestici efficienti dal punto di vista energetico. Inoltre, potrebbero esserci numerosi dispositivi energivori in casa tua che puoi gestire meglio o valutarne la dismissione.
	SP	Los electrodomésticos viejos suelen consumir mucha energía y agua. Sustituyéndolos por otros nuevos etiquetados como A o B, se puede ahorrar rápidamente más de 50 euros al año por aparato. Por tanto, será beneficioso sustituir todos los electrodomésticos viejos con más de 15 años, por otros nuevos de bajo consumo. Además, es posible que en su hogar haya algunos electrodomésticos que sean grandes consumidores de energía de los que tendría que hacerse una gestión responsable o reconsiderar su necesidad.
Applicable typology	Single-family houses, condominium households and energy-poor households	

Measure title: Turn devices off completely

PT: Desligar os equipamentos completamente

IT: Spegnerne completamente i dispositivi

SP: Apagar completamente los dispositivos

Measure description	EN	Standby consumption can waste unnecessary energy. You can quickly reduce this consumption by completely turning off the appliances or using a standby killer. An average family can save up to 11% of their electricity costs by eliminating standby consumption. Simply turn off the appliances via a socket with an on/off switch. Examples of standby consumers include: the digital TV decoder, the computer with printer, the coffee machine's warming mode, audio equipment, and the mini boiler.
	PT	O consumo em stand-by pode acarretar gastos desnecessários com energia. Pode diminuir rapidamente este consumo ao desligar totalmente os equipamentos. Uma família média pode poupar até 11% dos seus custos de eletricidade com a eliminação de consumos em stand-by e fantasma. Basta desligar os equipamentos através do botão próprio ou através de uma tomada com um interruptor de ligar/desligar. Também existem vários tipos de tomadas inteligentes que ajudam a eliminar os consumos desnecessários. Exemplos de aparelhos com consumos em stand-by são: box para televisão, router da internet, computador, impressora, máquina de café, equipamento de áudio, entre outros.
	IT	Il consumo in standby può sprecare energia inutilmente. Puoi ridurre rapidamente questo consumo spegnendo completamente gli elettrodomestici o utilizzando uno standby killer. Una famiglia media può risparmiare fino all'11% dei costi dell'elettricità eliminando il consumo in standby. Spegni semplicemente gli elettrodomestici tramite una presa con interruttore on/off. Esempi di dispositivi che consumano in standby includono: il decoder TV digitale, il computer con stampante, la modalità di mantenimento caldo della macchina da caffè, l'attrezzatura audio e il mini boiler.
	SP	El consumo en modo de espera puede desperdiciar energía innecesariamente. Puedes reducir rápidamente este consumo apagando completamente los electrodomésticos o usando un eliminador de standby. Una familia promedio puede ahorrar hasta un 11% de sus costos de electricidad eliminando el consumo en modo de espera. Simplemente apaga los electrodomésticos a través de un enchufe con interruptor de encendido/apagado. Ejemplos de consumidores en standby incluyen: el decodificador de TV digital, la computadora con impresora, el modo de calentamiento de la cafetera, el equipo de audio y el mini calentador.
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Tips for heating

PT: Dicas para aquecimento

IT: Consigli per il riscaldamento

SP: Consejos para la calefacción

Measure description	EN	It is possible to heat your old house and increase comfort without causing costs to skyrocket! Take advantage of sunlight to warm up the house by opening curtains and blinds during the day and closing them in the late afternoon. Improve the insulation of your windows, facades, attics, and roofs, ensuring that the indoor temperature is less susceptible to outdoor weather conditions. Evaluate the heating solutions available in the market, their initial costs, fuel type and efficiency, and choose the most suitable one for your home. Although considerably more expensive, air conditioning systems have a heating efficiency more than 3 times higher than conventional electric heaters, and they also have a cooling mode. When heating your home, remember that the recommended indoor comfort temperature is 18-20°C; each degree above this value can increase your heating energy consumption by 7%. Except in very cold areas, it's sufficient to turn on the heating during the day and turn it off at night since the accumulated heat allows for maintaining comfort. Keep in mind that you only need to heat the rooms you're using, and consider installing a smart thermostat to better manage your consumption.
	PT	Apesar do clima ameno, a maioria dos portugueses não aquece devidamente a sua casa no Inverno. No entanto, é possível aquecer a sua casa antiga e aumentar o conforto sem fazer disparar os custos! Aproveite a luz solar para aquecer a casa, abrindo os cortinados e estores durante o dia e fechando-os ao final da tarde. Melhore o isolamento das suas janelas, fachadas, sótãos e coberturas, garantindo que a temperatura interior é menos suscetível ao clima exterior. Analise bem as soluções de aquecimento existentes no mercado, os seus custos iniciais, tipo de combustível e eficiência, e escolha a mais apropriada para a sua casa. Embora bastante mais caros, os sistemas de ar condicionado têm uma eficiência de aquecimento mais de 3x superior aos aquecedores elétricos convencionais, possuindo também modo de arrefecimento. Quando estiver a aquecer a sua casa, lembre-se que a temperatura de conforto interior recomendada é de 18-20°C, cada grau acima deste valor pode aumentar o seu consumo de energia para aquecimento em 7%. Exceto em zonas muito frias, é suficiente ligar o aquecimento durante o dia, devendo-se desligar à noite pois o calor acumulado permite manter o conforto. Tenha em atenção que só precisa de aquecer as divisões que está a usar e considere a instalação de um termóstato inteligente para melhor gerir os seus consumos.
	IT	È possibile riscaldare la tua vecchia casa e aumentare il comfort senza far lievitare i costi! Approfitta della luce solare per riscaldare la casa aprendo tende e persiane durante il giorno e chiudendole nel tardo pomeriggio. Migliora l'isolamento delle tue finestre, facciate, soffitte e tetti, garantendo che la temperatura interna sia meno suscettibile alle condizioni meteorologiche esterne. Valuta le soluzioni di riscaldamento

		disponibili sul mercato, i loro costi iniziali, il tipo di combustibile e l'efficienza, e scegli quella più adatta alla tua casa. Sebbene considerevolmente più costosi, i sistemi di condizionamento d'aria hanno un'efficienza di riscaldamento più di 3 volte superiore ai riscaldatori elettrici convenzionali e dispongono anche della modalità di raffreddamento. Quando riscaldi la tua casa, ricorda che la temperatura interna di comfort consigliata è di 18-20°C; ogni grado sopra questo valore può aumentare il consumo energetico per il riscaldamento del 7%. Ad eccezione delle aree molto fredde, è sufficiente accendere il riscaldamento durante il giorno e spegnerlo di notte poiché il calore accumulato permette di mantenere il comfort. Tieni presente che devi riscaldare solo le stanze che stai utilizzando e considera l'installazione di un termostato intelligente per gestire meglio i tuoi consumi.
	SP	¡Es posible calentar tu casa antigua y aumentar el confort sin que los costos se disparen! Aprovecha la luz solar para calentar la casa abriendo cortinas y persianas durante el día y cerrándolas al final de la tarde. Mejora el aislamiento de tus ventanas, fachadas, áticos y techos, asegurando que la temperatura interior sea menos susceptible a las condiciones meteorológicas exteriores. Evalúa las soluciones de calefacción disponibles en el mercado, sus costos iniciales, tipo de combustible y eficiencia, y elige la más adecuada para tu hogar. Aunque considerablemente más caros, los sistemas de aire acondicionado tienen una eficiencia de calefacción más de 3 veces mayor que los calentadores eléctricos convencionales y también tienen modo de enfriamiento. Al calentar tu hogar, recuerda que la temperatura interior de confort recomendada es de 18-20°C; cada grado por encima de este valor puede aumentar el consumo de energía para calefacción en un 7%. Excepto en áreas muy frías, es suficiente encender la calefacción durante el día y apagarla por la noche, ya que el calor acumulado permite mantener el confort. Ten en cuenta que solo necesitas calentar las habitaciones que estás utilizando y considera instalar un termostato inteligente para gestionar mejor tu consumo.
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Tips for cooling

PT: Dicas para arrefecimento

IT: Consigli per il raffreddamento

SP: Consejos para la refrigeración

Measure description	EN	Increasingly, it becomes necessary to cool homes during summer, which can result in additional expenses on the energy bill. However, it is possible to cool your old house and enhance comfort without skyrocketing costs! Shield your home from solar radiation during the day by closing windows, doors, and curtains. Take advantage of cooler nights for free ventilation. Improve the insulation of your windows, façades, attics, and roofs, ensuring that the indoor temperature is less susceptible
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		to external weather conditions. Use fans to refresh your home whenever possible. These devices consume very little energy and allow you to reduce the use of other more expensive equipment. If you decide to invest in air conditioning, choose an equipment with high level of energy efficiency that is suitable for the size of your home's rooms. Be aware that portable air conditioning units are much less efficient than fixed ones. When cooling your home, remember that the recommended indoor comfort temperature is 25 °C. Each degree of difference results in a 7% increase in energy consumption. Note that you only need to cool the rooms you are using and consider installing a smart thermostat to better manage your energy consumption.
	PT	Cada vez mais, torna-se necessário arrefecer as casas portuguesas durante o Verão, o que pode acarretar despesas extra na fatura de energia. No entanto, é possível arrefecer a sua casa antiga e aumentar o conforto sem fazer disparar os custos! Proteja a sua casa da radiação solar durante o dia, fechando janelas, portadas e cortinas, e aproveite noites mais frescas para arrefecimento gratuito. Melhore o isolamento das suas janelas, fachadas, sótãos e coberturas, garantindo que a temperatura interior é menos suscetível ao clima exterior. Use ventoinhas para refrescar a sua casa sempre que possível. Estes equipamentos consomem muito pouca energia e permitem reduzir o uso de outros equipamentos mais dispendiosos. Se decidir investir num ar condicionado, escolha um de elevada eficiência energética e que seja adequado à dimensão das divisões da sua casa. Tenha atenção que as unidades de ar condicionado portáteis são muito menos eficientes do que as fixas. Quando estiver a arrefecer a sua casa, lembre-se que a temperatura de conforto interior recomendada é de 25°C. Cada grau de diferença, implica um aumento de 7% no consumo de energia. Tenha em atenção que só precisa de arrefecer as divisões que está a usar e considere a instalação de um termóstato inteligente para melhor gerir os seus consumos.
	IT	Diventa sempre più necessario raffreddare le case durante l'estate, il che può comportare ulteriori spese sulla bolletta energetica. Tuttavia, è possibile raffreddare la tua vecchia casa e migliorare il comfort senza far lievitare i costi! Proteggi la tua casa dalla radiazione solare durante il giorno chiudendo finestre, porte e tende. Approfitta delle notti più fresche per la ventilazione gratuita. Migliora l'isolamento delle tue finestre, facciate, soffitte e tetti, garantendo che la temperatura interna sia meno suscettibile alle condizioni meteorologiche esterne. Usa ventilatori per rinfrescare la tua casa quando possibile. Questi dispositivi consumano pochissima energia e ti permettono di ridurre l'uso di altre attrezzature più costose. Se decidi di investire in aria condizionata, scegli un livello di efficienza energetica elevato che sia adatto alle dimensioni delle stanze della tua casa. Tieni presente che le unità di aria condizionata portatili sono molto meno efficienti di quelle fisse. Quando raffreddi la tua casa, ricorda che la temperatura interna di comfort consigliata è di 25°C. Ogni grado di differenza comporta un aumento del consumo energetico.

		del 7%. Nota che devi raffreddare solo le stanze che stai utilizzando e considera l'installazione di un termostato intelligente per gestire meglio il tuo consumo energetico.
	SP	Cada vez es más necesario enfriar las casas durante el verano, lo que puede resultar en gastos adicionales en la factura de energía. Sin embargo, es posible enfriar tu casa antigua y mejorar el confort sin que los costos se disparen. Protege tu hogar de la radiación solar durante el día cerrando ventanas, puertas y cortinas. Aprovecha las noches más frescas para la ventilación gratuita. Mejora el aislamiento de tus ventanas, fachadas, áticos y techos, asegurando que la temperatura interior sea menos susceptible a las condiciones meteorológicas exteriores. Usa ventiladores para refrescar tu hogar siempre que sea posible. Estos dispositivos consumen muy poca energía y te permiten reducir el uso de otros equipos más costosos. Si decides invertir en aire acondicionado, elige un nivel de eficiencia energética alto que sea adecuado para el tamaño de las habitaciones de tu casa. Ten en cuenta que las unidades de aire acondicionado portátiles son mucho menos eficientes que las fijas. Al enfriar tu hogar, recuerda que la temperatura interior de confort recomendada es de 25°C. Cada grado de diferencia resulta en un aumento del 7% en el consumo de energía. Ten en cuenta que solo necesitas enfriar las habitaciones que estás utilizando y considera instalar un termostato inteligente para gestionar mejor tu consumo energético.
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Regulating heating equipment

PT: Ajustar equipamentos de climatização e de água quente

IT: Regolazione dell'impianto di riscaldamento

SP: Regulación del equipo de calefacción

Measure description	EN	By adjusting the (central) heating boiler properly, you can save on your energy bill. You can take care of part of the adjustment yourself. For example, you can lower the temperature for hot tap water in a combi boiler. Keep it above 60 °C, as legionella can occur at lower temperatures. The boiler temperature can often be lowered to 80 °C. For major maintenance, it is advisable to call in an installer.
	PT	Ao ajustar corretamente a sua caldeira, esquentador, termoacumulador ou ar condicionado, poderá poupar na sua fatura de energia. Além disso, esta regulação e manutenção é algo que pode fazer sozinho. Por exemplo, é possível reduzir a temperatura da água quente da torneira. No entanto, mantenha esta temperatura acima dos 60°C, já que a legionella pode ocorrer a temperaturas mais baixas. Adicionalmente, a maioria dos sistemas de aquecimento não estão devidamente calibrados, o que causa um desequilíbrio hidráulico e impede que a casa seja climatizada uniformemente, resultando em perdas de energia e em maior

		desconforto. Para intervenções de grande dimensão, é aconselhável recorrer a um instalador credenciado.
	IT	Regolando correttamente la caldaia (centrale), puoi risparmiare sulla bolletta energetica. Parte della regolazione può essere fatta da te. Ad esempio, puoi abbassare la temperatura dell'acqua calda sanitaria in una caldaia combinata. Mantienila sopra i 60°C, poiché la legionella può svilupparsi a temperature inferiori. La temperatura della caldaia può spesso essere abbassata a 80°C. Per una manutenzione più approfondita, è consigliabile chiamare il tecnico installatore.
	SP	Ajustando adecuadamente la caldera (central), puedes ahorrar en tu factura de energía. Puedes encargarte de parte del ajuste tú mismo. Por ejemplo, puedes bajar la temperatura del agua caliente en una caldera combinada. Mantenla por encima de 60°C, ya que la legionella puede aparecer a temperaturas más bajas. La temperatura de la caldera a menudo puede reducirse a 80°C. Para un mantenimiento mayor, es recomendable llamar a un instalador.
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Hydronic balancing of radiators

PT: Garantir o equilíbrio hidráulico dos radiadores

IT: Bilanciamento idronico dei radiatori

SP: Equilibrio hidráulico de radiadores

Measure description	EN	75% of heating systems are not set properly. This causes hydronic imbalance, which means that the hot water is not distributed well throughout the radiators in the building, which means that it cannot be heated uniformly, resulting in energy loss and discomfort.
	PT	75% dos sistemas de aquecimento não estão configurados corretamente. Isto provoca desequilíbrio, o que faz com que a água quente não seja bem distribuída pelos radiadores do edifício, o que significa que não pode ser aquecida uniformemente, resultando em perda de energia e desconforto.
	IT	Il 75% dei sistemi di riscaldamento non è impostato correttamente. Questo causa un bilanciamento idronico non corretto, il che significa che l'acqua calda non viene distribuita bene tra i radiatori nell'edificio, che quindi non può essere riscaldato uniformemente, risultando in una perdita di energia e disagio.
	SP	El 75% de los sistemas de calefacción no están configurados correctamente. Esto causa un desequilibrio hidráulico, lo que significa que el agua caliente no se distribuye bien a través de los radiadores en el edificio, lo que significa que no se puede calentar de manera uniforme, resultando en pérdida de energía e incomodidad.
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Thick curtains and shutters

PT: Colocar cortinas grossas e persianas

IT: Tende spesse e persiane

SP: Cortinas gruesas y persianas

Measure description	EN	Hanging thick curtains can result in much less heat loss through the window. This also applies to closing shutters on the exterior façade; a centuries-old trick. Note that shutters on the inside can cause surface condensation on the glass. Nowadays, there are also special insulating (roller) blinds that reduce heat loss through windows even more.
	PT	Colocar cortinas grossas e persianas pode reduzir significativamente as transferências de calor através das janelas. Isto também se aplica a portadas na fachada exterior; um truque com séculos de existência. Tenha em atenção que as persianas no interior podem causar condensação da superfície do vidro. Em edifícios com caixilhos e janelas antigas, para além de poder obter poupanças energéticas significativas em climatização, irá também sentir um aumento do conforto. No entanto, é necessário utilizar as cortinas e persianas de forma inteligente, maximizando os ganhos solares durante o inverno (abrir durante o dia, fechar durante a noite) e minimizando os ganhos solares durante o verão (fechar durante o dia, abrir durante a noite). Atualmente, existem soluções mais avançadas como sistemas automatizados e persianas isolantes especiais que reduzem ainda mais a transferência de calor através das janelas.
	IT	Appendere tende spesse può contribuire parecchio a ridurre le perdite di calore attraverso le finestre. Lo stesso vale per chiudere le persiane sulla facciata esterna; un trucco vecchio di secoli. Nota che le persiane interne possono causare condensa superficiale sul vetro. Oggi ci sono anche tende (a rullo) isolanti speciali che riducono ancora di più la perdita di calore attraverso le finestre.
	SP	Colgar cortinas gruesas puede resultar en una menor pérdida de calor a través de la ventana. Esto también se aplica a cerrar las persianas en la fachada exterior; un truco centenario. Ten en cuenta que las persianas en el interior pueden causar condensación superficial en el vidrio. Hoy en día, también existen persianas (enrollables) especiales aislantes que reducen aún más la pérdida de calor a través de las ventanas.
Applicable typology	Single-family houses, condominium households and energy-poor households	

Measure title: Radiator foil

PT: Instalar uma película refletora no radiador

IT: Pannelli termoriflettenti per radiatori

SP: Papel de aluminio para radiadores

Measure description	EN	With radiators a lot of heat gets lost through the exterior walls or windows. By placing radiator foil on the back of the radiator or on the wall behind it, the heat radiates into the room. This small investment reduces the heat loss through the directly adjacent façade by up to 80%.
	PT	Com os radiadores, perde-se muito calor pelas paredes externas ou janelas. Ao colocar uma película refletora na parte traseira do radiador ou na parede atrás dele, o calor irradia para o ambiente. Este pequeno investimento reduz a perda de calor através da fachada diretamente adjacente em até 80%.
	IT	Con i radiatori molta calore si perde attraverso le pareti esterne o le finestre. Posizionando dei pannelli termoriflettenti per radiatori sul retro del radiatore o sulla parete dietro di esso, il calore si irradia nella stanza. Questo piccolo investimento riduce la perdita di calore attraverso la facciata direttamente adiacente fino all'80%.
	SP	Con los radiadores, se pierde mucho calor a través de las paredes exteriores o las ventanas. Colocando papel de aluminio para radiadores en la parte trasera del radiador o en la pared detrás de él, el calor se irradia hacia la habitación. Esta pequeña inversión reduce la pérdida de calor a través de la fachada directamente adyacente hasta en un 80%.
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Radiator fan

PT: Instalar ventoinhas

IT: Ventola per radiatori

SP: Ventilador de radiador

Measure description	EN	A low-cost and easy solution for cooling is the installation of ceiling fans or the use of portable fans. These devices help circulate fresh air while using only 10% of the electricity of an air conditioner, requiring no major investments. The cooling effect of a fan allows you to increase the air conditioner's set temperature by 1°C, saving energy without any loss of comfort.
	PT	Uma solução fácil e de baixo custo para a arrefecimento é a instalação de ventoinhas de teto ou a utilização de ventoinhas portáteis. Estes equipamentos ajudam a circular ar fresco enquanto utilizam apenas 10% da eletricidade de um ar condicionado, não precisando de grandes investimentos. O efeito de arrefecimento de uma ventoinha permite aumentar a temperatura regulada do ar condicionado em 1°C, poupando energia sem qualquer perda de conforto.
	IT	Una soluzione economica e facile per raffreddare è l'installazione di ventilatori a soffitto o l'uso di ventilatori portatili. Questi dispositivi

		aiutano a far circolare aria fresca utilizzando solo il 10% dell'elettricità di un condizionatore d'aria, senza richiedere grandi investimenti. L'effetto rinfrescante di un ventilatore ti permette di aumentare la temperatura impostata del condizionatore d'aria di 1°C, risparmiando energia senza perdita di comfort.
	SP	Una solución económica y fácil para enfriar es la instalación de ventiladores de techo o el uso de ventiladores portátiles. Estos dispositivos ayudan a circular aire fresco mientras usan solo el 10% de la electricidad de un aire acondicionado, sin requerir grandes inversiones. El efecto refrescante de un ventilador te permite aumentar la temperatura configurada del aire acondicionado en 1°C, ahorrando energía sin pérdida de confort.
Applicable typology	Single-family houses, condominium households and energy-poor households	

Measure title: LED lamps

PT: Optar por iluminação LED

IT: Lampade a LED

SP: Lámparas LED

Measure description	EN	Easily saving energy starts with your lighting. Up to 8% of the total electricity consumption in a building is from lighting. By replacing incandescent bulbs with LED lights you can make significant savings. LED lights already come in many types, sizes and colours. There are dimmable types available and they have no start-up time such as energy-saving lights.
	PT	A poupança de energia começa facilmente com a iluminação, responsável por cerca de 2% do consumo total de eletricidade numa casa portuguesa. Ao substituir as lâmpadas incandescentes e de halógeno por lâmpadas LED, terá poupanças energéticas significativas em iluminação. Ao mesmo tempo, reduzirá a emissão de calor causada pelas lâmpadas ineficientes o que pode diminuir as necessidades de arrefecimento no verão. Hoje em dia, as lâmpadas LED estão disponíveis a preços muito acessíveis em inúmeros tipos, tamanhos e cores.
	IT	Per Risparmiare energia facilmente si può iniziare con l'illuminazione. Fino all'8% del consumo totale di elettricità in un edificio è dovuto all'illuminazione. Sostituendo le lampadine a incandescenza con luci a LED puoi ottenere risparmi significativi. Le luci a LED sono già disponibili in molti tipi, dimensioni e colori. Esistono tipi dimmerabili e non hanno tempo di avvio come le luci a risparmio energetico.
	SP	Ahorrar energía fácilmente comienza con tu iluminación. Hasta el 8% del consumo total de electricidad en un edificio es por iluminación. Al reemplazar las bombillas incandescentes con luces LED puedes lograr ahorros significativos. Las luces LED ya vienen en muchos tipos, tamaños y colores. Hay tipos regulables disponibles y no tienen tiempo de inicio como las luces de bajo consumo.

Applicable typology	Single-family houses, condominium households and energy-poor households
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Measure title: Window insulation

PT: Isolamento de janelas

IT: Isolamento delle finestre

SP: Aislamiento de ventanas

Measure description	EN	Windows are one of the building's components where heat transfer can be more pronounced. Old windows, with low insulation and solar protection, can significantly contribute to worsening thermal comfort and increasing drafts, water infiltrations, and exposure to external noise. However, there are various ways to improve windows' insulation with minimal investment. Eliminating drafts by applying weather-stripping to your windows and installing solar protection and barriers to cold/heat passage are crucial steps to reduce the heating and cooling needs of your home. There are several types of solutions that can be combined and installed either externally (preferably) or internally. Additionally, you can choose to apply an insulating or reflective film to your glass. If you decide to replace your single-pane windows, which is a more substantial investment, opt for efficient solutions such as double-pane or low-emissivity glass and frames with thermal break.
	PT	As janelas são componentes de um edifício onde as transferências de calor podem ser mais acentuadas. Janelas antigas, com baixo nível de isolamento e de proteção solar, podem contribuir significativamente para piorar o conforto térmico e aumentar as correntes de ar, as infiltrações de água e a exposição ao ruído exterior. Existem, no entanto, várias formas de melhorar o isolamento das janelas com investimento reduzido. Elimine as correntes de ar ao colocar fitas de calafetagem nas suas janelas e instale proteções solares e barreiras à passagem do frio/calor é fulcral para reduzir as necessidades de climatização da sua casa, existindo vários tipos de soluções que podem ser usadas de forma combinada e instaladas pelo exterior (de preferência) ou interior. Adicionalmente, pode também optar por colocar uma película isolante ou refletora nos seus vidros. Se decidir substituir os seus vidros simples, tratando-se de um investimento mais avoado, opte por soluções eficientes, com rotulagem energética Classe+, nomeadamente etiqueta A ou A+, vidros duplos ou de baixa emissividade e caixilhos com corte térmico.
	IT	Le finestre sono le componenti di un edificio in cui il trasferimento di calore può essere importante. Le vecchie finestre, con livelli bassi di isolamento e protezione solare, possono contribuire significativamente al peggioramento del comfort termico e all'aumento degli spifferi d'aria, infiltrazioni d'acqua e esposizione al rumore esterno. Tuttavia, ci sono vari modi per migliorare l'isolamento delle finestre con un investimento minimo. Eliminare gli spifferi d'aria applicando guarnizioni alle finestre e installando protezioni solari e barriere contro il passaggio del

		freddo/caldo sono passi cruciali per ridurre le esigenze di riscaldamento e raffreddamento della tua casa. Esistono diversi tipi di soluzioni che possono essere utilizzate in combinazione e installate sia esternamente (preferibilmente) che internamente. Inoltre, puoi scegliere di applicare una pellicola isolante o riflettente al tuo vetro. Se decidi di sostituire le tue finestre a vetro singolo, che è un investimento più sostanziale, opta per soluzioni efficienti come vetri doppi o a bassa emissività e telai con interruzioni termiche.
	SP	Las ventanas son componentes de un edificio donde la transferencia de calor puede ser más pronunciada. Las ventanas antiguas, con bajos niveles de aislamiento y protección solar, pueden contribuir significativamente a empeorar el confort térmico y aumentar las corrientes de aire, infiltraciones de agua y exposición al ruido exterior. Sin embargo, hay varias formas de mejorar el aislamiento de las ventanas con una inversión mínima. Eliminar las corrientes de aire aplicando burletes a tus ventanas e instalando protección solar y barreras contra el paso de frío/calor son pasos cruciales para reducir las necesidades de calefacción y refrigeración de tu hogar. Existen varios tipos de soluciones que se pueden usar en combinación e instalarse externamente (preferiblemente) o internamente. Además, puedes optar por aplicar una película aislante o reflectante a tu vidrio. Si decides reemplazar tus ventanas de un solo vidrio, lo cual es una inversión más sustancial, opta por soluciones eficientes como vidrio doble o de baja emisividad y marcos con rotura de puente térmico.
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Shower timer

PT: Temporizador no duche

IT: Timer per la doccia

SP: Temporizador de ducha

Measure description	EN	With a shower timer, such as an hourglass for under the shower, you can keep an eye on how long you are in the shower. With children, this is definitely recommended, because shorter showers not only save water, but also gas or electricity to heat the water. A 15-minute shower, with the tap running, consumes about 180 liters of water. If you reduce the time to just 5 minutes, this consumption drops to 60 liters of water and can save a lot of energy and money!
	PT	A utilização de um temporizador no duche – ou de uma ampulheta – permite controlar o tempo que demora. Com crianças, isto é definitivamente recomendado, já que um duche mais curto não só poupa água, como também a eletricidade ou gás necessários para aquecer a água. Um duche de 15 minutos, com a torneira aberta, consome cerca de 180 litros de água. Se reduzir o tempo para apenas 5 minutos, este consumo desce para 60 litros de água e pode poupar muita energia e dinheiro! Portugal está a passar por fenómenos recorrentes de seca e

		todos os consumidores podem ajudar a diminuir os efeitos desta grave carência de água.
	IT	Con un timer per la doccia, come una clessidra per la doccia, puoi tenere d'occhio quanto tempo trascorri sotto la doccia. Con i bambini, questo è sicuramente consigliato, perché le docce più brevi non solo risparmiano acqua, ma anche gas o elettricità per riscaldare l'acqua. Una doccia di 15 minuti, con il rubinetto aperto, consuma circa 180 litri di acqua. Se riduci il tempo a soli 5 minuti, questo consumo scende a 60 litri di acqua e si può risparmiare molta energia e denaro!
	SP	Con un temporizador de ducha, como un reloj de arena para la ducha, puedes controlar cuánto tiempo estás en la ducha. Con los niños, esto es definitivamente recomendable, porque las duchas más cortas no solo ahorran agua, sino también gas o electricidad para calentar el agua. Una ducha de 15 minutos, con el grifo abierto, consume unos 180 litros de agua. Si reduces el tiempo a solo 5 minutos, este consumo baja a 60 litros de agua y puede ahorrar mucha energía y dinero.
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Flow restrictor
PT: Redutor de caudal
IT: Limitatore di flusso
SP: Limitador de flujo

Measure description	EN	With a flow restrictor, you will consume less water when, for instance, washing your hands. Without compromising comfort, you save (hot) water at the wash basin tap. Additionally, to meet the flow rates specified by the EU, ensure that the taps in both the wash basin and kitchen have a maximum flow of 6 liters per minute. At the kitchen tap, the flow restrictor may be perceived as less convenient since it takes longer to fill a bucket or saucepan. Many faucets already come equipped with a flow restrictor, and if not, they can be purchased for a few euros. This investment will pay off within a year, making it a real 'quick win'.
	PT	Com um redutor de caudal, consumirá menos água sem dar por isso, por exemplo, ao lavar as mãos. Sem sacrificar o conforto, poderá poupar água (incluindo água aquecida) na torneira do lavatório. Além disso, para cumprir com os caudais de referência determinados pela UE, garanta que as torneiras do lavatório e da cozinha tenham um caudal máximo de 6 Litros/min. Na torneira da cozinha, o redutor de caudal pode tornar-se menos prático, já que demora mais tempo a encher uma panela. Muitas torneiras já têm um redutor de caudal instalado, e caso não tenham pode sempre adquirir um por apenas alguns euros. Um redutor de caudal pode reduzir para metade o consumo de água, contudo o aumento de velocidade associada faz com que haja a sensação que está a sair mais água e paga-se a si próprio no período de um ano, uma verdadeira "medida rápida".

	IT	Con un limitatore di flusso, consumerai meno acqua quando, ad esempio, ti lavi le mani. Senza compromettere il comfort, è possibile risparmiare acqua (anche calda) . Inoltre, per rispettare i flussi d'acqua specificati dall'UE, assicurati che i rubinetti del lavabo e della cucina abbiano un flusso massimo di 6 litri al minuto. Al rubinetto della cucina, il limitatore di flusso potrebbe essere percepito come meno conveniente poiché ci vuole più tempo per riempire un secchio o una pentola. Molti rubinetti sono già dotati di un limitatore di flusso e, se non lo sono, possono essere acquistati per pochi euro. Questo investimento si ripaga entro un anno, rendendolo una vera 'vittoria rapida'.
	SP	Con un limitador de flujo, consumirás menos agua al, por ejemplo, lavarte las manos. Sin comprometer el confort, ahorras agua (caliente) en el grifo del lavabo. Además, para cumplir con los caudales especificados por la UE, asegúrate de que los grifos del lavabo y la cocina tengan un caudal máximo de 6 litros por minuto. En el grifo de la cocina, el limitador de flujo puede percibirse como menos conveniente, ya que se tarda más en llenar un balde o una olla. Muchos grifos ya vienen equipados con un limitador de flujo y, si no lo tienen, se pueden comprar por unos pocos euros. Esta inversión se amortiza en un año, lo que la convierte en una verdadera 'ganancia rápida'.
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Water-saving shower head

PT: Cabeça de chuveiro eficiente

IT: Soffione doccia a risparmio idrico

SP: Cabezal de ducha de ahorro de agua

Measure description	EN	With a water-saving shower head, you consume less hot water without compromising comfort. It reduces flow and adds air to the water, giving you a normal powerful jet. A rain shower or other luxury shower does not necessarily have to waste water, provided it has a volume flow class S or better (to comply with the flow rates set by the EU ensures that showers have a maximum flow rate of 8 liters per minute). In addition, the 'mist shower' has a shower head that creates a mist and saves an extreme amount of water, which is a good idea in combination with a heat pump. When purchasing a new product, consult its water labelling and opt for the most efficient ones.
	PT	Com uma cabeça de chuveiro eficiente, estará a consumir menos água quente sem sacrificar o conforto. Este sistema reduz o caudal e acrescenta ar à água, proporcionando um jato normal e potente. Também permite interromper o fluxo de água durante o banho sem desligar a torneira e sem necessitar de voltar a regular a temperatura. Tratando-se de um equipamento de baixo custo, é uma ótima ideia para poupar água e também a energia necessária para a aquecer. Em Portugal, já existem esquemas de rotulagem de produtos que permitem identificar os mais eficientes, ao adquirir novos produtos prefira os que têm rótulo

		A. Além disso, para cumprir com os caudais de referência determinados pela UE, garanta que os chuveiros tenham um caudal máximo de 8 Litros/min.
	IT	Con un soffione doccia a risparmio idrico, consumi meno acqua calda senza compromettere il comfort. Riduce il flusso e aggiunge aria all'acqua, generando un getto potente. Una doccia a pioggia o altre docce di lusso non devono necessariamente sprecare acqua, a patto che abbiano una classe di flusso volumetrico S o superiore (per rispettare i flussi d'acqua stabiliti dall'UE, assicurati che le docce abbiano un flusso massimo di 8 litri al minuto). Inoltre, la 'doccia a nebulizzazione' ha un soffione che crea una nebulizzazione e risparmia una quantità estrema di acqua, che è una buona idea in combinazione con una pompa di calore. Quando acquisti un nuovo prodotto, consulta la sua etichetta idrica e opta per quelli più efficienti.
	SP	Con un cabezal de ducha de ahorro de agua, consumes menos agua caliente sin comprometer el confort. Reduce el flujo y agrega aire al agua, dándote un chorro potente normal. Una ducha de lluvia u otra ducha de lujo no necesariamente tiene que desperdiciar agua, siempre y cuando tenga una clase de flujo volumétrico S o superior (para cumplir con los caudales establecidos por la UE, asegúrate de que las duchas tengan un caudal máximo de 8 litros por minuto). Además, la 'ducha de niebla' tiene un cabezal que crea una niebla y ahorra una cantidad extrema de agua, lo cual es una buena idea en combinación con una bomba de calor. Al comprar un nuevo producto, consulta su etiqueta de eficiencia hídrica y opta por los más eficientes.
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Water-saving toilet

PT: Sanita eficiente

IT: WC a risparmio idrico

SP: Inodoro de ahorro de agua

Measure description	EN	An efficient toilet features a dual flush system with two switches that allow you to choose between 3.5 or 6 litres, instead of the 9-12 litres of a traditional toilet. When purchasing a new product, consult its water labelling and opt for the most efficient ones. The more frequently the toilet is used, the more sense it makes to invest in a modern toilet. Is a new toilet not an option? There are other cost-effective solutions, such as flush buttons with switches, adjustable fill valves, and counterweights, which can modernize your old toilet and save water. However, keep in mind that the savings of these adaptations are considerably smaller than with a modern toilet. A widely-used, easy, and cost-free idea is to place a water bottle inside your toilet tank to reduce the flush volume.
	PT	Uma sanita eficiente tem um sistema de dupla descarga com dois interruptores que lhe permite escolher entre 3,5 ou 6 litros, em vez dos 9-12 litros de uma sanita tradicional. Em Portugal, já existem esquemas de

		rotulagem de produtos que permitem identificar os mais eficientes, ao adquirir um novo sistema de autoclismo prefira os que têm rótulo A. Quanto mais frequentemente a sanita é utilizada, mais sentido faz comprar uma sanita moderna. Uma nova sanita não é uma opção? Existem outras soluções com custos mais baixos, como botões com interruptor de descarga, torneiras de enchimento regulável e contrapesos, que podem modernizar a sua sanita antiga e poupar água. No entanto, tenha em atenção que as poupanças são consideravelmente menores do que com uma sanita moderna. Uma ideia bastante usada, que é fácil e sem custos, é colocar uma garrafa de água dentro do seu autoclismo para reduzir o volume por descarga.
	IT	Un WC efficiente dispone di un sistema di doppio scarico con due pulsanti che ti permettono di scegliere tra 3,5 o 6 litri, invece dei 9-12 litri di un WC tradizionale. Quando acquisti un nuovo prodotto, consulta la sua etichetta idrica e opta per quelli più efficienti. Più frequentemente viene utilizzato il WC, più ha senso investire in un WC moderno. Un WC nuovo non è un'opzione? Ci sono altre soluzioni economiche, come pulsanti di scarico con interruttori, valvole di riempimento regolabili e contrappesi, che possono modernizzare il tuo vecchio WC e risparmiare acqua. Tuttavia, tieni presente che i risparmi sono considerevolmente minori rispetto a un WC moderno. Un'idea ampiamente utilizzata, facile e senza costi è posizionare una bottiglia d'acqua all'interno del serbatoio del WC per ridurre il volume dello scarico.
	SP	Un inodoro eficiente cuenta con un sistema de doble descarga con dos botones que te permiten elegir entre 3,5 o 6 litros, en lugar de los 9-12 litros de un inodoro tradicional. Al comprar un nuevo producto, consulta su etiqueta de eficiencia hídrica y opta por los más eficientes. Cuanto más frecuentemente se use el inodoro, más sentido tiene invertir en un inodoro moderno. ¿No es una opción un inodoro nuevo? Hay otras soluciones económicas, como botones de descarga con interruptores, válvulas de llenado ajustables y contrapesos, que pueden modernizar tu inodoro antiguo y ahorrar agua. Sin embargo, ten en cuenta que los ahorros son considerablemente menores que con un inodoro moderno. Una idea ampliamente utilizada, fácil y gratuita es colocar una botella de agua dentro del tanque del inodoro para reducir el volumen de descarga.
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Rain barrel

PT: Reservatório de água da chuva

IT: Barile per la pioggia

SP: Depósito de agua de lluvia

Measure description	EN	Rainwater can be reused to water the greenery around your building. Every year, a large amount of clean drinking water is used in gardens for watering the plants and the lawn. By collecting the rainwater (not drinkable) in a rain barrel and then using it, you save drinking water and
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		make use of a natural source. The rain barrel can also be implemented as an underground tank, but this does require a pump.
	PT	A água da chuva pode ser reutilizada para regar a vegetação ao redor do seu edifício. Todos os anos, uma grande quantidade de água potável limpa é utilizada nos jardins para regar as plantas e o relvado. Ao recolher a água da chuva (não potável) num barril de água da chuva e depois utilizá-la, poupa água potável e faz uso de uma fonte natural. O barril de água da chuva também pode ser instalado como um tanque subterrâneo, mas requer a utilização de uma bomba.
	IT	L'acqua piovana può essere riutilizzata per innaffiare il verde intorno al tuo edificio. Ogni anno, una grande quantità di acqua potabile pulita viene utilizzata nei giardini per annaffiare le piante e il prato. Raccogliendo l'acqua piovana (non potabile) in un barile per la pioggia e poi utilizzandola, risparmi acqua potabile e usi una fonte naturale. Il barile per la pioggia può anche essere implementato come serbatoio sotterraneo, ma questo richiede una pompa per il successivo utilizzo dell'acqua.
	SP	El agua de lluvia puede reutilizarse para regar las áreas verdes alrededor de tu edificio. Cada año, se usa una gran cantidad de agua potable limpia en los jardines para regar las plantas y el césped. Al recolectar el agua de lluvia (no potable) en un barril y luego usarla, ahorras agua potable y aprovechas una fuente natural. El barril de lluvia también puede implementarse como un tanque subterráneo, pero esto requiere una bomba.
Applicable typology		Single-family houses

Measure title: Insulate heating pipes

PT: Isolamento de tanques e tubagem de aquecimento

IT: Isolare i tubi di riscaldamento

SP: Aislar las tuberías de calefacción

Measure description	EN	Heating pipes often lose a lot of heat. By insulating these pipes in the unheated areas, such as crawl spaces, (central) heating cabinets and the attic, the heat is only dissipated where needed. It is often easy to insulate pipes by yourself, but the pipes must remain easily accessible. It is important not to insulate drinking water pipes in order to avoid the risk of legionella.
	PT	Os tanques de caldeiras e termoacumuladores mais antigos e a tubagem dos sistemas de aquecimento perdem frequentemente muito calor. Ao isolar os tubos nas áreas não aquecidas, como alçapões, armários de aquecimento central e o sótão, o calor só é dissipado onde é necessário. Muitas vezes é fácil isolar os tubos sozinho, mas estes têm de permanecer facilmente acessíveis. É importante não isolar os tubos de água potável, para evitar o risco de legionella.
	IT	I tubi di riscaldamento spesso disperdono molto calore. Isolando questi tubi nelle aree non riscaldate, come gli spazi di accesso, i locali di riscaldamento (centrali) e la soffitta, il calore viene dissipato solo dove è necessario. È spesso facile isolare i tubi da soli, ma i tubi devono rimanere

		facilmente accessibili. È importante non isolare i tubi dell'acqua potabile per evitare il rischio di legionella.
	SP	Las tuberías de calefacción a menudo pierden mucho calor. Al aislar estas tuberías en las áreas no calefaccionadas, como los espacios de acceso, gabinetes de calefacción (central) y el ático, el calor solo se disipa donde se necesita. A menudo es fácil aislar las tuberías uno mismo, pero las tuberías deben permanecer fácilmente accesibles. Es importante no aislar las tuberías de agua potable para evitar el riesgo de legionella.
Applicable typology	Single-family houses	

4.3.2 INSULATION & VENTILATION

Seams

Measure title: Draught exclusion window frames

PT: Fitas de calafetagem para janelas

IT: Profili delle finestre per l'eliminazione degli spifferi d'aria

SP: Marcos de ventanas para la eliminación de corrientes de aire

Measure description	EN	Draught strips can be used to close gaps between the window and frame. A draught strip can be applied to the frame or milled in. Placing a draught strip on the frame is a simple procedure. If you choose to have the draught strip milled in, make sure you have it done by a professional company and avoid the risk of moisture accumulating behind the strip. The installer mechanically makes a slot in the frame or window and then installs the draught strip. Note the difference in material. Plastic strips often do not stick or pulverize over time. A metal strip stays in place better and is therefore more 'durable' in use. By using draught strips, you can reduce air leakage from windows by 33% to 50%, significantly lowering the heating needed to keep your home warm.
	PT	As fitas de calafetagem podem ser utilizadas para fechar os espaços entre a janela e o caixilho, dentro e fora de casa. A instalação de uma fita de calafetagem no caixilho da janela é um procedimento bastante simples. Se optar por embutir a fita de calafetagem, certifique-se de que o faz através de uma empresa profissional, evitando o risco de acumulação de humidade atrás da fita. Tenha em atenção as diferenças de material. As fitas plásticas muitas vezes não colam ou ficam pulverizadas ao longo do tempo. Uma fita metálica resiste melhor à passagem do tempo, tornando-se assim mais durável na sua utilização. Com a utilização de fitas de calafetagem, pode reduzir as perdas de ar pelas janelas entre 33% e 50%, diminuindo significativamente a necessidade de aquecimento para manter o ambiente quente.
	IT	Le strisce antispiffero possono essere utilizzate per chiudere gli spazi tra la finestra e il telaio. Una striscia antispiffero può essere applicata al telaio o incorporata. Posizionare una striscia antispiffero sul telaio è una procedura semplice. Se scegli di incorporare la striscia antispiffero, assicurati di farlo fare da una ditta professionale per evitare il rischio di accumulo di umidità dietro la striscia. L'installatore crea meccanicamente una fessura nel telaio o nella finestra e poi installa la striscia antispiffero.

		Presta attenzione alla differenza tra i materiali . Le strisce di plastica spesso non aderiscono o si polverizzano nel tempo. Una striscia metallica rimane in posizione meglio ed è quindi più 'durevole' . Utilizzando strisce antispiffero, puoi ridurre le perdite d'aria dalle finestre dal 33% al 50%, riducendo significativamente il riscaldamento necessario per mantenere la tua stanza calda.
	SP	Las tiras de protección contra corrientes de aire se pueden usar para cerrar los espacios entre la ventana y el marco. Una tira de protección contra corrientes de aire se puede aplicar al marco o fresarse. Colocar una tira de protección contra corrientes de aire en el marco es un procedimiento sencillo. Si decides que la tira de protección contra corrientes de aire se fresara, asegúrate de que lo haga una empresa profesional y evita el riesgo de acumulación de humedad detrás de la tira. El instalador crea mecánicamente una ranura en el marco o en la ventana y luego instala la tira de protección contra corrientes de aire. Nota la diferencia en el material. Las tiras de plástico a menudo no se adhieren o se pulverizan con el tiempo. Una tira de metal se mantiene en su lugar mejor y es por lo tanto más 'duradera' en uso. Utilizando tiras de protección contra corrientes de aire, puedes reducir la fuga de aire de las ventanas entre un 33% y un 50%, disminuyendo significativamente la calefacción necesaria para mantener tu habitación caliente.
Advantages	EN	- Increases the comfort of the building - Fairly easy to implement - Also applicable for windows with low thickness and sash windows - Can be applied without lasting impact
	PT	- Aumenta o conforto do edifício - Muito fácil de implementar - Também é aplicável em janelas com baixa espessura e em janelas de correr - Pode ser aplicada sem um impacto prolongado
	IT	- Incrementa il comfort dell'edificio - Facile da implementare - Applicabile anche per finestre di basso spessore e finestre a ghigliottina - Può essere applicato senza impatto duraturo
	SP	- Aumenta el confort del edificio - Fácil de implementar - También aplicable para ventanas de poco grosor y ventanas de guillotina - Se puede aplicar sin impacto duradero
Point of attention	EN	- Pay attention to good ventilation when insulating - Possible moisture accumulation behind the profile - During maintenance, draught excluders are disassembled - Let an expert advise you well in advance - Milling is relatively expensive due to customisation

		• Milling of window frames, windows and doors is not always permitted in historical buildings
	PT	• Preste atenção à ventilação quando isolar a sua casa • Possível acumulação de humidade por detrás da instalação • Durante a manutenção, estes materiais são desmontados • Procure aconselhamento de um especialista antes de proceder à intervenção • A fixação é relativamente cara devido à necessidade de customizar • Alterações significativas em janelas e portas nem sempre são permitidas em edifícios antigos com valor histórico patrimonial
	IT	• Presta attenzione alla buona ventilazione durante l'isolamento • Possibile accumulo di umidità dietro il profilo • Durante la manutenzione, le strisce antispiffero vengono smontate • Lascia che un esperto ti consigli bene in anticipo • L'incorporazione è relativamente costosa a causa della personalizzazione • L'incorporazione in telai di finestre, finestre e porte non è sempre consentita negli edifici storici
	SP	• Presta atención a una buena ventilación al aislar • Posible acumulación de humedad detrás del perfil • Durante el mantenimiento, se desmontan las tiras de protección contra corrientes de aire • Deja que un experto te aconseje bien con anticipación • La fresadura es relativamente costosa debido a la personalización • La fresadura de marcos de ventanas, ventanas y puertas no siempre está permitida en edificios históricos
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Draught exclusion doors

PT: Veda portas

IT: Eliminazione degli spifferi d'aria nelle porte

SP: Eliminación de corrientes de aire en puertas

Measure description	EN	Often the joints at doors are not completely airtight. Brushes reduce these openings, e.g. at the letterbox or at the threshold, making it less draughty. Placing a draught strip on a door is a simple procedure. Draught strips are allowed on doors with historical value, because there is no need to mill a slot in the door and the procedure can be reversed. It is also possible to mill the draught exclusion into the door. In that case, let this done by a professional and avoid the risk of moisture accumulating behind the strip. A professional mechanically makes a slot in the door and then places the draught strip. Keep in mind that a milled brush is not always allowed in historically relevant doors.
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	PT	Muitas vezes as ligações nas portas não são completamente herméticas. O veda portas, bem como equipamentos mais tradicionais como escovas e chouriços para portas, reduz estas aberturas e limita as correntes de ar. A instalação de um veda portas é um procedimento simples e é permitida em zonas históricas, já que não há necessidade de perfurar a porta e o procedimento pode ser revertido. Também é possível colocar a calafetagem diretamente na porta. Neste caso, pode recorrer a um profissional para perfurar a porta e instalar a fita de calafetagem, evitando o risco de acumulação de humidade atrás da fita. Esta medida tem um custo a partir de 4 euros/m, dependendo do tipo de material a ser instalado.
	IT	Spesso le connessioni alle porte non sono completamente a tenuta d'aria. Le spazzole riducono queste aperture, ad esempio nella cassetta delle lettere o sulla soglia, riducendo gli spifferi. Posizionare una striscia antispiffero su una porta è una procedura semplice. Le strisce antispiffero sono consentite su porte di valore storico, poiché non è necessario fresare una fessura nella porta e la procedura può essere invertita. È anche possibile incorporare la striscia antispiffero nella porta. In tal caso, lascia che venga fatto da un professionista per evitare il rischio di accumulo di umidità dietro la striscia. Un professionista crea meccanicamente una fessura nella porta e poi posiziona la striscia antispiffero. Tieni presente che una spazzola incorporata non è sempre consentita in porte di valore storico.
	SP	A menudo, las conexiones en las puertas no son completamente herméticas. Las escobillas reducen estas aperturas, por ejemplo, en el buzón o en el umbral, haciéndolas menos corrientes. Colocar una tira de protección contra corrientes de aire en una puerta es un procedimiento sencillo. Las tiras de protección contra corrientes de aire están permitidas en puertas de valor histórico, ya que no es necesario fresar una ranura en la puerta y el procedimiento se puede revertir. También es posible fresar la protección contra corrientes de aire en la puerta. En ese caso, deja que lo haga un profesional y evita el riesgo de acumulación de humedad detrás de la tira. Un profesional crea mecánicamente una ranura en la puerta y luego coloca la tira de protección contra corrientes de aire. Ten en cuenta que una escobilla fresada no siempre está permitida en puertas de valor histórico.
Advantages	EN	• Increases the comfort of the building • Fairly easy to implement • Can be applied without lasting impact
	PT	• Aumenta o conforto do edifício • Bastante fácil de implementar • Pode ser aplicada sem um impacto prolongado
	IT	• Incrementa il comfort dell'edificio • Facile da implementare • Può essere applicato senza impatto duraturo
	SP	• Aumenta el confort del edificio • Fácil de implementar

		• Se puede aplicar sin impacto duradero
Point of attention	EN	• Pay attention to good ventilation when insulating • Possible moisture accumulation behind the profile • During maintenance, draught excluders are disassembled • Let an expert advise you well in advance • Milling is relatively expensive due to customisation • Milling of window frames, windows and doors is not always permitted in historical buildings
	PT	• Preste atenção à ventilação quando isolar a sua casa • Possível acumulação de humidade por detrás da instalação • Durante a manutenção, estes materiais são desmontados • Procure aconselhamento de um especialista antes de proceder à intervenção • A fixação é relativamente cara devido à necessidade de customizar • Alterações significativas em janelas e portas nem sempre são permitidas em edifícios antigos com valor histórico patrimonial
	IT	• Presta attenzione alla buona ventilazione durante l'isolamento • Possibile accumulo di umidità dietro il profilo • Durante la manutenzione, le strisce antispiffero vengono smontate • Lascia che un esperto ti consigli bene in anticipo • L'incorporazione è relativamente costosa a causa della personalizzazione • L'incorporazione in telai di finestre, finestre e porte non è sempre consentita negli edifici storici
	SP	• Presta atención a una buena ventilación al aislar • Posible acumulación de humedad detrás del perfil • Durante el mantenimiento, se desmontan las tiras de protección contra corrientes de aire • Deja que un experto te aconseje bien con anticipación • La fresadura es relativamente costosa debido a la personalización • La fresadura de marcos de ventanas, ventanas y puertas no siempre está permitida en edificios históricos
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Seam sealing

PT: Reparação de fissuras

IT: Sigillatura delle fessure

SP: Sellado de juntas

Measure description	EN	Draughts often come from seams and cracks in the masonry, on windows and doors and on the roof, but also from the fuse box or the crawl space. Sealing seams and cracks immediately increases comfort. Do this professionally and the annoying draught disappears. Seams between the
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		frame and (masonry) façade can be closed with a lime mortar that matches the existing masonry and joint mortar in your building. Or with water and airtight sealing tape. In old buildings, the use of sealant and PUR foam is not advisable and not permitted.
	PT	As correntes de ar estão frequentemente localizadas em juntas e fendas de alvenaria, em janelas, portas e no telhado, mas também podem ocorrer no armário do contador. A reparação de fissuras e fendas aumenta imediatamente o conforto. Invista algum tempo neste procedimento e as correntes de ar depressa desaparecerão. As fissuras entre os caixilhos e a fachada (alvenaria) podem ser seladas com uma argamassa de cal que combine com a alvenaria existente e com a argamassa para juntas do seu edifício. Também pode utilizar fita adesiva de vedação estanque à água e ao ar. Em edifícios antigos, a utilização de vedantes e espuma de poliuretano não é aconselhável e muitas vezes não é permitida.
	IT	Le correnti d'aria spesso provengono da fessure e crepe nella muratura, nelle finestre e nelle porte e sul tetto, ma anche dalla scatola dei fusibili o dal vespaio. Sigillare fessure e crepe aumenta immediatamente il comfort. Fai questo professionalmente e gli spifferi più fastidiosi spariranno. Le fessure tra il telaio e la facciata (muratura) possono essere chiuse con una malta a calce che si adatta alla muratura e alla malta esistente nel tuo edificio. Oppure con nastro sigillante resistente all'acqua e all'aria. Negli edifici antichi, l'uso di sigillanti e schiuma PUR non è consigliato e non è consentito.
	SP	Las corrientes de aire a menudo provienen de juntas mal selladas y grietas en la mampostería, en ventanas y puertas y en el techo, pero también en la caja de fusibles o en el espacio de acceso. Sellar juntas y grietas aumenta inmediatamente el confort. Hazlo profesionalmente y la corriente de aire desaparece. Las juntas entre el marco y la fachada (mampostería) se pueden sellar con un mortero de cal que coincida con la mampostería y el mortero de juntas existente en tu edificio. O con cinta selladora impermeable y hermética. En edificios antiguos, el uso de selladores y espuma PUR no se aconseja y no está permitido.
Advantages	EN	- Increases the comfort of the building - Fairly easy to implement - Insulates against cold, draughts and noise
	PT	- Aumenta o conforto do edifício - Bastante fácil de implementar - Isola contra o frio, correntes de ar e ruído
	IT	- Incrementa il comfort dell'edificio - Facile da implementare - Isola contro il freddo, gli spifferi e il rumore
	SP	- Aumenta el confort del edificio - Fácil de implementar - Aísla contra el frío, las corrientes de aire y el ruido
Point of attention	EN	- Pay attention to good ventilation when insulating - Not all fillers are allowed for monuments

	PT	• Preste atenção à ventilação quando isolar a sua casa • Nem todos os enchimentos são permitidos em edifícios históricos
	IT	• Presta attenzione alla buona ventilazione durante l'isolamento • Non tutti i sigillanti sono consentiti per gli edifici storici
	SP	• Presta atención a una buena ventilación al aislar • No todos los selladores están permitidos para monumentos
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Replacement of Exterior Doors

PT: Substituição de portas exteriores

IT: Sostituzione delle porte esterne

SP: Reemplazo de puertas exteriores

Measure description	EN	Upgrading exterior doors to energy-efficient models can significantly improve insulation and reduce heat loss. Considering doors with features such as tight weatherstripping and high-quality materials is crucial to minimize energy consumption and enhance thermal comfort.
	PT	A substituição de portas exteriores por modelos energeticamente eficientes pode melhorar significativamente o isolamento térmico e reduzir as perdas de calor. Considerar portas com características como vedação apertada e materiais de alta qualidade é fundamental para minimizar o consumo de energia e aumentar o conforto térmico.
	IT	Sostituire le porte esterne con modelli efficienti dal punto di vista energetico può migliorare significativamente l'isolamento e ridurre la perdita di calore. Considera porte con caratteristiche come guarnizioni e materiali di alta qualità per minimizzare il consumo di energia e migliorare il comfort termico.
	SP	Actualizar las puertas exteriores a modelos eficientes en energía puede mejorar significativamente el aislamiento y reducir la pérdida de calor. Considera puertas con características como burletes ajustados y materiales de alta calidad para minimizar el consumo de energía y mejorar el confort térmico.
Advantages	EN	• Improves thermal comfort and energy efficiency • Reduces heat loss and energy bills • Enhances security and durability
	PT	• Melhora o conforto térmico e a eficiência energética • Reduz as perdas de calor e as contas de energia • Aumenta a segurança e a durabilidade
	IT	• Migliora il comfort termico e l'efficienza energetica • Riduce la perdita di calore e le bollette energetiche • Migliora la sicurezza e la durata
	SP	• Mejora el confort térmico y la eficiencia energética • Reduce la pérdida de calor y las facturas de energía • Mejora la seguridad y la durabilidad

Point of attention	EN	- Choose doors with energy-efficient features and proper installation to maximize benefits - Ensure compliance with building codes and regulations regarding door replacement
	PT	- Escolha portas com características energeticamente eficientes e instalação adequada para maximizar os benefícios - Certifique-se de estar em conformidade com os códigos de construção e regulamentos relativos à substituição de portas
	IT	- Scegli porte con caratteristiche energeticamente efficienti e un'installazione adeguata per massimizzare i benefici - Assicurati di rispettare i codici edilizi e le normative riguardanti la sostituzione delle porte
	SP	- Elige puertas con características eficientes en energía y una instalación adecuada para maximizar los beneficios - Asegúrate de cumplir con los códigos y regulaciones de construcción respecto al reemplazo de puertas
Applicable typology		Single-family houses

Measure title: Door closers

PT: Mola hidráulica para porta

IT: Chiudiporta

SP: Cierra puertas

Measure description	EN	Did you know that heat can also be lost between rooms? Often, not all rooms in bigger homes are heated. As a result, a lot of heat is lost to unheated rooms through open doors. A simple solution to this problem is to install door closers, so you don't have to worry about it anymore!
	PT	Sabia que também é possível perder calor entre divisões dentro de um edifício? Muitas vezes, nem todas as divisões nos edifícios são aquecidas. Como resultado, perde-se muito calor em divisões não aquecidas através de portas abertas. Uma solução simples para este problema passa por instalar molas hidráulicas para as portas, para que não tenha de se preocupar mais com isso! Uma mola hidráulica simples custa entre 15 e 40 euros e pode ser comprada em qualquer loja de bricolage.
	IT	Sapevi che il calore può essere perso anche tra le stanze? Spesso, non tutte le stanze degli edifici più grandi sono riscaldate. Di conseguenza, molto calore si disperde nelle stanze non riscaldate attraverso le porte aperte. Una soluzione semplice a questo problema è installare i chiudiporta, così non dovrai più preoccupartene!
	SP	¿Sabías que el calor también puede perderse entre las habitaciones? A menudo, no todas las habitaciones en los edificios más grandes están calefaccionadas. Como resultado, se pierde mucho calor hacia las habitaciones no calefaccionadas a través de las puertas abiertas. Una solución simple a este problema es instalar cierra puertas, ¡así no tendrás que preocuparte más!
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Draught lobby

PT: Hall de entrada

IT: Bussola d'ingresso

SP: Vestíbulo contra corrientes de aire

Measure description	EN	A draught lobby is a closed entrance that is placed behind (or in front of) an exterior door to prevent draughts when opening the exterior door. It is an effective heat buffer between inside and outside. A draught portal reduces heat loss and provides extra comfort by eliminating draughts.
	PT	Um hall de entrada consiste numa entrada fechada que é colocada atrás (ou em frente) de uma porta exterior, para evitar correntes de ar ao abrir a porta exterior. É uma forma bastante eficiente de potenciar o isolamento térmico entre o interior e o exterior. Um hall de entrada reduz a perda de calor e proporciona um conforto adicional ao eliminar as correntes de ar.
	IT	Una bussola d'ingresso è un'entrata chiusa che viene posizionata dietro (o davanti) a una porta esterna per prevenire gli spifferi quando si apre la porta esterna. È un efficace buffer termico tra l'interno e l'esterno. Un ingresso contro gli spifferi riduce la perdita di calore e fornisce un comfort extra eliminando gli spifferi.
	SP	Un vestíbulo contra corrientes de aire es una entrada cerrada que se coloca detrás (o delante) de una puerta exterior para evitar las corrientes de aire al abrir la puerta exterior. Es un eficaz amortiguador de calor entre el interior y el exterior. Un vestíbulo contra corrientes de aire reduce la pérdida de calor y proporciona un confort extra al eliminar las corrientes de aire.
Applicable typology	Single-family houses, condominium households and energy-poor households	

Roof insulation

Measure title: Sloped roof exterior insulation

PT: Isolamento de telhado inclinado pelo exterior

IT: Isolamento Esterno del Tetto Inclinato

SP: Aislamiento Exterior del Techo Inclinado

Measure description	EN	Most heat is lost through the roof, so insulating the roof reduces energy consumption considerably. Roofs are best insulated on the outside, because this limits the risk of moisture problems, prevents heat loss and reduces energy consumption. Always have the roof insulation carried out by a professional insulation company. Roof insulation on the outside is not always possible because the roof becomes 5 to 15 cm thicker after insulation. This should not conflict with the monumental view or the connection to the gutter line.
	PT	A maior parte do calor é perdido através do telhado, pelo que o isolamento do telhado reduz consideravelmente o consumo de energia. Um telhado é mais eficazmente isolado a partir do exterior, já que isto

		limita o risco de problemas de humidade, evita perdas de calor e reduz o consumo de energia. É importante recorrer sempre a uma empresa profissional para realizar o isolamento do telhado. Os materiais de isolamento recomendados incluem poliestireno expandido (EPS), lã mineral e poliuretano. O isolamento do telhado a partir do exterior nem sempre é possível, uma vez que o telhado se torna 5 a 15 cm mais alto após o isolamento, podendo entrar em conflito com os limites locais para altura do edifício ou com a ligação à linha da sarjeta.
	IT	La maggior parte del calore si perde attraverso il tetto, quindi l'isolamento del tetto riduce notevolmente il consumo di energia. I tetti sono meglio isolati all'esterno, poiché ciò limita il rischio di problemi di umidità, previene la perdita di calore e riduce il consumo di energia. Fai sempre eseguire l'isolamento del tetto da una ditta professionale. L'isolamento del tetto all'esterno non è sempre possibile perché il tetto diventa 5-15 cm più spesso dopo l'isolamento. Questo non dovrebbe entrare in conflitto con la vista architettonica o la connessione alla linea della grondaia.
	SP	La mayor parte del calor se pierde a través del techo, por lo que aislar el techo reduce considerablemente el consumo de energía. Los techos se aíslan mejor por el exterior, ya que esto limita el riesgo de problemas de humedad, previene la pérdida de calor y reduce el consumo de energía. Siempre haz que el aislamiento del techo sea realizado por una empresa de aislamiento profesional. El aislamiento del techo por el exterior no siempre es posible porque el techo se vuelve de 5 a 15 cm más grueso después del aislamiento. Esto no debería entrar en conflicto con la vista monumental o la conexión a la línea de la canaleta.
Advantages	EN	- Increases the comfort of the building - No loss of space on the inside - It is possible to achieve very good insulation value - There is no chance of moisture problems if implemented correctly - Can also be combined with a green roof
	PT	- Aumenta o conforto do edifício - Não há perda de espaço no interior - É possível atingir um nível de isolamento muito bom - Não vão existir problemas de humidade se a medida for implementada corretamente
	IT	- Aumenta il comfort dell'edificio - Nessuna perdita di spazio all'interno - È possibile ottenere un valore di isolamento molto buono - Non c'è rischio di problemi di umidità se eseguito correttamente - Può anche essere combinato con un tetto verde
	SP	- Aumenta el confort del edificio - No hay pérdida de espacio en el interior - Es posible lograr un valor de aislamiento muy bueno - No hay riesgo de problemas de humedad si se implementa correctamente

		También se puede combinar con un techo verde
Point of attention	EN	- Never apply insulation both inside and outside because of the risk of moisture problems - The existing roof covering is (temporarily) removed - The roof package will be thicker and connections in the gutter and façade change - Insulating your building is always work for a professional company
	PT	- Nunca aplique isolamento simultaneamente no interior e exterior, devido ao risco de problemas de humidade - A cobertura do telhado existente é (temporariamente) removida - A espessura do telhado vai aumentar e tal pode modificar as conexões às calhas e fachadas - O isolamento de um edifício é sempre trabalho para uma empresa profissional
	IT	- Non applicare mai l'isolamento sia all'interno che all'esterno a causa del rischio di problemi di umidità - La copertura esistente viene (temporaneamente) rimossa - Il pacchetto del tetto sarà più spesso e le connessioni nella grondaia e nella facciata cambieranno - Isolare il tuo edificio è sempre un lavoro per una ditta professionale
	SP	- Nunca apliques aislamiento tanto en el interior como en el exterior debido al riesgo de problemas de humedad - La cubierta existente se retira temporalmente - El paquete del techo será más grueso y las conexiones en la canaleta y la fachada cambiarán - Aislar tu edificio siempre es un trabajo para una empresa profesional
Applicable typology	Single-family houses	
Final Energy Reduction	Only heating: $(\{\text{roof area}\} \times 0,0231 + 1,6271) \times \{\text{number of hours}\} \times 1,69 \times 89 \times 0,44$ Heating and cooling: $(\{\text{roof area}\} \times 0,0231 + 0,6271) \times (\{\text{number of hours winter}\} \times 2,33 \times 0,8 \times 89 \times 0,44 + \{\text{number of hours summer}\} \times 2,33 \times 0,8 \times 94 \times 0,44)$	
Improvement of thermal comfort	3 stars	
Investment estimate	$\{\text{roof area}\} \times 14,2 \times 1,7$	
Savings estimate	$\{\text{FER}\} \times \{\text{electricity price}\}$	
GHG Reduction	$\{\text{FER}\} \times \{\text{electricity CO}_2 \text{ emissions}\}$	

Measure title: Sloped roof interior insulation

PT: Isolamento de telhado inclinado pelo interior

IT: Isolamento Interno del Tetto Inclinato

SP: Aislamiento Interior de Cubierta Inclinada

Measure description	EN	Roof insulation prevents unnecessary heat loss through the roof. The roof can be insulated on the inside between the beams of the roof. This is less effective than insulating on the outside, but is often easier to implement. And for historically valuable roofs, insulating on the inside has the advantage that it does not alter the appearance of the façade on the outside. Keep in mind, however, that about 5 to 15 cm of space is lost inside and that the wooden structure is usually no longer visible. Always have roof insulation applied by a professional company to prevent moisture problems.
	PT	O isolamento do telhado evita perdas de calor desnecessárias. O telhado pode ser isolado a partir do interior, entre as vigas do telhado. Isto é menos eficaz do que isolar a partir do exterior, mas é muitas vezes mais fácil de implementar. Além disso, para telhados com valor histórico, o isolamento pelo interior tem a vantagem de não alterar a aparência da fachada exterior. No entanto, tenha em atenção que irá perder cerca de 5 a 15 cm de espaço no interior e que a estrutura de madeira da cobertura pode não ficar visível. Os materiais de isolamento recomendados incluem poliestireno expandido (EPS), lã mineral e poliuretano. É importante recorrer sempre a uma empresa profissional de isolamento para realizar o isolamento do telhado, a fim de evitar problemas de humidade.
	IT	L'isolamento del tetto previene la perdita di calore non necessaria attraverso il tetto. Il tetto può essere isolato all'interno tra le travi del tetto. Questo è meno efficace dell'isolamento all'esterno, ma è spesso più facile da implementare. E per i tetti di valore storico, l'isolamento all'interno ha il vantaggio di non alterare l'aspetto della facciata all'esterno. Tieni presente, però, che si perdono circa 5-15 cm di spazio all'interno e che la struttura in legno di solito non è più visibile. Fai sempre applicare l'isolamento del tetto da una ditta professionale per prevenire problemi di umidità.
	SP	El aislamiento de la cubierta evita la pérdida innecesaria de calor a través del techo. La cubierta se puede aislar por el interior entre las vigas del techo. Esto es menos efectivo que el aislamiento por el exterior, pero a menudo es más fácil de implementar. Y para cubiertas de valor histórico, el aislamiento por el interior tiene la ventaja de no alterar la apariencia de la fachada en el exterior. Ten en cuenta, sin embargo, que se pierden unos 5-15 cm de espacio en el interior y que la estructura de madera generalmente ya no es visible. Siempre haz que una empresa profesional aplique el aislamiento de la cubierta para evitar problemas de humedad.
Advantages	EN	- Increases the comfort of the building - It is possible to achieve very good insulation value - The face of your building will not change - Working from the inside is relatively easy
	PT	- Aumenta o conforto do edifício - É possível atingir um nível de isolamento muito bom - A fachada do edifício não vai mudar - Trabalhar a partir do interior é relativamente fácil

	IT	• Aumenta il comfort dell'edificio • È possibile ottenere un valore di isolamento molto buono • Il volto del tuo edificio non cambierà • Lavorare dall'interno è relativamente facile
	SP	• Aumenta el confort del edificio • Es posible lograr un valor de aislamiento muy bueno • La apariencia de tu edificio no cambiará • Trabajar desde el interior es relativamente fácil
Point of attention	EN	• Never apply insulation both inside and outside because of the risk of moisture problems • Insulating your building is always work for a professional company
	PT	• Nunca aplique isolamento simultaneamente no interior e exterior, devido ao risco de problemas de humidade • O isolamento de um edifício é sempre trabalho para uma empresa profissional
	IT	• Non applicare mai l'isolamento sia all'interno che all'esterno a causa del rischio di problemi di umidità • Isolare il tuo edificio è sempre un lavoro per una ditta professionale
	SP	• Nunca apliques aislamiento tanto en el interior como en el exterior debido al riesgo de problemas de humedad • Aislar tu edificio siempre es un trabajo para una empresa profesional
Applicable typology	Single-family houses	
Final Energy Reduction	Only heating: $(\{\text{roof area}\} * 0,0231 + 1,6271) * \{\text{number of hours}\} * 1,69 * 89 * 0,45$ Heating and cooling: $(\{\text{roof area}\} * 0,0231 + 0,6271) * (\{\text{number of hours winter}\} * 2,33 * 0,8 * 89 * 0,45 + \{\text{number of hours summer}\} * 2,33 * 0,8 * 94 * 0,45)$	
Improvement of thermal comfort	2 stars	
Investment estimate	$\{\text{roof area}\} * 14,2 * 1,7$	
Savings estimate	$\{\text{FER}\} * \{\text{electricity price}\}$	
GHG Reduction	$\{\text{FER}\} * \{\text{electricity CO}_2 \text{ emissions}\}$	

Measure title: Flat roof exterior insulation

PT: Isolamento exterior de telhado plano

IT: Isolamento Esterno del Tetto Piano

SP: Aislamiento Exterior de Cubierta Plana

Measure description	EN	Flat roofs are best to insulate on the outside of the roof, which prevents heat loss and reduces energy consumption. By applying insulating material on top of the roof structure, you avoid the risk of moisture
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		damage in the wooden structure. With interior insulation, this risk is greater for flat roofs.
	PT	Os telhados planos são melhores de isolar pelo exterior do telhado, o que previne a perda de calor e reduz o consumo de energia. Ao aplicar material isolante sobre a estrutura do telhado, evita-se o risco de danos por humidade na estrutura de madeira (algo que seria mais difícil de evitar com o isolamento pelo interior).
	IT	I tetti piani sono meglio isolati all'esterno, il che previene la perdita di calore e riduce il consumo di energia. Applicando materiale isolante sopra la struttura del tetto, si evita il rischio di danni da umidità nella struttura in legno. Con l'isolamento interno, questo rischio è maggiore per i tetti piani.
	SP	Las cubiertas planas se aíslan mejor por el exterior del techo, lo que evita la pérdida de calor y reduce el consumo de energía. Al aplicar material aislante sobre la estructura de la cubierta, se evita el riesgo de daños por humedad en la estructura de madera. Con el aislamiento interior, este riesgo es mayor para las cubiertas planas.
Advantages	EN	- Increases the comfort of the building - No loss of space on the inside - It is possible to achieve very good insulation value - There is no chance of moisture problems if implemented correctly - Can also be combined with a green roof
	PT	- Aumenta o conforto do edifício - Não há perda de espaço no interior - É possível alcançar um valor de isolamento muito bom - Não há risco de problemas de humidade se implementado corretamente - Também pode ser combinado com um telhado verde
	IT	- Aumenta il comfort dell'edificio - Nessuna perdita di spazio all'interno - È possibile ottenere un valore di isolamento molto buono - Non c'è rischio di problemi di umidità se eseguito correttamente - Può anche essere combinato con un tetto verde
	SP	- Aumenta el confort del edificio - No hay pérdida de espacio en el interior - Es posible lograr un valor de aislamiento muy bueno - No hay riesgo de problemas de humedad si se implementa correctamente - También se puede combinar con una cubierta verde
Point of attention	EN	- The existing roof covering is (temporarily) removed - The roof package will be thicker and connections in the gutter and façade change - Let an expert advise you well in advance - Insulating your building is always work for a professional company

		Never apply insulation both inside and outside because of the risk of moisture problems
	PT	- A cobertura do telhado existente é (temporariamente) removida - O pacote do telhado será mais espesso e as conexões na calha e fachada mudarão - Deve aconselhar-se previamente com um especialista - Isolar o seu edifício é um trabalho que deve ser sempre realizado por um profissional - Nunca aplique isolamento simultaneamente por dentro e por fora devido ao risco de problemas de humidade
	IT	- La copertura esistente viene (temporaneamente) rimossa - Il pacchetto del tetto sarà più spesso e le connessioni nella grondaia e nella facciata cambieranno - Fatti consigliare bene in anticipo da un esperto - Isolare il tuo edificio è sempre un lavoro per una ditta professionale - Non applicare mai l'isolamento sia all'interno che all'esterno a causa del rischio di problemi di umidità
	SP	- La cubierta existente se retira temporalmente - El espesor de la cubierta será más grueso y las conexiones en la canaleta y la fachada cambiarán - Consulte con un experto con anticipación - Aislar tu edificio siempre es un trabajo para una empresa profesional - Nunca apliques aislamiento tanto en el interior como en el exterior debido al riesgo de problemas de humedad
Applicable typology		If Single-family houses with flat roof

Measure title: Insulating the attic floor

PT: Isolamento do sótão

IT: Isolamento del Pavimento della Soffitta

SP: Aislamiento del Suelo del Ático

Measure description	EN	The attic is the upper part of a building, just below the roof. Warm air rises and is lost through the attic through the roof. Insulating the attic is interesting if the attic is not heated and is actually never used as a living space. The insulation material can be placed between the wooden floor beams or on top of the floor. Make sure that the access to the attic is also insulated. Insulating the attic floor is cheaper than roof insulation and yields the same reduction in heat loss.
	PT	O sótão é a parte superior de uma casa antiga, logo abaixo do telhado. O ar quente sobe e perde-se através do sótão e do telhado. Isolar o sótão é uma alternativa interessante, especialmente se o sótão não for aquecido e nunca for realmente utilizado como área de habitação. O material de isolamento pode ser colocado entre as vigas de madeira ou no pavimento. Certifique-se de que o acesso ao sótão é também isolado. O isolamento do chão do sótão é mais barato do que o isolamento do

		telhado e produz a mesma redução na perda de calor. Os materiais de isolamento recomendados incluem poliestireno expandido (EPS), lã mineral e poliuretano.
	IT	La soffitta è la parte superiore di un edificio, appena sotto il tetto. L'aria calda sale e si perde attraverso la soffitta e attraverso il tetto. Isolare la soffitta è opportuno se la soffitta non è riscaldata e non viene effettivamente mai utilizzata come spazio abitativo. Il materiale isolante può essere posizionato tra le travi del pavimento in legno o sopra il pavimento. Assicurati che l'accesso alla soffitta sia anche isolato. L'isolamento del pavimento della soffitta è più economico dell'isolamento del tetto e comporta la stessa riduzione della perdita di calore.
	SP	El ático es la parte superior de un edificio, justo debajo de la cubierta. El aire caliente sube y se pierde a través de la cubierta del ático. Aislar el ático es interesante si el ático no está calefaccionado y nunca se usa como espacio habitable. El material aislante se puede colocar entre las vigas del suelo de madera o sobre el suelo. Asegúrate de que el acceso al ático también esté aislado. El aislamiento del suelo del ático es más barato que el aislamiento de la cubierta y produce la misma reducción de pérdida de calor.
Advantages	EN	- Increases the comfort of the building - It is possible to achieve very good insulation value - The face of your building will not change - Short cost recovery period - Working from the inside is relatively easy
	PT	- Aumenta o conforto do edifício - É possível atingir um nível de isolamento muito bom - A fachada do edifício não vai mudar - Rápido retorno do investimento - Trabalhar a partir do interior é relativamente fácil
	IT	- Aumenta il comfort dell'edificio - È possibile ottenere un valore di isolamento molto buono - Il volto del tuo edificio non cambierà - Recupero dei costi in breve tempo - Lavorare dall'interno è relativamente facile
	SP	- Aumenta el confort del edificio - Es posible lograr un valor de aislamiento muy bueno - La apariencia de tu edificio no cambiará - Período corto de recuperación de costos - Trabajar desde el interior es relativamente fácil
Point of attention	EN	- Make sure that the floor remains walkable - Your floor will be raised by the insulation material - Due to lack of space, seamless insulation is often difficult in this case
	PT	Garanta que o pavimento permanece adequado para caminhar

		• A altura do seu pavimento vai aumentar devido ao material de isolamento • Devido à falta de espaço, o isolamento de fissuras é muitas vezes difícil neste caso • Isole também as partes inclinadas do telhado, debaixo do pavimento do sótão
	IT	• Assicurati che il pavimento rimanga calpestabile • Il pavimento sarà sollevato dal materiale isolante • A causa della mancanza di spazio, l'isolamento senza soluzione di continuità è spesso difficile in questo caso • Isola anche le parti inclinate del tetto, sotto il pavimento della soffitta
	SP	• Asegúrate de que el suelo siga siendo transitable • Tu suelo se elevará con el material aislante • Debido a la falta de espacio, el aislamiento continuo es a menudo difícil en este caso • También aísla las partes inclinadas de la cubierta, debajo del suelo del ático
Applicable typology		Single-family houses

Measure title: Combine with a green roof

PT: Telhados verdes

IT: Combinare con un Tetto Verde

SP: Combinar con una Cubierta Verde

Measure description	EN	Consider installing a green roof . This can double the lifespan of the roof finish and keep the space underneath the roof cooler in summer, reducing the cooling needs by up to 20%. Moreover, your green roof will keep the city cooler and the streets drier during heavy showers (see Water and Green section for more information).
	PT	Considere a instalação de uma cobertura verde no seu telhado. Isto pode duplicar a vida útil do acabamento do telhado e manter o espaço por baixo mais fresco no verão, reduzindo as necessidades de arrefecimento em até 20%. Além disso, o seu telhado verde manterá a cidade mais fresca e as ruas mais secas durante aguaceiros fortes. No entanto, tenha em atenção que isto altera drasticamente a aparência do telhado e, atualmente, não é permitido em zonas com valor patrimonial histórico (ver secção Água e vegetação para mais informações).
	IT	Considera l'installazione di un tetto verde. Questo può raddoppiare la durata della finitura del tetto e mantenere lo spazio sotto il tetto più fresco in estate, riducendo le esigenze di raffreddamento fino al 20%. Inoltre, il tuo tetto verde contribuirà a mantenere la città più fresca e le strade più asciutte durante le forti piogge (vedi la sezione Acqua e Verde per ulteriori informazioni).
	SP	Considera la instalación de una cubierta verde. Esto puede duplicar la vida útil del acabado del techo y mantener el espacio debajo de la cubierta más fresco en verano, reduciendo las necesidades de refrigeración hasta

		en un 20%. Además, tu cubierta verde ayudará a mantener la ciudad más fresca y las calles más secas durante las lluvias intensas (consulta la sección de Agua y Verde para más información).
Applicable typology	Single-family houses	

Measure title: Reflecting foil

PT: Película refletora

IT: Pellicola Termoriflettente

SP: Película Reflectante

Measure description	EN	Instead of a conventional insulation material, you can apply two or more layers of heat-reflecting film to the inside of the roof. The film is finished with plasterboard sheets on wooden slats or metal profiles. The price of this thin film with aluminium is estimated between 2 and 12 euros/m ² . This film is also available with a plasterboard finish as a ready-to-install set, allowing for a thickness equivalent to a traditional insulation material. The installation of films is only possible if no part of the roof with historical value is affected.
	PT	Em vez de um material de isolamento convencional, pode aplicar duas ou mais camadas de película refletora de calor no interior do telhado. A película é finalizada com placas de gesso cartonado em ripas de madeira ou perfis metálicos. O preço desta película fina com alumínio está estimado entre 2 e 12 euros/m ² . Esta película também está disponível com um acabamento em gesso cartonado como um conjunto preparado para instalação, permitindo obter uma espessura equivalente a um material de isolamento tradicional. A instalação de películas só é possível se não for afetada qualquer parte do telhado com valor histórico.
	IT	Invece di un materiale isolante convenzionale, puoi applicare due o più strati di pellicola termoriflettente all'interno del tetto. La pellicola è completata con lastre di cartongesso su listelli di legno o profili metallici. Il prezzo di questa pellicola sottile con alluminio è stimato tra 2 e 12 euro/m ² . Questa pellicola è disponibile anche con finitura in cartongesso come un kit pronto all'uso, permettendo uno spessore equivalente a un materiale isolante tradizionale. L'installazione delle pellicole è possibile solo se nessuna parte del tetto con valore storico è coinvolta.
	SP	En lugar de un material aislante convencional, puedes aplicar dos o más capas de película reflectante al calor en el interior de la cubierta. La película se completa con paneles de yeso sobre listones de madera o perfiles metálicos. El precio de esta película delgada con aluminio se estima entre 2 y 12 euros/m ² . Esta película también está disponible con acabado en paneles de yeso como un kit listo para instalar, permitiendo un grosor equivalente al de un material aislante tradicional. La instalación de las películas solo es posible si no se afecta ninguna parte de la cubierta de valor histórico.
Applicable typology	Single-family houses	

Measure title: Cooling roof covering

PT: Telhados brancos

IT: Rivestimento refrigerante per il Tetto

SP: Recubrimiento Refrigerante para Cubierta

Measure description	EN	Black roofs absorb a lot of light, which causes the roof and the spaces underneath to heat up. It also leads to heat stress in cities. This problem can easily be solved with cooling roof covering. The white color reflects the sunlight and limits the heating of the building. Keep in mind, however, that this changes the appearance of the roof and makes pollution more visible.
	PT	Os telhados com telhas de cerâmica absorvem muita luz e calor, o que faz com que o telhado e os espaços por baixo aqueçam bastante. Isto também conduz ao efeito de ilha de calor em cidades. Este problema pode ser facilmente resolvido com a aplicação de uma cobertura branca no telhado. A cor branca reflete a luz do sol e limita o aquecimento do edifício. No entanto, tenha em atenção que isto altera drasticamente a aparência do telhado, atualmente não é permitido em zonas com valor histórico e torna a poluição mais visível.
	IT	I tetti neri assorbono molta luce e calore, il che fa scaldare il tetto e gli spazi sottostanti. Questo porta anche a stress da calore nelle città. Questo problema può essere facilmente risolto con un rivestimento refrigerante per il tetto. Il colore bianco riflette la luce solare e limita il riscaldamento dell'edificio. Tieni presente, tuttavia, che questo cambia l'aspetto del tetto e rende più visibile l'inquinamento.
	SP	Las cubiertas negras absorben mucha luz y calor, lo que hace que el techo y los espacios debajo se calienten. Esto también conduce al estrés térmico en las ciudades. Este problema se puede resolver fácilmente con un recubrimiento refrigerante de cubierta. El color blanco refleja la luz solar y limita el calentamiento del edificio. Sin embargo, ten en cuenta que esto cambia la apariencia de la cubierta y hace que la contaminación sea más visible.
Applicable typology		Single-family houses

Floor insulation

Measure title: Ground floor underside insulation

PT: Isolamento do piso térreo por baixo

IT: Isolamento del Lato Inferiore del pavimento del Piano Terra

SP: Aislamiento por debajo del Suelo de Planta Baja

Measure description	EN	If your building has a basement or crawl space higher than 35-50 cm, it is possible to insulate the ground floor from below. From the crawl space or basement, the insulation material is applied under the floor, for example between the wooden beams. This saves energy, provides more comfort and can be applied without modifications to the existing floor. If there is water in the crawl space or basement, this needs to be taken care of first. In addition, always ensure that there is sufficient ventilation in the
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		crawl space or basement so that moisture can always be removed. Therefore, always seek proper advice from a professional company.
	PT	Se a sua casa antiga tiver um espaço debaixo do pavimento superior a 35-50 cm de altura, é possível isolar o piso térreo a partir de baixo. Neste espaço, o material de isolamento é aplicado por baixo do pavimento, por exemplo, entre as vigas de madeira. Isto permite poupar energia, proporciona mais conforto e pode ser aplicado sem modificações no pavimento existente. Assegure-se sempre de que existe ventilação suficiente na cave ou no espaço por debaixo do pavimento, para que a humidade possa ser sempre removida. Deve sempre obter aconselhamento junto de uma empresa profissional. Os materiais recomendados incluem poliestireno extrudido (XPS) e lã mineral.
	IT	Se il tuo edificio ha un seminterrato o un vespaio alto più di 35-50 cm, è possibile isolare il piano terra dal basso. Dal vespaio o dal seminterrato, il materiale isolante viene applicato sotto il pavimento, ad esempio tra le travi di legno. Questo consente di risparmiare energia, aumentare il comfort e può essere applicato senza modificare il pavimento esistente. Se c'è acqua nel vespaio o nel seminterrato, è necessario risolvere questo problema prima. Inoltre, assicurati sempre che ci sia una ventilazione adeguata nel vespaio o nel seminterrato in modo che l'umidità possa essere sempre rimossa. Pertanto, cerca sempre il consulto di un professionista.
	SP	Si tu edificio tiene un sótano o un semisótano de más de 35-50 cm de altura, es posible aislar el suelo por debajo. Desde el semisótano o el sótano, el material aislante se aplica debajo del suelo, por ejemplo, entre las vigas de madera. Esto ahorra energía, proporciona más comodidad y se puede aplicar sin modificaciones al suelo existente. Si hay agua en el semisótano o en el sótano, primero debes resolver este problema. Además, asegúrate de que haya una ventilación adecuada en el semisótano o en el sótano para que la humedad pueda ser eliminada. Por lo tanto, siempre busca el consejo adecuado de una empresa profesional.
Advantages	EN	- Increases the comfort of the building - The existing floor is retained - Fairly easy to implement
	PT	- Aumenta o conforto do edifício - O piso existente é mantido - Bastante fácil de implementar
	IT	- Aumenta il comfort dell'edificio - Il pavimento esistente viene mantenuto - Relativamente facile da implementare
	SP	- Aumenta el confort del edificio - Se mantiene el suelo existente - Relativamente fácil de implementar
Point of attention	EN	- Ensure adequate ventilation of the crawl space - See if the entire ground floor has a fully accessible crawl space - The crawl space should be at least 35-50 cm high

		• First solve existing moisture problems or water in the crawl space before you start insulating • Floor insulation is a requirement for underfloor heating • Use a bottom valve to prevent moisture transport from the bottom to the building
	PT	• Garanta ventilação adequada da cave • Verifique se todo o pavimento é acessível por baixo • A cave tem de ter um acesso com pelo menos 35-50 cm de altura • Primeiro resolva quaisquer problemas de humidade ou de água nas fundações antes de começar o isolamento • É necessário isolar o pavimento antes de colocar aquecimento de pavimento radiante • Use uma válvula inferior para evitar o transporte de humidade da parte inferior para o edifício
	IT	• Assicurate di avere una ventilazione adeguata nel vespaio • Verifica che l'intero piano terra abbia un vespaio completamente accessibile • Il vespaio dovrebbe essere alto almeno 35-50 cm • Risolvi prima i problemi di umidità esistenti o la presenza di acqua nel vespaio prima di iniziare l'isolamento • L'isolamento del pavimento è un requisito per il riscaldamento a pavimento • Usa una valvola inferiore per prevenire il trasporto dell'umidità dal basso verso l'edificio
	SP	• Asegúrate de una ventilación adecuada del semisótano • Verifica que todo el suelo tenga un espacio de registro completamente accesible • El espacio de registro debe tener al menos 35-50 cm de altura • Primero resuelve los problemas de humedad existentes o el agua en el espacio de registro antes de comenzar a aislar • El aislamiento del suelo es un requisito para la calefacción por suelo radiante • Usa una válvula inferior para prevenir el transporte de humedad desde el suelo al edificio
Applicable typology		Single-family houses

Measure title: Ground floor topside insulation

PT: Isolamento do piso térreo por cima

IT: Isolamento del Lato Superiore del pavimento del Piano Terra

SP: Aislamiento del Suelo por la Parte Superior

Measure description	EN	If the ground floor is not accessible from below, the floor can be insulated from above, which improves the comfort of the building. To apply floor insulation, the existing floor must be removed. It is therefore advisable to have this done if the floor is to be replaced anyway or if you are switching to underfloor heating. There are systems in which floor
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		insulation and underfloor heating are combined. Keep in mind that the floor will be 6 to 10 cm higher due to the insulation, this has consequences for connections with doors and stairs. Therefore, seek proper advice and prevent historical parts from being damaged. On monumental floors, it must be possible to remove the floor insulation later and return the floor to its original condition.
	PT	Se o piso térreo não for acessível por baixo, o piso pode ser isolado a partir de cima, o que melhora o conforto do edifício. Para aplicar o isolamento do piso, o pavimento existente tem de ser removido. Como tal, é aconselhável que isto seja feito se for necessário substituir o pavimento de qualquer forma ou se estiver a mudar para um pavimento radiante com aquecimento por baixo. Existem sistemas em que o isolamento do piso e o aquecimento por baixo do piso são combinados. Tenha em atenção que o piso será 6 cm a 10 cm mais alto devido ao isolamento, o que tem consequências nas ligações com portas e escadas. Assim, é importante obter aconselhamento e impedir quaisquer danos às partes do edifício com valor histórico. Os materiais recomendados incluem poliestireno extrudido (XPS) e lã mineral.
	IT	Se il piano terra non è accessibile da sotto, il pavimento può essere isolato dall'alto, migliorando il comfort dell'edificio. Per applicare l'isolamento del pavimento, il pavimento esistente deve essere rimosso. Pertanto, è consigliabile farlo se il pavimento deve comunque essere sostituito o se si sta passando al riscaldamento a pavimento. Esistono sistemi in cui l'isolamento del pavimento e il riscaldamento a pavimento sono combinati. Tieni presente che il pavimento sarà più alto di 6-10 cm a causa dell'isolamento, il che ha conseguenze per i collegamenti con porte e scale. Pertanto, cerca un consulto adeguato e previeni danni alle parti storiche. Su pavimenti storici, deve essere possibile rimuovere successivamente l'isolamento del pavimento e riportare il pavimento alle sue condizioni originali.
	SP	Si el suelo no es accesible desde abajo, se puede aislar desde arriba, lo que mejora el confort del edificio. Para aplicar el aislamiento del suelo, el suelo existente debe ser retirado. Por lo tanto, es aconsejable hacerlo si el suelo debe ser reemplazado de todos modos o si estás cambiando a calefacción por suelo radiante. Existen sistemas en los que el aislamiento del suelo y la calefacción por suelo radiante se combinan. Ten en cuenta que el suelo estará de 6 a 10 cm más alto debido al aislamiento, lo que tiene consecuencias para las conexiones con puertas y escaleras. Por lo tanto, busca el consejo adecuado y prevé daños a las partes históricas. En suelos monumentales, debe ser posible retirar posteriormente el aislamiento del suelo y devolver el suelo a su estado original.
Advantages	EN	• Ensures a pleasant feeling and warm feet • Also suitable for floors without crawl space • This is a good combination with underfloor heating
	PT	• Garante uma sensação de conforto e pés quentes • Também é adequada para pavimentos sem espaço inferior

		• Esta medida combina bem com o aquecimento de pavimento radiante
	IT	• Garantisce una sensazione piacevole e piedi caldi • Adatto anche per pavimenti senza vespaio • Ottima combinazione con riscaldamento a pavimento
	SP	• Asegura una sensación agradable y pies cálidos • También adecuado para suelos sin espacio registrable • Buena combinación con calefacción por suelo radiante
Point of attention	EN	• Your floor will be raised by the insulation material • Only possible if no historically valuable parts are affected • This is a drastic measure • This is a relatively costly investment • The face of the floor changes due to this measure
	PT	• A altura do seu pavimento vai aumentar devido ao material de isolamento • Só é possível se nenhuma parte histórica for afetada • Esta medida é drástica • Este investimento é relativamente caro • O aspeto do pavimento é modificado devido a esta medida
	IT	• Il pavimento risulterà sollevato a vaua del materiale isolante • Possibile solo se non sono coinvolte parti storicamente preziose • Misura drastica • Investimento relativamente costoso • L'aspetto del pavimento cambia a causa di questa misura
	SP	• El suelo se elevará por el espesor del material aislante • Solo posible si no se ven afectadas partes históricamente valiosas • Medida drástica • Inversión relativamente costosa • El aspecto del suelo cambia debido a esta medida
Applicable typology		Single-family houses

Measure title: Soil insulation

PT: Isolamento das fundações

IT: Isolamento del Suolo

SP: Aislamiento del Suelo

Measure description	EN	Is the crawl space less than 35 cm high and poorly accessible? And further excavation is not permitted or not feasible, floor insulation is often not an option, but soil insulation is. In this case, the insulation material is sprayed into the crawl space, creating an insulating layer at the bottom of the crawl space. Various materials are available, including shells and EPS granules. Seek proper advice regarding which material best suits the conditions of your crawl space. Floor insulation helps against soil moisture, which keeps the crawl space and the living space above it drier. Dry air heats up faster than damp air, which reduces the heat demand.
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		However, the insulating effect of soil insulation is slightly less compared to floor insulation.
	PT	A sua cave é pouco acessível? Se a escavação adicional não for permitida ou não for viável, o isolamento do pavimento por baixo muitas vezes não é uma opção; no entanto, tem sempre a possibilidade de proceder ao isolamento das fundações. Neste caso, o material isolante é pulverizado no alçapão, criando uma camada isolante no fundo do alçapão. Estão disponíveis vários materiais, incluindo coberturas e grânulos em poliestireno expandido (EPS). Obtenha aconselhamento adequado acerca dos materiais que melhor se adaptam às condições da sua cave. O isolamento ajuda a prevenir a humidade das fundações, o que ajuda a manter o alçapão e a área habitacional acima deste mais secos. O ar seco aquece mais rapidamente do que o ar húmido, o que reduz igualmente a necessidade de aquecimento. No entanto, o efeito isolante do isolamento das fundações é ligeiramente menor em comparação com o isolamento do pavimento.
	IT	Lo spazio di passaggio è meno di 35 cm di altezza e poco accessibile? E ulteriori scavi non sono permessi o fattibili, l'isolamento del pavimento è spesso un'opzione non praticabile, ma l'isolamento del suolo sì. In questo caso, il materiale isolante viene spruzzato nel vespaio, creando uno strato isolante sul fondo del vespaio. Sono disponibili vari materiali, tra cui gusci e granuli di EPS. Cerca un consulto adeguato riguardo al materiale che meglio si adatta alle condizioni del tuo vespaio. L'isolamento del pavimento aiuta contro l'umidità del suolo, mantenendo il vespaio e lo spazio abitativo sopra di esso più asciutto. L'aria secca si riscalda più velocemente dell'aria umida, riducendo la domanda di calore. Tuttavia, l'effetto isolante dell'isolamento del suolo è leggermente inferiore rispetto all'isolamento del pavimento.
	SP	Si el espacio de registro tiene menos de 35 cm de altura y es poco accesible, y no se permite o no es factible realizar una excavación adicional, el aislamiento del suelo suele no ser una opción, pero el aislamiento del suelo sí lo es. En este caso, el material aislante se rocía en el espacio de registro, creando una capa aislante en el fondo del espacio de este. Hay varios materiales disponibles, incluidos conchas y gránulos de EPS. Busca el consejo adecuado sobre qué material se adapta mejor a las condiciones de tu espacio de registro. El aislamiento del suelo ayuda contra la humedad del suelo, manteniendo el espacio de registro y el espacio habitable arriba más secos. El aire seco se calienta más rápido que el aire húmedo, lo que reduce la demanda de calor. Sin embargo, el efecto aislante del aislamiento del suelo por la parte exterior es ligeramente menor en comparación con el aislamiento del suelo por la parte interior.
Advantages	EN	• Also suitable for low crawl spaces of less than 35 cm • Good solution against damp crawl spaces • Fairly easy to implement
	PT	• Também é adequada para caves ou fundações inacessíveis com menos de 35 cm

		- Boa solução para caves apertadas e húmidas - Bastante fácil de implementar
	IT	- Adatto anche per vespai bassi inferiori a 35 cm - Buona soluzione contro i vespai umidi - Relativamente facile da implementare
	SP	- También adecuado para espacios de registro bajos de menos de 35 cm - Buena solución contra espacios de registro húmedos - Relativamente fácil de implementar
Point of attention	EN	- The crawl space should be at least 35-50 cm high - Let an expert advise you well in advance - Ensure adequate ventilation of the crawl space - Insulating your building is always work for a professional company - First solve existing moisture problems or water in the crawl space before you start insulating
	PT	- A cave tem de ter um acesso com pelo menos 35-50 cm de altura - Procure aconselhamento de um especialista antes de proceder à intervenção - Garanta ventilação adequada da cave - O isolamento de um edifício é sempre trabalho para uma empresa profissional - Primeiro resolva quaisquer problemas de humidade ou de água nas fundações antes de começar o isolamento
	IT	- Il vespaio dovrebbe essere alto almeno 35-50 cm - Consulta un esperto in anticipo - Assicurati di avere una ventilazione adeguata del vespaio - L'isolamento del tuo edificio è sempre lavoro per un'azienda professionale - Risolvi prima i problemi di umidità esistenti o l'acqua nel vespaio prima di iniziare l'isolamento
	SP	- El espacio de registro debe tener al menos 35-50 cm de altura - Consulta a un experto con antelación - Asegúrate de una ventilación adecuada del espacio de registro - Aislar tu edificio siempre es trabajo para una empresa profesional - Primero resuelve los problemas de humedad existentes o el agua en el espacio de registro antes de comenzar a aislar
Applicable typology		Single-family houses

Measure title: Floor replacement

PT: Substituição do pavimento

IT: Sostituzione del Pavimento

SP: Reemplazo del Suelo

Measure description	EN	If the floor of your property is in very poor condition and is not historically valuable, it may be interesting to investigate whether the ground floor
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		can be replaced by an insulated concrete floor. This will give you a floor with very good insulation value. It is possible to combine the new screed directly with underfloor heating. Comfort will increase considerably and the energy savings are also relatively high.
	PT	Se o piso da sua propriedade estiver em muito mau estado e não tiver valor histórico, pode ser interessante avaliar se o piso térreo pode ser substituído por um piso de betão isolado. Isto dar-lhe-á um pavimento com ótimo valor de isolamento. É possível combinar a nova betonilha diretamente com o aquecimento por baixo do pavimento. O conforto irá aumentar consideravelmente e a poupança de energia também será relativamente alta.
	IT	Se il pavimento della tua proprietà è in cattive condizioni e non è di valore storico, potrebbe essere interessante indagare se il pavimento del piano terra può essere sostituito con un pavimento in calcestruzzo isolato. Questo ti darà un pavimento con un ottimo valore isolante. È possibile combinare il nuovo massetto direttamente con il riscaldamento a pavimento. Il comfort aumenterà notevolmente e anche i risparmi energetici saranno relativamente elevati.
	SP	Si el suelo de tu propiedad está en muy mal estado y no es históricamente valioso, podría ser interesante investigar si el suelo del piso puede ser reemplazado por un suelo de hormigón con aislamiento. Esto te proporcionará un suelo con un muy buen valor de aislamiento. Es posible combinar el nuevo solado directamente con calefacción por suelo radiante. El confort aumentará considerablemente y los ahorros energéticos también serán relativamente altos.
Advantages	EN	• Also suitable for floors without crawl space • This is a good combination with underfloor heating • Increases the comfort of the building • It is possible to achieve very good insulation value
	PT	• Também é adequada para pavimentos sem espaço inferior • Esta medida combina bem com o aquecimento de pavimento radiante • Aumenta o conforto do edifício • É possível atingir um nível de isolamento muito bom
	IT	• Adatto anche per pavimenti senza vespaio • Ottima combinazione con riscaldamento a pavimento • Aumenta il comfort dell'edificio • È possibile ottenere un ottimo valore di isolamento
	SP	• También adecuado para suelos sin espacio de registro • Buena combinación con calefacción por suelo radiante • Aumenta el confort del edificio • Es posible lograr un muy buen valor de aislamiento
Point of attention	EN	• Only suitable for a major renovation • Only possible if no historically valuable parts are affected • This is always work for a professional company
	PT	• Apenas adequado para grandes renovações

		• Só é possível se nenhuma parte histórica for afetada • Esta é sempre uma tarefa para uma empresa profissional
	IT	• Adatto solo per una ristrutturazione importante • Possibile solo se non sono coinvolte parti storicamente preziose • Questo è sempre lavoro per un'azienda professionale
	SP	• Solo adecuado para una renovación importante • Solo posible si no se ven afectadas partes históricamente valiosas • Esto siempre es trabajo para una empresa profesional
Applicable typology		Single-family houses

Façade insulation

Measure title: Exterior wall insulation

PT: Isolamento de fachada pelo exterior

IT: Isolamento delle pareti esterne

SP: Aislamiento de la Muro de Fachada por el Exterior

Measure description	EN	With exterior wall insulation, insulation material is installed against the existing masonry or plaster and finished with new plaster or stone strips. The (wooden) construction of the building is 'wrapped', as it were. This form of façade insulation is not always desirable and, in the case of historical buildings, it is usually not permitted because it changes the façade considerably. Sometimes it can be applied to the rear and side walls, which are not visible from the public road. The advantage is that no space is lost inside and a historically valuable construction remains visible. With façade insulation on the outside, the risk of moisture problems is nil. And with good detailing at window frames and eaves, thermal bridges and leaks are prevented.
	PT	No isolamento da fachada a partir do exterior, o material de isolamento é instalado contra a alvenaria ou o estuque existente e finalizado com novos estuques ou tiras de pedra. Esta forma de isolamento da fachada nem sempre é desejável e, no caso de edifícios antigos com valor histórico, muitas vezes não é permitida uma vez que altera consideravelmente a fachada. Em edifícios com azulejos e com outras características exteriores como cantarias da pedra, é preciso garantir que estas não são afetadas pelos trabalhos de reabilitação. Por vezes, é possível aplicar esta solução nas paredes traseiras e laterais, que não são visíveis a partir da via pública. A vantagem é que não se perde espaço no interior. Com o isolamento da fachada a partir do exterior, o risco de problemas de humidade é nulo. E com cuidado especial na calafetagem dos caixilhos e nos parapeitos das janelas, irá evitar pontes térmicas e fugas. Os materiais de isolamento recomendados incluem poliestireno expandido (EPS), lã de rocha vulcânica e aglomerado de cortiça, podendo ser aplicados em fachadas ventiladas ou em sistema ETICS.
	IT	Con l'isolamento delle pareti esterne, il materiale isolante viene installato sulla muratura esistente e rifinito con nuovo intonaco. La struttura dell'edificio viene per così dire 'avvolta'. Questa forma di isolamento della

		facciata non è sempre desiderabile e, nel caso di edifici storici, solitamente non è permessa perché cambia notevolmente l'aspetto della facciata. A volte può essere applicata ai muri posteriori e laterali, che non sono visibili dalla strada pubblica. Il vantaggio è che non si perde spazio all'interno e una costruzione storicamente preziosa rimane visibile. Con l'isolamento della facciata all'esterno, il rischio di problemi di umidità è nullo. E con una buona progettazione dei telai delle finestre e delle grondaie, si prevengono i ponti termici e le perdite di calore.
	SP	Con el aislamiento de la fachada por el exterior, el material aislante se instala contra la mampostería o el enlucido existente y se termina con nuevo enlucido o tiras de piedra. La estructura (de madera) del edificio se 'envuelve', por así decirlo. Esta forma de aislamiento de fachada no siempre es deseable y, en el caso de edificios históricos, generalmente no está permitida porque cambia considerablemente la apariencia de la fachada. A veces se puede aplicar en las muros traseros y laterales, que no son visibles desde la vía pública. La ventaja es que no se pierde espacio en el interior y una construcción históricamente valiosa permanece visible. Con el aislamiento de fachada por el exterior, el riesgo de problemas de humedad es nulo. Y con una buena planificación en los marcos de ventanas y aleros, se previenen los puentes térmicos y las filtraciones.
Advantages	EN	- Increases the comfort of the building - No loss of space on the inside - The interior can be retained - It is possible to achieve very good insulation value
	PT	- Aumenta o conforto do edifício - Não há perda de espaço no interior - O interior pode permanecer - É possível atingir um nível de isolamento muito bom
	IT	- Aumenta il comfort dell'edificio - Nessuna perdita di spazio all'interno - L'interno può essere mantenuto - È possibile ottenere un ottimo valore di isolamento
	SP	- Aumenta el confort del edificio - No se pierde espacio en el interior - Se puede mantener el interior - Es posible obtener un excelente valor de aislamiento
Point of attention	EN	- This is a drastic measure - Never apply insulation both inside and outside because of the risk of moisture problems - The face of the façade changes - Insulating your building is always work for a professional company - It is advisable to consult a monument advisor of your municipality in advance
	PT	Esta medida é drástica

		- Nunca aplique isolamento simultaneamente no interior e exterior, devido ao risco de problemas de humidade - O aspeto da fachada é modificado - O isolamento de um edifício deve ser efetuado por uma empresa profissional - É recomendado que consulte o Município antes de proceder à intervenção
	IT	- Misura drastica - Non applicare mai l'isolamento sia all'interno che all'esterno a causa del rischio di problemi di umidità - L'aspetto della facciata cambia - Isolare il tuo edificio è sempre lavoro per un'azienda professionale - È consigliabile consultare in anticipo un consigliere sugli edifici storici del tuo comune
	SP	- Medida drástica - Nunca aplicar aislamiento tanto en el interior como en el exterior debido al riesgo de problemas de humedad - La apariencia de la fachada cambia - Aislar tu edificio siempre es trabajo para una empresa profesional - Es recomendable consultar con anticipación a un asesor de monumentos de tu municipio
Applicable typology		Single-family houses
Final Energy Reduction		Only heating: $(\{wall\ area\} * 0,0231 + 1,6271) * \{number\ of\ hours\} * 1,69 * 89 * 0,32$ Heating and cooling: $(\{wall\ area\} * 0,0231 + 0,6271) * (\{number\ of\ hours\ winter\} * 2,33 * 0,8 * 89 * 0,32 + \{number\ of\ hours\ summer\} * 2,33 * 0,8 * 94 * 0,32)$
Improvement of thermal comfort		3 stars
Investment estimate		$\{wall\ area\} * 99,07$
Savings estimate		$\{FER\} * \{electricity\ price\}$
GHG Reduction		$\{FER\} * \{electricity\ CO_2\ emissions\}$

Measure title: Interior wall insulation

PT: Isolamento de fachada pelo interior

IT: Isolamento della Pareti Interne

SP: Aislamiento del Muro de Fachada por el Interior

Measure description	EN	Pre-war buildings often do not have a cavity to insulate, but it is possible to insulate the façade on the inside with an insulation wall. With an insulation wall, a second wall is placed on the inside of the façade. The insulation wall consists of a wooden or stainless steel construction with insulation material in between. This measure requires a careful approach at so-called junctions in the façade, such as wooden floor beams that
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		have been incorporated in the façade. By applying insulation material, these are sensitive points for moisture accumulation and problems such as mould and wood rot can occur. This can be prevented by seeking proper advice beforehand and by having the work carried out by a professional company. You will notice a difference in the comfort of your building after your façade has been insulated.
	PT	Os edifícios antigos não têm uma cavidade de isolamento, mas é possível isolar a fachada no interior com uma parede de isolamento. A parede de isolamento consiste numa construção em madeira ou aço inoxidável com material de isolamento no meio. Esta medida requer uma abordagem cuidadosa nas chamadas juntas da parede, como vigas de madeira. Ao aplicar o material isolante, estes são pontos sensíveis à acumulação de humidade e podem ocorrer problemas como o bolor e o apodrecimento da madeira. Isto pode ser evitado ao procurar aconselhamento prévio adequado e ao recorrer a uma empresa profissional para a realização dos trabalhos. Notará uma diferença clara no conforto térmico da sua habitação após a sua fachada ter sido isolada. No entanto, tenha atenção que, ao isolar a parede pelo interior, estará a ocupar 10-15 cm de espaço interior com o isolamento. Os materiais de isolamento recomendados incluem poliestireno expandido (EPS), lã mineral e placa de aglomerado de cortiça.
	IT	Gli edifici pre-bellici spesso non hanno una cavità interna alle pareti da isolare, ma è possibile isolare la facciata all'interno con una parete isolante. Per farlo, viene posizionata una seconda parete all'interno composta da una struttura in legno o acciaio inox con materiale isolante tra di essa. Questa misura richiede un approccio accurato ai giunti nella facciata, come le travi. Applicando il materiale isolante, questi sono punti sensibili per l'accumulo di umidità e possono verificarsi problemi come muffa e marciume del legno, se presente. Questo può essere evitato cercando un buon consulto in anticipo e facendo eseguire i lavori da un'azienda professionale. Noterai una differenza nel comfort del tuo edificio dopo che la tua facciata è stata isolata.
	SP	Los edificios anteriores a la guerra a menudo no tienen una cámara de aire para aislar, pero es posible aislar la fachada por el interior con una pared aislante. Con una pared aislante, se coloca una segunda pared por el interior de la fachada. La pared aislante consta de una estructura de madera o acero inoxidable con material aislante en el medio. Esta medida requiere un enfoque cuidadoso en los llamados puntos de unión en la fachada, como las vigas de madera incorporadas en la fachada. Al aplicar el material aislante, estos son puntos sensibles para la acumulación de humedad y pueden ocurrir problemas como moho y podredumbre de la madera. Esto se puede evitar buscando un buen consejo de antemano y realizando el trabajo con una empresa profesional. Notarás una diferencia en el confort de tu edificio después de que tu fachada haya sido aislada.
Advantages	EN	- Increases the comfort of the building - The face of your building will not change

		• It is possible to achieve very good insulation value • Customisation is possible • Installations and pipes can be integrated
	PT	• Aumenta o conforto do edifício • A fachada do edifício não vai mudar • É possível atingir um nível de isolamento muito bom • É possível uma customização • A instalação e os tubos podem ser integrados
	IT	• Aumenta il comfort dell'edificio • L'aspetto del tuo edificio non cambia • È possibile ottenere un ottimo valore di isolamento • È possibile una personalizzazione • Gli impianti e le tubature possono essere integrati
	SP	• Aumenta el confort del edificio • La apariencia de tu edificio no cambia • Es posible obtener un excelente valor de aislamiento • Se puede personalizar • Las instalaciones y tuberías se pueden integrar
Point of attention	EN	• Requires specific detailing and construction • Only possible if no historically valuable parts are affected • Loss of space on the inside • Radiators and sockets have to be moved or modified in many cases • Do not apply vapour-tight insulation walls if there is a vapour-tight paint or finishing coat on the inside or outside. • Insulate the most frequently used rooms • Insulating your building is always work for a professional company
	PT	• Requer detalhes e construção mais específicos • Só é possível se nenhuma parte histórica for afetada • Perda de espaço no interior • Em muitos casos, os radiadores e tomadas têm de ser movidas ou modificadas • Não aplique isolamentos em vácuo se existir tinta ou acabamento em vácuo no interior ou exterior. • Isole as divisões que usa mais frequentemente • O isolamento de um edifício é sempre trabalho para uma empresa profissional
	IT	• Richiede dettagli e costruzioni specifici • Solo possibile se non sono coinvolte parti storicamente preziose • Perdita di spazio all'interno • I radiatori e le prese devono essere spostati o modificati in molti casi • Non applicare pareti isolanti a prova di vapore, se sono già presenti vernici o rivestimenti a prova di vapore all'interno o all'esterno

		- Isola le stanze più frequentemente utilizzate - Isolare il tuo edificio è sempre un lavoro per un'azienda professionale
	SP	- Requiere detalles y construcciones específicos - Solo posible si no se ven afectadas partes históricamente valiosas - Pérdida de espacio en el interior - Los radiadores y enchufes deben ser movidos o modificados en muchos casos - No aplicar paredes aislantes a prueba de vapor si hay pintura o revestimientos a prueba de vapor en el interior o exterior - Aísla las habitaciones más frecuentemente utilizadas - Aislar tu edificio siempre es trabajo para una empresa profesional
Applicable typology	Single-family houses, condominium households and energy-poor households	
Final Energy Reduction	Only heating: $(\{wall\ area\} * 0,0231 + 1,6271) * \{number\ of\ hours\} * 1,69 * 89 * 0,37$ Heating and cooling: $(\{wall\ area\} * 0,0231 + 0,6271) * (\{number\ of\ hours\ winter\} * 2,33 * 0,8 * 89 * 0,37 + \{number\ of\ hours\ summer\} * 2,33 * 0,8 * 94 * 0,37)$	
Improvement of thermal comfort	3 stars	
Investment estimate	$\{wall\ area\} * 99,07$	
Savings estimate	$\{FER\} * \{electricity\ price\}$	
GHG Reduction	$\{FER\} * \{electricity\ CO_2\ emissions\}$	

Measure title: Insulate thick walls from 40 cm

PT: Isolar paredes com espessura superior a 40 cm

IT: Isolamento di Pareti con spessore superiore a 40 cm

SP: Aislamiento de Muros Gruesos a partir de 40 cm de espesor

Measure description	EN	It is possible to insulate a solid exterior wall (40 cm thick). This saves energy and increases comfort inside. Insulating these solid walls requires a specific approach. The walls are affected by moisture from the outside due to precipitation and moisture from inside by e.g. people, appliances and bathrooms. Some of the moisture in the wall evaporates to the outside, but due to the thickness of the wall, part will dry by evaporation to the inside. It is important that this moisture can still evaporate after the insulation. Therefore, have the insulation carefully applied by a specialist. And choose a breathable insulation material that can absorb, retain and release moisture. We call this type of material surface active.
	PT	Em casas antigas, construídas de alvenaria de pedra ou taipa, algumas paredes exteriores podem apresentar uma espessura superior a 40 cm. Isolar estas fachadas sólidas é possível e permite poupar energia e aumentar o conforto no interior. No entanto, o isolamento destas paredes requer uma abordagem específica. As paredes são afetadas pela

		humidade do exterior devido à precipitação e pela humidade do interior, por exemplo, devida a pessoas e equipamentos. Parte da humidade acaba por evaporar para o exterior, mas, devido à espessura da parede, uma parte secará por evaporação no interior. É importante que esta humidade possa continuar a evaporar após o isolamento. Como tal, é importante que o isolamento seja cuidadosamente aplicado por um especialista. Também deve optar por um material de isolamento mais poroso que possa absorver, reter e libertar humidade.
	IT	È possibile isolare una parete esterna spessa (almeno 40 cm di spessore). Questo consente di risparmiare energia e aumentare il comfort interno. L'isolamento di queste pareti richiede un approccio specifico. Le pareti sono influenzate dall'umidità esterna dovuta alle precipitazioni e dall'umidità interna, ad esempio dalle persone, dagli elettrodomestici e dai bagni. Parte dell'umidità nella parete evapora verso l'esterno, ma a causa dello spessore della parete, una parte si asciuga per evaporazione verso l'interno. È importante che quest'umidità possa ancora evaporare dopo l'isolamento. Pertanto, fai applicare l'isolamento con attenzione da uno specialista e scegli un materiale isolante traspirante che possa assorbire, trattenere e rilasciare umidità.
	SP	Es posible aislar un muro por el exterior (a partir de 40 cm de espesor). Esto ahorra energía y aumenta el confort interior. Aislar estas muros requiere un enfoque específico. Los muros están afectados por la humedad del exterior debido a las precipitaciones y la humedad del interior, por ejemplo, de las personas, los electrodomésticos y los baños. Parte de la humedad en el muro se evapora hacia el exterior, pero debido al espesor del muro, parte se seca por evaporación hacia el interior. Es importante que esta humedad aún pueda evaporarse después del aislamiento. Por lo tanto, haz que el aislamiento sea aplicado cuidadosamente por un especialista y elige un material aislante transpirable que pueda absorber, retener y liberar humedad. Este tipo de material se llama tensioactivo.
Advantages	EN	- Increases the comfort of the building - The face of your building will not change - Customisation is possible - Installations and pipes can be integrated
	PT	- Aumenta o conforto do edifício - A fachada do edifício não vai mudar - É possível uma customização - A instalação e os tubos podem ser integrados
	IT	- Aumenta il comfort dell'edificio - L'aspetto del tuo edificio non cambia - È possibile la personalizzazione - Gli impianti e le tubature possono essere integrati
	SP	- Aumenta el confort del edificio - La apariencia de tu edificio no cambia - Se puede personalizar

		Las instalaciones y tuberías se pueden integrar
Point of attention	EN	- Requires specific detailing and construction - Radiators and sockets have to be moved or modified in many cases - Only possible if no historically valuable parts are affected - Insulate the most frequently used rooms - Insulating your building is always work for a professional company
	PT	- Requer detalhes e construção mais específicos - Em muitos casos, os radiadores e tomadas têm de ser movidas ou modificadas - Só é possível se nenhuma parte histórica for afetada - Isola as divisões que usa mais frequentemente - O isolamento de um edifício é sempre trabalho para uma empresa profissional
	IT	- Richiede dettagli e costruzioni specifici - I radiatori e le prese devono essere spostati o modificati in molti casi - Solo possibile se non sono coinvolte parti storicamente preziose - Isola le stanze più frequentemente utilizzate - Isolare il tuo edificio è sempre un lavoro per un'azienda professionale
	SP	- Requiere detalles y construcciones específicos - Los radiadores y enchufes deben ser movidos o modificados en muchos casos - Solo posible si no se ven afectadas partes históricamente valiosas - Aísla las habitaciones más frecuentemente utilizadas - Aislar tu edificio siempre es trabajo para una empresa profesional
Applicable typology		Single-family houses

Measure title: Insulating with a timber frame construction

PT: Isolamento de fachadas construídas com madeira

IT: Isolamento con Struttura in Legno

SP: Aislamiento con Entramado de Estructura de Madera

Measure description	EN	A wooden façade loses a lot of heat, so it is profitable to provide this façade with insulation material. Because these are wooden façade parts, extra attention is required when detailing and implementing this measure. The best way to insulate also depends on the situation. For example, it is unwise to simply fill a double-walled wooden façade with cavity insulation, because it must be possible to ventilate the wooden façade on the outside to prevent wood rot. Therefore, seek proper advice and always have insulation measures carried out by a professional company.
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	PT	Uma fachada com componentes de madeira perde calor, pelo que compensa aplicar material de isolamento. No entanto, tratando-se de partes da fachada em madeira, é necessária atenção adicional ao preparar e implementar esta medida. A melhor forma de aplicar o isolamento depende da situação. Por exemplo, não é sensato simplesmente encher uma fachada de parede dupla de madeira com isolamento de cavidades, porque tem de ser possível ventilar a fachada no exterior para evitar o apodrecimento da madeira. Assim, é importante obter aconselhamento e recorrer sempre a uma empresa profissional de isolamento para realizar os trabalhos de isolamento.
	IT	Una facciata in legno perde molto calore, quindi è vantaggioso dotare questa facciata di materiale isolante. Poiché si tratta di legno, è necessaria una particolare attenzione nella progettazione e nell'implementazione di questa misura. Il miglior modo per isolare dipende anche dalla specifica situazione. Ad esempio, non è saggio riempire semplicemente una facciata in legno a doppia parete con isolamento da cavità, perché è necessario poter ventilare la facciata in legno all'esterno per prevenire la marcescenza. Pertanto, cerca un buon professionista e fai eseguire sempre le misure di isolamento da un'azienda specializzata.
	SP	Una fachada de madera pierde mucho calor, por lo que es rentable dotar esta fachada con material aislante. Dado que se trata de partes de fachada de madera, se requiere una atención especial en la planificación y ejecución de esta medida. La mejor manera de aislar también depende de la situación. Por ejemplo, no es prudente llenar una fachada de madera de doble hoja con aislamiento, ya que debe ser posible ventilar la fachada de madera en el exterior para evitar la descomposición de la madera. Por lo tanto, busca un buen consejo y siempre realiza las medidas de aislamiento con una empresa profesional.
Advantages	EN	- Increases the comfort of the building - The face of your building will not change - Customisation is possible
	PT	- Aumenta o conforto do edifício - A fachada do edifício não vai mudar - É possível uma customização
	IT	- Aumenta il comfort dell'edificio - L'aspetto del tuo edificio non cambia - È possibile la personalizzazione
	SP	- Aumenta el confort del edificio - La apariencia de tu edificio no cambia - Se puede personalizar
Point of attention	EN	- Insulating your building is always work for a professional company - Let an expert advise you well in advance
	PT	O isolamento de um edifício é sempre trabalho para uma empresa profissional

		• Procure aconselhamento de um especialista antes de proceder à intervenção
	IT	• Isolare il tuo edificio è sempre lavoro per un'azienda specializzata • Fatti consigliare bene da un esperto in anticipo
	SP	• Aislar tu edificio siempre es trabajo para una empresa profesional • Consulta bien con un experto con antelación
Applicable typology		Single-family houses

Measure title: Cavity wall insulation

PT: Isolamento de parede dupla (com câmara)

IT: Isolamento delle Pareti a Cavità

SP: Aislamiento de Muros con Cámara de Aire

Measure description	EN	Cavity walls are relatively rare in historical buildings. If you have a building built from the 1920s onwards, there is a chance that a cavity wall will be present. A cavity wall has an open space – the cavity – between the solid outer and inner wall. This cavity can be filled with insulating material, which is a quick and relatively inexpensive way of insulating. For historical buildings, this requires a careful approach. Have a check carried out to ensure that the cavity is at least 5 cm wide and clean and that there are other connections between the outer and inner wall. After insulating, these connections are considerable thermal bridges and can cause mould formation. This can be prevented by seeking proper advice beforehand and having the cavity wall insulation carried out by a professional company. If the cavity wall is not suitable, consider an insulation wall on the inside of the façade.
	PT	Uma parede com câmara possui um espaço aberto entre a parede externa e interna sólida. Esta cavidade pode ser preenchida com material isolante, que é uma forma rápida e relativamente barata de isolar. Para edifícios históricos, isto requer uma abordagem cuidadosa. Faça uma verificação para garantir que a cavidade tenha pelo menos 5 cm de largura, esteja limpa e que existam outras ligações entre a parede externa e interna. Após o isolamento, essas ligações formam pontes térmicas consideráveis e podem causar formação de mofo. Isto pode ser evitado procurando previamente aconselhamento adequado e fazendo com que o isolamento das paredes seja realizado por uma empresa profissional. Se a parede com câmara não for adequada, considere uma parede de isolamento no interior da fachada.
	IT	Le pareti a cavità sono relativamente rare negli edifici storici. Se hai un edificio costruito dal 1920 in poi, c'è la possibilità che ci sia una parete a cavità. Una parete a cavità ha uno spazio vuoto- la cavità - tra la parete esterna e quella interna. Questa cavità può essere riempita con del materiale isolante, che è un modo rapido e relativamente economico di isolare. Per gli edifici storici, questo richiede un approccio accurato. Fai eseguire un controllo per assicurarti che la cavità sia larga almeno 5 cm e pulita e che ci siano altri collegamenti tra la parete esterna e quella interna. Dopo l'isolamento, questi collegamenti sono ponti termici

		considerevoli e possono causare la formazione di muffa. Questo può essere prevenuto cercando un buon consulto in anticipo e facendo eseguire l'isolamento della parete a cavità da un'azienda specializzata. Se la parete a cavità non è adatta, considera una parete isolante all'interno della facciata.
	SP	Los muros con cámara de aire son relativamente raros en edificios históricos. Si tienes un edificio construido desde 1920 en adelante, hay una posibilidad de que haya un muro con cámara de aire. Un muro con cámara de aire tiene un espacio abierto - la cámara de aire - entre la hoja exterior del muro y la interior. Esta cavidad puede llenarse con material aislante, lo que es un método rápido y relativamente económico de aislamiento. Para edificios históricos, esto requiere un enfoque cuidadoso. Haz realizar una inspección para asegurarte de que la cámara de aire tenga al menos 5 cm de ancho y esté limpia, y que haya otros enlaces entre la pared exterior e interior. Después del aislamiento, estos enlaces son puentes térmicos considerables y pueden causar la formación de moho. Esto se puede prevenir buscando un buen consejo de antemano y realizando el aislamiento de la cámara de aire del muro con una empresa profesional. Si la cámara de aire del muro no es adecuada, considera una pared aislante en el interior de la fachada.
Advantages	EN	- Fairly easy to implement - No loss of space on the inside - The face of your building will not change - Increases the comfort of the building
	IT	- Relativamente facile da implementare - Nessuna perdita di spazio all'interno - L'aspetto del tuo edificio non cambia - Aumenta il comfort dell'edificio
	SP	- Relativamente fácil de implementar - No se pierde espacio en el interior - La apariencia de tu edificio no cambia - Aumenta el confort del edificio
Point of attention	EN	- Have an expert examine the cavity for joints, such as mortar residue, protruding lintels, floors or balconies to prevent thermal bridges and moisture problems - The insulation material cannot be removed without permanent consequences - Only possible if no historically valuable parts are affected
	IT	- Fai esaminare la cavità da un esperto per giunti, come residui di malta, architravi sporgenti, pavimenti o balconi per prevenire ponti termici e problemi di umidità - Il materiale isolante non può essere rimosso senza conseguenze permanenti - Solo possibile se non sono coinvolte parti storicamente preziose
	SP	Haz que un experto examine la cámara de aire para observar juntas, como residuos de mortero, dinteles salientes, pisos o

		balcones para prevenir puentes térmicos y problemas de humedad • El material aislante no se puede quitar sin consecuencias permanentes • Solo es posible si no se ven afectadas partes históricamente valiosas
Applicable typology	Single-family houses	

Measure title: Moisture problems

PT: Problemas de humidade

IT: Problemi di Umidità

SP: Problemas de Humedad

Measure description	EN	If there is mould, condensation on the windows or other visible signs of moisture in your building, there is a good chance that there is a moisture problem. First resolve the moisture problem before you start working with insulating measures. Common causes of moisture problems are leaks and insufficient ventilation of crawl spaces and basements. Tip: Humid air and a damp construction costs more energy to heat, so solving a moisture problem will save energy and increase thermal comfort.
	PT	Se existir bolor, condensação nas janelas ou outros danos visíveis de humidade no seu edifício, há uma boa probabilidade de existir um problema. Primeiro, resolva o problema de humidade antes de começar a trabalhar nas medidas de isolamento. As causas comuns de problemas de humidade são as fugas e uma ventilação insuficiente. Dica: O ar húmido faz aumentar os custos de climatização, pelo que a resolução de um problema de humidade irá poupar energia e aumentar o conforto térmico.
	IT	Se ci sono muffe, condensa sulle finestre o macchie sulla vernice visibili nel tuo edificio, è probabile che ci sia un problema di umidità. Risolvi il problema di umidità prima di iniziare a lavorare con misure di isolamento. Le cause più comuni dei problemi di umidità sono le perdite e la ventilazione insufficiente dei sottotetti e delle cantine. Consiglio: L'aria umida e una costruzione umida hanno bisogno di più energia per riscaldarsi, quindi risolvere un problema di umidità permetterà di risparmiare energia e aumentare il comfort termico.
	SP	Si hay moho, condensación en las ventanas u otros problemas visibles de humedad en tu edificio, es probable que exista un problema de humedad. Resuelve primero el problema de humedad antes de comenzar con las medidas de aislamiento. Las causas comunes de los problemas de humedad son las fugas y la ventilación insuficiente en los espacios de rastreo y sótanos. Consejo: El aire húmedo y una construcción húmeda conllevan el uso de más energía para calentar, por lo que resolver un problema de humedad ahorrará energía y aumentará el confort térmico.

Applicable typology	Single-family houses, condominium households and energy-poor households
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Measure title: Moisture-regulating paint

PT: Tinta reguladora da humidade

IT: Pittura Regolatrice dell'Umidità

SP: Pintura Reguladora de Humedad

Measure description	EN	In addition to the application of insulation material, moisture-regulating paint can be a low-threshold measure to insulate the façade a little better. The paint regulates the moisture, which improves the insulation value of the wall. Dry air heats up faster than humid air, which reduces the heat demand. In addition, the risk of flaking paint is reduced. Consider using moisture-regulating paint when you next paint your walls.
	PT	Além da aplicação de material isolante, a tinta reguladora da humidade pode ser uma medida de baixo custo para isolar um pouco melhor a fachada. O ar seco aquece mais rapidamente do que o ar húmido, o que reduz igualmente a necessidade de aquecimento. Além disso, o risco de escamação da tinta é reduzido. Considere usar tinta reguladora da humidade da próxima vez que pintar as suas paredes.
	IT	Oltre all'applicazione di materiali isolanti, la pittura regolatrice dell'umidità può essere una misura a basso costo per migliorare leggermente l'isolamento della facciata. La pittura regola l'umidità, migliorando il valore isolante della parete. L'aria secca si riscalda più rapidamente rispetto all'aria umida, riducendo così la richiesta di calore. Inoltre, il rischio di scrostamenti della pittura è ridotto. Considera l'uso della pittura regolatrice dell'umidità quando pitturi le tue pareti.
	SP	Además de la aplicación de material aislante, la pintura reguladora de humedad puede ser una medida de bajo costo para aislar un poco mejor la fachada. La pintura regula la humedad, lo que mejora el valor aislante de la pared. El aire seco se calienta más rápido que el aire húmedo, lo que reduce la demanda de calor. Además, se reduce el riesgo de descascarillado de la pintura. Considera usar pintura reguladora de humedad cuando pintes tus paredes.
Advantages	EN	• Better moisture management of the walls and a reduced risk of flaking paint • Can be applied both indoors and outdoors • Not much more expensive than regular paint
	PT	• Melhor gestão da humidade nas paredes e redução do risco da tinta escamar • Pode ser aplicado tanto no interior como no exterior • Não é muito mais cara que tinta normal
	IT	• Migliora la gestione dell'umidità delle pareti e riduce il rischio di scrostamenti della pittura • Applicabile sia all'interno che all'esterno • Non molto più costosa della pittura normale

	SP	• Mejora la gestión de la humedad en las paredes y reduce el riesgo de descascarillado de la pintura • Se puede aplicar tanto en interiores como en exteriores • No es mucho más cara que la pintura normal
Point of attention	EN	• This paint is not an alternative to insulation, but a supplement • Remove older layers of paint first for optimal effect
	PT	• Esta tinta não é uma alternativa ao isolamento, é apenas um componente adicional • Retire as camadas de tinta antigas para obter um efeito otimizado
	IT	• Questa pittura non è un'alternativa all'isolamento, ma un complemento • Rimuovi prima gli strati di pittura più vecchi per un effetto ottimale
	SP	• Esta pintura no es una alternativa al aislamiento, sino un complemento • Elimina primero las capas de pintura más antiguas para obtener un efecto óptimo
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: LSF construction system

PT: Sistema construtivo LSF

IT: Sistema di Costruzione LSF

SP: Sistema de Construcción LSF

Measure description	EN	In construction, reconstruction or rehabilitation projects, consider the Lightweight Steel Framing (LSF) Construction System. It's a modern construction method that utilizes cold-formed galvanized steel profiles to create the building's structure. These profiles, with reduced thickness, are lightweight yet resilient, providing an efficient and durable alternative to traditional construction methods. This system offers design flexibility and allows for easy and efficient integration of thermal and acoustic insulation. Moreover, construction and reconstruction with LSF are renowned for their speed of execution and waste reduction, making it an increasingly popular choice for residential and commercial projects.
	PT	Na construção ou reconstrução, considere o Sistema Construtivo LSF, ou Lightweight Steel Framing. É um método moderno de construção que utiliza perfis de aço galvanizado formados a frio para criar a estrutura do edifício. Estes perfis, de espessura reduzida, são leves e resistentes, proporcionando uma alternativa eficiente e duradoura aos métodos tradicionais de construção. Este sistema oferece flexibilidade de design e permite a integração fácil e eficiente de isolamento térmico e acústico. Além disso, a construção e reconstrução com LSF é conhecida pela sua rapidez de execução e pela redução de desperdícios, tornando-a uma escolha cada vez mais popular em projetos residenciais e comerciais.

	IT	Nei progetti di costruzione, ristrutturazione o riabilitazione, considera il Sistema di Costruzione Lightweight Steel Framing (LSF). È un metodo di costruzione moderno che utilizza profili in acciaio zincato a freddo per creare la struttura dell'edificio. Questi profili, con uno spessore ridotto, sono leggeri ma resistenti, offrendo un'alternativa efficiente e durevole ai metodi di costruzione tradizionali. Questo sistema offre flessibilità progettuale e consente un'integrazione facile ed efficiente dell'isolamento termico e acustico. Inoltre, la costruzione e la ristrutturazione con LSF sono rinomate per la loro velocità di esecuzione e riduzione dei rifiuti, rendendolo una scelta sempre più popolare per progetti residenziali e commerciali.
	SP	En proyectos de construcción, reconstrucción o rehabilitación, considera el Sistema de Construcción Lightweight Steel Framing (LSF). Es un método de construcción moderno que utiliza perfiles de acero galvanizado en frío para crear la estructura del edificio. Estos perfiles, con un grosor reducido, son ligeros pero resistentes, proporcionando una alternativa eficiente y duradera a los métodos de construcción tradicionales. Este sistema ofrece flexibilidad de diseño y permite una integración fácil y eficiente del aislamiento térmico y acústico. Además, la construcción y reconstrucción con LSF son conocidas por su rapidez en la ejecución y reducción de residuos, lo que lo convierte en una opción cada vez más popular para proyectos residenciales y comerciales.
Advantages	EN	• Cost-effective and efficient • Enhanced structural strength and resistance to environmental factors • Prefabrication capabilities lead to faster construction • Suitable for both new constructions and rehabilitation projects • Provides thermal comfort
	PT	• Económico e eficiente • Maior resistência estrutural e resistência a fatores ambientais • Capacidades de pré-fabricação levam a uma construção mais rápida • Adequado tanto para construções novas como para projetos de reabilitação • Proporciona conforto térmico
	IT	• Economico ed efficiente • Maggiore resistenza strutturale e agli agenti atmosferici • Le capacità di prefabbricazione portano a una costruzione più veloce • Adatto sia per nuove costruzioni che per progetti di ristrutturazione • Offre comfort termico
	SP	• Económico y eficiente • Mayor resistencia estructural y a factores ambientales • Las capacidades de prefabricación conducen a una construcción más rápida

		• Adecuado tanto para nuevas construcciones como para proyectos de rehabilitación • Ofrece confort térmico
Point of attention	EN	• Ensure compliance with local building codes and regulations • Consider potential resistance to adoption in markets accustomed to traditional construction methods • Engage with reputable companies experienced in LSF construction for best results
	PT	• Garanta a conformidade com os códigos e regulamentações locais de construção • Considere a potencial resistência à adoção em mercados habituados aos métodos de construção tradicionais • Consulte empresas conceituadas e experientes em construção LSF para obter os melhores resultados
	IT	• Assicurati della conformità con i codici edilizi e le normative locali • Considera la resistenza potenziale all'adozione nei mercati abituati ai metodi di costruzione tradizionali • Collabora con aziende rinomate e esperte nella costruzione LSF per ottenere i migliori risultati
	SP	• Asegúrate de cumplir con los códigos de construcción y regulaciones locales • Considera la posible resistencia a la adopción en mercados acostumbrados a métodos de construcción tradicionales • Trabaja con empresas reputadas y experimentadas en construcción LSF para obtener los mejores resultados
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Heat loss through the façade

PT: Perdas de calor pela fachada

IT: Perdita di Calore attraverso la Facciata

SP: Pérdida de Calor a través de la Fachada

Measure description	EN	Did you know that it is fairly easy to gain insight into the heat loss of your building? By having thermal images taken of your façade, you can immediately see where heat is being lost. This insight helps you to better insulate and ultimately save money and energy.
	PT	Sabia que é bastante fácil obter informações sobre a perda de calor da sua casa antiga? Ao captar imagens térmicas da sua fachada, poderá ver imediatamente os pontos em que está a perder calor. Esta informação ajuda-o a isolar melhor e, em última análise, a poupar dinheiro e energia.
	IT	Sapevi che è abbastanza facile ottenere una panoramica della perdita di calore del tuo edificio? Facendo effettuare immagini termiche della tua facciata, puoi vedere immediatamente dove viene disperso il calore. Questa panoramica ti aiuterà a isolare meglio e, in ultima analisi, a risparmiare denaro ed energia.

	SP	¿Sabías que es bastante fácil obtener una visión de la pérdida de calor de tu edificio? Al hacer tomar imágenes térmicas de tu fachada, puedes ver inmediatamente dónde se está perdiendo el calor. Esta visión te ayudará a aislar mejor y, en última instancia, ahorrar dinero y energía.
Applicable typology	Single-family houses, condominium households and energy-poor households	

Windows

Measure title: Secondary windows (inside)

PT: Janela adicional (interior)

IT: Finestre Secondarie (Interno)

SP: Ventanas Secundarias (por el Interior)

Measure description	EN	Existing windows can be insulated by installing a secondary window on the inside of the building. With a secondary window - a second window behind the original window (inside) – you keep the existing historical window and do not change the façade view from the outside. Installing a secondary window is a job for a professional company. After installation make sure that there is sufficient ventilation to prevent condensation between the windows. When selecting the window, make sure that it matches the existing window in terms of colour, thickness of the glass and decomposition. If necessary, discuss this with a monument advisor from your municipality.
	PT	As janelas existentes podem ser isoladas através da instalação de uma janela secundária no interior do edifício. Com uma janela secundária – uma segunda janela atrás da janela original – irá manter a janela histórica existente e não estará a alterar a vista da fachada a partir do exterior. A instalação de uma janela secundária deve ser realizada por uma empresa profissional. Durante a construção, certifique-se de que existe ventilação suficiente para evitar a condensação entre as janelas. Ao selecionar a janela, certifique-se de que esta corresponde à janela existente em termos de cor, vidro e estrutura.
	IT	Le finestre esistenti possono essere isolate installando una finestra secondaria all'interno dell'edificio. Con una finestra secondaria - una seconda finestra dietro la finestra originale (interno) - si conserva la finestra storica esistente e non si cambia la vista della facciata dall'esterno. L'installazione di una finestra secondaria è un lavoro per una ditta specializzata. Dopo l'installazione, assicurati che ci sia una ventilazione adeguata per prevenire la condensa tra le finestre. Quando scegli la finestra, assicurati che corrisponda alla finestra esistente per colore, spessore del vetro e composizione. Se necessario, discuti questo con un consulente per i edifici storici del tuo comune.
	SP	Las ventanas existentes pueden ser aisladas instalando una ventana secundaria en el interior del edificio. Con una ventana secundaria - una segunda ventana detrás de la ventana original (en el interior) - conservas la ventana histórica existente y no cambias la vista de la fachada desde el exterior. La instalación de una ventana secundaria es un trabajo para una

		empresa profesional. Después de la instalación, asegúrate de que haya suficiente ventilación para prevenir la condensación entre las ventanas. Al elegir la ventana, asegúrate de que coincida con la ventana existente en cuanto a color, grosor del vidrio y composición. Si es necesario, discútelo con un asesor de monumentos de tu municipio.
Advantages	EN	• The existing window will remain intact • Protects against cold and increases comfort • Saves energy • Noise nuisance from outside is decreased • Not visible from the outside
	PT	• A janela existente permanece intacta • Protege contra o frio e aumenta o conforto • Poupa energia • O ruído do exterior é reduzido • Não é visível do exterior
	IT	• La finestra esistente rimarrà intatta • Protegge dal freddo e aumenta il comfort • Risparmia energia • Riduce il fastidio del rumore esterno • Non è visibile dall'esterno
	SP	• La ventana existente permanecerá intacta • Protege contra el frío y aumenta el confort • Ahorra energía • Disminuye la molestia del ruido exterior • No es visible desde el exterior
Point of attention	EN	• This measure has aesthetic consequences on the inside • Pay attention to good ventilation when insulating • Vent the cavity between the windows with outside air to prevent condensation • It is advisable to consult a monument advisor of your municipality in advance
	PT	• Esta medida tem consequências estéticas no interior • Preste atenção à ventilação quando isolar a sua casa • Ventile a cavidade entre as janelas com ar exterior para prevenir a condensação • É recomendado que consulte o Município antes de proceder à intervenção
	IT	• Questa misura ha conseguenze estetiche all'interno • Fai attenzione a una buona ventilazione durante l'isolamento • Ventila la cavità tra le finestre con aria esterna per prevenire la condensa • È consigliabile consultare in anticipo un consulente per edifici storici del tuo comune
	SP	• Esta medida tiene consecuencias estéticas en el interior • Presta atención a una buena ventilación al aislar

		• Ventila el espacio entre las ventanas con aire exterior para prevenir la condensación • Es aconsejable consultar con un asesor de monumentos de tu municipio con antelación
Applicable typology	Single-family houses, condominium households and energy-poor households	
Final Energy Reduction	PT: 10,1 kWh/m ² IT: 17,9 kWh/m ² ES: 15,5 kWh/m ²	
Improvement of thermal comfort	2 estrelas	
Investment estimate	220 EUR/m ²	
Savings estimate	{FER}*{electricity price}	
GHG Reduction	{FER}*{electricity CO ₂ emissions}	

Measure title: Secondary windows (outside)
PT: Janela adicional (exterior)
IT: Finestre Secondarie (Esterno)
SP: Ventanas Secundarias (por el Exterior)

Measure description	EN	An insulation window is an extra insulating window that is placed on the outside of the existing window. Draughts coming through gaps in the window frame can be removed by placing the insulation window on the entire window frame. This is a major improvement over single glazing. With insulation windows, cold at the window and noise from the outside are reduced. In many cases, this is only possible if the windows are not visible from the public space.
	PT	Uma janela de isolamento é uma janela isolante adicional que é instalada no exterior da janela existente. As correntes de ar também podem ter origem nas aberturas do caixilho. A janela de isolamento pode, portanto, ser instalada em todo o caixilho e, assim, fechar estas aberturas. Isto é uma importante melhoria em relação ao vidro único. Com janelas de isolamento, as transferências de calor através da janela e os ruídos sonoros do exterior são reduzidos. No entanto, em muitos casos a instalação de uma janela adicional só é possível se as janelas não forem visíveis a partir da via pública.
	IT	Una finestra di isolamento è una finestra isolante extra che viene posizionata all'esterno della finestra esistente. Le correnti d'aria provenienti da fessure nel telaio della finestra possono essere eliminate posizionando la finestra di isolamento su tutto il telaio della finestra. Questo è un grande miglioramento rispetto al vetro singolo. Con le finestre secondarie esterne, il freddo alla finestra e il rumore proveniente dall'esterno sono ridotti. In molti casi, ciò è possibile solo se le finestre non sono visibili dallo spazio pubblico.
	SP	Una ventana de aislamiento es una ventana aislante adicional que se coloca por el exterior de la ventana existente. Las corrientes de aire que

		entran por las rendijas en el marco de la ventana se pueden eliminar colocando la ventana de aislamiento en todo el marco de la ventana. Esto es una gran mejora con respecto al vidrio simple. Con las ventanas de aislamiento, el frío en la ventana y el ruido del exterior se reducen. En muchos casos, esto solo es posible si las ventanas no son visibles desde el espacio público.
Advantages	EN	• The existing window will remain intact • Not visible from the inside • Protects against cold and increases comfort • Noise nuisance from outside is decreased
	PT	• A janela existente permanece intacta • Não é visível do interior • Protege contra o frio e aumenta o conforto • O ruído do exterior é reduzido
	IT	• La finestra esistente rimarrà intatta • Non è visibile dall'interno • Protegge dal freddo e aumenta il comfort • Riduce il fastidio del rumore esterno
	SP	• La ventana existente permanecerá intacta • No es visible desde el interior • Protege contra el frío y aumenta el confort • Disminuye la molestia del ruido exterior
Point of attention	EN	• This measure has aesthetic consequences on the outside • Ventilate the cavity between the windows • It is advisable to consult a monument advisor of your municipality in advance
	PT	• Esta medida tem consequências estéticas no exterior • Ventile a cavidade entre janelas • É recomendado que consulte o Município antes de proceder à intervenção
	IT	• Questa misura ha conseguenze estetiche all'esterno • Ventila la cavità tra le finestre • È consigliabile consultare in anticipo un consulente per edifici storici del tuo comune
	SP	• Esta medida tiene consecuencias estéticas en el exterior • Ventila el espacio entre las ventanas • Es aconsejable consultar con un asesor de monumentos de tu municipio con antelación
Applicable typology		Single-family houses

Measure title: Thin double glazing

PT: Vidros duplos

IT: Doppio Vetro Sottile

SP: Doble Acristalamiento Delgado

Measure description	EN	Do your windows still have single glazing and wooden or aluminum frames without thermal break? If so, you are probably losing a lot of heat through the windows, making it more difficult to maintain a comfortable indoor temperature year-round. You are also more exposed to drafts and external noise, with all their harmful effects on health. Consider replacing single glazing with double glazing and the original frame with one that has a thermal break for better insulation. Double glazing consists of two panes of glass with a narrow cavity between them that is filled with an insulating gas. This upgrade will significantly improve thermal comfort and reduce external noise, potentially cutting your heating and cooling costs by up to 20%. Double glazing is available in various thicknesses, starting at 7 mm, and in many cases, only requires a small adjustment to the window.
	PT	As janelas do seu edifício ainda têm vidros simples e caixilhos de madeira ou de alumínio sem corte térmico? Se for esse o caso, provavelmente, está a perder muito calor através das janelas, tornando-se mais difícil conseguir uma temperatura interior confortável durante todo o ano. Está também mais exposto a correntes de ar e ruído exterior, com todos os seus efeitos prejudiciais na saúde. Considere substituir o vidro simples por vidro duplo e o caixilho original por um caixilho com corte térmico, para obter um isolamento melhor das suas janelas. O vidro duplo consiste em duas placas de vidro com uma cavidade estreita entre elas que é preenchida com um gás isolante. Com esta medida, notará uma diferença grande a nível de conforto térmico e diminuição do ruído exterior, podendo também reduzir até cerca de 20% os seus gastos em aquecimento e arrefecimento. O vidro duplo está disponível em diferentes espessuras, a partir de 7 mm, e em muitos casos requer apenas um pequeno ajuste na janela.
	IT	Le tue finestre hanno ancora vetro singolo e telai in legno o alluminio senza interruzione termica? In tal caso, stai probabilmente disperdendo molto calore attraverso le finestre, rendendo più difficile mantenere una temperatura interna confortevole tutto l'anno. Sei anche più esposto a spifferi e rumori esterni, con tutti i loro effetti nocivi sulla salute. Considera la sostituzione del vetro singolo con doppio vetro e del telaio originale con uno che abbia un'interruzione termica per un miglior isolamento. Il doppio vetro è composto da due lastre di vetro con una cavità stretta tra di esse riempita con un gas isolante. Questo aggiornamento migliorerà significativamente il comfort termico e ridurrà il rumore esterno, potenzialmente riducendo i tuoi costi di riscaldamento e raffreddamento fino al 20%. Il doppio vetro è disponibile in vari spessori, a partire da 7 mm, e nella maggior parte dei casi richiede solo una piccola regolazione della finestra.
	SP	¿Tus ventanas todavía tienen vidrio simple y marcos de madera o aluminio sin rotura de puente térmico? En ese caso, probablemente estás perdiendo mucho calor a través de las ventanas, lo que dificulta mantener una temperatura interior cómoda durante todo el año. También estás más expuesto a corrientes de aire y ruido externo, con todos sus efectos

		daños para la salud. Considera reemplazar el vidrio simple con vidrio doble y el marco original con uno que tenga una rotura de puente térmico para un mejor aislamiento. El doble acristalamiento consta de dos paneles de vidrio con una cavidad estrecha entre ellos llena de un gas aislante. Esta actualización mejorará significativamente el confort térmico y reducirá el ruido externo, reduciendo potencialmente tus costos de calefacción y refrigeración hasta en un 20%. El doble acristalamiento está disponible en varios espesores, a partir de 7 mm, y en muchos casos solo requiere un pequeño ajuste en la ventana.
Advantages	EN	• Can also be used for windows with limited thickness • Often fits into existing window frames • Historical appearance of the window remains virtually intact inside and outside • Prevents cold draught and draught • Noise nuisance from outside is decreased • Saves energy
	PT	• Também pode ser usado para janelas com espessura limitada • Muitas vezes encaixa nos caixilhos das janelas existentes • Aspeto histórico da janela permanece relativamente intacto no interior e exterior • Previne contra correntes de ar • O ruído do exterior é reduzido • Poupa energia
	IT	• Utilizzabile anche per finestre con spessore limitato • Spesso si adatta ai telai delle finestre esistenti • L'aspetto storico della finestra rimane praticamente intatto all'interno e all'esterno • Previene gli spifferi d'aria fredda • Riduce il fastidio del rumore esterno • Risparmia energia
	SP	• También se puede usar para ventanas con grosor limitado • A menudo se ajusta a los marcos de ventana existentes • El aspecto histórico de la ventana permanece prácticamente intacto tanto dentro como fuera • Previene las corrientes de aire frío • Reduce la molestia del ruido externo • Ahorra energía
Point of attention	EN	• The thicker the glass, and depending on the cavity filling, the higher the insulation value. • Choose a variant that matches the colour, hue, flatness and reflection of the existing glass • Choose a type of glass with a black spacer – the edge all around and between the two glass panes. • Process the glass in a special sealant with the same appearance as putty. It is also possible to paint this sealant in the colour of your windows

		• Combine this measure with gap sealing • Pay attention to good ventilation when insulating • It is advisable to consult a monument advisor of your municipality in advance
	PT	• Quanto mais espesso for o vidro, e dependendo do enchimento da cavidade, maior o valor de isolamento. • Escolha uma variante que seja compatível com as características estéticas do vidro existente • Escolha um tipo de vidro com elevado valor de isolamento. • Coloque uma fita de calafetagem que combine com a cor da sua janela • Combine esta medida com o isolamento de fissuras • Preste atenção à ventilação quando isolar a sua casa • É recomendado que consulte o Município antes de proceder à intervenção
	IT	• Maggiore è lo spessore tra i vetri e a seconda del riempimento della cavità, maggiore è il valore isolante. • Scegli una variante che corrisponda al colore, tono e riflessione del vetro esistente • Scegli un tipo di vetro con uno spaziatore nero – il bordo tutto intorno e tra i due vetri. • Tratta il vetro con un sigillante speciale dello stesso aspetto della calce. È anche possibile verniciare questo sigillante del colore delle tue finestre • Combina questa misura con la sigillatura delle fessure • Fai attenzione a una buona ventilazione durante l'isolamento • È consigliabile consultare in anticipo un consulente per edifici storici del tuo comune
	SP	• Cuanto mayor sea el espesor del vidrio y dependiendo del llenado de la cavidad, mayor será el valor aislante. • Elige una variante que coincida con el color, tono, planitud y reflexión del vidrio existente • Elige un tipo de vidrio con un espaciador negro – el borde alrededor y entre los dos paneles de vidrio. • Procesa el vidrio con un sellador especial con el mismo aspecto que el masilla. También es posible pintar este sellador del color de tus ventanas • Combina esta medida con el sellado de fisuras • Presta atención a una buena ventilación al aislar • Es aconsejable consultar con un asesor de monumentos de tu municipio con antelación
Applicable typology	Single-family houses, condominium households and energy-poor households	
Final Energy Reduction	PT: 10,6 kWh/m ² IT: 18,6 kWh/m ² ES: 16,1 kWh/m ²	

Improvement of thermal comfort	2 stars
Investment estimate	230 EUR/m ²
Savings estimate	{FER}*{electricity price}
GHG Reduction	{FER}*{electricity CO ₂ emissions}

Measure title: Vacuum glass

PT: Vidro a vácuo

IT: Vetro a Vuoto

SP: Vidrio al Vacío

Measure description	EN	Vacuum glass consists of two panes of glass with a narrow cavity between them which is vacuum drawn. The space between the panes of glass is preserved by small black spheres between the panes. The insulation value of this type of glass is very good, even better than insulated glass. Due to its low thickness, vacuum glass often fits into existing window frames without major modifications. The weight does increase, which means that hinges or counterweights may no longer work properly in the case of sliding windows. In that case, adjust the hinges. We recommend combining vacuum glass with gap sealing. By insulating windows, the natural ventilation of your building disappears, so make sure you are properly advised about possible ventilation solutions.
	PT	O vidro a vácuo consiste em dois painéis de vidro com uma cavidade estreita entre eles que é trefilada a vácuo. O espaço entre as vidraças é preservado por pequenas esferas pretas entre as vidraças. O valor de isolamento deste tipo de vidro é muito bom. Devido à sua baixa espessura, o vidro a vácuo geralmente cabe em caixilhos de janelas existentes sem grandes modificações. O peso aumenta, o que significa que as dobradiças ou contrapesos podem já não funcionar corretamente no caso de janelas de correr. Nesse caso, ajuste as dobradiças. Recomendamos combinar vidro a vácuo com vedação de lacunas. Ao isolar as janelas, a ventilação natural do seu edifício desaparece, por isso certifique-se de que está devidamente informado sobre possíveis soluções de ventilação.
	IT	Il vetro a vuoto è composto da due lastre di vetro con una cavità stretta tra di esse, che viene messa sotto vuoto. Lo spazio tra le lastre di vetro è mantenuto da piccole sfere nere. Il valore di isolamento di questo tipo di vetro è molto buono, anche migliore rispetto al vetro isolante. Grazie al suo ridotto spessore, il vetro a vuoto spesso si adatta ai telai delle finestre esistenti senza modifiche significative. Il peso aumenta, il che significa che le cerniere o i contrappesi potrebbero non funzionare correttamente nel caso di finestre scorrevoli. In tal caso, regola le cerniere. Consigliamo di combinare il vetro a vuoto con la sigillatura delle fessure. Isolando le finestre, la ventilazione naturale del tuo edificio scompare, quindi

		assicurati di ricevere una consulenza adeguata sulle possibili soluzioni di ventilazione.
	SP	El vidrio al vacío está compuesto por dos paneles de vidrio con una cavidad estrecha entre ellos que se ha evacuado. El espacio entre los paneles de vidrio se mantiene mediante pequeñas esferas negras. El valor de aislamiento de este tipo de vidrio es muy bueno, incluso mejor que el vidrio aislante. Debido a su bajo grosor, el vidrio al vacío a menudo se adapta a los marcos de ventana existentes sin modificaciones importantes. El peso aumenta, lo que significa que las bisagras o contrapesos pueden no funcionar correctamente en el caso de ventanas correderas. En ese caso, ajusta las bisagras. Recomendamos combinar el vidrio al vacío con el sellado de huecos. Al aislar las ventanas, la ventilación natural de tu edificio desaparece, así que asegúrate de recibir un buen asesoramiento sobre posibles soluciones de ventilación.
Advantages	EN	• Often fits into existing window frames • Can also be used for windows with limited thickness • Protects against cold and increases comfort • It is possible to achieve very good insulation value • Noise nuisance from outside is decreased • The glass can be implemented with ‘puckered’ glass which preserves the appearance of old blown glass.
	IT	• Spesso si adatta ai telai delle finestre esistenti • Utilizzabile anche per finestre con spessore limitato • Protegge dal freddo e aumenta il comfort • È possibile ottenere un ottimo valore di isolamento • Riduce il fastidio del rumore esterno • Il vetro può essere sostituito con vetro ‘arricciato’ che conserva l’aspetto del vetro soffiato antico
	SP	• A menudo se adapta a los marcos de ventana existentes • También se puede usar para ventanas con espesor limitado • Protege contra el frío y aumenta el confort • Es posible lograr un muy buen valor de aislamiento • Reduce la molestia del ruido externo • El vidrio se puede implementar con vidrio ‘arrugado’ que conserva la apariencia del vidrio soplado antiguo
Point of attention	EN	• It is advisable to consult a monument advisor of your municipality in advance • Reinforce counterweights of sliding windows or replace them with a modern spring system • The small spheres are visible • Combine this measure with gap sealing • Pay attention to good ventilation when insulating • This is a relatively costly investment
	IT	• È consigliabile consultare in anticipo un consulente per edifici storici del tuo comune

		• Rinforza i contrappesi delle finestre scorrevoli o sostituiscili con un sistema a molla moderno • Le piccole sfere sono visibili • Combina questa misura con la sigillatura delle fessure • Fai attenzione a una buona ventilazione durante l'isolamento • È un investimento relativamente costoso
	SP	• Es aconsejable consultar a un asesor de monumentos de tu municipio con antelación • Refuerza los contrapesos de las ventanas correderas o sustitúyelos por un sistema de resorte moderno • Las pequeñas esferas son visibles • Combina esta medida con el sellado de huecos • Presta atención a una buena ventilación al aislar • Es una inversión relativamente costosa
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Insulated glass

PT: Vidros duplos de baixa emissividade

IT: Vetro Isolante

SP: Vidrio Aislante

Measure description	EN	Double insulated glass has a good insulation value. It consists of two panes of glass with a space between them filled with a noble gas that insulates. An insulating film is also applied to the glass. By replacing your existing glass with double insulated glass, you save a lot on your energy bill and take care of cold draught at the windows. In addition to an insulating effect, it also reduces noise pollution from outside. Double insulated glass is not always possible in historical buildings due to its thickness and weight.
	PT	Os vidros duplos de baixa emissividade minimizam a quantidade de radiação infravermelha e ultravioleta que passa através do vidro, sem minimizar a quantidade de luz que entra na sua casa. Quando o calor interior tenta sair para o exterior, durante o inverno, o revestimento de baixa emissividade reflete-o de volta para o interior. O contrário acontece durante o verão. Ao substituir o seu vidro único por vidro duplo com revestimento de baixa emissividade, pode poupar na sua conta de energia e melhorar o seu conforto térmico, tanto no inverno como no verão. Além de um efeito isolante, também reduz a poluição sonora proveniente do exterior. O revestimento de vidro é extremamente fino e não causa uma diferença visível na cor, sendo apropriado para edifícios com valor histórico.
	IT	Il doppio vetro isolante ha un buon valore di isolamento. È composto da due lastre di vetro con uno spazio tra di esse riempito con un gas nobile che isola. Viene anche applicato un film isolante al vetro. Sostituendo il vetro esistente con vetro doppio isolante, risparmierai molto sulla bolletta energetica e ridurrai le correnti d'aria fredde alle finestre. Oltre

		all'effetto isolante, riduce anche l'inquinamento acustico esterno. Il vetro doppio isolante non è sempre possibile negli edifici storici a causa del suo spessore e peso.
	SP	El vidrio doble aislante tiene un buen valor de aislamiento. Consiste en dos paneles de vidrio con un espacio entre ellos lleno de un gas noble que aísla. También se aplica una película aislante al vidrio. Al reemplazar tu vidrio existente con vidrio doble aislante, ahorrarás mucho en tu factura de energía y reducirás las corrientes de aire frío en las ventanas. Además de un efecto aislante, también reduce la contaminación acústica externa. El vidrio doble aislante no siempre es posible en edificios históricos debido a su grosor y peso.
Advantages	EN	• High energy savings • Noise nuisance from outside is decreased • Makes a big difference compared to the old situation • Protects against cold and increases comfort
	PT	• Poupanças energéticas elevadas • O ruído do exterior é reduzido • Provoca uma grande diferença comparado com a solução antiga • Protege contra o frio e aumenta o conforto
	IT	• Elevati risparmi energetici • Riduce il fastidio del rumore esterno • Fa la differenza rispetto alla situazione precedente • Protegge dal freddo e aumenta il comfort
	SP	• Altos ahorros energéticos • Reduce la molestia del ruido externo • Hace una gran diferencia en comparación con la situación anterior • Protege contra el frío y aumenta el confort
Point of attention	EN	• Usually does not fit in a historical window, unless the window (and frame) can be replaced • Combine this measure with gap sealing • Pay attention to good ventilation when insulating • It is advisable to consult a monument advisor of your municipality in advance
	PT	• Usualmente não encaixa nas janelas mais antigas, a não ser que os caixilhos sejam substituídos • Combine esta medida com o isolamento de fissuras • Preste atenção à ventilação quando isolar a sua casa • É recomendado que consulte o Município antes de proceder à intervenção
	IT	• Di solito non si adatta a una finestra storica, a meno che la finestra (e il telaio) possano essere sostituiti • Combina questa misura con la sigillatura delle fessure • Fai attenzione a una buona ventilazione durante l'isolamento • È consigliabile consultare in anticipo un consulente per edifici storici del tuo comune

	SP	• Generalmente no se adapta a una ventana histórica, a menos que la ventana (y el marco) puedan ser reemplazados • Combina esta medida con el sellado de huecos • Presta atención a una buena ventilación al aislar • Es aconsejable consultar a un asesor de monumentos de tu municipio con antelación
Applicable typology	Single-family houses, condominium households and energy-poor households	

Measure title: Triple glazing

PT: Vidros triplos

IT: Triplo Vetro

SP: Triple Acristalamiento

Measure description	EN	Triple glazing involves the installation of windows with three layers of glass, separated by a layer of insulating gas. This configuration enhances thermal insulation and soundproofing, providing improved comfort and energy efficiency for buildings. Triple glazing is particularly effective in reducing heat loss during cold seasons and minimizing external noise infiltration.
	PT	Os vidros triplos envolvem a instalação de janelas com três camadas de vidro, separadas por uma camada de gás isolante. Essa configuração melhora o isolamento térmico e acústico, proporcionando maior conforto e eficiência energética para os edifícios. Os vidros triplos são particularmente eficazes na redução da perda de calor durante as estações frias e na minimização da infiltração de ruídos externos.
	IT	Il triplo vetro implica l'installazione di finestre con tre strati di vetro, separati da uno strato di gas isolante. Questa configurazione migliora l'isolamento termico e l'isolamento acustico, fornendo un miglior comfort ed efficienza energetica. Il triplo vetro è particolarmente efficace nel ridurre la perdita di calore durante le stagioni fredde e minimizzare l'infiltrazione di rumore esterno.
	SP	El triple acristalamiento implica la instalación de ventanas con tres capas de vidrio, separadas por una capa de gas aislante. Esta configuración mejora el aislamiento térmico y la insonorización, proporcionando un mejor confort y eficiencia energética para los edificios. El triple acristalamiento es particularmente efectivo para reducir la pérdida de calor durante las estaciones frías y minimizar la infiltración de ruido externo.
Advantages	EN	• Enhanced thermal insulation • Improved soundproofing • Increased comfort indoors • Higher energy efficiency
	PT	• Isolamento térmico aprimorado • Melhor isolamento acústico • Maior conforto no interior • Maior eficiência energética

	IT	• Migliorato isolamento termico • Migliorato isolamento acustico • Maggiore comfort interno • Maggiore efficienza energetica
	SP	• Mejora del aislamiento térmico • Mejora de la insonorización • Mayor confort interior • Mayor eficiencia energética
Point of attention	EN	• Proper installation and sealing are crucial for maximizing the benefits of triple glazing. Ensure that the windows are installed by qualified professionals to avoid air leaks or condensation issues.
	PT	• A instalação e vedação adequadas são cruciais para maximizar os benefícios dos vidros triplos. Certifique-se de que as janelas sejam instaladas por profissionais qualificados para evitar fugas de ar ou problemas de condensação.
	IT	• Una corretta installazione e sigillatura sono cruciali per massimizzare i benefici del triplo vetro. Assicurati che le finestre siano installate da professionisti qualificati per evitare perdite d'aria o problemi di condensa.
	SP	• Una instalación y sellado adecuados son cruciales para maximizar los beneficios del triple acristalamiento. Asegúrate de que las ventanas sean instaladas por profesionales cualificados para evitar fugas de aire o problemas de condensación.
Applicable typology	Single-family houses, condominium households and energy-poor households	
Final Energy Reduction	PT: 18 kWh/m ² IT: 31,9 kWh/m ² ES: 27,6 kWh/m ²	
Improvement of thermal comfort	3 estrelas	
Investment estimate	247 EUR/m ²	
Savings estimate	{FER}*{electricity price}	
GHG Reduction	{FER}*{electricity CO ₂ emissions}	

Measure title: Solar blinds

PT: Estores e persianas

IT: Tende Solari

SP: Persianas

Measure description	EN	Even in earlier times, the shutters were closed on cold or hot days to keep the indoor climate comfortable. In some historical buildings, these shutters are still present, but it is often seen as a big job to close them. Still, this can save a lot of energy.
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	PT	Os estores plissados têm uma estrutura alveolar e podem ser fornecidos com uma película isolante no lado da janela. Estes estores são ajustáveis por baixo e por cima, podendo ser colocados no interior ou exterior da janela. Os estores plissados neutralizam as correntes de ar em períodos frios devido ao efeito isolante e podem servir como cortinas de sol em períodos quentes. Os estores e persianas permitem melhorar o isolamento e poupar energia. Os sistemas inteligentes permitem maximizar as poupanças, com a instalação de detetores solares/crepusculares que acionam os motores de persianas ou estores automáticos. No verão, fecham automaticamente quando incide o sol, reduzindo as necessidades de arrefecimento. No inverno, fecham automaticamente ao anoitecer, reduzindo as necessidades de aquecimento.
	IT	Anche nei tempi passati, le persiane venivano chiuse nei giorni freddi o caldi per mantenere il clima interno confortevole. In alcuni edifici storici, queste persiane sono ancora presenti, ma spesso è visto come un grande lavoro chiuderle. Tuttavia, questo può far risparmiare molta energia.
	SP	Incluso en tiempos antiguos, se cerraban las persianas en días fríos o calurosos para mantener el clima interior confortable. En algunos edificios históricos, estas persianas aún están presentes, pero a menudo se considera un gran trabajo cerrarlas. Aun así, esto puede ahorrar mucha energía.
Advantages	EN	• Creates a pleasant indoor climate • Protects against UV radiation • Saves energy
	PT	• Cria um clima interior agradável • Protege contra radiação UV • Poupa energia
	IT	• Crea un clima interno piacevole • Protegge dai raggi UV • Risparmia energia
	SP	• Crea un clima interior agradable • Protege contra la radiación UV • Ahorra energía
Point of attention	EN	• Sun protection for monuments should be reversible and should not cause damage to window frames or casings. • When placing interior sun protection, position it as close to the glass as possible to prevent the indoor air from heating up.
	PT	• A proteção solar para monumentos deve ser reversível e não deve causar danos à madeira da janela ou aos caixilhos. • Ao colocar proteção solar no interior, posicione-a o mais próximo possível do vidro para evitar que o ar interior aqueça.
	IT	• La protezione solare per edifici storici deve essere reversibile e non deve danneggiare i telai o i rivestimenti delle finestre • Quando si posiziona la protezione solare interna, collocarla il più vicino possibile al vetro per prevenire il riscaldamento dell'aria

	SP	• La protección solar para monumentos debe ser reversible y no debe dañar los marcos o revestimientos de las ventanas • Al colocar protección solar interior, colócala lo más cerca posible del vidrio para evitar que el aire interior se caliente
Applicable typology	Single-family houses, condominium households and energy-poor households	

Measure title: Replacement of windows

PT: Substituição de janelas

IT: Sostituzione delle Finestre

SP: Reemplazo de Ventanas

Measure description	EN	Windows are components of a building where heat transfer can be more pronounced. Old windows, with low insulation and solar protection levels, can significantly contribute to worsening thermal comfort and increasing drafts, water infiltrations, and exposure to external noise. However, there are various ways to improve window insulation with minimal investment. Eliminating drafts by applying weather-stripping to your windows and installing solar protection and barriers to cold/heat passage are crucial steps to reduce the heating and cooling needs of your home. There are several types of solutions that can be used in combination and installed either externally (preferably) or internally. Additionally, you can choose to apply an insulating or reflective film to your glass. If you decide to replace your single-pane windows, which is a more substantial investment, opt for efficient solutions such as double-pane or low-emissivity glass and frames with thermal breaks.
	PT	As janelas são componentes de um edifício onde as transferências de calor podem ser mais acentuadas. Janelas antigas, com baixo nível de isolamento e de proteção solar, podem contribuir significativamente para piorar o conforto térmico e aumentar as correntes de ar, as infiltrações de água e a exposição ao ruído exterior. Existem, no entanto, várias formas de melhorar o isolamento das janelas com investimento reduzido. Elimine as correntes de ar ao colocar fitas de calafetagem nas suas janelas e instale proteções solares e barreiras à passagem do frio/calor é fulcral para reduzir as necessidades de climatização da sua casa, existindo vários tipos de soluções que podem ser usadas de forma combinada e instaladas pelo exterior (de preferência) ou interior. Adicionalmente, pode também optar por colocar uma película isolante ou refletora nos seus vidros. Se decidir substituir os seus vidros simples, tratando-se de um investimento mais avultado, opte por soluções eficientes, com rotulagem energética Classe+, nomeadamente etiqueta A ou A+, vidros duplos ou de baixa emissividade e caixilhos com corte térmico.
	IT	Le finestre sono componenti di un edificio dove la dispersione di calore può essere più pronunciata. Le finestre vecchie, con bassi livelli di isolamento e protezione solare, possono contribuire significativamente a peggiorare il comfort termico e aumentare le correnti d'aria, le

		infiltrazioni d'acqua e l'esposizione al rumore esterno. Tuttavia, ci sono vari modi per migliorare l'isolamento delle finestre con un investimento minimo. Eliminare le correnti d'aria applicando guarnizioni di tenuta alle finestre e installare protezioni solari e barriere al passaggio di freddo/caldo sono passaggi cruciali per ridurre le esigenze di riscaldamento e raffreddamento della tua casa. Esistono diverse soluzioni che possono essere utilizzate in combinazione e installate sia esternamente (preferibilmente) che internamente. Inoltre, puoi scegliere di applicare un film isolante o riflettente al vetro. Se decidi di sostituire le finestre a vetro singolo, che è un investimento più sostanziale, opta per soluzioni efficienti come vetro doppio o a bassa emissività e telai con interruzioni termiche.
	SP	Las ventanas son componentes de un edificio donde la transferencia de calor puede ser más pronunciada. Las ventanas antiguas, con bajos niveles de aislamiento y protección solar, pueden contribuir significativamente a empeorar el confort térmico y aumentar las corrientes de aire, las infiltraciones de agua y la exposición al ruido exterior. Sin embargo, existen varias maneras de mejorar el aislamiento de las ventanas con una inversión mínima. Eliminar las corrientes de aire aplicando burletes a tus ventanas e instalar protección solar y barreras contra el paso de frío/calor son pasos cruciales para reducir las necesidades de calefacción y refrigeración de tu hogar. Hay varias soluciones que se pueden usar en combinación y se pueden instalar tanto externamente (preferiblemente) como internamente. Además, puedes optar por aplicar una película aislante o reflectante a tu vidrio. Si decides reemplazar tus ventanas de un solo panel, que es una inversión más sustancial, opta por soluciones eficientes como vidrio doble o de baja emisividad y marcos con rotura de puente térmico.
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Smart windows

PT: Janelas inteligentes

IT: Finestre Intelligenti

SP: Ventanas Inteligentes

Measure description	EN	Smart windows are equipped with technology that allows for automatic adjustment of transparency or tint based on external conditions such as sunlight or temperature. This feature helps regulate indoor temperature and optimize natural light, enhancing energy efficiency and comfort.
	PT	As janelas inteligentes estão equipadas com tecnologia que permite o ajuste automático da transparência ou tonalidade com base nas condições externas, como a luz solar ou temperatura. Esta funcionalidade ajuda a regular a temperatura interior e otimizar a luz natural, melhorando a eficiência energética e o conforto.
	IT	Le finestre intelligenti sono dotate di tecnologia che consente la regolazione automatica della trasparenza o della tonalità in base alle

		condizioni esterne come la luce solare o la temperatura. Questa funzione aiuta a regolare la temperatura interna e ottimizzare la luce naturale, migliorando l'efficienza energetica e il comfort.
	SP	Las ventanas inteligentes están equipadas con tecnología que permite el ajuste automático de la transparencia o el tinte en función de las condiciones externas, como la luz solar o la temperatura. Esta característica ayuda a regular la temperatura interior y optimizar la luz natural, mejorando la eficiencia energética y el confort.
Applicable typology	Single-family houses, condominium households and energy-poor households	

Measure title: Solar shading

PT: Proteção do sol

IT: Schermatura Solare

SP: Protección Solar

Measure description	EN	Solar shades for your windows provide a comfortable indoor climate in the summer by keeping radiant heat from the sun outside. Solar shades on the outside, such as blinds, shutters, or awnings, keeps the heat out better in the summer than solar shades on the inside, so you don't have to cool as much, which saves energy. Sun protection helps save energy by reducing the need for cooling your rooms, and solutions like shutters or blinds also decrease heat loss in the winter. If solar shades on the outside is not allowed in your situation, take a look at the options for solar blinds on the inside, like thick curtains. There are all sorts of solar blind systems on the market that differ in shape, size and colour. You can operate the blinds manually, or automatically using sensors.
	PT	Uma boa proteção solar para as suas janelas proporciona um clima interior confortável no verão, ao manter o calor radiante do sol no exterior. A proteção solar no exterior, como persianas, estores ou palas, é mais eficaz do que a proteção solar no interior, sendo também possível colocar estes dispositivos entre duas janelas. A proteção do sol permite poupar energia ao diminuir as necessidades de arrefecimento das suas divisões, além disso, as soluções como os estores ou persianas permite também a diminuição de perdas de calor no inverno. Se a proteção solar no exterior não for permitida na sua situação, informe-se sobre as opções de proteção solar no interior, como cortinas grossas. Existem inúmeros tipos de sistemas de proteção solar no mercado que diferem na sua forma, tamanho e cor. Pode operar a proteção solar manualmente ou automaticamente, através de sensores.
	IT	Le tende solari per le finestre offrono un clima interno confortevole in estate mantenendo il calore radiante del sole all'esterno. Le tende solari esterne, come persiane, tapparelle o tende da sole, mantengono meglio il calore all'esterno in estate rispetto alle tende solari interne, riducendo così la necessità di raffreddamento e risparmiando energia. La protezione solare aiuta a risparmiare energia riducendo la necessità di raffreddare gli ambienti e soluzioni come le persiane o le tapparelle riducono anche la

		perdita di calore in inverno. Se le tende solari esterne non sono consentite nella tua situazione, considera le opzioni per tende solari interne, come tende spesse. Esistono vari sistemi di tende solari sul mercato che differiscono per forma, dimensione e colore. Puoi azionare le tende manualmente o automaticamente utilizzando sensori.
	SP	Las protecciones solares para tus ventanas proporcionan un clima interior confortable en verano al mantener el calor radiante del sol afuera. Las protecciones solares externas, como persianas, contraventanas o toldos, dejan pasar menos calor en verano en comparación con las protecciones solares internas, por lo que no necesitas enfriar tanto, lo que ahorra energía. La protección solar ayuda a ahorrar energía al reducir la necesidad de enfriar tus habitaciones, y soluciones como las contraventanas o las persianas también disminuyen la pérdida de calor en invierno. Si las protecciones solares externas no están permitidas en tu situación, considera las opciones para protecciones solares internas, como cortinas gruesas. Hay una variedad de sistemas de protecciones solares en el mercado que difieren en forma, tamaño y color. Puedes operar las persianas manualmente o automáticamente usando sensores.
Advantages	EN	• Creates a pleasant indoor climate • Protects against UV radiation • Saves energy
	PT	• Cria um clima interior agradável • Protege contra radiação UV • Poupa energia
	IT	• Crea un clima interno piacevole • Protegge dai raggi UV • Risparmia energia
	SP	• Crea un clima interior agradable • Protege contra la radiación UV • Ahorra energía
Point of attention	EN	• Sun protection for monuments should be reversible and should not cause damage to window frames or casings. • When placing interior sun protection, position it as close to the glass as possible to prevent the indoor air from heating up.
	PT	• A proteção solar para monumentos deve ser reversível e não deve causar danos à madeira da janela ou aos caixilhos. • Ao colocar proteção solar no interior, posicione-a o mais próximo possível do vidro para evitar que o ar interior aqueça.
	IT	• La protezione solare per gli edifici storici dovrebbe essere reversibile e non danneggiare i telai o le cornici delle finestre. • Quando si installa una protezione solare interna, posizionala il più vicino possibile al vetro per evitare che l'aria interna si riscaldi
	SP	• La protección solar para monumentos debe ser reversible y no debe causar daño a los marcos de las ventanas o a los revestimientos. Al colocar protección solar interior, colócala lo

		más cerca posible del vidrio para evitar que el aire interior se caliente.
Applicable typology	Single-family houses, condominium households and energy-poor households	

Measure title: Insulating window film

PT: Película isolante para janelas

IT: Pellicola Isolante per Finestre

SP: Película Aislante para Ventanas

Measure description	EN	This can be a good option for monumental glass. This film bounces the internal heat radiation back into the room, so less heat is lost. The requirement for applying the film, is that the film can be removed from the window without any damage and that the colour does not deviate from the original situation. There are different types of glass film, with different properties. Choose a water-based film, which can be removed without damaging the window. And make sure that the colour, hue, flatness and reflection of the glass does not change because of the film. This way, it is possible to retain the existing glass without any consequences for the counterweights or springs of sliding windows. Even though less heat is lost, cold draughts remain with the glass because the insulation value is insufficient.
	PT	Existem diferentes tipos de película de vidro com diferentes propriedades. Normalmente, permitem refletir a radiação térmica interior novamente para a divisão, perdendo-se menos calor. Ao mesmo tempo, conseguem alcançar níveis de redução do fator solar muito significativos, não sacrificando a entrada de luz na habitação. A condição é que a película possa ser retirada da janela sem qualquer dano e que a cor não se afaste da cor original. Escolha uma película à base de água, que pode ser removida sem danificar a janela. Desta forma, é possível manter o vidro existente sem quaisquer consequências para as janelas. Mesmo que a perda de calor e os ganhos solares sejam atenuados, o valor de isolamento é insuficiente comparado com outras soluções.
	IT	Questa può essere una buona opzione per i vetri di edifici storici. Questa pellicola riflette il calore interno nella stanza, riducendo così la perdita di calore. Il requisito per applicare la pellicola è che essa possa essere rimossa dalla finestra senza danneggiarla e che il colore non devii dall'originale. Esistono diversi tipi di pellicola per vetri, con proprietà diverse. Scegli una pellicola a base d'acqua, che può essere rimossa senza danneggiare la finestra. Assicurati che il colore, la tonalità, la planarità e il riflesso del vetro non cambino a causa della pellicola. In questo modo, è possibile mantenere il vetro esistente senza conseguenze per i contrappesi o le molle delle finestre scorrevoli. Anche se si perde meno calore, le correnti d'aria fredda persistono poiché il valore di isolamento è insufficiente.

	SP	Esta puede ser una buena opción para vidrios en edificios monumentales. Esta película refleja la radiación de calor interna de vuelta al interior de la habitación, reduciendo así la pérdida de calor. El requisito para aplicar la película es que pueda ser retirada de la ventana sin dañar la misma y que el color no se desvíe de la situación original. Existen diferentes tipos de película para vidrio, con propiedades diversas. Elige una película a base de agua, que se pueda quitar sin dañar la ventana. Asegúrate de que el color, el matiz, la planitud y el reflejo del vidrio no cambien debido a la película. De esta manera, es posible conservar el vidrio existente sin afectar los contrapesos o los muelles de las ventanas correderas. Aunque se pierde menos calor, las corrientes de aire frío permanecen con el vidrio porque el valor de aislamiento es insuficiente.
Applicable typology	Single-family houses, condominium households and energy-poor households	

Ventilation

Measure title: Ventilation grilles (natural ventilation)

PT: Ventilação natural

IT: Griglie di Ventilazione (Ventilazione Naturale)

SP: Rejillas de Ventilación (Ventilación Natural)

Measure description	EN	By insulating, the natural ventilation of the building disappears. There is no more natural supply because gaps and seams are closed. One possibility to supply air in a natural way is to install (insulated) ventilation grilles. This can be done in the façade or in combination with new windows. Consult with the municipality on which option will best suit the façade appearance. If it is not allowed to install grilles, it is an option not to close any gaps above 1.80 metres. At this height, you will have little to no draught, but fresh air will still enter the building.
	PT	Ao instalar uma solução de isolamento, a ventilação natural do edifício diminui. Deixa de existir uma ventilação natural, já que os espaços e as juntas são fechados. Uma possibilidade de fornecer ar de forma natural é instalar grelhas de ventilação (com isolamento). Isto pode ser feito na fachada ou em combinação com novas janelas. Consulte o município para saber qual é a opção que melhor se adequa ao aspeto da fachada. Se não for permitida a instalação de grelhas, uma alternativa passa por não fechar quaisquer aberturas acima de 1,80 metros. A esta altura, terá poucas ou nenhuma corrente de ar, mas o ar fresco continuará a entrar no edifício.
	IT	Con l'isolamento, la ventilazione naturale dell'edificio scompare. Non c'è più alcun apporto naturale poiché fessure e giunti sono chiusi. Una possibilità per fornire aria in modo naturale è installare griglie di ventilazione (isolanti). Questo può essere fatto nella facciata o in combinazione con nuove finestre. Consulta con il comune quale opzione si adatta meglio all'aspetto della facciata. Se non è permesso installare griglie, è possibile non chiudere fessure superiori a 1,80 metri. A questa

		altezza, avrai poco o nessuno spiffero, ma l'aria fresca entrerà comunque nell'edificio.
	SP	Con el aislamiento, la ventilación natural del edificio desaparece. Ya no hay suministro natural porque las brechas y las juntas están cerradas. Una posibilidad para proporcionar aire de manera natural es instalar rejillas de ventilación (aisladas). Esto se puede hacer en la fachada o en combinación con nuevas ventanas. Consulta con el municipio cuál opción se adapta mejor a la apariencia de la fachada. Si no se permite instalar rejillas, es una opción no cerrar las brechas superiores a 1,80 metros. A esta altura, tendrás poco o ningún tiro de aire, pero el aire fresco aún entrará en el edificio.
Advantages	EN	• Contributes to a healthy indoor climate • No noise production • Maintenance friendly • No electrical control required
	PT	• Contribui para a qualidade do ar interior • Não produz ruído • Manutenção fácil • Não é necessário controlo elétrico
	IT	• Contribuisce a un clima interno sano • Nessuna produzione di rumore • Facile da mantenere • Nessun controllo elettrico richiesto
	SP	• Contribuye a un clima interior saludable • No produce ruido • Fácil de mantener • No se requiere control eléctrico
Point of attention	EN	• Supply air temperature is not adjustable and can lead to comfort problems at low temperatures • Limited dampening of outside noise • Heat can be lost through grids • Only possible if no historically valuable parts are affected
	PT	• A temperatura do ar de abastecimento não é ajustável, o que pode levar a problemas de conforto a temperaturas baixas • Não reduz significativamente o ruído exterior • Pode ser perdido calor através das grelhas • Só é possível se nenhuma parte histórica for afetada
	IT	• La temperatura dell'aria in ingresso non è regolabile e può causare problemi di comfort a basse temperature • Limitata attenuazione del rumore esterno • Il calore può essere perso attraverso le griglie • Solo possibile se non sono coinvolti elementi storicamente preziosi
	SP	• La temperatura del aire de suministro no es ajustable y puede causar problemas de confort a bajas temperaturas • Atención limitada al ruido exterior

		• Se puede perder calor a través de las rejillas • Solo es posible si no se afectan partes históricas
Applicable typology	Single-family houses, condominium households and energy-poor households	

Measure title: Natural and mechanical ventilation
PT: Ventilação natural e mecânica
IT: Ventilazione Naturale e Meccanica
SP: Ventilación Natural y Mecánica

Measure description	EN	In historical buildings, it is important to ventilate well to prevent moisture problems. This can be done through a combination of natural ventilation and mechanical ventilation. Have (insulated) ventilation grilles fitted for the supply of clean air. These ventilation grilles are available in various variants. For rooms such as the bathroom and kitchen, mechanical extraction can be used for ventilation. This requires ventilation ducts to be installed throughout the building. Make sure that no monumental parts are affected when installing the ducts.
	PT	Em edifícios antigos, é importante ventilar bem para prevenir problemas de humidade. Isto pode ser feito através de uma combinação de ventilação natural e ventilação mecânica. Instale grelhas de ventilação (com isolamento) para ter uma fonte de ar limpo. Estas grelhas de ventilação estão disponíveis em várias variantes. Para divisões como a casa de banho e a cozinha, a extração mecânica pode ser utilizada para ventilação, sendo que deve escolher exaustores e ventoinhas que sejam energeticamente eficientes (rótulo A). Isto requer a instalação de condutas de ventilação em todo o edifício. Certifique-se de que nenhuma parte histórica é afetada na instalação das condutas.
	IT	Negli edifici storici, è importante ventilare bene per prevenire problemi di umidità. Questo può essere fatto attraverso una combinazione di ventilazione naturale e meccanica. Fai installare griglie di ventilazione (isolanti) per l'apporto di aria pulita. Queste griglie di ventilazione sono disponibili in varie varianti. Per stanze come il bagno e la cucina, può essere utilizzata l'estrazione meccanica per la ventilazione. Questo richiede l'installazione di condotti di ventilazione in tutto l'edificio. Assicurati che nessuna parte storica sia coinvolta durante l'installazione dei condotti.
	SP	En edificios históricos, es importante ventilar bien para prevenir problemas de humedad. Esto se puede hacer mediante una combinación de ventilación natural y mecánica. Instala rejillas de ventilación (aisladas) para el suministro de aire limpio. Estas rejillas de ventilación están disponibles en varias variantes. Para habitaciones como el baño y la cocina, se puede utilizar extracción mecánica para la ventilación. Esto requiere la instalación de conductos de ventilación en todo el edificio. Asegúrate de que no se afecten partes monumentales durante la instalación de los conductos.
Advantages	EN	• Contributes to a healthy indoor climate

		• Relatively simple system • Volume flows are ensured by the extraction • Available in various variants & styles
	PT	• Contribui para a qualidade do ar interior • Sistema relativamente simples • Os volumes são garantidos pela extração • Disponível em várias variantes e estilos
	IT	• Contribuisce a un clima interno sano • Sistema relativamente semplice • I flussi di volume sono garantiti dall'estrazione • Disponibile in diverse varianti e stili
	SP	• Contribuye a un clima interior saludable • Sistema relativamente simple • Los flujos de volumen están garantizados por la extracción • Disponible en varias variantes y estilos
Point of attention	EN	• Wind on the façade can cause draught problems and energy loss will increase. • Limited dampening of outside noise • Opt for mechanical ventilation with energy-efficient motor/fan.
	PT	• O vento pode provocar correntes de ar e aumentar as perdas de calor. • Não reduz significativamente o ruído exterior • Optar por ventilação mecânica com motor e ventoinha eficientes.
	IT	• Il vento sulla facciata può causare problemi di spifferi e l'energia persa aumenterà. • Limitata attenuazione del rumore esterno • Opta per ventilazione meccanica con motore/ventola a risparmio energetico.
	SP	• El viento en la fachada puede causar problemas de corrientes de aire y aumentar la pérdida de energía. • Atención limitada al ruido exterior • Opta por ventilación mecánica con motor/ventilador eficiente en energía.
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Balanced ventilation

PT: Ventilação mecânica controlada

IT: Ventilazione Bilanciata

SP: Ventilación Equilibrada

Measure description	EN	There are various options for ventilating your building. Balanced ventilation is a central system for ventilating the entire building. Fresh outside air is blown into the rooms via a duct system from a supply air box. And the exhaust air box, in turn, dissipates the 'used' air. In a heat recovery unit, the supply and exhaust air boxes are brought together to
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		exchange heat and save energy, potentially reducing heating and cooling needs by around 25%. A balanced ventilation system with CO ₂ and humidity sensors is efficient because no more fresh air is supplied than necessary.
	PT	Existem várias opções para a ventilação do seu edifício. A ventilação mecânica controlada é um sistema central para toda a habitação. O ar fresco exterior é conduzido para as divisões através de um sistema de condutas a partir de uma caixa de fornecimento de ar. E a caixa de ar de escape, por sua vez, dissipa o ar "usado". Numa unidade com recuperação de calor, as caixas de ar de fornecimento e escape são combinadas, de modo a permitir a permutação de calor e a potenciar as poupanças de energia, que podem reduzir as necessidades para aquecimento e arrefecimento em cerca de 25%. Como em qualquer sistema de ventilação mecânica, o ar de admissão é filtrado, evitando a entrada de poluentes na sua casa. Estes sistemas não necessitam de grelhas de entrada de ar nas fachadas ou janelas, o que permite obter melhor conforto acústico. Um sistema de ventilação com sensores de dióxido de carbono e de humidade é eficiente, uma vez que não é fornecido mais ar fresco do que o necessário.
	IT	Esistono diverse opzioni per ventilare il tuo edificio. La ventilazione bilanciata è un sistema centrale per ventilare l'intero edificio. L'aria fresca esterna viene immessa nelle stanze tramite un sistema di condotti da una scatola di aria di immissione. E la scatola di aria di estrazione disperde a sua volta l'aria 'usata'. In un'unità di recupero di calore, le scatole di aria di immissione e di estrazione vengono unite per scambiarsi il calore e risparmiare energia, riducendo potenzialmente i bisogni di riscaldamento e raffreddamento di circa il 25%. Un sistema di ventilazione bilanciato con sensori di CO ₂ e umidità è efficiente perché non viene fornita più aria fresca di quanto necessario.
	SP	Existen varias opciones para ventilar tu edificio. La ventilación equilibrada es un sistema central para ventilar todo el edificio. El aire fresco exterior se introduce en las habitaciones a través de un sistema de conductos desde una caja de aire de suministro. Y la caja de aire de extracción, a su vez, disipa el aire 'usado'. En una unidad de recuperación de calor, las cajas de aire de suministro y extracción se combinan para intercambiar calor y ahorrar energía, reduciendo potencialmente las necesidades de calefacción y refrigeración en aproximadamente un 25%. Un sistema de ventilación equilibrada con sensores de CO ₂ y humedad es eficiente porque no se suministra más aire fresco del necesario.
Advantages	EN	• The supply air is filtered, ensuring a healthy indoor climate • Heat recovery from ventilation air • When providing the system with CO₂ sensors, no more fresh air will be supplied than necessary • Creates a pleasant indoor climate
	PT	• O ar é filtrado à entrada da casa, garantindo uma qualidade do ar interior saudável • Existe recuperação de calor do ar de ventilação

		• Ao fornecer sensores de CO₂, o sistema não fornece mais ar fresco do que o necessário • Cria um clima interior agradável
	IT	• L'aria di immissione è filtrata, garantendo un clima interno sano • Recupero di calore dall'aria di ventilazione • Quando si fornisce il sistema con sensori di CO₂, non viene fornita più aria fresca del necessario • Crea un clima interno piacevole
	SP	• El aire de suministro está filtrado, garantizando un clima interior saludable • Recuperación de calor del aire de ventilación • Cuando se equipa el sistema con sensores de CO₂, no se suministra más aire fresco del necesario • Crea un clima interior agradable
Point of attention	EN	• Works less well when windows are open • Consider the aesthetic consequences for your property when installing supply and exhaust channels. • It is important that the system is properly set up and maintained. • Good positioning is important to prevent noise nuisance
	PT	• Funciona pior quando as janelas estão abertas • Considere as consequências estéticas na sua propriedade quando instalar condutas de fornecimento de ar e de exaustão. • É importante que o sistema seja instalado e mantido adequadamente. • A instalação correta é importante para prevenir problemas de ruído
	IT	• Funziona meno bene quando le finestre sono aperte • Considera le conseguenze estetiche per la tua proprietà quando installi i canali di immissione e di estrazione. • È importante che il sistema sia impostato e mantenuto correttamente. • Una buona posizione è importante per prevenire il disturbo del rumore.
	SP	• Funciona peor cuando las ventanas están abiertas • Considera las consecuencias estéticas para tu propiedad al instalar los canales de suministro y extracción. • Es importante que el sistema esté bien configurado y mantenido. • Una buena ubicación es importante para prevenir molestias por ruido.
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Demand-driven ventilation
PT: Ventilação inteligente

IT: Ventilazione intelligente
SP: Ventilación por Demanda

Measure description	EN	Good ventilation is important for healthy air in the building. A demand-driven ventilation system with smart sensors works efficiently. For instance, CO ₂ sensors detect the need for clean air in rooms such as the bedroom or living room. And in the bathroom or kitchen, humidity sensors measure humidity. The system only turns on if the CO ₂ or humidity levels are too high. With the choice of a demand-driven ventilation system, fresh air is only supplied when needed.
	PT	Uma boa ventilação é importante para o ar saudável no interior do edifício. Um sistema de ventilação mecânica, centralizado ou descentralizado, equipado com sensores inteligentes funciona de forma particularmente eficiente. Por exemplo, os sensores de dióxido de carbono detetam a necessidade de ar limpo em divisões como o quarto ou a sala de estar. E na casa de banho ou na cozinha os sensores de humidade medem a humidade. O sistema só é ativado se os níveis de dióxido de carbono ou de humidade forem demasiado elevados. Ao optar por um sistema de ventilação inteligente, o ar fresco só é fornecido quando necessário.
	IT	Una buona ventilazione è importante per mantenere l'aria sana all'interno dell'edificio. Un sistema di ventilazione intelligente “a domanda” con sensori funziona in modo efficiente. Ad esempio, i sensori di CO ₂ rilevano la necessità di aria fresca in stanze come la camera da letto o il soggiorno. E in bagno o cucina, i sensori di umidità misurano l'umidità. Il sistema si accende solo se i livelli di CO ₂ o umidità sono troppo alti. Con la scelta di un sistema di ventilazione a domanda, l'aria fresca viene fornita solo quando è necessario.
	SP	Una buena ventilación es importante para mantener el aire saludable en el edificio. Un sistema de ventilación por demanda con sensores inteligentes funciona de manera eficiente. Por ejemplo, los sensores de CO ₂ detectan la necesidad de aire limpio en habitaciones como el dormitorio o la sala de estar. Y en el baño o la cocina, los sensores de humedad miden la humedad. El sistema solo se activa si los niveles de CO ₂ o humedad son demasiado altos. Con la opción de un sistema de ventilación por demanda, el aire fresco solo se suministra cuando es necesario.
Advantages	EN	• When providing the system with CO₂ sensors, no more fresh air will be supplied than necessary • Ventilates efficiently and energy-consciously
	PT	• Ao fornecer sensores de CO₂, o sistema não fornece mais ar fresco do que o necessário • Ventila de forma eficiente
	IT	• Quando il sistema è dotato di sensori di CO₂, non viene fornita più aria fresca del necessario • Ventila in modo efficiente riducendo dispersioni di energia

	SP	• Cuando el sistema tiene sensores de CO₂, no se suministra más aire fresco del necesario • Ventila de manera eficiente y consciente de la energía
Point of attention	EN	• It is important that the system is properly set up and maintained. • At least 1 sensor has to be installed per room to be controlled
	PT	• É importante que o sistema seja instalado e mantido adequadamente. • É necessário instalar pelo menos um sensor por divisão
	IT	• È importante che il sistema sia correttamente impostato e mantenuto. • È necessario installare almeno 1 sensore per stanza per il controllo
	SP	• Es importante que el sistema esté bien configurado y mantenido. • Se debe instalar al menos 1 sensor por habitación para el control
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Decentralized ventilation with heat recovery
PT: Ventilação descentralizada com recuperação de calor
IT: Ventilazione Decentralizzata con Recupero di Calore
SP: Ventilación Descentralizada con Recuperación de Calor

Measure description	EN	If ventilation ducts are not possible in your building, a decentralised ventilation system with heat recovery may be the solution. You can then install a façade ventilation unit in a room you often use. The ventilation unit regulates both the extraction of polluted air and the supply of clean air. Heat recovery ensures that the heat from the extracted air heats up the fresh air, so that heat is not lost and you save energy. The grilles for air extraction and supply are also available in brick format so that they are virtually invisible. The other rooms can be provided with natural ventilation through ventilation grilles. Toilet, shower and kitchen are separately extracted mechanically, which does require ducts.
	PT	Se não forem possíveis condutas de ventilação no seu edifício, um sistema de ventilação descentralizado com recuperação de calor pode ser a solução, para tal pode instalar uma unidade de ventilação numa sala usada com frequência.
	IT	Se non è possibile installare i condotti di ventilazione nel tuo edificio, un sistema di ventilazione decentralizzato con recupero di calore può essere la soluzione. Puoi quindi installare un'unità di ventilazione sulla facciata in una stanza che usi spesso. L'unità di ventilazione regola sia l'estrazione dell'aria inquinata che l'apporto di aria pulita. Il recupero di calore garantisce che il calore dall'aria estratta riscaldi l'aria fresca, così il calore non viene perso e risparmi energia. Le griglie per l'estrazione e l'apporto dell'aria sono disponibili anche in formato muratura in modo che siano praticamente invisibili. Le altre stanze possono essere fornite di ventilazione naturale tramite griglie di ventilazione. L'aria da bagno,

		doccia e cucina devone essere estratta meccanicamente in modo separato, il che richiede condotti.
	SP	Si los conductos de ventilación no son posibles en tu edificio, un sistema de ventilación descentralizado con recuperación de calor puede ser la solución. Puedes instalar una unidad de ventilación en la fachada en una habitación que usas con frecuencia. La unidad de ventilación regula tanto la extracción del aire contaminado como el suministro de aire limpio. La recuperación de calor asegura que el calor del aire extraído calienta el aire fresco, evitando la pérdida de calor y ahorrando energía. Las rejillas para la extracción y suministro de aire también están disponibles en formato de ladrillo para que sean prácticamente invisibles. Las otras habitaciones pueden ser ventiladas de manera natural a través de rejillas de ventilación. El aire del baño, el inodoro y la cocina debe ser extraído mecánicamente por separado, lo que requiere conductos.
Advantages	EN	• No need for a large channel system. • Heat recovery from ventilation air
	PT	• Recuperação de calor do ar de ventilação
	IT	• Nessuna necessità di un grande sistema di condotti. • Recupero di calore dall'aria di ventilazione
	SP	• No es necesario un gran sistema de conductos. • Recuperación de calor del aire de ventilación
Point of attention	EN	• The sound can be perceived as disturbing • This is an electrical system that can increase electricity consumption, which is more than compensated for by energy gains from heat recovery. • Kitchen, toilet and shower still need to be separately mechanically extracted
	PT	• O som pode ser percebido como perturbador • Trata-se de um sistema elétrico que pode aumentar o consumo de eletricidade, que é mais do que compensado pelos ganhos energéticos provenientes da recuperação de calor • Necessário garantir extração mecânica para outras divisões, como cozinha e casas-de-banho
	IT	• Il suono può essere percepito come disturbante • Questo è un sistema elettrico che può aumentare il consumo di elettricità, compensato più che adeguatamente dai guadagni energetici del recupero di calore. • L'aria da cucina, WC e doccia deve comunque essere estratta meccanicamente.
	SP	• El sonido puede ser percibido como molesto • Este es un sistema eléctrico que puede aumentar el consumo de electricidad, lo cual es más que compensado por las ganancias energéticas de la recuperación de calor. • El aire de la cocina, el inodoro y la ducha aún necesita ser extraído mecánicamente por separado.

Applicable typology	Single-family houses, condominium households and energy-poor households
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Measure title: Clean filters
PT: Limpeza dos filtros
IT: Pulizia dei Filtri
SP: Limpieza de Filtros

Measure description	EN	It is important that ventilation ducts are open and that the filters are clean. If filters are not clean, you will blow ‘dirty’ air into your building. In addition, a polluted (balanced) system has a lower capacity and consumes more electricity because of a higher resistance.
	PT	É importante que as condutas de ventilação sejam abertas e que os filtros sejam limpos. Se os filtros não forem limpos, será fornecido ar "sujo" para a sua casa. Além disso, um sistema poluído tem uma capacidade inferior e consome mais eletricidade devido a uma maior resistência.
	IT	È importante che i condotti di ventilazione siano liberi e che i filtri siano puliti. Se i filtri non sono puliti, si immette aria ‘sporca’ nell’edificio. Inoltre, un sistema (bilanciato) inquinato ha una capacità inferiore e consuma più elettricità a causa di una maggiore resistenza al flusso d’aria.
	SP	Es importante que los conductos de ventilación estén despejados y que los filtros estén limpios. Si los filtros no están limpios, se insuflará aire ‘sucio’ en el edificio. Además, un sistema (equilibrado) contaminado tiene una capacidad inferior y consume más electricidad debido a una mayor resistencia.
Applicable typology		Single-family houses, condominium households and energy-poor households

4.3.3 ELECTRICITY

Generating electricity

Measure title: Solar panels
PT: Painéis solares fotovoltaicos
IT: Pannelli solari
SP: Paneles solares

Measure description	EN	Solar panels are a sustainable way to generate your own electricity. On average, solar panels last 25 years while they usually pay for themselves rather quickly. The most common panels consist of photovoltaic (PV) cells, which we call PV panels. These are usually installed on roofs. Other alternative places for your roof are pergolas and carports. These solar panels come in different varieties, such as blue and matt black. The PV panels capture energy from the sun and convert it into electricity. You also need an inverter, which is a small cabinet in your house that converts the generated direct current into alternating current that we use in homes.
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	PT	Os painéis solares fotovoltaicos são uma forma sustentável de produzir a sua própria eletricidade e os seus custos têm diminuído de forma significativa nos últimos anos. Em média, os painéis solares duram 25 anos e geralmente pagam-se a si próprios em menos de 10 anos. Normalmente, são instalados em telhados e estão disponíveis em diferentes variedades. Em Portugal, em média temos mais de 2200 horas de sol por ano, por exemplo em Lisboa são mais de 2800 horas de sol por ano, e os painéis fotovoltaicos são uma forma de captar esta radiação solar e convertê-la em eletricidade. Também é necessário um inversor, que é uma pequena caixa instalada na sua casa para converter a corrente contínua produzida em corrente alternada, que utilizamos nas nossas habitações. Ao transformar a sua casa numa Unidade de Produção para Autoconsumo (UPAC), está a produzir e consumir localmente a sua própria energia elétrica. Pode vender a produção em excesso à rede, mas o retorno é muito baixo. Assim, tenha atenção em agendar os seus consumos de eletricidade (por exemplo máquinas de lavar) para o período diurno. Peça a um profissional para dimensionar, instalar e manter o seu sistema de energia renovável.
	IT	I pannelli solari sono un modo sostenibile per generare la propria elettricità. In media, i pannelli solari durano 25 anni e solitamente si ripagano piuttosto rapidamente. I pannelli più comuni consistono in celle fotovoltaiche (PV), che chiamiamo pannelli fotovoltaici. Questi sono solitamente installati sui tetti. Altri luoghi alternativi al tetto sono le pergole e i porticati. Questi pannelli solari sono disponibili in diverse varietà, come blu e nero opaco. I pannelli PV catturano l'energia dal sole e la convertono in elettricità. È necessario anche un inverter, che consiste in un piccolo armadio in cui avviene la conversione di corrente continua generata in corrente alternata che utilizziamo nelle abitazioni.
	SP	Los paneles solares son una forma sostenible de generar tu propia electricidad. En promedio, los paneles solares duran 25 años y suelen amortizarse rápidamente. Los paneles más comunes consisten en células fotovoltaicas (FV), que llamamos paneles FV. Estos generalmente se instalan en cubiertas. Otros lugares alternativos a la cubierta son las pérgolas y los garajes. Estos paneles solares vienen en diferentes variedades, como azul y negro mate. Los paneles FV capturan la energía del sol y la convierten en electricidad. También necesitas un inversor, que es un pequeño gabinete en tu casa que convierte la corriente continua generada en corriente alterna que usamos en los hogares.
Advantages	EN	• Generating your own sustainable energy • Suitable for flat and pitched roofs • Short cost recovery period • Combining solar panels with a green roof can increase the efficiency of the solar panels.
	PT	• Produz a sua própria energia sustentável • Adequada para telhados planos e inclinados • Rápido retorno do investimento

		• A combinação de painéis solares com um telhado verde pode aumentar a eficiência dos painéis solares
	IT	• Generare la propria energia sostenibile • Adatto per tetti piani e inclinati • Breve periodo di recupero dei costi • Combinare i pannelli solari con un tetto verde può aumentare l'efficienza dei pannelli solari
	SP	• Generar tu propia energía sostenible • Adecuado para cubiertas planas e inclinadas • Corto período de recuperación de costos • Combinar paneles solares con una cubierta verde puede aumentar la eficiencia de los paneles solares
Point of attention	EN	• Roof must be free of shade from chimneys, dormers, trees • In historically valuable buildings and/or districts, solar panels may often not be visible from the public space. • Historical buildings may have a small electricity connection, which may limit the number of solar panels you can connect • Suitable for an orientation of the roof to south (preferred), west or east • Solar panels come in different versions in terms of power and quality • When applying solar panels, pay attention to the quality of the installation, the type of roof and roof insulation. This can have an effect on the (fire) insurance of the building • Note the certification of the panel, e.g. Cradle to Cradle, which guarantees a smaller footprint • Modern panels have 300 Wp or more power per panel • Tip! Have a specialist check the construction of your roof before you place any solar panels on it
	PT	• O telhado tem de estar livre de sombras de chaminés, árvores, ou outras • Em edifícios e áreas com valor histórico patrimonial, atualmente os painéis muitas vezes não podem ser visíveis do espaço público. • Os edifícios antigos podem ter uma conexão elétrica de baixa potência, o que pode limitar o número de painéis que pode conectar • Adequado para telhados orientados a sul (de preferência), oeste ou este
	IT	• Il tetto deve essere privo di ombre da camini, abbaini, alberi • In edifici e/o distretti di valore storico, i pannelli solari spesso non possono essere visibili dallo spazio pubblico • Gli edifici storici possono avere un limitato impianto elettrico, il che può limitare il numero di pannelli solari che puoi collegare • Adatto per un'orientazione del tetto a sud (preferibile), ovest o est

		• I pannelli solari sono disponibili in diverse versioni per potenza e qualità • Quando si installano i pannelli solari, prestare attenzione alla qualità dell'installazione, al tipo di tetto e all'isolamento del tetto. Questo può influire sull'assicurazione (incendio) dell'edificio • Nota la certificazione del pannello, ad esempio Cradle to Cradle, che garantisce una minore impronta ecologica • I pannelli moderni hanno una potenza di 300 Wp o più per pannello • Suggerimento! Fai controllare da uno specialista la struttura del tuo tetto prima di installare i pannelli solari
	SP	• La cubierta debe estar libre de sombras de chimeneas, lucernarios, árboles • En edificios y/o distritos de valor histórico, los paneles solares a menudo no pueden ser visibles desde el espacio público • Los edificios históricos pueden tener una pequeña conexión eléctrica, lo que puede limitar el número de paneles solares que puedes conectar • Adecuado para una orientación de la cubierta hacia el sur (preferida), oeste o este • Los paneles solares vienen en diferentes versiones en términos de potencia y calidad • Al instalar paneles solares, presta atención a la calidad de la instalación, el tipo de cubierta y el aislamiento de la cubierta. Esto puede afectar el seguro (contra incendios) del edificio • Revisa la certificación del panel, por ejemplo, Cradle to Cradle, que garantiza una menor huella ecológica • Los paneles modernos tienen 300 Wp o más de potencia por panel • ¡Consejo! Haz que un especialista revise la estructura de tu cubierta antes de instalar los paneles solares
Applicable typology	Single-family houses, condominium households and energy-poor households	
Renewable Energy Generation	Assuming the consumption of all electricity produced and a typical household of 3 people: PT: 1955 kWh/m ² ; IT: 1795 kWh kWh/m ² ; ES: 2044 kWh/m ²	
Investment estimate	1420 EUR/m ²	
Savings estimate	Annual savings: PT: 393 EUR/m ² .year IT: 460 EUR/m ² .year SP: 423 EUR/m ² .year	
GHG Reduction	PT: 432 kgCO ₂ e/m ² .year; IT: 500 kgCO ₂ e/m ² .year	

	ES: 401 kgCO ₂ e/m ² .year
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Measure title: Solar panels for an owners' association and Renewable energy communities

PT: Painéis solares em condomínios e Comunidades de Energia Renovável

IT: Pannelli solari per un'associazione di proprietari e comunità di energia rinnovabile

SP: Paneles solares para una comunidad de propietarios y comunidades de energía renovable

Measure description	EN	Many buildings are divided into apartments and organised as an Owners' Association. 'Even then, you can install solar panels on the roof. For example, the generated solar power from the communal roof can be distributed to the electricity meters of the residents, so that the electricity is worth more than on the collective meter of your owners' association. If you would like to know more, please contact us.
	PT	Muitos edifícios estão divididos em apartamentos e são geridos como um condomínio. Ainda assim, é possível instalar painéis solares no telhado. Por exemplo, a eletricidade solar produzida a partir do telhado comum pode ser usada para consumos de eletricidade em áreas partilhadas (garagens, escadas e elevadores) e pode também ser distribuída pelos contadores de eletricidade dos residentes. Atualmente, pode-se transformar um condomínio numa verdadeira comunidade de energia renovável.
	IT	Molti edifici sono suddivisi in appartamenti e organizzati come un'Associazione di Proprietari. Anche in questo caso, è possibile installare pannelli solari sul tetto. Ad esempio, l'energia solare prodotta dal tetto comune può essere distribuita ai contatori elettrici dei residenti, in modo che l'elettricità abbia un valore maggiore rispetto al contatore collettivo della tua associazione di proprietari. Se desideri saperne di più, contattaci.
	SP	Muchos edificios están divididos en apartamentos y organizados como una Comunidad de Propietarios. Incluso en este caso, se pueden instalar paneles solares en la cubierta. Por ejemplo, la energía solar generada en la cubierta puede ser distribuida a los contadores de electricidad de los residentes, de manera que la electricidad tenga un valor mayor que en el contador colectivo de tu comunidad de propietarios. Si deseas saber más, contáctanos.
Applicable typology	Multi-family house	

Measure title: Thin-film solar panels

PT: Painéis fotovoltaicos finos

IT: Pannelli solari a film sottile

SP: Paneles solares de película delgada

Measure description	EN	Thin-film solar panels (also called CIS panels) are deep black, which makes them look better than other types of panels. Thin-film solar panels have a lower generation efficiency per surface area than standard solar panels. However, they are a lot cheaper, which makes it possible to install more of these solar panels. In addition, the panels can generate more energy
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		per installed capacity. These are a good choice in cases where there is more surface area than needed in terms of energy generation.
	PT	Os painéis solares finos (também denominados painéis CIS) são de cor preta intensa, o que lhes dá um aspeto mais elegante do que outros tipos de painéis. Os painéis solares finos têm uma eficiência de produção de eletricidade por superfície menor do que os painéis solares normais. No entanto, são muito mais baratos, o que possibilita a instalação de mais painéis fotovoltaicos deste tipo.
	IT	I pannelli solari a film sottile (chiamati anche pannelli CIS) sono di un nero profondo, il che li rende esteticamente più gradevoli rispetto ad altri tipi di pannelli. I pannelli solari a film sottile hanno un'efficienza di generazione inferiore per unità di superficie rispetto ai pannelli solari standard. Tuttavia, sono molto più economici, il che consente di installarne un numero maggiore. Inoltre, i pannelli possono generare più energia per capacità installata. Questi sono una buona scelta nei casi in cui c'è più superficie disponibile rispetto a quanto necessario per la generazione di energia.
	SP	Los paneles solares de película delgada (también llamados paneles CIS) son de un negro profundo, lo que los hace más estéticamente agradables que otros tipos de paneles. Los paneles solares de película delgada tienen una eficiencia de generación inferior por unidad de superficie en comparación con los paneles solares estándar. Sin embargo, son mucho más baratos, lo que permite instalar más de estos paneles solares. Además, los paneles pueden generar más energía por capacidad instalada. Son una buena opción en casos donde hay más superficie disponible de la necesaria para la generación de energía.
Advantages	EN	• Relatively inexpensive technology • More environmentally friendly production technology
	PT	• Tecnologia relativamente barata • Tecnologia de produção mais amigável do ambiente
	IT	• Tecnologia relativamente economica • Tecnologia di produzione più ecologica
	SP	• Tecnología relativamente económica • Tecnología de producción más ecológica
Point of attention	EN	• This is not an attractive measure for small roof areas due to the low yield
	PT	• Esta não é uma medida atraente para pequenas áreas de telhados devido ao baixo rendimento
	IT	• Questa misura non è attraente per aree di tetto piccole a causa del basso rendimento
	SP	• Esta medida no es atractiva para áreas de techo pequeñas debido al bajo rendimiento
Applicable typology		Single-family houses

Measure title: Green energy contract

PT: Contrato de eletricidade renovável

IT: Contratto di energia verde
SP: Contrato de energía verde

Measure description	EN	If your building does not offer opportunities to generate your own green energy, you can opt for a green energy contract. With a green energy contract, you usually only receive electricity that comes from windmills and solar panels. Your gas will be compensated and this will soon make you more sustainable. By purchasing your electricity green, your electricity consumption will become a lot more sustainable in one fell swoop. There are many different energy suppliers that offer green electricity. But never forget, the less you consume, the lower your emissions.
	PT	Se o seu edifício não tiver condições para produzir a sua própria eletricidade renovável, por exemplo por não ser possível efetuar modificações no telhado, pode optar por um contrato de eletricidade renovável. Com um contrato de eletricidade renovável, normalmente só obtém eletricidade proveniente de aerogeradores, painéis solares e barragens. O seu consumo de combustíveis fósseis será menor, pelo que, em pouco tempo, contribuirá para uma maior sustentabilidade. Ao adquirir eletricidade renovável, o seu consumo de eletricidade tornar-se-á mais sustentável. Existem muitos comercializadores de energia diferentes em Portugal que fornecem eletricidade renovável. Tenha atenção à informação disponibilizada nos contratos e lembre-se que até as fontes renováveis têm impactos ambientais. Nunca se esqueça: quanto menos energia consumir, mais baixas serão as suas emissões.
	IT	Se il tuo edificio non offre opportunità per generare la tua energia verde, puoi optare per un contratto di energia verde. Con un contratto di energia verde, di solito ricevi solo elettricità proveniente da turbine eoliche e pannelli solari. Il tuo gas sarà compensato e questo ti renderà presto più sostenibile. Acquistando elettricità verde, il tuo consumo di energia diventerà molto più sostenibile in un colpo solo. Ci sono molti fornitori di energia che offrono elettricità verde. Ma non dimenticare mai, meno consumi, minori saranno le tue emissioni.
	SP	Si tu edificio no ofrece oportunidades para generar tu propia energía verde, puedes optar por un contrato de energía verde. Con un contrato de energía verde, generalmente solo recibes electricidad proveniente de molinos de viento y paneles solares. Tu gas será compensado y esto te hará más sostenible en poco tiempo. Al comprar electricidad verde, tu consumo de electricidad se volverá mucho más sostenible de inmediato. Hay muchos proveedores de energía que ofrecen electricidad verde. Pero nunca olvides, cuanto menos consumas, menores serán tus emisiones.
Advantages	EN	• The prices are competitive • You contribute to a cleaner climate
	PT	• Os preços são competitivos • Pode contribuir para um clima mais limpo • Pode contribuir para a geração de eletricidade sustentável em Portugal

Point of attention	IT	• I prezzi sono competitivi • Contribuisci a un clima più pulito
	SP	• Los precios son competitivos • Contribuyes a un clima más limpio
	EN	• Pay close attention to how ‘green’ an energy contract actually is • Green or eco gas means offsetting your gas consumption
	PT	• Preste atenção aos detalhes do contrato de energia renovável • Os gases renováveis permitem reduzir o seu consumo de gás natural
	IT	• Fai attenzione a quanto è effettivamente “verde” un contratto di energia • Gas verde o ecologico significa compensare il consumo di gas
	SP	• Presta atención a cuán “verde” es realmente un contrato de energía • Gas verde o ecológico significa compensar tu consumo de gas
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Energy cooperative: Remote solar and wind

PT: Cooperativas de Energia Renovável

IT: Cooperativa energetica: Solare e eolico a distanza

SP: Cooperativa energética: Solar y eólico a distancia

Measure description	EN	If you don't have a (suitable) roof for solar panels yourself, you can invest in sustainable projects at an external location near you via an energy cooperative. This is possible via the postal code scheme. Together with other participants in the cooperative, you invest in, for example, a solar park or solar panels on a large agricultural roof. The generated electricity will benefit your energy bill.
	PT	Se não tiver um telhado adequado para painéis solares, pode investir em projetos sustentáveis noutros locais através de uma cooperativa de energia renovável. Juntamente com outros participantes da cooperativa, pode investir, por exemplo, na instalação de painéis solares num telhado de um edifício ocupado por uma instituição social. Assim, ajuda essas entidades a diminuir as suas faturas de energia, contribui para um sistema energético mais limpo e, ainda, investe as suas poupanças de forma lucrativa. Atualmente, também se pode juntar aos seus vizinhos para produzir energia renovável no seu bairro e comunidade. As comunidades de energia renovável permitem que os cidadãos, além de produzir e consumir, também possam ter atividades de partilha, armazenamento e de venda da energia excedente. Explore estas oportunidades de participar na criação de um sistema energético mais sustentável!
	IT	Se non hai un tetto adatto per pannelli solari, puoi investire in progetti sostenibili in una località esterna vicino a te tramite una cooperativa energetica. Insieme ad altri partecipanti alla cooperativa, investi, ad esempio, in un parco solare o in pannelli solari su un grande tetto agricolo. L'energia generata beneficerà nella tua bolletta energetica.

	SP	Si no tienes una cubierta adecuada para instalar paneles solares, puedes invertir en proyectos sostenibles en una ubicación externa cercana a ti a través de una cooperativa energética. Esto es posible mediante el esquema del código postal. Junto con otros participantes en la cooperativa, inviertes, por ejemplo, en un parque solar o en paneles solares en una gran cubierta agrícola. La electricidad generada beneficiará tu factura de energía.
Advantages	EN	• Take advantage of collective purchasing discount • You contribute to sustainable power generation in the country • Also possible for tenants (except if your rent includes energy consumption)
	PT	• Aproveita as vantagens associadas a compras em grupo • Pode contribuir para a geração de eletricidade sustentável em Portugal • Também é possível para arrendatários (exceto se a renda inclui consumo de energia)
	IT	• Approfitti dello sconto collettivo sugli acquisti • Contribuisci alla generazione di energia sostenibile nel paese • Possibile anche per inquilini (tranne se l'affitto include il consumo energetico)
	SP	• Aprovechas el descuento colectivo en la compra • Contribuyes a la generación sostenible de energía en el país • También es posible para inquilinos (excepto si tu alquiler incluye el consumo de energía)
Point of attention	EN	• There are tax advantages, but these are complex • Limited choice of participating energy suppliers. All participants may have to be connected to the same energy supplier
	PT	• Existem vantagens fiscais, mas são complexas • Escolha limitada de fornecedores de energia
	IT	• Ci sono vantaggi fiscali, ma sono complessi • Scelta limitata di fornitori di energia partecipanti. Tutti i partecipanti possono dover essere collegati allo stesso fornitore di energia
	SP	• Existen ventajas fiscales, pero son complejas • Elección limitada de proveedores de energía participantes. Todos los participantes pueden tener que estar conectados al mismo proveedor de energía
Applicable typology	Single-family houses, condominium households and energy-poor households	

Measure title: Small wind turbine

PT: Microturbina eólica

IT: Turbina eolica di piccole dimensioni

SP: Turbina eólica pequeña

Measure description	EN	With a wind turbine you generate your own sustainable wind energy. Today, wind turbines come in many shapes and sizes. Whether a small wind turbine is suitable for your situation strongly depends on the environment, for example the wind area, the available free space and obstacles. Also check the regulations in your municipality and province. In addition to generating energy for your own use, it is sometimes also possible to sell surplus energy back to the grid or to the neighbourhood.
	PT	Com uma turbina eólica, pode produzir a sua própria energia eólica sustentável. Atualmente, as turbinas eólicas estão disponíveis em muitas formas e tamanhos. A adequação de uma pequena turbina eólica à sua situação depende bastante do ambiente, como, por exemplo, a área de exposição ao vento, o espaço livre disponível e os obstáculos à instalação. Consulte os regulamentos no seu município; esta tecnologia não é muito adequada nem costuma ser permitida em zonas históricas urbanas. Além de produzir eletricidade para uso próprio, é também possível revender o excedente à rede ou à vizinhança.
	IT	Con una turbina eolica puoi generare la tua energia sostenibile. Oggi le turbine eoliche sono disponibili in molte forme e dimensioni. Se una turbina eolica di piccole dimensioni è adatta alla tua situazione dipende fortemente dall'ambiente, come la direzione e l'intensità del vento, lo spazio disponibile e gli ostacoli. Controlla anche le normative nel tuo comune e nella tua provincia. Oltre a generare energia per il proprio uso, a volte è anche possibile vendere l'energia in surplus alla rete o al vicinato.
	SP	Con una turbina eólica generas tu propia energía eólica sostenible. Hoy en día, las turbinas eólicas vienen en muchas formas y tamaños. La idoneidad de una turbina eólica pequeña para tu situación depende en gran medida del entorno, como el área de viento, el espacio libre disponible y los obstáculos. También revisa las normativas en tu municipio y provincia. Además de generar energía para tu propio uso, a veces también es posible vender el excedente de energía a la red o al vecindario.
Applicable typology		Single-family houses

Measure title: Field setup solar panels

PT: Instalação de painéis solares num campo

IT: Not applicable

SP: Instalación de paneles solares sobre el terreno

Measure description	EN	When it is not possible to install solar panels on your building but you own a piece of land, a field setup can be an option. This is a relatively expensive way compared to solar panels on the roof, as an entirely new construction has to be made. There are also smaller variants where ballast trays for roof constructions are used on the ground.
	PT	Quando não é possível instalar painéis solares no seu prédio, mas possui um terreno, pode usá-lo como opção. Esta é uma forma relativamente

		cara em comparação com os painéis solares no telhado, uma vez que é necessário fazer uma construção inteiramente nova.
	SP	Cuando no es posible instalar paneles solares en tu edificio pero posees un terreno, una instalación sobre el terreno puede ser una opción. Este es un método relativamente costoso en comparación con los paneles solares en la cubierta, ya que se debe realizar una construcción completamente nueva. También hay variantes más pequeñas donde se utilizan placas lastradas para cubiertas en el suelo.
Applicable typology		Multi-family house

Measure title: Inverter

PT: Inversor

IT: Inverter

SP: Inversor

Measure description	EN	When you have made the switch to solar panels, you need an inverter to be able to use the electricity. Installers often offer solar panels that include an inverter. Choose a high-quality inverter and ask about the warranties.
	PT	Ao fazer a instalação de painéis fotovoltaicos, é necessário um inversor para poder utilizar a eletricidade nos seus eletrodomésticos. Normalmente, as empresas de instalação disponibilizam painéis solares que incluem um inversor. Opte por um inversor de alta qualidade e informe-se sobre as garantias.
	IT	Quando hai effettuato il passaggio ai pannelli solari, hai bisogno di un inverter per poter utilizzare l'elettricità. Gli installatori spesso offrono pannelli solari che includono un inverter. Scegli un inverter di alta qualità e informati sulle garanzie.
	SP	Cuando hayas realizado el cambio a paneles solares, necesitas un inversor para poder utilizar la electricidad. Los instaladores a menudo ofrecen paneles solares que incluyen un inversor. Elige un inversor de alta calidad y pregunta sobre las garantías.
Applicable typology		Single-family houses

Measure title: Optimisers

PT: Optimizador

IT: Ottimizzatori

SP: Optimizadores

Measure description	EN	The installation of solar panels involves looking for the most optimal position in relation to the sun, but also for the building. Of course, it can happen that not all panels are oriented the same or that during the day, shade falls on one of the panels due to a tree or a chimney. Normally, solar panels are connected in series, which means all panels perform as well as the least favourable panel. What a waste! By adding an optimiser, the panels are read individually and you benefit from each panel in the most optimal way.
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	PT	A instalação de painéis solares envolve encontrar a posição ideal relativamente ao sol, mas também ao edifício. Naturalmente, pode acontecer que nem todos os painéis tenham a mesma orientação ou que, durante o dia, seja projetada sombra sobre um dos painéis devido a uma árvore, chaminé ou edifício adjacente. Os painéis solares são geralmente ligados em série, o que significa que todos os painéis têm um desempenho apenas tão bom quanto o painel menos eficiente. Isto é um desperdício! Ao adicionar um otimizador, os painéis estão ligados em paralelo e funcionam mais individualmente, pelo que beneficia de cada painel da forma mais otimizada possível.
	IT	L'installazione di pannelli solari implica la ricerca della posizione ottimale in relazione al sole e all'edificio. Naturalmente, può succedere che non tutti i pannelli siano orientati allo stesso modo o che durante il giorno, l'ombra di un albero o di un camino cada su uno dei pannelli. Normalmente, i pannelli solari sono collegati in serie, il che significa che tutti i pannelli funzionano come il pannello meno favorevole. Che spreco! Aggiungendo un ottimizzatore, i pannelli vengono letti individualmente e puoi beneficiare di ogni pannello nel modo migliore.
	SP	La instalación de paneles solares implica buscar la posición más óptima en relación con el sol, pero también para el edificio. Por supuesto, puede suceder que no todos los paneles estén orientados de la misma manera o que durante el día, la sombra de un árbol o una chimenea caiga sobre uno de los paneles. Normalmente, los paneles solares están conectados en serie, lo que significa que todos los paneles funcionan como el panel menos favorable. ¡Qué desperdicio! Al agregar un optimizador, los paneles se leen individualmente y te beneficias de cada panel de la manera más óptima.
Applicable typology		Single-family houses

Measure title: Solar tile

PT: Telha solar

IT: Tegole solari

SP: Teja solar

Measure description	EN	Solar panels that look like roof tiles: they exist! The panel is integrated into the roof tile. This solar tile resembles a modern shiny roof tile and is therefore not always permitted on historic buildings. These roof tiles are particularly suitable for smaller roofs or for roofs with many interruptions (such as chimneys or windows). It can be difficult to accommodate many solar panels on such roofs, but the solar tile can easily be placed around them.
	PT	Painéis solares que parecem telhas: existem! O painel está integrado na telha. Esta telha solar assemelha-se a uma telha moderna e brilhante e, portanto, nem sempre é permitida em edifícios históricos. Estas telhas são particularmente adequadas para telhados mais pequenos ou para telhados com muitas interrupções (como chaminés ou janelas). Pode ser

		difficil acomodar muitos painéis solares nesses telhados, mas a telha solar pode ser facilmente colocada ao redor deles.
	IT	I pannelli solari che sembrano tegole per tetti: esistono! Il pannello è integrato nelle tegole del tetto. Questa tegola solare somiglia a una tegola moderna e lucida e quindi non è sempre permessa sugli edifici storici. Queste tegole sono particolarmente adatte per tetti più piccoli o per tetti con molte interruzioni (come camini o finestre). Può essere difficile posizionare molti pannelli solari su tali tetti, ma le tegole solari possono essere facilmente posizionate attorno a essi.
	SP	¿Existen paneles solares que parecen tejas para cubiertas! El panel está integrado en la teja de la cubierta. Esta teja solar se asemeja a una teja moderna y brillante, por lo que no siempre está permitida en edificios históricos. Estas tejas son particularmente adecuadas para cubiertas más pequeñas o para cubiertas con muchas interrupciones (como chimeneas o ventanas). Puede ser difícil colocar muchos paneles solares en tales cubiertas, pero la teja solar se puede colocar fácilmente alrededor de ellos.
Advantages	EN	Due to the small size of a roof tile, more surface area in solar panels can be applied on non-standard roof tops
	PT	Devido ao reduzido tamanho de uma telha, maior área de superfície de painéis solares pode ser aplicada em telhados não padronizados
	IT	Date le piccole dimensioni di una tegola, è possibile applicare una maggiore superficie di pannelli solari su tetti non standard
	SP	Debido al tamaño pequeño de una teja, se puede aplicar una mayor superficie de paneles solares en cubiertas no estándar
Point of attention	EN	- The solar tile stands out shiny against a matte roof tile - The size of the solar tile may deviate from the requirements of the Building Appearance Regulations - The roof tile lasts longer than the integrated solar cells - Installation requires a lot of wiring and connection points
	PT	- A telha solar destaca-se com brilho contra uma telha fosca - O tamanho da placa solar pode divergir dos requisitos dos Regulamentos Municipais - A telha dura mais que as células solares integradas - A instalação requer muitos fios e pontos de conexão
	IT	- La tegola solare risulta lucida rispetto a una tegola opaca - Le dimensioni della tegola solare possono deviare dai requisiti delle Normative sull'Aspetto Edilizio - La tegola dura più a lungo delle celle solari integrate - L'installazione richiede molti cablaggi e punti di connessione
	SP	- La teja solar destaca brillante en comparación con una teja opaca - El tamaño de la teja solar puede desviarse de los requisitos de las Normativas de Apariencia de los Edificios - La teja dura más que las células solares integradas - La instalación requiere mucho cableado y puntos de conexión

Applicable typology	Single-family houses
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Measure title: Power window

PT: Janela solar

IT: Finestra con generazione di energia

SP: Ventana con generación de energía

Measure description	EN	If your building has many windows that need to be replaced, choose a combination of insulation and energy generation. With a power window, a thin coating is applied over the surface of the glass that can transfer the energy from the sun to the edges of the glazing. Solar cells are integrated in the edges of these windows, which convert the energy into electrical energy. There are also variants in which sun blinds can be operated between the glass panes, which keeps the inside cool while energy is generated!
	PT	Se o seu edifício tiver muitas janelas que precisam de ser substituídas, opte por uma combinação de isolamento e produção de energia. Com uma janela solar fotovoltaica, é aplicado um revestimento fino sobre a superfície do vidro, o qual pode transferir a energia do sol para os caixilhos. As células solares são integradas nos caixilhos, convertendo a energia produzida em energia elétrica. Existem também variantes em que podem ser utilizadas em estores ou entre placas de vidro, o que mantém a janela fresca e também produz energia!
	IT	Se ilman a tuo edificio ha molte finestre che devono essere sostituite, scegli una combinazione di isolamento e generazione di energia. Con una finestra con generazione di energia, uno strato sottile viene applicato sulla superficie del vetro, che può trasferire l'energia del sole verso i bordi del vetro. Le celle solari sono integrate nei bordi di queste finestre, convertendo l'energia in energia elettrica. Esistono anche varianti in cui le tapparelle possono essere azionate tra i vetri, mantenendo l'interno fresco mentre viene generata energia!
	SP	Si tu edificio tiene muchas ventanas que necesitan ser reemplazadas, elige una combinación de aislamiento y generación de energía. Con una ventana con generación de energía, se aplica un recubrimiento fino sobre la superficie del vidrio que puede transferir la energía del sol a los bordes del acristalamiento. Las células solares están integradas en los bordes de estas ventanas, convirtiendo la energía en energía eléctrica. También hay variantes en las que se pueden operar persianas entre los cristales, lo que mantiene el interior fresco mientras se genera energía.
Applicable typology	Single-family houses	

Monitoring and storage

Measure title: Energy consumption manager

PT: Monitorização e gestão do consumo de energia

IT: Sistema di monitoraggio del consumo energetico

SP: Gestor de consumo energético

Measure description	EN	When do I consume a lot of energy and with which devices? An energy consumption manager will make this transparent for you. This also gives you insight into standby energy consumption, for example for devices that still consume energy on standby. This makes saving energy easier and more fun, because the effect is immediately visible. Systems vary from a screen on the wall to websites and apps. You will often see energy consumption decrease in real-time if, for example, you turn down the heating or turn off the lights. With an energy consumption manager, you can save 5 to 10% on your total energy consumption.
	PT	Quando consumo mais energia e com que equipamentos? Quanta eletricidade está a produzir o meu painel solar? Um sistema de monitorização e gestão do consumo de energia tornará toda esta informação mais clara para si. Também lhe fornecerá informações sobre os consumos de energia em stand-by e sobre os consumos fantasma. Isto torna a poupança de energia mais fácil e mais prática, uma vez que o efeito é imediatamente visível. Os sistemas podem variar desde um ecrã na parede até sites e aplicações. Muitas vezes, poderá ver reduções no consumo de energia em tempo real se, por exemplo, desligar o aquecimento ou apagar as luzes. Adicionalmente, em alguns casos, poderá controlar os seus equipamentos remotamente e programá-los da forma mais conveniente e confortável. Com um gestor de consumos de energia, pode poupar 5% a 10% no seu consumo total de energia. Algumas tecnologias requerem que mude para um quadro elétrico inteligente ou que instale várias tomadas inteligentes. Existem ofertas no mercado a partir de 100€, mais uma mensalidade que pode rondar os 4€, mas os verdadeiros custos vão variar conforme as funcionalidades do sistema e o número e tipo de equipamentos que tem em sua casa.
	IT	Quando consumo energia e con quali dispositivi? Un sistema di monitoraggio del consumo energetico ti renderà tutto questo trasparente. Ti offre anche una visione del consumo di energia in standby, ad esempio per i dispositivi che continuano a consumare energia anche in modalità standby. Questo rende il risparmio energetico più facile e divertente, perché l'effetto è visibile immediatamente. I sistemi variano da uno schermo a muro a siti web e app. Spesso vedrai una diminuzione del consumo di energia in tempo reale se, ad esempio, abbassi il riscaldamento o spegni le luci. Con un sistema di monitoraggio del consumo energetico, puoi risparmiare dal 5 al 10% sul tuo consumo energetico totale.
	SP	¿Cuándo consumo mucha energía y con qué dispositivos? Un gestor de consumo energético te hará transparente esta información. También te dará una visión del consumo de energía en espera, por ejemplo, para dispositivos que aún consumen energía en modo espera. Esto hace que el ahorro energético sea más fácil y divertido, porque el efecto es visible de inmediato. Los sistemas varían desde una pantalla en la pared hasta sitios web y aplicaciones. A menudo verás disminuir el consumo de energía en tiempo real si, por ejemplo, bajas la calefacción o apagas las

		lucres. Con un gestor de consumo energético, puedes ahorrar entre el 5% y el 10% en tu consumo total de energía.
Advantages	EN	• Easy insight into electricity and gas consumption • Can be read and controlled remotely • It is possible to monitor electricity, gas and water consumption
	PT	• Informação fácil sobre o consumo de eletricidade e gás • Pode ser lido e controlado remotamente • É possível monitorizar o consumo de eletricidade, gás e água
	IT	• Facile panoramica sul consumo di elettricità e gas • Può essere letto e controllato da remoto • È possibile monitorare il consumo di elettricità, gas e acqua
	SP	• Visión fácil del consumo de electricidad y gas • Se puede leer y controlar de forma remota • Es posible monitorizar el consumo de electricidad, gas y agua
Point of attention	EN	• Most consumption managers require a smart meter • The more advanced systems are expensive
	PT	• Muitos gestores de consumos necessitam de estar associados a um quadro inteligente • Os sistemas mais avançados são caros
	IT	• La maggior parte dei gestori di consumo richiede un contatore intelligente • I sistemi più avanzati sono costosi
	SP	• La mayoría de los gestores de consumo requieren un contador inteligente • Los sistemas más avanzados son costosos
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Battery

PT: Bateria doméstica

IT: Batteria domestica

SP: Batería

Measure description	EN	Solar panels generate energy during the day, while there can also be a high energy demand early in the morning and in the evening. To be less dependent on the electricity grid, a home battery can be a solution. The home battery is also a solution for owners of electric cars. Moreover, with a battery there, is usually no need to upgrade the grid connection, which reduces annual extra costs. The current generation of home batteries has a high efficiency, takes up little space and has a nice design. Home batteries last for years.
	PT	Os painéis solares fotovoltaicos produzem eletricidade durante o dia, mas também podem existir consumos elevados ao início da manhã e à noite. Para estar menos dependente da rede elétrica, uma bateria doméstica pode ser uma solução. A bateria doméstica é também uma solução para os proprietários de carros elétricos. Com uma bateria

		instalada, normalmente não há necessidade de aumentar a potência da ligação à rede elétrica, o que reduz os custos anuais adicionais. A geração atual de baterias domésticas tem uma elevada eficiência, ocupa pouco espaço e apresenta um design apelativo. Além disso, os seus custos estão a descer e as baterias domésticas têm uma vida útil de vários anos. Mesmo que, neste momento, não lhe compense comprar uma bateria, ao instalar um sistema solar fotovoltaico garanta que este permite a sua instalação mais tarde.
	IT	I pannelli solari generano energia durante il giorno, mentre ci può essere anche una grande richiesta di energia presto al mattino e alla sera. Per essere meno dipendenti dalla rete elettrica, una batteria domestica può essere una soluzione. La batteria domestica è anche una soluzione per i proprietari di auto elettriche. Inoltre, con una batteria, di solito non è necessario aggiornare la connessione alla rete, il che riduce i costi annuali aggiuntivi. La generazione attuale di batterie domestiche ha un'alta efficienza, occupa poco spazio e ha un design elegante. Le batterie domestiche durano per anni.
	SP	Los paneles solares generan energía durante el día, mientras que también puede haber una alta demanda de energía temprano en la mañana y por la tarde. Para depender menos de la red eléctrica, una batería doméstica puede ser una solución. La batería doméstica también es una solución para los propietarios de coches eléctricos. Además, con una batería, generalmente no es necesario actualizar la conexión a la red, lo que reduce los costos adicionales anuales. La generación actual de baterías domésticas tiene una alta eficiencia, ocupa poco espacio y tiene un diseño atractivo. Las baterías domésticas duran años.
Advantages	EN	• Less dependence on the present energy grid • Reduced annual grid management costs • Independent energy supply
	PT	• Menor dependência da rede de abastecimento de energia • Redução dos custos anuais de gestão da rede • Abastecimento de energia independente
	IT	• Minore dipendenza dalla rete elettrica attuale • Riduzione dei costi annuali di gestione della rete • Fornitura di energia indipendente
	SP	• Menor dependencia de la red energética actual • Reducción de los costos anuales de gestión de la red • Suministro de energía independiente
Point of attention	EN	• This is a relatively costly investment • Reserve space for a home battery during a renovation
	PT	• Este investimento é relativamente caro • Durante uma renovação, reserve espaço para uma bateria doméstica, mesmo que não a vá instalar no imediato
	IT	• È un investimento relativamente costoso • Riserva spazio per una batteria domestica durante una ristrutturazione

	SP	• Es una inversión relativamente costosa • Reserva espacio para una batería doméstica durante una renovación
Applicable typology	Single-family houses, condominium households and energy-poor households	

Measure title: Electric car charging station

PT: Ponto de carregamento para carro elétrico

IT: Stazione di ricarica per auto elettriche

SP: Estación de carga para coches eléctricos

Measure description	EN	If you have an electric car, you can charge via a charging station, which is faster than a conventional socket. Charging stations are often easy to install in or near a and this is stimulated by municipal regulations. Make sure that the charging station has sufficient power, otherwise charging times may be very long. Eventually it will even become possible to temporarily store energy in the batteries of your electric car.
	PT	Se tiver um carro elétrico, pode carregá-lo num ponto de carregamento, o que é mais rápido do que numa tomada convencional. Normalmente, os pontos de carregamento são fáceis de instalar numa casa com garagem ou perto dela, e isso tem sido estimulado pelos regulamentos municipais. Certifique-se de que o ponto de carregamento é alimentado com energia suficiente por exemplo através de um painel fotovoltaico, caso contrário, os tempos de carregamento poderão ser muito longos. Com a evolução da tecnologia, acabará por ser possível armazenar temporariamente eletricidade nas baterias do seu carro elétrico para depois usar na sua casa.
	IT	Se hai un'auto elettrica, puoi ricaricarla tramite una stazione di ricarica, che è più veloce di una presa convenzionale. Le stazioni di ricarica sono spesso facili da installare dentro o vicino a casa e questo è incentivato dalle normative comunali. Assicurati che la stazione di ricarica abbia una potenza sufficiente, altrimenti i tempi di ricarica potrebbero essere molto lunghi. In futuro sarà anche possibile immagazzinare temporaneamente energia nelle batterie della tua auto elettrica.
	SP	Si tienes un coche eléctrico, puedes cargarlo a través de una estación de carga, que es más rápida que un enchufe convencional. Las estaciones de carga suelen ser fáciles de instalar en o cerca de tu casa y esto está incentivado por las normativas municipales. Asegúrate de que la estación de carga tenga suficiente potencia, de lo contrario, los tiempos de carga pueden ser muy largos. En el futuro, incluso será posible almacenar temporalmente energía en las baterías de tu coche eléctrico.
Advantages	EN	• Fast and safe charging of your electric car • Different power ratings, choice depending on type of car
	PT	• Carregamento rápido e seguro do seu carro elétrico • A escolha da potência depende do tipo de carro
	IT	• Ricarica veloce e sicura della tua auto elettrica

Point of attention		• Diverse potenze, scelta a seconda del tipo di auto
	SP	• Carga rápida y segura de tu coche eléctrico • Diferentes potencias, elección según el tipo de coche
	EN	• At low power it still takes a long time to charge the car • It may be necessary to upgrade the electricity connection, there are costs associated with this
	PT	• O carregamento do carro é mais demorado quando se usa potências baixas • Pode ser necessário aumentar a potência contratada ou mudar para uma corrente trifásica, com os custos associados
	IT	• Con potenza bassa, la ricarica dell'auto richiede ancora molto tempo • Potrebbe essere necessario aggiornare la connessione elettrica, con costi associati
	SP	• Con baja potencia, la carga del coche todavía lleva mucho tiempo • Puede ser necesario actualizar la conexión eléctrica, con costos asociados
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Power cutters

PT: Disjuntores

IT: Interruttori di corrente

SP: Interruptores de corriente

Measure description	EN	Over time, the contacts of the circuit breaker may develop corrosion, becoming a potential source of serious electrical damage. Keep your electrical connections in perfect condition by periodically turning the circuit breaker on and off to prevent costly repairs later on.
	PT	Com o tempo, os contactos do disjuntor podem apresentar corrosão, tornando-se um possível foco de graves danos elétricos. Mantenha as suas ligações elétricas em perfeitas condições ao ligar e desligar periodicamente o disjuntor para evitar reparações dispendiosas mais tarde.
	IT	Nel tempo, i contatti degli interruptori automatici possono sviluppare corrosione, diventando una potenziale fonte di gravi danni elettrici. Mantieni i tuoi collegamenti elettrici in perfette condizioni accendendo e spegnendo periodicamente gli interruptori automatici per prevenire costose riparazioni in seguito.
	SP	Con el tiempo, los contactos del interruptor automático pueden desarrollar corrosión, convirtiéndose en una fuente potencial de graves daños eléctricos. Mantén tus conexiones eléctricas en perfectas condiciones encendiendo y apagando periódicamente el interruptor automático para prevenir reparaciones costosas en el futuro.
Applicable typology		Single-family houses, condominium households and energy-poor households

Lighting

Measure title: LED lamps

PT: Lâmpadas LED

IT: Lampade LED

SP: Lámparas LED

Measure description	EN	Easily saving energy starts with your lighting. Up to 8% of the total electricity consumption in a building is from lighting. By replacing incandescent bulbs with LED lights you can make significant savings. LED lights already come in many types, sizes and colours. There are dimmable types available and they have no start-up time such as energy-saving lights.
	PT	A poupança de energia começa facilmente com a iluminação, responsável por cerca de 2% do consumo total de eletricidade numa casa portuguesa. Ao substituir as lâmpadas incandescentes e de halógeno por lâmpadas LED, terá poupanças energéticas significativas em iluminação. Ao mesmo tempo, reduzirá a emissão de calor causada pelas lâmpadas ineficientes o que pode diminuir as necessidades de arrefecimento no verão. Hoje em dia, as lâmpadas LED estão disponíveis a preços muito acessíveis em inúmeros tipos, tamanhos e cores.
	IT	Risparmiare energia in modo semplice inizia con l'illuminazione. Fino all'8% del consumo totale di elettricità in un edificio è dovuto all'illuminazione. Sostituendo le lampadine a incandescenza con luci LED puoi ottenere risparmi significativi. Le luci LED sono già disponibili in molti tipi, dimensioni e colori. Esistono varianti dimmerabili e non hanno tempi di accensione come le lampade a risparmio energetico.
	SP	Ahorrar energía fácilmente comienza con tu iluminación. Hasta el 8% del consumo total de electricidad en un edificio proviene de la iluminación. Al reemplazar las bombillas incandescentes con luces LED, puedes lograr ahorros significativos. Las luces LED ya están disponibles en muchos tipos, tamaños y colores. Existen tipos regulables y no tienen tiempo de arranque como las lámparas de ahorro energético.
Advantages	EN	• Short cost recovery period • 25,000 burning hours compared to 7,000 for an energy-saving bulb and 1,000 for a light bulb • A quick and easy measure to save energy and money • Available in various variants & styles • You can carry out this measure yourself
	PT	• Rápido retorno do investimento • 25,000 horas úteis comparado com 7,000 horas para uma lâmpada eficiente e 1,000 para uma lâmpada • Uma medida rápida e fácil para poupar energia e dinheiro • Disponível em várias variantes e estilos • Pode implementar esta medida sozinho
	IT	• Breve periodo di recupero dei costi

		• 25.000 ore di accensione rispetto a 7.000 per una lampadina a risparmio energetico e 1.000 per una lampadina tradizionale • Misura rapida e facile per risparmiare energia e denaro • Disponibile in diverse varianti e stili • Puoi eseguire questa misura da solo
	SP	• Periodo corto de recuperación de costos • 25.000 horas de funcionamiento en comparación con 7.000 para una lámpara de ahorro energético y 1.000 para una bombilla convencional • Medida rápida y fácil para ahorrar energía y dinero • Disponible en varias variantes y estilos • Puedes realizar esta medida por ti mismo
Point of attention	EN	• LED bulbs do not fit all fixtures, check this carefully before purchasing the bulbs • It may be necessary to install a special dimmer
	PT	• Existem vários tipos de casquilhos, tenha em atenção quais são os de sua casa antes de comprar as lâmpadas LED • Pode ser necessário instalar um regulador específico
	IT	• Le lampadine LED non si adattano a tutti i portalampade, controlla attentamente prima di acquistare le lampadine • Potrebbe essere necessario installare un dimmer speciale
	SP	• Las bombillas LED no se adaptan a todos los accesorios de lámparas, verifica esto cuidadosamente antes de comprar las bombillas • Puede ser necesario instalar un regulador especial
Applicable typology	Single-family houses, condominium households and energy-poor households	
Final Energy Reduction	$\{\text{number of lamps}\} \times \{\text{average number of hours per day}\} \times 365 \times 0,010$	
Investment estimate	$\{\text{number of lamps}\} \times 3$	
Savings estimate	$FER \times \{\text{electricity price}\}$	
GHG Reduction	$FER \times \{\text{electricity CO}_2 \text{ emissions}\}$	

Measure title: Sensors for lighting

PT: Sensores automáticos

IT: Sensori per l'illuminazione

SP: Sensores para iluminación

Measure description	EN	We all leave the light on from time to time. It uses quite a lot of energy unnoticed. By combining motion sensors with LED lamps, you reduce the energy consumption for your lighting. The motion sensors pick up the changes in heat radiation, so the light only comes on when someone enters a room. This way, you avoid wasting energy.
	PT	Todos nós deixamos a luz acesa de vez em quando. Mas sempre que o fazemos, estamos a consumir energia de forma desnecessária. Ao usar

		sensores de movimento em divisões pouco usadas ou em zonas de passagem, pode diminuir os gastos dessas lâmpadas entre 20% e 75%, dependendo do tipo de divisão e da frequência com que se esquece de apagar as luzes. Pode também usar reguladores de intensidade luminosa para ajustar a luz a cada momento ou atividade específica, podendo ser colocados na parede ou nas lâmpadas e, em alguns casos, controlados à distância. Tenha atenção que nem todas as lâmpadas permitem esta regulação. Embora não sejam muito usados em Portugal, os detetores crepusculares medem a quantidade de luz disponível, apenas acionando a iluminação artificial quando necessário. A compra e instalação de um sensor automático tem um custo estimado entre 10€ e 30€.
	IT	Tutti noi lasciamo la luce accesa di tanto in tanto. Questo consuma molta energia senza che ce ne accorgiamo. Combinando sensori di movimento con lampade LED, riduci il consumo energetico per l'illuminazione. I sensori di movimento rilevano la presenza di una persona, così la luce si accende solo quando qualcuno entra in una stanza. In questo modo eviti di sprecare energia.
	SP	Todos dejamos la luz encendida de vez en cuando. Esto consume bastante energía sin que nos demos cuenta. Al combinar sensores de movimiento con lámparas LED, reduces el consumo de energía para tu iluminación. Los sensores de movimiento detectan los cambios en la radiación de calor, por lo que la luz solo se enciende cuando alguien entra en una habitación. De este modo, evitas el desperdicio de energía.
Advantages	EN	• The lighting switches on/off automatically • Makes a big difference compared to the old situation • Short cost recovery period • Saves energy
	PT	• A luz liga-se e desliga-se automaticamente • Provoca uma grande diferença comparado com a solução antiga • Rápido retorno do investimento • Poupa energia
	IT	• L'illuminazione si accende/spegne automaticamente • Fa una grande differenza rispetto alla situazione precedente • Breve periodo di recupero dei costi • Risparmia energia
	SP	• La iluminación se enciende/apaga automáticamente • Hace una gran diferencia respecto a la situación anterior • Periodo corto de recuperación de costos • Ahorra energía
Point of attention	EN	• Often used in public areas, less suitable for bedrooms for example
	PT	• Frequentemente usado em áreas públicas, menos adequado para quartos por exemplo
	IT	• Spesso utilizzato in spazi pubblici, meno adatto per camere da letto

	SP	A menudo utilizado en zonas comunes, menos adecuado para dormitorios, por ejemplo
Applicable typology	Single-family houses, condominium households and energy-poor households	

Measure title: Solar Light Tube

PT: Tubo Solar

IT: Tubo di luce solare

SP: Tubo de luz solar

Measure description	EN	Solar tubes, also known as sun pipes or light tunnels, are used to bring natural sunlight into interior spaces. They capture sunlight through exterior domes and channel it to interior diffusers, providing natural lighting in areas like bathrooms, corridors, and basements.
	PT	Os tubos solares, também conhecidos como túneis de luz, são utilizados para trazer luz natural para espaços interiores. Eles captam a luz solar através de cúpulas exteriores e a direcionam para difusores interiores, proporcionando iluminação natural em áreas como casas-de-banho, corredores e caves.
	IT	I tubi solari, noti anche come tunnel di luce, vengono utilizzati per portare la luce naturale negli spazi interni. Catturano la luce solare attraverso cupole esterne e la canalizzano verso diffusori interni, fornendo illuminazione naturale in aree come bagni, corridoi e cantine.
	SP	Los tubos solares, también conocidos como tuberías de sol o túneles de luz, se utilizan para llevar luz natural a los espacios interiores. Capturan la luz solar a través de cúpulas exteriores y la canalizan hacia difusores interiores, proporcionando iluminación natural en áreas como baños, pasillos y sótanos.
Advantages	EN	- Reduces the need for artificial lighting, saving energy and reducing electricity costs - Enhances indoor comfort and well-being by providing natural light
	PT	- Reduz a necessidade de iluminação artificial, economizando energia e reduzindo os custos de eletricidade - Melhora o conforto e o bem-estar interiores ao fornecer luz natural
	IT	- Riduce la necessità di illuminazione artificiale, risparmiando energia e riducendo i costi elettrici - Migliora il comfort e il benessere interno fornendo luce naturale
	SP	- Reduce la necesidad de iluminación artificial, ahorrando energía y reduciendo los costos eléctricos - Mejora el confort y el bienestar interior al proporcionar luz natural
Point of attention	EN	- Proper installation and maintenance are important for optimal performance and durability of solar light tubes - Consider architectural compatibility and aesthetic considerations during installation

	PT	• A instalação e manutenção adequadas são importantes para o desempenho e durabilidade ideais dos tubos solares • Considere a compatibilidade arquitetónica e as considerações estéticas durante a instalação
	IT	• Una corretta installazione e manutenzione sono importanti per le prestazioni ottimali e la durabilità dei tubi di luce solare • Considera la compatibilità architettonica e le considerazioni estetiche durante l'installazione
	SP	• Una instalación y mantenimiento adecuados son importantes para el rendimiento óptimo y la durabilidad de los tubos de luz solar • Considera la compatibilidad arquitectónica y las consideraciones estéticas durante la instalación
Applicable typology		Single-family houses

Measure title: Natural light

PT: Luz natural

IT: Luce naturale

SP: Luz natural

Measure description	EN	Do not underestimate the power of natural light. A single south-facing window can illuminate 20 to 100 times its area. Consider also painting the walls and ceiling with light colours, especially in rooms that receive little natural light. Energy savings from turning off lights and making better use of natural light can reach up to 25% of your total lighting consumption. Several studies indicate that natural lighting also contributes to increased productivity, happiness, health, and calmness in people.
	PT	Não negligencie o poder da luz natural. Uma única janela virada a sul pode iluminar 20 a 100 vezes a sua área. Considere também pintar as paredes e teto com cores claras, especialmente em divisões que recebem pouca luz natural. A poupança de energia ao desligar as lâmpadas e ao utilizar melhor a luz natural pode chegar a 25% do seu consumo total de iluminação. Vários estudos mostram que a iluminação natural também ajuda as pessoas a serem mais produtivas, felizes, saudáveis e calmas.
	IT	Non sottovalutare il potere della luce naturale. Una singola finestra esposta a sud può illuminare da 20 a 100 volte la sua area. Considera anche di dipingere le pareti e il soffitto con colori chiari, specialmente in stanze che ricevono poca luce naturale. I risparmi energetici derivanti dallo spegnimento delle luci e dall'utilizzo migliore della luce naturale possono raggiungere fino al 25% del tuo consumo totale di illuminazione. Diversi studi indicano che la luce naturale contribuisce anche a un aumento della produttività, felicità, salute e calma delle persone.
	SP	No subestimes el poder de la luz natural. Una sola ventana orientada al sur puede iluminar de 20 a 100 veces su área. Considera también pintar las paredes y el techo con colores claros, especialmente en habitaciones que reciben poca luz natural. Los ahorros energéticos al apagar las luces y al hacer un mejor uso de la luz natural pueden alcanzar hasta el 25% de

		tu consumo total de iluminación. Varios estudios indican que la iluminación natural también contribuye a un aumento de la productividad, felicidad, salud y calma de las personas.
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Work light

PT: Iluminação direcionada para a atividade

IT: Luce di lavoro

SP: Iluminación de trabajo

Measure description	EN	Use direct lighting for activities such as reading, working, or cooking. This helps you stay focused and save energy by transitioning from brighter ceiling lights to less powerful options like table lamps and under-cabinet lighting in the kitchen. The main advantage of targeted lighting is gaining immediate control of your environment, tailoring the illumination to your needs. Avoid opaque lamps and lampshades with many obstacles to the passage of light, which often require the use of brighter or more numerous bulbs. Clean the lamps regularly, as accumulated dust reduces light transmission efficiency.
	PT	Utilize iluminação direta para atividades como ler, trabalhar ou cozinhar. Isto ajuda a se manter concentrado e a poupar energia, passando das luzes de teto mais potentes para opções menos potentes como os candeeiros de mesa e a iluminação de bancada na cozinha. A principal vantagem da iluminação direcionada consiste em obter o controlo imediato do seu ambiente, adequando a iluminação às suas necessidades. Evite candeeiros e abat-jours opacos ou com muitos obstáculos à passagem da luz, que obrigam geralmente à utilização de lâmpadas mais potentes ou em maior número. Limpe as lâmpadas regularmente, o pó acumulado diminui a eficiência da transmissão da luz.
	IT	Utilizza l'illuminazione diretta per attività come leggere, lavorare o cucinare. Questo ti aiuta a concentrarti e a risparmiare energia passando da luci da soffitto più luminose a opzioni meno potenti come lampade da tavolo e illuminazione sotto i mobili in cucina. Il principale vantaggio dell'illuminazione mirata è avere un controllo immediato del tuo ambiente, adattando l'illuminazione alle tue esigenze. Evita lampade opache e paralumi con molti ostacoli al passaggio della luce, che spesso richiedono l'uso di lampadine più luminose o numerose. Pulisci regolarmente le lampade, poiché la polvere accumulata riduce l'efficienza della trasmissione della luce.
	SP	Utiliza la iluminación directa para actividades como leer, trabajar o cocinar. Esto te ayuda a mantenerte concentrado y a ahorrar energía al pasar de luces de techo más brillantes a opciones menos potentes como lámparas de mesa e iluminación bajo los armarios en la cocina. La principal ventaja de la iluminación dirigida es obtener un control inmediato de tu entorno, adaptando la iluminación a tus necesidades. Evita lámparas opacas y pantallas de lámparas con muchos obstáculos al

		paso de la luz, que a menudo requieren el uso de bombillas más brillantes o numerosas. Limpia las lámparas regularmente, ya que el polvo acumulado reduce la eficiencia de la transmisión de luz.
Applicable typology		Single-family houses, condominium households and energy-poor households

Cooking

Measure title: Electric stove

PT: Cozinhar com eletricidade

IT: Piano cottura elettrico e a induzione

SP: Cocina eléctrica

Measure description	EN	To completely eliminate the use of gas, transitioning to electric cooking is essential. Among electric stoves, an induction stove stands out as the most sustainable choice, consuming at least 20% less energy than ceramic or halogen stoves. It's important to check for the correct electrical connections in the meter cupboard. Additionally, not all pans are suitable for use on an induction stove. However, there are pan bottoms available that can be acquired to adapt old pans for use with induction stoves.
	PT	Para eliminar completamente o consumo de gás, é necessário fazer a transição para cozinhar com eletricidade. Entre os fogões elétricos, o fogão de indução destaca-se como a opção mais sustentável, consumindo pelo menos 20% menos energia do que os fogões de vitrocerâmica ou halógeno. É importante verificar se tem as ligações elétricas corretas no quadro elétrico. Além disso, nem todos os tachos são adequados para utilização num fogão de indução. No entanto, existem fundos de panela disponíveis que podem ser adquiridos para adaptar tachos antigos para utilização com fogões de indução.
	IT	Per eliminare completamente l'uso del gas, è essenziale passare alla cottura elettrica. Tra i piani cottura elettrici, il piano a induzione si distingue come la scelta più sostenibile, consumando almeno il 20% in meno di energia rispetto ai piani in ceramica o alogeni. È importante verificare le connessioni elettriche corrette nel quadro elettrico. Inoltre, non tutte le pentole sono adatte per l'uso su un piano a induzione. Tuttavia, esistono dei fondi per pentole che possono essere acquistati per adattare pentole vecchie all'uso con piani a induzione.
	SP	Para eliminar completamente el uso de gas, es esencial hacer la transición a la cocina eléctrica. Entre las cocinas eléctricas, la cocina de inducción se destaca como la opción más sostenible, consumiendo al menos un 20% menos de energía que las cocinas de cerámica o halógenas. Es importante verificar las conexiones eléctricas correctas en el cuadro de distribución. Además, no todas las sartenes son adecuadas para usar en una cocina de inducción. Sin embargo, existen fondos para sartenes que se pueden adquirir para adaptar sartenes viejas para su uso con cocinas de inducción.
Advantages	EN	• No more gas consumption • Available in various variants & styles

	PT	- Não terá mais consumos de gás - Disponível em várias variantes e estilos
	IT	- Nessun consumo di gas - Disponibile in varie varianti e stili
	SP	- Sin consumo de gas - Disponibile en varias variantes y estilos
Point of attention	EN	It may be necessary to upgrade the electricity connection, there are costs associated with this
	PT	Pode ser necessário aumentar a potência contratada ou mudar para uma corrente trifásica, com os custos associados
	IT	Potrebbe essere necessario aggiornare la connessione elettrica, con costi associati
	SP	Puede ser necesario actualizar la conexión eléctrica, con costos asociados
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Efficient oven usage

PT: Forno eficiente

IT: Uso efficiente del forno

SP: Uso eficiente del horno

Measure description	EN	Simple actions can save energy when cooking with the oven. Preheating is necessary for most ovens, but unless you're baking bread or cakes, you may not even need to preheat. Turning off the oven before the end of the cooking time is sufficient - the retained heat will finish the process. Ovens operate more efficiently when the air inside circulates freely, so avoid placing aluminium foil on the oven racks or stacking multiple containers. Leave at least 2.5 cm of space on all sides. If you plan to clean the oven using the automatic function, start while it's still warm from use.
	PT	Algumas ações simples podem poupar energia ao cozinhar com o forno. Dez minutos é o tempo necessário para pré-aquecer a maioria dos fornos e, a menos que esteja a fazer pães ou bolos, poderá nem precisar do pré-aquecimento. Desligue o forno antes do fim do tempo de cozedura – o calor retido irá terminar o processo. Os fornos funcionam de modo mais eficiente quando o ar no interior circula livremente, por isso, evite colocar folhas de alumínio nas prateleiras do forno ou sobrepor vários recipientes e deixe, pelo menos, 2,5 cm de espaço em todos os lados. Se estiver a planear limpar o forno com a função automática, comece enquanto este ainda está quente da utilização.
	IT	Azioni semplici possono far risparmiare energia durante la cottura con il forno. Il preriscaldamento è necessario per la maggior parte dei forni, ma a meno che tu non stia cuocendo pane o dolci, potresti non avere nemmeno bisogno di preriscaldare. Spegnerne il forno prima della fine del tempo di cottura è possibile: il calore residuo completerà il processo di cottura. I forni funzionano più efficientemente quando l'aria all'interno circola liberamente, quindi evita di mettere fogli di alluminio sulle griglie

		del forno o di impilare contenitori multipli. Lascia almeno 2,5 cm di spazio su tutti i lati. Se prevedi di pulire il forno utilizzando la funzione automatica, inizia mentre è ancora caldo dall'uso.
	SP	Acciones simples pueden ahorrar energía al cocinar con el horno. El precalentamiento es necesario para la mayoría de los hornos, pero a menos que estés horneando pan o pasteles, es posible que ni siquiera necesites precalentar. Apagar el horno antes del final del tiempo de cocción es suficiente: el calor residual completará el proceso. Los hornos funcionan de manera más eficiente cuando el aire interior circula libremente, así que evita colocar papel de aluminio en las rejillas del horno o apilar múltiples recipientes. Deja al menos 2,5 cm de espacio en todos los lados. Si planeas limpiar el horno usando la función automática, comienza mientras aún esté caliente del uso.
Applicable typology	Single-family houses, condominium households and energy-poor households	

Measure title: Efficient pots

PT: Tachos e panelas eficientes

IT: Pentole efficienti

SP: Ollas eficientes

Measure description	EN	In the oven, pots and pans made of glass and ceramic heat more efficiently than metal ones. On the stove, copper pots and those with a copper bottom heat up quickly and help save energy with each use. Whenever possible, use a pressure cooker to reduce cooking times and energy consumption by 50% or more. Once the water begins to boil, reduce the flame intensity to maintain a simmer. Always use a pot or pan that is the right size for the amount of food you are cooking, and choose the stove burner with the appropriate size to avoid wasting energy and releasing excess heat into the kitchen.
	PT	No forno, os tachos e as panelas de vidro e cerâmica aquecem com maior eficiência do que os de metal. No fogão, os tachos e as panelas de cobre e com fundo de cobre aquecem rapidamente e ajudam a poupar energia em cada utilização. Sempre que possível, utilize uma panela de pressão para reduzir em 50%, ou mais, os tempos de cozedura e o consumo de energia. Assim que a água começar a ferver, reduza a intensidade da chama para manter o ponto de ebulição. Utilize sempre um tacho ou uma panela com o tamanho ideal para a quantidade de alimentos que vai cozinhar e escolha o bico do fogão com o tamanho adequado, para evitar desperdiçar energia e libertar calor para a cozinha.
	IT	Nel forno, pentole e padelle in vetro e ceramica si scaldano più efficientemente rispetto a quelle in metallo. Sulla cucina, le pentole in rame e quelle con fondo in rame si scaldano rapidamente e aiutano a risparmiare energia ad ogni uso. Ogni volta che è possibile, utilizza una pentola a pressione per ridurre i tempi di cottura e il consumo di energia fino al 50% o più. Una volta che l'acqua inizia a bollire, riduci l'intensità della fiamma per mantenere un sobbollire. Utilizza sempre una pentola

		o padella della giusta dimensione per la quantità di cibo che stai cucinando e scegli il fornello con la dimensione appropriata per evitare sprechi di energia e rilascio di calore in eccesso in cucina.
	SP	En el horno, las ollas y sartenes de vidrio y cerámica se calientan de manera más eficiente que las de metal. En la estufa, las ollas de cobre y las que tienen fondo de cobre se calientan rápidamente y ayudan a ahorrar energía en cada uso. Siempre que sea posible, utiliza una olla a presión para reducir los tiempos de cocción y el consumo de energía en un 50% o más. Una vez que el agua comience a hervir, reduce la intensidad de la llama para mantener un hervor suave. Usa siempre una olla o sartén del tamaño adecuado para la cantidad de comida que estás cocinando y elige el quemador de la estufa con el tamaño apropiado para evitar desperdiciar energía y liberar calor excesivo en la cocina.
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Gas stove flames

PT: Chamas do fogão a gás

IT: Fiamme del fornello a gas

SP: Llamas del fogón a gas

Measure description	EN	When cooking with gas, the stove flames should be blue. A yellow or orange flame may indicate inefficient fuel combustion, and the stove may require maintenance.
	PT	Ao cozinhar com gás, as chamas do fogão devem ser azuis. Uma chama amarela ou laranja poderá indicar uma queima ineficiente de combustível, e o fogão poderá necessitar de manutenção.
	IT	Quando cucini con il gas, le fiamme del fornello dovrebbero essere blu. Una fiamma gialla o arancione può indicare una combustione del combustibile inefficiente e il fornello potrebbe richiedere manutenzione.
	SP	Al cocinar con gas, las llamas del fogón deben ser azules. Una llama amarilla o naranja puede indicar una combustión ineficiente del combustible y el fogón puede requerir mantenimiento.
Applicable typology		Single-family houses, condominium households and energy-poor households

Home Appliances

Measure title: Replace energy guzzlers

PT: Substituir equipamentos ineficientes

IT: Sostituzione degli elettrodomestici energivori

SP: Reemplazo de electrodomésticos que consumen mucha energía

Measure description	EN	Old appliances are often energy guzzlers. New appliances labelled A or B are much more economical, quickly saving you €40 a year! Therefore, replace all old appliances (with more than 15 years) with new energy-
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		efficient ones. In addition, there may be a number of large consumers in your building who you can consciously deal with or reconsider the need for.
	PT	Os eletrodomésticos antigos são frequentemente grandes consumidores de energia (e de água). Os eletrodomésticos com a etiqueta A e B são muito mais económicos, permitindo-lhe poupar rapidamente mais de 50 euros por equipamento e por ano! Por este motivo, deve substituir os eletrodomésticos antigos (mais de 15 anos) por novos equipamentos energeticamente eficientes. Além disso, podem existir vários equipamentos na sua casa com consumos de energia demasiado altos, cujo propósito deve ser equacionado e cuja utilidade pode ser repensada.
	IT	Gli elettrodomestici vecchi sono spesso molto energivori. I nuovi elettrodomestici contrassegnati con la classe A o B sono molto più efficienti, facendoti risparmiare rapidamente 40 € all'anno! Pertanto, sostituisci tutti gli elettrodomestici vecchi (con più di 15 anni) con nuovi modelli ad alta efficienza energetica. Inoltre, potrebbero esserci alcuni grandi dispositivi energivori nel tuo edificio chei puoi gestire consapevolmente o reconsiderarne la necessità.
	SP	Los electrodomésticos viejos suelen ser grandes consumidores de energía. Los nuevos electrodomésticos etiquetados con la clase A o B son mucho más económicos, ahorrando rápidamente 40 € al año! Por lo tanto, reemplaza todos los electrodomésticos viejos (de más de 15 años) con modelos nuevos y eficientes en energía. Además, puede haber algunos grandes consumidores en tu edificio con los que puedes tratar conscientemente o reconsiderar su necesidad.
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Washing machine

PT: Máquina de lavar roupa

IT: Lavatrice

SP: Lavadora

Measure description	EN	Depending on the water temperature, 40% to 90% of energy consumption in a washing machine can be attributed to water heating. Therefore, make sure to use low-temperature programs with shorter wash cycles (modern detergents are equally effective in cold and hot water). Lowering the temperature from 60°C to 30°C can reduce energy consumption by 25% to 50%. Regularly clean the filters and use a descaler to remove limescale from the machine and pipes. For tumble dryers, clean the filter before or after each load to maintain optimal airflow. Always wait until you have enough laundry to fill the washing or drying machine, and consider air-drying clothes on a rack whenever possible. Lastly, measure the detergent carefully, as using an excessive amount can make the machine less efficient.
	PT	Dependendo da temperatura da água, 40% a 90% do consumo de energia numa máquina de lavar pode destinar-se ao aquecimento de água. Assim,

		certifique-se de que utiliza programas de baixa temperatura com ciclos de lavagem mais curtos (os detergentes atuais têm a mesma eficácia em água fria e quente). Reduzir a temperatura de 60°C para 30°C pode reduzir o consumo de energia entre 25% e 50%. Limpe regularmente os filtros e utilize um amaciador para remover o calcário da máquina e dos tubos. No caso das máquinas de secar, limpe o filtro antes ou depois de cada carga para manter um fluxo de ar ideal. Espere sempre até ter roupa suficiente para encher a máquina de lavar ou secar e considere secar a roupa no estendal sempre que possível. Por fim, calcule bem a quantidade de detergente necessária, uma vez que uma quantidade excessiva torna a máquina menos eficiente.
	IT	A seconda della temperatura dell'acqua, dal 40% al 90% del consumo energetico di una lavatrice può essere attribuito al riscaldamento dell'acqua. Pertanto, assicurati di utilizzare programmi a bassa temperatura con cicli di lavaggio più brevi (i detergenti moderni sono altrettanto efficaci in acqua fredda e calda). Abbassare la temperatura da 60°C a 30°C può ridurre il consumo di energia dal 25% al 50%. Pulisci regolarmente i filtri e utilizza un decalcificante per rimuovere il calcare dalla lavatrice e dai tubi. Per le asciugatrici, pulisci il filtro prima o dopo ogni carico per mantenere un flusso d'aria ottimale. Aspetta sempre di avere abbastanza bucato per riempire la lavatrice o l'asciugatrice e considera di asciugare i vestiti all'aria su un stendibiancheria quando possibile. Infine, misura il detergente con attenzione, poiché l'uso eccessivo può rendere la macchina meno efficiente.
	SP	Dependiendo de la temperatura del agua, del 40% al 90% del consumo de energía en una lavadora puede atribuirse al calentamiento del agua. Por lo tanto, asegúrate de utilizar programas a baja temperatura con ciclos de lavado más cortos (los detergentes modernos son igualmente efectivos en agua fría y caliente). Reducir la temperatura de 60°C a 30°C puede reducir el consumo de energía en un 25% al 50%. Limpia regularmente los filtros y usa un descalcificador para eliminar la cal de la máquina y los tubos. Para las secadoras, limpia el filtro antes o después de cada carga para mantener un flujo de aire óptimo. Espera siempre a tener suficiente ropa para llenar la lavadora o la secadora y considera secar la ropa al aire en un tendedero cuando sea posible. Por último, mide el detergente con cuidado, ya que el uso excesivo puede hacer que la máquina sea menos eficiente.
Applicable typology	Single-family houses, condominium households and energy-poor households	
Final Energy Reduction	PT: $(11,389 * \{\text{equipment age}\}) * 516/1000$ ES: $(10,771 * \{\text{equipment age}\}) * 539/1000$ IT: $(9,087 * \{\text{equipment age}\}) * 504/1000$	
Investment estimate	$\{\text{capacity}\} * 37,615 + 91,117$	
Savings estimate	$\{\text{FER}\} * \{\text{electricity price}\}$	
GHG Reduction	$\{\text{FER}\} * \{\text{electricity CO}_2 \text{ emissions}\}$	

Measure title: Dishwasher

PT: Máquina de lavar loiça

IT: Lavastoviglie

SP: Lavavajillas

Measure description	EN	Up to 90% of a dishwasher's energy consumption is used for water heating. Opting for low-temperature programs can save a significant amount of energy. Regularly check the drainage pipes, hoses, and filters of the dishwasher and remove any blockages. If residue builds up in the machine, its efficiency will decrease, and it may not clean properly. Unless dishes are extremely dirty or food has dried on them, you can place them directly in the dishwasher without pre-rinsing by hand, saving both water and energy. Furthermore, always fill the dishwasher before starting a washing cycle. Lastly, you can minimize drying time and let the dishes air dry.
	PT	Até 90% do consumo de energia de uma máquina de lavar loiça destina-se ao aquecimento da água. Se optar por programas de baixa temperatura, poupará muita energia. Verifique regularmente os tubos de drenagem, as mangueiras e os filtros da máquina de lavar loiça, e remova quaisquer obstruções. Se ocorrer acumulação de resíduos na máquina, a sua eficiência irá diminuir e poderá não lavar adequadamente. A menos que os pratos estejam extremamente sujos ou a comida tenha secado, pode colocá-los diretamente na máquina de lavar sem fazer a pré-lavagem à mão e poupar, assim, água e energia. Além disso, encha sempre a máquina de lavar loiça antes de iniciar um ciclo de lavagem. Por fim, também pode reduzir ao mínimo o tempo de secagem e deixar os pratos secar ao ar.
	IT	Fino al 90% del consumo energetico di una lavastoviglie è utilizzato per riscaldare l'acqua. Optare per programmi a bassa temperatura può far risparmiare una quantità significativa di energia. Controlla regolarmente i tubi di scarico, i tubi e i filtri della lavastoviglie e rimuovi eventuali ostruzioni. Se si accumulano residui, l'efficienza della lavastoviglie diminuirà e potrebbe non lavare correttamente. A meno che i piatti non siano estremamente sporchi o il cibo non si sia incrostato su di essi, puoi metterli direttamente nella lavastoviglie senza risciacquare a mano, risparmiando sia acqua che energia. Inoltre, riempi sempre la lavastoviglie prima di avviare un ciclo di lavaggio. Infine, puoi minimizzare il tempo di asciugatura e lasciare che i piatti asciughino all'aria.
	SP	Hasta el 90% del consumo energético de un lavavajillas se utiliza para calentar el agua. Optar por programas a baja temperatura puede ahorrar una cantidad significativa de energía. Revisa regularmente los tubos de desagüe, las mangueras y los filtros del lavavajillas y elimina cualquier obstrucción. Si se acumulan residuos en la máquina, su eficiencia disminuirá y puede que no limpie adecuadamente. A menos que los platos estén extremadamente sucios o la comida se haya secado en ellos, puedes colocarlos directamente en el lavavajillas sin enjuagar a mano, ahorrando tanto agua como energía. Además, llena siempre el lavavajillas

		antes de iniciar un ciclo de lavado. Por último, puedes minimizar el tiempo de secado y dejar que los platos se sequen al aire.
Applicable typology		Single-family houses, condominium households and energy-poor households
Final Energy Reduction		PT: $(18,99 * \{\text{equipment age}\}) * 410/1000$ ES: $(12,215 * \{\text{equipment age}\}) * 408/1000$ IT: $(15,094 * \{\text{equipment age}\}) * 404/1000$
Investment estimate		560 EUR
Savings estimate		$\{\text{FER}\} * \{\text{electricity price}\}$
GHG Reduction		$\{\text{FER}\} * \{\text{electricity CO}_2 \text{ emissions}\}$

Measure title: Efficient refrigerator and freezer

PT: Frigorífico e congelador eficientes

IT: Frigorifero e congelatore efficienti

SP: Frigorifico y congelador eficientes

Measure description	EN	Typically, the refrigerator is the appliance that consumes the most energy in a household. If your home has an old refrigerator or freezer (over 15 years old), it is likely consuming much more energy than necessary to keep your food fresh. Modern refrigerators and freezers have significantly higher efficiency, especially those labelled with energy classes A or B. The investment cost to replace an outdated appliance will pay off through resulting energy savings. When considering a new refrigerator or freezer, choose a more efficient model, as the initial cost difference will be offset by reduced electricity consumption. A modern cooling appliance also generates much less noise.
	PT	Normalmente, o frigorífico é o aparelho que mais energia consome numa habitação portuguesa. Se a sua casa tem um frigorífico ou um congelador antigo (com mais de 15 anos), está provavelmente a consumir muito mais energia do que a necessária para manter os seus alimentos frescos. Os frigoríficos e congeladores modernos têm uma eficiência muito maior, particularmente os que apresentam a etiqueta energética A ou B. O custo do investimento para substituir um equipamento antigo irá pagar-se a si próprio com a poupança de energia resultante. Se pretender adquirir um novo frigorífico ou congelador, opte por um equipamento mais eficiente, uma vez que a diferença nos custos iniciais será compensada pelo consumo reduzido de eletricidade. Um equipamento de refrigeração moderno também produz muito menos ruído.
	IT	Tipicamente, il frigorifero è l'elettrodomestico che consuma più energia in una casa. Se la tua casa ha un frigorifero o congelatore vecchio (più di 15 anni), è probabile che consumi molta più energia del necessario per mantenere il cibo fresco. I frigoriferi e i congelatori moderni hanno un'efficienza significativamente più alta, specialmente quelli contrassegnati con le classi energetiche A o B. Quando consideri un nuovo frigorifero o congelatore, scegli un modello più efficiente, poiché

		la differenza di costo iniziale sarà compensata dal ridotto consumo di elettricità. Un frigorifero moderno genera anche molto meno rumore.
	SP	Típicamente, el refrigerador es el electrodoméstico que consume más energía en un hogar. Si tu casa tiene un refrigerador o congelador viejo (de más de 15 años), es probable que consuma mucha más energía de la necesaria para mantener tus alimentos frescos. Los refrigeradores y congeladores modernos tienen una eficiencia significativamente más alta, especialmente aquellos etiquetados con las clases energéticas A o B. El costo de inversión para reemplazar un electrodoméstico obsoleto se recuperará a través de los ahorros de energía resultantes. Al considerar un nuevo refrigerador o congelador, elige un modelo más eficiente, ya que la diferencia de costo inicial se compensará con el menor consumo de electricidad. Un electrodoméstico de enfriamiento moderno también genera mucho menos ruido.
Applicable typology		Single-family houses, condominium households and energy-poor households
Final Energy Reduction		PT: $(0,957 * \{\text{equipment age}\}) * 8760/1000$ ES: $(1,1075 * \{\text{equipment age}\}) * 8760/1000$ IT: $(0,9312 * \{\text{equipment age}\}) * 8760/1000$
Investment estimate		$\{\text{capacity}\} * 3,1688 - 216,65$
Savings estimate		$\{\text{FER}\} * \{\text{electricity price}\}$
GHG Reduction		$\{\text{FER}\} * \{\text{electricity CO}_2 \text{ emissions}\}$

Measure title: Refrigerator and freezer
PT: Frigorífico e congelador
IT: Frigorifero e congelatore
SP: Refrigerador y congelador

Measure description	EN	Some quick and low-cost actions can ensure that your refrigerator or freezer operates efficiently, lasts longer, and keeps food fresher. Regularly clean or vacuum the dust from the coils on the back and bottom of the appliances. Create a clear space of 5 cm around the appliances, especially in the area of the coils and compressor. Place your refrigerator protected from direct sunlight and away from heat-generating equipment. Ensure that the refrigerator door closes and seals properly. If not, replace the rubber gaskets. Remove any layers of ice from the walls of the refrigerator or freezer. Set the thermostat temperature for the refrigerator to 4 to 5 °C and the freezer to -18 °C. Lower temperatures can increase consumption by 5 to 10%.
	PT	Algumas ações rápidas e de baixo custo podem assegurar que o seu frigorífico ou congelador funciona de forma eficiente, dura mais tempo e mantém os alimentos mais frescos. Limpe ou aspire regularmente o pó das bobinas nas partes posterior e inferior dos equipamentos. Crie um espaço livre de 5 cm em redor dos equipamentos, especialmente na área das bobinas e do compressor. Coloque o seu frigorífico protegido da luz solar direta e longe de equipamentos geradores de calor. Certifique-se de

		que a porta do frigorífico fecha e veda devidamente. Se não for o caso, substitua os vedantes de borracha. Remova as camadas de gelo das paredes do frigorífico ou do congelador. Regule a temperatura do termóstato do frigorífico para 4 a 5 °C e do congelador para -18 °C. Temperaturas inferiores podem aumentar em 5 a 10% o consumo e poderão até estragar alguns alimentos.
	IT	Alcune azioni rapide e a basso costo possono garantire che il tuo frigorifero o congelatore funzioni in modo efficiente, duri più a lungo e mantenga il cibo più fresco. Pulisci o aspira regolarmente la polvere dalle bobine sul retro e sul fondo degli elettrodomestici. Lascia uno spazio libero di 5 cm intorno agli elettrodomestici, specialmente nella zona delle bobine e del compressore. Colloca il frigorifero protetto dalla luce diretta del sole e lontano da apparecchi che generano calore. Assicurati che la porta del frigorifero si chiuda e sigilli correttamente. In caso contrario, sostituisci le guarnizioni in gomma. Rimuovi eventuali strati di ghiaccio dalle pareti del frigorifero o del congelatore. Imposta la temperatura del termostato per il frigorifero a 4-5°C e per il congelatore a -18°C. Temperature più basse possono aumentare il consumo del 5-10%.
	SP	Algunas acciones rápidas y de bajo costo pueden asegurar que tu refrigerador o congelador funcione de manera eficiente, dure más tiempo y mantenga los alimentos más frescos. Limpia o aspira regularmente el polvo de las bobinas en la parte trasera y inferior de los electrodomésticos. Crea un espacio claro de 5 cm alrededor de los electrodomésticos, especialmente en el área de las bobinas y el compresor. Coloca el refrigerador protegido de la luz solar directa y alejado de equipos que generen calor. Asegúrate de que la puerta del refrigerador cierre y selle correctamente. Si no es así, reemplaza las juntas de goma. Elimina cualquier capa de hielo de las paredes del refrigerador o congelador. Ajusta la temperatura del termostato para el refrigerador a 4-5°C y para el congelador a -18°C. Temperaturas más bajas pueden aumentar el consumo en un 5-10%.
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Standby usages

PT: Consumos em stand-by e potência fantasma

IT: Consumo in standby

SP: Consumos en standby

Measure description	EN	Standby power consumption refers to the electricity used by devices and equipment when they are not performing their main function. Phantom power is caused by circuits that continue to be powered even when the device is turned off. This phantom consumption occurs in power supplies, circuits, sensors, digital keyboards, screens, and various LED lights. By adding up all the small devices, standby energy and phantom power can account for 11% of a household's annual electricity consumption.
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		To eliminate standby power consumption and phantom power in your home, make sure to turn off devices you don't frequently use, switch them off before going on vacation, and completely power down devices that have a standby mode. You can also purchase a power strip with a switch to group devices and turn them all off with a simple routine action. Nowadays, smart, automatic, and programmable outlets are also available to help manage and reduce standby power consumption effectively.
	PT	O consumo em stand-by consiste na eletricidade utilizada pelos aparelhos e pelos equipamentos enquanto estes não estão a executar a sua função principal. A potência fantasma é causada por circuitos que continuam a ser alimentados, mesmo quando o dispositivo está desligado. Este consumo fantasma ocorre em fontes de alimentação, circuitos e sensores, teclados digitais e ecrãs, e diversas luzes LED. Ao somar todos os pequenos dispositivos, a energia em stand-by e a potência fantasma podem representar 11% do consumo anual de eletricidade de um agregado familiar. Para eliminar o consumo em stand-by e a potência fantasma na sua casa, certifique-se de que desliga os dispositivos que não utiliza com frequência, de que os desliga antes de ir de férias e de que desliga completamente os dispositivos que têm modo stand-by. Também pode adquirir uma tomada múltipla com interruptor para agrupar dispositivos e, assim, desligá-los todos com uma simples ação de rotina. Hoje em dia, é também possível encontrar tomadas inteligentes, automáticas e programáveis.
	IT	Il consumo di energia in standby si riferisce all'elettricità utilizzata dai dispositivi e dalle attrezzature quando non stanno svolgendo la loro funzione principale. L'energia fantasma è causata da circuiti che continuano ad essere alimentati anche quando il dispositivo è spento. Questo consumo fantasma si verifica in alimentatori, circuiti, sensori, tastiere digitali, schermi e vari LED. Sommando tutti i piccoli dispositivi, l'energia in standby e l'energia fantasma possono rappresentare l'11% del consumo annuale di elettricità di una casa. Per eliminare il consumo di energia in standby e l'energia fantasma nella tua casa, assicurati di spegnere i dispositivi che non usi frequentemente, di spegnerli prima di andare in vacanza e di spegnere completamente i dispositivi che hanno una modalità standby. Puoi anche acquistare una ciabatta con interruttore per raggruppare i dispositivi e spegnerli tutti con una semplice azione di routine. Oggi sono anche disponibili prese intelligenti, automatiche e programmabili per aiutare a gestire e ridurre efficacemente il consumo di energia in standby.
	SP	El consumo de energía en standby se refiere a la electricidad utilizada por dispositivos y equipos cuando no están realizando su función principal. La energía fantasma es causada por circuitos que continúan alimentados incluso cuando el dispositivo está apagado. Este consumo fantasma ocurre en fuentes de alimentación, circuitos, sensores, teclados digitales, pantallas y varias luces LED. Sumando todos los pequeños dispositivos, la energía en standby y la energía fantasma pueden representar el 11% del

		consumo anual de electricidad de un hogar. Para eliminar el consumo de energía en standby y la energía fantasma en tu hogar, asegúrate de apagar los dispositivos que no usas con frecuencia, apáguelos antes de irte de vacaciones y apaga completamente los dispositivos que tienen un modo de espera. También puedes comprar una regleta con interruptor para agrupar los dispositivos y apagarlos todos con una acción simple de rutina. Hoy en día también están disponibles enchufes inteligentes, automáticos y programables para ayudar a gestionar y reducir efectivamente el consumo de energía en standby.
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Elevators

PT: Elevadores

IT: Ascensori

SP: Ascensores

Measure description	EN	Elevators can provide a high energy demand. Energy can be saved in existing elevators by replacing the lighting in the lift with LED lighting. Make sure that the lighting, but also ventilation and displays, are switched off when the lift is on standby. With multiple elevators, the peak load can be reduced by applying the elevator sequence circuit, so that they are not put into operation at the same time if not needed.
	PT	Os elevadores podem representar uma grande procura por energia. A energia pode ser economizada em elevadores existentes substituindo a iluminação do elevador por iluminação LED. Certifique-se de que a iluminação, mas também a ventilação e os visores, estão desligados quando o elevador está em modo de espera. Com vários elevadores, o pico de carga pode ser reduzido aplicando o circuito sequencial do elevador, para que não sejam colocados em operação ao mesmo tempo se não forem necessários.
	IT	Gli ascensori possono richiedere un alto consumo di energia. È possibile risparmiare energia negli ascensori esistenti sostituendo l'illuminazione con luci LED. Assicurati che l'illuminazione, ma anche la ventilazione e i display, siano spenti quando l'ascensore è in modalità standby. Con più ascensori, il carico di punta può essere ridotto applicando il circuito di sequenza degli ascensori, in modo che non vengano messi in funzione contemporaneamente se non necessario.
	SP	Los ascensores pueden requerir una alta demanda de energía. Se puede ahorrar energía en los ascensores existentes reemplazando la iluminación del ascensor con luces LED. Asegúrate de que la iluminación, así como la ventilación y los displays, estén apagados cuando el ascensor esté en modo standby. Con varios ascensores, la carga máxima puede reducirse aplicando el circuito de secuencia del ascensor, para que no se pongan en funcionamiento al mismo tiempo si no es necesario.
Applicable typology		Multi-family house

Climatization

Measure title: Orientation of Windows According to Climate

PT: Orientação das Janelas de Acordo com o Clima

IT: Orientamento delle finestre secondo il clima

SP: Orientación de ventanas según el clima

Measure description	EN	Orienting windows according to the existing climate involves strategically positioning them to maximize or minimize exposure to sunlight, depending on the regional climate conditions. For instance, in colder regions, south-facing orientation should be prioritized to capture more sunlight, while in warmer regions, it's advisable to avoid this orientation to minimize heat gain.
	PT	Orientar as janelas de acordo com o clima existente envolve posicionar estrategicamente de forma a maximizar ou minimizar a exposição à luz solar, dependendo das condições climáticas regionais. Por exemplo, em regiões mais frias, a orientação voltada para sul deve ser privilegiada para captar mais luz solar, enquanto em regiões mais quentes, é aconselhável evitar essa orientação para minimizar o ganho de calor.
	IT	Orientare le finestre secondo il clima esistente implica posizionarle strategicamente per massimizzare o ridurre l'esposizione alla luce solare, a seconda delle condizioni climatiche regionali. Ad esempio, nelle regioni più fredde, si dovrebbe dare priorità all'orientamento verso sud per catturare più luce solare, mentre nelle regioni più calde è consigliabile evitare questo orientamento per ridurre l'accumulo di calore.
	SP	Orientar las ventanas según el clima existente implica posicionarlas estratégicamente para maximizar o minimizar la exposición a la luz solar, dependiendo de las condiciones climáticas regionales. Por ejemplo, en regiones más frías, se debe priorizar la orientación hacia el sur para captar más luz solar, mientras que en regiones más cálidas, es aconsejable evitar esta orientación para minimizar la ganancia de calor.
Advantages	EN	• Optimizes energy efficiency by maximizing natural heating and cooling • Enhances occupant comfort by regulating indoor temperature and reducing reliance on artificial heating and cooling systems
	PT	• Otimiza a eficiência energética ao maximizar o aquecimento e arrefecimento naturais • Melhora o conforto dos ocupantes ao regular a temperatura interna e reduzir a dependência de sistemas de aquecimento e arrefecimento artificiais
	IT	• Ottimizza l'efficienza energetica massimizzando il riscaldamento e il raffreddamento naturale • Aumenta il comfort degli occupanti regolando la temperatura interna e riducendo la dipendenza dai sistemi di riscaldamento e raffreddamento artificiali
	SP	• Optimiza la eficiencia energética maximizando la calefacción y el enfriamiento natural

		• Aumenta el confort de los ocupantes regulando la temperatura interior y reduciendo la dependencia de sistemas de calefacción y enfriamiento artificiales
Point of attention	EN	• Proper analysis of local climate conditions and building surroundings is essential for effective orientation • Ensure compatibility with local building regulations and architectural guidelines
	PT	• Uma análise adequada das condições climáticas locais e do entorno do edifício é essencial para uma orientação eficaz • Garantir a compatibilidade com os regulamentos locais de construção e diretrizes arquitetónicas
	IT	• Un'analisi accurata delle condizioni climatiche locali e dell'ambiente circostante è essenziale per un'orientazione efficace • Garantire la compatibilità con le normative edilizie locali e le linee guida architettoniche
	SP	• Un análisis adecuado de las condiciones climáticas locales y del entorno es esencial para una orientación eficaz • Asegúrate de que sea compatible con las normativas locales de construcción y directrices arquitectónicas
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Shading Systems

PT: Sistemas de Sombreamento

IT: Sistemi di ombreggiamento

SP: Sistemas de sombreado

Measure description	EN	Shading systems involve utilizing shading elements such as awnings, sunshades, and deciduous trees to provide shade to the building. These elements are strategically placed to block or filter sunlight, reducing solar heat gain during hot months and maximizing solar gain during colder months.
	PT	Os sistemas de sombreamento envolvem o uso de elementos de sombreamento, como toldos, proteções solares e árvores de folha caduca para fornecer sombra ao edifício. Esses elementos são estrategicamente posicionados para bloquear ou filtrar a luz solar, reduzindo o ganho de calor solar durante os meses quentes e maximizando o ganho solar durante os meses mais frios.
	IT	I sistemi di ombreggiamento prevedono l'utilizzo di elementi di ombreggiamento come tende solari, frangisole e alberi a foglia caduca per fornire ombra all'edificio. Questi elementi sono posizionati strategicamente per bloccare o filtrare la luce solare, riducendo il guadagno di calore solare durante i mesi caldi e massimizzando il guadagno solare durante i mesi più freddi.
	SP	Los sistemas de sombreado implican la utilización de elementos de sombreado como toldos, parasoles y árboles de hojas caducas para

		proporcionar sombra al edificio. Estos elementos se colocan estratégicamente para bloquear o filtrar la luz solar, reduciendo la ganancia de calor solar durante los meses cálidos y maximizando la ganancia solar durante los meses fríos.
Advantages	EN	• Reduces cooling loads by minimizing direct sunlight exposure to building surfaces • Enhances occupant comfort by mitigating glare and maintaining a comfortable indoor temperature • Contributes to energy efficiency by reducing the need for artificial cooling and heating
	PT	• Reduz as cargas de arrefecimento ao minimizar a exposição direta à luz solar nas superfícies do edifício • Melhora o conforto dos ocupantes ao diminuir a entrada do sol no verão, possibilitando que ela ocorra no inverno, e manter uma temperatura interna confortável • Contribui para a eficiência energética ao reduzir a necessidade de arrefecimento e aquecimento mecânico
	IT	• Riduce la necessità di raffreddamento minimizzando l'esposizione diretta alla luce solare sulle superfici dell'edificio • Aumenta il comfort degli occupanti mitigando l'abbagliamento e mantenendo una temperatura interna confortevole • Contribuisce all'efficienza energetica riducendo la necessità di raffreddamento e riscaldamento artificiali
	SP	• Reduce la carga de enfriamiento minimizando la exposición directa a la luz solar en las superficies del edificio • Aumenta el confort de los ocupantes mitigando el deslumbramiento y manteniendo una temperatura interior cómoda • Contribuye a la eficiencia energética al reducir la necesidad de enfriamiento y calefacción artificiales
Point of attention	EN	• Proper design and placement of shading systems are crucial to ensure effective shading without blocking desirable views or compromising aesthetic appeal • Regular maintenance of shading elements is necessary to ensure their effectiveness and longevity
	PT	• O projeto adequado e o posicionamento dos sistemas de sombreamento são cruciais para garantir sombreamento eficaz sem bloquear vistas desejáveis ou comprometer o apelo estético • A manutenção regular dos elementos de sombreamento é necessária para garantir a sua eficácia e longevidade
	IT	• La progettazione e il posizionamento corretti dei sistemi di ombreggiamento sono cruciali per garantire un'ombreggiatura efficace senza bloccare viste desiderabili o compromettere l'appeal estetico • La manutenzione regolare degli elementi di ombreggiamento è necessaria per garantire la loro efficacia e longevità

	SP	• Un diseño y una colocación adecuados de los sistemas de sombreado son cruciales para garantizar un sombreado eficaz sin bloquear vistas deseables o comprometer el atractivo estético • El mantenimiento regular de los elementos de sombreado es necesario para garantizar su efectividad y durabilidad
Applicable typology		Single-family houses

Space heating

Measure title: Air heat pump

PT: Bomba de calor ar-ar ou bomba de calor ar-água

IT: Pompa di calore aria-aria o aria-acqua

SP: Bomba de calor aire-aire o aire-agua

Measure description	EN	An (electric) air heat pump extracts energy from the outside air which can be used for heating tap water and for space heating. Electricity is used instead of gas. It is possible to go all-electric or install a hybrid system. In an all-electric system, the heat pump, in combination with a buffer tank, generates all the necessary heat for both heating and domestic hot tap water. You can also opt for a hybrid heat pump, whereby the heat pump only generates heat if it is above 4°C outside. The all-electric heat pump only works in combination with a low-temperature delivery system, such as underfloor heating. It is important that your building is well-insulated before you consider switching to low-temperature heating and a heat pump. The air heat pump has an outside element and a smaller interior element. The outside element can be placed at various locations outside the building, taking into account possible noise production (not near windows) and whether the outside element is visible from the public space. The interior element is placed next to the boiler together with the buffer tank.
	PT	Uma bomba de calor é um sistema elétrico que extrai energia do ar exterior e o utiliza para climatizar um espaço ou para aquecer água. Estes sistemas são constituídos por uma unidade exterior e uma, ou mais, unidades interiores. Uma bomba de calor ar-ar, a que vulgarmente chamamos ar condicionado, é utilizada para climatizar o ar interior e apresenta uma eficiência de aquecimento muito superior a sistemas mais tradicionais (como os aquecedores a óleo e termoventiladores elétricos). Uma bomba de calor ar-água é usada para aquecer água que, por sua vez, pode ser utilizada para usos sanitários ou para aquecimento de espaços através de radiadores, piso radiante ou outros meios de dispersão de calor. Neste caso, a unidade interior da bomba de calor possui um tanque de armazenamento de água semelhante ao de uma caldeira, mas com uma eficiência muito superior. Regra geral, só fará sentido instalar uma bomba de calor ar-água, para aquecimento de espaços, no caso da substituição direta de uma caldeira a gás natural, ou seja, se já existir um sistema de dispersão de calor instalado ou se estiver a fazer uma reabilitação que permita a sua

		instalação a um custo aceitável. Caso contrário, em princípio, fará mais sentido instalar uma bomba de calor ar-ar (ar condicionado), com o benefício adicional de também poder ser usada para arrefecimento de espaços. É importante que o seu edifício antigo esteja bem isolado antes de considerar instalar uma bomba de calor. A unidade externa pode ser instalada em vários locais fora do edifício, tendo em conta a possível produção de ruído e se a secção externa é visível a partir da via pública (em zonas históricas usualmente não pode ser visível).
	IT	Una pompa di calore è un sistema elettrico che estrae energia dall'aria esterna che può essere utilizzata per riscaldare l'acqua e per climatizzare gli ambienti interni. Si utilizza elettricità anziché gas. È possibile optare per un sistema completamente elettrico o installare un sistema ibrido. In un sistema completamente elettrico, la pompa di calore, in combinazione con un serbatoio di accumulo, genera tutto il calore necessario sia per il riscaldamento che per l'acqua calda sanitaria. È anche possibile optare per una pompa di calore ibrida, in cui la pompa di calore genera calore solo se la temperatura esterna è superiore ai 4°C. La pompa di calore completamente elettrica funziona solo in combinazione con un sistema di riscaldamento a bassa temperatura, come il riscaldamento a pavimento. È importante che l'edificio sia ben isolato prima di considerare il passaggio al riscaldamento a bassa temperatura e alla pompa di calore.
	SP	Una bomba de calor aire (eléctrica) extrae energía del aire exterior que puede ser utilizada para calentar el agua y para la calefacción de los espacios. Se utiliza electricidad en lugar de gas. Es posible optar por un sistema completamente eléctrico o instalar un sistema híbrido. En un sistema completamente eléctrico, la bomba de calor, en combinación con un tanque de acumulación, genera todo el calor necesario tanto para la calefacción como para el agua caliente sanitaria. También puedes optar por una bomba de calor híbrida, en la que la bomba de calor solo genera calor si la temperatura exterior está por encima de los 4°C. La bomba de calor completamente eléctrica solo funciona en combinación con un sistema de entrega a baja temperatura, como la calefacción por suelo radiante. Es importante que tu edificio esté bien aislado antes de considerar el cambio a calefacción a baja temperatura y una bomba de calor.
Advantages	EN	• Very sustainable • Highly efficient system • No ground source required
	PT	• Muito sustentável • Sistema altamente eficiente • Nenhuma fonte de terra necessária
	IT	• Molto sostenibile • Sistema altamente efficiente • Nessuna fonte di calore a terra necessaria
	SP	• Muy sostenible • Sistema altamente eficiente

Point of attention		• No se requiere fuente de calor geotérmica
	EN	• Low-temperature heating and good insulation required • Good positioning is important to prevent noise nuisance • Keep sufficient distance around the outdoor unit • The indoor and outdoor units can be placed at a maximum distance of 45 metres apart • With an all-electric heat pump, correct dimensioning by means of heat loss is very important • It may be necessary to upgrade the electricity connection, there are costs associated with this
	PT	• É necessário ter aquecimento de baixa temperatura e bom isolamento • A instalação correta é importante para prevenir problemas de ruído • Mantenha espaço suficiente à volta da unidade exterior • A unidade interior e exterior podem ser colocadas a uma distância máxima de 45 metros • Com uma bomba de calor totalmente elétrica, é muito importante dimensionar tendo em consideração as perdas de calor • Pode ser necessário aumentar a potência contratada ou mudar para uma corrente trifásica, com os custos associados
	IT	• Riscaldamento a bassa temperatura e buona isolamento necessari • Una buona posizione è importante per prevenire disturbi da rumore • Mantenere una distanza sufficiente attorno all'unità esterna • Le unità interne ed esterne possono essere posizionate a una distanza massima di 45 metri • Con una pompa di calore completamente elettrica, un corretto dimensionamento per evitare perdita di calore è molto importante • Potrebbe essere necessario aggiornare la connessione elettrica, ci sono costi associati a questo
	SP	• Se requiere calefacción a baja temperatura y buen aislamiento • Una buena ubicación es importante para prevenir molestias por ruido • Mantén una distancia suficiente alrededor de la unidad exterior • Las unidades interior y exterior pueden estar separadas por una distancia máxima de 45 metros • Con una bomba de calor completamente eléctrica, el correcto dimensionamiento para evitar pérdida de calor es muy importante • Puede ser necesario actualizar la conexión eléctrica, hay costos asociados con esto

Applicable typology	Single-family houses, condominium households and energy-poor households
Final Energy Reduction	Energy reduction by heated area per hour of daily heating (kWh): PT: - 10-20 m2: 98 a 171 kWh - 20-35 m2: 171 a 274 kWh - 35-55 m2: 274 a 406 kWh - 55-80 m2: 406 a 566 kWh - + de 80 m2: 566 a 1308 kWh IT: - 10-20 m2: 102 a 178 kWh - 20-35 m2: 178 a 283 k
Improvement of thermal comfort	3 stars
Investment estimate	{heating area}*22,005+248,32+13,3*{heating area}
Savings estimate	Savings estimate by heated area per hour of daily heating:: PT: - 10-20 m2: 20 a 34 EUR - 20-35 m2: 34 a 55 EUR - 35-55 m2: 55 a 82 EUR - 55-80 m2: 82 a 114 EUR - + de 80 m2: 114 a 263 EUR IT: - 10-20 m2: 26 a 46 EUR - 20-35 m2: 46 a 73 EUR - 35-55 m2: 7
GHG Reduction	GHG reduction by heated area per hour of daily heating: PT: - 10-20 m2: 20 a 34 kgCO ₂ e - 20-35 m2: 34 a 55 kgCO ₂ e - 35-55 m2: 55 a 82 kgCO ₂ e - 55-80 m2: 82 a 114 kgCO ₂ e - + de 80 m2: 114 a 263 kgCO ₂ e IT: - 10-20 m2: 26 a 46 kgCO ₂ e - 20-35 m2: 46 a 73 kgC

Measure title: Hybrid heat pump

PT: Bomba de calor híbrida

IT: Pompa di calore ibrida

SP: Bomba de calor híbrida

Measure description	EN	If the heat demand is so high that it is not possible to heat with just a heat pump, a hybrid heat pump offers the solution. If it is really cold outside, below 5 °C, it is difficult for the air heat pump to extract heat from the outside air. In the case of a hybrid heat pump, a gas-fired boiler will then
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		switch on. Ask the installer whether your existing central heating system is suitable for this or opt for a new system with a heat pump and central heating boiler in one. The hybrid heat pump also uses a central heating system to heat tap water, so no buffer tank is required. It is also not necessary to switch to low-temperature heating, such as underfloor heating. Insulation and ventilation are required because otherwise, electricity consumption will become too high. For this reason, it is also interesting to explore whether you can combine the heat pump with solar panels. Most of the year, the heat pump will be in operation, which will save a lot of gas. And the costs of a hybrid heat pump are lower than those of other heat pump systems. Keep in mind that air heat pumps have an external part. These must be carefully placed due to noise production, for example not near windows. It is possible to place a casing around the external part for noise insulation.
	PT	Se a procura de calor for tão elevada que não seja possível aquecer apenas com uma bomba de calor, uma bomba de calor híbrida oferece a solução. Se estiver muito frio lá fora, abaixo de 5 °C, será difícil para a bomba de calor a ar extrair calor do ar externo. No caso de uma bomba de calor híbrida, a ligação será feita a uma caldeira a gás. Pergunte ao instalador se o seu sistema de aquecimento central existente é adequado para isso ou opte por um novo sistema com bomba de calor e caldeira de aquecimento central num só. A bomba de calor híbrida também utiliza um sistema de aquecimento central para aquecer a água da torneira, pelo que não é necessário nenhum tanque tampão. Também não é necessário mudar para aquecimento de baixa temperatura, como piso radiante. O isolamento e a ventilação são necessários porque, caso contrário, o consumo de eletricidade tornar-se-á demasiado elevado. Por esta razão, também é interessante explorar se é possível combinar a bomba de calor com painéis solares. Na maior parte do ano, a bomba de calor estará em funcionamento, o que permitirá poupar muito gás. E os custos de uma bomba de calor híbrida são inferiores aos de outros sistemas de bombas de calor. Tenha em mente que as bombas de calor a ar possuem uma parte externa. Estes devem ser colocados com cuidado devido à produção de ruído, por exemplo, não perto de janelas. É possível colocar um invólucro em torno da parte externa para isolamento acústico.
	IT	Se la domanda di calore è così alta da non poter essere soddisfatta solo con una pompa di calore, una pompa di calore ibrida offre la soluzione. Se è davvero freddo all'esterno, sotto i 5 °C, è difficile per la pompa di calore ad aria estrarre calore dall'aria esterna. In caso di pompa di calore ibrida, si accenderà quindi una caldaia a gas. Chiedi all'installatore se il tuo attuale sistema di riscaldamento è adatto per essere alimentato utilizzando questa tecnologia. La pompa di calore ibrida utilizza anche un sistema di riscaldamento centrale per riscaldare l'acqua sanitaria, quindi non è necessario un serbatoio di accumulo. Non è nemmeno necessario passare al riscaldamento a bassa temperatura, come il riscaldamento a pavimento. L'isolamento e la ventilazione sono necessari altrimenti il consumo di elettricità diventerà molto alto. Per questo motivo, è anche

		interessante esplorare se è possibile combinare la pompa di calore con pannelli solari. Per la maggior parte dell'anno, la pompa di calore sarà in funzione, il che farà risparmiare molto gas. E i costi di una pompa di calore ibrida sono inferiori a quelli di altri sistemi di pompe di calore. Tieni presente che le pompe di calore ad aria hanno una parte esterna. Questa deve essere posizionata con attenzione a causa del rumore che generano durante il funzionamento, ad esempio non vicino alle finestre. È possibile posizionare un rivestimento attorno alla parte esterna per l'isolamento acustico.
	SP	Si la demanda de calor es tan alta que no es posible calentar solo con una bomba de calor, una bomba de calor híbrida ofrece la solución. Si hace mucho frío afuera, por debajo de 5 °C, es difícil para la bomba de calor aire extraer calor del aire exterior. En el caso de una bomba de calor híbrida, se encenderá entonces una caldera a gas. Consulta con el instalador si tu sistema de calefacción central existente es adecuado para esto o opta por un nuevo sistema con bomba de calor y caldera de calefacción central en uno. La bomba de calor híbrida también utiliza un sistema de calefacción central para calentar el agua sanitaria, por lo que no se requiere un tanque de acumulación. Tampoco es necesario cambiar a calefacción a baja temperatura, como la calefacción por suelo radiante. Se requiere aislamiento y ventilación porque, de lo contrario, el consumo de electricidad será demasiado alto. Por esta razón, también es interesante explorar si puedes combinar la bomba de calor con paneles solares. La bomba de calor funcionará la mayor parte del año, lo que ahorrará mucho gas. Y los costos de una bomba de calor híbrida son más bajos que los de otros sistemas de bombas de calor. Ten en cuenta que las bombas de calor tienen una parte externa. Estas deben ser colocadas cuidadosamente debido a la producción de ruido, por ejemplo, alejadas de las ventanas. Es posible colocar un revestimiento alrededor de la unidad externa para aislamiento acústico.
Advantages	EN	• Sustainable and efficient energy source • Is also able to ensure cooling in summer (depending on the type) • No ground source required • Lower investment than for an all-electric heat pump • Relatively limited impact on building and user
	PT	• Fonte de energia sustentável e eficiente • Também é capaz de garantir arrefecimento no verão (dependendo do tipo) • Nenhuma fonte terrestre necessária • Menor investimento do que para uma bomba de calor totalmente elétrica • Impacto relativamente limitado no edifício e no utilizador
	IT	• Sostenibile e fonte di energia efficiente • Può anche garantire il raffrescamento in estate (a seconda del tipo) • Nessuna fonte di calore a terra necessaria

		• Investimento inferiore rispetto a una pompa di calore completamente elettrica • Impatto relativamente limitato sull'edificio e sull'utente
	SP	• Fuente de energía sostenible y eficiente • También puede garantizar el enfriamiento en verano (según el tipo) • No se requiere fuente de calor geotérmica • Inversión menor que para una bomba de calor totalmente eléctrica • Impacto relativamente limitado en el edificio y el usuario
Point of attention	EN	• Have the installer adjust when the central heating is switched on, indicating what you think is important, saving more gas or heating as economically as possible • Although the delivery system does not always need to be adjusted, low temperature dispensing will lead to the highest efficiency • This is always work for a professional installer • Good insulation is required • Good positioning is important to prevent noise nuisance • The indoor and outdoor units can be placed at a maximum distance of 45 metres apart • Keep sufficient distance around the outdoor unit • It may be necessary to upgrade the electricity connection, there are costs associated with this
	PT	• Peça ao instalador que ajuste o momento em que o aquecimento central está ligado, indicando o que considera importante, poupando mais gás ou aquecimento da forma mais económica possível • Embora o sistema de entrega nem sempre precise de ser ajustado, a distribuição em baixa temperatura levará a maior eficiência • Trabalho para um instalador profissional • É necessário um bom isolamento • Um bom posicionamento é importante para evitar incómodos sonoros • As unidades interior e exterior podem ser colocadas a uma distância máxima de 45 metros uma da outra • Mantenha distância suficiente ao redor da unidade externa • Poderá ser necessário atualizar a ligação elétrica, existem custos associados a isso
	IT	• Farla regolare dall'installatore quando si accende il riscaldamento centrale, indicando ciò che ritieni importante, risparmiare più gas o riscaldare in modo più economico possibile • Anche se il sistema di distribuzione non sempre necessita di essere regolato, la distribuzione a bassa temperatura porterà alla massima efficienza

		• Questo è sempre lavoro per un installatore professionista • È necessario un buon isolamento • Una buona posizione è importante per prevenire disturbi da rumore • Le unità interne ed esterne possono essere posizionate a una distanza massima di 45 metri • Mantenere una distanza sufficiente attorno all'unità esterna • Potrebbe essere necessario aggiornare la connessione elettrica, ci sono costi associati a questo
	SP	• Haz que el instalador ajuste cuándo se enciende la calefacción central, indicando lo que consideres importante, ahorrar más gas o calentar de la manera más económica posible • Aunque el sistema de distribución no siempre necesita ser ajustado, la distribución a baja temperatura llevará a la mayor eficiencia • Este es siempre trabajo para un instalador profesional • Se requiere un buen aislamiento • Una buena ubicación es importante para prevenir molestias por ruido • Las unidades interior y exterior pueden colocarse a una distancia máxima de 45 metros • Mantén una distancia suficiente alrededor de la unidad exterior • Puede ser necesario actualizar la conexión eléctrica, hay costos asociados con esto
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Ground source heat pump

PT: Bomba de calor geotérmica

IT: Pompa di calore geotermica

SP: Bomba de calor geotérmica

Measure description	EN	A ground source heat pump uses thermal energy from the ground. At 55 to 100 metres below ground level, the constant ground temperature of 12 °C is extracted with a heat exchanger. A heat pump increases this thermal energy to a suitable temperature for low-temperature heating, maximum 55 °C. A ground source is most suitable if you also use it to cool the building, for the purpose of regenerating the ground source over summer. This heat pump requires good building insulation, ventilation and possibly a new form of heating in your building, such as underfloor heating. The investment is higher than with an air-source heat pump, especially because of the construction of the ground source. Keep in mind that you need a permit for this and that the garden must be accessible. With monuments, this can often be challenging.
	PT	Uma bomba de calor de fonte subterrânea utiliza energia térmica do solo. De 55 a 100 metros abaixo do nível do solo, a temperatura constante do solo de 12 °C é extraída com um trocador de calor. Uma bomba de calor

		aumenta esta energia térmica para uma temperatura adequada para aquecimento a baixa temperatura, no máximo 55 °C. Uma fonte subterrânea é mais adequada se também a usar para arrefecer o edifício, com a finalidade de regenerar a fonte subterrânea durante o verão. Esta bomba de calor requer um bom isolamento do edifício, ventilação e possivelmente uma nova forma de aquecimento no seu edifício, como o piso radiante. O investimento é superior ao de uma bomba de calor de fonte aérea, principalmente devido à construção da fonte subterrânea. Tenha em mente que precisa de uma licença para isso e que o jardim deve ser acessível. Com monumentos, isto pode muitas vezes ser um desafio.
	IT	Una pompa di calore geotermica utilizza l'energia termica presente nel terreno. A 55-100 metri sotto il livello del suolo, la temperatura costante del terreno di circa 12 °C viene estratta tramite uno scambiatore di calore. Una pompa di calore aumenta questa energia termica a una temperatura adatta per il riscaldamento a bassa temperatura, massimo 55 °C. Una sorgente di calore è più adatta se la utilizzi anche per raffreddare l'edificio, al fine di rigenerare la sorgente di calore durante l'estate. Questa pompa di calore richiede un buon isolamento dell'edificio, ventilazione e possibilmente una nuova forma di riscaldamento nel tuo edificio, come il riscaldamento a pavimento. L'investimento è superiore rispetto a una pompa di calore ad aria, soprattutto a causa della costruzione della sorgente di calore. Tieni presente che è necessario un permesso per questo e che il giardino deve essere accessibile. Con gli edifici storici, questo può essere spesso impegnativo.
	SP	Una bomba de calor geotérmica utiliza la energía térmica del suelo. A 55-100 metros por debajo del nivel del suelo, la temperatura constante del suelo de 12 °C se extrae mediante un intercambiador de calor. Una bomba de calor aumenta esta energía térmica a una temperatura adecuada para calefacción a baja temperatura, máximo 55 °C. Una fuente de calor es más adecuada si también la usas para enfriar el edificio, con el propósito de regenerar la fuente de calor durante el verano. Esta bomba de calor requiere un buen aislamiento del edificio, ventilación y posiblemente una nueva forma de calefacción en tu edificio, como calefacción por suelo radiante. La inversión es superior a la de una bomba de calor de aire, especialmente debido a la construcción de la fuente de calor. Ten en cuenta que necesitas un permiso para esto y que el jardín debe ser accesible. Con los edificios monumentales, esto puede ser a menudo un desafío.
Advantages	EN	• Saves energy • Sustainable and efficient energy source • No outdoor unit required • No noise production
	PT	• Economiza energia • Fonte de energia sustentável e eficiente • Não é necessária unidade externa • Sem produção de ruído
	IT	• Risparmia energia

Point of attention		• Sostenibile e fonte di energia efficiente • Nessuna unità esterna necessaria • Nessuna produzione di rumore
	SP	• Ahorra energía • Fuente de energía sostenible y eficiente • No se requiere unidad exterior • No produce ruido
	EN	• Low-temperature heating and good insulation required • Pay attention to good ventilation when insulating • It is not possible and permitted to place a ground source anywhere • Take into account the weight of the boiler vessel relative to the strength of the supporting structure • With an all-electric heat pump, correct dimensioning by means of heat loss is very important • It may be necessary to upgrade the electricity connection, there are costs associated with this • With an all-electric variant, a boiler vessel is required for the hot tap water, which is placed next to the inner part of the heat pump
	PT	• É necessário aquecimento a baixa temperatura e bom isolamento • Preste atenção à boa ventilação ao isolar • Não é possível e permitido colocar uma fonte terrestre em qualquer lugar • Leve em consideração o peso do recipiente da caldeira em relação à resistência da estrutura de suporte • Com uma bomba de calor totalmente elétrica, o dimensionamento correto através da perda de calor é muito importante • Poderá ser necessário atualizar a ligação elétrica, existem custos associados a isso • Na variante totalmente elétrica, é necessário um reservatório de caldeira para a água quente da torneira, que é colocado junto à parte interna da bomba de calor
	IT	• Riscaldamento a bassa temperatura e buon isolamento necessari • Prestare attenzione alla buona ventilazione durante l'isolamento • Non è possibile e permesso posizionare una sorgente di calore ovunque • Tenere conto del peso del serbatoio della caldaia rispetto alla resistenza della struttura di supporto • Con una pompa di calore completamente elettrica, il corretto dimensionamento per evitare perdite di calore è molto importante

		• Potrebbe essere necessario aggiornare la connessione elettrica, ci sono costi associati a questo • Con una variante completamente elettrica, è necessario un serbatoio della caldaia per l'acqua calda sanitaria, che viene posizionato accanto alla parte interna della pompa di calore
	SP	• Se requiere calefacción a baja temperatura y buen aislamiento • Presta atención a una buena ventilación cuando se aísla • No es posible ni está permitido colocar una fuente de calor en cualquier lugar • Ten en cuenta el peso del depósito de la caldera en relación con la resistencia de la estructura portante • Con una bomba de calor totalmente eléctrica, el correcto dimensionamiento mediante pérdida de calor es muy importante • Puede ser necesario actualizar la conexión eléctrica, hay costos asociados con esto • Con una variante totalmente eléctrica, se requiere un depósito de caldera para el agua sanitaria, que se coloca junto a la parte interior de la bomba de calor
Applicable typology		Single-family houses

Measure title: Ground-coupled heat exchanger

PT: Permutador de calor terra-ar

IT: Scambiatore di calore suolo-aria

SP: Intercambiador de calor acoplado al suelo

Measure description	EN	A ground-coupled heat exchanger is basically a storage for heat (or cold) deep in the ground. The system lies between 55 and 100 metres below ground level, and uses the constant ground temperature of 12 °C. In summer, this temperature can be used to cool. In winter, 12 °C is relatively warm and can therefore heat the water. A heat pump increases the temperature to make it suitable for low-temperature heating. A ground-coupled heat exchanger system is particularly suitable for heating at a district level or for large buildings. In other situations, such as for a residential home, an ordinary heat pump with a ground source is more suitable.
	PT	Um permutador de calor terra-ar é basicamente um armazenamento de calor (ou frio) nas profundezas do solo. O sistema fica entre 55 e 100 metros abaixo do nível do solo e utiliza a temperatura constante do solo de 12 °C. No verão, essa temperatura pode ser aproveitada para arrefecer. No inverno, 12 °C é relativamente quente e pode, portanto, aquecer a água. Uma bomba de calor aumenta a temperatura para torná-la adequada para aquecimento a baixa temperatura. Um sistema de permutador de calor terra-ar é particularmente adequado para aquecimento a nível distrital ou para grandes edifícios. Noutras situações, como numa casa residencial, uma bomba de calor normal com fonte subterrânea é mais adequada.

	IT	Per uno scambiatore di calore suolo-aria è fondamentale uno stoccaggio di calore (o di “freddo”) in profondità nel terreno. Il sistema si trova tra 55 e 100 metri sotto il livello del suolo e utilizza la temperatura costante del terreno di circa 12 °C. In estate, questa temperatura può essere utilizzata per raffreddare. In inverno, 12 °C è relativamente caldo e può quindi riscaldare l'acqua. Una pompa di calore aumenta la temperatura per renderla adatta al riscaldamento a bassa temperatura. Un sistema di scambiatore di calore accoppiato al terreno è particolarmente adatto per il riscaldamento a livello distrettuale o per grandi edifici. In altre situazioni, come per una casa residenziale, una pompa di calore ordinaria con una sorgente di calore a terra è più adatta.
	SP	Un intercambiador de calor acoplado al suelo es básicamente un almacenamiento de calor (o frío) en profundidad en el suelo. El sistema se encuentra entre 55 y 100 metros debajo del nivel del suelo y utiliza la temperatura constante del suelo de 12 °C. En verano, esta temperatura puede usarse para enfriar. En invierno, 12 °C es relativamente cálido y puede por lo tanto calentar el agua. Una bomba de calor aumenta la temperatura para hacerla adecuada para calefacción a baja temperatura. Un sistema de intercambiador de calor acoplado al suelo es particularmente adecuado para calefacción a nivel de distrito o para grandes edificios. En otras situaciones, como para una vivienda residencial, una bomba de calor ordinaria con fuente de calor geotérmica es más adecuada.
Advantages	EN	• Saves energy • Sustainable and efficient energy source • No outdoor unit required • No noise production • This system enables sustainable and cost-efficient cooling, which is also necessary for a good source balance
	PT	• Economiza energia • Fonte de energia sustentável e eficiente • Não é necessária unidade externa • Sem produção de ruído • Este sistema permite um arrefecimento sustentável e económico, que também é necessário para um bom equilíbrio da fonte
	IT	• Risparmia energia • Sostenibile e fonte di energia efficiente • Nessuna unità esterna necessaria • Nessuna produzione di rumore • Questo sistema consente un raffreddamento sostenibile ed economico, necessario anche per un buon equilibrio della sorgente
	SP	• Ahorra energía • Fuente de energía sostenible y eficiente • No se requiere unidad exterior • No produce ruido

		• Este sistema permite un enfriamiento sostenible y económico, necesario también para un buen equilibrio de la fuente
Point of attention	EN	• Low-temperature heating and good insulation required • Pay attention to good ventilation when insulating • It is not possible and permitted to place a ground source anywhere • Take into account the weight of the boiler vessel relative to the strength of the supporting structure • With an all-electric heat pump, correct dimensioning by means of heat loss is very important • It may be necessary to upgrade the electricity connection, there are costs associated with this • With an all-electric variant, a boiler vessel is required for the hot tap water, which is placed next to the inner part of the heat pump
	PT	• É necessário aquecimento a baixa temperatura e bom isolamento • Preste atenção à boa ventilação ao isolar • Não é possível e permitido colocar uma fonte terrestre em qualquer lugar • Leve em consideração o peso do recipiente da caldeira em relação à resistência da estrutura de suporte • Com uma bomba de calor totalmente elétrica, o dimensionamento correto através da perda de calor é muito importante • Poderá ser necessário atualizar a ligação elétrica, existem custos associados a isso • Na variante totalmente elétrica, é necessário um reservatório de caldeira para a água quente da torneira, que é colocado junto à parte interna da bomba de calor
	IT	• Riscaldamento a bassa temperatura e buon isolamento necessari • Prestare attenzione alla buona ventilazione durante l'isolamento • Non è possibile posizionare una sorgente di calore ovunque • Tenere conto del peso del serbatoio della caldaia rispetto alla resistenza della struttura di supporto • Con una pompa di calore completamente elettrica, il corretto dimensionamento per evitare perdita di calore è molto importante • Potrebbe essere necessario aggiornare la connessione elettrica, ci sono costi associati a questo • Con una variante completamente elettrica, è necessario un serbatoio della caldaia per l'acqua sanitaria, che viene posizionato accanto alla parte interna della pompa di calore
	SP	• Se requiere calefacción a baja temperatura y buen aislamiento • Presta atención a una buena ventilación cuando se aísla

		• No es posible ni está permitido colocar una fuente de calor en cualquier lugar • Ten en cuenta el peso del depósito de la caldera en relación con la resistencia de la estructura portante • Con una bomba de calor totalmente eléctrica, el correcto dimensionamiento mediante pérdida de calor es muy importante • Puede ser necesario actualizar la conexión eléctrica, hay costos asociados con esto • Con una variante totalmente eléctrica, se requiere un depósito de caldera para el agua sanitaria, que se coloca junto a la parte interior de la bomba de calor
Applicable typology	Single-family houses, condominium households and energy-poor households	

Measure title: District heating

PT: Not applicable

IT: Teleriscaldamento

SP: Calefacción urbana

Measure description	EN	The heat released by waste and power plants can be used in some areas to heat residential areas and industrial estates. The residual heat from large power plants is collected in large vessels of water and channelled into the city via an underground pipe system. Buildings connected to district heating can use this heat for heating and hot tap water. Heat grids can operate at both high and low temperatures, in which case good building insulation and low-temperature heating, such as underfloor heating, are important.
	IT	Il calore rilasciato dagli impianti di rifiuti e di energia può essere utilizzato in alcune aree per riscaldare aree residenziali e zone industriali. Il calore residuo delle grandi centrali elettriche viene raccolto in grandi serbatoi d'acqua e canalizzato in città tramite un sistema di tubazioni sotterranee. Gli edifici collegati al riscaldamento di quartiere possono utilizzare questo calore per il riscaldamento e per l'acqua sanitaria. Le reti di calore possono funzionare sia a temperature elevate che basse, nel qual caso è importante un buon isolamento dell'edificio e riscaldamento a bassa temperatura, come il riscaldamento a pavimento.
Advantages	EN	• Save 40-80% CO₂ depending on the heat source • District heating often runs on a high temperature, so no adjustments to the delivery system are required • Suitable for heating of tap water • Requires no maintenance by occupant • Takes up little room
	IT	• Risparmia il 40-80% di CO₂ a seconda della fonte di calore • Il riscaldamento di quartiere spesso funziona a una temperatura alta, quindi non sono necessarie modifiche al sistema di distribuzione

		• Adatto per il riscaldamento dell'acqua sanitaria • Non richiede manutenzione da parte dell'occupante • Occupa poco spazio
Point of attention	EN	• The connection costs of district heating can be high • Good insulation is recommended • Environmental impact depends on the heat source • Because the gas connection disappears, you also make the switch to electric cooking • Take into account a relatively high standing charge
	IT	• I costi di collegamento del riscaldamento di quartiere possono essere elevati • Si consiglia un buon isolamento • L'impatto ambientale dipende dalla fonte di calore • Poiché la connessione a gas scompare, si passa anche alla cucina elettrica • Considera un relativo costo fisso elevato
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Condensing boiler

PT: Caldeira de condensação

IT: Caldaia a condensazione

SP: Caldera de condensación

Measure description	EN	Most people opt for a condensing boiler when their old central heating boiler needs replacing. On average, a boiler will last fifteen years, during which time boilers will have become more energy efficient. Modern condensing boilers use condensation heat and can, therefore, achieve a high efficiency. In addition, modern boilers can modulate and are better adjustable, so that they do not run at full speed with a small heat demand. With a new boiler, you can save up to 20% on the gas bill, which means you earn back your investment within a few years.
	PT	A maioria das pessoas opta por uma caldeira de condensação quando a sua antiga caldeira de aquecimento central precisa de ser substituída. Em média, uma caldeira tem uma vida útil de 15-20 anos. As caldeiras de condensação modernas utilizam o calor dos gases de exaustão e atingem um rendimento muito mais elevado do que as caldeiras antigas. Além disso, os sistemas modernos permitem modulação, ajustando o nível de aquecimento às necessidades de cada momento. Com uma nova caldeira, poderá poupar até 20% na conta do gás, o que significa que recuperará o seu investimento dentro de alguns anos. Apesar da substituição direta da caldeira a gás por um modelo mais eficiente trazer ganhos em termos de eficiência energética, considere a possibilidade de optar por uma bomba de calor elétrica. Desta forma, pode reduzir ainda mais o seu consumo de energia e trocar o gás natural por uma fonte de energia mais limpa.
	IT	La maggior parte delle persone opta per una caldaia a condensazione quando la loro vecchia caldaia deve essere sostituita. In media, una

		caldaia dura quindici anni, durante i quali le caldaie diventeranno più efficienti dal punto di vista energetico. Le moderne caldaie a condensazione sfruttano il calore di condensazione e possono, quindi, raggiungere un'alta efficienza. Inoltre, le caldaie moderne si possono modulare e sono meglio regolabili, quindi non funzionano a piena potenza con una bassa richiesta di calore. Con una nuova caldaia, puoi risparmiare fino al 20% sulla bolletta del gas, il che significa che recuperi l'investimento in pochi anni.
	SP	La mayoría de las personas opta por una caldera de condensación cuando su antigua caldera central necesita ser reemplazada. En promedio, una caldera durará quince años, durante los cuales las calderas se volverán más eficientes energéticamente. Las calderas de condensación modernas utilizan el calor de condensación y, por lo tanto, pueden alcanzar una alta eficiencia. Además, las calderas modernas pueden modular y son más ajustables, por lo que no funcionan a plena capacidad con una baja demanda de calor. Con una nueva caldera, puedes ahorrar hasta un 20% en la factura de gas, lo que significa que recuperas la inversión en unos pocos años.
Advantages	EN	• Efficient, economical, modulating
	PT	• Eficiente, económico e variável
	IT	• Efficiente, economica, modulante
	SP	• Eficiente, económica, modulante
Point of attention	EN	• This system uses gas • Flue gas ducts must be replaced, can be complex
	PT	• Este sistema usa gás natural • A tubagem de exaustão necessita de ser substituída, o que pode ser complexo
	IT	• Questo sistema utilizza gas • I condotti dei fumi devono essere sostituiti, può essere complesso
	SP	• Este sistema utiliza gas • Los conductos de gases de combustión deben ser sustituirse, puede ser complejo
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Pellet boiler

PT: Salamandras, recuperadores de calor e caldeiras a pellets

IT: Stufa a pellet

SP: Caldera de pellets

Measure description	EN	An alternative to an open fireplace or an ordinary wood-burning stove is a pellet stove. The pellet stove only heats the room in which the stove is located. There is also a central heating pellet stove, which is a variant of the pellet stove that can be connected to the central heating system, such as the boiler or a buffer tank for hot water. The central heating pellet
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		stove can therefore heat water for several rooms. The fuel of a (central heating) pellet stove consists of wood pellets, which are small rods of sawdust and wood waste, a cheaper fuel than gas. The pellet reservoir will need to be refilled regularly. For both variants of the pellet stove, place a particulate filter in the chimney or flue gas duct to capture particulate matter.
	PT	Os pellets são produzidos através de resíduos de diferentes tipos de madeira, por exemplo provenientes de trabalhos de limpeza florestal, que são picados a seco, triturados e comprimidos, sendo uma fonte de energia bastante barata. Em comparação com a lenha tradicional, os pellets apresentam poder calorífico superior, baixo teor de humidade e isenção de resinas. Estes fatores tornam a sua eficiência de queima muito superior (aproveitam até 90% do calor gerado), com os benefícios adicionais da facilidade de ignição e da baixa produção de gases e cinzas. No entanto, as cinzas resultantes têm de ser consideradas resíduo tóxico e descartadas da maneira indicada pelo produtor. É também preciso ter atenção aos fabricantes e à qualidade e origem dos pellets, para garantir que são produzidos de forma renovável e sustentável. O uso de pellets em salamandras ou em recuperadores de calor é uma alternativa interessante para aquecimento ambiente, apresentando algumas vantagens face a lareiras abertas e a recuperadores de calor a lenha. Normalmente, o aquecimento a pellets aquece apenas a divisão em que se encontra. No entanto, existem também caldeiras a pellets que podem ser ligadas ao sistema de aquecimento central e aquecer várias divisões e água sanitária. Para qualquer variante de aquecimento a pellets, pode instalar um filtro de partículas na chaminé ou conduta de gás de combustão para capturar as partículas em suspensão. Salamandras e recuperadores de calor a pellets têm um custo estimado entre 200 e 2000 euros, enquanto caldeiras a pellets custam entre 1500 e 5500 euros, dependendo da sua potência e capacidade. Estas soluções não requerem grandes intervenções, apenas terá de ligar o equipamento ao sistema de exaustão do seu edifício.
	IT	Un'alternativa al camino aperto o a una normale stufa a legna è una stufa a pellet. La stufa a pellet può riscaldare solo la stanza in cui si trova, ma esistono anche stufe a pellet per riscaldamento centrale, che è una variante della stufa a pellet che possono essere collegate al sistema di riscaldamento centrale, come la caldaia o un serbatoio di accumulo per acqua calda. La stufa a pellet per riscaldamento centrale può quindi riscaldare acqua per più stanze. Il combustibile di una stufa a pellet è composto da pellet di legno, che sono piccoli bastoncini di segatura e rifiuti di legno, un combustibile più economico rispetto al gas. Il serbatoio dei pellet dovrà essere riempito regolarmente. Per entrambe le varianti della stufa a pellet, posiziona un filtro antiparticolato nel camino o nel condotto dei fumi per catturare le particelle.
	SP	Una alternativa a una chimenea abierta o a una estufa de leña ordinaria es una estufa de pellets. La estufa de pellets solo calienta la habitación en la que se encuentra. También existe una estufa de pellets para calefacción

		central, que es una variante de la estufa de pellets que se puede conectar al sistema de calefacción central, como la caldera o un tanque de acumulación de agua caliente. La estufa de pellets para calefacción central puede calentar agua para varias habitaciones. El combustible de una (caldera de pellets) está compuesto por pellets de madera, que son pequeños cilindros de serrín y desechos de madera, un combustible más barato que el gas. El depósito de pellets deberá rellenarse regularmente. Para ambas variantes de la estufa de pellets, coloca un filtro antipartículas en la chimenea o en el conducto de gases de escape para capturar las partículas.
Advantages	EN	• Emits less particulate matter than a fireplace or ordinary wood burner • Saves energy through efficient heating • The fuel is a natural raw material with a low CO₂ footprint, provided it is of good origin • Relatively inexpensive fuel
	PT	• Emite menos matéria particulada do que uma lareira ou queimador de lenha convencional • Poupa energia através de um aquecimento eficiente • O combustível é uma matéria prima natural com baixa pegada carbónica, desde que a sua origem seja sustentável • Combustível relativamente barato
	IT	• Emette meno particelle rispetto a un camino o una stufa a legna ordinaria • Risparmia energia grazie al riscaldamento efficiente • Il combustibile è una materia prima naturale con una bassa impronta di CO₂, purché sia di buona origine • Combustibile relativamente economico
	SP	• Emite menos partículas que una chimenea o estufa de leña ordinaria • Ahorra energía mediante un calentamiento eficiente • El combustible es una materia prima natural con una baja huella de CO₂, siempre que sea de buena procedencia • Combustible relativamente económico
Point of attention	EN	• Pay attention to the quality mark for a sustainable choice • Flue gases can be disturbing for local residents • Keep in mind that you need a storage for pellets • Requires a flue gas duct • Let an expert advise you well in advance • Pay attention to the quality of the pellet stove • Ash pan and flue gas duct must be emptied and cleaned regularly
	PT	• Preste atenção à qualidade do produto sustentável • Os gases de exaustão podem ser incómodos para os residentes • Lembre-se que precisa de um local para armazenar os pellets • Requer uma tubagem para exaustão de gases

		• Procure aconselhamento de um especialista antes de proceder à intervenção • Preste atenção à qualidade da caldeira/lareira a pellets • O coletor de cinzas e o exaustor devem ser esvaziados e limpos regularmente
	IT	• Prestare attenzione al marchio di qualità per una scelta sostenibile • I fumi possono essere disturbanti per i residenti locali • Considera che hai bisogno di uno stoccaggio per il pellet • Richiede un condotto per i fumi • Fatti consigliare bene in anticipo da un esperto • Fai attenzione alla qualità della stufa a pellet • Il cassetto delle ceneri e il condotto dei fumi devono essere svuotati e puliti regolarmente
	SP	• Presta atención al sello de calidad para una elección sostenible • Los gases de combustión pueden ser molestos para los residentes locales • Ten en cuenta que necesitas un almacenamiento para los pellets • Requiere un conducto para gases de combustión • Consulta anticipadamente con un experto • Presta atención a la calidad de la estufa de pellets • El cajón de cenizas y el conducto de gases de combustión deben vaciarse y limpiarse regularmente
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Fireplace with heat recovery

PT: Lareira com recuperador de calor

IT: Camino con recupero di calore

SP: Chimenea con recuperación de calor

Measure description	EN	Old buildings often have traditional fireplaces for space heating and cooking, most of which were deactivated during the last century. Besides creating a cosy atmosphere on cold winter days, these fireplaces can also be used to reduce some heating costs. However, traditional open fireplaces have an efficiency rate of only 5% to 20%, losing most of the heat through the chimney and serving as an entry point for outside air. Inserting a wood-burning stove is an advanced metal appliance, often with a glass front for flame visibility, that can be installed inside a masonry fireplace. They utilize a heat recovery chamber and can increase the efficiency of a fireplace by 5 to 10 times. Estimated costs for this measure range from 800 to 3400 euros, depending on the system's size and installation. Nowadays, it's also possible to turn your fireplace into a smart whole-house heating system. Ensure that any fireplace interventions are carried out by a professional. Additional Tip: A chimney cap consists of a hinged metal plate just above the chimney throat that closes when the fireplace is not in use. If it's not
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		effective enough, you can get an additional damper for the chimney cap, which closes at the top. These two dampers together effectively prevent the entry of cold air in winter and hot air in summer, thereby reducing heating and cooling costs. Additional Tip: Another way to improve fireplace efficiency is to burn the right type of firewood. Make sure the wood is dry, as green wood produces a lot of smoke but not much heat.
	PT	Os edifícios antigos têm frequentemente lareiras tradicionais para aquecimento de espaços e confeção de alimentos, as quais foram na sua maioria desativadas durante o século passado. Além de proporcionarem um ambiente agradável nos dias frios de inverno, estas lareiras podem também ser utilizadas para diminuir alguns custos associados ao aquecimento. No entanto, as lareiras tradicionais abertas têm uma taxa de eficiência de apenas 5% a 20%, perdendo a maior parte do calor através da chaminé e sendo um ponto de entrada para ar exterior. Os recuperadores de calor são equipamentos metálicos avançados de queima de madeira, geralmente com um vidro que permite a vista das chamas, que podem ser instalados no interior de uma lareira de alvenaria. Utilizam uma câmara de recuperação de calor e permitem aumentar 5 a 10 vezes a eficiência de uma lareira. Os custos estimados para esta medida variam entre os 800 e os 3400 euros, dependendo do tamanho do sistema e da instalação. Atualmente, é também possível transformar a sua lareira num sistema de aquecimento inteligente para toda a casa. Certifique-se de que qualquer intervenção na sua lareira é efetuada por um profissional. Dica adicional: O chapéu para chaminé consiste numa placa metálica articulada logo acima da garganta da chaminé que se fecha quando a lareira não está a ser utilizada. Se não for suficientemente eficaz, pode obter um regulador adicional para a tampa da chaminé, que se fecha no topo desta. Estes dois reguladores, em conjunto, fazem um trabalho muito eficaz para impedir a entrada de ar frio no inverno e de ar quente no verão, reduzindo assim os custos de aquecimento e arrefecimento. Dica adicional: Outra forma de melhorar a eficiência da lareira é queimar o tipo certo de lenha. Certifique-se de que a lenha está seca. A madeira verde produz muito fumo, mas não muito calor.
	IT	Gli edifici antichi spesso hanno camini tradizionali per il riscaldamento degli ambienti e la cucina, la maggior parte dei quali sono stati disattivati durante il secolo scorso. Oltre a creare un'atmosfera accogliente nelle fredde giornate invernali, questi camini possono anche essere utilizzati per ridurre alcuni costi di riscaldamento. Tuttavia, i camini tradizionali a fuoco aperto hanno un'efficienza che varia solo dal 5% al 20%, perdendo la maggior parte del calore attraverso il camino e servendo come punto d'ingresso per l'aria esterna. L'inserimento di una stufa a legna può essere una miglioria, spesso con una parte frontale in vetro per la visibilità delle fiamme, che può essere installato all'interno di un camino in muratura. Utilizzano una camera di recupero del calore e possono aumentare l'efficienza di un camino da 5 a

		10 volte. I costi stimati per questa misura variano da 800 a 3400 euro, a seconda delle dimensioni e dell'installazione del sistema. Oggi è anche possibile trasformare il tuo camino in un sistema di riscaldamento intelligente per tutta la casa. Assicurati che eventuali interventi sul camino siano eseguiti da un professionista. Suggerimento aggiuntivo: Un cappello per il camino consiste in una piastra metallica articolata appena sopra la bocca del camino che si chiude quando il camino non è in uso. Se non è abbastanza efficace, puoi aggiungere un ulteriore chiusura per il cappello del camino, che si chiude nella parte superiore. Queste due chiusure insieme prevengono efficacemente l'ingresso di aria fredda in inverno e aria calda in estate, riducendo così i costi di riscaldamento e raffreddamento. Suggerimento aggiuntivo: Un altro modo per migliorare l'efficienza del camino è bruciare il tipo giusto di legna. Assicurati che il legno sia asciutto, poiché il legno verde produce molto fumo ma poco calore.
	SP	Los edificios antiguos suelen tener chimeneas tradicionales para calefacción de espacios y cocina, la mayoría de las cuales se desactivaron durante el siglo pasado. Además de crear un ambiente acogedor en los fríos días de invierno, estas chimeneas también pueden utilizarse para reducir algunos gastos de calefacción. Sin embargo, las chimeneas tradicionales tienen una eficiencia que varía solo entre el 5% y el 20%, perdiendo la mayor parte del calor a través de la chimenea y sirviendo como punto de entrada para el aire exterior. Las estufas de inserción de leña son aparatos metálicos avanzados, a menudo con una parte frontal de vidrio para la visibilidad de las llamas, que se pueden instalar dentro de una chimenea de mampostería. Utilizan una cámara de recuperación de calor y pueden aumentar la eficiencia de una chimenea de 5 a 10 veces. Los costes estimados para esta medida oscilan entre 800 y 3400 euros, dependiendo del tamaño y la instalación del sistema. Hoy en día, también es posible convertir tu chimenea en un sistema de calefacción inteligente para toda la casa. Asegúrate de que cualquier intervención en la chimenea sea realizada por un profesional. Consejo adicional: Un sombrerete de chimenea consiste en una placa metálica articulada justo encima de la garganta de la chimenea que se cierra cuando la chimenea no está en uso. Si no es lo suficientemente efectivo, puedes adquirir un regulador adicional para el sombrerete de la chimenea, que se cierra en la parte superior. Estos dos reguladores juntos previenen eficazmente la entrada de aire frío en invierno y aire caliente en verano, reduciendo así los gastos de calefacción y refrigeración. Consejo adicional: Otra forma de mejorar la eficiencia de la chimenea es quemar el tipo adecuado de leña. Asegúrate de que la madera esté seca, ya que la madera verde produce mucho humo pero poco calor.
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Electric boiler
PT: Caldeira elétrica

IT: Caldaia elettrica
SP: Caldera eléctrica

Measure description	EN	While traditional boilers use fuel to generate heat, an electric boiler relies solely on electricity, achieving an efficiency rate of nearly 100% (for modern gas boilers, this rate is around 90%). Electric boilers do not emit greenhouse gases. However, it is crucial to consider that overall efficiency and carbon footprint depend on how the electricity is produced – whether it is efficient and renewable or not. An electric boiler can be a suitable solution for older homes not connected to the gas grid or with very low heating needs. However, they may not meet higher heating demands, and it's essential to factor in operating costs, as electricity is typically more expensive than gas. Keep in mind that various technologies exist for space heating, and the optimal solution can vary depending on each home.
	PT	Enquanto as caldeiras tradicionais utilizam combustível para produzir calor, uma caldeira elétrica utiliza apenas a eletricidade, conseguindo obter uma taxa de eficiência de quase 100% (para as caldeiras modernas a gás esta taxa é de cerca de 90%). As caldeiras elétricas não emitem gases com efeito de estufa. Contudo, é essencial ter em atenção que a eficiência global e a pegada de carbono dependerão da forma como a eletricidade é produzida – se é eficiente e renovável ou não. Uma caldeira elétrica pode ser uma boa solução para casas antigas que não estão ligadas à rede de gás ou que têm necessidades de aquecimento muito reduzidas. No entanto, não são capazes de satisfazer exigências de aquecimento mais elevadas e é importante considerar os custos de funcionamento, uma vez que a eletricidade é normalmente mais cara do que o gás. Convém não esquecer que existem várias tecnologias para aquecimento de espaços e que a solução ideal pode variar em função de cada casa.
	IT	Mentre le caldaie tradizionali utilizzano combustibile per generare calore, una caldaia elettrica si basa esclusivamente sull'elettricità, raggiungendo un'efficienza di quasi il 100% (per le caldaie a gas moderne, questo valore è intorno al 90%). Le caldaie elettriche non emettono gas serra diretti. Tuttavia, è cruciale considerare che l'efficienza complessiva e l'impronta di carbonio dipendono da come viene prodotta l'elettricità - se è efficiente e rinnovabile o meno. Una caldaia elettrica può essere una soluzione adatta per case più vecchie non collegate alla rete del gas o con esigenze di riscaldamento molto basse. Tuttavia, potrebbero non soddisfare le richieste di riscaldamento più elevate, ed è essenziale considerare i costi operativi, poiché l'elettricità è generalmente più costosa del gas. Tieni presente che esistono diverse tecnologie per il riscaldamento degli spazi e la soluzione ottimale può variare a seconda di ciascuna casa.
	SP	Mientras que las calderas tradicionales utilizan combustible para generar calor, una caldera eléctrica se basa exclusivamente en la electricidad, alcanzando una eficiencia de casi el 100% (para las calderas a gas modernas, esta tasa es de alrededor del 90%). Las calderas eléctricas no

		emiten gases de efecto invernadero. Sin embargo, es crucial considerar que la eficiencia general y la huella de carbono dependen de cómo se produce la electricidad, ya sea eficiente y renovable o no. Una caldera eléctrica puede ser una solución adecuada para casas más antiguas no conectadas a la red de gas o con necesidades de calefacción muy bajas. Sin embargo, pueden no cumplir con demandas de calefacción más altas, y es esencial tener en cuenta los costes operativos, ya que la electricidad suele ser más cara que el gas. Ten en cuenta que existen diversas tecnologías para calefacción de espacios y la solución óptima puede variar según cada hogar.
Applicable typology	Single-family houses, condominium households and energy-poor households	

Measure title: Smart meter

PT: Contador inteligente

IT: Contatore Intelligente

SP: Contador Inteligente

Measure description	EN	By installing a smart meter, you can reduce your energy or water consumption patterns by around 5 to 10%. These meters provide real-time data, enabling you to make informed decisions about energy efficiency and allowing for remote monitoring and management of energy usage, empowering you to optimize your consumption and reduce costs. Additionally, smart meters can facilitate the integration of renewable energy sources and support grid stability.
	PT	Ao instalar um contador inteligente, pode reduzir os seus padrões de consumo de energia ou água em cerca de 5 a 10%. Estes contadores fornecem dados em tempo real, permitindo-lhe tomar decisões informadas sobre eficiência energética e possibilitando a monitorização e gestão remota do uso de energia, capacitando-o a otimizar o seu consumo e reduzir custos. Além disso, os contadores inteligentes podem facilitar a integração de fontes de energia renovável e apoiar a estabilidade da rede elétrica.
	IT	Installando un contatore intelligente, è possibile ridurre il consumo di energia o acqua di circa il 5-10%. Questi contatori forniscono dati in tempo reale, consentendoti di prendere decisioni informate sull'efficienza energetica e permettendo il monitoraggio e la gestione remoti dell'uso dell'energia, aiutandoti a ottimizzare il consumo e ridurre i costi. Inoltre, i contatori intelligenti possono facilitare l'integrazione delle fonti di energia rinnovabile e supportare la stabilità della rete.
	SP	Al instalar un contador inteligente, puedes reducir tus patrones de consumo de energía o agua en alrededor de un 5 a 10%. Estos contadores proporcionan datos en tiempo real, lo que te permite tomar decisiones informadas sobre la eficiencia energética y permiten la monitorización y gestión remota del uso de energía, ayudándote a optimizar el consumo y reducir los gastos. Además, los contadores inteligentes pueden facilitar

		la integración de fuentes de energía renovable y apoyar la estabilidad de la red.
Advantages	EN	- Insight into energy and water demand and consumption per room and installation - Saves energy and water through efficient heating - Can be read and controlled remotely
	PT	- Informação sobre as necessidades de energia e água e o consumo por divisão e por instalação - Poupa energia e água através de um aquecimento eficiente - Pode ser lido e controlado remotamente
	IT	- Informazioni dettagliate sulla domanda e sul consumo di energia e acqua per stanza e impianto - Risparmio energetico e idrico grazie al riscaldamento efficiente - Può essere letto e controllato da remoto
	SP	- Información detallada sobre la demanda y el consumo de energía y agua por habitación e instalación - Ahorro de energía y agua gracias a una calefacción eficiente - Puede ser leído y controlado de forma remota
Point of attention	EN	- In the case of very well insulated buildings and economical heating and water usage behaviour, this measure will save little energy and water - Choose a smart meter that suits your needs, as some may not be suitable for irregular usage patterns
	PT	- No caso de edifícios muito bem isolados com aquecimento eficiente e uso eficiente de água, esta medida não permitirá grandes poupanças - Escolha um contador inteligente adequado para si, pois alguns podem não ser adequados para padrões de uso irregulares
	IT	- In edifici molto ben isolati e con un comportamento parsimonioso nell'uso del riscaldamento e dell'acqua, questa misura comporterà un risparmio energetico e idrico limitato - Scegli un contatore intelligente che si adatti alle tue esigenze, poiché alcuni potrebbero non essere adatti a modelli di utilizzo irregolari
	SP	- En el caso de edificios muy bien aislados y con un comportamiento de uso económico de la calefacción y el agua, esta medida ahorrará poca energía y agua - Elige un contador inteligente que se ajuste a tus necesidades, ya que algunos pueden no ser adecuados para patrones de uso irregulares
Applicable typology	Single-family houses, condominium households and energy-poor households	

Measure title: Setpoint and night-time reduction

PT: Temperatura de aquecimento e redução noturna

IT: Temperatura di azionamento e Riduzione Notturna

SP: Punto de Ajuste y Reducción Nocturna

Measure description	EN	Heating systems are only set properly if they are adjusted to all available internal and external heat sources, such as people, lighting, computers and the sun. Night-time reduction is one of the resulting measures. With night-time reduction, the temperature is lowered. This ensures that there are no large fluctuations, and therefore large peaks, in the system. Especially for larger buildings, it is useful to set a setpoint and a night-time reduction. This allows the entire building to be set correctly at once (although preferences can still be adjusted manually). The lighting and heating/cooling will be lowered or switched off during absence and this can save a lot of money and energy!
	PT	Os sistemas de aquecimento só estão regulados corretamente se forem ajustados a todas as fontes de calor internas e externas disponíveis, como pessoas, iluminação, computadores e o sol. Em Portugal, a temperatura recomendada para aquecimento de espaços interiores é entre 18°C e 20°C. Se estiver a aquecer a sua casa a uma temperatura superior, poderá estar a consumir mais energia do que o necessário (o consumo aumenta 7% por cada grau extra). A redução noturna é outra ação através da qual pode reduzir o consumo de energia sem perder conforto térmico. Como o nome indica, nesta medida o aquecimento é desligado ou reduzido durante a noite, quando a temperatura não necessita de ser tão elevada e a inércia térmica do edifício permite reter calor suficiente.
	IT	I sistemi di riscaldamento funzionano correttamente solo se sono regolati tenendo conto di tutte le fonti di calore interne ed esterne disponibili, come persone, illuminazione, computer e il sole. La riduzione notturna è una delle misure risultanti. Con la riduzione notturna, la temperatura viene abbassata. Ciò garantisce che non vi siano grandi fluttuazioni, e quindi grandi picchi, nel sistema. Soprattutto per edifici di grandi dimensioni, è utile impostare un setpoint e una riduzione notturna. Questo consente di regolare correttamente l'intero edificio in una sola volta (anche se le preferenze possono ancora essere regolate manualmente). L'illuminazione e il riscaldamento/raffreddamento verranno abbassati o spenti durante l'assenza, il che può far risparmiare molto denaro ed energia!
	SP	Los sistemas de calefacción solo funcionan correctamente si están ajustados para tener en cuenta todas las fuentes de calor internas y externas disponibles, como personas, iluminación, computadoras y el sol. La reducción nocturna es una de las medidas resultantes. Con la reducción nocturna, la temperatura se baja. Esto garantiza que no haya grandes fluctuaciones, y por lo tanto, grandes picos en el sistema. Especialmente para edificios más grandes, es útil establecer un punto de ajuste y una reducción nocturna. Esto permite ajustar todo el edificio correctamente de una vez (aunque las preferencias aún se pueden ajustar manualmente). La iluminación y la calefacción/refrigeración se reducirán o se apagarán durante la ausencia, lo que puede ahorrar mucho dinero y energía.

Applicable typology	Single-family houses, condominium households and energy-poor households
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Measure title: Heating System Maintenance

PT: Manutenção do sistema de aquecimento

IT: Manutenzione del Sistema di Riscaldamento

SP: Mantenimiento del Sistema de Calefacción

Measure description	EN	Many heating systems are not properly configured. One of the reasons is hydraulic imbalance in the radiators, meaning that hot water is not evenly distributed throughout the building, resulting in energy losses and increased discomfort. Additionally, heat pumps and boilers may be improperly sized or calibrated, necessitating regular maintenance to ensure optimal operation. Remember, keeping your fireplace, heat recovery unit, or stove, as well as the chimney, clean will also enhance their efficiency.
	PT	A maioria dos sistemas de aquecimento não estão devidamente configurados. Uma das causas é um desequilíbrio hidráulico nos radiadores, o que significa que a água quente não é bem distribuída por todo o edifício, resultando em perdas de energia e em maior desconforto. Também as bombas de calor e caldeiras podem estar mal dimensionadas ou calibradas, requerendo manutenção regular para garantir o seu funcionamento ótimo. Não se esqueça, manter a sua lareira, recuperador de calor ou salamandra e chaminé limpas também irá melhorar a sua eficiência.
	IT	Molti sistemi di riscaldamento non sono configurati correttamente. Una delle ragioni è lo squilibrio idraulico nei radiatori, il che significa che l'acqua calda non viene distribuita uniformemente in tutto l'edificio, causando perdite di energia e maggiore disagio. Inoltre, le pompe di calore e le caldaie possono essere di dimensioni o calibrate in modo errato, necessitando di una manutenzione regolare per garantire un funzionamento ottimale. Ricorda, mantenere puliti il camino, l'unità di recupero del calore o la stufa, così come il camino stesso, ne migliorerà anche l'efficienza.
	SP	Muchos sistemas de calefacción no están configurados correctamente. Una de las razones es el desequilibrio hidráulico en los radiadores, lo que significa que el agua caliente no se distribuye uniformemente por todo el edificio, lo que resulta en pérdidas de energía e incomodidad aumentada. Además, las bombas de calor y las calderas pueden estar mal dimensionadas o calibradas, lo que requiere un mantenimiento regular para garantizar un funcionamiento óptimo. Recuerda, mantener limpios el hogar de la chimenea, la unidad de recuperación de calor o estufa, así como la chimenea misma, también mejorará su eficiencia.
Applicable typology	Single-family houses, condominium households and energy-poor households	

Measure title: Air-conditioning single

PT: Ar condicionado para uma divisão

IT: Condizionatore d'Aria Singolo

SP: Aire Acondicionado Individual

Measure description	EN	If only one room in your home needs cooling, a single-split air conditioning unit (air-to-air heat pump) may be the ideal solution. Its purpose is to condition a space, combining functions such as heating, cooling, dehumidification, ventilation, renewal, and filtration. A single-split air conditioner has only one indoor unit connected to the outdoor compressor. Air conditioning units have high efficiency ratings and can provide excellent cooling when there is warm air outside. A well-maintained air-to-air heat pump can provide three times more thermal energy than the electrical energy it consumes. Installing an air conditioning system in your home can dramatically increase your comfort during the summer (and in some cases in the winter), but it will also represent a significant additional cost on your energy bill if you are not accustomed to climate control. However, for adequate comfort levels, annual savings can be around 75%. Nonetheless, consider first improving the insulation level of your home and using solar protection devices intelligently. These measures will reduce your cooling needs, allowing you to install less powerful air conditioning equipment and reduce usage time. Note that the installation of outdoor units is not usually allowed on the façades of historical buildings, so you may need to find a discreet location. Opt for high-efficiency equipment (with an inverter system) that uses natural refrigerants such as carbon dioxide or propane instead of refrigerants with high global warming potential fluorinated gases. Consult a professional for the installation of the air conditioning system.
	PT	Se apenas uma divisão da sua casa precisar de ser arrefecida, um aparelho de ar condicionado mono-split (bomba de calor ar-ar) pode ser a solução ideal. O seu objetivo é climatizar um espaço podendo acumular as funções de aquecimento, arrefecimento, desumidificação, renovação, filtragem e ventilação. Um ar condicionado mono-split tem apenas uma unidade interior ligada ao compressor exterior. As unidades de ar condicionado têm elevados índices de eficiência e podem proporcionar um excelente arrefecimento quando existe ar quente no exterior. Uma bomba de calor ar-ar bem conservada pode fornecer três vezes mais energia térmica do que a energia elétrica que consome. A instalação de um sistema de ar condicionado na sua casa pode aumentar dramaticamente o seu conforto durante o verão (e em alguns casos no inverno), mas também representará um custo adicional significativo na sua fatura de energia caso não tenha o hábito de climatizar a habitação (contudo para níveis de conforto adequados, as poupanças estão na ordem dos 75% anuais). No entanto, considere primeiro aumentar o nível de isolamento da sua casa e utilizar dispositivos de proteção solar de forma inteligente. Estas medidas

		levarão à redução das suas necessidades de arrefecimento, permitindo instalar equipamentos de ar condicionado menos potentes e reduzir o tempo de utilização. Tenha em atenção que a instalação de unidades exteriores não é normalmente permitida nas fachadas de edifícios históricos, pelo que poderá ter de encontrar um local fora da vista. Opte por equipamentos de elevada eficiência energética (com sistema inverter) e que utilizem refrigerantes naturais, como o dióxido de carbono ou o propano, em vez de refrigerantes com gases fluorados de elevado potencial de aquecimento global. Consulte um profissional para a instalação do sistema de ar condicionado.
	IT	Se solo una stanza della tua casa necessita di raffreddamento, un'unità di condizionamento d'aria a singolo split (pompa di calore aria-aria) potrebbe essere la soluzione ideale. Il suo scopo è condizionare uno spazio, combinando funzioni come riscaldamento, raffreddamento, deumidificazione, ventilazione, rinnovo e filtrazione. Un condizionatore a singolo split ha solo un'unità interna collegata al compressore esterno. Le unità di condizionamento d'aria hanno alti livelli di efficienza e possono fornire un raffreddamento eccellente quando c'è aria calda all'esterno. Una pompa di calore aria-aria ben mantenuta può fornire tre volte più energia termica di quella elettrica consumata. Installare un sistema di condizionamento d'aria nella tua casa può aumentare notevolmente il comfort durante l'estate (e in alcuni casi anche in inverno), ma rappresenterà anche un costo aggiuntivo significativo sulla bolletta energetica se non sei abituato al controllo del clima. Tuttavia, per livelli di comfort adeguati, i risparmi annuali possono arrivare al 75%. Tuttavia, considera prima il miglioramento del livello di isolamento della tua casa e di usare dispositivi di protezione solare in modo intelligente. Queste misure ridurranno le tue esigenze di raffreddamento, permettendoti di installare apparecchiature di condizionamento d'aria meno potenti e di ridurre il tempo di utilizzo. Nota che l'installazione di unità esterne non è generalmente consentita sulle facciate degli edifici storici, quindi potrebbe essere necessario trovare una posizione discreta. Opta per apparecchiature ad alta efficienza (con sistema inverter) che utilizzano refrigeranti naturali come anidride carbonica o propano invece di refrigeranti con un elevato potenziale di riscaldamento globale, come i gas fluorurati. Consulta un professionista per l'installazione del sistema di condizionamento dell'aria.
	SP	Si solo una habitación de tu hogar necesita enfriarse, una unidad de aire acondicionado de split único (bomba de calor aire-aire) puede ser la solución ideal. Su propósito es acondicionar un espacio, combinando funciones como calefacción, enfriamiento, deshumidificación, ventilación, renovación y filtración. Un aire acondicionado de split único tiene solo una unidad interior conectada al compresor exterior. Las unidades de aire acondicionado tienen altos índices de eficiencia y pueden proporcionar una excelente refrigeración cuando hay aire

		caliente afuera. Una bomba de calor aire-aire bien mantenida puede proporcionar tres veces más energía térmica de la energía eléctrica que consume. Instalar un sistema de aire acondicionado en tu hogar puede aumentar significativamente tu comodidad durante el verano (y en algunos casos en invierno), pero también representará un coste adicional significativo en tu factura de energía si no estás acostumbrado al control del clima. Sin embargo, para niveles de confort adecuados, los ahorros anuales pueden rondar el 75%. No obstante, primero considera mejorar el nivel de aislamiento de tu hogar y utilizar dispositivos de protección solar de manera inteligente. Estas medidas reducirán tus necesidades de enfriamiento, lo que te permitirá instalar equipos de aire acondicionado menos potentes y reducir el tiempo de uso. Ten en cuenta que generalmente no se permite la instalación de unidades exteriores en las fachadas de edificios históricos, por lo que puede que necesites encontrar una ubicación discreta. Opta por equipos de alta eficiencia (con sistema inversor) que utilicen refrigerantes naturales como dióxido de carbono o propano en lugar de refrigerantes con un alto potencial de calentamiento global, como los gases fluorados. Consulta a un profesional para la instalación del sistema de aire acondicionado.
Applicable typology	Single-family houses, condominium households and energy-poor households	
Final Energy Reduction	replacement of old inefficient airco: $((\{\text{cooling area}\} * 0,1433 + 0,03) * (\{\text{average number of hours per summer day}\} * 0,5 * 94) * 2,33 - (\{\text{cooling area}\} * 0,1433 + 0,03) * (\{\text{average number of hours per summer day}\} * 0,5 * 94))$ inexistent airco: -	
Improvement of thermal comfort	1 star 3 stars	
Investment estimate	$\{\text{cooling area}\} * 22,005 + 248,32 + 13,3 * \{\text{cooling area}\}$	
Savings estimate	$FER * \{\text{electricity price}\}$	
GHG Reduction	$FER * \{\text{electricity CO}_2 \text{ emissions}\}$	

Measure title: Air-conditioning multi
PT: Ar condicionado para várias divisões
IT: Condizionatore d'Aria Multisplit
SP: Aire Acondicionado Multisplit

Measure description	EN	If multiple rooms in your home require cooling, a multi-split air conditioning system (air-to-air heat pump) can be the ideal solution for climate control with individual temperature control. Its purpose is to condition a space, combining functions such as heating, cooling, dehumidification, ventilation, renewal, and filtration. Multi-split systems can easily have four indoor units connected to a single outdoor unit. Air conditioning units have high efficiency ratings and can provide excellent cooling when there is warm air outside. A well-maintained heat pump can
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		provide three times more thermal energy than the electrical energy it consumes. Installing an air conditioning system in your home can significantly increase your comfort during the summer, but it will also represent a significant additional cost on your energy bill. Therefore, consider first improving the insulation level of your home and using solar protection devices intelligently. These measures will reduce your cooling needs, allowing you to install less powerful air conditioning equipment and reduce usage time. Note that the installation of outdoor units is not usually allowed on the façades of historical buildings, so you may need to find a discreet location. Opt for high-efficiency equipment (with an inverter system) that uses natural refrigerants such as carbon dioxide or propane instead of refrigerants with high global warming potential fluorinated gases. Consult a professional for the installation of the air conditioning system.
	PT	Se várias divisões da sua habitação necessitarem de arrefecimento, um ar condicionado para várias divisões (bomba de calor ar-ar) pode ser a solução ideal para climatização com controlo individual da temperatura. O seu objetivo é climatizar um espaço podendo acumular as funções de aquecimento, arrefecimento, desumidificação, renovação, filtragem e ventilação. Sistemas multi-split podem facilmente ter quatro unidades interiores ligadas a uma única unidade exterior. As unidades de ar condicionado têm elevados índices de eficiência e podem proporcionar um excelente arrefecimento quando existe ar quente no exterior. Uma bomba de calor bem conservada pode fornecer três vezes mais energia térmica do que a energia elétrica que consome. A instalação de um sistema de ar condicionado na sua casa pode aumentar dramaticamente o seu conforto durante o verão, mas também representará um custo adicional significativo na sua fatura de energia. Assim, considere primeiro aumentar o nível de isolamento da sua casa e utilizar dispositivos de proteção solar de forma inteligente. Estas medidas levarão à redução das suas necessidades de arrefecimento, permitindo instalar equipamentos de ar condicionado menos potentes e reduzir o tempo de utilização. Tenha em atenção que a instalação de unidades exteriores não é normalmente permitida nas fachadas de edifícios históricos, pelo que poderá ter de encontrar um local fora da vista. Opte por equipamentos de elevada eficiência energética (com sistema inverter) e que utilizem refrigerantes naturais, como o dióxido de carbono ou o propano, em vez de refrigerantes com gases fluorados de elevado potencial de aquecimento global. Consulte um profissional para a instalação do sistema de ar condicionado.
	IT	Se più stanze della tua casa richiedono raffreddamento, un sistema di condizionamento d'aria multisplit (pompa di calore aria-aria) può essere la soluzione ideale per il controllo del clima con controllo individuale della temperatura. Il suo scopo è condizionare uno spazio, combinando funzioni come riscaldamento, raffreddamento, deumidificazione, ventilazione, rinnovo e filtrazione. I sistemi multisplit possono facilmente

		collegare quattro unità interne a una singola unità esterna. Le unità di condizionamento d'aria hanno alti livelli di efficienza e possono fornire un raffreddamento eccellente quando c'è aria calda all'esterno. Una pompa di calore ben mantenuta può fornire tre volte più energia termica di quella elettrica consumata. Installare un sistema di condizionamento d'aria nella tua casa può aumentare significativamente il comfort durante l'estate, ma rappresenterà anche un costo aggiuntivo significativo sulla bolletta energetica. Pertanto, considera prima il miglioramento del livello di isolamento della tua casa e di usare dispositivi di protezione solare in modo intelligente. Queste misure ridurranno le tue esigenze di raffreddamento, permettendoti di installare apparecchiature di condizionamento d'aria meno potenti e di ridurre il tempo di utilizzo. Nota che l'installazione di unità esterne non è generalmente consentita sulle facciate degli edifici storici, quindi potrebbe essere necessario trovare una posizione discreta. Opta per apparecchiature ad alta efficienza (con sistema inverter) che utilizzano refrigeranti naturali come anidride carbonica o propano invece di refrigeranti con un elevato potenziale di riscaldamento globale, come i gas fluorurati. Consulta un professionista per l'installazione del sistema di condizionamento d'aria.
	SP	Si varias habitaciones de tu hogar necesitan enfriarse, un sistema de aire acondicionado multisplit (bomba de calor aire-aire) puede ser la solución ideal para el control climático con control individual de temperatura. Su propósito es acondicionar un espacio, combinando funciones como calefacción, enfriamiento, deshumidificación, ventilación, renovación y filtración. Los sistemas multisplit pueden conectar fácilmente cuatro unidades interiores a una sola unidad exterior. Las unidades de aire acondicionado tienen altos índices de eficiencia y pueden proporcionar una excelente refrigeración cuando hay aire caliente afuera. Una bomba de calor bien mantenida puede proporcionar tres veces más energía térmica de la energía eléctrica que consume. Instalar un sistema de aire acondicionado en tu hogar puede aumentar significativamente tu comodidad durante el verano, pero también representará un coste adicional significativo en tu factura de energía. Por lo tanto, considera primero mejorar el nivel de aislamiento de tu hogar y utilizar dispositivos de protección solar de manera inteligente. Estas medidas reducirán tus necesidades de enfriamiento, lo que te permitirá instalar equipos de aire acondicionado menos potentes y reducir el tiempo de uso. Ten en cuenta que generalmente no se permite la instalación de unidades exteriores en las fachadas de edificios históricos, por lo que puede que necesites encontrar una ubicación discreta. Opta por equipos de alta eficiencia (con sistema inversor) que utilicen refrigerantes naturales como dióxido de carbono o propano en lugar de refrigerantes con un alto potencial de calentamiento global, como los gases fluorados. Consulta a un profesional para la instalación del sistema de aire acondicionado.
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Movable air-conditioning

PT: Ar condicionado portátil

IT: Condizionatore Portatile

SP: Aire Acondicionado Portátil

Measure description	EN	Portable air conditioning units operate very similarly to any other type of air conditioner for space cooling. The main difference lies in the fact that, in conventional air conditioning units, heat is released by the outdoor unit, whereas in portable units, hot air is vented outside through a hose. A portable unit typically comes with a hose and a window kit, allowing you to set up the system quickly and easily. However, portable air conditioners are much less efficient than conventional units (energy consumption can be twice as high), may release residual heat indoors, compromise insulation, and are also noisier. Despite these drawbacks, this type of equipment can be a solution for residences in older buildings without a suitable space for the outdoor unit. Note that energy labelling is not directly comparable between fixed and portable equipment: the A class of portable air conditioners is equivalent to the F class of fixed systems.
	PT	Os aparelhos de ar condicionado portátil funcionam de forma muito semelhante a qualquer outro tipo de aparelho de ar condicionado para arrefecimento de espaços. A principal diferença reside no facto de, nos aparelhos convencionais de ar condicionado, o calor ser libertado pela unidade exterior, enquanto nas unidades portáteis o ar quente é conduzido para o exterior através de uma mangueira. Um equipamento portátil traz normalmente uma mangueira e um kit de janela, que lhe permite configurar o sistema de forma rápida e fácil. No entanto, os aparelhos de ar condicionado portátil são muito menos eficientes do que as unidades convencionais (o consumo de energia pode ser duas vezes superior), podem libertar calor residual dentro de casa, comprometer o isolamento e são também mais ruidosos. Mesmo com estas desvantagens, este tipo de equipamento pode ser uma solução para habitações em edifícios mais antigos sem um espaço adequado para colocação da unidade exterior. Atenção, a rotulagem energética não é diretamente comparável entre equipamentos fixos e portáteis: a classe A de ar condicionado portátil é equivalente a classe F de sistemas fixos.
	IT	Le unità di condizionamento d'aria portatili funzionano in modo molto simile a qualsiasi altro tipo di condizionatore per il raffreddamento degli spazi. La principale differenza risiede nel fatto che, nelle unità di condizionamento convenzionali, il calore viene rilasciato dall'unità esterna, mentre nelle unità portatili, l'aria calda viene evacuata all'esterno tramite un tubo. Un'unità portatile viene generalmente fornita con un tubo e un kit per finestra, che ti permette di installare il sistema in modo rapido e semplice. Tuttavia, i condizionatori portatili sono molto meno efficienti delle unità convenzionali (il consumo energetico può essere il doppio), possono rilasciare calore residuo

		all'interno, compromettere l'isolamento e sono anche più rumorosi. Nonostante questi svantaggi, questo tipo di attrezzatura può essere una soluzione per le residenze in edifici più vecchi senza uno spazio adeguato per l'unità esterna. Nota che l'etichettatura energetica non è direttamente comparabile tra apparecchiature fisse e portatili: la classe A dei condizionatori portatili è equivalente alla classe F dei sistemi fissi.
	SP	Las unidades de aire acondicionado portátiles funcionan de manera muy similar a cualquier otro tipo de aire acondicionado para enfriar espacios. La principal diferencia radica en que, en las unidades de aire acondicionado convencionales, el calor se libera a través de la unidad exterior, mientras que en las unidades portátiles, el aire caliente se ventila al exterior a través de una manguera. Una unidad portátil generalmente viene con una manguera y un kit para ventanas, lo que te permite instalar el sistema de manera rápida y sencilla. Sin embargo, los aires acondicionados portátiles son mucho menos eficientes que las unidades convencionales (el consumo de energía puede ser el doble), pueden liberar calor residual en interiores, comprometer el aislamiento y también son más ruidosos. A pesar de estos inconvenientes, este tipo de equipo puede ser una solución para residencias en edificios antiguos sin un espacio adecuado para la unidad exterior. Ten en cuenta que la etiqueta energética no es directamente comparable entre equipos fijos y portátiles: la clase A de los aires acondicionados portátiles es equivalente a la clase F de los sistemas fijos.
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Cooling temperature

PT: Temperatura de arrefecimento

IT: Temperatura di Raffreddamento

SP: Temperatura de Refrigeración

Measure description	EN	In summer, the recommended indoor comfort temperature is between 22°C and 25 °C. Any additional cooling below this temperature may not be necessary and will increase your electricity bill by 7% for each extra degree. Install a programmable thermostat to strategically adjust heating and cooling based on your daily routines. An intelligent and automated system can save you a significant amount on your energy bill.
	PT	No verão, a temperatura de conforto térmico recomendada é de 22°C a 25°C. Qualquer arrefecimento adicional abaixo desta temperatura pode não ser necessário e aumentará a sua conta de eletricidade em 7% por cada grau extra. Instale um termóstato programável para poder regular estrategicamente o aquecimento e o arrefecimento de acordo com as suas rotinas diárias. Um sistema inteligente e automatizado poderá poupar-lhe muito dinheiro na fatura de energia.
	IT	In estate, la temperatura interna di comfort consigliata è tra 22°C e 25°C. Qualsiasi raffreddamento aggiuntivo sotto questa temperatura potrebbe non essere necessario e aumenterà la tua bolletta elettrica del 7% per ogni

		grado in più. Installa un termostato programmabile per regolare strategicamente il riscaldamento e il raffreddamento in base alle tue routine quotidiane. Un sistema intelligente e automatizzato può farti risparmiare una quantità significativa sulla bolletta energetica.
	SP	En verano, la temperatura de confort interior recomendada está entre 22°C y 25°C. Cualquier enfriamiento adicional por debajo de esta temperatura puede no ser necesario y aumentará tu factura de electricidad en un 7% por cada grado extra. Instala un termostato programable para ajustar estratégicamente la calefacción y refrigeración en función de tus rutinas diarias. Un sistema inteligente y automatizado puede ahorrarte una cantidad significativa en tu factura de energía.
Applicable typology		Single-family houses, condominium households and energy-poor households

Space cooling

Measure title: Air-conditioning maintenance

PT: Manutenção do equipamento

IT: Manutenzione dell'Aria Condizionata

SP: Mantenimiento del Aire Acondicionado

Measure description	EN	Proper maintenance of your air conditioning units through simple actions can increase their efficiency and lifespan, as well as make achieving thermal comfort easier. Ensure that the tubes and drains are not clogged. Inspect the seals on the air conditioning units or between portable units and window frames, replacing any that show signs of damage. Clean your air conditioning filter once a month; dust can reduce airflow by 1% per week. Make sure the heat produced by the units does not interfere with a nearby thermostat, causing the air conditioning unit to run more than necessary. Additionally, ensure that your air conditioning is not exposed to direct sunlight (covering it with a tarp or building a shelter can increase efficiency by 5% to 10%).
	PT	A manutenção adequada das suas unidades de ar condicionado, por meio de ações simples, pode aumentar a sua eficiência e vida útil, além de permitir alcançar o conforto térmico mais facilmente. Certifique-se de que os tubos e as drenagens não estão entupidos. Inspeção os vedantes nos aparelhos de ar condicionado ou entre as unidades portáteis e os caixilhos das janelas, e substitua aqueles que apresentem sinais de danos. Limpe o filtro do seu ar condicionado uma vez por mês; o pó pode reduzir o fluxo de ar em 1% por semana. Assegure-se de que o calor produzido pelos aparelhos não interfere com um termóstato nas proximidades, fazendo a unidade de ar condicionado funcionar mais do que o necessário. Além disso, certifique-se de que o seu ar condicionado não está exposto à luz solar direta (cobri-lo com uma lona ou construir um abrigo pode aumentar a eficiência entre 5% e 10%).
	IT	Una corretta manutenzione delle tue unità di aria condizionata tramite semplici azioni può aumentarne l'efficienza e la durata, oltre a facilitare il raggiungimento del comfort termico. Assicurati che i tubi e gli scarichi

		non siano intasati. Ispeziona le guarnizioni delle unità di aria condizionata o tra le unità portatili e i telai delle finestre, sostituendo quelle che mostrano segni di usura. Pulisci il filtro dell'aria condizionata una volta al mese; la polvere può ridurre il flusso d'aria dell'1% a settimana. Assicurati che il calore prodotto dalle unità non interferisca con un termostato vicino, causando un funzionamento eccessivo dell'aria condizionata. Inoltre, assicurati che l'unità dell'aria condizionata non sia esposta alla luce solare diretta (coprirla con un telo o costruire una tettoia può aumentare l'efficienza dal 5% al 10%).
	SP	El mantenimiento adecuado de tus unidades de aire acondicionado mediante acciones simples puede aumentar su eficiencia y vida útil, así como facilitar la consecución del confort térmico. Asegúrate de que los tubos y desagües no estén obstruidos. Inspecciona los sellos de las unidades de aire acondicionado o entre las unidades portátiles y los marcos de las ventanas, reemplazando cualquiera que muestre signos de daño. Limpia el filtro del aire acondicionado una vez al mes; el polvo puede reducir el flujo de aire en un 1% por semana. Asegúrate de que el calor producido por las unidades no interfiera con un termostato cercano, haciendo que la unidad de aire acondicionado funcione más de lo necesario. Además, asegúrate de que tu aire acondicionado no esté expuesto a la luz solar directa (cubrirlo con una lona o construir un refugio puede aumentar la eficiencia entre un 5% y un 10%).
Applicable typology	Single-family houses, condominium households and energy-poor households	

Measure title: Ceiling fans

PT: Ventoinhas de teto

IT: Ventilatori a Soffitto

SP: Ventiladores de Techo

Measure description	EN	An easy and cost-effective cooling solution is the installation of a ceiling fan. This equipment helps circulate fresh air while using only 1/10 of the electricity of an air conditioner. During winter, the fan blades should rotate clockwise to push warm air down; in summer, they should rotate counter clockwise to pull warm air up. The cooling effect of a ceiling fan allows you to increase the thermostat on your air conditioner by 1°C, saving energy without any loss of comfort. Installing a ceiling fan can cost between 200 and 700 euros and can reduce cooling needs by up to 40%, depending on the existing situation. It's also possible to install a fan in the attic to prevent hot air from descending to lower rooms. If you don't want to install a ceiling fan, there's a wide variety of portable devices that produce a similar cooling effect with lower capacity.
	PT	Uma solução fácil e de baixo custo para arrefecimento é a instalação de uma ventoinha de teto. Este equipamento ajuda a circular ar fresco enquanto utiliza apenas 1/10 da eletricidade de um ar condicionado. Durante o inverno, as pás da ventoinha devem rodar no sentido horário para empurrar o ar quente para baixo; no verão, devem rodar no sentido

		anti-horário para puxar o ar quente para cima. O efeito de arrefecimento de uma ventoinha permite aumentar o termóstato no seu ar condicionado em 1 °C, poupando energia sem qualquer perda de conforto. A instalação de uma ventoinha de teto pode custar entre 200 e 700 euros e pode reduzir as necessidades de arrefecimento até 40%, dependendo da situação existente. Também é possível instalar uma ventoinha no sótão, para evitar que o ar quente desça para as divisões inferiores. Caso não deseje instalar uma ventoinha de teto, existe uma grande variedade de dispositivos portáteis que produzem o mesmo efeito de arrefecimento, mas com menor capacidade.
	IT	Una soluzione di raffreddamento semplice ed economica è l'installazione di un ventilatore a soffitto. Questo dispositivo aiuta a far circolare l'aria fresca consumando solo un decimo dell'elettricità di un condizionatore. Durante l'inverno, le pale del ventilatore dovrebbero ruotare in senso orario per spingere l'aria calda verso il basso; in estate, dovrebbero ruotare in senso antiorario per spingere l'aria calda verso l'alto. L'effetto di raffreddamento percepito grazie a un ventilatore a soffitto ti consente di aumentare di 1°C il termostato del tuo condizionatore, risparmiando energia senza perdere comfort. Installare un ventilatore a soffitto può costare tra i 200 e i 700 euro e può ridurre le esigenze di raffreddamento fino al 40%, a seconda della situazione esistente. È anche possibile installare un ventilatore in soffitta per impedire all'aria calda di scendere nelle stanze inferiori. Se non desideri installare un ventilatore a soffitto, c'è una vasta gamma di dispositivi portatili che producono un effetto di raffreddamento simile con una capacità inferiore.
	SP	Una solución de refrigeración sencilla y económica es la instalación de un ventilador de techo. Este equipo ayuda a circular el aire fresco mientras usa solo 1/10 de la electricidad de un aire acondicionado. Durante el invierno, las aspas del ventilador deben girar en el sentido de las agujas del reloj para empujar el aire caliente hacia abajo; en verano, deben girar en sentido contrario a las agujas del reloj para subir el aire caliente. El efecto de enfriamiento de un ventilador de techo te permite aumentar el termostato de tu aire acondicionado en 1°C, ahorrando energía sin ninguna pérdida de confort. Instalar un ventilador de techo puede costar entre 200 y 700 euros y puede reducir las necesidades de refrigeración hasta en un 40%, dependiendo de la situación existente. También es posible instalar un ventilador en el ático para evitar que el aire caliente descienda a las habitaciones inferiores. Si no deseas instalar un ventilador de techo, existe una amplia variedad de dispositivos portátiles que producen un efecto de enfriamiento similar con menor capacidad.
Applicable typology		Single-family houses, condominium households and energy-poor households

Heat emission

Measure title: Underfloor heating

PT: Aquecimento por piso radiante hidráulico

IT: Riscaldamento a Pavimento

SP: Calefacción por Suelo Radiante

Measure description	EN	Underfloor heating is a comfortable and efficient way of heating. Thin pipes are laid in the floor through which hot water flows. The water gives off its heat to the floor, which in turn radiates heat itself. The room is heated uniformly. This is in contrast to traditional radiators, where the heat flow is different and heated air often remains suspended under the ceiling. Underfloor heating is a form of low-temperature heating, where the central heating only has to heat the water between 30 and 45 °C. This saves energy consumption.
	PT	O aquecimento por piso radiante hidráulico é uma forma confortável e eficiente de aquecimento central. Pequenos tubos finos são instalados no chão, através dos quais flui água quente. A água liberta o seu calor para o chão, que por sua vez irradia o seu próprio calor. Desta forma, a divisão é aquecida uniformemente. Isto contrasta com os radiadores tradicionais, em que o fluxo de calor é localizado e o ar aquecido permanece frequentemente suspenso sob o teto. O aquecimento por piso radiante é uma forma de aquecimento a baixa temperatura, em que o aquecimento central só tem de aquecer a água entre 30 e 45 °C. Isto permite poupar no consumo de energia. A água quente pode ser produzida através de vários equipamentos como bombas de calor ar-água, caldeiras a gás ou caldeiras a pellets/biomassa. Aproveite o momento de substituição do pavimento para instalar um sistema de aquecimento por piso radiante e aumentar o seu conforto térmico.
	IT	Il riscaldamento a pavimento è un modo confortevole ed efficiente di riscaldare. Sotto il pavimento vengono posati tubi sottili attraverso i quali scorre acqua calda. L'acqua cede il suo calore al pavimento, che a sua volta irradia calore. L'ambiente è riscaldato uniformemente, a differenza dei radiatori tradizionali, dove il flusso di calore è diverso e l'aria calda spesso rimane sospesa sotto il soffitto. Il riscaldamento a pavimento è una forma di riscaldamento a bassa temperatura, dove il sistema di riscaldamento centrale deve riscaldare l'acqua solo tra i 30 e i 45 °C. Questo permette di risparmiare energia.
	SP	La calefacción por suelo radiante es una forma cómoda y eficiente de calefacción. Se colocan tuberías finas en el suelo a través de las cuales circula agua caliente. El agua emite su calor al suelo, que a su vez irradia calor. La habitación se calienta de manera uniforme. Esto contrasta con los radiadores tradicionales, donde el flujo de calor es diferente y el aire caliente a menudo permanece suspendido bajo el techo. La calefacción por suelo radiante es una forma de calefacción a baja temperatura, donde la calefacción central solo tiene que calentar el agua entre 30 y 45 °C. Esto ahorra consumo de energía.
Advantages	EN	• Increases the comfort of the building • Saves energy through efficient heating • Even, constant and environmentally friendly heating of your building • Can be fully concealed

		• Very sustainable • Is also able to ensure cooling in summer if combined with a heat pump
	PT	• Aumenta o conforto do edifício • Poupa energia através de um aquecimento eficiente • Aquecimento equilibrado, constante e amigo do ambiente para o seu edifício • Pode ser totalmente ocultado • Muito sustentável • Também é possível garantir o arrefecimento no verão, se combinado com uma bomba de calor
	IT	• Aumenta il comfort dell'edificio • Risparmia energia grazie a un riscaldamento efficiente • Riscaldamento uniforme, costante ed ecologico del tuo edificio • Può essere completamente nascosto • Molto sostenibile • Può anche garantire il raffreddamento in estate se combinato con una pompa di calore
	SP	• Aumenta el confort del edificio • Ahorra energía gracias a una calefacción eficiente • Calefacción uniforme, constante y respetuosa con el medio ambiente del edificio • Puede ser completamente oculta • Muy sostenible • También puede garantizar la refrigeración en verano si se combina con una bomba de calor
Point of attention	EN	• Relatively long heating time • Floor insulation is a requirement for underfloor heating • Requires specific detailing and construction • The face of the floor changes due to this measure • The distance between the tubes determines the output capacity • Choose an energy-efficient circulation pump
	PT	• Tempo de aquecimento relativamente longo • É necessário isolar o pavimento antes de colocar aquecimento de pavimento radiante • Requer detalhes e construção mais específicos • O aspeto do pavimento é modificado devido a esta medida • A distância entre os tubos determina a capacidade • Escolha uma bomba de circulação eficiente
	IT	• Tempo di riscaldamento relativamente lungo • L'isolamento del pavimento è un requisito per il riscaldamento a pavimento • Richiede dettagli specifici e costruzione • La superficie del pavimento cambia a causa di questa misura • La distanza tra i tubi determina la capacità di riscaldamento • Scegli una pompa di circolazione a basso consumo energetico

	SP	• Tiempo de calentamiento relativamente largo • Se requiere aislamiento del suelo para la calefacción por suelo radiante • Requiere detalles específicos y construcción • El aspecto del suelo cambia debido a esta medida • La distancia entre los tubos determina la capacidad de salida • Elige una bomba de circulación eficiente en términos de energía
Applicable typology	Single-family houses, condominium households and energy-poor households	

Measure title: Wall and ceiling heating

PT: Aquecimento de paredes e tetos

IT: Riscaldamento a Parete e Soffitto

SP: Calefacción por Pared y Techo

Measure description	EN	Like underfloor heating, wall and ceiling heating consists of thin tubes located just below the surface. These are installed on the inside of the wall or ceiling. By allowing hot water to flow through them, the heat is emitted to the wall or ceiling, giving off a pleasant radiant heat. A combination with insulation on the inside of the wall is required to prevent the radiant heat from radiating to the outside as well.
	PT	Tal como o aquecimento por piso radiante, o aquecimento de paredes e tetos consiste em tubos finos colocados logo abaixo da superfície. Estes são instalados no interior da parede ou do teto. Ao permitir a passagem de água quente através deles, o calor é emitido para a parede ou teto, libertando um calor radiante agradável. Uma combinação com isolamento no interior da parede é necessária para evitar que o calor radiante irradie também para o exterior.
	IT	Come il riscaldamento a pavimento, il riscaldamento a parete e soffitto consiste in tubi sottili situati appena sotto la superficie. Questi sono installati all'interno della parete o del soffitto. Facendo scorrere acqua calda attraverso di essi, il calore viene emesso alla parete o al soffitto, irradiando un piacevole calore radiante. È necessaria una combinazione con l'isolamento interno della parete per evitare che il calore radiante venga disperso verso l'esterno.
	SP	Al igual que la calefacción por suelo radiante, la calefacción por pared y techo consiste en tubos finos ubicados justo debajo de la superficie. Estos se instalan en el interior de la pared o techo. Al permitir que el agua caliente fluya a través de ellos, el calor se emite a la pared o techo, irradiando un calor agradable. Se requiere una combinación con aislamiento en el interior de la pared para evitar que el calor radiante se disipe hacia el exterior.
Advantages	EN	• No noise production • Alternative to underfloor heating • Increases the comfort of the building • Saves energy through efficient heating

		• Even, constant and environmentally friendly heating of your building • Is also able to ensure cooling in summer if combined with a heat pump
	PT	• Não produz ruído • Alternativa ao pavimento radiante • Aumenta o conforto do edifício • Poupa energia através de um aquecimento eficiente • Aquecimento equilibrado, constante e amigo do ambiente para o seu edifício • Também é possível garantir o arrefecimento no verão, se combinado com uma bomba de calor
	IT	• Nessuna produzione di rumore • Alternativa al riscaldamento a pavimento • Aumenta il comfort dell'edificio • Risparmia energia grazie a un riscaldamento efficiente • Riscaldamento uniforme, costante ed ecologico del tuo edificio • Può anche garantire il raffreddamento in estate se combinato con una pompa di calore
	SP	• Sin producción de ruido • Alternativa a la calefacción por suelo radiante • Aumenta el confort del edificio • Ahorra energía gracias a una calefacción eficiente • Calefacción uniforme, constante y ecológica del edificio • También puede garantizar la refrigeración en verano si se combina con una bomba de calor
Point of attention	EN	• Relatively long heating time • Good insulation is required • Let an expert advise you well in advance • Loss of space on the inside • Renovation of wall and new finish needed
	PT	• Tempo de aquecimento relativamente longo • É necessário um bom isolamento • Procure aconselhamento de um especialista antes de proceder à intervenção • Perda de espaço no interior • É necessário renovar a parede e colocar um acabamento novo
	IT	• Tempo di riscaldamento relativamente lungo • È necessario un buon isolamento • Lascia che un esperto ti consigli con largo anticipo • Perdita di spazio all'interno • Necessaria la ristrutturazione della parete e una nuova finitura
	SP	• Tiempo de calentamiento relativamente largo • Se requiere un buen aislamiento • Deja que un experto te aconseje con anticipación • Pérdida de espacio en el interior

	• Renovación de la pared y nuevo acabado necesario
Applicable typology	Single-family houses, condominium households and energy-poor households

Measure title: Low-temperature heating

PT: Radiador de baixa temperatura

IT: Riscaldamento a Bassa Temperatura

SP: Calefacción a Baja Temperatura

Measure description	EN	Low-temperature radiators (also known as LT radiators or LT convectors) heat with central heating water at a significantly lower temperature than conventional radiators. Depending on the situation, the central heating system only needs to heat the water up to 55 °C instead of up to 70-90 °C. This saves you energy consumption. It is also an improvement in comfort, as low-temperature radiators heat your home evenly and constantly. Good building insulation and the switch to low-temperature heating are an important prerequisite for a heat pump.
	PT	Os radiadores de baixa temperatura aquecem com recurso a água de aquecimento central a uma temperatura significativamente mais baixa do que os radiadores convencionais. Dependendo da situação, o sistema de aquecimento central só tem de aquecer a água até 55°C em vez de até 70-90°C. Isto permite poupar no consumo de energia e alarga as possibilidades de equipamentos a instalar. Permite também obter uma melhoria no conforto, uma vez que os radiadores a baixa temperatura aquecem a sua casa de maneira uniforme e constante. Um bom isolamento e a mudança para aquecimento a baixa temperatura são um pré-requisito importante para uma bomba de calor.
	IT	I radiatori a bassa temperatura (noti anche come LT radiatori o LT convettori) riscaldano con acqua di riscaldamento centrale a una temperatura significativamente più bassa rispetto ai radiatori convenzionali. A seconda della situazione, il sistema di riscaldamento centrale deve riscaldare l'acqua solo fino a 55 °C invece che fino a 70-90 °C. Questo ti permette di risparmiare energia. È anche un miglioramento del comfort, poiché i radiatori a bassa temperatura riscaldano la tua casa in modo uniforme e costante. Un buon isolamento dell'edificio e il passaggio al riscaldamento a bassa temperatura sono un prerequisite importante per una pompa di calore.
	SP	Los radiadores de baja temperatura (también conocidos como radiadores LT o convectores LT) calientan con agua de calefacción central a una temperatura significativamente más baja que los radiadores convencionales. Dependiendo de la situación, el sistema de calefacción central solo necesita calentar el agua hasta 55 °C en lugar de hasta 70-90 °C. Esto ahorra consumo de energía. También es una mejora en el confort, ya que los radiadores de baja temperatura calientan tu hogar de manera uniforme y constante. Un buen aislamiento del edificio y el cambio a la calefacción a baja temperatura son un requisito importante para una bomba de calor.

Advantages	EN	• Even, constant and environmentally friendly heating of your building • Saves energy • Increases the comfort of the building • No major structural interventions required • Highly efficient system
	PT	• Aquecimento equilibrado, constante e amigo do ambiente para o seu edifício • Poupa energia • Aumenta o conforto do edifício • Não são necessárias grandes intervenções estruturais • Sistema altamente eficiente
	IT	• Riscaldamento uniforme, costante ed ecologico del tuo edificio • Risparmia energia • Aumenta il comfort dell'edificio • Nessun intervento strutturale importante richiesto • Sistema altamente efficiente
	SP	• Calefacción uniforme, constante y respetuosa con el medio ambiente del edificio • Ahorra energía • Aumenta el confort del edificio • No se requieren grandes intervenciones estructurales • Sistema altamente eficiente
Point of attention	EN	• Good insulation is required • Relatively long heating time • This measure has aesthetic consequences on the inside
	PT	• É necessário um bom isolamento • Tempo de aquecimento relativamente longo • Esta medida tem consequências estéticas no interior
	IT	• È necessario un buon isolamento • Tempo di riscaldamento relativamente lungo • Questa misura ha conseguenze estetiche all'interno
	SP	• Se requiere un buen aislamiento • Tiempo de calentamiento relativamente largo • Esta medida tiene consecuencias estéticas en el interior
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Infrared heating

PT: Aquecedores de infravermelhos e emissores térmicos

IT: Riscaldamento a infrarossi

SP: Calefacción por infrarrojos

Measure description	EN	Unlike other systems, infrared does not heat via water. Infrared panels, like the sun, use radiant heat, which means it heats floors, walls, people and objects, which then release their heat to the air. Although heating via
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		electricity is more expensive than gas, you can still save money with infrared heating. This is because you are heating in a targeted way and do not need to heat unnecessary space to achieve the desired comfort. Heating with infrared panels is an environmentally friendly choice as a supplementary heating system and in rooms that are used incidentally (such as a music room, study room or bathroom). Please note that if they are constantly on, it once again becomes more expensive than heating with gas.
	PT	Ao contrário de outros sistemas, os aquecedores de infravermelhos (também chamados de painéis de convecção ou de placas radiantes) e emissores térmicos não aquecem através da água ou óleo. Os painéis infravermelhos utilizam calor radiante, o que significa que permitem aquecer o chão, as paredes, pessoas e até objetos, que por sua vez libertam o seu calor para o ar. Embora o aquecimento através da eletricidade seja mais caro do que o gás ou biomassa, ainda é possível poupar dinheiro com estas soluções. Isto acontece porque está a aquecer de uma forma orientada e não precisa de aquecer áreas desnecessárias para alcançar o conforto desejado. O aquecimento com painéis infravermelhos ou com emissores térmicos é uma escolha amiga do ambiente enquanto sistema de aquecimento suplementar e em divisões utilizadas pontualmente (como uma casa de banho). Tenha em atenção que, se os equipamentos estiverem constantemente ligados, esta solução torna-se mais cara do que o aquecimento central a gás. Embora exijam um investimento bastante mais alto, as bombas de calor (ar condicionado) têm uma eficiência muito superior aos aquecedores de infravermelhos e aos emissores térmicos e, a médio/longo prazo, podem ser a solução mais custo-eficaz.
	IT	A differenza di altri sistemi, il riscaldamento a infrarossi non utilizza l'acqua. I pannelli a infrarossi, come il sole, usano il calore radiante, il che significa che riscaldano pavimenti, pareti, persone e oggetti, che poi rilasciano il loro calore nell'aria. Anche se il riscaldamento tramite elettricità è più costoso rispetto al gas, è comunque possibile risparmiare denaro con il riscaldamento a infrarossi. Questo perché il riscaldamento è mirato e non è necessario riscaldare spazi non necessari per ottenere il comfort desiderato. Riscaldare con pannelli a infrarossi è una scelta ecologica come sistema di riscaldamento supplementare e in stanze utilizzate occasionalmente (come una sala musica, uno studio o un bagno). Nota che, se vengono mantenuti costantemente accesi, diventa di nuovo più costoso rispetto al riscaldamento a gas.
	SP	A diferencia de otros sistemas, la calefacción por infrarrojos no calienta mediante agua. Los paneles de infrarrojos, como el sol, utilizan calor radiante, lo que significa que calientan suelos, paredes, personas y objetos, que luego liberan su calor al aire. Aunque calentar con electricidad es más caro que con gas, aún puedes ahorrar dinero con la calefacción por infrarrojos. Esto se debe a que el calentamiento es dirigido y no necesitas calentar espacios innecesarios para lograr el confort deseado. Calentar con paneles de infrarrojos es una opción

		ecológica como sistema de calefacción complementario y en habitaciones que se usan ocasionalmente (como una sala de música, estudio o baño). Ten en cuenta que, si se mantienen encendidos constantemente, nuevamente se vuelve más caro que calentar con gas.
Advantages	EN	• Comfortable radiant heat • Useful for spaces that are used briefly, incidentally and unilaterally • Infrared panels only heat where heat is required • No pipes and radiators needed • Infrared panels can be switched on rapidly • Available in various variants & styles
	PT	• Calor radiante confortável • Útil para espaços que são usados apenas por curtos períodos de tempo • Os painéis de infravermelhos aquecem apenas as zonas onde é necessário • Não são necessários tubos e radiadores • Os painéis de infravermelhos podem ser ligados rapidamente • Disponível em várias variantes e estilos
	IT	• Calore radiante confortevole • Utile per spazi utilizzati brevemente, occasionalmente e unilateralmente • I pannelli a infrarossi riscaldano solo dove è necessario il calore • Nessun bisogno di tubi e radiatori • I pannelli a infrarossi possono essere accesi rapidamente • Disponibili in varie varianti e stili
	SP	• Calor radiante cómodo • Útil para espacios que se usan brevemente, ocasionalmente y unilateralmente • Los paneles de infrarrojos solo calientan donde se requiere calor • No se necesitan tuberías ni radiadores • Los paneles de infrarrojos se pueden encender rápidamente • Disponibles en varias variantes y estilos
Point of attention	EN	• This measure has aesthetic consequences on the inside • Not possible in some cases due to the presence of wall cladding, cornices or fragile stucco ceilings • When used as main heating not more economical than gas • Combine with motion sensors so that the infrared panel switches off as soon as you leave the room • Place in rooms where you only stay for brief periods • Infrared panels have a range of approximately 3 metres. Outside this range, the heat is not felt • Separate system required for hot water supply • It may be necessary to upgrade the electricity connection, there are costs associated with this
	PT	• Esta medida tem consequências estéticas no interior

		• Em alguns casos não é possível, devido à presença de revestimentos, cornijas ou estuques • Quando usado como fonte principal de aquecimento, não é mais económico do que o gás • Combine com sensores de movimento para o painel infravermelho se desligar quando sai da divisão • Coloque em divisões onde apenas entre por breves períodos de tempo • Os painéis infravermelhos têm um alcance de aproximadamente 3 metros. Fora desta área, o calor não se sente • É necessário um sistema separado para abastecimento de água quente • Pode ser necessário aumentar a potência contratada ou mudar para uma corrente trifásica, com os custos associados
	IT	• Questa misura ha conseguenze estetiche all'interno • Non possibile in alcuni casi a causa della presenza di rivestimenti murali, cornici o soffitti con stucchi fragili • Quando usato come riscaldamento principale, non è più economico del gas • Combina con sensori di movimento in modo che il pannello a infrarossi si spenga appena si lascia la stanza • Posizionare in stanze dove si soggiorna solo per brevi periodi • I pannelli a infrarossi hanno un raggio di circa 3 metri. Fuori da questo raggio, il calore non si avverte • Sistema separato richiesto per l'approvvigionamento di acqua calda • Potrebbe essere necessario un aggiornamento della connessione elettrica, con costi associati
	SP	• Esta medida tiene consecuencias estéticas en el interior • No es posible en algunos casos debido a la presencia de revestimientos de paredes, cornisas o techos con estucos frágiles • Cuando se usa como calefacción principal, no es más económico que el gas • Combina con sensores de movimiento para que el panel de infrarrojos se apague tan pronto como abandones la habitación • Colocar en habitaciones donde permanezcas poco tiempo • Los paneles de infrarrojos tienen un alcance de aproximadamente 3 metros. Fuera de este rango, el calor no se siente • Se requiere un sistema independiente para el suministro de agua caliente • Puede ser necesario actualizar la conexión eléctrica, con costes asociados
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Insulate heating-pipes

PT: Isolamento térmico da tubagem de aquecimento

IT: Isolamento delle tubazioni di riscaldamento

SP: Aislamiento de tuberías de calefacción

Measure description	EN	Heating pipes often lose a lot of heat. By insulating these pipes in the unheated areas, such as crawl spaces, (central) heating cabinets and the attic, the heat is only dissipated where it is needed. It is often easy to insulate pipes yourself, but the pipes must remain easily accessible. It is important not to insulate drinking water pipes in order to avoid the risk of legionella.
	PT	A tubagem de aquecimento perde frequentemente muito calor. Ao isolar estas tubagens nas áreas não aquecidas, como alçapões, armários de aquecimento central e o sótão, o calor só é dissipado onde é necessário. O isolamento com espuma dividida pode ser adquirido na maioria das lojas de bricolage e instalado facilmente. Muitas vezes é fácil isolar os tubos sozinho, mas estes têm de permanecer facilmente acessíveis. É importante não isolar os tubos de água potável, para evitar o risco de legionella.
	IT	Le tubazioni di riscaldamento spesso disperdono molto calore. Isolando queste tubazioni nelle aree non riscaldate, come i vani di accesso, i locali caldaia e le soffitte, il calore viene disperso solo dove è necessario. È spesso facile isolare le tubazioni da soli, ma devono rimanere facilmente accessibili. È importante non isolare le tubazioni dell'acqua potabile per evitare il rischio di legionella.
	SP	Las tuberías de calefacción suelen perder mucho calor. Al aislar estas tuberías en las áreas no calefactadas, como espacios de acceso, armarios de calefacción (central) y el ático, el calor solo se disipa donde es necesario. A menudo es fácil aislar las tuberías uno mismo, pero las tuberías deben permanecer fácilmente accesibles. Es importante no aislar las tuberías de agua potable para evitar el riesgo de legionela.
Advantages	EN	• A quick and easy measure to save energy and money • You can carry out this measure yourself • Pipes remain at a constant temperature, which also reduces the risk of freezing
	PT	• Uma medida rápida e fácil para economizar energia e dinheiro • Pode realizar esta medida sozinho • Os tubos permanecem a uma temperatura constante, o que também reduz o risco de congelamento
	IT	• Una misura rapida e semplice per risparmiare energia e denaro • Puoi eseguire questa misura da solo • Le tubazioni mantengono una temperatura costante, riducendo anche il rischio di congelamento
	SP	• Una medida rápida y sencilla para ahorrar energía y dinero • Puedes realizar esta medida tú mismo

		Las tuberías se mantienen a una temperatura constante, lo que también reduce el riesgo de congelación
Point of attention	EN	- It is necessary to have sufficient space around the pipes so that insulation material can be installed - Prevent drinking water pipes from being insulated in connection with legionella
	PT	- É necessário ter espaço suficiente ao redor dos tubos para que o material de isolamento possa ser instalado - Evitar que os tubos de água potável sejam isolados devido à legionella
	IT	- È necessario avere spazio sufficiente intorno alle tubazioni per installare il materiale isolante - Evitare di isolare le tubazioni dell'acqua potabile per prevenire il rischio di legionella
	SP	- Es necesario tener suficiente espacio alrededor de las tuberías para instalar el material de aislamiento - Evita aislar las tuberías de agua potable para prevenir el riesgo de legionela
Applicable typology		Single-family houses

Measure title: Zone control

PT: Controle por zonas

IT: Controllo delle zone

SP: Control por zonas

Measure description	EN	With zone control, the temperature can be set separately for each room. For example, you can turn the heating on in one room and leave it off in the other. This is done by installing an electrically operated radiator button on each radiator. This system can be operated via an app (e.g. on your smartphone) or a control panel. Zone control provides more comfort, energy savings and works well together with a smart thermostat.
	PT	Através do controlo à zona, a temperatura pode ser definida separadamente para cada divisão. Por exemplo, pode ligar o aquecimento numa divisão e deixá-lo desligado noutra. Isto é feito através da instalação de um botão de ativação operado eletricamente em cada radiador ou através do uso de sistemas de ar condicionado multi-split. Estes sistemas podem ser operados através de uma aplicação (por exemplo, no seu smartphone) ou de um painel de controlo. O controlo à zona proporciona mais conforto, poupança de energia e funciona bastante bem em conjunto com um termóstato inteligente.
	IT	Con il controllo delle zone, la temperatura può essere regolata separatamente per ogni stanza. Ad esempio, è possibile accendere il riscaldamento in una stanza e lasciarlo spento in un'altra. Ciò avviene installando un pulsante del radiatore a comando elettrico su ogni radiatore. Questo sistema può essere controllato tramite un'app (ad esempio, sullo smartphone) o un pannello di controllo. Il controllo delle

Advantages		zone offre maggiore comfort, risparmio energetico e funziona bene insieme a un termostato intelligente.
	SP	Con el control por zonas, se puede ajustar la temperatura por separado para cada habitación. Por ejemplo, puedes encender la calefacción en una habitación y dejarla apagada en otra. Esto se logra instalando un botón de radiador operado eléctricamente en cada radiador. Este sistema se puede operar a través de una aplicación (por ejemplo, en tu smartphone) o un panel de control. El control por zonas proporciona mayor confort, ahorro de energía y funciona bien junto con un termostato inteligente.
	EN	• Saves energy through efficient heating • Increases the comfort of the building • The temperature can be better adjusted to the user's wishes • The thermostat buttons can be adjusted manually, via a central control panel or via a smartphone app. Timetables are also possible • It is possible to set the temperature for each individual room • With the GEO-fencing option, the heating switches on when you approach the building
	PT	• Poupa energia através de um aquecimento eficiente • Aumenta o conforto do edifício • A temperatura pode ser melhor ajustada às necessidades do utilizador • Os botões do termóstato podem ser ajustados manualmente, via o painel de controlo central ou via uma aplicação num smartphone. Também é possível criar horários de funcionamento • É possível definir temperaturas específicas para cada divisão • Com a opção de partilha de localização, o aquecimento liga-se quando se aproxima do edifício
	IT	• Risparmia energia grazie al riscaldamento efficiente • Aumenta il comfort dell'edificio • La temperatura può essere meglio regolata secondo i desideri dell'utente • Gli interruttori del termostato possono essere regolati manualmente, tramite un pannello di controllo centrale o tramite un'app per smartphone. Sono possibili anche orari programmati • È possibile impostare la temperatura per ogni singola stanza • Con l'opzione di geolocalizzazione, il riscaldamento si accende quando ti avvicini all'edificio
	SP	• Ahorra energía mediante una calefacción eficiente • Aumenta el confort del edificio • La temperatura se puede ajustar mejor a los deseos del usuario • Los botones del termostato se pueden ajustar manualmente, a través de un panel de control central o mediante una aplicación para smartphones. También son posibles horarios programados • Es posible establecer la temperatura para cada habitación individual

		• Con la opción de GEO-fencing, la calefacción se enciende cuando te acercas al edificio
Point of attention	EN	• Savings effect depends on property and level of insulation • Simple on/off radiator buttons cannot be directly replaced by smart radiator buttons • When the boiler supports OpenTherm, the smart thermostat buttons can communicate with the boiler • Most systems require a Wi-Fi connection. Make sure that the range throughout the house is sufficient • When selecting a system, pay attention to security
	PT	• As poupanças dependem da propriedade e do nível de isolamento • A substituição dos botões on/off simples dos radiadores por controlo inteligente não é direta • Algumas caldeiras permitem comunicação com um termóstato inteligente • A maior parte dos sistemas requerem uma conexão ao Wi-Fi. Garanta que tem ligação suficiente em toda a casa • Quando selecionar um sistema, preste atenção à segurança
	IT	• L'effetto del risparmio dipende dalla proprietà e dal livello di isolamento • Interruttori semplici on/off non possono essere direttamente sostituiti con pulsanti intelligenti • Quando la caldaia supporta OpenTherm, i pulsanti del termostato intelligenti possono comunicare con la caldaia • La maggior parte dei sistemi richiede una connessione Wi-Fi. Assicuratevi che la copertura in tutta la casa sia sufficiente • Quando scegli un sistema, presta attenzione alla sicurezza
	SP	• El efecto del ahorro depende de la propiedad y el nivel de aislamiento • Los botones de radiador simples de encendido/apagado no se pueden reemplazar directamente con botones de radiador inteligentes • Cuando la caldera es compatible con OpenTherm, los botones del termostato inteligente pueden comunicarse con la caldera • La mayoría de los sistemas requieren una conexión Wi-Fi. Asegúrate de que la cobertura en toda la casa sea suficiente • Al seleccionar un sistema, presta atención a la seguridad
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Replace radiators with convectors

PT: Substituir radiadores por convectores

IT: Sostituire i radiatori con convettori

SP: Reemplazar radiadores con convectores

Measure description	EN	If your radiator needs replacement and low temperature radiators are not yet an option, consider replacing them with convectors. Cold air is sucked in at the bottom of the convector and rises as it is heated. Convectors are often smaller than radiators, heat up the room faster and, in some variants, convectors can also cool. In addition to the normal convectors, there are also low temperature convectors that can save 25% on the energy bill.
	PT	Se o seu radiador precisar de ser substituído e os radiadores de baixa temperatura ainda não forem uma opção, considere a possibilidade de os substituir por convetores. O ar frio é aspirado no fundo do convetor e sobe à medida que é aquecido. Os convetores são frequentemente mais pequenos do que os radiadores, aquecem a divisão mais rapidamente e, em algumas variantes, os convetores também podem arrefecer. Além dos convetores normais, existem também convetores de baixa temperatura que o podem ajudar a poupar ainda mais na fatura energética.
	IT	Se il tuo radiatore deve essere sostituito e i radiatori a bassa temperatura non sono ancora un'opzione, considera la sostituzione con convettori. L'aria fredda viene aspirata nella parte inferiore del convettore e sale mentre viene riscaldata. I convettori sono spesso più piccoli dei radiatori, riscaldano la stanza più velocemente e, in alcune varianti, possono anche raffreddare. Oltre ai convettori normali, esistono anche convettori a bassa temperatura che possono far risparmiare il 25% sulla bolletta energetica.
	SP	Si tu radiador necesita ser reemplazado y los radiadores de baja temperatura aún no son una opción, considera reemplazarlos con convectores. El aire frío es aspirado en la parte inferior del convector y sube a medida que se calienta. Los convectores son a menudo más pequeños que los radiadores, calientan la habitación más rápido y, en algunas variantes, los convectores también pueden enfriar. Además de los convectores normales, también existen convectores de baja temperatura que pueden ahorrar un 25% en la factura energética.
Applicable typology	Single-family houses, condominium households and energy-poor households	

Measure title: Hydronic balancing

PT: Equilíbrio hidráulico

IT: Bilanciamento idronico

SP: Equilíbrio hidráulico

Measure description	EN	75% of the heating systems are not set properly. This causes hydronic imbalance, which means that the hot water is not distributed well throughout the building, which means that it cannot be heated uniformly, resulting in energy loss and discomfort.
	PT	75% dos sistemas de aquecimento não estão configurados corretamente. Isto provoca desequilíbrio hidráulico, o que faz com que a água quente não seja bem distribuída por todo o edifício, o que significa que não pode

		ser aquecida uniformemente, resultando em perda de energia e desconforto.
	IT	Il 75% dei sistemi di riscaldamento non è regolato correttamente. Questo causa uno squilibrio idraulico, il che significa che l'acqua calda non è distribuita bene in tutto l'edificio, con conseguente riscaldamento non uniforme, spreco di energia e minore comfort.
	SP	El 75% de los sistemas de calefacción no están configurados correctamente. Esto causa un desequilibrio hidráulico, lo que significa que el agua caliente no se distribuye bien por todo el edificio, lo que provoca un calentamiento no uniforme, pérdida de energía e incomodidad.
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Heating curve optimization

PT: Otimização da curva de aquecimento

IT: Ottimizzazione della curva di riscaldamento

SP: Optimización de la curva de calefacción

Measure description	EN	Many boilers are set for a high flow temperature. This quickly heats up the building. However, an HR-boiler is more efficient at the lowest possible return temperature. Lowering the supply temperature based on the desired indoor temperature, outdoor temperature and use of the building (night, weekend, etc.) provides more comfort and savings.
	PT	Muitas caldeiras são configuradas para altas temperaturas de fluxo. Isso aquece rapidamente o edifício. No entanto, uma caldeira HR é mais eficiente na temperatura de retorno mais baixa possível. A redução da temperatura de alimentação em função da temperatura interior desejada, da temperatura exterior e da utilização do edifício (noite, fim de semana, etc.) proporciona mais conforto e poupança.
	IT	Molte caldaie sono impostate per una temperatura di mandata elevata. Questo riscalda rapidamente l'edificio. Tuttavia, una caldaia a condensazione (HR) è più efficiente a una temperatura di ritorno il più bassa possibile. Abbassare la temperatura di mandata in base alla temperatura interna desiderata, alla temperatura esterna e all'uso dell'edificio (notte, weekend, ecc.) fornisce più comfort e risparmio.
	SP	Muchas calderas están configuradas para una alta temperatura de flujo. Esto calienta rápidamente el edificio. Sin embargo, una caldera de condensación (HR) es más eficiente a la temperatura de retorno más baja posible. Reducir la temperatura de suministro en función de la temperatura interior deseada, la temperatura exterior y el uso del edificio (noche, fin de semana, etc.) proporciona más confort y ahorro.
Applicable typology		Single-family houses, condominium households and energy-poor households

Hot water

Measure title: Solar boiler

PT: Sistema solar térmico

IT: Caldaia solare

SP: Caldera solar

Measure description	EN	A solar boiler consists of a boiler and a panel that looks very similar to a solar panel. However, the collected sunlight is not converted into electricity, but is used to heat (tap) water. Collectors on the roof ensure that the liquid in the plate or pipes is heated up. The heated liquid is led to a storage tank with water. This way, the water in the storage tank heats up. If the water is not warm enough, an after-heater (high-efficiency combination boiler, electrical element or heat pump) will be added. Placing solar collectors could be a challenge for monumental buildings, because the elements have to be placed out of sight on the roof. The solar boiler is less viable for small households with a high-efficiency combination boiler.
	PT	Um sistema solar térmico é constituído por um tanque e um painel solar. Neste sistema, a luz solar recolhida não é convertida em eletricidade, mas sim utilizada para aquecer água para usos sanitários (casa de banho e cozinha). Os coletores no telhado asseguram que o líquido na placa ou nos tubos é aquecido, que depois é conduzido para um tanque de armazenamento com água. Os painéis solares térmicos não são, na sua generalidade, suficientes para produzir toda a água quente necessária (por exemplo em dias encobertos), implicando a necessidade de dispor de sistemas de apoio a gás natural, eletricidade ou biomassa. Em Portugal, esta solução permite reduzir até 70% do consumo de energia da rede no aquecimento de água, desde que o sistema esteja bem dimensionado para o perfil do agregado e mediante uma utilização correta. O tempo de recuperação do investimento de um sistema solar térmico varia entre 10 e 12 anos, dependendo da energia de apoio, tipo de instalação e fim a que se destina para um equipamento cujo tempo de vida útil é da ordem de 20 anos. Atualmente, existem sistemas solares térmicos em que o tanque pode ser colocado dentro de casa (sistemas de circulação forçada), minimizando o impacto visual no exterior do edifício tipicamente associado aos sistemas de termossifão. Mesmo assim, os coletores solares são um desafio para edifícios antigos em zonas históricas, uma vez que têm de ser instalados no telhado longe da vista. Garanta que o telhado pode suportar a carga adicional do sistema solar térmico e que este é dimensionado, instalado e mantido por um profissional.
	IT	Una caldaia solare è composta da una caldaia e un pannello che assomiglia molto a un pannello fotovoltaico. Tuttavia, la luce solare raccolta non viene convertita in elettricità, ma viene utilizzata per riscaldare l'acqua (potabile). I collettori sul tetto assicurano che il liquido nella piastra o nelle tubazioni si riscaldi. Il liquido riscaldato viene condotto a un serbatoio di accumulo con acqua. In questo modo, l'acqua nel serbatoio di accumulo si riscalda. Se l'acqua non è abbastanza calda, verrà aggiunto un riscaldatore supplementare (caldaia a condensazione).

		ad alta efficienza, elemento elettrico o pompa di calore). L'installazione di collettori solari potrebbe rappresentare una sfida per gli edifici storici, poiché gli elementi devono essere collocati fuori dalla vista sul tetto. É opportuno valutarne le efficienze sulla base della dimensione della casa e del numero di abitanti con un professionista.
	SP	Una caldera solar consta de una caldera y un panel que se parece mucho a un panel solar. Sin embargo, la luz solar recogida no se convierte en electricidad, sino que se utiliza para calentar agua (potable). Los colectores en la cubierta aseguran que el líquido en la placa o tuberías se caliente. El líquido calentado se lleva a un tanque de almacenamiento con agua. De esta manera, el agua en el tanque de almacenamiento se calienta. Si el agua no está lo suficientemente caliente, se añadirá un calentador adicional (caldera de condensación de alta eficiencia, elemento eléctrico o bomba de calor). Colocar colectores solares puede ser un desafío para edificios monumentales, ya que los elementos deben colocarse fuera de la vista en la cubierta. La caldera solar es menos viable para hogares pequeños con una caldera de condensación de alta eficiencia.
Advantages	EN	• Sustainable heating of tap water • Also functions on cloudy days • A favourable cost recovery period compared to an electric boiler • Flat plate collector is cheaper to buy than a vacuum tube collector
	PT	• Aquecimento sustentável da água da torneira • Também funciona em dias nublados • Tempo de retorno do investimento mais favorável, quando comparado com o de uma caldeira elétrica • Um coletor de placa plana é mais barato que um coletor em tubo de vácuo
	IT	• Riscaldamento sostenibile dell'acqua potabile • Funziona anche nei giorni nuvolosi • Periodo di ammortamento favorevole rispetto a una caldaia elettrica • Il collettore a piastra piana è più economico da acquistare rispetto a un collettore a tubi sottovuoto
	SP	• Calentamiento sostenible del agua potable • Funciona también en días nublados • Periodo de recuperación de costes favorable en comparación con una caldera eléctrica • El colector de placa plana es más barato de comprar que un colector de tubo de vacío
Point of attention	EN	• Cost recovery periods of solar collectors are longer than those of solar panels • The shorter the distance between collector and boiler, the higher the efficiency • Works best facing between south-east and south-west, at an angle of 40-45°

		• The solar collector works best in summer • Not always allowed with historically valuable properties • Have the load-bearing capacity of the roof checked before installation • Take into account the weight of the boiler vessel relative to the strength of the supporting structure • Pay attention to proper sizing according to needs and usage patterns
	PT	• O período de retorno do investimento é mais longo para painéis solares térmicos do que para painéis solares fotovoltaicos • Quanto mais curta for a distância entre o coletor e a caldeira, maior a eficiência • Funciona melhor orientado para sudoeste e sudeste, num ângulo de 40-45° • O coletor solar funciona melhor no verão • Nem sempre permitido em propriedades com valor patrimonial • Inspeção a capacidade de suportar cargas do telhado antes de instalar o equipamento • Tenha em atenção o peso da caldeira relativamente à resistência estrutural do edifício • Tenha atenção ao correto dimensionamento de acordo com as necessidades e padrões de uso
	IT	• I periodi di ammortamento dei collettori solari sono più lunghi di quelli dei pannelli solari • Più breve è la distanza tra il collettore e la caldaia, maggiore è l'efficienza • Funziona meglio con orientamento tra sud-est e sud-ovest, con un'inclinazione di 40-45° • Il collettore solare funziona al meglio in estate • Non sempre consentito in edifici di valore storico • Verificare la capacità portante del tetto prima dell'installazione • Considerare il peso del serbatoio della caldaia rispetto alla resistenza della struttura portante • Prestare attenzione alle dimensioni adeguate in base alle esigenze e ai modelli di utilizzo
	SP	• Los períodos de recuperación de costes de los colectores solares son más largos que los de los paneles solares • Cuanto más corta es la distancia entre el colector y la caldera, mayor es la eficiencia • Funciona mejor orientado entre sureste y suroeste, con un ángulo de 40-45° • El colector solar funciona mejor en verano • No siempre permitido en propiedades de valor histórico • Verifica la capacidad de carga de la cubierta antes de la instalación • Ten en cuenta el peso del tanque de la caldera en relación con la resistencia de la estructura de soporte

		Presta atención al tamaño adecuado según las necesidades y los patrones de uso
Applicable typology	Single-family houses, condominium households and energy-poor households	
Renewable Energy Generation	PT:1443 kWh/per person IT:1327 kWh/per person ES:1502 kWh/por persona	
Investment estimate	{number of people}*162,8+1170,6	
Savings estimate	PT: - If natural gas water heater: 160 euro/person - If electric water heater: 158 euro/person IT: - If natural gas water heater: 195 euro/person - If electric water heater: 193 euro/person ES: - Calentador de gas natural: 190 euro/persona - Calentador eléctrico:	
GHG Reduction	PT: - If natural gas water heater: 175 tCO ₂ /person - If electric water heater: 174 tCO ₂ /person IT: - If natural gas water heater: 212 tCO ₂ /person - If electric water heater: 209 tCO ₂ /person ES: - Calentador de gas natural: 180 tCO ₂ /persona - Calentador eléctrico:	

Measure title: Heat pump boiler

PT: Bomba de calor ar-água

IT: Caldaia a pompa di calore

SP: Caldera de bomba de calor

Measure description	EN	A heat pump boiler is a compact heat pump connected to a cylinder that uses ambient air or ventilation air to heat tap water. The system uses heat from the ventilation air to heat tap water up to 60 °C. The cooled ventilation air is sent outside. This heat pump system is not intended for space heating but only for the generation of hot tap water. A heat pump boiler is often used as a replacement for a ventilation system (mechanical extraction) or as a replacement for an electric boiler system.
	PT	Uma bomba de calor ar-água está ligada a um cilindro e utiliza ar ambiente para aquecer água para usos sanitários. A bomba de calor pode ser combinada com um depósito já existente, ou com um depósito novo. Existem versões com duas unidades (exterior e interior), que também servem para aquecimento central, e versões compactas com apenas uma unidade, que servem só para aquecimento de águas sanitárias. No caso das bombas de calor apenas para águas sanitárias, estas devem ser

		instaladas dentro da habitação num local arejado e não habitado, sendo necessário instalar condutas se a divisão tiver menos de 20 m ² . Dentro da tipologia de equipamentos elétricos, as bombas de calor são os que apresentam atualmente uma melhor eficiência, produzindo 3 a 4 unidades de calor por unidade de eletricidade consumida. Ou seja, as bombas de calor são 3 a 4 vezes mais eficientes do que um termoacumulador elétrico. Estes sistemas podem ser combinados com painéis fotovoltaicos para usarem eletricidade renovável ou podem servir de reserva para sistemas solares térmicos. As bombas de calor mais avançadas possuem tecnologia de controlo inteligente e com possibilidade de conexão Wi-Fi. Tenha atenção que o equipamento deve ser dimensionado de acordo com as necessidades de água quente da sua casa. A instalação deve ser efetuada por um profissional num local adequado.
	IT	Una caldaia a pompa di calore è una pompa di calore compatta collegata a un cilindro, utilizza l'aria ambiente o l'aria di ventilazione per riscaldare l'acqua potabile. Il sistema utilizza il calore dell'aria di ventilazione per riscaldare l'acqua fino a 60 °C. L'aria di ventilazione raffreddata viene espulsa all'esterno. Questo sistema di pompa di calore non è destinato al riscaldamento degli ambienti, ma solo alla produzione di acqua calda potabile. Una caldaia a pompa di calore è spesso utilizzata come sostituto di un sistema di ventilazione (estrazione meccanica) o come sostituto di un sistema di caldaia elettrica.
	SP	Una caldera de bomba de calor es una bomba de calor compacta conectada a un cilindro que utiliza el aire ambiente o el aire de ventilación para calentar agua potable. El sistema utiliza el calor del aire de ventilación para calentar agua hasta 60 °C. El aire de ventilación enfriado se envía al exterior. Este sistema de bomba de calor no está destinado a la calefacción de espacios, sino solo para la generación de agua caliente potable. Una caldera de bomba de calor se usa a menudo como reemplazo de un sistema de ventilación (extracción mecánica) o como reemplazo de un sistema de caldera eléctrica.
Advantages	EN	• Saves energy • No more gas consumption
	PT	• Poupa energia • Não terá mais consumos de gás
	IT	• Risparmia energia • Non consuma più gas
	SP	• Ahorra energía • No más consumo de gas
Point of attention	EN	• When ambient air is used, the efficiency is reduced significantly in winter. Not every heat pump boiler can operate at low temperatures • Good positioning is important to prevent noise nuisance • The heat pump boiler has a relatively small capacity. With a large tap water demand, it can take a long time to regain temperature

		- Do not make the capacity of the boiler tank too large to reduce downtime losses - Not suitable for heating central heating water - Pay attention to proper sizing according to needs and usage patterns
	PT	- Quando é usado ar exterior, a eficiência reduz significativamente no inverno. Nem todas as bombas de calor conseguem operar a baixas temperaturas - A instalação correta é importante para prevenir problemas de ruído - A bomba de calor tem uma capacidade relativamente limitada. Se a sua casa necessitar de muita água quente, pode demorar algum tempo a aquecer - Se a caldeira tiver uma capacidade muito superior às suas necessidades, irá desperdiçar muita energia enquanto não está a usar a água quente - Não é adequado para aquecimento central de água - Tenha atenção ao correto dimensionamento de acordo com as necessidades e padrões de uso
	IT	- Quando si utilizza l'aria ambiente, l'efficienza si riduce significativamente in inverno. Non tutte le caldaie a pompa di calore sono in grado di funzionare a basse temperature - Una buona posizione è importante per prevenire il rumore - La caldaia a pompa di calore ha una capacità relativamente piccola. Con una grande richiesta di acqua calda, può richiedere molto tempo per recuperare la temperatura - Non eccedere con la capacità del serbatoio della caldaia per ridurre le perdite di calore durante l'inattività - Non adatta per il riscaldamento dell'acqua per il riscaldamento centralizzato - Prestare attenzione alle dimensioni adeguate in base alle esigenze e ai modelli di utilizzo
	SP	- Cuando se usa aire ambiente, la eficiencia se reduce significativamente en invierno. No todas las calderas de bomba de calor pueden operar a bajas temperaturas - Una buena ubicación es importante para prevenir molestias por ruido - La caldera de bomba de calor tiene una capacidad relativamente pequeña. Con una gran demanda de agua caliente, puede tardar mucho en recuperar la temperatura - No hagas que la capacidad del tanque de la caldera sea demasiado grande para reducir las pérdidas por inactividad - No es adecuada para calentar agua de calefacción central - Presta atención al tamaño adecuado según las necesidades y los patrones de uso

Applicable typology	Single-family houses, condominium households and energy-poor households
Final Energy Reduction	483 kWh/per person
Investment estimate	{number of people}*253,56+783,34+350
Savings estimate	{FER}*{electricity price}
GHG Reduction	{FER}*{electricity CO ₂ emissions}

Measure title: Continuous flow heater

PT: Aquecedor de fluxo contínuo

IT: Scaldabagno istantaneo

SP: Calentador de agua instantáneo

Measure description	EN	There are several ways to heat the hot tap water of your building without gas. Systems such as electric boilers and heat pump boilers take up a relatively large amount of space. An electric continuous flow heater can offer a compact alternative. An electric continuous flow heater only heats the water that is actually used. The heating element switches on when you open the hot water tap and immediately heats the water that flows through it. For brief and varied usage, it is interesting to install an electric continuous flow heater because it lets you heat more efficiently. A instantaneous water heater uses less energy and takes up less space than an electric boiler. However, an electric continuous flow heater does require a larger electricity connection.
	PT	Existem várias maneiras de aquecer a água quente da torneira do seu prédio sem gás. Sistemas como caldeiras elétricas e caldeiras com bomba de calor ocupam uma quantidade relativamente grande de espaço. Um aquecedor elétrico de fluxo contínuo pode oferecer uma alternativa compacta. Um aquecedor elétrico de fluxo contínuo aquece apenas a água realmente utilizada. A resistência liga-se ao abrir a torneira da água quente e aquece imediatamente a água que por ela flui. Para usos breves e variados, é interessante instalar um aquecedor elétrico de fluxo contínuo, pois permite aquecer com mais eficiência. Um aquecedor de água instantâneo consome menos energia e ocupa menos espaço do que uma caldeira elétrica. No entanto, um aquecedor elétrico de fluxo contínuo requer uma conexão elétrica maior.
	IT	Esistono diversi modi per riscaldare l'acqua potabile del tuo edificio senza gas. Sistemi come le caldaie elettriche e le caldaie a pompa di calore occupano uno spazio relativamente grande. Uno scaldabagno istantaneo elettrico può offrire un'alternativa compatta. Uno scaldabagno istantaneo elettrico riscalda solo l'acqua che viene effettivamente utilizzata. L'elemento riscaldante si accende quando apri il rubinetto dell'acqua calda e riscalda immediatamente l'acqua che lo attraversa. Per utilizzi brevi e variabili, è utile installare uno scaldabagno istantaneo elettrico perché ti permette di riscaldare in modo più efficiente. Uno scaldabagno istantaneo utilizza meno energia e occupa meno spazio

		rispetto a una caldaia elettrica. Tuttavia, uno scaldabagno istantaneo elettrico richiede una connessione elettrica adeguata.
	SP	Hay varias formas de calentar el agua potable de tu edificio sin gas. Sistemas como las calderas eléctricas y las calderas de bomba de calor ocupan una cantidad relativamente grande de espacio. Un calentador de agua instantáneo eléctrico puede ofrecer una alternativa compacta. Un calentador de agua instantáneo eléctrico solo calienta el agua que se utiliza realmente. El elemento calefactor se enciende cuando abres el grifo de agua caliente y calienta inmediatamente el agua que pasa por él. Para usos breves y variados, es interesante instalar un calentador de agua instantáneo eléctrico porque permite calentar de manera más eficiente. Un calentador de agua instantáneo utiliza menos energía y ocupa menos espacio que una caldera eléctrica. Sin embargo, un calentador de agua instantáneo eléctrico requiere una conexión eléctrica más grande.
Advantages	EN	• Interesting solution when tap water points are spread over greater distances • Takes up little room • Direct hot water
	PT	• Solução interessante quando os pontos de água da torneira estão espalhados por distâncias maiores • Ocupa pouco espaço • Água quente direta
	IT	• Soluzione interessante quando i punti di prelievo dell'acqua sono distribuiti su distanze più ampie • Occupa poco spazio • Acqua calda diretta
	SP	• Solución interesante cuando los puntos de agua potable están distribuidos a mayores distancias • Ocupa poco espacio • Agua caliente directa
Point of attention	EN	• Combine with a water-saving shower head and other water-saving measures • An instantaneous water heater requires a 3-phase connection (minimum 11 kW) • Pay attention to proper sizing according to needs and usage patterns
	PT	• Combine com um chuveiro que economiza água e outras medidas de economia de água • Um aquecedor de água instantâneo requer uma conexão trifásica (mínimo 11 kW) • Tenha atenção ao correto dimensionamento de acordo com as necessidades e padrões de uso
	IT	• Combinare con un soffione di risparmio d'acqua e altre misure di risparmio idrico • Uno scaldabagno istantaneo richiede una connessione trifase (minimo 11 kW)

		• Prestare attenzione alle dimensioni adeguate in base alle esigenze e ai modelli di utilizzo
	SP	• Combínalo con una ducha con dispositivo de ahorro de agua y otras medidas de ahorro de agua • Un calentador de agua instantáneo requiere una conexión trifásica (mínimo 11 kW) • Presta atención al tamaño adecuado según las necesidades y los patrones de uso
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Booster heat pump

PT: Not applicable

IT: Not applicable

SP: Bomba de calor auxiliar/de refuerzo

Measure description	EN	If you are connected to a heat network or collective heat pump with a supply of up to 50 °C, you will need a separate tap water supply. A booster heat pump is suitable for heating tap water up to 65 °C with the heat of the central heating water. Even in summer, when no hot central heating water is supplied, this booster heat pump can make tap water from the central heating water. The water is stored in a boiler tank. Depending on the tap water demand, this can be a tank of 120 litres up to more than 300 litres.
	SP	Si estás conectado a una red de calefacción o a una bomba de calor colectiva con un suministro de hasta 50 °C, necesitarás un suministro separado para el agua potable. Una bomba de calor auxiliar es adecuada para calentar agua potable hasta 65 °C con el calor del agua de calefacción central. Incluso en verano, cuando no se suministra agua caliente de calefacción central, esta bomba de calor auxiliar puede producir agua potable a partir del agua de calefacción central. El agua se almacena en un tanque. Dependiendo de la demanda de agua potable, esto puede ser un tanque de 120 litros hasta más de 300 litros.
Advantages	EN	• Highly efficient system • Comfortable amount of tap water through boiler • Saves energy • No more gas consumption
	SP	• Sistema altamente eficiente • Cómoda cantidad de agua potable a través de la caldera • Ahorra energía • No consume más gas
Point of attention	EN	• Space required for boiler, storage, buffer and/or boiler vessels • Good positioning is important to prevent noise nuisance • Pay attention to proper sizing according to needs and usage patterns

	SP	• Espacio requerido para el tanque, almacenamiento, buffer y/o recipientes • Una buena ubicación es importante para prevenir molestias por ruido • Presta atención al tamaño adecuado según las necesidades y los patrones de uso
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Biomass boiler

PT: Caldeira a biomassa

IT: Caldaia a biomassa

SP: Caldera de biomasa

Measure description	EN	Do you have residual wood from your garden, park, or the surrounding area? This is more than just a waste stream and can be used as biomass. There are various types of wood-fired heating systems suitable for residual wood. For example, a wood gasifier can heat with logs, sawdust and large shreds. Well-dried wood shavings from felling, pruning and sawdust from your area can be used in a woodchip installation. A biomass boiler produces heat by burning this waste. The heat released is used to heat water for central heating. An indirectly fired boiler can also be used to heat tap water. Is a biomass boiler actually sustainable? Burning wood releases CO₂. The idea behind this is that trees can absorb this CO₂. The trees later serve as fuel again, thus creating a sustainable chain. This is questionable because CO₂ is still released into the air and burning is much faster than trees grow back. In any case, pay close attention to the origin of the fuel.
	PT	As caldeiras a biomassa podem representar uma boa alternativa ao uso de combustíveis fósseis, como gásóleo e gás natural, para aquecimento de espaços e de água sanitária, com a vantagem de não emitirem dióxido de carbono. A biomassa é obtida através de produtos de origem vegetal ou animal que depois é usada na produção de energia calorífica, podendo ser encontrada no formato de lenha, estilha, briquetes e pellets. Esta fonte de energia pode ser considerada renovável, mas é necessário garantir que a sua produção e origem são sustentáveis. Numa situação ideal, a biomassa pode promover a economia local e a limpeza ordenada das florestas. As caldeiras a pellets são atualmente as mais compactas e por isso as mais utilizadas no setor doméstico. Estes equipamentos possuem elevada eficiência energética e são programáveis e fáceis de usar. O custo da biomassa é, normalmente, inferior ao da eletricidade e do gás, podendo ser uma alternativa viável particularmente em zonas semiurbanas e rurais. No entanto, este equipamento representa um investimento entre 2000 e 4000 euros e pode não ser adequado para zonas urbanas. Desta maneira, as caldeiras a biomassa são mais caras do que os esquentadores, caldeiras ou mesmo bombas de calor, requerem

		mais espaço para a sua instalação e para o armazenamento da biomassa e precisam de uma manutenção mais regular.
	IT	Hai residui di legno dal tuo giardino, parco o area circostante? Questi non sono solo rifiuti, ma posson essere utilizzati come biomassa. Esistono vari tipi di sistemi di riscaldamento a base di legna adatti ai vari residui di legno. Ad esempio, un gassificatore a legna può funzionare con ceppi, segatura e residui grossolani. Le segature ben asciutte da abbattimenti, potature e segatura della tua zona possono essere utilizzate in un impianto a cippato di legno. Una caldaia a biomassa produce calore bruciando questi rifiuti. Il calore prodotto viene utilizzato per riscaldare l'acqua per il riscaldamento centrale. Una caldaia a combustione indiretta può essere utilizzata anche per riscaldare l'acqua potabile. Una caldaia a biomassa è effettivamente sostenibile? La combustione del legno rilascia CO₂. L'idea alla base di questo è che gli alberi possono assorbire questa CO₂ per crescere, poi serviranno nuovamente come combustibile, creando così un ciclo sostenibile. Questo è discutibile perché la CO₂ viene comunque rilasciata nell'aria e la combustione è molto più veloce della crescita degli alberi. In ogni caso, presta particolare attenzione all'origine del combustibile.
	SP	¿Tienes restos de madera de tu jardín, parque o área circundante? Esto no son sólo desechos, sino que pueden ser utilizados como biomasa. Existen varios tipos de sistemas de calefacción a base de madera adecuados para estos residuos. Por ejemplo, un gasificador de madera puede calentar con troncos, serrín y trozos grandes. Las virutas de madera bien secas provenientes de la tala, poda y serrín de tu área pueden utilizarse en una instalación para astillas de madera. Una caldera de biomasa produce calor quemando estos desechos. El calor generado se utiliza para calentar el agua para la calefacción central. Una caldera de combustión indirecta también puede utilizarse para calentar el agua potable. ¿Es realmente sostenible una caldera de biomasa? La quema de madera libera CO₂. La idea detrás de esto es que los árboles pueden absorber este CO₂. Luego, los árboles sirven nuevamente como combustible, creando así una cadena sostenible. Esto es cuestionable porque el CO₂ aún se libera en el aire y la quema es mucho más rápida que el crecimiento de los árboles. En cualquier caso, presta especial atención al origen del combustible.
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Efficient gas-heater

PT: Esquentador a gás eficiente

IT: Scaldabagno a gas efficiente

SP: Calentador de gas eficiente

Measure description	EN	Water heaters are instant production devices, meaning they heat water only when needed. They generate heat through the combustion of
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		natural gas, propane, or butane, with electric models also available. Natural gas water heaters are among the most common sanitary water heating devices in Portuguese homes, especially in areas with a gas supply network. If your water heater is over 10 years old, it's likely to be inefficient, leading to higher gas bills and suboptimal performance. A notable feature of modern water heaters is that they do not have a continuously burning pilot flame, eliminating standby consumption. By replacing your old gas water heater with a newer model, you'll enhance efficiency and could save up to 20% in energy consumption for water heating. When choosing a water heater, in addition to your consumption profile, consider the energy efficiency label. Water heaters can be automatic or manual, with or without temperature control; they can be thermostatic or condensing. Ensure that the replacement is done by a professional. Although they may require a higher initial investment, there are other water heating solutions such as solar panels and heat pumps that could be interesting alternatives.
	PT	Os esquentadores são equipamentos de produção instantânea, isto é, aquecem a água apenas quando é necessária. Produzem calor através da combustão de gás natural, propano ou butano, sendo que também existem equipamentos elétricos. Os esquentadores a gás natural encontram-se entre os equipamentos de aquecimento de águas sanitárias mais comuns nas casas portuguesas, particularmente em zonas com rede de abastecimento de gás. Se o seu esquentador tem mais de 10 anos, é provável que seja pouco eficiente, levando a maiores custos na fatura de gás, e que o seu funcionamento não seja ótimo. Uma vantagem dos esquentadores modernos é não terem a chama piloto permanentemente ligada, eliminando assim consumos em stand-by. Ao substituir o seu esquentador a gás por um modelo mais recente, estará a aumentar a sua eficiência e poderá poupar até 20% do consumo de energia no aquecimento de água. Na seleção de um esquentador, para além do perfil de consumo, deve ser considerada a etiqueta com a classificação energética. Os esquentadores podem ser de ligação automática ou manual, com ou sem controlo de temperatura; podem ser termostáticos ou de condensação. Garanta que a substituição do esquentador é efetuada por um profissional. Embora tenham um investimento superior, existem outras soluções para aquecimento de água, como painéis solares e bombas de calor, que podem ser uma alternativa interessante.
	IT	Gli scaldabagni sono dispositivi di produzione istantanea, il che significa che riscaldano l'acqua solo quando necessario. Generano calore attraverso la combustione di gas naturale, propano o butano, o elettricità. Gli scaldabagni a gas naturale sono tra i dispositivi di riscaldamento dell'acqua sanitaria più comuni nelle case, specialmente nelle zone servite da una rete di metano. Se il tuo scaldabagno ha più di 10 anni, è probabile che sia inefficiente, portando a bollette del gas più alte e a prestazioni non ottimali. Una caratteristica notevole degli scaldabagni moderni è che non hanno una fiamma pilota continuamente

		accesa, eliminando il consumo in standby. Sostituendo il tuo vecchio scaldabagno a gas con un modello più recente, migliorerai l'efficienza e potresti risparmiare fino al 20% nei consumi energetici per il riscaldamento dell'acqua. Quando scegli uno scaldabagno, oltre al tuo profilo di consumo, considera l'etichetta di efficienza energetica. Gli scaldabagni possono essere automatici o manuali, con o senza controllo della temperatura; possono essere termostatici o a condensazione. Assicurati che la sostituzione sia effettuata da un professionista. Anche se potrebbe richiedere un investimento iniziale più elevato, ci sono altre soluzioni per il riscaldamento dell'acqua, come i pannelli solari e le pompe di calore, che potrebbero essere alternative interessanti.
	SP	Los calentadores de agua son dispositivos de producción instantánea, lo que significa que calientan el agua solo cuando es necesario. Generan calor a través de la combustión de gas natural, propano o butano, con modelos eléctricos también disponibles. Los calentadores de agua a gas natural son uno de los dispositivos de calefacción de agua sanitaria más comunes, especialmente en áreas con red de suministro de gas. Si tu calentador de agua tiene más de 10 años, es probable que sea ineficiente, lo que puede llevar a facturas de gas más altas y un rendimiento poco óptimo. Una característica notable de los calentadores de agua modernos es que no tienen una llama piloto continuamente encendida, eliminando el consumo en espera. Al reemplazar tu viejo calentador de gas con un modelo más nuevo, mejorarás la eficiencia y podrías ahorrar hasta un 20% en el consumo de energía para el calentamiento de agua. Al elegir un calentador de agua, además de tu perfil de consumo, considera la etiqueta de eficiencia energética. Los calentadores de agua pueden ser automáticos o manuales, con o sin control de temperatura; pueden ser termostáticos o de condensación. Asegúrate de que el reemplazo lo realice un profesional. Aunque pueda requerir una inversión inicial mayor, existen otras soluciones de calentamiento de agua, como los paneles solares y las bombas de calor, que podrían ser alternativas interesantes.
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Gas-powered condense boiler

PT: Caldeira de condensação

IT: Caldaia a condensazione a gas

SP: Caldera de condensación a gas

Measure description	EN	In conventional boilers, combustion gases are released into the atmosphere through the chimney. Heat is lost when the steam formed during the combustion process is pushed out. Modern boilers are more efficient for several reasons, but their main advantage is that they are all condensing boilers. A condensing boiler has a larger heat exchanger, recovering more heat, sending cooler gases into the duct, and being more efficient. Boilers over 20 years old may have significantly reduced
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		efficiency, around 60%, while modern condensing boilers have an efficiency between 89-94%. If it's necessary to replace an old boiler, upgrading to a new and efficient one can be a simple but profitable measure. Ensure that the boiler replacement is carried out by a professional. Although they may require a higher initial investment, there are other water heating solutions such as solar panels and heat pumps that could be interesting alternatives.
	PT	Nas caldeiras convencionais, os gases de combustão são libertados para a atmosfera através da chaminé. O calor perde-se quando o vapor que se forma durante o processo de combustão é empurrado para fora. As caldeiras modernas são mais eficientes por várias razões, mas a sua principal vantagem é que são todas caldeiras de condensação. Uma caldeira de condensação tem um permutador de calor maior, pelo que recupera mais calor, envia gases mais frios para a conduta e é mais eficiente. As caldeiras com mais de 20 anos podem ter uma eficiência muito reduzida, de cerca de 60%, enquanto as caldeiras de condensação modernas têm uma eficiência entre 89-94%. Se for necessário substituir uma caldeira antiga, a troca por uma nova e eficiente pode ser uma medida simples mas rentável. Garanta que a substituição da caldeira é efetuada por um profissional. Embora tenham um investimento superior, existem outras soluções para aquecimento de água, como painéis solares e bombas de calor, que podem ser uma alternativa interessante.
	IT	Nelle caldaie convenzionali, i gas di combustione vengono rilasciati nell'atmosfera attraverso il camino. Il calore si perde quando il vapore formato durante il processo di combustione viene espulso. Le caldaie moderne sono più efficienti per vari motivi, ma il loro principale vantaggio è che tutte sono caldaie a condensazione. Una caldaia a condensazione ha uno scambiatore di calore più grande, recuperando più calore, inviando gas più freddi nel condotto e risultando più efficiente. Le caldaie di oltre 20 anni possono avere un'efficienza significativamente ridotta, intorno al 60%, mentre le caldaie a condensazione moderne hanno un'efficienza tra l'89% e il 94%. Se è necessario sostituire una vecchia caldaia, l'aggiornamento a una nuova ed efficiente può essere una misura semplice e vantaggiosa. Assicurati che la sostituzione della caldaia sia eseguita da un professionista. Anche se potrebbe richiedere un investimento iniziale più elevato, ci sono altre soluzioni per il riscaldamento dell'acqua, come i pannelli solari e le pompe di calore, che potrebbero essere alternative interessanti.
	SP	En las calderas convencionales, los gases de combustión se liberan a la atmósfera a través de la chimenea. Se pierde calor cuando el vapor formado durante el proceso de combustión es expulsado. Las calderas modernas son más eficientes por varias razones, pero su principal ventaja es que todas son calderas de condensación. Una caldera de condensación tiene un intercambiador de calor más grande, recuperando más calor, enviando gases más fríos al conducto y siendo más eficiente. Las calderas de más de 20 años pueden tener una eficiencia significativamente reducida, alrededor del 60%, mientras que las calderas de condensación

		modernas tienen una eficiencia entre el 89% y el 94%. Si es necesario reemplazar una caldera antigua, actualizar a una nueva y eficiente puede ser una medida simple pero rentable. Asegúrate de que la sustitución de la caldera sea realizada por un profesional. Aunque pueda requerir una inversión inicial mayor, existen otras soluciones de calentamiento de agua, como los paneles solares y las bombas de calor, que podrían ser alternativas interesantes.
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Insulate boiler

PT: Isolamento térmico de tanques de água quente

IT: Isolare il boiler

SP: Aislar el deposito de agua caliente

Measure description	EN	Although modern hot water storage tanks are generally well-insulated, older models often experience significant heat loss. If you have an older hot water tank, check if it feels warm to the touch; if so, it indicates the need for additional insulation. Insulating your water tank can save about 7% to 16% on water heating costs. You can purchase a pre-cut insulation jacket or blanket for around 25 euros at most hardware stores. It's an easy-to-install material that pays for itself in about a year. For an electric boiler, you may also consider insulating under the tank, which can save an additional 4% to 9% of water heating energy.
	PT	Embora os tanques modernos de armazenamento de água quente já estejam geralmente bem isolados, os modelos mais antigos perdem frequentemente muito calor. Se tiver um tanque de água quente mais antigo, verifique se está quente ao toque; em caso afirmativo, isto indica que necessita de isolamento adicional. O isolamento do seu tanque de água pode poupar cerca de 7% a 16% em custos de aquecimento de água. Pode adquirir um revestimento ou cobertor pré-cortado a partir de cerca de 25 euros na maioria das lojas de bricolage. Trata-se de um material fácil de instalar e que se paga a si próprio em cerca de um ano. Para uma caldeira elétrica, pode também considerar o isolamento debaixo do tanque, o que pode permitir poupar mais 4% a 9% da energia do aquecimento de água.
	IT	Sebbene i serbatoi di acqua calda moderni siano generalmente ben isolati, i modelli più vecchi spesso sperimentano una significativa dispersione di calore. Se hai un serbatoio di acqua calda vecchio, verifica se è caldo al tatto; se sì, indica la necessità di un'ulteriore isolamento. Isolare il tuo serbatoio di acqua può far risparmiare circa dal 7% al 16% sui costi di riscaldamento dell'acqua. Puoi acquistare una copertura isolante pre-tagliata o una copertura standard per circa 25 euro nella maggior parte dei negozi di ferramenta. È un materiale facile da installare che si ripaga in circa un anno. Per un boiler elettrico, potresti anche considerare di isolare sotto il serbatoio, il che può far risparmiare un ulteriore 4% - 9% dell'energia per il riscaldamento dell'acqua.

	SP	Aunque los tanques de agua caliente modernos están generalmente bien aislados, los modelos más antiguos a menudo experimentan una pérdida significativa de calor. Si tienes un tanque de agua caliente más viejo, verifica si está caliente al tacto; si es así, indica la necesidad de un aislamiento adicional. Aislar tu tanque de agua puede ahorrar aproximadamente entre el 7% y el 16% en los costos de calentamiento del agua. Puedes comprar una funda o manta de aislamiento precortada por unos 25 euros en la mayoría de las ferreterías. Es un material fácil de instalar que se amortiza en aproximadamente un año. Para una caldera eléctrica, también puedes considerar aislar debajo del tanque, lo que puede ahorrar un 4% al 9% adicional en la energía para el calentamiento del agua.
Applicable typology	Single-family houses, condominium households and energy-poor households	

Measure title: Shower tray or drain heat recovery

PT: Recuperador de calor na drenagem do chuveiro

IT: Not applicable

SP: Recuperación de calor del desagüe o del plato de ducha

Measure description	EN	With heat recovery in the shower drain and shower tray, the heat exchange takes place in the shower drain or directly under the shower tray. Dirty shower water that flows into the drain when showering flows adjacent to the cold water supply. As a result, less energy is required to get the shower water to the right temperature. A heat recovery shower drain or shower tray is higher than a conventional shower tray, so take an elevated shower tray and the height of the shower area into account. This measure allows for a final reduction of 50% in energy use for this function.
	PT	Com a recuperação de calor na drenagem do chuveiro e na base de chuveiro, a permutação de calor tem lugar no ralo do chuveiro ou diretamente por baixo da base de chuveiro. A água suja que flui para o esgoto durante o duche corre numa tubagem adjacente ao abastecimento de água fria. Como resultado, é necessária menos energia para aquecer a água do duche até alcançar a temperatura certa. A altura de uma base de chuveiro recuperadora de calor é mais elevada do que uma base de chuveiro convencional, por isso considere este fator quando decidir renovar a sua casa de banho. Esta medida permite uma redução final de 50% na utilização de energia para esta função.
	SP	Con la recuperación de calor en el desagüe de la ducha y el plato de ducha, el intercambio de calor tiene lugar en el desagüe de la ducha o directamente debajo del plato de ducha. El agua sucia de la ducha que fluye hacia el desagüe mientras te duchas fluye junto al suministro de agua fría. Como resultado, se requiere menos energía para llevar el agua de la ducha a la temperatura adecuada. Un desagüe o plato de ducha con recuperación de calor es más alto que un plato de ducha convencional, por lo que hay que tener en cuenta un plato de ducha elevado y la altura

		de la zona de ducha. Esta medida permite una reducción final del 50% en el uso de energía para esta función.
Advantages	EN	• Construction is easier than in case of shower pipe heat recovery • Can be used anywhere (in case of sufficient headroom), including on the ground floor
	PT	• A construção é mais fácil do que no caso da recuperação de calor do tubo do chuveiro • Pode ser usado em qualquer lugar (no caso de espaço livre suficiente), inclusive no térreo
	SP	• La construcción es más sencilla que en el caso de la recuperación de calor en los tubos de la ducha. • Puede usarse en cualquier lugar (si hay suficiente espacio), incluyendo el piso de abajo.
Point of attention	EN	• The installation height is higher than usual • Thermostatic mixer required • The shower tray and shower channel heat exchangers require regular maintenance • Pay attention to proper sizing according to needs and usage patterns
	PT	• A altura de instalação é maior que o normal • Misturador termostático necessário • A base de duche e os permutadores de calor do canal de duche necessitam de manutenção regular • Tenha atenção ao correto dimensionamento de acordo com as necessidades e padrões de uso
	SP	• La altura de instalación es mayor de lo habitual. • Se requiere un mezclador termostático. • Los intercambiadores de calor del desagüe y del plato de ducha requieren mantenimiento regular. • Presta atención al dimensionamiento adecuado según las necesidades y los patrones de uso.
Applicable typology	Single-family houses, condominium households and energy-poor households	

Measure title: Shower pipe heat recovery

PT: Recuperador de calor na tubagem do chuveiro

IT: Not applicable

SP: Recuperación de calor en los tubos de la ducha

Measure description	EN	In households, most hot tap water is used in the bathrooms. If you manage to reduce this consumption, you will need smaller all-electric heat pump and boiler tanks. This will save costs and space for the installation. Heat can be recovered from the dirty shower water, which is being flushed away hot. With shower pipe heat recovery, the vertical outlet pipe under the shower is replaced by a copper shower pipe consisting of an inner pipe with (hot) wastewater and an outer casing
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		with clean (cold) water. Heat exchange takes place between these two layers, so that the cold (clean) water is pre-heated without consuming energy.
	PT	Nas habitações, a maioria da água quente da torneira é utilizada nas casas de banho. Se conseguir reduzir este consumo, poderá optar por equipamentos de menor capacidade e potência. Isto irá permitir reduzir os custos e espaço necessários para a instalação, bem como levar a poupanças na fatura de energia. O calor pode ser recuperado a partir da água do chuveiro que está a ser escoada ainda quente. Com a recuperação de calor na tubagem do chuveiro, a tubagem de saída vertical debaixo do chuveiro é substituída por uma tubagem de cobre constituída por um tubo interno para águas residuais (quentes) e um tubo externo com água limpa (fria). A permutação de calor ocorre entre estas duas camadas, de modo a que a água fria (limpa) seja pré aquecida sem consumir energia. Esta é uma boa solução quando se encontra a renovar uma casa de banho da sua casa.
	SP	En los hogares, la mayor parte del agua caliente se usa en los baños. Si logras reducir este consumo, necesitarás tanques de bomba de calor eléctricos más pequeños. Esto ahorrará costes y espacio para la instalación. El calor puede recuperarse del agua sucia de la ducha, que se está evacuando caliente. Con la recuperación de calor en los tubos de la ducha, el tubo de salida vertical debajo de la ducha se reemplaza por un tubo de cobre compuesto por un tubo interno con aguas residuales (calientes) y una carcasa externa con agua limpia (fría). El intercambio de calor ocurre entre estas dos capas, de modo que el agua fría (limpia) se precalienta sin consumir energía.
Advantages	EN	• Saves energy • The shower pipe with heat recovery has a long service life
	PT	• Poupa energia • Um recuperador de calor no tubo do chuveiro tem uma vida útil longa
	SP	• Ahorra energía. • El tubo de la ducha con recuperación de calor tiene una larga vida útil.
Point of attention	EN	• The installation requires rebuilding, renovation is a good time • Savings effect is limited with short showers • Thermostatic mixer required • Not suitable for a bathroom on the ground floor • Make sure that the shower pipe heat exchanger remains accessible for maintenance • Pay attention to proper sizing according to needs and usage patterns
	PT	• Esta instalação requer reconstrução, a renovação do edifício pode ser o melhor momento • As poupanças são limitadas em duchas curtos • É necessário um misturador termostático • Não é adequado para uma casa de banho no piso térreo

		• Garanta que o recuperador de calor na tubagem do chuveiro permanece acessível para manutenção • Tenha atenção ao correto dimensionamento de acordo com as necessidades e padrões de uso
	SP	• La instalación requiere reconstrucción, el momento adecuado es durante una renovación. • El efecto de ahorro es limitado con duchas cortas. • Se requiere un mezclador termostático. • No es adecuado para un baño en la planta baja. • Asegúrate de que el intercambiador de calor del tubo de la ducha sea accesible para el mantenimiento. • Presta atención al dimensionamiento adecuado según las necesidades y los patrones de uso.
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Hot fill white goods

PT: Máquinas de lavar com entrada para água quente

IT: Collegamento degli elettrodomestici alla linea dell'acqua calda

SP: Electrodomésticos con toma de agua caliente

Measure description	EN	A washing machine and dishwasher use electric heating elements to generate hot water. Because a sustainable heating system or gas boiler can do this more efficiently, it is convenient to use this system for these appliances as well. With a hot fill, you can connect the white goods to a hot water tap. In this way, the machine does not have to heat up the water first to be able to wash, which of course saves a lot of electricity, with estimates suggesting that the electricity consumption of a washing machine can be reduced by about 40% and that of a dishwasher by about 70%. The hot fill is particularly efficient if the hot water is generated sustainably, for example by a heat pump or solar boiler. Not all washing machines have both cold and hot water connections, in which case a hot water selector needs to be installed.
	PT	As máquinas de lavar roupa e as máquinas de lavar loiça utilizam resistências elétricas para produzir água quente. No entanto, um sistema de aquecimento sustentável poderia aquecer a mesma água de forma muito mais eficiente. Assim, é conveniente utilizar estes sistemas também para a abastecer a água quente dos seus eletrodomésticos. Através de uma entrada de água quente, pode ligar os equipamentos diretamente a uma torneira de água quente. Desta forma, a máquina não tem de aquecer primeiro a água para poder efetuar a lavagem, o que, naturalmente, permite poupar muita eletricidade, estimando-se que o consumo de eletricidade da máquina de lavar roupa pode ser reduzido em cerca de 40% e da máquina de lavar loiça em cerca de 70%. O enchimento a quente é particularmente recomendado se a água quente for produzida de forma sustentável, por exemplo, através de uma bomba de calor ou sistema solar térmico. Tenha atenção na compra de novos

		eletrodomésticos, visto que nem todas as máquinas de lavar estão preparadas para receber água quente. No caso de máquinas de lavar loiça poderá usar apenas uma ligação para a água (quente ou fria). As máquinas de lavar roupa têm de ser bitérmicas, ou seja, equipadas com entrada dupla para ligação a água fria e quente.
	IT	Una lavatrice e una lavastoviglie utilizzano elementi riscaldanti elettrici per generare acqua calda. Poiché un sistema di riscaldamento sostenibile o una caldaia a gas possono farlo in modo più efficiente, è conveniente utilizzare questo sistema anche per questi elettrodomestici. Puoi collegare gli elettrodomestici a un rubinetto di acqua calda. In questo modo, la macchina non deve riscaldare prima l'acqua per poter lavare, il che naturalmente fa risparmiare molta elettricità, con stime che suggeriscono che il consumo di elettricità di una lavatrice può essere ridotto di circa il 40% e quello di una lavastoviglie di circa il 70%. Il riempimento a caldo è particolarmente efficiente se l'acqua calda è generata in modo sostenibile, ad esempio da una pompa di calore o una caldaia solare. Non tutte le lavatrici hanno sia il collegamento dell'acqua fredda che quello dell'acqua calda, nel qual caso è necessario installare un selettore di acqua calda.
	SP	Una lavadora y un lavavajillas utilizan elementos calefactores eléctricos para generar agua caliente. Dado que un sistema de calefacción sostenible o una caldera a gas puede hacerlo de manera más eficiente, es conveniente utilizar este sistema también para estos electrodomésticos. Con un llenado con agua caliente, puedes conectar los electrodomésticos a un grifo de agua caliente. De esta manera, la máquina no tiene que calentar el agua primero para poder lavar, lo que naturalmente ahorra mucha electricidad, con estimaciones que sugieren que el consumo de electricidad de una lavadora puede reducirse en aproximadamente un 40% y el de un lavavajillas en aproximadamente un 70%. El llenado con agua caliente es particularmente eficiente si el agua caliente se genera de manera sostenible, por ejemplo, mediante una bomba de calor o una caldera solar. No todas las lavadoras tienen tanto conexiones de agua fría como de agua caliente, en cuyo caso se debe instalar un selector de agua caliente.
Advantages	EN	• In white goods, heating is realised by means of an electric spiral. A gas boiler or sustainable generator has a higher efficiency • The machine itself does not need to heat the water, which saves electricity • Longer lifespan of the white goods • No water heating time in the machine
	PT	• Em eletrodomésticos, o aquecimento é efetuado através de uma espiral elétrica. Uma caldeira a gás ou um gerador de calor mais sustentável tem uma eficiência mais elevada • A máquina não precisa de aquecer a água, o que poupa eletricidade • Maior durabilidade dos eletrodomésticos • Não existe tempo de aquecimento da água dentro da máquina

	IT	- Negli elettrodomestici, il riscaldamento è realizzato tramite una resistenza elettrica. Una caldaia a gas o un generatore sostenibile ha una maggiore efficienza. - La macchina stessa non deve riscaldare l'acqua, il che fa risparmiare elettricità. - Maggiore durata degli elettrodomestici. - Nessun tempo di riscaldamento dell'acqua nella macchina.
	SP	- En los electrodomésticos, la calefacción se realiza mediante una espiral eléctrica. Una caldera a gas o un generador sostenible tiene una mayor eficiencia. - La máquina misma no necesita calentar el agua, lo que ahorra electricidad. - Mayor durabilidad de los electrodomésticos. - No hay tiempo de calentamiento del agua en la máquina.
Point of attention	EN	- There must be a hot water pipe from the boiler, or from the hot water tap in the kitchen or bathroom. Usually this is installed by an installer - The temperature of the water supply must not exceed 60 °C - Make sure that the hot water hose between the hot water washing machine or hot water selector and the supply tap can withstand temperatures up to approx. 80 °C - This is a relatively costly investment - Hot fill does not work on every device. Please check the manual of your device for this - Pay attention to proper sizing according to needs and usage patterns
	PT	- Tem de haver um tubo de água quente da caldeira ou da torneira de água quente da casa-de-banho ou da cozinha. Usualmente isto é instalado por um profissional - A temperatura da água não pode exceder os 60 °C - Garanta que a mangueira entre a máquina de lavar e o abastecimento de água quente consegue resistir a temperaturas até aproximadamente 80 °C - Este investimento é relativamente caro - O enchimento a quente não funciona em todas as máquinas de lavar. Por favor verifique o manual do seu equipamento - Tenha atenção ao correto dimensionamento de acordo com as necessidades e padrões de uso
	IT	- Deve esserci una connessione di acqua calda dalla caldaia o dal rubinetto di acqua calda in cucina o in bagno. Di solito, questo è installato da un installatore. - La temperatura dell'acqua di alimentazione non deve superare i 60 °C. - Assicurarsi che il tubo di acqua calda tra la lavatrice e il rubinetto di alimentazione possa sopportare temperature fino a circa 80 °C.

		• Questo è un investimento relativamente costoso. • Il riempimento a caldo non funziona su tutti i dispositivi. Verificare il manuale del dispositivo per questo. • Prestare attenzione alla dimensione adeguata in base alle necessità e ai modelli di utilizzo.
	SP	• Debe haber un tubo de agua caliente desde la caldera o desde el grifo de agua caliente en la cocina o el baño. Normalmente, esto lo instala un instalador. • La temperatura del suministro de agua no debe exceder los 60 °C. • Asegúrate de que la manguera de agua caliente entre la lavadora de agua caliente o el selector de agua caliente y el grifo de suministro pueda soportar temperaturas de hasta aproximadamente 80 °C. • Esta es una inversión relativamente costosa. • El llenado con agua caliente no funciona en todos los dispositivos. Verifica el manual de tu dispositivo para esto. • Presta atención al dimensionamiento adecuado según las necesidades y los patrones de uso.
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Solar thermal roof

PT: Telhado térmico e fotovoltaico

IT: Tetto solare termico

SP: Tejado solar térmico

Measure description	EN	A thermal and photovoltaic roof is essentially a hybrid combination of photovoltaic solar panels and a solar thermal system. This roof generates hot water and electricity from solar energy. The panels on the roof convert sunlight into electricity and ensure that solar heat is exchanged with water inside the storage tank. The heated water can be used for tap water.
	PT	Um telhado térmico e fotovoltaico é na realidade uma combinação híbrida de painéis solares fotovoltaicos e um sistema solar térmico. Este telhado produz água quente e eletricidade a partir da energia solar. Os painéis no telhado convertem a luz solar em eletricidade e asseguram que o calor solar é permutado com água no interior do tanque de armazenamento. A água aquecida pode ser utilizada para água da torneira.
	IT	Un tetto termico e fotovoltaico è essenzialmente una combinazione ibrida di pannelli solari fotovoltaici e di un sistema solare termico. Questo tetto genera acqua calda ed elettricità dall'energia solare. I pannelli sul tetto convertono la luce solare in elettricità e assicurano che il calore solare venga scambiato con l'acqua all'interno del serbatoio di accumulo. L'acqua riscaldata può essere utilizzata per l'acqua sanitaria.

	SP	Un tejado térmico y fotovoltaico es esencialmente una combinación híbrida de paneles solares fotovoltaicos y un sistema solar térmico. Este tejado genera agua caliente y electricidad a partir de la energía solar. Los paneles en el tejado convierten la luz solar en electricidad y aseguran que el calor solar se intercambie con el agua dentro del tanque de almacenamiento. El agua calentada puede ser utilizada para agua sanitaria.
Applicable typology	Single-family houses, condominium households and energy-poor households	

Measure title: Water temperature

PT: Temperatura de aquecimento da água

IT: Temperatura dell'acqua

SP: Temperatura del agua

Measure description	EN	Adjusting down the water heating temperature setting is a simple and cost-free efficiency measure that can lead to energy savings of 4% to 22% for hot water consumption. While some manufacturers set thermostats to 60°C, most homes typically only require them to be set at 48°C, which also slows down mineral accumulation and corrosion. Especially during the summer, you can experiment with lowering the water heating temperature to 48°C (or even to 30-35°C) and check if your desired comfort level is achieved. Although 48°C is considered safe for the majority of the population, individuals with a weakened immune system may want to consider keeping the hot water tank at 60°C if their appliance does not have automatic periodic heating up cycles to prevent legionella. If you plan to be away for at least 3 days, completely turn off the water heating.
	PT	Reduzir o ponto de regulação da temperatura de aquecimento da água é uma medida de eficiência fácil e gratuita que pode conduzir a uma poupança de 4% a 22% no consumo de energia em água quente. Embora alguns fabricantes fixem os termostatos a 60°C, a maioria das habitações normalmente só requer que sejam fixados a 48 °C, o que também atrasa a acumulação de minerais e a corrosão. Especialmente durante o verão, pode experimentar baixar a temperatura de aquecimento da água para 48°C (ou até para 30-35°C) e verificar se o seu nível de conforto desejado é alcançado. Mesmo que 48°C seja considerado seguro para a maioria da população, os indivíduos com um sistema imunitário debilitado podem querer considerar manter o tanque de água quente a 60°C caso o seu aparelho não possuir ciclos de aquecimento periódicos automáticos para prevenir a legionella. Se planeia estar ausente durante pelo menos 3 dias, desligue completamente o aquecimento da água.
	IT	Regolare verso il basso la temperatura di riscaldamento dell'acqua è una misura di efficienza semplice e senza costi che può portare a risparmi energetici dal 4% al 22% per il consumo di acqua calda. Sebbene alcuni produttori impostino i termostati a 60°C, la maggior parte delle case richiede tipicamente solo una impostazione a 48°C, il che rallenta anche

		l'accumulo di minerali e la corrosione. Specialmente durante l'estate, puoi provare a abbassare la temperatura di riscaldamento dell'acqua a 48°C (o anche a 30-35°C) e verificare se viene raggiunto il livello di comfort desiderato. Sebbene 48°C sia considerato sicuro per la maggior parte della popolazione, le persone con un sistema immunitario compromesso potrebbero considerare di mantenere il serbatoio dell'acqua calda a 60°C se l'apparecchio non ha cicli di riscaldamento periodico automatico per prevenire la legionella. Se prevedi di essere assente per almeno 3 giorni, spegni completamente il riscaldamento dell'acqua.
	SP	Ajustar a la baja la temperatura de calefacción del agua es una medida de eficiencia simple y sin coste que puede llevar a ahorros de energía del 4% al 22% en el consumo de agua caliente. Mientras que algunos fabricantes ajustan los termostatos a 60°C, la mayoría de las casas típicamente solo requieren una configuración a 48°C, lo que también ralentiza la acumulación de minerales y la corrosión. Especialmente durante el verano, puedes experimentar reduciendo la temperatura de calefacción del agua a 48°C (o incluso a 30-35°C) y verificar si se alcanza el nivel de confort deseado. Aunque 48°C se considera seguro para la mayoría de la población, las personas con un sistema inmunitario debilitado pueden considerar mantener el tanque de agua caliente a 60°C si su aparato no tiene ciclos de calefacción automática periódica para prevenir la legionella. Si planeas estar ausente por al menos 3 días, apaga completamente el calentamiento del agua.
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Water Heating System Maintenance

PT: Manutenção do sistema de aquecimento de água

IT: Manutenzione del sistema di riscaldamento dell'acqua

SP: Mantenimiento del sistema de calefacción de agua

Measure description	EN	Regardless of the water heating system in your building, it is crucial to ensure regular maintenance. Water heating systems often operate flawlessly for a decade or more without any intervention, but a few minutes of annual maintenance can extend their lifespan and maintain efficiency and safety. Test the relief valve by placing a bucket under the discharge pipe and lifting the lever on the valve. If the valve does not release water when the lever is lifted, replace it. Empty the boiler or water heater tank to flush out sediment that has settled at the bottom. The accumulation of sediment shortens the lifespan of the water heating system and reduces its efficiency.
	PT	Qualquer que seja o sistema de aquecimento de água presente no seu edifício, é importante assegurar uma manutenção regular. Os sistemas de aquecimento de água funcionam muitas vezes perfeitamente durante uma década ou mais sem qualquer intervenção, mas alguns minutos de manutenção uma vez por ano podem prolongar a sua vida útil e manter a sua eficiência e segurança. Teste a válvula de escape colocando um

		balde sob o tubo de escape e levantando a alavanca na válvula. Se a válvula não libertar água ao levantar a alavanca, substitua-a. Esvazie o tanque da caldeira ou termoacumulador para escoar os sedimentos que se instalaram no fundo do tanque. A acumulação de sedimentos encurta a vida útil do sistema de aquecimento de água e reduz a sua eficiência.
	IT	Indipendentemente dal sistema di riscaldamento dell'acqua nel tuo edificio, è cruciale garantire una manutenzione regolare. I sistemi di riscaldamento dell'acqua spesso funzionano perfettamente per un decennio o più senza alcun intervento, ma pochi minuti di manutenzione annuale possono estenderne la vita e mantenere l'efficienza e la sicurezza. Verifica la valvola di sfogo posizionando un secchio sotto il tubo di scarico e sollevando la leva sulla valvola. Se la valvola non rilascia acqua quando la leva è sollevata, sostituiscila. Svuota il serbatoio della caldaia o del riscaldatore d'acqua per eliminare i sedimenti che si sono depositati sul fondo. L'accumulo di sedimenti accorcia la durata del sistema di riscaldamento dell'acqua e ne riduce l'efficienza.
	SP	Independientemente del sistema de calefacción de agua en tu edificio, es crucial asegurar un mantenimiento regular. Los sistemas de calefacción de agua a menudo operan perfectamente durante una década o más sin intervención, pero unos minutos de mantenimiento anual pueden extender su vida útil y mantener la eficiencia y seguridad. Prueba la válvula de aliviadero colocando un cubo debajo del tubo de descarga y levantando la palanca en la válvula. Si la válvula no libera agua cuando se levanta la palanca, reemplázala. Vacía el tanque de la caldera o del calentador de agua para eliminar los sedimentos que se han acumulado en el fondo. La acumulación de sedimentos acorta la vida útil del sistema de calefacción de agua y reduce su eficiencia.
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Non-visible solar collectors

PT: Coletores solares não visíveis

IT: Collettori solari non visibili

SP: Colectores solares no visibles

Measure description	EN	Tap water can be heated from solar energy with solar collectors. This innovation is a non-visible system. A grid with pipes is placed under the roof tiles. The entire roof surface gets the extra function of a solar collector, without being visible!
	PT	A água da torneira pode ser aquecida a partir de energia solar com coletores solares. Esta inovação é um sistema não visível. Uma grade com tubos é colocada sob as telhas. Toda a superfície do telhado ganha a função extra de coletor solar, sem ser visível!
	IT	L'acqua sanitaria può essere riscaldata dall'energia solare mediante collettori solari. Questa innovazione è un sistema non visibile. Una griglia con tubi è posizionata sotto le tegole del tetto. L'intera superficie del

		tetto acquisisce la funzione aggiuntiva di collettore solare, senza essere visibile!
	SP	El agua sanitaria puede ser calentada con energía solar mediante colectores solares. Esta innovación es un sistema no visible. Se coloca una rejilla con tuberías debajo de las tejas del tejado. ¡Toda la superficie del tejado obtiene la función adicional de colector solar, sin ser visible!
Applicable typology		Single family house

4.3.4 Water and green

Green environment

Measure title: Green roof

PT: Telhados verdes

IT: Tetto verde

SP: Cubierta verde

Measure description	EN	Multifunctional roofs offer all kinds of benefits to residents and the environment. In general, Southern Europe is increasingly experiencing extreme phenomena such as heatwaves and floods. Our gutters and sewers cannot process all that water fast enough. On a green roof, some of the rainwater is collected on the roof where it gradually evaporates and is drained off slowly. This not only prevents waterlogging, it also has a cooling effect on your home and the environment. In addition, green roofs are good for biodiversity and offer an attractive view for those who look out on the roof. There are various options, from a simple sedum roof to an extensive (edible) roof garden. Which option best suits your roof depends on your wishes and the type of roof. For example, it is important to check whether your roof can withstand the weight of a green roof.
	PT	As cidades portuguesas sofrem cada vez mais de fenómenos extremos como ondas de calor e cheias. Os danos causados são agravados pelo efeito de ilha de calor e pela impermeabilização do solo. Os telhados verdes podem contribuir para minimizar estes dois problemas, melhorando, ao mesmo tempo, o isolamento térmico dos edifícios. Em edifícios já bem isolados, as poupanças com um telhado verde serão muito pouco significativas. Em edifícios mal isolados, as poupanças com a instalação de um telhado verde que inclua também uma componente de isolamento térmico serão bastante superiores. Além disso, os telhados verdes promovem a biodiversidade e proporcionam uma vista atrativa. Existem várias opções de telhados verdes, sendo que se deve sempre optar por vegetação nativa adaptada ao clima da região. A melhor opção depende das suas preferências e do telhado em si, por isso é importante verificar se este pode suportar o peso adicional. Atenção, em edifícios antigos e em zonas históricas atualmente não é permitida a instalação de telhados verdes.
	IT	I tetti multifunzionali offrono una varietà di benefici per i residenti e per l'ambiente. In generale, l'Europa meridionale sta sperimentando sempre più fenomeni estremi come ondate di calore e alluvioni. I nostri pluviali e fognature non riescono a gestire tutta quell'acqua abbastanza

		velocemente. Su un tetto verde, parte dell'acqua piovana viene raccolta sul tetto dove evapora gradualmente e viene drenata lentamente. Questo non solo previene l'allagamento, ma ha anche un effetto rinfrescante sulla tua casa e sull'ambiente. Inoltre, i tetti verdi sono benefici per la biodiversità e offrono una vista attraente per chi guarda. Esistono varie opzioni, da un semplice tetto a sedum a un ampio giardino sul tetto. Quale opzione si adatta meglio al tuo tetto dipende dalle tue preferenze e dal tipo di tetto. Ad esempio, è importante verificare se il tuo tetto può sostenere il peso di un tetto verde.
	SP	Los techos multifuncionales ofrecen una variedad de beneficios para los residentes y el medio ambiente. En general, el sur de Europa está experimentando cada vez más fenómenos extremos como olas de calor e inundaciones. Nuestras canaletas y alcantarillas no pueden procesar toda esa agua lo suficientemente rápido. En una cubierta verde, parte del agua de lluvia se recoge en la cubierta donde se evapora gradualmente y se drena lentamente. Esto no solo previene la acumulación de agua, sino que también tiene un efecto refrescante en tu hogar y en el entorno. Además, las cubiertas verdes son beneficiosas para la biodiversidad y ofrecen una vista atractiva para quienes miran hacia ellos. Hay varias opciones, desde una cubierta de sedum hasta un jardín en la cubierta (comestible). Qué opción se adapta mejor a tu cubierta depende de tus deseos y del tipo de techo. Por ejemplo, es importante verificar si tu forjado puede soportar el peso de un cubierta verde.
Advantages	EN	• Available in various variants & styles • Cooling and soundproofing in the building • Longer lifespan of the roofing • The view on the roof is improved • Good in terms of CO₂ reduction • Buffering of rainwater • Contributes to more biodiversity • Combining solar panels with a green roof can increase the efficiency of the solar panels.
	PT	• Disponível em várias variantes e estilos • Arrefecimento e redução do ruído no edifício • Maior durabilidade do telhado • A vista do telhado é melhorada • Positivo em termos de redução de emissões de CO₂ • Efeito tampão para a água da chuva • Contribui para aumentar a biodiversidade urbana
	IT	• Disponibile in varie varianti e stili • Raffrescamento e isolamento acustico dell'edificio • Maggiore durata della copertura • Miglioramento della vista sul tetto • Riduzione della CO₂ • Accumulo di acqua piovana • Contribuisce a una maggiore biodiversità

		La combinazione di pannelli solari con un tetto verde può aumentare l'efficienza dei pannelli solari.
	SP	- Disponibile en varias variantes y estilos - Refrigeración y aislamiento acústico del edificio - Mayor durabilidad de la cubierta - Mejora de la estética de la cubierta - Reducción de CO₂ - Acumulación de agua de lluvia - Contribuye a una mayor biodiversidad - La combinación de paneles solares con un techo verde puede aumentar la eficiencia de los paneles solares.
Point of attention	EN	- Investment can increase, depending on the type of vegetation - Have a roof scan carried out by an expert - Tip! Have the construction of your roof checked by a specialist before installing a green roof.
	PT	- O investimento pode aumentar, dependendo do tipo de vegetação - Peça a um profissional para inspecionar o seu telhado
	IT	- L'investimento può aumentare a seconda del tipo di vegetazione - Fai eseguire una scansione del tetto da un esperto - Suggerimento! Fai controllare la struttura del tuo tetto da uno specialista prima di installare un tetto verde.
	SP	- La inversión puede aumentar dependiendo del tipo de vegetación - Haz que un experto realice un escaneo de la cubierta ¡Consejo! Haz que un especialista revise la estructura de tu forjado antes de instalar una cubierta verde.
Applicable typology		Single family house

Measure title: Façade garden

PT: Fachadas verdes

IT: Giardino di facciata

SP: Jardín vertical en fachada

Measure description	EN	Exchange your street tiles for a façade garden! A façade garden is good for the greening and water resistance of the immediate surroundings. Because rainwater can sink into the façade garden, less rainwater is discharged into the street sewer. The greenery also has a cooling effect and increases biodiversity. This measure is easy to implement yourself.
	PT	Considere a possibilidade de adicionar vegetação à sua fachada. Uma fachada verde é ideal para promover a biodiversidade, arrefecer a sua rua e edifício e adicionar capacidade de infiltração de água às áreas adjacentes. Uma vez que a água da chuva pode penetrar na fachada verde, é descarregada menos água para os esgotos públicos. Na instalação de uma fachada verde, é preciso proteger a parede contra os danos provocados pelas plantas e pela humidade. Instalar uma fachada

		verde é algo que pode fazer sozinho, no entanto tenha em atenção que este tipo de alteração à fachada não é permitido e pode não ser aconselhado em zonas históricas.
	IT	Sostituisci il classico intonaco con un giardino di facciata! Un giardino di facciata è utile per il verde e trattenere l'acqua piovana evitando di scaricarla velocemente in strada. Poiché l'acqua piovana può infiltrarsi nel giardino di facciata, viene scaricata meno acqua piovana nella fogna stradale. Il verde ha anche un effetto rinfrescante e aumenta la biodiversità.
	SP	¡Cambia tus baldosas por un jardín vertical! Un jardín vertical en la fachada es bueno para la vegetación y la resistencia al agua del entorno inmediato. Debido a que el agua de lluvia puede infiltrarse en el jardín de la fachada, se descarga menos agua de lluvia en el alcantarillado de la calle. La vegetación también tiene un efecto refrescante y aumenta la biodiversidad. Esta medida es fácil de implementar por ti mismo.
Advantages	EN	• Good in terms of CO₂ reduction • Buffering of rainwater • Contributes to more biodiversity • The rainwater is slowly released to the groundwater
	PT	• Positivo em termos de redução de emissões de CO₂ • Efeito tampão para a água da chuva • Contribui para aumentar a biodiversidade urbana • A água da chuva infiltra lentamente nos lençóis freáticos
	IT	• Riduzione del CO₂ • Accumulo di acqua piovana • Contribuisce a una maggiore biodiversità • L'acqua piovana viene rilasciata lentamente alle falde acquifere
	SP	• Reducción de CO₂ • Acumulación de agua de lluvia • Contribuye a una mayor biodiversidad • El agua de lluvia se libera lentamente al agua subterránea
Point of attention	EN	• If you are not the owner of the ground floor, please ask the resident for permission. • The façade garden needs maintenance, think of weeding and watering the plants. • Make sure there is enough space for passers-by, also take into account wider vehicles such as wheelchairs, mobility scooters and pushchairs.
	PT	• As fachadas verdes necessitam de manutenção, tenha em atenção as necessidades de rega e as ervas daninhas. • Garanta que existe espaço suficiente para passagens e tenha em consideração veículos mais largos como cadeiras de rodas e carrinhos de bebé.
	IT	• Se non sei il proprietario del piano terra, chiedi il permesso al residente.

		- Il giardino di facciata richiede manutenzione, pensa alla pulizia e all'irrigazione delle piante. - Assicurati che ci sia spazio sufficiente per i passanti, tenendo conto anche di veicoli più larghi come sedie a rotelle, scooter per disabili e passeggini.
	SP	- Si no eres el propietario de la planta baja, pide permiso al residente. - El jardín de fachada requiere mantenimiento, piense en quitar hierbas y el riego de las plantas. - Asegúrate de que haya suficiente espacio para los transeúntes, teniendo en cuenta también vehículos más anchos como sillas de ruedas, scooters para movilidad reducida y carritos de bebé.
Applicable typology		Single family house

Around the building

Measure title: Rain barrel

PT: Armazenamento de água da chuva

IT: Barile per acqua piovana

SP: Barril para agua de lluvia

Measure description	EN	Rainwater can be reused to water the greenery around your building. Every year, a large amount of clean drinking water is used in gardens for watering the plants and the lawn. By collecting the rainwater (not drinkable) in a rain barrel and then using it, you save drinking water and make use of a natural source. The rain barrel can also be implemented as an underground tank, but this does require a pump.
	PT	A água da chuva pode ser reutilizada para regar a vegetação ao redor do seu edifício. Todos os anos, uma grande quantidade de água potável limpa é utilizada nos jardins para regar as plantas e o relvado. Ao recolher a água da chuva (não potável) num barril de água da chuva e depois utilizá-la, poupa água potável e faz uso de uma fonte natural. O barril de água da chuva também pode ser instalado como um tanque subterrâneo, mas requer a utilização de uma bomba.
	IT	L'acqua piovana può essere riutilizzata per annaffiare il verde intorno al tuo edificio. Ogni anno, una grande quantità di acqua potabile viene utilizzata nei giardini per annaffiare piante e prati. La raccolta dell'acqua piovana (non potabile) in un barile e il suo utilizzo ti permette di risparmiare acqua potabile e sfruttare una risorsa naturale. Il barile per acqua piovana può anche essere installato come serbatoio sotterraneo, ma questo richiede una pompa.
	SP	El agua de lluvia puede reutilizarse para regar el jardín alrededor de tu edificio. Cada año, se utiliza una gran cantidad de agua potable en los jardines para regar las plantas y el césped. Al recolectar el agua de lluvia (no potable) en un barril y utilizarla, ahorras agua potable y aprovechas una fuente natural. El barril para agua de lluvia también puede instalarse como un tanque subterráneo, pero esto requiere una bomba.

Applicable typology	Single-family houses, condominium households and energy-poor households
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Measure title: Rainproof outdoor area

PT: Espaço exterior resistente à chuva

IT: Area esterna resistente all'acqua

SP: Área exterior a prueba de agua

Measure description	EN	It is starting to rain more often and more heavily, which causes a lot of water nuisance. You can make the space around your extra rainproof by choosing better water infiltration options. First of all, choose water-permeable pavements. There are different water-permeable pavements, such as shells, gravel, wood chips or even porous tiles. Try to limit the amount of pavement in the outdoor area, so there is more room for water, but also for greenery.
	PT	Com as alterações climáticas, prevê-se que chova com mais frequência e intensidade, o que causa muitos incómodos hídricos. Assim, pode tornar o espaço ao seu redor mais permeável, escolhendo melhores opções de infiltração de água. Em primeiro lugar, escolha pavimentos permeáveis à água, como cascalho, lascas de madeira ou até mesmo ladrilhos porosos, vegetação ou outros pavimentos permeáveis, como conchas, cascalho, lascas de madeira, ou mesmo ladrilhos porosos. Procure limitar a quantidade de pavimento na área externa.
	IT	Con l'aumento della frequenza e dell'intensità delle piogge, è possibile che si verifichino problemi di allagamento. Puoi rendere lo spazio esterno più impermeabile scegliendo opzioni migliori per l'infiltrazione dell'acqua. Innanzitutto, opta per pavimenti permeabili all'acqua. Esistono diversi tipi di pavimenti permeabili, come conchiglie, ghiaia, segatura o anche piastrelle porose. Cerca di limitare la quantità di pavimentazione nell'area esterna, in modo da lasciare più spazio per l'acqua e anche per il verde.
	SP	Con el aumento en la frecuencia e intensidad de las lluvias, pueden surgir problemas de inundación. Puedes hacer que el espacio exterior sea a prueba de agua eligiendo mejores opciones de infiltración de agua. Primero, elige pavimentos permeables al agua. Hay diferentes tipos de pavimentos permeables, como conchas, grava, astillas de madera o incluso baldosas porosas. Trata de limitar la cantidad de pavimento en el área exterior, para dejar más espacio para el agua, pero también para el verde.
Applicable typology	Single family house	

Measure title: Green parking lot

PT: Estacionamento verde

IT: Parcheggio verde

SP: Aparcamiento verde

Measure description	EN	The parking lot can be used for more than just parking. It is advisable to cover the parking spaces with semi-paved surfaces so that they are nice and green and rainwater can infiltrate into the ground. Moreover, by placing a carport, covered with solar panels, electric cars can be charged with self-generated electricity. Of course, the energy can also be used in your house.
	PT	O estacionamento pode ser usado para mais do que apenas estacionar. É aconselhável cobrir os lugares de estacionamento com superfícies semi-pavimentadas para que fiquem bonitos e verdes e a água da chuva possa infiltrar-se no solo. Além disso, ao colocar uma garagem coberta com painéis solares, os carros elétricos podem ser carregados com eletricidade autogerada. Claro, a energia também pode ser usada na sua casa.
	IT	Il parcheggio può essere utilizzato per più di semplici posteggi. È consigliabile coprire i posti auto con superfici semi-pavimentate in modo che siano verdi e che l'acqua piovana possa infiltrarsi nel terreno. Inoltre, installando una tettoia coperta da pannelli solari, è possibile ricaricare le auto elettriche con elettricità autoprodotta. Naturalmente, l'energia può essere utilizzata anche per la tua casa.
	SP	El aparcamiento puede utilizarse para más que simplemente estacionar vehículos. Es aconsejable cubrir los espacios de estacionamiento con superficies semi-pavimentadas para que sean verdes y el agua de lluvia pueda infiltrarse en el suelo. Además, al colocar un garaje cubierto con paneles solares, se pueden cargar coches eléctricos con electricidad autoproducida. Por supuesto, la energía también puede usarse en tu hogar.
Applicable typology		Single family house

Measure title: Filtration circulation pump

PT: Bomba de circulação e filtração

IT: Pompa di circolazione con filtrazione

SP: Bomba de circulación con filtración

Measure description	EN	Do you have a swimming pool or pond by your house? With a durable filtration circulation pool and pond pumps, you can regulate the flow and speed entirely by yourself or automatically, unlike standard circulation pumps, which only run at full power, saving you over 80% of energy costs!
	PT	Tem uma piscina ou lagoa perto de casa? Com bombas de circulação durável para piscinas e lagos, pode regular o fluxo e a velocidade inteiramente sozinho ou automaticamente, ao contrário das bombas de circulação padrão, que só funcionam na potência máxima, economizando mais de 80% nos custos de energia!
	IT	Hai una piscina o uno stagno vicino alla tua casa? Con una pompa di circolazione con filtrazione durevole, puoi regolare il flusso completamente da solo o automaticamente, a differenza delle pompe di circolazione standard, che funzionano solo a piena potenza, risparmiando oltre l'80% dei costi energetici!

	SP	¿Tienes una piscina o estanque cerca de tu casa? Con una bomba de circulación con filtración duradera, puedes regular el flujo y la velocidad completamente por ti mismo o automáticamente, a diferencia de las bombas de circulación estándar, que solo funcionan a plena potencia, ¡ahorrando más del 80% de los costos energéticos!
Applicable typology	Single family house	

Measure title: Helophyte filter

PT: Filtro helófito

IT: Filtro di elofite

SP: Filtro de helófitos

Measure description	EN	You can purify and reuse your grey wastewater (slightly contaminated wastewater, such as shower or washing-up water) on your own premises using a helophyte filter. A helophyte filter or swamp filter is a simple, natural way to purify grey wastewater (although not to the point of becoming potable water). Helophytes are aquatic plants and provide a suitable living environment for the bacteria that break down the waste substances from the wastewater to a quality that is harmless to the environment. The water can then be discharged to the surface water instead of the sewer. The process has a high purification efficiency and the purified water can even be reused to flush toilets. Some energy is needed to pump the wastewater through the filter.
	PT	Pode purificar e reutilizar as suas águas residuais cinzentas (águas residuais levemente contaminadas, como água de chuveiro ou de lavagem) nas suas próprias instalações usando um filtro helófito. Um filtro helófito ou filtro de pântano é uma maneira simples e natural de purificar (ainda que não ao ponto de se tornar água potável) águas residuais cinzentas. As helófitas são plantas aquáticas e fornecem um ambiente de vida adequado para as bactérias que decompõem as substâncias residuais das águas residuais a uma qualidade inofensiva ao meio ambiente. A água pode então ser descarregada nas águas superficiais em vez do esgoto. O processo tem alta eficiência de purificação e a água purificada pode até ser reaproveitada na descarga da sanita. É necessária alguma energia para bombear as águas residuais através do filtro.
	IT	Puoi purificare e riutilizzare le tue acque grigie (acque leggermente contaminate, come l'acqua della doccia o dei lavelli) utilizzando un filtro di elofite. Un filtro di elofite o filtro palustre è un modo semplice e naturale per purificare le acque grigie (anche se non al punto di diventare acqua potabile). Le elofite sono piante acquatiche e forniscono un ambiente idoneo ai batteri che degradano le sostanze di scarto dalle acque reflue a una qualità innocua per l'ambiente. L'acqua può quindi essere scaricata nelle acque superficiali anziché nella rete fognaria. Il processo ha un'alta efficienza di purificazione e l'acqua purificata può essere riutilizzata per i WC. È necessaria un po' di energia per pompare le acque reflue attraverso il filtro.

	SP	Puedes purificar y reutilizar tus aguas grises (aguas ligeramente contaminadas, como el agua de la ducha o de los fregaderos) en tu propia propiedad utilizando un filtro de helófitos. Un filtro de helófitos o filtro de pantano es una forma simple y natural de purificar las aguas grises (aunque no hasta el punto de convertirlas en agua potable). Los helófitos son plantas acuáticas que proporcionan un entorno adecuado para las bacterias que descomponen los residuos de las aguas residuales hasta una calidad inofensiva para el medio ambiente. El agua puede luego descargarse en las aguas superficiales en lugar de en el alcantarillado. El proceso tiene una alta eficiencia de purificación y el agua purificada puede incluso reutilizarse para el inodoro. Se necesita algo de energía para bombear las aguas residuales a través del filtro.
Applicable typology	Single family house	

Water use

Measure title: Thermostatic faucet and efficient shower head

PT: Torneira termostática e cabeça de chuveiro eficiente

IT: Rubinetto termostatico e soffione doccia efficiente

SP: Grifo termostático y cabezal de ducha eficiente

Measure description	EN	A modern water-saving shower head uses considerably less water without compromising on shower comfort. Standard shower heads use 10 to 15 litres of water per minute, while a water-saving showerhead can reduce this water flow to as little as 5 litres per minute (to comply with the flow rates set by the EU, ensure that showers have a maximum flow rate of 8 liters per minute). It reduces the flow and adds air to the water, which means you experience a normal powerful jet that remains pleasant. Even a rain shower or another luxury shower does not necessarily have to waste water. Pay attention to the volume flow class, this must be S, besides, when purchasing a new product, consult its water labeling and opt for the most efficient ones. An important additional advantage is that less water needs to be heated. This does more than just reduce the water and energy bill: the generator can often be downsized, which is especially interesting for sustainable generators such as heat pumps. Moreover, your water and energy bills will be lower.
	PT	Em Portugal, em média, cerca de 32% do consumo de água nas nossas casas ocorre durante os duchos e banhos. Quanto tempo fica no duche à espera que a temperatura da água chegue ao nível desejado? Para além do desconforto, todo este tempo de espera representa um gasto desnecessário de água e energia! A vantagem das torneiras termostáticas

		é que permitem fixar a temperatura da água, sem gastos de água ou de energia para atingir a temperatura de conforto. Numa torneira convencional, são gastos em média 8 litros antes de sequeir começar o seu banho. Em contraste, nas torneiras termostáticas a água sai sempre à temperatura desejada, levando a poupanças de até 20% do consumo de energia em aquecimento de água. Com um redutor de caudal integrado, pode também poupar 20% a 50% do consumo de água. Estas torneiras evitam a ocorrência de queimaduras, ao limitar a temperatura a 38°C. O custo das torneiras termostáticas varia entre 50 e 220 euros. Adicionalmente, poderá optar por uma cabeça de chuveiro eficiente, para consumir menos água quente sem sacrificar o conforto. Este sistema reduz o caudal e acrescenta ar à água, proporcionando um jato normal e potente. As cabeças de chuveiro normais utilizam 10 a 15 litros de água por minuto, enquanto uma cabeça de chuveiro economizadora pode reduzir este fluxo para apenas 5 litros por minuto (para cumprir com os caudais de referência determinados pela UE, garanta que os chuveiros tenham um caudal máximo de 8 Litros/min). Também permite interromper o fluxo de água durante o banho sem desligar a torneira e sem necessitar de voltar a regular a temperatura. Tratando-se de um equipamento de baixo custo, entre 8 e 45 euros, é uma ótima ideia para poupar água e também a energia necessária para a aquecer. Em Portugal, já existem esquemas de rotulagem de produtos que permitem identificar os mais eficientes, ao adquirir novos produtos prefira os que têm rótulo A.
	IT	Un soffione per la doccia moderno a risparmio idrico utilizza considerevolmente meno acqua senza compromettere il comfort della doccia. I soffioni doccia standard utilizzano da 10 a 15 litri d'acqua al minuto, mentre un soffione doccia a risparmio idrico può ridurre questo flusso fino a soli 5 litri al minuto (per rispettare i tassi di flusso stabiliti dall'UE, assicurarsi che le docce abbiano un tasso di flusso massimo di 8 litri al minuto). Riduce il flusso e aggiunge aria all'acqua, il che significa che si sperimenta un getto potente che rimane piacevole. Anche una doccia a pioggia o un'altra doccia di lusso non deve necessariamente sprecare acqua. Presta attenzione alla classe di flusso volumetrico, questa deve essere S; inoltre, quando acquisti un nuovo prodotto, consulta l'etichettatura dell'acqua e opta per quelli più efficienti. Un importante vantaggio aggiuntivo è che meno acqua deve essere riscaldata. Questo non solo riduce la bolletta dell'acqua e dell'energia: il generatore può spesso essere ridotto di dimensioni, il che è particolarmente interessante per i generatori sostenibili come le pompe di calore. Inoltre, le tue bollette dell'acqua e dell'energia saranno più basse.
	SP	Un cabezal de ducha moderno que ahorra agua utiliza considerablemente menos agua sin comprometer la comodidad de la ducha. Los cabezales de ducha estándar utilizan de 10 a 15 litros de agua por minuto, mientras que un cabezal de ducha que ahorra agua puede reducir este flujo de agua a tan solo 5 litros por minuto (para cumplir con las tasas de flujo establecidas por la UE, asegúrese de que las duchas

		tengan una tasa de flujo máximo de 8 litros por minuto). Reduce el flujo y añade aire al agua, lo que significa que experimenta un chorro potente normal que sigue siendo agradable. Incluso una ducha de lluvia u otra ducha de lujo no necesariamente tiene que desperdiciar agua. Preste atención a la clase de flujo volumétrico, esta debe ser S; además, al comprar un nuevo producto, consulte su etiquetado de agua y opte por los más eficientes. Una ventaja adicional importante es que se necesita calentar menos agua. Esto no solo reduce la factura del agua y de la energía: el generador a menudo puede reducirse en tamaño, lo cual es especialmente interesante para generadores sostenibles como las bombas de calor. Además, sus facturas de agua y energía serán más bajas.
Advantages	EN	• Saves on water use • Saves energy • The capacity of boiler vessel or all-electric heat pump can be reduced
	PT	• Poupa água • Poupa energia • A capacidade do tanque da caldeira ou da bomba de calor elétrica pode ser reduzida
	IT	• Risparmia sull'uso dell'acqua • Risparmia energia • La capacità del serbatoio della caldaia o della pompa di calore completamente elettrica può essere ridotta
	SP	• Ahorra en el uso de agua • Ahorra energía • La capacidad del depósito de la caldera o de la bomba de calor totalmente eléctrica puede reducirse
Point of attention	EN	• Pay attention to the tapping limit. Some devices do not turn on when the volume flow is too low
	PT	• Preste atenção às limitações de caudal. Alguns equipamentos não se ligam quando o caudal é muito baixo
	IT	• Presta attenzione al limite di prelievo. Alcuni dispositivi non si accendono quando il flusso volumetrico è troppo basso
	SP	• Preste atención al límite de activación. Algunos dispositivos no se encienden cuando el flujo volumétrico es demasiado bajo
Applicable typology	Single-family houses, condominium households and energy-poor households	

Measure title: Regular Replacement of Faucets and Showerheads

PT: Substituição Regular de Torneiras e Cabeças de Chuveiro

IT: Sostituzione regolare di rubinetti e docce

SP: Reemplazo regular de grifos y cabezales de ducha

Measure description	EN	Regularly replacing faucets and showerheads helps prevent water waste and ensures optimal performance. Over time, faucets and showerheads can develop leaks or lose efficiency, leading to unnecessary water
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		consumption. By periodically replacing them, you can maintain water efficiency in your home and reduce the risk of leaks and drips. When replacing, prioritize selecting solutions with the best water efficiency ratings, taking into account the current labeling system in place.
	PT	A substituição regular de torneiras e cabeças de chuveiro ajuda a evitar o desperdício de água e garante um desempenho ótimo. Com o tempo, as torneiras e cabeças de chuveiro podem desenvolver fugas ou perder eficiência, o que leva a um consumo desnecessário de água. Ao substituí-las periodicamente, é possível manter a eficiência hídrica em sua casa e reduzir o risco de fugas e pingos. Ao trocar, prefira as soluções com melhor valor de eficiência hídrica, nomeadamente considerando o sistema de rotulagem em vigor.
	IT	La sostituzione regolare di rubinetti e docce aiuta a prevenire sprechi d'acqua e garantisce prestazioni ottimali. Con il tempo, i rubinetti e le docce possono sviluppare perdite o perdere efficienza, portando a un consumo inutile di acqua. Sostituendoli periodicamente, puoi mantenere l'efficienza idrica nella tua casa e ridurre il rischio di perdite e gocciolamenti. Quando effettui la sostituzione, dai priorità a soluzioni con le migliori valutazioni di efficienza idrica, tenendo conto dell'attuale sistema di etichettatura in vigore.
	SP	Reemplazar regularmente grifos y cabezales de ducha ayuda a prevenir el desperdicio de agua y asegura un rendimiento óptimo. Con el tiempo, los grifos y cabezales de ducha pueden desarrollar fugas o perder eficiencia, lo que lleva a un consumo innecesario de agua. Al reemplazarlos periódicamente, puedes mantener la eficiencia hídrica en tu hogar y reducir el riesgo de fugas y goteos. Al reemplazar, prioriza seleccionar soluciones con las mejores calificaciones de eficiencia hídrica, teniendo en cuenta el sistema de etiquetado actual en vigor.
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Water-saving toilet

PT: Sanita eficiente

IT: WC a risparmio idrico

SP: Inodoro con ahorro de agua

Measure description	EN	An efficient toilet features a dual flush system with two switches that allow you to choose between 3.5 or 6 litres, instead of the 9-12 litres of a traditional toilet. When purchasing a new product, consult its water labeling and opt for the most efficient ones. The more frequently the toilet is used, the more sense it makes to invest in a modern toilet. For example, for a household of 4 people, the toilet pays for itself within 4 to 9 years. Is a new toilet not an option? There are other cost-effective solutions, such as flush buttons with switches, adjustable fill valves, and counterweights, which can modernize your old toilet and save water. However, keep in mind that the savings are considerably smaller than
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		with a modern toilet. A widely-used, easy, and cost-free idea is to place a water bottle inside your toilet tank to reduce the flush volume.
	PT	Uma sanita eficiente tem um sistema de dupla descarga com dois interruptores que lhe permite escolher entre 3,5 ou 6 litros, em vez dos 9-12 litros de uma sanita tradicional. Em Portugal, já existem esquemas de rotulagem de produtos que permitem identificar os mais eficientes, ao adquirir um novo sistema de autoclismo prefira os que têm rótulo A. Quanto mais frequentemente a sanita é utilizada, mais sentido faz comprar uma sanita moderna. Por exemplo, para um agregado familiar de 4 pessoas, a sanita paga-se a si própria em 4 a 9 anos. Uma nova sanita não é uma opção? Existem outras soluções com custos mais baixos, como botões com interruptor de descarga, torneiras de enchimento regulável e contrapesos, que podem modernizar a sua sanita antiga e poupar água. No entanto, tenha em atenção que as poupanças são consideravelmente menores do que com uma sanita moderna. Uma ideia bastante usada, que é fácil e sem custos, é colocar uma garrafa de água dentro do seu autoclismo para reduzir o volume por descarga.
	IT	Un WC efficiente dispone di un sistema di scarico a doppio pulsante con due opzioni che permettono di scegliere tra 3,5 o 6 litri, invece dei 9-12 litri di un WC tradizionale. Quando acquisti un nuovo prodotto, consulta l'etichettatura di risparmio dell'acqua e opta per quelli più efficienti. Più il WC viene utilizzato, più ha senso investire in un WC moderno. Ad esempio, per una famiglia di 4 persone, il WC si ripaga da solo in 4-9 anni. Un nuovo WC non è un'opzione? Ci sono altre soluzioni economiche, come pulsanti di scarico con interruttori, valvole di riempimento regolabili e contrappesi, che possono modernizzare il tuo vecchio WC e risparmiare acqua. Tuttavia, tieni presente che i risparmi sono considerevolmente inferiori rispetto a un WC moderno. Un'idea ampiamente utilizzata, facile e gratuita è quella di inserire una bottiglia d'acqua all'interno del serbatoio del WC per ridurre il volume dello scarico.
	SP	Un inodoro eficiente cuenta con un sistema de doble descarga con dos botones que permiten elegir entre 3,5 o 6 litros, en lugar de los 9-12 litros de un inodoro tradicional. Al comprar un nuevo producto, consulta su etiquetado de agua y opta por los más eficientes. Cuanto más se use el inodoro, más sentido tiene invertir en un inodoro moderno. Por ejemplo, para un hogar de 4 personas, el inodoro se amortiza en 4 a 9 años. ¿No es una opción un inodoro nuevo? Hay otras soluciones rentables, como botones de descarga con interruptores, válvulas de llenado ajustables y contrapesos, que pueden modernizar tu inodoro antiguo y ahorrar agua. Sin embargo, ten en cuenta que los ahorros son considerablemente menores que con un inodoro moderno. Una idea ampliamente utilizada, fácil y gratuita es colocar una botella de agua dentro del tanque del inodoro para reducir el volumen de descarga.
Advantages	EN	• Saves on water use • Suitable for large households

	PT	- Poupa água - Apropriado para casas grandes
	IT	- Risparmia sull'uso dell'acqua - Adatto per famiglie numerose
	SP	- Ahorra en el uso de agua - Adecuado para hogares grandes
Point of attention	EN	The correct setting determines the savings effect
	PT	O contexto determina as poupanças
	IT	L'impostazione corretta determina l'effetto di risparmio
	SP	La configuración correcta determina el efecto de ahorro
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Water reuse
PT: Reutilização de águas cinzentas
IT: Riutilizzo dell'acqua
SP: Reutilización del agua

Measure description	EN	Rainwater or greywater (not drinkable) can be used for example for flushing the toilet. The water is collected in a reservoir, possibly cleaned, and then used in the toilet. In an ultimate situation, you no longer use drinking water to flush with. This often requires a larger intervention, because a separate pipe system may have to be installed to separate greywater and/or rainwater from drinking water. This is often a costly and complicated modification in existing buildings.
	PT	A água cinzenta (não potável), por exemplo proveniente do lavatório ou duche, pode ser utilizada, entre outras coisas, para a descarga do autoclismo. A água é recolhida num reservatório e depois utilizada na casa de banho. Num cenário ideal, deixaria completamente de utilizar água potável para a descarga. Isto requer frequentemente uma intervenção maior, porque pode ter de ser instalado um sistema de canalização independente para separar a água cinzenta e/ou a água da chuva da água potável. Esta é geralmente uma modificação dispendiosa e complicada em edifícios existentes, mas pode ser interessante considerar se estiver a fazer uma reabilitação profunda do seu edifício antigo.
	IT	L'acqua piovana o l'acqua grigia (non potabile) possono essere utilizzate, ad esempio, per lo scarico del WC. L'acqua viene raccolta in un serbatoio, eventualmente pulita, e poi utilizzata nel WC. In una situazione ottimale, non si usa più acqua potabile per lo scarico. Questo richiede spesso un intervento più ampio, poiché potrebbe essere necessario installare un sistema di tubazioni separato per separare l'acqua grigia e/o l'acqua piovana dall'acqua potabile. Si tratta spesso di una modifica costosa e complicata negli edifici esistenti.
	SP	El agua de lluvia o el agua gris (no potable) pueden usarse, por ejemplo, para las descargas del inodoro. El agua se recoge en un depósito, posiblemente se limpia, y luego se utiliza en el inodoro. En una situación

		ideal, ya no se usa agua potable para la descarga. Esto suele requerir una intervención mayor, ya que puede ser necesario instalar un sistema de tuberías separativo para separar el agua gris y/o el agua de lluvia del agua potable. A menudo, esta es una modificación costosa y complicada en edificios existentes.
Advantages	EN	• Saves on water use • Less strain on the sewer system • Rainwater is free and easy to collect
	PT	• Poupa água • Menor esforço para o sistema de esgotos • A água da chuva é grátis e fácil de recolher
	IT	• Risparmia sull'uso dell'acqua • Minore pressione sul sistema fognario • L'acqua piovana è gratuita e facile da raccogliere
	SP	• Ahorro de agua • Menos presión sobre el sistema de alcantarillado • El agua de lluvia es gratuita y fácil de recoger
Point of attention	EN	• It is often necessary to lay new pipes • The installation requires rebuilding, renovation is a good time
	PT	• Frequentemente é necessário colocar uma nova tubagem • Esta instalação requer reconstrução, a renovação do edifício pode ser o melhor momento
	IT	• Spesso è necessario posare nuovi tubi • L'installazione richiede ricostruzioni; la ristrutturazione è un buon momento
	SP	• A menudo es necesario instalar tuberías nuevas • La instalación requiere remodelaciones; la renovación es un buen momento
Applicable typology		Single family house

Measure title: Shower timer

PT: Temporizador no duche

IT: Timer per la doccia

SP: Temporizador de ducha

Measure description	EN	With a shower timer, such as an hourglass for under the shower, you can keep an eye on how long you are in the shower. With children, this is definitely recommended, because shorter showers not only save water, but also gas or electricity to heat the water.
	PT	A utilização de um temporizador no duche – ou de uma ampulheta – permite controlar o tempo que demora. Com crianças, isto é definitivamente recomendado, já que um duche mais curto não só poupa água, como também a eletricidade ou gás necessários para aquecer a água. Um duche de 15 minutos, com a torneira aberta, consome cerca de 180 litros de água. Se reduzir o tempo para apenas 5 minutos, este consumo desce para 60 litros de água e pode poupar muita energia e

		dinheiro! Portugal está a passar por fenómenos recorrentes de seca e todos os consumidores podem ajudar a diminuir os efeitos desta grave carência de água.
	IT	Con un timer per la doccia, come una clessidra da posizionare sotto la doccia, puoi monitorare quanto tempo trascorri sotto la doccia. Questo è particolarmente consigliato per i bambini, poiché docce più brevi non solo risparmiano acqua, ma anche gas o elettricità per riscaldare l'acqua.
	SP	Con un temporizador de ducha, como un reloj de arena para colocar bajo la ducha, puedes controlar cuánto tiempo pasas en la ducha. Esto es especialmente recomendable para los niños, ya que las duchas más cortas no solo ahorran agua, sino también gas o electricidad para calentar el agua.
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Flow restrictor

PT: Redutor de caudal

IT: Limitatore di flusso

SP: Limitador de caudal

Measure description	EN	With a flow restrictor, you will consume less water when, for instance, washing your hands. Without compromising comfort, you save (hot) water at the wash basin tap. Additionally, to meet the flow rates specified by the EU, ensure that the taps in both the wash basin and kitchen have a maximum flow of 6 liters per minute. At the kitchen tap, the flow restrictor may be perceived as less convenient since it takes longer to fill a bucket or saucepan. Many faucets already come equipped with a flow restrictor, and if not, they can be purchased for a few euros. This investment will pay off within a year, making it a real 'quick win'.
	PT	Com um redutor de caudal, consumirá menos água sem dar por isso, por exemplo, ao lavar as mãos. Sem sacrificar o conforto, poderá poupar água (incluindo água aquecida) na torneira do lavatório. Além disso, para cumprir com os caudais de referência determinados pela UE, garanta que as torneiras do lavatório e da cozinha tenham um caudal máximo de 6 Litros/min. Na torneira da cozinha, o redutor de caudal pode tornar-se menos prático, já que demora mais tempo a encher uma panela. Muitas torneiras já têm um redutor de caudal instalado, e caso não tenham pode sempre adquirir um por apenas alguns euros. Um redutor de caudal pode reduzir para metade o consumo de água, contudo o aumento de velocidade associada faz com que haja a sensação que está a sair mais água e paga-se a si próprio no período de um ano, uma verdadeira "medida rápida".
	IT	Con un limitatore di flusso, consumerai meno acqua quando, ad esempio, ti lavi le mani. Senza compromettere il comfort, risparmi acqua (calda) al rubinetto del lavabo. Inoltre, per rispettare i flussi d'acqua specificati dall'UE, assicurati che i rubinetti sia del lavabo che della cucina abbiano un flusso massimo di 6 litri al minuto. Al rubinetto della cucina, il

		limitatore di flusso potrebbe risultare meno comodo poiché serve più tempo per riempire un secchio o una pentola. Molti rubinetti sono già dotati di un limitatore di flusso, e se non lo sono, possono essere acquistati per pochi euro. Questo investimento si ripagherà entro un anno, rendendolo una vera "soluzione veloce".
	SP	Con un limitador de caudal, consumirás menos agua cuando, por ejemplo, te laves las manos. Sin comprometer el confort, ahorrarás agua (caliente) en el grifo del lavabo. Además, para cumplir con los caudales especificados por la UE, asegúrate de que los grifos tanto del lavabo como de la cocina tengan un caudal máximo de 6 litros por minuto. En el grifo de la cocina, el limitador de caudal puede ser menos conveniente ya que toma más tiempo llenar un cubo o una olla. Muchos grifos ya vienen equipados con un limitador de caudal, y si no es así, se pueden comprar por unos pocos euros. Esta inversión se amortiza en un año, convirtiéndola en una verdadera "solución rápida".
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Heat recovery in the shower

PT: Recuperador de calor no duche

IT: Recupero di calore nella doccia

SP: Recuperación de calor en la ducha

Measure description	EN	By exchanging heat in the shower drain you save energy to heat water. Good for your wallet and very handy if you want to start heating with sustainable generators such as a heat pump. Read more about this in the topic heating.
	PT	A recuperação de calor no dreno do chuveiro permite-lhe poupar energia para aquecer água. Isto é ótimo para a sua carteira e especialmente útil se pretender começar a utilizar sistemas de aquecimento de água sanitária sustentáveis. Leia mais sobre isto no tópico "Água quente".
	IT	Scambiando calore nel tubo di scarico della doccia, risparmi energia per riscaldare l'acqua. È vantaggioso per il tuo portafoglio e molto utile se desideri iniziare a riscaldare con generatori sostenibili come una pompa di calore. Leggi di più su questo argomento nella sezione riscaldamento.
	SP	Al intercambiar calor en el desagüe de la ducha, ahorras energía para calentar el agua. Es beneficioso para tu bolsillo y muy útil si deseas comenzar a calentar con generadores sostenibles como una bomba de calor. Lee más sobre este tema en la sección de calefacción.
Applicable typology		Single-family houses, condominium households and energy-poor households

Measure title: Fix water leaks

PT: Correção de fugas de água

IT: Riparazione delle perdite d'acqua

SP: Reparación de fugas de agua

Measure description	EN	A small water leak may seem insignificant, but over time, it can evolve into a significant waste of potable water. If the leak occurs in the hot water circuit, you may also be wasting energy and increasing your energy bill. Check your older faucets, showers, and toilets for any leaks or drips, and take prompt action to repair them. A single faucet dripping at a rate of 10 drops per minute can waste over 1300 litres per year.
	PT	Uma pequena fuga de água pode parecer irrelevante, mas com o passar do tempo pode tornar-se num desperdício significativo de água potável. Se a fuga ocorrer no circuito de água quente, pode também estar a desperdiçar energia e a aumentar a sua fatura energética. Verifique as suas torneiras, chuveiros e sanitas mais antigas para detetar quaisquer fugas ou pingos e aja rapidamente para as reparar. Uma única torneira a pingar à velocidade de 10 gotas por minuto pode desperdiçar mais de 1300 litros por ano.
	IT	Una piccola perdita d'acqua può sembrare insignificante, ma nel tempo può trasformarsi in uno spreco significativo di acqua potabile. Se la perdita avviene nel circuito dell'acqua calda, potresti anche sprecare energia e aumentare la tua bolletta energetica. Controlla i tuoi vecchi rubinetti, docce e WC per eventuali perdite o gocciolamenti e agisci prontamente per ripararli. Un singolo rubinetto che perde a una velocità di 10 gocce al minuto può sprecare oltre 1300 litri all'anno.
	SP	Una pequeña fuga de agua puede parecer insignificante, pero con el tiempo puede convertirse en un desperdicio significativo de agua potable. Si la fuga ocurre en el circuito de agua caliente, también podrías estar desperdiciando energía y aumentando tu factura de energía. Revisa tus grifos, duchas e inodoros antiguos para detectar posibles fugas o goteos, y actúa rápidamente para repararlos. Un solo grifo que gotea a una velocidad de 10 gotas por minuto puede desperdiciar más de 1300 litros al año.
Applicable typology	Single-family houses, condominium households and energy-poor households	

5. CONCLUSION

This deliverable covers the efforts of work package 4 of HORIS project. HORIS project aims to create a digital OSS to empower homeowners throughout the renovation process, helping them navigate the complexities involved. Buildings in the EU are inefficient and are being renovated at a low rate (EC, 2024). Homeowners face numerous barriers during the renovation process, such as a lack of information and awareness about the costs and benefits, difficulties in decision-making, high upfront investment costs, or limited access to funding (Bertone et al., 2018; Bertoldi et al., 2020). One proposed solution to these barriers is the establishment of OSS, which provides technical assistance and inclusive support for building renovations (EC, 2024).

Aligned with these challenges and with HORIS objectives, the focus of this deliverable was to collect information to include in the digital OSS platform, covering financing schemes, multiple regulatory frameworks, and technical aspects and solutions tailored to the realities of Italy, Spain, and Portugal covering the identification of key building typologies, tailor-made assessments of potential renovation impacts and a series of multilevel solutions for different building components and equipment.

The first section involved collecting public, private, and other financing schemes for the three countries (Portugal, Italy, and Spain). Each financing scheme identified includes the providing entity, a description of the scheme, the amount offered, and the conditions for application. Eleven public financing schemes, three private schemes, and three local schemes were identified in Portugal. Italy was found to have two public and two private schemes, along with one innovative financing solution. In Spain, twenty-one public and six private financing options were documented.

The second section mapped out each country's legal and regulatory environment related to home renovation. This legal framework was divided into specific renovation interventions, such as space heating and cooling systems, domestic hot water preparation, ventilation, household appliance replacement, water efficiency measures, the installation of solar photovoltaic and thermal collectors, lighting, building automation, e-mobility, and charging stations, green infrastructure, lifting installations, energy certification, construction, work mediation, maintenance and inspection of technical systems, and electrical installations. For each intervention, relevant legislation and key homeowner considerations were identified.

Finally, the project team identified and categorized technical solutions for home renovation in the analyzed countries. An initial list of measures from previous projects (*De Groene Menukaart* and *Menu de Renovação Verde* (Sequeira & Gouveia, 2022) was updated/extended for Portugal and adapted to the Italian and Spanish contexts. These solutions were organized into four categories: Tips, Measures, Key Measures, and Points of Attention. Tips included quick, low-cost measures; Measures involved moderate interventions with detailed descriptions and applicable regulations; Key Measures represented significant energy reduction or thermal comfort improvement interventions, often with simplified calculation tools for investment and savings estimation; Points of Attention highlighted potential issues or considerations to prevent adverse outcomes. These solutions were further divided into eight intervention areas, including quick wins (18 tips), insulation and ventilation (6 key measures, 24 measures, 11 tips, and 2 points of attention), electricity measures (3 key measures, 13 measures, 13 tips, and 2 innovations), climate control (23

key measures, 12 measures, 7 tips, 1 innovation, and 1 point of attention), and water and green measures (4 measures and 11 tips).

These measures are closely related to homeowner profiles and the information provided in the platform's self-scan feature, which calculates the impact of the measures based on individual data. For homeowners who choose not to register, the platform will offer an average impact assessment for each measure.

While the collected financing, regulatory, and technical information is comprehensive and reflects the current reality in each country, it is also subject to change. Therefore, the HORIS platform will continuously update and complement this information to ensure homeowners receive accurate and current guidance.

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