

PRESIDENCY OF THE COUNCIL OF MINISTERS**Council of Ministers Resolution No 8-A/2021**

Summary: Approves the Long-term Strategy for the Renovation of Buildings.

In November 2016, the European Commission presented the package 'Clean Energy for all Europeans', hereinafter referred to as the Clean Energy Package, consisting of a series of legislative proposals in the fields of energy efficiency, renewable energies and the internal electrical power market, with a view to promoting the energy transition in the coming decades to comply with the Paris Agreement on climate change and the climate crisis.

Accordingly, under Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action, the European Union approved a series of targets which aim to achieve by 2030, a 32% share of renewable energy in gross final consumption, a 32.5% increase in energy efficiency, a 40% reduction in greenhouse gas emissions (GHG) compared to 1990 levels and 15% of electricity interconnections, while also promoting competitiveness, modernisation and the sustainability of the European energy system, without jeopardising the goals of economic development and job creation.

Portugal has committed to achieving carbon neutrality by 2050 by approving the Roadmap to Carbon Neutrality 2050 (RCN 2050), through Council of Ministers Resolution No 107/2019 of 1 July 2019 which establishes a trajectory to reduce GHG emissions by between 45% and 55% by 2030, between 65% and 75% by 2040 and between 85% and 90% by 2050, as compared to 2005 levels.

To comply with the objectives for decarbonisation and the energy transition in social and economic terms, based on RCN 2050, the National Energy and Climate Plan 2030 (NECP 2030) was drawn up and approved through Council of Ministers Resolution No 53/2020 of 10 July 2020, which sets out targets and objectives and establishes the policies and measures for 2030. More specifically, this involves a reduction in GHG emissions and the promotion of energy efficiency by reducing the consumption of primary energy by 32.5%, reinforcing renewable energies by incorporating 47% of such energies into gross final consumption, ensuring security of supply, developing the internal energy market and promoting initiatives for research and innovation. For buildings, NECP 2030 sets out specific actions with a view to reducing their respective carbon intensity while also promoting the energy renovation of buildings, with particular attention being paid to the goal to implement the Nearly Zero Energy Buildings (NZEB) concept in the construction of new buildings and in the transformation of existing buildings.

In December 2019, the European Commission presented the European Green Deal, established as a new growth strategy to transform the European Union into a fair and prosperous society, with a modern, competitive and efficient economy in the use of resources as a result of, among other aspects, net zero GHG emissions by 2050. The European Green Deal identified the renovation of buildings, both public and private, as a key initiative to drive energy efficiency in the sector and comply with decarbonisation goals. In order to achieve such energy efficiency and economic growth, in October 2020, the European Commission published a new strategy to drive the renovation entitled 'A Renovation Wave for Europe - greening our buildings, creating jobs, improving lives' (COM(2020) 662), where the construction sector features as one of the largest consumers of energy in Europe, as around 75% of building stock is energy inefficient according to current building standards, and is also responsible for one third of GHG emissions in the European Union. For these reasons, it is considered that a remodelled and improved European building stock will be a vital element in a decarbonised and clean energy system. Beyond the energy plan, the construction sector also plays a relevant role in the environmental performance of buildings and infrastructures throughout their life cycle. It is vital to create

incentives to improve design so as to reduce environmental impact and increase the durability and recyclability of individual components.

Under the Clean Energy Package, Directive (EU) 2018/844 of the European Parliament and of the Council of 30 May 2018, amending Directive 2010/31/EU on the energy performance of buildings and Directive 2012/27/EU on energy efficiency, identifies building stock as requiring particular attention due to the high levels of energy consumption and high CO₂ emissions. Accordingly, Article 2-A of Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010, as amended, requires each Member State to establish a long-term renovation strategy to support the renovation of the national stock of residential and non-residential buildings, both public and private, into a highly energy efficient and decarbonised building stock by 2050, facilitating the cost-effective transformation of existing buildings into nearly zero-energy buildings (NZEB), including a roadmap with measures and indicative milestones for 2030, 2040 and 2050, specifying how they contribute to achieving the Union's energy efficiency targets and reducing GHG emissions.

When preparing and drawing up this strategy, hereinafter referred to as the Long-Term Building Renovation Strategy (LTRS), an analysis was conducted of energy consumption patterns and thermal comfort indices for the national building stock. A list of associated benefits was also created such as improved labour productivity and improved health, gains in the fight against energy poverty. Furthermore costs arising from the implementation of the policies and measures required for the purpose were identified. These costs were based on the specificities of the buildings covered, including their type and geographical location.

More specifically, the measures set out in LTRS include work on building envelopes, the replacement of existing systems with more efficient systems, the promotion of renewable energies, the use of technical solutions, when suitable, for achieving the goal of energy renovation in the buildings covered. These measures will be duly coordinated with the identification and analysis of mechanisms to deal with market failures as potential obstacles by adopting other measures such as the setting up and/or developing funding programmes for renovation and mobilising investment, both public and private, as well as reinforcing incentive policies and market monitoring.

To comply with the respective objectives, the policies and actions set out in LTRS were organised in accordance with seven areas of action.

The first area of action includes measures to renovate buildings by creating a suitable financial framework for the purpose. Among other measures, this involves setting up or redirecting credit lines for the energy renovation of buildings in line with energy performance and sustainability criteria. The section on public buildings in the current Programme for Energy Efficiency in Public Administration is also being reviewed to include material and water efficiency measures and boost the environmental performance of buildings.

The second area of action seeks to develop and foster smart buildings by promoting research and technological innovation.

The third area of action relates to the reinforcing of laws and regulations for the energy certification of buildings, which involves, among other measures, the labelling of products and/or services relating to the energy renovation of buildings, the use of energy certificates as mechanisms to access financing or other types of benefits and the qualification of the energy class of buildings as an incentive factor in the rental market.

The fourth area of action seeks to overcome shortcomings seen in occupational training and qualification with regard to the energy efficiency performance of buildings and resources. This will involve the reinforcing and developing syllabus content and education projects to align supply in the sector with the goals to promote energy efficiency and decarbonisation in the buildings covered.

The fifth area of action involves combating energy poverty by reducing charges on energy and other consumption and by supporting more vulnerable households in the energy renovation of their homes through financing mechanisms and tax benefits.

The sixth area of action aims to provide information and raise awareness among people as well as public and private companies with respect to the benefits which can be achieved through building renovation. This will include advertising and awareness campaigns and the use of information and technology to provide and develop knowledge among the target audience on such matters.

The seventh and final area of action seeks to implement a series of indicators and mechanisms to monitor the progress of LTRS and establish practical results in the energy performance of the buildings covered, by coordinating efforts among public entities to create and develop a monitoring system.

LTRS aims to meet European and national objectives to achieve carbon neutrality and promote energy efficiency in existing buildings, with the goal of transforming them into NZEB. The performance improvement of buildings and the implementing of the principles of the circular economy and efficiency in the use of resources are also vital to ensure the sustainability of intervention work, and for this reason these principles are included in LTRS. Accordingly, it is important to note the objectives and actions of LTRS are aligned and coordinated with the European Green Deal, where the priority Renovation Wave initiative seeks to provide an active mechanism for intervention by making available financing instruments which aim to increase the rate and quality of renovation in existing buildings and, as such, help decarbonise building stock throughout Europe.

Finally, the LTRS is of particular importance to comply with other strategic objectives, which include combating energy poverty and relaunching the economy after the difficulties, caused by COVID-19. Underlying objectives of LTRS also prioritise the national construction industry and regeneration of the current economic and social recovery process by creating employment and investment opportunities, without neglecting the required balance with climate targets and the efficient management of resources.

The importance placed on building renovation is also clear in the Economic and Social Stabilisation Plan, approved by Council of Ministers Resolution No 41/2020 of 6 June 2020, which sets out the Support Programme for More Efficient Buildings, and in the draft Recovery and Resilience Plan, which establishes the Energy Efficiency in Buildings initiative.

When LTRS was drawn up, it was subject to a participation and coordination process with a range of stakeholders through the public participation of numerous public and civil society entities, followed by the respective public hearing.

Accordingly,

in accordance with Article 199g) of the Constitution, the Council of Ministers hereby resolves to:

1 - approve the Long-Term Strategy for the Renovation of Buildings (LTRS), which is set out in the annex to this resolution, of which it forms an integral part.

2 - reinforce the importance of compliance with the following objectives of LTRS for the decades of 2030, 2040 and 2050, with respect to 2018, with reference to all of the national stock of existing buildings:

a) renovated area of buildings of 363 680 501 m² by 2030, 635 637 685 m² by 2040 and 747 953 071 m² by 2050;

b) primary energy savings of 11% by 2030, 27% by 2040, and 34% by 2050;

c) reduce hours of discomfort of 26% by 2030, 34% by 2040, and 56% by 2050.

3 - create the LTRS Coordination Group to monitor, supervise and coordinate the LTRS, coordinated by the Directorate-General of Energy and Geology with the technical and operational support of ADENE-Agency for Energy, the National Laboratory of Civil Engineering, and the Institute for Housing and Urban Rehabilitation.

4 - determine that the composition, competences and rules of operation of the LTRS Coordination Group are set by order of the members of the government responsible for the areas of energy, infrastructure and housing.

5 - determine that the members of the LTRS Coordination Group do not earn any additional income or bonus for performing their duties.

6 - determine that progress of LTRS be assessed by the Coordination Group on a biannual basis as of the date of approval, and that it is published in the websites of the entities referred to in No 3.

7 - establish that LTRS will be the document to be submitted to the European Commission pursuant to Article 15 of Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018, in conjunction with the provisions of Article 2-A of Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010, as amended, and that, for this purpose, it must be converted with the due adaptations, to the structure as provided for in Annex IV of the abovementioned regulation.

8 - determine that LTRS be reviewed no more than once every five years as of the date of its approval.

9 - determine that this resolution enter into force on the day following its publication.

Presidency of the Council of Ministers, 28 January 2021. — The Prime Minister, *António Luís Santos da Costa*.

ANNEX

(as referred to in No 1)

Long-term Strategy for the Renovation of Buildings

0. EXECUTIVE SUMMARY

Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action, included in the legislative package ‘Clean energy for all Europeans’, provides for the preparation by Member States of their integrated national energy and climate plans. At the same time, Directive (EU) 2018/844 of the European Parliament and of the Council of 30 May 2018, also included in the abovementioned legislative package, amended Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (EPBD Directive) through, among other provisions, the introduction of Article 2-A which states that Member States are required to establish a long-term strategy to support the renovation, by 2050, of their national stock of residential and non-residential buildings, both public and private, including a roadmap with measures and indicative milestones for 2030, 2040 and 2050, specifying how they contribute to achieving the Union’s energy efficiency targets, with the goal of drawing up a Long-Term Strategy for the Renovation of Buildings (LTRS).

Despite the different time horizons, the National Energy and Climate Plan 2030 (NECP 2030), approved by Council of Ministers Resolution No 53/2020 of 10 July 2020, was prepared in combination with the long-term goals of the Roadmap to Carbon Neutrality 2050 (RCN 2050), approved by Council of Ministers Resolution No 107/2019 of 1 July 2019, which shall also guide LTRS. NECP 2030 *identifies the need to ‘develop and implement a long-term strategy that enables the promotion of building renovation, contributing to an increase in energy efficiency of the building stock and changing the paradigm of recent decades, which has focused solely on new construction, and contributing in turn to an increase in the quality of existing building stock, which is increasingly in need of urgent action to increase people’s comfort levels, reduce energy poverty and generate energy efficiency gains’*.

The energy renovation of the national stock of buildings is a vital measure for compliance with national energy and climate objectives as set out in NECP 2030 and RCN 2050, as well for compliance

with other strategic objectives, more specifically, combating energy poverty and relaunching the economy after the difficulties caused by COVID-19.

Renovating buildings and making them more efficient can help achieve multiple objectives, more specifically, lowering the country's energy costs and dependency, reducing GHG, improving comfort levels and indoor air quality, health benefits, boosting labour productivity, combating energy poverty, prolonging the working life of buildings and increasing their resilience. Energy renovation also promotes improvements with regard to other aspects of the energy performance of buildings such as resource efficiency, particularly water resources, due to the strong link with energy consumption. It also provides an important contribution to the climate resilience of buildings and cities and, as a result, the country itself. The main vulnerabilities in Portugal to climate change are set out in the Action Programme for Adaptation to Climate Change (P-3AC), approved by Council of Ministers Resolution No 130/2019 of 2 August 2019. This programme seeks to implement adaptation measures and establish action lines to create a reference framework for national intervention with respect to climate change in accordance with the National Strategy for Adaptation to Climate Change 2020 (ENAAC 2020), approved by Council of Ministers Resolution No 56/2015 of 30 July 2015. It is also directly related to the planned measures to reduce the vulnerability of urban areas to heat waves and the increase in maximum temperature.

Emphasising energy efficiency from a broader perspective and promoting renewable sources of energy takes on particular relevance and priority, and LTRS seeks to provide an effective response. The goal is to transform national building stock into Nearly Zero Energy Buildings, but without neglecting other key challenges, more specifically, improving standards of living, economic impact, creating jobs and compliance with energy and climate targets. It is particularly important that building renovation also takes into consideration the improvement of environmental performance, implementation of the principles of the circular economy, resource efficiency, the use of recycled and biologically based materials and the promotion of green structures such as on façades and roofing.

LTRS analyses the energy requirements and thermal comfort of the national building stock, as well as its potential impact with regard to co-benefits and on the economy. A bottom-up model was therefore developed for national building stock, based on the information in 240 650 energy certificates issued under the Energy Certification System for Buildings (ECS). 30 types of residential buildings were considered in this universe, in the different climate regions, as well as eight types of non-residential buildings, characterised by building geometry, the construction solutions used in the envelope, the climate control systems and the domestic hot water (DHW) production systems. Occupancy profiles were also specified as were use of lighting and equipment so as to quantify energy use which was close to real figures. Comfort levels and energy requirements for these archetypes were determined by using hourly dynamic simulation models.

Based on this detailed assessment, measures and improvement packages were defined and assessed as technically viable, considering the current market for each type, taking into consideration their specificity and geographical location. These policy packages provide for intervention work on a building's envelope through the thermal insulation of façades and roofing and the installation of more efficient windows, and the replacement of existing systems with more efficient systems, such as heat pumps, chillers and heat exchangers, etc. Also promoted are renewable energy sources, such as solar thermal and photovoltaic panels. The abovementioned policy packages should not be regarded from a prescriptive and inflexible viewpoint, but rather as a starting point for modelling based on technical criteria and guided by a rationale of thermal comfort. They do not seek to ignore any technical solutions, provided that such solutions prove to be better and more suitable for the energy renovation of building stock.

Analysing the results, it was possible to conclude that, with the exception of multi-dwellings built after 2016, all other buildings have a category IV level of comfort in accordance with that set out in the following table. This means that, currently, national building stock has some thermal discomfort for over 95% of the year. It can also be seen that the thermal discomfort is higher in winter, where older housing

located in more severe climate zones is more affected. Without active heating, it is estimated that minimum indoor temperatures can frequently fall below 10 °C.

Table 1 - Categories of comfort

CATEGORY	DESCRIPTION
I	High level of expectation, recommended for spaces occupied by highly sensitive and fragile people with special needs such as the disabled, those suffering from illness, very small children and the elderly
II	Normal level of expectation, to be used for new and renovated construction
III	Acceptable and moderate level of expectation, can be used in existing buildings
IV	Values outside the criteria defined in previous categories. This category should only be acceptable during a limited part of the year

The result obtained with respect to the thermal comfort of housing in Portugal comes from the low use of power for climate control in relation to expectable energy needs for a stock of old buildings with poor energy performance. Consequently, preliminary results indicate that, in the specific national context, the co-benefits of energy renovation, such as improved health, labour productivity and increased value of property, together with energy savings, are vital if total savings resulting from energy efficiency measures are to be maximised.

The national context is different to that of Central and Northern Europe, and as such, the analysis conducted and the measures proposed in LTRS have been adapted to Portugal, more specifically, to ensure a level of comfort considered acceptable (category III).

By simulating the packages of improvement measures which act on a building's envelope, the results indicate that in older multi-dwelling buildings located in milder winter climate zones and in buildings built after 2006, it is possible to achieve an acceptable category of thermal comfort (category III), with strictly passive solutions such as, fitting thermal insulation on the envelope or replacing inefficient windows. In a similar manner, in single-family buildings located in these zones, and even if the measures to improve the respective building envelopes are not enough to achieve an acceptable level of thermal comfort, the results suggest a significant improvement in the reduction of hours of discomfort over the year (thermal comfort acceptable at least 90% of the time), as well as a significant improvement as regards minimum and maximum indoor temperatures. Thermal comfort results are obtained without the use of climate control systems, in other words, it is not necessary to increase the energy consumption of dwellings. For dwellings located in more severe winter climate zones, and for the passive improvement measures proposed, the use of complementary climate control equipment is necessary to ensure an acceptable level of comfort.

The results of simulating the packages of improvement measures with regard to the energy efficiency of buildings, together with comfort measures in the case of residential buildings, indicate that it is precisely in the stock of residential buildings that the policy packages achieve greater primary energy savings (40% in residential buildings and 28% in non-residential buildings, by 2050), more specifically, in buildings built prior to 1990 and particularly in single-family buildings. In non-residential buildings, and from an individual perspective, the greatest savings can be seen in public buildings with high levels of energy consumption, such as in buildings in the health sector and multi-sport event centres. However, it can be seen that, when results are observed for the breakdown of stock, cumulative savings are more significant in private buildings, more specifically, in buildings for commerce, offices and hotels, due to the high number of such buildings in the national stock. Similarly, and taking into account that thermal comfort was established as a priority criterion in the renovation of residential buildings, with the roadmap and simulated packages of improvement measures, it is also possible to see a reduction in hours of discomfort in 56% of the year. Of note is the positive evolution in

the minimum temperature of housing from 10 °C to 16 °C in the worst scenario, which contributes to the series of co-benefits with regard to the health of occupants, labour productivity, an increase in property value and combating energy poverty.

With respect to the investment necessary up to 2050 to achieve the packages of improvement measures proposed which act on the energy efficiency of existing buildings, a total of €143.492bn ²⁰²⁰ was estimated. The largest parcel concerned the renovation of residential buildings, at a cost of €110.078bn ²⁰²⁰ against the €33.414bn ²⁰²⁰ for non-residential buildings. Considering the savings in energy consumption, it is estimated that, after 30 years, there will be a financial return on investment of €112.289bn ²⁰²⁰ for residential buildings and €108.547bn ²⁰²⁰ for non-residential buildings, demonstrating the economic benefit of the investment in the energy renovation of buildings.

To frame estimated investment figures for the 2050 horizon, and based on the statistics available for economic activity in the construction sector, it can be seen that from 2000 to 2009, the turnover of construction companies stood at an average annual value of around €30bn, with a maximum of more than €36bn in 2006. Due to the economic crisis and its impact on the construction sector, from 2010 to 2018, the turnover of construction companies fell to €22bn, having reached a minimum of €17bn in 2016.

Complementary data is provided by the report on 'Management Indicators and Forecast Models for the Construction Industry' issued by the Portuguese Association of Construction Materials Traders (APCMC), which shows similar figures to those mentioned above, estimating total turnover of close to €18bn for 2020. This figure is further broken down by type of construction or type of building, and estimates turnover for building renovation at above €7bn with the figure for residential buildings standing at €5.8bn and non-residential buildings at €1.4bn. A part of these figures for the construction sector refer to types of improvement measures set out in LTRS, particularly those relating to building envelopes, such as the fitting of thermal insulation or the installation of efficient windows. It is thus expected that this strategy will reinforce these improvement measures by speeding up investment in the construction sector. Figures are estimated at an average of around €4.7bn/year (approximately €3.6bn/year for residential buildings and around €1.1bn/year for non-residential buildings).

From a different perspective, LTRS analyses the market problems presenting obstacles to the transformation of buildings and the maximisation of potential energy savings. With regard to split incentives, it emphasises the need to reinforce policies for the rental market, with greater monitoring and improved energy renovation of buildings as criteria to increase value in housing support programmes and to define significant performance and comfort levels. In relation to the market shortcomings currently seen on a national level, of note are those relating to lack of understanding of the use of energy and potential savings, lack of attractive and easy to access financial products and financing mechanisms, limited information on building stock, limited use of efficient and smart technologies and deficiencies in training.

LTRS also analyses the policies and actions necessary to achieve the renovation of existing building stock, from a broad energy efficiency perspective, considering the co-benefits covered by the simulations and the efficiency of other resources, such as water and metal resources, supported by a national roadmap setting out targets and progress indicators. The proposed support policies have been grouped into seven Areas of Action (AA): AA1 - Building Renovation; AA2 - Smart Buildings; AA3 - Energy Certification; AA4 - Training and Qualification; AA5 - Combating Energy Poverty; AA6 - Information and Awareness Raising and AA7 - Monitoring.

With regard to the mobilisation of investment, of note are existing financing programmes as well as those planned for coming years, with a view to supporting, among other objectives, the energy renovation of buildings. There are also support mechanisms for mobilising public and private investment which will complement the abovementioned programmes. As such, LTRS is in alignment with the European Recovery Plan, where the priority Renovation Wave initiative includes the provision of

financing instruments with a view to increasing the rate and quality of renovation in existing buildings and, as a result, compliance with the goal to decarbonise building stock throughout Europe.

As the simulation model defined that 100% of existing building stock in 2018 would be renovated by 2050 (through the implementation of different packages of improvement measures at different stages of the roadmap), and that the production of renewable energy was considered, including that produced locally, it can be seen that LTRS is in alignment with the goals established by the European Union to create decarbonised building stock which is highly energy efficient and with NZEB. National goals for carbon neutrality will also be achieved.

Achieving the goals proposed by LTRS will reinforce and drive the national construction and renovation industry against a background of economic and social recovery, while also providing huge potential for decarbonisation. Portugal's goal is to maximise this opportunity in full, based on a medium/long-term strategic vision to mobilise investment.

The new energy and climate model underway to achieve carbon neutrality is a unique opportunity for Portugal, which will transform the national economy through sustainable development based on a democratic and fair model, creating employment and wealth and territorial cohesion as well as preserving resources. The path to the decarbonisation of the economy is also an opportunity for investment and employment.

1. FRAMEWORK AND SCOPE OF LTRS

In Portugal, the domestic and services sectors, and the associated building stock, are responsible for more than 30% of final energy consumed. Almost two thirds of the national building stock was built before the introduction, in 1990, of energy efficiency requirements for new buildings, through Decree-Law No 40/90 of 6 February 1990, since repealed, which in many cases reflects high energy needs and even situations involving energy poverty, impacting on thermal comfort and the health of occupants. As such, it was concluded that the national building stock is old, particularly in the residential sector.

Among the problems affecting the energy performance of national buildings, in addition to the natural ageing of materials and lack of maintenance, it is possible to highlight the physical characteristics of buildings, especially with regard to the low thermal performance of the envelope and the inefficiency of the energy systems installed. Accordingly, to comply with national goals with respect to energy and climate as set out in NECP 2030 and RCN 2050, it is important to promote and support the in-depth energy renovation of national building stock.

The good energy performance of buildings must be considered as the core of national energy and climate policy, together with the electrification of consumption based on renewable sources. Potential energy savings in buildings is highly significant, and in some cases, energy efficiency measures could contribute to a reduction of more than 50%. This reduction in energy consumption will also allow a highly significant reduction in CO₂ emissions by the buildings sector, further contributing to compliance with energy efficiency and renewable objectives set by Portugal and the European Union.

Achieving carbon neutrality by 2050 requires a significant reduction in GHG, it is therefore important to design and implement sector strategies which will allow such a reduction to be achieved and consolidated. The evolution of GHG emissions in different trajectories of carbon neutrality requires highly significant decarbonisation of the national economy by 2030, and as such, it will be necessary to ensure that the different sectors of activity contribute to this objective. On a sector level, a series of national targets has been defined for the 2030 horizon in relation to those not included in the European Emissions Trading Scheme, and set out in NECP 2030, based on RCN 2050. LTRS seeks to create the conditions required so that these targets can be reached.

In the case of the residential and services sectors, a highly significant reduction is expected in emissions between 2020 and 2030. To promote the decarbonising of these sectors and comply with

emissions reduction commitments, it is important to reinforce actions leading to the energy renovation of buildings.

Table 2 - Overall national targets and national sector targets for the reduction of CO_{2eq} emissions with respect to 2005 [Source: RCN 2050, NECP 2030]

SECTOR	2020	2030
TOTAL	-18% to -23%	-45% to -55%
Services	-65%	-70%
Residential	-14%	-35%

Renovating buildings and making them more efficient from an energy perspective can also help achieve a range of objectives, more specifically, lowering the country's energy bill and dependency, improving comfort levels and indoor air quality, health benefits, boosting labour productivity, combating energy poverty, prolonging the working life of buildings and increasing their resilience.

The LTRS seeks to provide an effective response to this situation, and will apply to the national building stock of public and private residential and non-residential buildings (commerce and services), pursuant to the provisions of Article 2.A of the EPBD.

Also in accordance with Article 2-A, the aim is for LTRS to facilitate access to suitable financing mechanisms that stimulate the mobilisation of the necessary investment, and as such, help achieve a decarbonised and highly energy efficient building stock by 2050, and the cost-effective transformation of existing buildings into NZEB.

For this purpose, LTRS establishes a roadmap with improvement measures, measurable progress indicators and indicative milestones for 2030, 2040 and 2050.

LTRS has also come about at an important time in the Community plan, with the launching of the European Green Deal by the European Commission, as a roadmap to make the European Union economy sustainable, transforming climate and environmental challenges into opportunities in all areas of policy intervention and providing a fair and inclusive transition for all. Identified in the abovementioned Green Deal are several key measures for the decarbonisation of the energy sector and the increase of energy efficiency in buildings.

Among other sectors, buildings are at the centre of concerns underlying the European Green Deal. This fact is also recognised in the actions provided for in the roadmap presented at the end of 2019, which includes an initiative dedicated especially to building renovation called Renovation Wave, which seeks to address the current low renovation rates throughout the European Union, and to provide a structure enabling renovation to play a vital role in the support of a green and digital recovery.

With the Renovation Wave, the European Commission aims to achieve a faster and deeper renovation of buildings, where the intention is to build a European financing instrument of €91bn per year, which can be combined with other sources of financing, and could reach €350bn. At a later stage, this instrument could be extended to private buildings through the provision of 'green' mortgages, which will mobilise additional investment of €50bn.

It is now important to reinforce foundations for the renovation of buildings in Portugal by implementing LTRS and other instruments, in coordination with the abovementioned initiatives, particularly the Renovation Wave.

Furthermore, in the current epidemiological situation caused by COVID-19, where we are spending more time at home and our houses are even being used as offices for teleworking, greater importance is being placed on indoor comfort, on the relevance of measures to maximise health services and on the urgency of public and private investment measures which can drive economic recovery, thus making clear the value of LTRS.

2. BUILDING STOCK

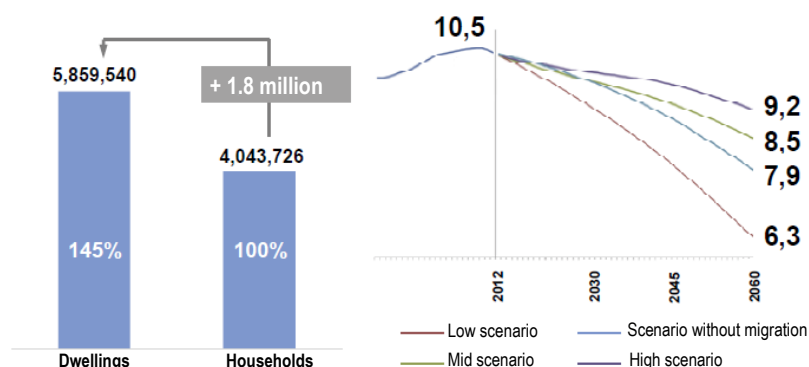
2.1 OVERVIEW OF PROPERTY STOCK

RESIDENTIAL SECTOR

Number of dwellings and households

Based on available data, in 2011 the population of Portugal was approximately 10 557 600, with around four million families. In the same year, it was estimated that the number of dwellings stood at almost six million, meaning that there was an excess in relation to the number of families of almost two million dwellings, as a result of empty property or seasonal use. In addition to this excess of housing, estimates point to a fall in the resident population in Portugal, which can be considered quite steep, depending on the assumptions used.

Figure 1 - Estimate of the number of dwellings and families (INE, I. P. 2011) [left] and estimate of resident population and forecasts 2012-2060 (INE, I. P., 2014) [right]



Dwellings and energy efficiency requirements

The first requirements on energy efficiency to assess the thermal behaviour of buildings for housing and to prevent overheating and construction issues were introduced in Portugal in 1990 through Decree-Law No 40/90 of 6 February 1990, since repealed. The estimate of building stock built until then, without any energy efficiency requirements stood at around 3.8 million dwellings, in other words, around two thirds of existing buildings. In 2006, the ECS was introduced in accordance with Decree-Laws Nos 78/2006 of 4 April 2006, 79/2006 of 4 April 2006, and 80/2006 of 4 April 2006, later repealed by Decree-Law No 118/2013 of 20 August 2013, as amended. The EPBD was then transposed into domestic law, since amended by Directive (EU) 2018/844 of the European Parliament and of the Council of 30 May 2018.

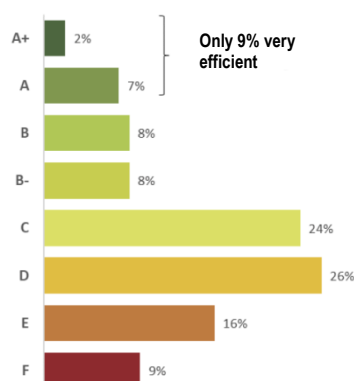
The following figures show the number of dwellings built with respect to energy efficiency requirements and energy performance for the housing sector up to 2018, demonstrating that just 9% of certified dwellings qualify as being very efficient (efficiency class A and A+). Energy certification data also shows that almost half of the improvement measures suggested by the qualified experts who conducted the energy audits for the issue of the energy certificates refer to the opaque envelope.

Figure 2 - Efficiency requirements and built dwellings (INE, I. P. 2015)

Dwellings without EE requirements

Requirements

Figure 3 - Energy performance for the residential sector based on the classes of energy certificates issued up to 2018 (ADENE-Energy Agency)



Conservation state and energy performance

It can be seen that in general, national building stock does not have the required capacity to provide suitable living conditions for occupants, more specifically, in relation to good indoor air quality and thermal and acoustic comfort. This leads to pathologies in construction elements which can cause health problems. Recent studies and data clearly demonstrate this situation. Unsatisfactory indoor air quality (particularly in housing, crèches and nurseries), and exposure to dampness and mould in more than 30% of dwellings (when the European Union average is around 16%), means that Portugal is the country with the second highest winter death rate in the European Union. Around 19% of the population are not able to heat their homes to suitable levels of comfort.

With respect to the conservation state and energy performance of national building stock, the following figures show that there is a directly proportional relationship between the state of conservation and energy performance. Given that a significant part of the abovementioned building stock is old and requires renovation, it is important to ensure that, during renovation, improvements are also carried out in relation to energy efficiency to optimise costs and time.

Figure 4 - Conservation state by construction period (INE, I. P., 2011)

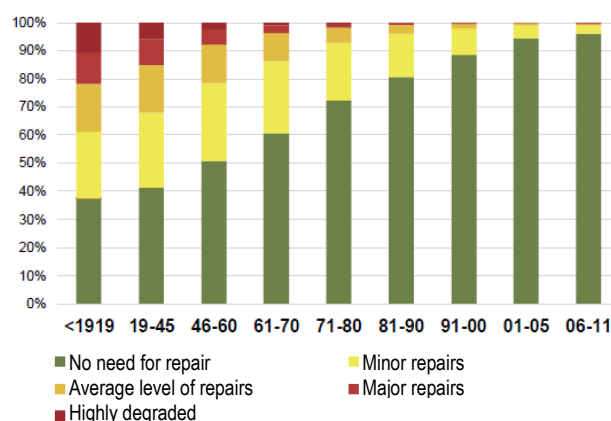
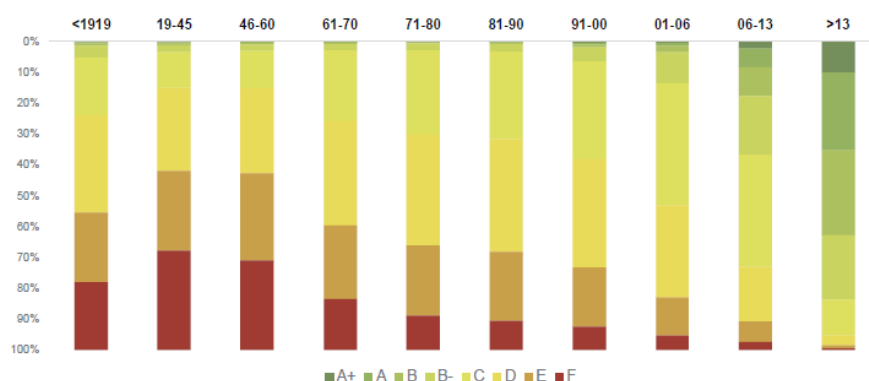


Figure 5 - Energy Performance by construction period (ADENE- Agency for Energy)



Target segment of buildings to be renovated

The study looked at all the dwellings in existence at the time (around 3.8 million in total), with the exception of empty homes and second or seasonal homes. It should be noted that although this universe corresponds to the buildings included in the reference model for the LTRS, which are considered of priority importance, many of the measures and actions planned may also benefit other buildings mentioned earlier.

Although LTRS considers the renovation of all building stock up to 2050, the worst performing segments have been prioritised in the initial stages, up to 2030, as they correspond to buildings built before 1990.

The rationale to consider the renovation of the entire building stock is based on the fact that given their current state and advanced age, existing buildings will require intervention work by 2050, assuming that by 2030, 65% of housing prior to 1990 will be the target of 'some renovation or other' which improves comfort, as needed. Buildings for which no comfort improvement has been identified or where there is no possibility of intervention work have been excluded.

Table 3 - Target segment of residential buildings to be renovated

Type of building	Construction period	Climate Zone	Number of dwellings to be renovated
Single Family	<1960	I1	275 719
		I2	246 051
		I3	38 826



Type of building	Construction period	Climate Zone	Number of dwellings to be renovated
Multi-dwelling	1961-1990	I1	420 770
		I2	489 503
		I3	77 978
	1991-2005	I1	209 624
		I2	259 548
		I3	34 251
	2006-2016	I1	57 006
		I2	67 333
		I3	9 132
	>2016	I1	1 805
		I2	1 355
		I3	195
	<1960	I1	169 540
		I2	15 152
		I3	775
	1961-1990	I1	595 478
		I2	133 918
		I3	12 335
	1991-2005	I1	410 485
		I2	160 669
		I3	12 071
	2006-2016	I1	92 615
		I2	30 111
		I3	2 208
	>2016	I1	3 177
		I2	1 092
		I3	84
			3 828 805

NON-RESIDENTIAL SECTOR

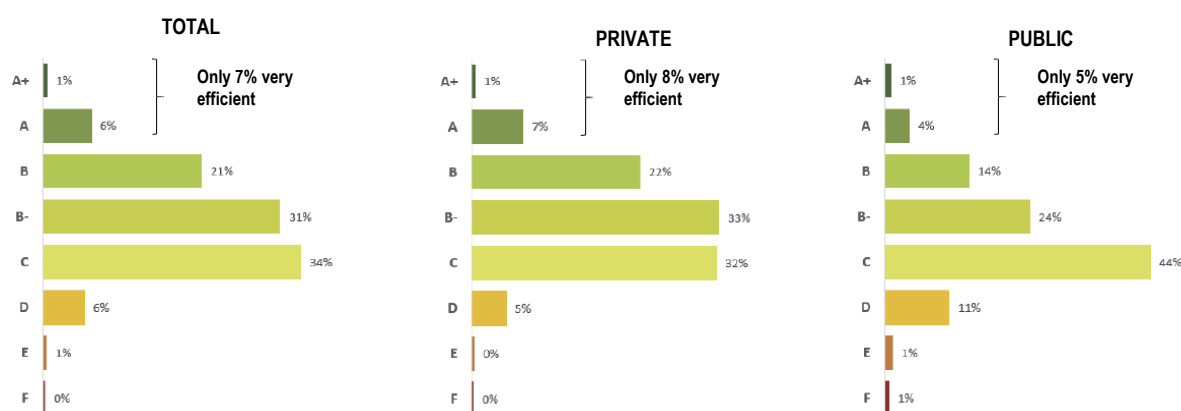
Number of buildings

Data are limited on the national building stock for service buildings. The energy certification database, which covered only a part of all existing buildings at July 2018, recorded 109 792 energy certificates for service buildings, 6 738 of which corresponded to large service buildings, 4 405 to small service buildings with climate control systems and 98 649 to small buildings without climate control systems. For energy simulation models, LTRS considered the sample of energy certificates for large services buildings with a floor area greater than 500 m².

Energy Efficiency Requirements

An analysis of the following figure based on the universe that was the object of the study mentioned in the previous point, shows that only 7% of certified large services buildings up to 2018 have a very efficient energy performance (classes A and A+). However, and unlike housing, 59% of energy certificates have an energy class of B- or higher, suggesting an already reasonable level of energy efficiency in building stock. It is however to be expected that potential energy savings as a result of energy efficiency improvement measures may be lower when compared to residential buildings, when taking into consideration the difference between these two categories in total building stock. In a comparison of the energy performance of public and private non-residential buildings, it is the public sector that has the worst performance, as 57% of energy certificates have energy class C or lower, as against 38% in the private sector.

Figure 6 - Energy performance for large services buildings based on the classes of energy certificates issued up to 2018 (ADENE-Energy Agency)



Target segment of buildings to be renovated

For the non-residential sector, the worst performing public buildings were defined as priority, as described in the previous point, but also those buildings where there is direct contact with the public, i.e. in the areas of education, health, sports arenas and other government services. This means that the stock to be renovated in these segments is estimated at 50% by 2030, 75% by 2040 and 100% by 2050, corresponding to a fairly demanding annual renovation rate of 5% in the first decade and 2.5% in remaining decades. This prioritisation is in line with Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency (EED Directive), and with the EPBD, the provisions of which require an example to be set by public authorities through the implementation and practice of energy efficiency improvements, and under which programmes are already underway such as the Energy Efficiency Programme in Public Administration (ECO.AP).

In addition to contributing to the reduction of public expenditure, public investment is a mechanism to drive the economy, justifying the focus on the renovation of national building stock. For private buildings, considerable work is also planned, although less demanding initially, to renovate 25% of building stock by 2030, 50% by 2040 and between 75% and 100% by 2050. However, it can be seen that in accordance with recent observations, private buildings are normally more efficient than public buildings, so it is expectable that private initiative will naturally absorb this rate of renovation work, supported by mechanisms and incentives designed for the purpose.

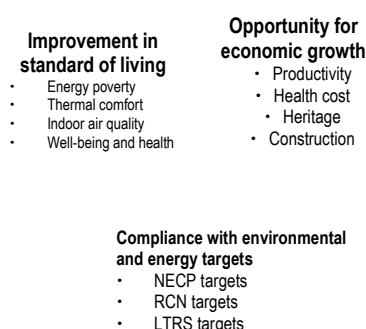
3. IDENTIFICATION OF IMPROVEMENT MEASURES

3.1 RATIONALE FOR THE STRATEGY TO RENOVATE BUILDING STOCK

The rationale behind the strategy which is to be implemented in national building stock consists of transforming property into NZEB so as to meet other priority and relevant national challenges which go beyond the energy and emissions aspects, more specifically, to increase thermal comfort, make gains in the fight against energy poverty, increase indoor air quality and prevent pathologies in construction and safety. Equally important is the efficient management of resources and materials, efficiency in water use and improvement in the environmental performance of buildings. It is thought that it will be possible to meet the different objectives established, including the decarbonisation of existing buildings, increasing the share of renewable energy and transformation of property into NZEB. This approach will include other priority challenges that will give rise to other relevant benefits, such as increasing the value of buildings by improving their state of conservation.

LTRS is based on three main areas:

- I. the improvement of standards of living, where the priorities are to combat energy poverty, improve thermal comfort and indoor air quality and promote the health and well-being of occupants;
- II. the opportunity for economic growth through co-benefits associated with the renovation of national building stock, while promoting labour productivity, reducing health costs, increasing the value of property and driving the construction sector;
- III. compliance with energy and climate targets aligning the assumptions and results of LTRS with other national energy policy instruments, more specifically, RCN 2050 and NECP 2030.

Figure 7 - Assumptions that leverage LTRS

3.2 IDENTIFICATION OF COST-EFFECTIVE APPROACHES IN RENOVATION: TYPE OF BUILDING AND CLIMATE ZONE

To quantify the impact of the different renovation scenarios, it was necessary to describe the national building stock in detail through simulation models. For this purpose, a sample of 240 650 energy certificates (EC) was used, issued by the Energy Certification System (ECS) up to 2018, to define the input data model, which included the construction period, type of building, geographical location, solar orientation of the different construction elements, useful floor area, the glazed or opaque fraction of façades, the thermal transmission factor of the different construction elements, boundary conditions and the climate control and DHW systems installed.

Energy simulation models were built in an hourly dynamic simulation environment to allow effective consumption to be estimated (unlike the nominal theoretical consumption of energy certificates) as well as thermal comfort conditions. To achieve this goal, building occupancy profiles were defined as was the use of climate control systems taking into account the ISO 17772-1:2017 standard.

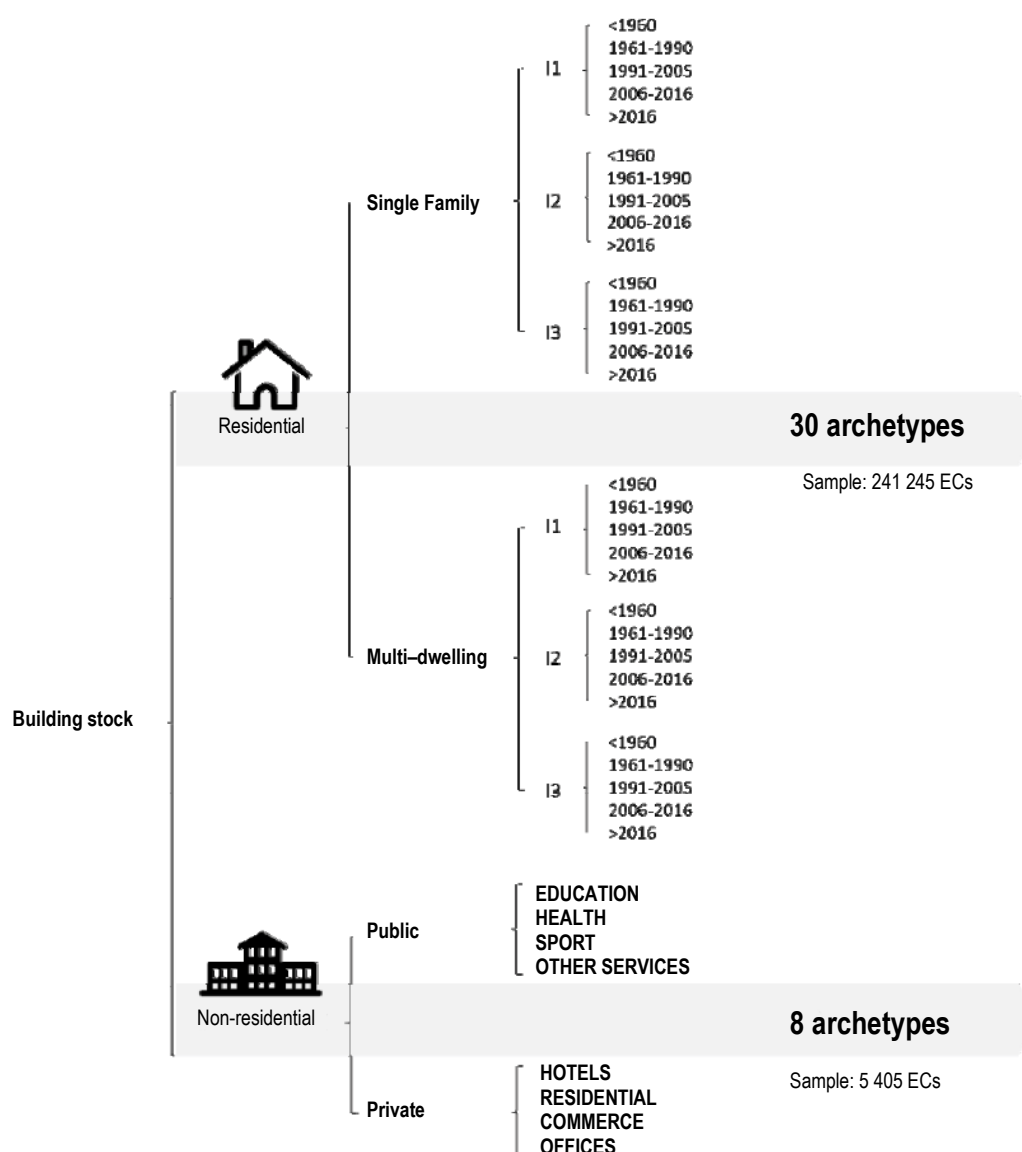
Due to the high number of buildings to be simulated and the complexity of these models and computing requirements, building stock was classified in archetypes which are representative of groups of samples of buildings. These archetypes function as virtual models which represent, on average, the infrastructure characteristics, consumption, thermal comfort and climate control systems of the sample of certificates on which they are based. As a result, it is possible to characterise the national building stock based on a finite number of archetypes where the larger the number of archetypes and homogeneity of the sample represented, the more the virtual model resembles reality.

The following figure shows the segmentation of the building stock into different archetypes taking into account type and use, more specifically, residential (30 archetypes) or non-residential (8

archetypes). Residential building stock was then broken down by type of building (single-family or multi-dwelling), by winter climate zone (I1, I2 and I3) and by construction period (<1960; 1961-1990; 1991-2005; 2006-2016 and >2016). The criteria of classification by winter climate zones, is mainly due to the considerable heating requirements of national residential buildings when compared to cooling requirements, and the fact that the latter can be partly reduced by implementing passive ventilation measures, such as night time ventilation, taking advantage of thermal inertia and the cooler evening temperatures which exist in Portugal.

Considering the types of most representative buildings in the ECS, non-residential building stock was broken down into public buildings (education, health, sports arenas and other services) and private buildings (hotels, residential, commerce and offices).

Figure 8 - Classification of building stock used in simulations



Thermal comfort as an energy renovation criterion in residential buildings

With respect to methodology, energy requirements and thermal comfort requirements were first analysed for the national building stock, with emphasis on the residential sector. Based on this detailed assessment (baseline scenario), possible improvement measures were explored for each type of

building and geographical location, and possible policies and measures were identified to support their implementation.

To define the most suitable type of intervention for each archetype, the criterion of thermal comfort was used due to the national situation, where the use of climate control equipment is limited and buildings are at free-floating temperature at most times (a simulation without climate control systems and considering natural ventilation). For this purpose, the European Comfort Standard EN 15251:2007 was applied, in accordance with which the comfort criteria in buildings with natural ventilation and without cooling equipment are adaptive in the summer. This is due to the extensive dependence on expectations of outdoor temperatures for comfortable indoor temperatures, and also through the possibility of controlling temperatures by opening windows, when convenient, and the use of suitable clothing. When outside temperatures are higher over a few days, people tend to moderate their expectations for comfortable indoor temperatures, which also increase during this time, and for this reason, comfort temperature limits are not fixed, but rather variable and depend on outdoor temperatures.

Improvement measures were selected to ensure that the archetypes achieve acceptable comfort conditions, i.e., that they rise from category IV to category III of comfort, without the need for a corresponding increase in energy consumption. The archetypes corresponding to the target segment of buildings to be renovated for the housing sector and the results of the comfort assessment can be found in Chapter 7 - Estimate of benefits.

Improvement measures considered

As the initial rationale was the thermal comfort of housing, passive improvement measures were studied for the envelope in this segment of buildings. These measures are based on the minimum requirements set out in current regulations for each climate region, in line with cost-optimal analyses and the definition of NZEB (nearly zero-energy buildings), in accordance with the data shown in the following table.

Table 4 - Package of improvement measures involving the envelope

Construction element	Walls	Roofing	Glazing
Type	Thermal insulation $\lambda = 0,037 \text{ (W/m}^\circ\text{C)}$	Thermal insulation $\lambda = 0.04 \text{ (W/m}^\circ\text{C)}$	Span with double glazing $U \text{ (W/m}^2\text{/}^\circ\text{C)}$
Thermal characteristic			Solar factor of a glazed span
Rationale	Additional thickness to achieve minimum requirement for each climate region	Additional thickness to achieve minimum requirement for each climate region	Solution required to achieve minimum value of thermal transmission coefficient and maximum admissible solar factor for glazed spans for each climate region.

For archetypes where passive solutions are not enough to achieve a category III class of comfort in free float temperatures, or for those where climate control systems are already installed (such as in non-residential buildings), improvement measures are planned for climate control and energy production systems, in accordance with the data shown in the following table.

Table 5 - Package of measures to improve climate control systems and energy production

Function	Type of equipment
----------	-------------------



Heating/Cooling	Reversible air to air heat pumps
Heating	Biomass heat exchanger
	Near-surface geothermal
DHW	Solar thermal with electric back up
	Air-to-water heat pump
	Biomass boiler

Furthermore, other improvement measures are planned to replace lighting with LED systems and to install photovoltaic panels for own power production, sharing and injection or storage of any excess produced. The following section shows the roadmap of scenarios with the policy packages to be implemented by 2050.

The measures referred to earlier may be implemented individually or cumulatively, depending on the level of renovation in question. The level of renovation is defined by the specific characteristics of the building, considering the type of construction system and systems installed, and by the respective energy requirements, varying in accordance with location. Considering the variability of the national building stock, these levels will naturally be different. Older buildings with worse performance will, in principle, require greater renovation (and more improvement measures are therefore considered), unlike more recent buildings (less improvement measures considered).

It is also important to note that standard technical construction solutions, even those guaranteeing the best performance in specific conditions, may, in some cases, not be suitable for certain buildings. Therefore, and without prejudice to the use of such improvement measures in the LTRS support model, other non-standard technical construction solutions may be considered, provided that their performance is equivalent, duly substantiated and proven (may form part of a database on solutions which are applicable in similar situations) thus avoiding the loss of character of the building stock.

Analysis of economic impact

To assess the economic impact of the different improvement packages used in LTRS, the economic assessment methodology as applied to energy efficiency projects was used, where the savings brought about by the efficiency measures are considered to represent positive monetary flows for the investment project.

For each package of energy efficiency measures, an initial investment value was identified as were operating and maintenance costs, the residual values of equipment at the end of the period under analysis and the savings achieved, calculated as the difference in energy consumption (electricity, gas, biomass and heating diesel) between the reference building (current case) and the building after implementing the policy packages.

To conduct this analysis, different assumptions to characterise the variables were considered:

Project life span, where each package consists of a series of measures, with various technologies and life spans and implemented at different times. To be able to compare all the packages and technologies included, each one was analysed taking into consideration an application period of 30 years, from 2020 to 2050. Within each package and should the technologies have a lower life span than the respective implementation period, reinvestment (partial or total, depending on the technology) was considered over the following 30 years, after which the residual values of the technologies are considered. All values are calculated considering 2020 values.

Investment costs, where an extensive market study was conducted of the different technologies based on a project variable (e.g. the area of application of insulation or glazing, the performance coefficient for heat pumps or power for lighting), with a view to characterising the investment costs of the different measures. A clustering analysis was then conducted on the different points, followed by a regression on the cluster centroids which were identified. The regression curve is then used to calculate

the investment cost for each package. For some of the technologies where only one cluster was identified, the information from the resulting centroid was used, more specifically:

- Residual value: as each package includes technologies with different life spans, the linear depreciation of the equipment in the measures was considered, and the respective residual value at the end of the assessment period was also considered;
- Discount rate: the investment discount rate was calculated based on the inflation rate recorded over the last decade (1.5%) and on the average cost of capital over the last decade (1%), and as such, the rate used was 2.52%;
- Evolution of energy prices: to better estimate savings, the evolution of prices for the different types of energy recorded over the last decade was considered. As these changes were different to inflation, the base costs and the annual evolution rates considered are broken down in the following table.

Table 6 - Energy costs

Energy vector	Base price	Annual evolution
Electricity (residential)	0.2246 €/kWh	1.50%
Natural gas (residential)	0.0759 €/kWh	1.00%
Biomass:	0.05 €/kWh	0.00%
Diesel	1.08 €/litre	3.40%
Diesel	0.108 €/kWh	3.40%

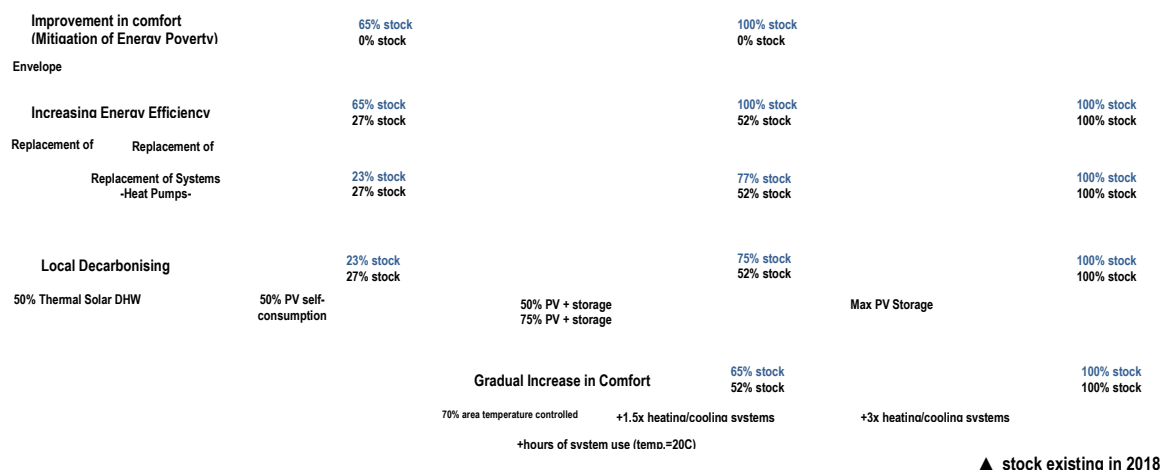
3.3 TIMING OF IMPROVEMENT MEASURES

In view of the improvement measures set out above, a series of policy packages was designed to provide a gradual view of the impacts and investment requirements needed to achieve the LTRS.

With respect to the LTRS, it is important to clarify that the energy renovation of buildings corresponds to a series of actions on a building's envelope, replacing or acquiring highly efficient technical systems (including the installation of infrastructure and e-vehicle charging points when renovating large buildings, in compliance with the EPBD), and the integration of renewable energies. The following figure shows a roadmap with four policy packages to be implemented by 2050, duration the planned improvement measures, the respective percentage of building stock affected, the stage at which they will be implemented and their duration. It is important to note that these packages are cumulative (e.g. in a part of building stock built prior to 1990, work may only be necessary on the envelope, while in another part it will be necessary to also consider the replacement of systems), also corresponding to different levels of renovation. For example, in the package for improvement of comfort, work on the envelope may require fitting thermal insulation, or only reinforcing the insulation, or the replacement of glazed spans.

A fifth package of improvement measures was also tested, the aim of which was to simulate the impact of some integration of sensors to automatically control shading and natural ventilation devices in buildings. Overall, a figure of around 2% in energy savings arises from these measures, and as such, this residual value was considered in comparison to the model error. The reason why such a low figure is obtained is that in residential buildings, optimisation in the use of blinds and the opening of windows by occupants was assumed (behavioural action) so as to improve indoor thermal comfort. In non-residential buildings (services), optimisation in the use of natural ventilation sensors takes place at night (mainly during summer), which normally corresponds to periods when the building is empty and has low use of cooling systems. In these buildings, benefits are more related to the increase in hours of comfort than to the reduction in energy consumption, although mostly in vacant periods.

Figure 9 - Roadmap of the policy packages to be implemented by 2050



PACKAGE 1 - Improving comfort and combating energy poverty

This package of improvement measures aims to act on the thermal envelope of buildings so as to ensure acceptable levels of comfort (category III) without increasing energy consumption for heating, thus helping eliminate situations of energy poverty.

The implementation of this package is divided into two stages:

by 2030, to be implemented in residential buildings with worst energy performance, more specifically, permanent dwellings built prior to 1990, corresponding to 65% of national building stock in 2018;

by 2040, in remaining residential buildings built up to 2016, corresponding to almost 100% of national building stock in 2018.

In the case of non-residential buildings, the results of simulations show a worsening of comfort conditions and consequent increase in energy consumption, especially in the summer, mainly due to the high thermal load which coincides with daytime occupancy. Therefore, this package of measures was not considered in non-residential buildings.

PACKAGE 2 - Increase Energy Efficiency

This package of measures considers the replacement of almost all current lighting with LED lamps by 2030, thus contributing to a significant reduction in electricity consumption through a relatively small investment. It also considers a gradual reduction of 10% in energy consumption by equipment, taking into account the trend to increase the energy efficiency of such equipment.

This package is cumulative with the previous package, and will be implemented by:

2030, in 65% of the residential stock and in 27% of the non-residential stock;
2040, in 100% of the residential stock and in 52% of the non-residential stock;
2050, in 100% of the building stock in 2018.

Finally, the replacement of heating, cooling and DHW systems with more efficient systems (e.g. heat pumps), is only planned for residential buildings unable to achieve category III comfort after the implementation of Package 1, applicable, with due adaptations, to social housing and to the Controlled Costs Housing scheme (HCC). In non-residential buildings, priority is given to public buildings (50% in 2030, 75% in 2040 and 100% in 2050) as against figures for private buildings (25% in 2030, 50% in 2040 and between 75% and 100% in 2050), as in these cases, there is greater contact with the public, as well as greater potential for reducing public expenditure.

This package also aims to promote the electrification of building stock, and the replacement of gas and diesel systems with electric systems is planned for both sectors by 2040. In the case of residential buildings, additional efforts will be made to replace LPG by 2030, with particular emphasis on families in a situation of energy poverty.

PACKAGE 3 - Local decarbonisation

This package of measures aims to reinforce the focus on renewable energies with emphasis on local power production. Accordingly, one of the assumptions of modelling is based on the elimination of 50% of DHW requirements through solar panels to be installed in both residential as well as non-buildings, whenever roof area is available, taking into consideration the identity and heritage value of buildings.

With special focus on non-residential buildings and taking into account their high energy consumption combined with the period of photovoltaic production coinciding with the high occupancy period, this package also provides for the implementation of photovoltaic systems. Modelling assumptions point to 50% self-sufficiency, corresponding to 27% of stock in 2030, whenever roof area is available, taking into consideration the identity and heritage value of buildings.

By 2040, and with the maturing of the battery market, the gradual implementation of such systems is also expected in residential buildings. Modelling assumptions point to 50% self-sufficiency and the sale or sharing of excess production to the grid.

By 2050, the model is designed to maximise electrical power production, optimising the introduction of photovoltaic systems with batteries, taking into consideration the cost-optimal nature of this measure and physical availability for installation.

PACKAGE 4 - Gradual increase in comfort

With the gradual improvement in the standard of living and the quality of buildings and with greater availability for new technologies, it is expectable that future generations will be more demanding with regard to the thermal comfort of housing. As such, it will be prudent to consider a rebound effect in relation to reductions in energy consumption, meaning that the progression of indicators will be more conservative.

This package of measures, which is cumulative with previous measures and to be implemented by 2040 and 2050, defines an increase in heated and cooled area, number of hours of use of the systems in residential buildings, and a gradual increase in the availability of cooling systems which is expected to triple by 2050. It is important to note that the increase in consumption arising from this effect does not compromise the aim of LTRS to transform national building stock into NZEB, as the active systems considered are electric (and therefore will benefit from the introduction of at source renewable energies), have high energy efficiency and are complemented by photovoltaic systems using storage, whenever roof area is available, taking into consideration the identity and heritage value of buildings.

3.4 COST-EFFECTIVE TRANSFORMATION OF BUILDINGS INTO NZEB

As mentioned earlier, the EPBD requires each Member State to establish a long-term renovation strategy to decarbonise building stock and make it highly energy efficient by 2050 and to facilitate the cost-effective transformation of existing buildings into nearly zero-energy buildings. Also in accordance with the abovementioned Directive, part of the energy consumption (efficient) of such buildings must be largely renewable in origin and preferably produced locally.

Accordingly, in light of the abovementioned directive and the need to transform national building stock into NZEB, it has been concluded that, initially, deep intervention will be required with regard to building envelopes and, at a later stage, with regard to equipment (including the installation of infrastructure and e-vehicle charging points), so as to ensure high energy efficiency. Local renewable energy systems will also be installed. Such measures are not directly called for by the two abovementioned requirements.

The approach adopted by LTRS, with a view to transforming national building stock into NZEB is based on assumptions and drivers which are in alignment with underlying assumptions and drivers, exactly as defined for NZEB. Therefore, and without prejudice to the consideration that the definition of NZEB is not static and will evolve over the years, LTRS uses certain approaches that are in line with the general definition of NZEB presented in the abovementioned directive, complemented with other drivers:

1st pillar NZEB - Low energy requirements: Passive renovation solutions provided for in the archetypes so defined are based on the minimum requirements in force at the time they were drawn up, which in turn are derived from the requirements analysed in cost-optimal studies following the application of the framework defined by the European Commission with national assumptions. The interpretation of useful energy requirements in final energy is assessed in housing based on the comfort categories set out in Standard EN 15251:2007 and with the following approach:

- if category III or higher is achieved, it is assumed that the archetypes have a suitable level of comfort and that they are likely to lead to lower final energy requirements and, consequently, energy not being consumed for heating or cooling;
- if, after the application of passive measures, the archetypes achieve category IV, although far from the description of category III, it is assumed that active systems leading to an effective final energy consumption will be needed, where the use of efficient heat pumps has been partly considered.

2nd pillar NZEB - Contribution of renewable energies: The contribution of renewable energies was considered based on several assumptions including the use of such renewable energy, solar thermal systems, biomass equipment and photovoltaic systems, all exclusively or as a complement to the heat pumps referred to in the 1st pillar NZEB.

3rd pillar NZEB - Source of renewable energies: The contribution of renewable energies in the model is firstly based on the forms of local capture or conversion for the equipment referred to in the 2nd pillar NZEB. Equally considered in the results for the different aims of LTRS were the effects of electrification, taking into account the current and future renewable fraction in the production of electricity, as provided for in diverse national energy policy instruments.

4. MARKET FAILURES

Despite the general increase in investment in the improvement of the energy performance of buildings and the many examples of good practices resulting in cost-effective energy savings, information continues to be limited with respect to the effectiveness of the different financial support measures, both nationally as well as on an EU level.

Obstacles still exist which hinder investment in the improvement of the energy performance of buildings, particularly with regard to the lack of awareness and specialised skills concerning the

financing of energy efficiency by all players. Factors include the high initial investment costs, the relatively long periods of amortisation and the risks. This is also true for the perception of risk in energy efficiency investment, interest rates and the priorities of final beneficiaries. Examples include lack of demand for financial products and mechanisms, and constraints arising from the owner/tenant relationship, both with respect to the definition of corresponding rights and obligations, as well as to who is responsible for taking on the costs involved.

Furthermore, the importance of an adapted approach to the financing of energy efficiency means that close cooperation should be promoted between public authorities, financing entities, the construction industry and the public, as the wide-ranging financing mechanisms and the complexity of applying to such instruments has proven to be a constraint both for people in general as well as public and private entities.

Changing established behaviour and ideas is more difficult to achieve but leads to more effective results, and as such, efforts should be focused on the process to provide more information and raise awareness among owners and users with regard to the overall benefits of energy renovation, including lower energy bills, improved comfort and an increase in the value of the property. The macro-economic reasoning to evolve in this direction is solid, therefore the mobilisation of existing incentives and the defining of other more specific incentives, together with efforts to raise awareness so as to change attitudes, constitute the right path to achieve these goals.

4.1 SPLIT-INCENTIVE DILEMMAS

Splitting incentives between owners and tenants and the way in which renovation benefits are shared form obstacles to energy efficiency. Incentives are split between the owner and the tenant of a building, or between owners, when the party who pays for the energy renovation or updates to improve energy efficiency cannot recover all of the benefits and savings generated.

Although Portugal is not a country with a high rate of residential building rental (according to CENSUS 2011, 794 465 classical family dwellings were rented, representing around 20% of stock), this sector could contribute to the energy renovation incentive of national building stock, so it is important to implement solutions which avoid split incentives for the energy renovation of buildings.

In this regard, a series of programmes has been implemented to promote the rental market, which could contribute to an increase in the current rental rate, thus providing an opportunity to intervene with respect to split incentives. A number of these programmes fall under the New Generation of Housing Policies, provided for in Council of Ministers Resolution No 50-A/2018 of 2 May 2018. Of note are the following:

Accessible Rental Programme: aims to promote a wide supply of housing for rental at prices that are compatible with the earnings of families. In this programme, rents are planned to be 20% lower than the reference value calculated based on several factors, more specifically the degree of energy efficiency. The minimum duration of a rental contract included in this programme is five years.

Young People Porta 65 Programme: aims to support housing rental by allocating a percentage of the rent as a monthly subsidy, which has the goal of regulating incentives for young renters, thus stimulating more autonomous life styles for young people living alone, in families or sharing. This programme further seeks to rehabilitate degraded urban areas and promote the rental market.

Rehabilitate to Rent Programme - Accessible Housing: the aim here is to finance renovation operations in buildings that are 30 or more years old. After renovation, such buildings are required to be predominantly for housing purposes, and apartments are intended for rent under the conditional rental regime.

Support programme for access to housing 1st Right: aimed at the rehabilitation of buildings and rental to people living in unfit housing conditions and who do not have the financial capacity to bear the

cost of suitable housing. The supported rental scheme applies to housing owned by (in)direct administration entities of the State, the autonomous regions, local authorities, the public corporate sector and regional and (inter)municipal corporate sectors, which they (sub)lease with rents being calculated based on the earnings of the target households.

Policies and actions to combat the splitting of incentives in Portugal must be proportional to the rental market in existing building stock. However, only limited information is available on the rental market, particularly as regards the number of properties rented by the non-residential sector, as well as the socio-demographic characteristics of tenants or the average duration of a rental contract in Portugal. It is difficult to accurately depict the current status of this market in a way that would enable the promotion of energy efficiency in rental properties to be optimised.

All the programmes mentioned already contribute in some way to combating split-incentive dilemmas, in an attempt to provide a series of distinct scales, with different beneficiaries and aims. However, the incorporation of additional support for the improvement of energy performance in buildings may prove to be an effective measure for recognising the importance of energy renovation. In the specific cases of social housing or the Controlled Cost Housing (HCC) scheme, it is necessary to continue to invest in energy renovation so as to maximise the performance and comfort levels of rented property, always taking into consideration a balance between investment and the limits of applicable rents and associated costs.

4.2 MARKET SHORTCOMINGS

The concept 'market shortcomings' includes the issues which tend to delay the transformation of property and the maximisation of potential energy savings, more specifically:

- lack of understanding with regard to the use of energy and potential savings;
- limited renovation and construction activity against a background of post-financial crisis;
- lack of attractive financing products;
- limited information on the stock of property;
- limited implementation of efficient and smart technologies.

Lack of understanding with regard to the use of energy and potential savings

Portugal already has a series of initiatives that aim to address the issues of poor availability of information and energy illiteracy among the public:

CINERGIA - Energy Information Centre: aims to provide the energy consuming public and energy producers with an integrated vision of the energy sector, thus contributing to greater energy literacy in civil society;

Energy Observatory: aims to promote greater transparency, greater competition and greater dissemination of knowledge on energy, thus contributing to greater energy literacy, the efficient use of energy resources and a reduction in the time to change supplier, through easy access to impartial and independent information;

Save Energy: platform to compare electricity and natural gas tariffs, where the aim is to provide consumers with a tool allowing an informed choice/change of supplier, while also promoting efficiency in the consumption of energy;

Project 'Informed Consumer, Careful Consumer': aimed at residents in the interior of the country where the goal is to make people more aware with regard to energy consumption and promote efficiency and lower energy use in homes.

Despite these efforts, investment must continue in information campaigns and awareness raising with respect to the (in)direct benefits of energy renovation, so as to promote energy renovation in the renovation market. Development efforts must be coordinated between the different entities so as to make it possible to obtain a range of actions which reach different layers of society and which bring together the different players who work closely with the public and who have knowledge of local issues, such as consumer associations and regional energy agencies.

Limited renovation and construction activity against a background of post-financial crisis

In recent years, the construction industry has experienced a deep crisis caused by the recession in the world economy. However, and according to the National Statistics Institute (INE, I. P.), as of 2017, the production index in this sector started to record monthly growth, driven by the residential sector, in accordance with data from the Portuguese Confederation of Construction and Property.

The number of licensed buildings in Portugal grew 17.6% over the previous year, where buildings licensed for new construction reinforced their predominance in 2018, representing 68.9% of all licensed buildings.

Building renovation work (changing, extending and rebuilding) grew 11.7% and in 2018, had a weighting of 25.3%. Growth of 19.0% was seen over figures for 2017 in the number of concluded buildings, involving mostly new construction (73.6%). Residential buildings represent 72.2% of all buildings completed, while concluded renovation work grew by 10.6% (2.6% in 2017), with total weighting of 26.4% in 2018.

However, in 2016, the percentage of renovated buildings (large-scale renovations) was still very low (estimate of around 0.1%) with respect to the needs of existing stock.

No official statistics exist with respect to less extensive renovation work (replacement of windows, installation of thermal insulation, etc.) which would allow an annual renovation rate to be established.

Lack of attractive financing products

A set of active financing products are in force to support the renovation of building stock in Portugal, which also promote the implementation of energy efficiency measures. Some of these instruments form part of the New Generation of Housing Policies established in 2018 which have the aims of ensuring access by everyone to suitable housing and creating conditions so that both urban and building renovation go from the exception to the rule.

However, some of these policies to mobilise investment for energy renovation are defined with a short time span (up to 2023) and have limited financing. It is therefore necessary to establish a strategy to mobilise public and private investment and improve access to medium and long-term financing mechanisms, ensuring the cost-effectiveness of the support measures and mechanisms to achieve the goals set out in LTRS.

The financing products available do not always seek to maximise the positive impacts of energy renovation. As provided for in the EPBD, renovation measures and incentives must depend on planned or obtained energy savings, along with the positive benefits relating to health, safety and air quality, etc.

Financing products should also seek to reduce the perceived risk of investors in financing operations. Furthermore, and with a view to minimising the negative effect of some products currently available on the market, financing solutions must have attractive conditions so as to differentiate them from other credit products and drive their uptake by consumers and companies. At the same time, financial products must be flexible, both with respect to administrative procedures as well as the time taken to conclude them.

There is also a series of actions related to the public urban policies currently in force which need to be converged so as to act coherently in urban rehabilitation. For example, the establishing of

strategies for delimiting the Urban Rehabilitation Area (URA) integrated into a systematic process for spatial planning, as URAs form criteria of access to many of the abovementioned financial instruments, more specifically tax benefits.

Limited information on the stock of property

There is considerable disparity in official information available on building stock in Portugal. The main source of information on the residential sector is the National Statistics Institute (INE, I. P.), where data is mostly provided by censuses (Population and Housing Censuses), which take place every 10 years.

Every year, the National Statistics Institute publishes statistics on Housing and Construction, however, they are frequently insufficient for full monitoring of national building stock or its transformation. For example, with regard to day-to-day renovation work (other than large-scale renovation), there is no information available allowing the real annual renovation rate of buildings to be gauged, as statistical information available from INE on the licensing of concluded building work comes from checks by municipal authorities under the Legal Regime for Construction and land Development, which allows exemption from licensing or authorisation for a significant part of improvement work conducted in buildings.

The information available on public and private non-residential buildings is particularly poor. Barómetro ECO.AP aims to characterise, compare and disseminate the energy performance of central government buildings to the public, and provide some information on the respective consumption and energy mix including renewables, by geographical location. Moreover, the State Property Information System also provides reports with some information on State property (e.g. quantity of buildings, ownership, function and location). Energy certificates are a further source of fairly extensive information as they compile data on building construction systems under the Energy Certification System (ECS), as well as on climate control and energy production systems. However, the sample referred to (around 1.4 million residential dwellings and 185 000 non-residential spaces, up to 2018) does not cover all building stock.

It was concluded that the abovementioned databases have limited information on building stock (both with regard to the available indicators as well as the sample provided), and it is often not possible to cross-reference information from different sources (due to lack of common identifiers and levels of information aggregation). It is therefore necessary to develop a comprehensive monitoring programme capable of providing a complete picture of building stock with reasonable frequency.

Limited implementation of efficient and smart technologies

The installation of smart meters has numerous advantages for consumers, including automatic, real-time readings of consumption, thus providing users of non-residential buildings with greater control and enabling them to monitor consumption.

With regard to the electricity sector, the largest distribution network operator is now installing smart meters all over the country (by the end of 2020 it is expected that 60% of residential clients will have a smart meter in their homes). The aim is for the entire country to be able to take advantage of such equipment.

In the gas sector, also a pilot project aims to install smart meters. However, this change is still at a very early stage, and the pilot project only has 100 meters in the Lisbon metropolitan area.

With respect to water, a series of initiatives exist for some management entities to install smart meters.

It is also important to ensure that methods are adopted enabling consumers to take advantage of the data they can see and analyse, as collected by real-time metering systems, so they can quickly respond. It is hoped that this will bring about a positive change in consumer behaviour.

In non-residential buildings, particularly in those for commerce and services, the use of smart management systems has huge potential for growth with considerable advantages to be gained with regard to energy performance and resource efficiency etc.

Future requirements for the interconnection of buildings for smart cities will also mean greater application of such systems.

In short, it is necessary to focus on and accelerate the creation of infrastructure in existing buildings in order to prepare them for the challenges of energy transition and digitalisation.

5. AREAS OF ACTION (AA) AND POLICIES

As a result of the analysis of building stock, the cost-effectiveness of improvement measures and the identification of market failures, a Building Programme has been provided for, shown in the following figure, based on a series of AA in line with the strategic objectives set out in the EPBD, more specifically:

set up a favourable environment for the deep renovation of national building stock so as to create NZEB with a view to improving the respective energy performance and, as a consequence, their environment performance;

promote smart buildings, making them more efficient, safer and more comfortable;

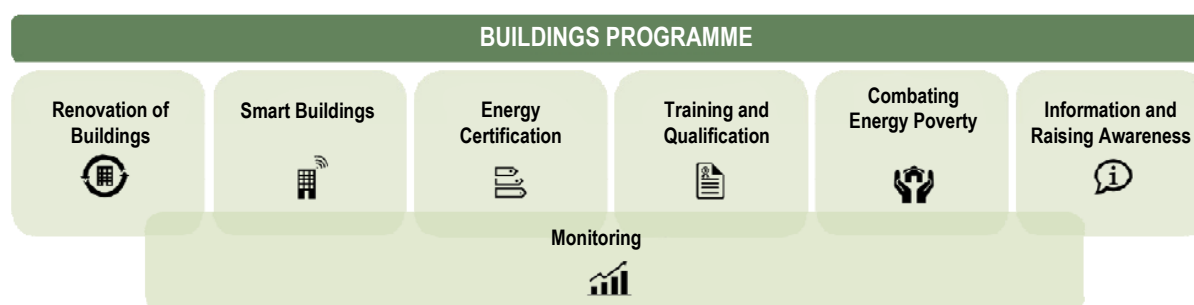
reinforce the role and contribution of energy certification to improve the energy performance of buildings, considering instruments for the environmental certification of construction products and services;

increase the technical capacity of construction and energy professionals, aligning this capacity with energy efficiency and building decarbonisation targets;

combat energy poverty, supporting more vulnerable households in the energy renovation of their homes;

raise public awareness of both energy and non-energy benefits to be obtained from renovation, providing them with the information that will promote and facilitate the interventions.

Figure 10 - Areas of action in the Buildings Programme



In order to define which policies should be implemented to promote each AA, a Europe-wide benchmarking exercise was performed which identified more than one hundred policies relating to the energy renovation of buildings and support for implementing improvement measures in such buildings. 70 measures were analysed considering their potential relevance for Portugal.

As part of LTRS, the proposed measures have been grouped into seven AA:

AA1 - Renovation of Buildings;
AA2 - Smart Buildings;
AA3 - Energy Certification;
AA4 - Training and Qualification;
AA5 - Combating Energy Poverty;
AA6 - Information and Raising Awareness;
AA7 - Monitoring.

Taking into account that the indicative targets needed to achieve energy efficiency aims in the European Union are very high and that in Portugal, the current rate of renovation in building stock is significantly below that required to comply with these targets, a number of policies and actions considered as disruptive are presented, with the aim of producing a change in the status quo.

Also included are complementary measures to reinforce energy efficiency, which broaden the scope of intervention work and the range of players, increase the combined potential of savings for families and users of buildings (through resources connected with energy). There is also further potential to align LTRS and financial instruments with different national and regional priorities involving water shortages and the need to introduce water management measures so as to increase autonomy and resilience during periods of drought (through greater efficiency in the use of alternative sources of water) and aims to reduce high water peaks (particularly through the use of rainwater).

Table 7 - Policies by area of action

Area of action	Type	Policies
AA1 - Renovation of Buildings	Actions to stimulate cost-effective deep renovation of buildings	Financial support through the setting up or reorienting of credit lines for renovation, in line with the sustainability criteria of buildings Reorienting of tax revenue for the improvement of the energy and environmental performance of buildings Simplify and standardise processes and audits Review the regulatory framework for the energy performance of buildings, considering instruments for the environmental certification of construction products and services
	Actions intended to combat split-incentive dilemmas	Combat split incentives by promoting a balance of incentives and benefits between tenants and owners
	Actions seeking to overcome market shortcomings	Combat market shortcomings through innovative financing solutions
	Actions to stimulate cost-effective deep renovation and actions intended to combat split-incentive dilemmas	Create a legal and financial framework which reinforces the role of owner/condominium associations
	Actions directed at all public buildings and actions intended to combat split-incentive dilemmas	ECO.AP review in coordination with the objectives of LTRS
	Actions to assess progress achieved and future evolution	Research and Innovation Programmes
AA2 - Smart Buildings	Initiatives intended to promote smart technologies	Introduction of flexibility mechanisms and focus on technological innovation Adapting the infrastructure of buildings to



Area of action	Type	Policies
		accommodate smart technology Implementation of monitoring mechanisms for buildings
AA3 - Energy Certification	Actions to stimulate cost-effective deep renovation of buildings Actions which address segments with poor performance Actions to promote the active participation of all energy transition agents while also promoting sustainability in construction	Reinforce the use of energy certification as a standardised support tool for financing programmes, considering instruments for the environmental certification of construction products and services Reinforce the use of energy certification as a standardised tool for access to tax benefits, considering instruments for the environmental certification of construction products and services Updating of ECS Promotion of renovation in segments with poor performance Labelling of products and services connected to the renovation of buildings Voluntary energy certification and labelling programmes, considering instruments for the environmental certification of construction products and services
AA4 - Training and Qualification	Initiatives intended to promote professional qualification in the field of building performance with regard to energy and resource efficiency	Action plan for quality of construction and energy transition (PAQCTE) Education in energy transition training programme in water use efficiency in the water-energy nexus
AA5 - Combating Energy Poverty	National actions to combat energy poverty	Provision of financing and tax benefits for those renovating buildings Increase levels of comfort
AA6 - Information and Raising Awareness	Actions to promote the active participation of everyone in the energy transition	Support for implementing renovation measures Raise the public's awareness with regard to energy efficiency and the water-energy nexus, including the integration of water efficiency, and the efficiency of other resources and the principles of the circular economy Demonstration programmes and reinforcement of experience sharing
AA7 - Monitoring	Actions to assess progress achieved and future evolution	Implementation of a system of progress monitoring indicators for LTRS within an integrated data collection system Implement performance monitoring mechanisms for buildings



AA1- RENOVATION OF BUILDINGS

SET UP A FAVOURABLE ENVIRONMENT FOR THE DEEP RENOVATION OF NATIONAL BUILDING STOCK WITH A VIEW TO IMPROVING THE RESPECTIVE ENERGY PERFORMANCE AND THAT OF OTHER CONNECTED



RESOURCES

POLICY

Financial support through the setting up or reorienting of credit lines for renovation, in line with the sustainability criteria of buildings

TYPE

Actions to stimulate cost-effective deep renovation of buildings

ACTIONS

- Promote, in coordination with the financial sector and starting from a critical assessment of previous models, a loan framework leveraging private investment up to 2050, while also mobilising public, private and mixed financing;
- Review financing programmes for building renovation provided by the financial sector so as to make them more attractive and effective;
- Develop a framework of incentives to implement improvement measures with greater associated risk or which allow private sector financing to be leveraged;
- Promote the setting up of specific lines of financing (e.g. by ensuring synergies between the removal of asbestos and energy efficiency measures for roofing, or energy and water efficiency, increasing the combined potential of savings in the water-energy nexus, or the use of products, services, business models and waste-free construction methods which do not contribute to pollution, the use of secondary raw materials from waste, or naturally regenerative materials);
- Develop financial support to stimulate electrification and the replacement of heating and cooling systems with models using renewable energy sources, particularly solar thermal systems, boilers adapted to renewable gases, biomass heat exchangers and boilers and photovoltaic panels for heat pumps, near-surface geothermal systems, as well as hybrid systems which combine two or more technologies for ambient heating in non-residential buildings;
- Promote the setting up of lines of financing which are easy to access and which drive market dynamics to promote energy efficiency measures for tenants, such as the installation of efficient windows, the reinforcing of wall and roofing insulation and the use of renewable energy sources.
- Incorporate into the different lines of financing criteria for environmental sustainability, the efficient management of resources, including materials and water, the promotion of sustainable techniques in construction and sustainable buildings,



and the promotion of biologically based materials.

SCOPE

Residential and non-residential buildings

DURATION

2021-2030 (assessment with possible review in 2025 and review in 2030)

POLICY

Reorienting of tax revenue for the improvement of the energy and environmental performance of buildings

TYPE

Actions to stimulate cost-effective deep renovation of buildings

ACTIONS

- Assess the current framework of energy duties, channelling part of income to the implementation of improvement measures in building stock;
- Introduce tax incentives for energy efficiency and the use of renewable energy sources and a more favourable taxation scheme for buildings intended to produce renewable energies and for NZEB;
- Promote notices to support the implementation of improvement measures for water and energy use in the water-energy nexus.

SCOPE

Residential and non-residential buildings

DURATION

2021-2030 (assessment with possible review in 2025 and review in 2030)

Policy

Simplify and standardise processes and audits

Type

Actions to stimulate cost-effective deep renovation of buildings



Actions

- Align the current energy audit framework so as to standardise the procedures provided for in the EED and EPBD, allowing the different sectors, regardless of size, to benefit from an audit;
- Simplify and dematerialise licensing procedures and standardise documents relating to the building process, by reducing the bureaucratic burden and licensing costs.

Scope

Residential and non-residential buildings

Duration

2021-2030 (assessment with possible review in 2025 and review in 2030)

Policy

Review the regulatory framework for the energy performance of buildings, considering instruments for the environmental certification of construction products and services

Type

Actions to stimulate cost-effective deep renovation of buildings

Actions

- Improve the current regulatory framework, including the establishing of performance levels for NZEB, provided for in the transposition of the EPBD;
- Include other indicators with minimum regulatory levels (e.g. comfort, water consuming devices and DHW) set out in more detail in the European X-tend project and in the Joint Research Centre report (JRC) 'Follow-up of the MEErP Preparatory Study on Taps and Showers';
- Define more ambitious regulatory minimums with regard to the energy performance of non-residential buildings;
- Study the need to establish a minimum standard for energy performance, materials and water performance in buildings by 2030 and for following years;
- Ensure the future alignment of stimulus actions for the renovation of buildings with the document resulting from the review process for Regulatory Decree No 23/95 of 23 August 1995 approving the General Regulations for Public and Building Systems



for Water Distribution and Waste Water Drainage. This alignment will take into consideration the integration of water efficiency measures and the use of alternative sources of water (including rainwater and domestic grey water for compatible purposes);

- Align regulatory requirements for energy performance and instruments which exist or are to be created, for the labelling of energy and/or water efficiency for building components, devices, equipment and systems, so as to promote the usefulness of the latter as instruments for verifying compliance with requirements and as an incentive for the selection of more efficient solutions;
- Coordinate with the initiatives provided for under the new framework for self-consumption and energy communities, with a view to reinforcing the installation of equipment for self-consumption from renewable energy sources.

Scope

Residential and non-residential buildings

Duration

2021-2030 (assessment with possible review in 2025 and review in 2030)

Policy

Combat split incentives by promoting a balance of incentives and benefits between tenants and owners

Type

Actions intended to combat split-incentive dilemmas

Actions

- Study the access to tax benefits by owners investing in energy and water renovation in buildings, through measures impacting on Personal Income Tax (IRS) on property income and/or deduction of renovation investment costs against IRS;
- Use labelling or environmental certification systems and water classifications, such as the AQUA+ index, (along with energy certification, provided for in AA3) as a project assessment tool (ex-ante and ex-post) and the identification of typical improvement measures to support the assessment of applications for financing the renovation of building stock, so as to reduce perceived risk and improve project



credibility.

Scope

Residential and non-residential buildings

Duration

2021-2030 (assessment with possible review in 2025 and review in 2030)

Policy

Combating market shortcomings through innovative financing solutions

Type

Actions seeking to overcome market shortcomings

Actions

- Collaborate with financial entities in the design of specific products to finance the energy renovation of buildings, considering instruments for the environmental certification of construction products and services, in line with the evolution of sound regulations for environmentally responsible financial products;
- Design a financing framework which allows the combination/complementarity of different sources of public and private financing, and type of subsidy;
- Introduce the concepts of energy performance and sustainable buildings in risk assessment indicators, emphasising sustainability criteria as opportunities for investment and as a driver of property value, in coordination with legislation applicable to the financial sector;
- Promote the setting up of flexible financing platforms which allow beneficiaries to share risks and maximise public funds;
- Promote the setting up of creative forms of financing by incorporating new financial innovation concepts such as crowdfunding and blockchain, in coordination with supervisory authorities;
- Promote the review of property subject to co-ownership, linking the incentive to the execution of work which promotes energy efficiency, including the integration of water efficiency and other resources and the principles of the circular economy;
- Standardise criteria for measuring and checking the energy savings achieved through



renovation projects, more specifically through the requirement to apply internationally recognised protocols (e.g. International Energy Efficiency Financing Protocol (The International Performance Measurement and Verification Protocol (IPMVP)));

- Set up a national database for the effective technical and financial performance of investment in energy efficiency, contributing to the European database on the De-risking Energy Efficiency Platform (DEEP);
- Ensure access to renewable energies and alternative sources of water in buildings, including for tenants and those who live in property subject to co-ownership;
- Promote the development of financing solutions based on energy models such as those in the Metered Energy Efficiency Transaction Structure or Property Assessed Clean Energy Programs based on on-bill or on-tax finance systems or solutions using Energy Services Companies (ESC).

Scope

Residential and non-residential buildings

Duration

2021-2030 (assessment with possible review in 2025 and review in 2030)

Policy

Create a legal and financial framework which reinforces the role of owner/condominium associations

Type

Actions to stimulate cost-effective deep renovation and combat split-incentive dilemmas

Actions

- Regulate and promote the renovation of common property of buildings through the duty, in coordination with financial measures, to maintain the general conservation state of a building (façade, roofing and common areas) together with measures to promote energy and water efficiency, including the integration of efficiency of other resources and the principles of the circular economy;
- Regulate and promote the implementation of energy and material efficiency measures, renewable sources of energy, water efficiency and the use of alternative water sources when the common areas of buildings are renovated, providing



incentives for the installation of systems and configuration of building networks allowing rainwater and domestic grey water to be used for compatible purposes. Install green façades and roofing as a means of promoting energy efficiency, water management, and improved quality of air in structures and buildings;

- Promote financial support mechanisms for common property renovation projects for owners' associations/condominiums, with specific financial programmes which operationalise the actions proposed in the previous points;
- Study the setting up of a public support programme to reduce the perceived risk in energy efficiency investment in common building elements (façades, roofing and common areas).

Scope

Residential and non-residential buildings

Duration

2021-2030 (assessment with possible review in 2025 and review in 2030)

Policy

ECO.AP review in coordination with the objectives of LTRS

Type

Actions directed at all public buildings and actions intended to combat split-incentive dilemmas

Actions

- Draw up an action plan by defining a roadmap up to 2030 and 2050, prioritising the activities to be developed and the level of investment for the different intervention scenarios and quantified targets with respect to each ministry, in line with the objectives of LTRS (renovation of 5% of public building stock, per year, up to 2030, and 2.5% up to 2050);
- Structure and reinforce the inter-ministerial network of interlocutors to implement the action plan for public building stock and requalification of the position of Local Energy Manager, to be referred to as Energy and Resource Manager;
- Create a tax and regulatory framework favouring investment in improvement measures for energy and environmental performance, as well as for water and other resources with regard to the buildings covered by the programme;
- Promote financing models which enable gains in scale and a reduction in the



perceived risk of investment in energy efficiency, through:

- mechanisms to combine projects from different entities and/or types within the scope of the programme;
 - measures, activities or specific conditions that help accomplish projects and involve solutions with a longer financial return (e.g. involving the thermal envelope of buildings) or less mature technologies.
- Review forms of management contracts for energy efficiency, promoting the use of this model of financing energy efficiency and renewable energies in public buildings;
 - Coordinate with current means of financing (e.g. the Operational Programme for Sustainability and Efficient Use of Resources (POSEUR)) which will reinforce the incentive to improve energy and resource performance (particularly with respect to water) in public buildings;
 - Create an annual energy performance assessment model for buildings leased by government with a view to defining intervention and use improvement strategies with differentiated and duly regulated targets;
 - Broaden the scope of the current programme, including the efficiency of other resources, particularly with respect to water, increasing the combined potential of savings in the water-energy nexus;
 - Promote the use of available roofing space in public buildings with good solar exposure for self-consumption and decentralised power production;
 - Ensure the inclusion of environmental criteria in public contracts based on the National Strategy for Ecological Public Procurement (ENCPE 2020), approved by Council of Ministers Resolution No 38/2016 of 29 July 2016;
 - Reinforce the leadership role of the State by example through the promotion of the principle of sustainability in construction and renovation mechanisms by employing voluntary systems for assessing sustainability in construction.

Scope

Public buildings

Duration

2021-2030 (assessment with possible review in 2025 and review in 2030)

Policy



Research and Innovation Programmes

Type

Actions to assess progress achieved and future evolution

Actions:

- Promote prospective and analysis studies on the medium and long-term renovation of buildings;
- Analyse the results of Portuguese R&D projects related to the fields of energy and water renovation in buildings and boosting environmental performance, capitalising on the respective results and lessons learnt, so that when R&D programmes are created, the needs and shortcomings detected can be addressed;
- Promote research and innovation (R&I) programmes that allow technical solutions to be developed for the high efficiency renovation of building stock, preferably based on endogenous resources, e.g. secondary raw materials, implementing even more cost-efficient improvement measures that enable better integration of such solutions. These solutions can be matched to the specific requirements of buildings (e.g. the design of solar panels which are compatible with different types of roofing, minimising the impact on the urban image);
- Study the relationship between energy performance and the associated indoor comfort of buildings (e.g. quality of indoor air, temperature, humidity and lighting/natural light) and its effects on energy efficiency and on the health and/or productivity of occupants. This will particularly address the monetisation and inclusion of these factors in the cost-benefit assessment of the renovation and improvement measures in building stock;
- Create a voluntary portfolio of pilot-buildings with support mechanisms allowing such mechanisms to be used by the scientific community in the experimenting of solutions which promote the real environment energy and water renovation of buildings and the improvement of their environmental performance;
- Extend knowledge on the interaction between improvement of the environmental and energy performance of buildings, more specifically with respect to the incorporating of recycled and bio materials, resource efficiency and the implementation of passive solutions.

Scope

Research studies and programmes to be conducted by entities in the national scientific and technological system

Duration

2021-2030 (assessment with possible review in 2025 and review in 2030)



AA2 - SMART BUILDINGS

PROMOTE SMART BUILDINGS, MAKING THEM MORE EFFICIENT, SAFER AND MORE COMFORTABLE

Policy

Introduction of flexibility mechanisms and focus on technological innovation

Type

Initiatives intended to promote smart technologies

Actions

- Classify buildings with regard to their ‘smart readiness indicator’ allowing smart technologies and functionalities to be recognised which can drive energy and water efficiency, sustainability, and efficiency in other resources based on an integrated approach in line with the principles of a circular economy and other performance characteristics for building stock;
- Reinforce the role of demand-side flexibility in the management of the national energy system, ensuring that benefits reach consumers;
- Promote the integrated energy renovation of sets of buildings and their envelopes, ensuring good connections between buildings and the creation of energy communities with energy management solutions (renewable production and integrated and flexible management of consumption and storage), focused on citizens and which help disseminate the concept of smart cities;
- Promote the setting up of financing geared to support innovation with the aim of introducing new technological concepts into buildings in the areas of energy efficiency and the water-energy nexus, including the integration of water efficiency and that of other resources and the principles of the circular economy. Promote greater proximity with start-ups and innovation nurseries.

Scope

Residential and non-residential buildings

Duration



2021-2030 (assessment with possible review in 2025 and review in 2030)

Policy

Adapting the infrastructure of buildings to accommodate smart technology

Type

Initiatives intended to promote smart technologies

Actions

- Reinforce and accelerate the installation of smart meters, including mechanisms to support demand-side management, within a framework of economic sustainability for electricity, gas and water, by 2030 in all buildings;
- Promote the installation of temperature, relative humidity, lighting and CO₂ sensors in new residential buildings and those subject to large-scale renovation and in all non-residential buildings by 2030, provided that it is economically viable;
- Promote the installation of systems and equipment which allow the integrated management of energy consumption and production, thus generating savings and enabling load transfer between tariff periods;
- Promote the adaptation of buildings, especially those subject to large-scale renovation, in order to provide them with the infrastructure necessary for the smart charging of electric vehicles, in line with the EPBD;
- Install digital infrastructure in buildings so as to provide them with greater resilience, more specifically in situations of changes in the patterns of use (e.g. the promotion of teleworking).

Scope

Residential and non-residential buildings

Duration

2021-2030 (assessment with possible review in 2025 and review in 2030)

Policy

Implementation of monitoring mechanisms for buildings

Type



Initiatives intended to promote smart technologies

Actions

- Implement automation and control systems in buildings with nominal thermal power greater than 290 kW by 2025, and provide incentives for their installation in buildings where the respective power is greater than 100 kW by 2030;
- Create mechanisms to periodically collect information on electricity, gas, water, waste production through telemetry, surveys, platform interoperability, etc.;
- Integration of new and old building systems into a single platform, allowing transparent monitoring and billing methods to be employed;
- Reinforce the current Electronic Production Unit Recording System with a view to establishing an electronic system capable of efficiently and safely regulating and controlling records for small distributed power production units;
- Implement an electronic information platform on distributed production, self-consumption and energy communities with the aim of informing consumers and facilitating the entire process to install distributed production systems, with focus on self-consumption.

Scope

Residential and non-residential buildings

Duration

2021-2030 (assessment with possible review in 2025 and review in 2030)



AA3 - ENERGY CERTIFICATION

REINFORCE THE ROLE AND CONTRIBUTION OF THE BUILDING ENERGY EFFICIENCY CERTIFICATION SYSTEM IN IMPROVING THE ENERGY PERFORMANCE OF BUILDINGS

Policy

Reinforce the use of the energy certification of buildings, considering instruments for the environmental certification of construction products and services as a standardised support tool for financing programmes

Type

Actions to stimulate cost-effective deep renovation of buildings



Actions

- Reinforce the use of energy certification as a standard tool to assess projects (*ex-ante* and *ex-post*) and to identify typical improvement measures to support the assessment of applications for financing the renovation of building stock, so as to reduce perceived risk and improve project credibility, adopting the same approach with respect to environmental certification instruments for construction products and services;
- Simplify and dematerialise the processes to access financing by using digital instruments, such as energy certification, promoting interoperability between different systems and platforms;
- Link the cost of financing to the energy class achieved;
- Prioritise financing in deeper and fuller intervention work based on the potential improvement in the energy certificate.

Scope

Residential and non-residential buildings

Duration

2021-2030 (assessment with possible review in 2025 and review in 2030)

Policy

Reinforce the use of certification of buildings, considering instruments for the environmental certification of construction products and services as a standardised tool to access tax benefits

Type

Actions to stimulate cost-effective deep renovation of buildings

Actions

- Study the reinforcement of tax incentives when the proposed energy classification is equal to or greater than that of the energy certificate or whenever the focus is on the measures proposed in the certificate (e.g. by including energy renovation as a means of increasing the quality and comfort coefficient and thus reducing Municipal



Property Tax (IMI));

- Study the reinforcement of tax incentives in the purchase of products/services whose energy classification corresponds to the two highest classes or which have high environmental performance identified on the label or certificate, and which incorporate recycled materials (e.g. intermediate VAT rate and/or deductions in personal income tax);
- Simplify and dematerialise the processes to access tax benefits by using digital instruments, such as energy certification, promoting interoperability between different systems and platforms.
- Analyse the introduction of tax incentives for energy efficiency and the production of energy from renewable sources for self-consumption as well as a more favourable taxation scheme for buildings intended to produce renewable energies (e.g. tax incentives through measures impacting on IMI for NZEB).

Scope

Residential and non-residential buildings

Duration

2021-2030 (assessment with possible review in 2025 and review in 2030)

Policy

Updating of ECS

Type

Actions to stimulate cost-effective deep renovation of buildings

Actions

- Update ECS through the introduction of a new version of the energy certificate, aligning it with other initiatives such as the improvement of technical methodologies so as to obtain better data;
- Gradual implementation of the digital version of the energy certificate as a means of bringing together information (providing the information to the owner) on the property's energy consumption and, gradually, on other aspects related to the efficient use of resources impacting on environmental performance and on the decarbonisation of building stock;



- Interconnect the energy certificate with supply and demand platforms ('one-stop-shop' type) such as Portal casA+;
- Create a building renovation passport as an optional instrument which complements the energy certificate (in line with that developed under the European project iBRoad);
- Adjust the energy certificate so as to more accurately reflect the characteristics of the building which can be checked, among other factors, in a situation of energy poverty;
- Analyse, as part of an annual performance assessment model, the relevance of the repercussion on energy costs of prolonged excessive annual consumption in relation to the energy certificate estimate, duly regulated;
- Assess the complementing of ECS with information relating to the environmental performance of buildings, more specifically with regard to water and material efficiency, among other aspects.

Scope

Residential and non-residential buildings

Duration

2021-2030 (assessment with possible review in 2025 and review in 2030)

Policy

Promotion of renovation in segments with poor performance

Type

Actions which address segments with poor performance

Actions

- Develop efficient energy incentive measures which ensure suitable levels of comfort and thermal performance, whenever such buildings are intended for rental;
- Include energy efficiency criteria in rentals;
- Establish a minimum standard of energy performance in buildings for the worst performing segments which are targeted for intervention by 2030, as provided for in AA1.



Scope

Residential buildings with poor performance

Duration

2021-2030 (assessment with possible review in 2025 and review in 2030)

Policy

Labelling of products and services connected to the renovation of buildings

Type

Actions to promote the active participation of all energy transition agents

Actions

- Reinforce the regulatory framework for the labelling of products and services connected to the construction sector;
- Promote the suitable dissemination of information and communication on the new generation of energy labels arising from Regulation (EU) 2017/1369 of the European Parliament and of the Council of 4 July 2017.

Scope

Products and services connected to the renovation of buildings

Duration

2021-2030 (assessment with possible review in 2025 and review in 2030)

Policy

Voluntary energy certification and labelling programmes considering instruments for the environmental certification of construction products and services

Type

Actions to promote the active participation of all energy transition agents

Actions

- Create energy efficiency charter, the requirements of which go beyond the

obligatory, which public and private buildings can join up to as frontrunners;

- Assess the broadening of certification and labelling systems to sectors and products not covered enabling them to join voluntarily and benefit from incentives/benefits created specifically for the purpose;
- Integrate a contribution based on voluntary systems for certification, classification and energy and water labelling, mobility and other areas associated with the sustainability of buildings, to improve the respective energy class, thus promoting a more comprehensive approach to resource management (e.g. coordination with the calculation methodologies provided for in the EPBD where the aim will be to improve the energy class based on the performance level obtained in voluntary systems with regard to products and buildings, energy and water certification and labelling, mobility and sustainability which are complementary to the energy certificate);
- Promote environmental certification and labelling programmes, more specifically with respect to the incorporation of recycled and bio materials as well as for water efficient buildings and systems to assess construction sustainability.

Scope

Residential and non-residential buildings and products or services connected to energy renovation

Duration

2021-2030 (assessment with possible review in 2025 and review in 2030)



AA4 - TRAINING AND QUALIFICATION

INCREASE THE TECHNICAL CAPACITY OF CONSTRUCTION AND ENERGY PROFESSIONALS, ALIGNING THIS CAPACITY WITH THE AIMS TO PROMOTE ENERGY EFFICIENCY AND THE DECARBONISATION OF BUILDINGS

Policy

Action plan for quality of construction and energy transition (PAQCTE)

Type

Initiatives intended to promote professional qualification in the field of building performance with regard to energy and resource efficiency

Actions

- Operationalise training programmes in energy efficiency and the water-energy nexus, including the integration of water efficiency and efficiency of other resources and the principles of the circular economy, which reinforce the technical expertise of those working in the construction industry. Programmes will include building renovation and take into account the variability of existing buildings so as to ensure the assessment and implementation of high-quality improvement measures and ensure sustainable construction;
- Adapt the training of professionals working in construction, providing them with the qualifications necessary to build with NZEB certification, AQUA+ water certification, Passive House or LiderA certification or other environmental certifications as well as the tools to assess and recognise sustainable construction;
- Adopt the updated results and recommendations arising from the Portuguese experience in the BUILD UP Skills initiative (www.buildup.eu/en/skills) to define and/or adapt specific programmes for training and/or qualifying professionals;
- Study and implement incentive measures for the training of technicians by entities belonging to the National Scientific and Technological System and other qualified entities (including the companies actually supplying technical solutions), in accordance with common requirements and standards defined by ECS in coordination with representative associations for each sector covered
- Upgrading of qualified professionals via use of such professionals as a:
 - regulatory requirement which is verifiable in certification and labelling and water classification processes;
 - factor for eligibility, or valorisation in financial incentive systems;
 - differentiating criterion for the market, evidenced via a seal of quality, awarded with respect to energy certification and water classification, whenever possible, taking into account consumption and monitoring profiles.
- Promote the training of professionals working in the field of construction and consumers, in coordination with stakeholders and non-governmental organisations, as well as provide training for other professionals, particularly in the distribution sector who are in direct contact with the consumer so as to raise awareness with regard to more sustainable production standards and consumption;
- Reinforce education and training content and projects, more specifically with regard to paths to qualification and education and training in the area of building efficiency (energy, materials and water efficiency), promoting, whenever possible, the use of materials already developed and concluded by recognised research entities and the



creating of platforms to access and divulge such materials;

- Define a dissemination and communication strategy for PAQCTE;
- Create a seal of quality based on the energy certificate and on water classification, and whenever possible, on consumption and monitoring profiles, which functions as a differentiating criterion and enables access to renovation incentives.

Scope

Professionals from the construction industry and education and training system

Duration

2021-2030 (assessment with possible review in 2025 and review in 2030)

Policy

Education for the energy transition

Type

Initiatives intended to promote better information and qualification in the field of energy and resource efficiency

Actions

- Promote training in companies, for both management and workers as well as consumers, in coordination with stakeholders and non-governmental organisations for the growing implementation of energy efficiency criteria (e.g. the class of energy or label certificate), water efficiency and the use of resources in their professional activities and individual purchasing and consumer choices;
- Promote knowledge among company professionals (particularly in the fields of construction products and materials and energy equipment and systems), focusing on those who come into direct contact with consumers (e.g. the distribution sector), to raise awareness with regard to more sustainable production standards and consumption;
- Reinforce the content of academic syllabuses and educational and training projects in the areas of energy efficiency, and the use of materials in buildings in primary, secondary and non-higher post-secondary education, more specifically with regard to the qualifications set out in the National Qualifications Catalogue;
- Create and/or support internship programmes for higher education students specifically oriented to raising awareness and training future professionals in energy efficiency, water efficiency and the use of resources in buildings. This will promote

the more generalised implementation of principles and good practices in the use of resources by future consumers and professionals;

- Create a National Awards Programme for Energy Transition in Buildings focusing on different levels of education and specific areas of the economy and intended to stimulate interest, knowledge, education and raise awareness in society.

Scope

Professionals from the construction industry and education and training system

Duration

2021-2030 (assessment with possible review in 2025 and review in 2030)

Policy

Training programme in water efficiency and the water-energy nexus

Type

Initiatives intended to promote professional qualification in the field of building performance with regard to energy and resource efficiency, as well as the reinforcing of such competences in educational and training content and projects

Actions

- Promote already available training courses for AQUA+ auditors and consultants in the water efficiency of buildings, as well as qualification references, as preparation for the Strategic European Partnership WATTerSkills, which will provide technicians and specialists with the required knowledge in water efficiency and the water-energy nexus in buildings.

Scope

Professionals from the construction industry and education and training system, residential and non-residential buildings and products and services connected to energy renovation

Duration

2021-2030 (assessment with possible review in 2025 and review in 2030)



A5 - COMBATING ENERGY POVERTY

COMBAT ENERGY POVERTY BY SUPPORTING MORE VULNERABLE



FAMILIES IN THE RENOVATION OF THEIR HOUSING, THUS HELPING
REDUCE ENERGY AND WATER BILLS

Policy

Provision of financing and tax benefits for those renovating buildings

Type

National actions to combat energy poverty

Actions

- Publicise and promote existing financial support for local entities undertaking support programmes for the energy renovation of social housing;
- Study the introduction of tax benefits and bonuses for energy savings under the building energy certification scheme;
- Propose the inclusion of a social criterion in the awarding of tax and financial benefits.

Scope

Private individuals and local facilitator entities

Duration

2021-2030 (assessment with possible review in 2025 and review in 2030)

Policy

Increase levels of comfort

Type

Actions to combat energy poverty

Actions

- Support more vulnerable users of energy and low-income families through specific financing support programmes for the renovation of buildings, so as to enable investment in energy efficiency;
- Study the allocation of support for the replacement/acquisition of ambient heating and DHW systems with efficient systems (e.g. solar thermal, heat pumps, near-surface geothermal), as well as the replacement/acquisition of more efficient terminal water use devices (taps, showers, toilet flush mechanisms) from a water and

energy use perspective;

- Promote the integration of more vulnerable energy users and low-income families into renewable energy communities, while also promoting the replacement of fossil fuel based equipment with electric devices;
- Support measures for ambient heating and DHW systems via the online tool (European project *HARP*) for the issue of an energy label for heating equipment, viewing of market alternatives and contact with suppliers;
- Support measures in relation to water use devices, which can be supported by existing water certification systems for products on a national level provided by the National Association for Quality in Building Installations and on a European level, with the preparation, which is already underway by industry, of the Unified Water Label, which provides information on water and energy performance for products using water;
- Ensure alignment of the future long-term strategy to combat energy poverty with LTRS, with the aims of obtaining a diagnosis and characterisation of the issue, developing monitoring indicators, monitoring strategies, establishing aims to combat energy poverty in the medium and long-term on a local, regional and national level. Propose specific measures, including measures with respect to renovation of the building stock with a view to achieving such aims, as well as methods of financing.

Scope

Citizens and entities who can facilitate on a local level

Duration

2021-2030 (assessment with possible review in 2025 and review in 2030)



AA6 - INFORMATION AND RAISING AWARENESS

RAISE THE AWARENESS OF PEOPLE AND PUBLIC AND PRIVATE COMPANIES TO THE NON-ENERGY BENEFITS OF RENOVATION, PROVIDING THEM WITH THE INFORMATION WHICH WILL PROMOTE AND FACILITATE INTERVENTION WORK

Policy

Support for implementing renovation measures

Type

Actions to promote the active participation of everyone in the energy transition

Actions

- Create a virtual one-stop-shop, with information points spread around the country, to support energy and water performance improvement in buildings, where it will be possible to obtain information on how to carry out renovation and on the financial mechanisms available, etc.;
- Operationalise a one-stop-shop and create an electronic platform providing greater flexibility in licensing procedures for power production projects, reducing licensing times and providing clear information to promoters and the public;
- Adapt and disseminate current platforms for the energy sector to identify the support and financing available, as well as the time limits for applications;
- Reinforce work carried out by local energy and climate agencies in technical support and the operationalisation of access to financial support, promote energy and water efficiency, the rational use of local endogenous resources and the use of new technologies with the aim of sustainable development;
- Create a local programme for disseminating information and providing support for self-consumption renewable energy projects (individual, collective or via energy communities), so as to reduce information asymmetry and support companies, municipalities and the public in the development of such projects;
- Support measures which promote the reuse of building components, for example, agreements between municipal authorities and companies to: i) store components taken from demolition/renovation work; ii) maintenance criteria; iii) cataloguing and referencing; and iv) dissemination.

Scope

Citizens and public and private entities

Duration

2021-2030 (assessment with possible review in 2025 and review in 2030)

Policy

Raise the public's awareness with regard to energy efficiency and the water-energy nexus, including the integration of water and the efficiency of other resources and the principles of the circular economy

Type

Actions to promote the active participation of everyone in the energy transition

Actions

- Reinforce advertising campaigns to promote energy efficiency and savings, water efficiency and the use of resources and the advantages of renovation through, for example, local and general media and billboards;
- Promote awareness raising campaigns with respect to sustainable production and consumption through participation and coordination with the different stakeholders in the value chain (manufacturer-distributor-consumer) with emphasis on sectors which have a special multiplier effect such as distribution and tourism, due to their direct influence on consumers and supply chains;
- Support the production of institutional communication and information campaigns (non-commercial) promoted by sector associations and other organisations representing the fields of energy and water efficiency in buildings;
- Promote environmental education programmes at schools in partnership with local entities with a view to raising awareness among younger people with regard to the issue of climate change and human impact on energy transition, more specifically, in relation to behaviour in the consumption of energy, water and other resources;
- Organise conventions on the monitoring of the market for energy efficiency upgrading, following strategies which speed up energy transition;
- Promote scientific studies to improve knowledge, improve access to information and develop instruments to support policy design which will take into consideration the impact of building renovation in areas such as employment, health and economic return on public investment;
- Create marketing tools, more specifically, signage which recognises where best practices have been implemented and identifies public and private infrastructure which has adopted projects which demonstrate the application of circular solutions (e.g. reuse of components, ecological label, demolition guides, environmental product declarations, cradle-to-cradle approach), in accordance with that set out in the Action Plan for the National Circular Economy, approved by Council of Ministers Resolution No 197-A/2017 of 11 December 2017, as amended;
- Promote living labs for the decarbonisation of cities which involve the municipality, institutions of knowledge and companies in the development of pilot projects;
- Promote better communication of the benefits of energy efficiency in property transactions beyond the energy certificate (e.g. energy requirements, CO₂ emissions and reduction of Municipal Property tax (IMI)), supported, whenever possible, by



information provided on the energy certificate;

- Disseminate current platforms and promote new and better platforms for energy literacy which employ new information technologies so as to bring about an evolution in communication with the public, taking advantage of the gradual raising of awareness and availability of people to use new technologies (e.g. CINERGIA — Energy Information Centre and the Energy Observatory). Adopt an approach to integrate the different aspects involved in building renovation such as, energy, decarbonisation, resource efficiency and sustainability;
- Promote and develop new platforms to improve integration with the market through the Poupa Energia Platform (Save Energy), with the aim of facilitating change of supplier in the retail market.

Scope

Citizens, civil society, academia and public entities

Duration

2021-2030 (assessment with possible review in 2025 and review in 2030)

Policy

Demonstration programmes and reinforcement of experience sharing

Type

Actions to promote the active participation of everyone in the energy transition

Actions

- Promote demonstration programmes which stimulate building renovation, making clear the viability of implementing efficient technical solutions and the respective benefits generated;
- Create an integrated plan to inform on energy efficiency and share new experiences among public authorities;
- Coordinate dialogue between training agents/trainees on a national level;
- Introduce the concepts of efficiency (energy, materials and water), the circular economy and low carbon throughout the construction industry value chain, so as to drive building renovation.

Scope

Citizens and public and private entities

Duration

2021-2030 (assessment with possible review in 2025 and review in 2030)



AA7 - MONITORING

IT IS IMPORTANT TO SET UP AN LTRS MONITORING PLAN FOR ALL POLICIES AND ACTIONS DEFINED WHICH IS BASED ON A SERIES OF INDICATORS AND MECHANISMS TO MONITOR PROGRESS ALLOWING THE IMPLEMENTATION OF THE STRATEGY AND ITS IMPACT TO BE ASSESSED

Policy

Implementation of a system of progress monitoring indicators for LTRS within an integrated data collection system

Type

Actions to assess progress achieved and future evolution

Actions

- Coordination with relevant entities (ADENE-Energy Agency, Portuguese Environmental Agency, Institute of Public Markets, Property and Construction, etc.) to develop a monitoring system for LTRS based on the progress indicators set out therein;
- Coordination with the Portfolio of Public Buildings for Housing;
- Ensure that the Consumption and Energy Efficiency Management System - system for common general registration, sector reporting and energy consumption monitoring, provided for in NECP 2030 - provides the necessary data, as far as possible, to quantify LTRS monitoring indicators;
- Create a digital Building Logbook to operate as an up-to-date file on all information relating to the building and renovations undertaken over time and which can be included in existing general systems, more specifically, the general registration system for building characteristics and history;
- Create a framework of quality standards associated with the construction industry so as to allow efficiency measures to be assessed and compared (energy, materials and water) and other adopted standards to enhance confidence in the improvement measures implemented and the benefits generated (energy and non-energy);

Scope

Indicator system to monitor LTRS

Duration

2021-2030 (assessment with possible review in 2025 and review in 2030)

Policy

Implementation of performance monitoring mechanisms for building stock

Type

Actions to assess progress achieved and future evolution

Actions

- Create a system to monitor the progress of LTRS by using already existing national monitoring structures, without prejudice to the necessary adaptations (contributing with public data, indicators and projections, e.g. for the Public Administration Open Data Platform and for National Policies and Measures System);
- Propose the setting up of a ‘National Renovation Committee’ to monitor the evolution of renovation indicators, which would contribute regularly to the dialogue and debate provided for by the Portuguese National Energy Council, framed under NECP 2030, as an action to promote platforms for dialogue with respect to sustainable development;
- Create a specific plan to monitor the renovation of government buildings, with special focus on coordination between local and central public administration, maximising the Barómetro ECO.AP (Barometer for Resource Efficiency in Public Administration), a tool which is available and in continuous evolution and can be used to monitor energy consumption in public administration. Version 2.0 is currently under development and will be extended to other consumption, particularly water;
- Create a Resource Observatory, as part of the Energy Observatory, to monitor the evolution of building stock, energy poverty and the improvement in energy and environmental performance, including the integration of water efficiency, the efficiency of other resources and the principles of the circular economy into a single platform;
- Promote annual publications with official data on energy and environmental performance, including the integration of water efficiency and that of other resources and the principles of the circular economy with respect to building stock;
- Periodic monitoring of the evolution of national building stock with analysis being

conducted on a regional level.
Scope
Performance monitoring mechanisms for building stock
Duration
2021-2030 (assessment with possible review in 2025 and review in 2030)

5.1 RELATIONSHIP BETWEEN AREAS OF ACTION AND PACKAGES OF IMPROVEMENT MEASURES

The AA refer to a series of integrated policies and actions necessary to achieve a clear trajectory with regard to the modernisation of buildings, supported by a national roadmap setting out targets and progress indicators. A number of these policies are vital to achieving the packages of improvement measures presented above.

The following figure shows the relationship between the seven areas of action and the four packages of improvement measures to be implemented in building stock by 2050, where it can be seen that most of the areas of action proposed help achieve goals relating to an increase in thermal comfort, combating energy poverty and reinforcing the focus on energy efficiency in existing buildings, in line with the strategic vision of the LTRS. At the same time, albeit in a less direct manner, a commitment to the local production of renewable energies, in line with the current scheme for self-consumption and energy communities, is also promoted along with policies and actions intended to facilitate the transformation of building stock into NZEB.

Finally, all the policies and actions are identified which promote an increase in energy consumption to ensure levels of thermal comfort (e.g. through incentives to acquire or replace heating equipment), although with less relevance in LTRS.

Figure 11 - Relationship between areas of action and packages of improvement measures

Areas of Action	Improvement Policy Packages for Building Stock			
	Comfort/Mitigation of Energy Poverty	Increase Energy Efficiency	Local Decarbonising	Comfort/Increase Energy Consumption
AA1 - Renovation of Buildings	☆☆☆	☆☆☆	☆☆	
AA2 - Smart Buildings		☆☆☆	☆☆	☆☆
AA3 - Energy Certification	☆☆☆	☆☆☆	☆☆	
AA4 - Training and Qualification	☆☆☆	☆☆☆	☆☆	
AA5 - Combating Energy Poverty	☆☆☆	☆☆☆	☆☆	☆☆☆
AA6 - Information and Raising Awareness		☆☆☆	☆☆	
AA7 - Monitoring	☆☆☆	☆☆☆	☆☆	

5.2 SYNERGIES WITH CURRENT AND EXPECTED PLANS AND STRATEGIES IN DIFFERENT AREAS OF GOVERNMENT ACTION

The renovation of building stock, leveraged by goals to reduce GHG emissions, increase energy efficiency, and promote renewable energies and sustainability, will also help achieve other public policy objectives in the following areas of government action:

Protection of health and reduction in costs relating to illnesses and health expenditure, more specifically through coordination with the National Health Plan Working Group, contributing to compliance with the respective objectives, i.e. improvement in general health conditions;

Prevention of the illegal removal of hazardous substances such as asbestos, by conciliating intervention work on public buildings (e.g. schools) with compliance with normal procedures for the removal of such substances and by implementing measures which improve the energy and environmental performance of buildings. This coordination must be achieved by collaborating with the working group set up for the purpose of removing asbestos, which involves representatives from all areas of government, to ensure the implementation of this measure;

Improvement in air quality, contributing to the pursuit of national policy, more specifically the National Strategy for the Air, approved by Council of Ministers Resolution No 46/2016 of 26 August 2016, through the promoting of efficient climate control solutions via LTRS as a vital instrument for the next generation of policies to be adopted in this regard for the next decade;

Urban and architectural planning and protection of cultural heritage, promoting coordination with instruments for spatial planning, the environment and urban planning, more specifically, Municipal Master Development Plans, with a view to improving the definition of policies to safeguard and enhance the value of heritage in coordination with the respective entities, such as the Directorate-General of Cultural Heritage;

Coordination with the full renovation of buildings and autonomous units, promoting closer dialogue between the entities responsible for the support programmes and the policy and financial instruments in the areas of property management, housing, rentals and urban rehabilitation, more specifically, the Housing and Urban Rehabilitation Institute and the National Laboratory of Civil Engineering, thus ensuring due collaboration between the respective plans, strategies and programmes;

Improvement in comfort and well-being conditions for people and access to decent housing;

Combat situations of energy poverty;

Promotion of the construction industry and associated sectors, increasing employment and added value through ongoing dialogue with sector associations with a view to raising awareness for the need to renovate buildings while respecting best practices;

Transition to a circular economy based on sustainable construction, promoting the use of secondary raw materials, waste materials of biological origin and environmental services to reduce and/or replace non-renewable materials, together with the use of alternative sources of water (e.g. grey water and water for reuse);

Reduction in water consumption in buildings, helping conserve water resources and reducing energy consumption associated with the urban water cycle;

Reduction in the vulnerability of buildings to fires, floods, earthquakes and climate change;

Modernisation of public administration, ensuring the alignment of LTRS with ECO. AP and with the Strategy for Innovation and Modernisation of the State and Public Administration 2020-2023, approved by Council of Ministers Resolution No 55/2020 of 31 July 2020, ensuring the contribution of public building renovation to modernisation and to the development of the working quality of State services and to the improvement of conditions for public services, with benefits for efficiency indexes;

Coordination with the National Strategy for Ecological Public Procurement (ENCPE 2020), the main aim of which is to include environmental criteria in public contracts, combining them with economic and social aspects. These criteria seek to promote a reduction in pollution and the consumption of natural resources, increase the efficiency of systems while also setting an example of good practices, driving technological and product innovation by suppliers and service providers.

Office buildings are included on List A of ENCPE 2020, which refers to priority goods and services. This group includes equipment connected to a building, the systems for cooling, heating, ventilation, electricity supply and even envelope elements such as windows, thermal insulation, flooring

and coverings. Also on List A are heating systems with water circulation, which includes water heaters used to attain and maintain a desired indoor temperature level for closed spaces, where the maximum output power is 400 kW. List A further includes working areas relating to equipment and devices impacting on water consumption for which criteria and guides are currently being defined for inclusion in public contracts.

Coordination with ENAAC 2020 which seeks to implement adaptation measures, mainly identifying physical intervention work with direct impact on the territory.

P-3AC aims to achieve the second aim of ENAAC 2020, by establishing lines of action and priority adaptation measures. Line of action No 5, which seeks to reduce the vulnerability of urban areas to heat waves and the increase in maximum temperature, sets out measures to address the heat island effect, particularly during heat waves, by installing green infrastructure, creating shaded areas and ventilation corridors, and establishing green zones with plant covering which is drought resistant, etc.

P-3AC also includes other measures such as the adopting of good water management practices in the urban environment with a view to reducing consumption, communication actions, dissemination, education and raising awareness with respect to the risks of climate change and adaptation measures, training programmes for technicians and decision makers in the assessment of vulnerabilities to climate change and in adaptive management. Monitoring and assessment instruments will also be set up on a national, regional, intermunicipal and municipal level.

Requalification of school buildings, promoting greater synergy with the School Building Modernisation Programme for Secondary Education, approved by Council of Ministers Resolution No 1/2007 of 3 January 2007, which aims to ensure a higher level of energy renovation in schools and help reduce energy bills while also improving comfort for school users;

Technological innovation and digital transition, coordinating with national plans and strategies, more specifically, the Action Plan for Digital Transition, approved by Council of Ministers Resolution No 30/2020 of 21 April 2020, which seeks to monitor building renovation by reinforcing national technologies and competences in building automation and control systems, with a view to digitalising the respective functionalities, among other aims;

Coordination with the electric mobility sector by installing charging points and infrastructure as part of the process to renovate services in order to comply with national and European objectives, associated, whenever possible, to the local production of electricity from renewable sources with a view to increasing the number of electric vehicles;

Coordination with strategies aimed at relevant energy alternatives, such as the National Strategy for Hydrogen, with a view to using this gas as an energy solution for meeting the needs of buildings, in combination, where possible, with the local production of electricity from renewable sources;

There are therefore strong synergies between existing or expected plans and strategies in the abovementioned government areas and the LTRS, and the respective objectives should be taken into account when implementing the policies associated to such government action, as well as to other relevant areas.

6. INVESTMENT

6.1 INVESTMENT TO BE MOBILISED

LTRS is based on a series of improvement measures for building stock supported by a series of policies and actions aimed at creating a favourable framework for renovation.

In order to implement the abovementioned policy packages by 2050, total investment of €256₂₀₂₀/m² is estimated for expected energy savings of €283₂₀₂₀/m². From a perspective of financial effort, and taking into account the area to be renovated, total investment is estimated to be around €143.492bn₂₀₂₀ by 2050 (€4.783bn₂₀₂₀/year). Most of the investment refers to the renovation of residential building stock, as can be seen in the following table. In residential building stock, this effort is greater in 2040 and 2050, while in services buildings, greatest effort will be sooner in 2030.

Table 8 - Investment estimated up to 2050, total and by sector

	2030	2040	2050	Total [€bn ₂₀₂₀]
Residential [€bn ₂₀₂₀]	26.760	42.441	40.877	110.078
Non-Residential [€bn ₂₀₂₀]	18.500	13.968	945	33.414
Total [€bn ₂₀₂₀]	45.261	56.409	41.822	143.492

With regard to necessary investment by improvement measure, and up to 2050, passive renovation of residential buildings will account for the greatest investment, as can be seen in the data shown in the following table.

The focus on thermal insulation solutions for building façades and roofing, as well as the replacement of glazed spans, takes on particular relevance in LTRS, as this approach has the potential to significantly improve the indoor thermal comfort of housing, without the need to increase energy consumption.

Bearing in mind that the measures presented in the programming in Chapter 3 should be achieved by the end of 2040, this represents an investment of €7.671bn₂₀₂₀ (€0.384bn₂₀₂₀/year) so as to provide considerable support in the renovation of building stock, thus helping to combat energy poverty in Portugal.

Table 9 - Investment estimated up to 2050, by measures and by sector

	Passive Envelope	Lighting	Efficient Systems	Solar Thermal	Solar Photovoltaic + Storage	Increase in Comfort	Total
Residential [€bn ₂₀₂₀]	40.373	354	14.588	11.960	18.861	23.943	113.579
Non-Residential [€bn ₂₀₂₀]	-	1.033	6.003	8.847	13.309	4.222	33.414
Total [€bn ₂₀₂₀]	40.373	1.387	20.591	20.807	32.170	28.165	143.493

To frame estimated investment figures for the 2050 horizon, and based on the statistics available for economic activity in the construction sector, it can be seen that from 2000 to 2009, the turnover of construction companies stood at an average annual value of around €30bn, with a maximum of over €36bn in 2006. Due to the economic crisis and its impact on the construction sector, from 2010 to 2018, the turnover of construction companies fell to €22bn, having reached a minimum of €17bn in 2016.

Complementary data is provided by the report on 'Management Indicators and Forecast Models for the Construction Industry' issued by APCMC, which shows similar figures to those mentioned above, estimating total turnover of close to €18bn € for 2020. This figure is further broken down by type of construction or type of building, and estimates turnover for building renovation at above €7bn, with residential buildings standing at €5.8bn, and non-residential buildings at €1.4bn. Part of these figures for the construction sector refers to types of improvement measures set out in LTRS, particularly those relating to building envelopes, such as the fitting of thermal insulation or the installation of efficient windows. It is thus expected that this strategy will reinforce these improvement measures by speeding up investment in the construction sector. Figures are close to those estimated earlier.

In addition to the abovementioned investment, further investment has also been identified for Building Automation and Control Systems (SACE), which is not directly generated by the LTRS simulation model, but rather from contributions collected during the public hearing process, and which is estimated based on the policies and actions relating to SACE set out in Chapter 5. As such, the following additional investment has been identified:

SACE in residential buildings: €1.5bn₂₀₂₀;
SACE in non-residential buildings: €4bn₂₀₂₀

There are also additional savings that come from the assumptions presented in Chapter 7 of LTRS, considering a number of co-benefits from energy renovation which take on particular importance in a specific national context. These co-benefits include the minimum effects generated by the reduction in health costs, an increase in productivity and higher property values, from an investor perspective. As a result of this estimate, by 2050, the following conclusions can be drawn:

For every day, per year, where worker illness can be avoided, it is possible to save around €5.2bn₂₀₂₀;

This results in one more day of work per year, thus allowing an increase in productivity of 5 900 M €₂₀₂₀;

As a result of building renovation, an increase of around 5.9% is expected in property value, adding €26bn₂₀₂₀.

In light of the above, the combined effects of these three co-benefits allow savings of around €37.1bn₂₀₂₀ to be achieved. This initial analysis indicates that the calculation of co-benefits is vital to maximising the total savings from energy efficiency measures, allowing on average, a gain of over 25% in combination with savings in energy acquisition.

6.2 FINANCING PROGRAMMES

Several financing programmes are planned for coming years which are intended to support energy renovation, as well revitalise degraded areas. These programmes provide financing for the housing sector, both private and social, central and local Public Administration buildings and the corporate sector.

The support provided by these programmes can be as a subsidy, reimbursable or otherwise, and can be granted through financial instruments.

Financial instruments are a means of accessing capital which is reimbursable, and the enable a multiplier effect as they can be applied at different cycles of aid, preferably with private co-investment, thus leveraging public funds.

National Instruments

Renovation and promotion of housing

Housing access support programme. 1st Entitlement

A programme mainly targeting the renovation of buildings and rental properties, promote housing solutions for people who live in unacceptable conditions and cannot afford the cost of suitable housing.

Support may be granted directly to families or entities, to promote housing solutions, more specifically, to the autonomous regions and municipalities, public entities, residents' associations and housing cooperatives and owners of property located in degraded zones.

The planned amount of financing through non-reimbursable subsidies is €700m by 2024.

Financial Instrument for Renovation and Urban Revitalisation

Financial instrument which aims to revitalise cities, support the physical revitalisation of areas dedicated to disadvantaged communities and support energy efficiency in housing.

This instrument provides loans under more favourable conditions than those available on the market for the full renovation of buildings, intended for housing or other activities, including more suitable integrated energy efficiency solutions during such renovation, in buildings located in Urban Rehabilitation Areas (URA).

Funding stands at €1.4bn, which can be executed by 2023.

Renovate to Rent - Accessible Housing

The aim of this programme is to provide funding for renovation operations in buildings that are 30 or more years old. After renovation, such buildings are required to be predominantly for housing purposes, and apartments are intended for rent under the conditional rental regime.

Any individual or public or private collective person may apply to this programme (credit line), provided that they own the building that is to be renovated.

The amount of financing stands at €50m, which will be extended up to 2023. This programme is expected to be reformulated.

National Fund for Building Renovation

This instrument promotes property renovation, particularly vacant or available public heritage, for subsequent rental and, especially for rental at accessible costs for permanent housing and for temporary residence by students, thus increasing the public supply of housing in this segment and the optimisation of public property resources.

Initially, applications may be submitted by local authorities, private charitable institutions, direct and indirect administration of the State and public institutes. Other public entities may also use the National Fund for Building Renovation (FNRE) through a protocol to be signed between the management entity of the heritage in question and *Fundiestamo*, more specifically, Public Stock Corporations, public companies and public universities. At a later stage, private individuals may also submit applications for building renovation.

Under FNRE, the constitution of a number of sub-funds is also planned, each with asset autonomy and a duration of 10 years, which may be extended.

Energy Renovation

Energy Efficiency Fund

A financial instrument capable of financing the programmes and measures set out in the National Action Plan for Energy Efficiency (PNAEE) in all of its lines of action, created by Decree-Law No 50/2010 of 20 May 2010, as amended.

Every year, different specific notices are launched with respect to the Energy Efficiency Fund. Notice 25 - Energy Efficiency in Buildings was launched in 2018, with a maximum €3.1 million budget for allocation to projects, financing applications implementing measures to promote energy efficiency in buildings. Applications are currently being analysed and eligible candidates include natural persons who own single-family houses that are occupied or autonomous units in multi-family buildings, as well as private law legal persons that own occupied services buildings, with the exception of entities with Portuguese Classification of Economic Activities (CAE) 01 to 33.

Portugal 2020

As part of Portugal 2020, in a partnership agreement between Portugal and the European Commission, the programming principles of the Europe 2020 Strategy were adopted with regard to economic, social and territorial development to be promoted between 2014 and 2020.

The abovementioned partnership agreement combines the work of European Structural and Investment Funds, and consists of several themed areas, more specifically, competitiveness and internationalisation, social inclusion and employment, human capital, sustainability and efficiency in the use of resources. These areas are operationalised via 16 operational programmes, including PO SEUR

(Operational Programme - Sustainability and Efficiency in the Use of Resources) and seven regional programmes (five on the mainland and one in each autonomous region).

The measures of interest in the area of energy consumption in buildings are framed within a number of investment priorities of the respective Themed Objective 4, which is also oriented to comply with European '20-20-20' targets and with the targets set out in PNAEE and ECO.AP. With regard to Themed Objective 5, it will also be possible to frame the financing of green infrastructure within the renovation of buildings, as such infrastructure is vital for adapting and improving the energy efficiency of buildings.

Operational Programme - Sustainability and Efficiency in the Use of Resources

POSEUR can support actions concerning buildings, addressing as specific objectives the increase in energy efficiency of public infrastructure with respect to the State central administration as well as the increase in energy efficiency in the housing sector.

The main goal of the support mechanisms is to increase energy efficiency in public buildings and private housing, while also reducing energy bills. The final beneficiaries of these actions are central administration bodies and owners of autonomous units in buildings and private dwellings.

POSEUR aims to support existing buildings, preferably those with worst energy performance. Intervention work in buildings is required to lead to significant improvements and achieve a minimum increase of two levels in the energy performance certificate. Accordingly, the minimum obligatory requirements are those set out in regulations approved by Decree-Law No 118/2013 of 20 August 2013, as amended, and in Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources.

The projects supported must generate savings greater than the costs of implementing the project, which include investment costs, operation and maintenance costs and re-investment due to substitution. The actions supported can take the following forms:

- application of thermal insulation on walls, flooring, roofing and blindspace boxes;
- replacement of glazing components of envelope and shading devices that are inefficient in terms of energy performance;
- intervention work or replacement of technical systems installed to increase energy efficiency by integrating solar systems for hot water, incorporation of small-scale power production, heating, ventilation and air conditioning;
- replacement of existing systems with high efficiency systems, or through intervention work on existing systems which seeks to increase their energy efficiency, interior lighting, and exterior lighting in the case of central government buildings;
- installation of systems and equipment that allow the management of energy consumption, by calculating and managing energy consumption, thus generating savings and enabling load transfer between tariff periods;
- installation of thermal solar panels to produce DHW;
- installation of energy production systems for self-consumption from renewable energy sources;
- audits, studies, diagnoses and energy analyses required for undertaking investment, and subsequent performance evaluation.

POSEUR also seeks to cover awareness campaigns aimed at both building sectors to promote the efficient use of energy.

Allocation of around €200m, for both public infrastructure as well as the housing sector, creating a total of approximately €400m. The Cohesion Fund will support these objectives and funding is granted

through reimbursable and non-reimbursable subsidies and through a financial instrument, where funding is different in each area of intervention.

The intervention work to be undertaken in central government buildings can be promoted by the departments themselves or by an energy services company (ESC).

In the first situation, support granted corresponds to a maximum of 95% of all eligible expenditure and include a reimbursable subsidy whereby a minimum of 70% of net energy savings are returned. In the second situation, financing is processed through a Financial Instrument for Energy (IFE2020) under Portugal 2020, as a financial instrument created under the area of sustainability and efficiency in the use of resources and which is expected to operate with the European Investment Bank. This will be particularly advantageous for ESC, as it eliminates the risk of granting credit to third-party entities.

With regard to interventions work in private housing, IFE2020 offers better conditions of access to financing and mobilisation guarantees for bank financing.

When subsidies are non-reimbursable, the financing allocated is not returned by the beneficiary. Audits, studies and other projects assessments as well as awareness campaigns conducted by ADENE fall under this method.

Regional Operational Programmes

Regional Operational Programmes (Regional OP) under Portugal 2020 refer to the seven NUTS II regions in 2013, which are also separated through their degree of development.

The support to be granted comes from the European Regional Development Fund, which seeks to reduce differences in the levels of development of the various regions and, as such, has a different allocation, depending on the degree of development. The themed regional programmes meet the objectives mentioned above while the measures to be supported seek to achieve the following aims:

- a) increase in energy efficiency in companies, supporting the implementation of energy efficiency measures and rationalising consumption;
- b) increase in energy efficiency in local public government infrastructure, supporting the implementation of integrated energy efficiency measures and rationalising consumption;
- c) increase in energy efficiency in the housing sector, supporting the implementation of energy efficiency measures and renewable production in social housing.

In a similar manner as to that which takes place with POSEUR, preference is given to buildings and infrastructure to be renovated which have the worst energy performance and which can go up two levels in energy classification. The actions supported to comply with the objectives listed in subparagraphs b) and c) have the same form as those in the themed operational programme. In this case, there is also support for public lighting. Aid takes the form of a non-reimbursable subsidy, and in the scenario provided for in subparagraph b), may also be granted through IFE2020. In the scenario provided for in subparagraph a), different criteria exist in each region with regard to the type of beneficiary.

Support for companies takes the form of a reimbursable subsidy granted through IFE2020, while energy audits and diagnostic studies for all the abovementioned measures will be financed through non-reimbursable subsidies.

Property Rehabilitation and Conservation Fund

Here the aim and purpose is to finance the recovery, reconstruction, renovation and conservation of State property under the conditions set out in Ministerial Implementing Order No 293/2009 of 24 March 2009, which also approved the respective management regulations.

Beneficiaries of the fund are the direct and indirect administration bodies of the State who are users of State property and who submit applications as provided for in the management regulations to property management units, further to the respective property conservation and renovation plans drawn up in compliance with the State Property Management Programme.

Article 7 in the fund's management regulation on application assessment criteria, includes express reference to conservation and rehabilitation work intended to promote energy efficiency in buildings, which may be classified as priority.

Plan for the Promotion of Efficiency in the Consumption of Electrical Power (PPEC)

Promoted by the Energy Services Regulator, the aim of PPEC is to promote measures intended to improve efficiency in electrical power consumption, through actions undertaken by electricity suppliers, power transmission and distribution system operators, associations and entities which defend consumer interests, corporate associations, municipal associations, energy agencies and higher education institutions and research centres, and are intended for consumers in the different market segments.

Environmental Fund

The aim of the EF, created by Decree-Law No 42-A/2016 of 12 August 2016, as amended, is to support environmental policies to achieve sustainable development objectives, thus contributing to compliance with national and international objectives and commitments, more specifically those relating to climate change, water resources, waste and the preservation of nature and biodiversity.

Accordingly, and in coordination with national strategies such as ENAEC 2020, the National Strategy for Environmental Education, approved by Council of Ministers Resolution No 100/2017 of 11 July 2017 and the Action Plan for the Circular Economy, approved by Council of Ministers Resolution No 190-A/2017 of 11 December 2017, the EF finances entities, activities and projects which seek to mitigate and/or adapt to climate change, use water efficiently and protect water resources, assist in the transition to a circular economy, educate and raise awareness with regard to the environment and research and development in environmental subjects.

Economic and Social Stabilisation Programme

The Economic and Social Stabilisation Programme, approved by Council of Ministers Resolution No 41/2020 of 6 June 2020, approves a series of economic and social stabilisation measures. Included among the measures approved are the 'Support Programme for more Sustainable Buildings', which focuses on improving the energy efficiency of buildings and the respective decarbonisation, achieved through the Environmental Fund, covering:

- support for the installation of efficient windows, insulation of façades and roofing, and other work to promote energy efficiency in buildings;

- installation of photovoltaic panels and other equipment for the production of renewable power, installation of heat pumps and other equipment which uses energy from renewable sources;

- intervention work with a view to water efficiency, including the replacement of equipment;

- intervention work which promotes the incorporation of biomaterials, recycled materials, nature-based solutions, green façades and roofing and bioclimatic architectural solutions.

The aim of this initiative is to help reduce energy bills and improve the level of comfort and indoor air quality, thus combating energy poverty and improving health.

Portugal 2030

The Multi-annual Financial Framework 2021-2027 will be one of the main sources of financing for the decarbonisation of the economy. This is because it establishes a commitment (still under negotiation) to allocate 25% of total budget spending to climate action, which includes energy transition. As such, the preparation of the financing framework for the 2021-2027 period will reflect the guidelines set out on a European level and form an important source of financing for LTRS.

For the 2021-2027 period, and to ensure that the goals are achieved, it will be necessary to take full advantage of the Multi-annual Financial Framework to orientate the coming cycle of financing for the energy transition, avoiding the financing of investments which are not in line with this objective.

It is also important that Community funds are mobilised as soon as they are available, which will not be possible without well-designed priority actions and projects which are justifiable under the strategy set out and which have sufficient merit to be quickly approved. This will further demonstrate the path to be taken for other projects of the same nature.

Banco Português de Fomento, S.A.

As a national development bank, this institution has the resources to provide Portuguese companies with suitable means of financing to help them transform. It will operate as a Green Bank, supporting necessary investment to assist in the decarbonisation of the economy and in the fight against climate change.

European Instruments

European Recovery Fund

The recovery fund, currently under development, was created to deal with the effects caused by COVID-19 on the economy, particularly in the most affected sectors. It can thus provide an opportunity for the energy sector with respect to decarbonisation. It is an important financial support instrument to implement energy efficiency actions, such as the renovation of buildings, bringing together resources to assist the economic and environmental plan.

The draft Recovery and Resilience Plan submitted to the European Commission includes an initiative directed at the Energy Efficiency of Buildings, which will allow actions to be leveraged in the short-term under LTRS.

European Investment Bank

The European Investment Bank is the European Union's financial institution and is the largest multilateral financial institution in the world. It is one of the entities with greatest influence in climate financing. As such, it contributes to integration, development and cohesion on a European scale, financing projects to support European Union policies. It recently took on the role of European Climate Bank, after approval of an energy loan policy, and it is the largest shareholder in the European Fund for Strategic Investments (EFSI), which funds investment in small and medium-sized enterprises (SME).

EFSI is one of the three pillars of the Investment Plan for Europe and its aim is to overcome current market shortcomings, addressing these failings and mobilising private investment. It assists in the funding of strategic investment in key areas such as infrastructure, research and innovation, education, renewable energy and energy efficiency, and also provides risk financing for SME.

LTRS is aligned with the objectives of the Portugal 2030 Strategy, particularly with regard to sustainability and the use of endogenous resources, with the goal that the implementation of this strategy will benefit the abovementioned financial support framework. It also reinforces the need to support the renovation of buildings, given that multiple objectives can be achieved in line with the priorities of the Portugal 2030 Strategy.

6.3 SUPPORT MECHANISMS TO MOBILISE PUBLIC AND PRIVATE INVESTMENT WITH A VIEW TO MEETING THE OBJECTIVES SET OUT IN LTRS

Achieving the renovation goals for national building stock requires that financing programmes be complemented by a series of support mechanisms for mobilising public and private investment. As such, and in line with the abovementioned policies and actions, support mechanisms will be promoted based on:

financing models which provide potential gains of scale and increase the viability of projects and the interest of the market, including ESC, through aggregating platforms providing access to investors and the use of standardised packages for renovation solutions for clients with similar requirements;

promoting forms of finance based on the incorporation of new financial innovation concepts such as crowdfunding and blockchain, in coordination with supervisory authorities;

reinforcing the use of energy certification as a standard tool to assess building performance (*ex-ante*), identify typical improvement measures and quantify savings (*ex-post*) together with, whenever applicable, the assessment of actual consumption to support the granting of finance, from a perspective of reduced perceived risk in energy renovation projects. Financing may be complemented by environmental certification of construction products and services;

standardisation of measurement criteria and verification of energy savings achieved through renovation projects, more specifically through the requirement to apply internationally recognised protocols (e.g. the IPMVP Protocol), which will allow an effective database of technical and financial performance to be built for energy efficiency investment on a national level and contribute to the European DEEP database;

reinforcement of 'sustainability criteria' in the improvement in the financial value of property in line with the evolution of sound regulations with regard to environmentally responsible financial products;

promotion of financing mechanisms by entities in the financial system, fostering long-term financing for ESC and other investors;

inclusion of innovative financing mechanisms such as on-bill and on-tax finance;

introduction of standardised risk assessment criteria for investment in energy efficiency, which underpin and support financing decisions;

promotion of tax incentives based on property tax, with a view to mobilising investment in the improvement of buildings;

study the promotion of guarantee mechanisms in collaboration with banking entities, insurance companies, technology suppliers and SME, which will help remove barriers to investment in energy efficiency, in line with the evolution of sound regulations for environmentally responsible financial products;

reinforcement of public investment in energy efficiency, providing a stimulus for supplementary investment from the private sector or to correct specific market shortcomings, introducing and/or revitalising:

- credit schemes co-financed by public funds;
- risk sharing instruments;
- subsidies directed at vulnerable consumers;

- subsidies for technical assistance and covering the costs of energy performance certificates and energy audits, when they are not mandatory;
- public capital funds for energy efficiency;

orientation of investment to public building stock which is energy efficient in alignment with Eurostat guidelines, based on a reformulation of the model for Energy Efficiency Management Contracts and the promotion of financing models which provide for gains of scale and a reduction in perceived risk;

clarification of accounting treatment of energy performance contracts allowing public funds to be channelled and combined more effectively and speed up the mobilisation of financial instruments;

creation, in coordination with municipal and regional entities, of accessible and transparent advisory mechanisms for consumers with regard to the energy renovation of buildings and the financial instruments available, such as 'one-stop shops' with integrated technical and financial services which facilitate the grouping of projects, making them more attractive for the financial market.

In the specific case of promoting support programmes for energy efficiency in housing, a series of vital criteria will be established to consider in future support instruments in this regard, more specifically:

location of buildings: the selection criteria of buildings to be supported must firstly consider the state of conservation of the building, while location criteria will be complementary (namely, location in URA).

Extensive building stock currently exists outside central and historic areas where the need for renovation is increasingly clear.

Given the size of this building stock, to achieve the ambitious targets for energy efficiency improvements in housing requires that eligibility to future public support be ensured.

Type of intervention: whenever possible associate intervention which leads to an improvement in energy efficiency with seismic rehabilitation work (structural) in buildings, as well as interventions which aim to increase fire safety. The construction methods to be used in such interventions must provide for the recovery of materials and components which can be applied in new construction or in renovation projects, as well as the incorporation of secondary raw materials instead of new raw materials. These methods must also contribute to banks for the reuse of construction components that already exist or are to be created.

Scale of intervention and ownership of buildings: the full renovation of buildings on a significant scale and, as such, with considerable impact in terms of improvement in energy efficiency means that future public support must take into consideration multi-unit properties requiring intervention in common areas. In order for this to happen, the eligibility of condominiums must be ensured, without neglecting the fact that many such properties are not professionally managed and do not have any real guarantees to offer, requiring special attention when support measures are designed.

Intensity of incentives: in the case of mobilising financial instruments or using loans to provide support, experience has shown that demand depends on the perception of real gains, seen through significantly lower interest rates and other costs in comparison to general market conditions.

Public housing: experience gained from the Integrated Action Plans for Disadvantaged Communities and the support provided by OPs to improve energy efficiency in social housing, with access to non-reimbursable subsidies, shows the needs for renovation and the potential demand for public support in the public housing sector, and as such, its eligibility should be considered.

Performance: within Europe, both with respect to that set out in the EPBD as well as in the current rules for access to funds, financing for building renovation must depend on the savings that are planned or obtained. As such, when future programmes are defined, criteria must be determined to

enable energy savings and other savings associated with other benefits to be evaluated, and which criteria are most suitable for specific programmes.

7. ESTIMATES OF BENEFITS

7.1 ESTIMATE OF EXPECTED ENERGY SAVINGS

Thermal comfort

The model used to assess thermal comfort is in accordance with standard EN 15251:2007 and was applied to residential buildings. A free-floating temperature assessment was made to reflect the impact of applying the measures to the passive envelope.

This standard establishes different categories of comfort. A dwelling will achieve a specific comfort category when the indoor operative temperature falls within the limits established for that category for at least 95% of hours of occupancy in a year.

Category IV comfort is the lowest, corresponding to thermal discomfort. Category III is defined as *'an acceptable, moderate level of expectation and should be used for existing buildings'*. Category II corresponds to a *'normal level of expectation should be used for new buildings and renovations'* and Category I corresponds to a *'High level of expectation, recommended for spaces occupied by very sensitive and fragile persons with special requirements, like the disabled, the sick, very young children, and the elderly'*. Consequently, the archetypes corresponding to the target segment to be renovated were analysed with regard to their category of comfort prior to applying any improvement measures.

The following table shows the results of this model. As already mentioned, with the exception of multi-family dwellings built after 2016, all other buildings have a category IV level of comfort in a reference scenario. This means that, currently, national building stock has some thermal discomfort during more than 95% of hours in a year. After implementing the improvement measures on the passive envelope and using current regulations as a reference, it can be seen that multi-dwelling buildings in Climate Zone I1 have a Category III level of acceptable thermal comfort. In buildings built after 2006, this category can also be seen in I2. In single-family houses, although the measures are not sufficiently demanding to reach Category III in I1, when the percentage of hours is analysed to change category, values of less than 5% can be seen, which means that during at least 90% of the time, such buildings will have acceptable thermal comfort. The same thing happens in multi-family dwellings in I2, built before 2006.

These results allow us to conclude that:

it is possible to achieve Category III, or higher, in 34% of building stock, corresponding to an acceptable level of thermal comfort without the need for active systems;

the universe of buildings where the category can change is less than 5% in 33% of stock, which means that with a supplementary requirement in the passive envelope it would be possible to achieve Category III, in accordance with the previous point;

accepting a cut at 90% of thermal comfort hours annually, a positive evolution of 3% can be seen for 67% of residential building stock, allowing Category III to be achieved.

Table 10 - Results of the comfort model - Reference scenario and passive scenario

Type of building	Climate Zone	Construction period	ID	Comfort Category Reference Scenario	% to change category	Comfort Category Passive Scenario	% to change category
Single Family	I1	<1960	Arch.1	cat IV	20%	cat IV	2%
Single Family	I2	<1960	Arch.2	cat IV	33%	cat IV	14%
Single Family	I3	<1960	Arch.3	cat IV	59%	cat IV	54%
Single Family	I1	1961-1990	Arch.4	cat IV	20%	cat IV	4%

Type of building	Climate Zone	Construction period	ID	Comfort Category Reference Scenario	% to change category	Comfort Category Passive Scenario	% to change category
Single Family	I2	1961-1990	Arch.5	cat IV	40%	cat IV	33%
Single Family	I3	1961-1990	Arch.6	cat IV	59%	cat IV	54%
Single Family	I1	1991 -2005	Arch.7	cat IV	24%	cat IV	4%
Single Family	I2	1991 -2005	Arch.8	cat IV	48%	cat IV	36%
Single Family	I3	1991 -2005	Arch.9	cat IV	57%	cat IV	35%
Single Family	I1	2006-2016	Arch.10	cat IV	19%	cat IV	2%
Single Family	I2	2006-2016	Arch.11	cat IV	28%	cat IV	20%
Single Family	I3	2006-2016	Arch.12	cat IV	51%	cat IV	32%
Single Family	I1	>2016	Arch.13	cat IV	2%	cat IV	2%
Single Family	I2	>2016	Arch.14	cat IV	9%	cat IV	9%
Single Family	I3	>2016	Arch.15	cat IV	24%	cat IV	24%
Multi-dwelling	I1	<1960	Arch.16	cat IV	16%	cat III	8%
Multi-dwelling	I2	<1960	Arch.17	cat IV	26%	cat IV	1%
Multi-dwelling	I3	<1960	Arch.18	cat IV	48%	cat IV	13%
Multi-dwelling	I1	1961-1990	Arch.19	cat IV	12%	cat III	7%
Multi-dwelling	I2	1961-1990	Arch.20	cat IV	24%	cat IV	4%
Multi-dwelling	I3	1961-1990	Arch.21	cat IV	50%	cat IV	18%
Multi-dwelling	I1	1991-2005	Arch.22	cat IV	18%	cat III	8%
Multi-dwelling	I2	1991-2005	Arch.23	cat IV	26%	cat IV	2%
Multi-dwelling	I3	1991-2005	Arch.24	cat IV	52%	cat IV	16%
Multi-dwelling	I1	2006-2016	Arch.25	cat IV	5%	cat III	8%
Multi-dwelling	I2	2006-2016	Arch.26	cat IV	17%	cat III	11%
Multi-dwelling	I3	2006-2016	Arch.27	cat IV	50%	cat IV	17%
Multi-dwelling	I1	>2016	Arch.28	cat II	4%	cat II	4%
Multi-dwelling	I2	>2016	Arch.29	cat III	5%	cat III	5%
Multi-dwelling	I3	>2016	Arch.30	cat IV	19%	cat IV	19%

Energy saving

The energy model used to estimate final energy consumption by archetype and for existing building stock is a dynamic bottom-up hourly simulation model. Energy simulation models were built so that it was possible to estimate effective nominal consumption of power, and as such, expected energy savings will be more conservative and more in line with the real national situation.

The following table provides a summary of the model's main results, in 2050, individually for each archetype and generally for the corresponding building stock.

As can be expected, in residential buildings and from an individual perspective (by archetype), greater energy savings can be seen in older single-family buildings located in more extreme climatic zones. It is in these buildings that energy requirements are highest and, consequently, the policy packages implemented have greater savings potential. However, the breakdown of these packages throughout national building stock is highly variable. For this reason, and by extrapolating results for all buildings, greatest energy savings occur in buildings built before 1990 in milder climatic zones, which is where a greater number of buildings exist.

However, in non-residential buildings, the greatest savings can be seen in public buildings with high levels of energy consumption (e.g. buildings in the health sector and sports arenas). When results are observed for the breakdown of stock, cumulative savings are more significant in private buildings, more specifically, in buildings for commerce, offices and hotels, due to the high number of such buildings in national stock.

These results allow us to conclude that:

policy packages in residential buildings achieve greater primary energy savings (total of 0.90 Mtoe as against 0.58 Mtoe in non-residential buildings); furthermore, it is in these buildings that thermal

comfort measures are planned, aligning the 'Energy Efficiency First' priority with assumptions of improvement in living conditions for occupants;

it is in services buildings that measures implemented are more profitable, reaching potential savings of the same magnitude as residential buildings (€107.803bn₂₀₂₀ as against €111.309bn₂₀₂₀, respectively) for a much lower level of investment (€33.004bn₂₀₂₀ as against €110.343bn₂₀₂₀);

it is in residential buildings built before 1990 that it will be possible to achieve greater primary energy savings, promoting policies and actions in worse performing segments;

in single-family houses it is possible to achieve considerable primary energy savings (0.52 Mtoe).

Despite the potential primary energy savings in public buildings, which LTRS will prioritise when implementing policy packages in non-residential buildings, it is in private buildings that cumulative primary energy savings will be greater, more specifically, in buildings for commerce.

Table 11 - Results of energy model - Savings by archetype and for total stock

Type of building	Climate Zone	Construction period	ID	Primary energy saving (2050) Archetype (kWh/m ²)	Primary energy saving (2050) Total building stock (Mtoe)
Single Family	I1	<1960	Arch.1	24.0	0.06
Single Family	I2	<1960	Arch.2	24.0	0.05
Single Family	I3	<1960	Arch.3	45.3	0.02
Single Family	I1	1961-1990	Arch.4	17.2	0.07
Single Family	I2	1961-1990	Arch.5	27.6	0.13
Single Family	I3	1961-1990	Arch.6	47.8	0.03
Single Family	I1	1991-2005	Arch.7	16.4	0.05
Single Family	I2	1991-2005	Arch.8	24.5	0.09
Single Family	I3	1991-2005	Arch.9	39.4	0.02
Single Family	I1	2006-2016	Arch.10	7.0	0.01
Single Family	I2	2006-2016	Arch.11	10.7	0.01
Single Family	I3	2006-2016	Arch.12	13.7	0.00
Single Family	I1	>2016	Arch.13	5.6	0.00
Single Family	I2	>2016	Arch.14	5.5	0.00
Single Family	I3	>2016	Arch.15	7.4	0.00
Multi-dwelling	I1	<1960	Arch.16	17.1	0.03
Multi-dwelling	I2	<1960	Arch.17	19.4	0.00
Multi-dwelling	I3	<1960	Arch.18	27.4	0.00
Multi-dwelling	I1	1961-1990	Arch.19	16.8	0.14
Multi-dwelling	I2	1961-1990	Arch.20	19.5	0.03
Multi-dwelling	I3	1961-1990	Arch.21	28.1	0.00
Multi-dwelling	I1	1991-2005	Arch.22	18.3	0.11
Multi-dwelling	I2	1991-2005	Arch.23	21.0	0.04
Multi-dwelling	I3	1991-2005	Arch.24	30.1	0.00
Multi-dwelling	I1	2006-2016	Arch.25	14.5	0.02
Multi-dwelling	I2	2006-2016	Arch.26	15.5	0.00
Multi-dwelling	I3	2006-2016	Arch.27	25.1	0.00
Multi-dwelling	I1	>2016	Arch.28	9.5	0.00
Multi-dwelling	I2	>2016	Arch.29	13.3	0.00
Multi-dwelling	I3	>2016	Arch.30	10.6	0.00
Public	I1	-	OTHER	24.3	0.01
Private	I1	-	COMMERCE	34.7	0.29
Public	I1	-	EDUCATION	19.9	0.01
Private	I1	-	OFFICE	17.5	0.08
Private	I1	-	HOTELS	22.6	0.08
Private	I1	-	RESIDENCE	25.3	0.03
Public	I1	-	HEALTH	55.1	0.06
Public	I1	-	SPORT	52.1	0.03

7.2 EXPECTED NON-ENERGY CO-BENEFITS

In addition to the benefits estimated by the comfort and energy models, a series of co-benefits also exist which can be quantified. The abovementioned estimate is a challenge as, although there is a general perception of possible co-benefits relating to the renovation of a building (e.g. with respect to health, safety and air quality), there are still very few studies which provide specific figures.

In order to monetise possible co-benefits from the measures proposed in LTRS, a number of indicators have been specified, which would apparently be more direct in a possible co-relation, and the following hypotheses have been analysed:

Health of occupants

Studies exist which prove that indoor temperature, dampness and mould can contribute to an increase in illnesses such as rhinitis and asthma;

Furthermore, in accordance with the OECD Health and Care report, every Portuguese person goes to the doctor four times a year on average;

Accepting that good living conditions have a positive impact on the health of occupants, an increase in construction quality through the renovation of the passive envelope of buildings and, as a result, an increase in thermal comfort, may lead to a reduction of at least one visit to the doctor per year;

The average cost of a consultation varies considerably depending on the public or private doctors available, but an average cost of €20 per consultation, per inhabitant, per year has been considered;

The average number of occupants per dwelling is 2.6;

In light of the above, the benefit relating to the health of occupants, in other words, lower costs due to illness and health expenses was estimated at €52/year/dwelling.

Labour productivity

Based on the assumption that one person will spend one day less ill per year, there will be one extra day of work per year;

The average salary of a worker in Portugal in 2018 was €970.40, corresponding to €44.11/day;

According to the National Statistics Institute, in 2018, the population in Portugal was 10 283 800, and 51% were active (5 232 600), corresponding to an average of 1.33 active people per dwelling;

In light of the above, the benefit relating to labour productivity was estimated at €58.7/year/dwelling.

Increase in property value

According to the National Statistics Institute, the average value of property in March 2018 was estimated at €1 167/m²;

An increase in property value of 5.9% was considered, as a result of energy renovation;

In light of the above, the benefit relating to the increase in property value was estimated at €68.85/m².

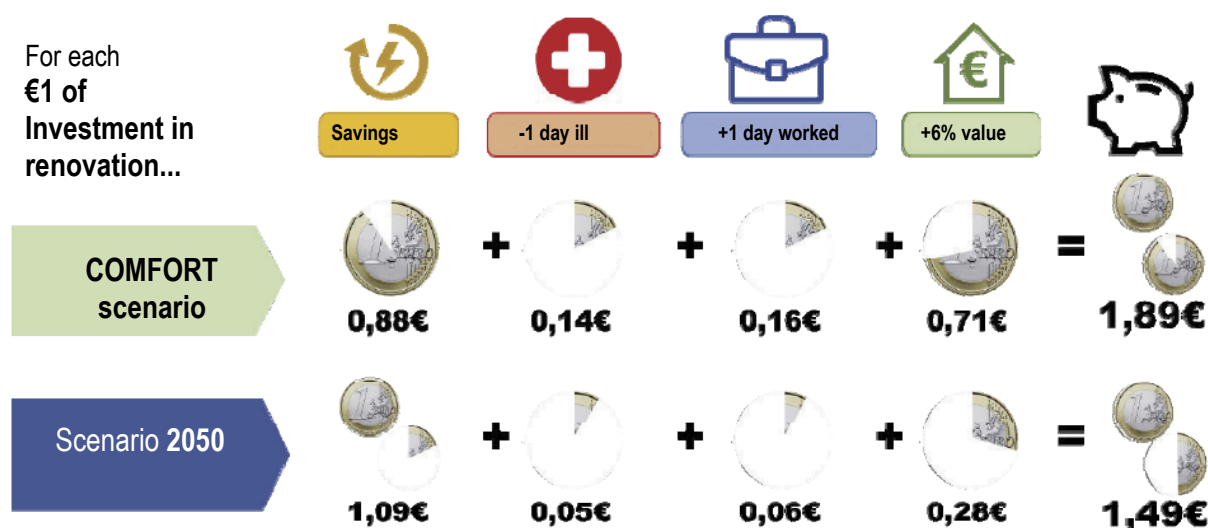
The following figure shows the results of this exercise, applied to existing building stock, for a comfort scenario (where only work on the passive envelope was considered, without the use of active systems) and for the 2050 scenario, after implementing all the packages of improvement measures.

It can be seen that, for every euro invested in renovation, in the comfort scenario, savings relating to energy consumption would not, *per se*, be enough to cover the required investment (€0.88). However, when including the co-benefits arising from lower health costs (€0.14), with the increase in

labour productivity (€0.16) and the increase in property value (€0.71), savings total €1.89, resulting in a positive return on investment of 89%.

In the 2050 scenario, where investment and savings include active systems, cumulative savings are €1.49, resulting in a positive return on investment of 49%.

Figure 12 - Monetisation of the (minimum) benefits relating to energy renovation



Without prejudice to the preliminary results set out herein, a more exhaustive analysis of the correlation and synergies in different fields is necessary (and, possibly, the identification of other aspects which have not been quantified here), so as to provide a comprehensive estimate of potential co-benefits arising from the energy renovation of buildings.

Considering that the abovementioned assumptions include the minimum impact caused, the quantification of co-benefits could be larger, provided that they are duly supported.

Other co-benefits

Combating Energy Poverty

The concept of energy poverty does not have a consensual definition, and several alternatives exist. Energy poverty is the result of a combination of low income, high energy bills and poor energy performance of housing. Generally, the concept of energy poverty refers to the inability to reach thermal comfort in housing through suitable heating or cooling, due to economic reasons.

The EPBD addresses the importance of prioritising other possible benefits, more specifically, combating energy poverty, increasing thermal comfort, improving air quality, preventing construction pathologies and improving safety. These benefits come mostly, but not exclusively, from measures for the deep energy renovation of building envelopes, identified in the improvement measures package 'Increase in Thermal Comfort - Combating Energy Poverty'.

Reduction of water use

Recent European and national studies estimate that, depending on when they were built, buildings have water efficiency potential of 30 to 50%, with investment return times of one to two years.

Adding the benefits arising from the water-energy nexus, it is estimated that the combined potential savings in water and final energy for families in Portugal could reach the equivalent of 50% of

the water bill. This would represent savings of around €800m per year, just in the domestic sector (based on data from the National Statistics Institute on total annual average expenditure per household in Portugal, with reference to July 2017). This potential is even greater with the introduction into buildings of use of rainwater and domestic grey water for compatible purposes.

Studies carried out on government buildings show potential average water savings of between 14 and 25%, depending on the type of building. Measures mainly focus on reducing consumption through efficiency and, in some specific situations, by using rainwater. Potential water savings for the public supply network is thus also greater in these buildings.

Given this potential, and with respect to the water-energy nexus, the JRC Report 'Follow-up of the MEErP Preparatory Study on Taps and Showers' reinforces the importance of long-term strategies for the renovation of buildings to consider the use of more efficient devices when using water and energy, as energy efficiency measures.

Increased energy resilience and security

The use of local energy sources increases energy resilience and security, providing Portugal with energy independence, as it allows energy imports to be reduced.

Furthermore, the combination of reducing consumption with the growing electrification of energy use and employing local production, allows infrastructure (maintenance and/or expansion) costs to be reduced, with an economic impact that can be significant over the long-term.

As consumers come to play an active role in energy production (becoming an active customer and obtaining extra income from excess production), they also become more aware of their own consumption and waste. This in turn increases energy literacy and, as a result, reduces excessive consumption and inefficiency in energy use (leading to a lower energy bill) and a reduction in GHG emissions.

Benefits with regard to the chain of value associated with the construction industry and property sector

LTRS provides for a series of consumer awareness raising actions to implement sustainable consumption, coordinating the different players in the chain of value, from the manufacturer to the distributor and consumer, allowing the products offered to the construction industry to be improved. There will also be specialised training for the sector with regard to the use of more suitable and more efficient materials and new construction techniques.

Accordingly, a multiplier effect is expected in employment, not only through the increased need for building renovation, but also in the use of materials which can be manufactured in Portugal and the use of intensive and specialised labour.

Moreover, a renovated and energy efficient building stock will certainly have highly positive effects on several sectors, particularly the tourism industry, improving the experience that this sector has to offer and increasing the quality of supply through sustained growth.

8. ROADMAP

8.1 MEASURABLE PROGRESS INDICATORS

Measuring progress on the road to meeting the long-term objectives established for 2050 will be achieved through a series of preferably annual indicators, without prejudice to possible adjustments based on developments in available data.

Many of the indicators presented herein do not as yet exist in official national statistics. Given the need to acquire data for these indicators, as well as periodic reporting requirements of such data,



specific policies and actions have been identified in the Area of Action - Monitoring, set out in Chapter 5. The detailed definition of these indicators, as well as the identification of the entities responsible for producing them will be defined in the LTRS governance model.

The implementation of such progress indicators in particular, as well as LTRS in general, will be monitored through a multidisciplinary working group set up for the purpose.

	Progress indicators
a) Indicators describing national building stock	Number of buildings/dwellings/m², considering the type of building, construction period, size and climate zone; Total real annual energy consumption, by final use and considering the type of building, construction period, size and climate zone and final use of energy of building and associated GHG emissions; Total local energy production, by type of source of renewable energy and considering the type of building, construction period, size and climate zone and renewable energy source of building; Thermal comfort index, considering the type of building, construction period, size and climate zone; Total number and annual percentage of buildings renovated, by type of renovation and considering the type of building, construction period, size and climate zone and type of renovation of building; Total m² renovated, considering the type of building, construction period, size and climate zone; Reduction of GHG emissions associated with renovated buildings; Amount of construction and demolition waste produced per m² renovated; Amount of construction and demolition waste forwarded for recycling per m² renovated; Amount of components, products and materials removed from renovations per m² renovated; Total number of energy certificates, by energy class and considering the type of building, construction period, size and climate zone and building energy class; Number and m² of total NZEBs, considering the type of building, construction period, size and climate zone; Total number and m² of buildings with green façades and roofing and considering the type of building, size of building, green area and location; Total annual water consumption in buildings, by final use and considering the type of building, construction period, size and climate zone, (non) potable uses and water sources used (public supply network and use of alternative sources of water); Total use of alternative sources of water in buildings, by type of source of 'renewable' water (rainwater, grey water, water for reuse from waste water treatment stations (WWTS)), and considering the type of building, construction period, size and climate zone and existence of uses outside the building; Total number of water performance (AQUA+) classifications issued, by water class and considering the type of building, construction period, size and climate zone and existence of uses outside the building.
b) Indicators relating to cost-effective approaches to relevant renovations	Cost-effectiveness of renovation measures, through net current value, investment recovery period and the cost of investment by annual savings, considering the type of building, construction period, size and climate zone; Potential energy savings, considering the type of building, construction power period, a size and climate zone;



	Progress indicators
c) Policy and action monitoring indicators aimed at:	Value from fees on energy, or other charges, channelled to the implementation of energy and water efficiency measures; Potential water savings, total and considering the type of building, construction power period, a size and climate zone and the existence of exterior uses;
i. Stimulating cost-effective deep renovation of buildings	Total and annual proportion of buildings subject to deep renovation and renovation in NZEB; public incentives for deep renovation (identification, budget and duration); Public and private investment in deep renovations (value executed); Final annual energy savings achieved through deep renovation (absolute value and percentage); Savings in materials achieved with the application of the principles of the circular economy (absolute value and percentage); Reduction in water consumption from public supply network achieved through deep renovation (absolute value and percentage).
ii. Work on worst performing segments of the national building stock	Public investment in policies that address the abovementioned issues (split incentives, energy poverty, etc.); Number and percentage of buildings by energy class and considering the type of building, construction period, size, climate zone and energy class of building.
iii. Work with regard to split-incentive dilemmas and market shortcomings	Number and percentage of buildings and dwellings rented by type of building, owner and energy class; Savings arising from access to tax benefits by owners of rented property; Amount financed by specific financial programmes that operationalise energy and water renovation in buildings.
iv. Combating energy poverty	Number and percentage of people affected by energy poverty, by geographical location (preferably statistical sub-section); Proportion of available income of families spent on energy, by geographical location (preferably statistical sub-section); Late payments of bills for public utility services, by geographical location (preferably statistical sub-section); Number and percentage of people living in unsuitable housing conditions (including thermal discomfort), by geographical location (preferably statistical sub-section); Energy poverty vulnerability index, by geographical location (preferably statistical sub-section); Amount awarded in energy cheques, by geographical location (preferably statistical sub-section), if implemented; Amount awarded in subsidies for the replacement of ambient heating and DHW systems with more efficient systems.
v. Work on public buildings	Total m ² of public buildings renovated: by type of building, size, owner, acquisition regime and climate zone; Total number of buildings by energy class, and considering the type of building, size, owner, acquisition regime and climate zone; Total annual energy consumption by final use, and considering the type of building, size, owner, acquisition regime and climate zone and associated GHG emissions; Total local energy production, by type of source of renewable energy and considering the type of building, size, owner, acquisition regime and climate zone; Total number, and percentage of renovated buildings and considering the type of building, size, owner, acquisition regime and climate zone; Reduction of GHG emissions associated with renovated buildings; Total number and m ² of NZEB and considering the type of building, size, owner, acquisition regime and climate zone;



	Progress indicators
	Total number and m² of buildings with green façades and roofing and considering the type of building, size of building, green area and location; Savings in materials achieved with the application of the principles of the circular economy (absolute value and percentage); Total use of alternative sources of water in buildings, by type of source of 'renewable' water (rainwater, grey water, water for reuse from WWTP), and considering the type of building, construction period, size and climate zone and existence of uses outside the building; Reduction in water consumption from public supply network achieved through deep renovation (absolute value and percentage); Total potential water savings identified, and considering the type of building, construction period, size and climate zone of the building and the existence of outside uses.
vi. Promoting smart technologies in the construction of buildings and energy communities	Number of buildings equipped with energy and water management systems or similar smart systems: by type of building (with focus on non-residential type); Number of buildings equipped with smart meters and sensors, by type of building, geographical location and type of meter; Number of buildings equipped with electric vehicle charging points; Public and private investment in smart technologies (including smart energy networks); Production of energy from small production units, by geographical location (preferably statistical sub-section); Number of people participating in energy communities, by geographical location (preferably statistical sub-section).
vii. Work with regard to professional qualifications in the construction and energy efficiency sectors	Number of students with university degrees specialising in energy efficiency and associated smart technologies; Number of technicians trained through courses focusing on energy efficiency and the water/energy nexus, including the integration of water efficiency and other resources and the principles of the circular economy, associated smart technologies and NZEB (e.g. experts qualified with respect to ESC and AQUA+); Budget for national research programmes in the field of the energy efficiency of buildings; Participation by national universities in international scientific research projects (e.g. H2020) on energy efficiency in buildings.
d) Monitoring indicators for expected energy savings and other possible benefits;	Reduction in electricity costs: by household (residential) and by type of building (non-residential) after completing the energy renovation of the building; Water savings effectively achieved, by type of building and geographical location (preferably statistical sub-section); Impact on the performance of the thermal comfort index after energy renovation in a building; Impact on the vulnerability to energy poverty index after energy renovation in a building; Reduction in health costs attributable to the energy renovation of buildings; Gains in labour productivity attributable to the energy renovation of buildings; Increase in property value attributable to the energy renovation of buildings; Reduction in GHG emissions associated with renovated buildings; Reduction in water and energy costs through water efficiency measures: by household (residential) and by type of building (non-residential) after completing the water renovation of the building; Water savings effectively achieved, by type of building and geographical location (preferably statistical sub-section);

	Progress indicators
e) Investment mobilisation monitoring indicators	Savings in materials achieved with the application of the principles of the circular economy (absolute value and percentage); Employment in the construction industry (number of jobs created per million euros invested in the sector); Increase in GDP in the construction industry.
i. Reduction in perceived risk for investors and the private sector	Perceived risk of energy efficiency operations (based on surveys).
ii. Use of public financing to stimulate investment by private sector or correct market shortcomings	Percentage of total investment in energy and water savings corresponding to public investment; Number of public-private partnership initiatives.
iii. Orientation of investment to an efficient public building stock	Public investment in the renovation of public buildings.
iv. Accessible and transparent advisory services.	Initiatives by one-stop-shops; Awareness raising initiatives (number, target-public reached, target-public adopting measures).

8.2 OBJECTIVES - 2030, 2040 and 2050

In coordination with the aims of RCN 2050 and NECP 2030, a series of objectives have been defined for 2030, 2040 and 2050. These objectives define the progress to be achieved by implementing packages of improvement measures in existing buildings with respect to expected impact as well as the required financing.

The objectives are based on the following series of result indicators:

- Percentage of primary of energy savings;
- Percentage of local renewable energy;
- Percentage of total renewable energy;
- Percentage reduction of GHG emissions in the residential and services sector;
- Renovated area of buildings (m²);
- Percentage of buildings renovated (with respect to existing buildings in 2018);
- Percentage reduction in of hours of discomfort in housing;
- Investment in improvement measures (€₂₀₂₀/m²);
- Energy savings (€₂₀₂₀/m²).

The following tables show, in relation to 2018, the objectives for residential and non-residential building stock and for all building stock.

Table 12 - Objectives for residential buildings with respect to 2018

Indicator	2030	2040	2050
Percentage of primary energy savings	15%	37%	40%
Percentage of local renewable energy	10%	35%	73%
Percentage of total renewable energy	57%	62%	98%
Percentage of reduction in CO ₂ emissions	16%	56%	85%
Renovated area of buildings (m ₂)	299524729	513059967	514265282
Percentage of renovated buildings	70%	100%	100%
Percentage reduction in hours of discomfort	26%	34%	56%
Weighted mean investment (€ ₂₀₂₀ /m ²)	82	165	258
Savings (€ ₂₀₂₀ /m ²)	88	191	279

Table 13 - Objectives for non-residential buildings with respect to 2018

Indicator	2030	2040	2050
Percentage of primary energy savings	7%	15%	28%
Percentage of local renewable energy	11%	25%	54%
Percentage of total renewable energy	78%	87%	97%
Percentage of reduction in CO ₂ emissions	15%	37%	68%
Renovated area of buildings (m ²)	64155772	122577719	233687788
Percentage of renovated buildings	27%	52%	100%
Percentage reduction in hours of discomfort	N/A	N/A	N/A
Weighted mean investment (€ ₂₀₂₀ /m ²)	81	145	155
Savings (€ ₂₀₂₀ /m ²)	137	240	447

Table 14 - Objectives for total building stock with respect to 2018

Indicator	2030	2040	2050
Percentage of primary of energy savings	11%	27%	34%
Percentage of local renewable energy	11%	30%	63%
Percentage of total renewable energy	68%	75%	98%
Percentage of reduction in CO ₂ emissions	15%	47%	77%
Renovated area of buildings (m ²)	363680501	635637685	747953071
Percentage of renovated buildings	69%	99%	100%
Percentage reduction in hours of discomfort	26%	34%	56%
Weighted mean investment (€ ₂₀₂₀ /m ²)	82	164	256
Savings (€ ₂₀₂₀ /m ²)	89	192	283

The results of simulations and the implementation of the abovementioned policy packages suggest cumulative primary energy savings of 40% in residential buildings by 2050, and 28% in non-residential buildings, totalling 34% with regard to all existing buildings to date.

The residential sector has the potential to achieve significant savings mainly through the replacement of ambient heating and DHW systems with more efficient systems (e.g. solar thermal, heat pumps or near-surface geothermal) and by reducing energy needs through work to improve the envelope. In the non-residential sector, savings are lower as existing equipment (mostly heat pumps and chillers) are already efficient to some degree and as such, replacement with new equipment will have less impact.

With respect to the implementation of local renewable power production systems, greater impact will be seen through photovoltaic panels installed on non-residential buildings and this measure is especially attractive (both with regard to the potential to reduce CO₂ emissions, as well as in the relation between investment and savings achieved). In this specific indicator, it has been estimated that by 2050, around 63% of energy consumption by all buildings will be produced locally through photovoltaic panels (using batteries) to supply electricity, or through solar thermal panels and biomass systems to supply DHW.

CO₂ emissions calculated locally for building stock has been estimated at 85% and 68% for residential and non-residential buildings, respectively, providing a total reduction of 77% in CO₂ emissions by 2050 (with respect to 2018).

With the significant electrification of systems planned up to 2040, any electricity which is not produced locally is expected to be almost exclusively renewable (90% to 95% penetration of renewable energy at source is expected by 2050). Given that the simulation model considered that 100% of buildings existing in 2018 would be renovated by 2050 (although different policy packages would be

implement at different stages as described in Chapter 3), together with the estimated results for local and at source energy production (98% total renewable energy), it is possible to conclude that LTRS is in alignment with the goal to create decarbonised building stock, which is highly energy efficient and with NZEB.

Taking into account that thermal comfort was established as a priority criterion in the renovation of residential buildings, with the roadmap and policy packages, a reduction in hours of discomfort can be seen in 56% of the year. Of note is the positive evolution in the minimum temperature of housing, from 10 C to 16 C in the worst scenario, which contributes towards the co-benefits described in Chapter 7 and helps combat energy poverty.

With regard to the analysis of the economic impact, it can be concluded that overall cumulative energy savings over 30 years are always higher than the required investment, for both residential buildings (where the return on investment is low, although positive) as well as non-residential buildings (where the return on investment is quite high). In order to achieve the policy packages for all building stock, total investment required by 2050 is estimated at €256₂₀₂₀/m² for expected energy savings of €283₂₀₂₀/m².

8.3 CONTRIBUTION TO REACHING EUROPEAN UNION ENERGY EFFICIENCY OBJECTIVES

Relation with other national energy policy instruments

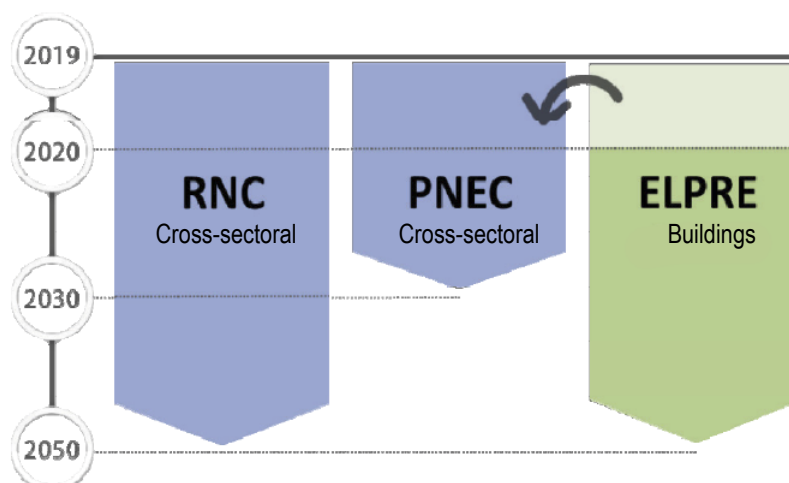
When drawing up LTRS, a bottom-up model was used which allows the impact of introducing new technologies for thermal comfort and energy consumption in existing buildings to be estimated. In order to ensure alignment of the results of this simulation model with other national energy policy instruments for buildings, more specifically, RCN 2050 and NECP 2030, compatibility with the assumptions set out in such instruments was considered in the definition of input parameters for LTRS.

It is important that these three instruments - RCN 2050, NECP 2030 and LTRS - are coordinated and are consistent, although on different scales and levels of coverage, contributing to a coherent strategy for Portugal, seeking to achieve the objectives laid down by the European Union.

The model adopted in LTRS is in alignment with RCN 2050 and NECP 2030, and aims to include the assumptions set out therein, for example with regard to the electrification of building stock, or the type of technologies to be introduced such as the specific focus on heat pumps for heating, etc., with a view to achieving energy and climate targets by 2030. The results from the LTRS model are in line with achieving the targets and goals established in these two strategic documents.

Furthermore, important elements from LTRS should feature in NECP 2030, more specifically with regard to the indicative milestones for public and private residential and non-residential buildings, total construction area to be renovated and the equivalent annual energy savings to be achieved from 2020 to 2030 in the example to be set by public buildings and the indicative stages for 2030, 2040 and 2050. Other aspects include measurable progress indicators established on a national level, an evidence-based estimate of expected energy savings and general benefits, and their contribution to European Union energy efficiency targets, as set out in the LTRS roadmap.

Figure 13 - Relation between RCN 2050, NECP 2030 and LTRS



RCN 2050

Among other commitments, in RCN 2050 Portugal pledges to '*Promote the decarbonisation of the residential sector, focusing on urban rehabilitation and increased energy efficiency in buildings, fostering the gradual electrification of the sector and the use of more efficient equipment, thus combating energy poverty*', reflecting the rationale behind LTRS.

In order to achieve this commitment, RCN 2050 sets out a series of drivers for decarbonisation of the residential and services sectors, where LTRS is also in alignment:

insulation and renovation are achieved in LTRS through the measures package '*Improvement of Comfort - Combating Energy Poverty*', where the introduction and reinforcement of thermal insulation in existing buildings is planned, more specifically, in roofing, façades and through the full replacement of glazed spans with high thermal performance solutions;

energy Efficiency is achieved in LTRS through the measures package '*Increase in Energy Efficiency*' which aims to install systems which are more efficient for heating, cooling and DHW, high performance electrical equipment such as LEDs for lighting and the use of equipment with higher classes of energy efficiency;

electrification is achieved in LTRS through the measures package '*Increase if Energy Efficiency*' in buildings where the gradual replacement of existing systems is planned, by 2040 (e.g. Natural gas systems) with highly efficient electric systems (particularly heat pumps, as they provide a cost-effective solution for the decarbonisation of buildings) for heating and cooling. However, given their relevance mainly in rural areas, biomass solutions have been maintained, but are replaced, when possible, with more efficient systems (e.g. heat exchangers);

solar thermal is achieved in LTRS through the measures package '*Local Decarbonising*', where the installation of renewable energy sources is planned by 2050, more specifically, solar thermal for DHW. LTRS also aims to introduce decentralised systems for the production of electricity (through photovoltaic panels) supported by storage systems (e.g. batteries) to increase the flexibility between supply and demand and to drive local energy markets and foster the consumption of shared energy promoting positive energy neighbourhoods).

RCN 2050 also stresses the need to increase the thermal comfort requirement, a scenario also considered in LTRS through the measures package '*Gradual Increase in Comfort*', which provides for reinforcement in the use of heating and cooling systems, supported by the increasing trend for electrification in the building sector and the use of more efficient equipment (e.g. heat pumps), the

increased use of insulation materials and by higher rates of urban renovation (e.g. replacement of windows).

NECP 2030

NECP 2030 sets out several lines of action including *'the promoting of energy renovation in building stock and NZEB'*, with the aim of *'mobilising the efforts required to promote energy efficiency through the renovation of buildings'*. In order to ensure the effective energy renovation of building stock, NECP 2030 sets out action measures including a long-term strategy for the renovation of buildings, which is established in LTRS.

Throughout NECP 2030, a series of assumptions are established which serve as the basis for the results and leverage the plan up to 2030, which are in alignment with LTRS, more specifically:

promotion of renovation as the main form of intervention for buildings and urban development, increasing the working life of buildings and maximising the resources already invested, helping reduce GHG emissions while also minimising construction waste and contributing to the conservation of nature and biodiversity;

reinforcement of the thermal comfort of housing, both with regard to heating as well as cooling, emphasising insulation solutions, which is achieved in LTRS through the packages of improvement measures *'Improvement in Comfort - Combating Energy Poverty'*.

Energy transition which does not aggravate energy poverty, which is achieved in LTRS through the packages of improvement measures *'Improving Comfort - Combating Energy Poverty'* which focuses on increasing the quality of the passive envelope of buildings and on thermal comfort and *'Specific Area of Action AA5 Combating Energy Poverty'* which seeks to implement a series of actions to combat energy poverty and reduce electricity, gas and water bills, thus supporting more vulnerable families in the renovation of their homes.

Continuation of the trend for electrification in the building sector, which is achieved in LTRS through the measures package *'Increase in Energy Efficiency'* in buildings, where the gradual replacement of existing systems is planned with highly efficient electric systems by 2040. Heat pumps are considered as the principal solution as they are one of the most efficient systems for ambient heating and cooling, helping increase comfort and reinforcing the electrification of consumption.

A decarbonised and decentralised electricity system, which is achieved in LTRS through the measures package *'Local Decarbonising'*, which aims to introduce decentralised systems for the production of electricity, supported by storage systems (e.g. batteries) to increase the flexibility between supply and demand and to drive local energy markets and foster the consumption of shared energy (promoting positive energy neighbourhoods).

A significant role for solar in the production of hot water, which is achieved in LTRS through the measures package *'Local Decarbonising'*, which aims to incorporate solar thermal in (non) residential buildings with significant DHW requirements by 2050.

Promotion of sustainable techniques in construction and sustainable buildings, by incorporating secondary raw materials in components (for construction, bioclimatic architecture, passive houses and modular, multifunctional and dynamic architecture), the re-use of construction components and the use of recycled components (both in new construction as well as in renovation), the certification of buildings as an instrument to drive sustainability in construction (e.g. ecological labelling, classification systems based on criteria of efficiency and sustainability, analysis of life cycle, cradle-to-cradle approaches — cyclical systems), the water efficiency of construction and the reduction of energy needs, including the energy used into the construction itself, and the promotion and use of renewable energy sources.



Form of the act:

Council of Ministers Resolution.

Office in charge:

Office of the Minister for the Environment and Climate Action

a) Summary to be published in the *Official Portuguese Gazette*:

Approves the Long-term Strategy for the Renovation of Buildings

b) Summary of project content:

The main aim of the Long-Term Strategy for the Renovation of Buildings (LTRS) is to provide incentive and support mechanisms for the renovation of public and private (non)residential buildings so as to obtain a decarbonised and highly energy efficient building stock, thus facilitating the transformation of existing buildings into NZEB, in compliance with national and European objectives for carbon neutrality and energy transition.

This strategy is also of particular importance to comply with other strategic objectives, more specifically, the mitigation of energy poverty and the economic and social recovery process by creating employment and investment opportunities.

c) Requirement of form proposed for the project:

Article 199(g) of the Constitution of the Portuguese Republic.

3 Reference to the participation or hearing of entities, with indication of the law providing for such hearing and the respective content:

3.1 Prior reasoned opinions

N/A

Entities	Yes	No	Date of request	Date of issue	Not applicable
Minister of State and Foreign Affairs Minister of State and the Presidency Minister of State and Finance Minister for the Modernisation of the State and Public Administration					

3.2 Hearings

N/A

If yes, which:

Entity	Nature	Law which provides for the hearing, if applicable	Date of request	Date of completion/issue:	Conclusion/result of hearing:
--------	--------	---	-----------------	---------------------------	-------------------------------



--	--	--	--	--	--

4 Current legal framework and grounds for the respective amendment:

Directive (EU) 2018/844 of the European Parliament and of the Council of 30 May 2018, included in the 'Clean Energy for all Europeans' package, amended Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings through, among other provisions, the introduction of Article 2-A which states that Member States are required to establish a long-term strategy to support renovation, by 2050, of their national stock of residential and non-residential buildings, both public and private, including a roadmap with measures and indicative milestones for 2030, 2040 and 2050, specifying how they contribute to achieving the Union's energy efficiency targets.

Accordingly, this strategy is in compliance with the object and provisions of the National Energy and Climate Plan 2021-2030, set out in Council of Ministers Resolution No 53/2020 of 10 July 2020, in turn prepared and approved for compliance with the objectives for decarbonisation and energy, social and economic transition, provided for in the Roadmap for Carbon Neutrality 2050, set out in Council of Ministers Resolution No 107/2019 of 1 July 2019.

5 Clear identification of the legislation to be amended or repealed:

N/A

5.1 Legislation to be amended, with all amendments since made and the order number of amendment

5.2 Legislation to be repealed

6 Summary assessment of the financial and human resources required of Government for short and medium-term execution, as well as new administrative acts created:

6.1 Financial means involved - income:

How much (EUR): N/A

6.2 Financial means involved - expenditure:

How much (un): N/A

6.3 Human resources involved:

How much (un): N/A

6.4 New administrative acts created:

Which: N/A

7 Assessment of the impact of the project when, due to subject matter, it is related to gender equality:



To what extent: N/A

8 Assessment of the impact of the project when, due to subject matter, it is related to conditions of the participation and social integration of the disabled:

To what extent: N/A

9 Relationship to the Government Programme:

Chapter II.i of the XXII Constitutional Government Programme: Energy Transition

10 Relationship to the policies of the European Union:

Which / Why: 'Clean Energy for all Europeans' package

Directive (EU) 2018/844 of the European Parliament and of the Council of 30 May 2018 is one of the directives making up the 'Clean Energy for all Europeans' package, seeking to reinforce the focus on energies from renewable sources, increase energy efficiency and gradually move away from energy produced from fossil fuels, with a view to developing a sustainable, competitive, safe and decarbonised energy system by 2050.

11 Media note:

The Council of Ministers approved the Long-Term Strategy for the Renovation of Buildings (LTRS), with a view to creating the necessary incentive and support mechanisms for actions to renovate national building stock in compliance with national and European objectives for carbon neutrality and the promotion of energy efficiency in existing public and private buildings, in combination with rational and balanced maximisation of the respective investment opportunities and creation of employment.

Complementary legislation, including regulations instruments

(to which Article 26(1)(i) and Article 27(1) of the Statute refer)

Complementary legislation projects, including regulations projects:

N.A.

Degree and costs of adapting information technology and systems already installed and underway

(to which Article 27(2) of the Statute refers)

N/A

Report:

Prior assessment of legislative impact - 'How much does it cost?'

a) Has the information sheet been completed?

b) Have reasoned opinions or other documents from companies/representatives of companies been included (particularly, micro, small and medium enterprises), including workers' organisations, which have been provided under hearings held during the process to draw up draft legislation?

113942517



www.dre.pt