

# Aspects regarding the sustainable rehabilitation of buildings in the European legislative context

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## Abstract

This paper summarizes the international and European policies, underlining the importance of the legislative context in the existing concern at all levels for a sustainable construction development. Given that the construction sector is responsible for 40% of energy consumption and 36% of greenhouse emissions of the planet's carbon emissions, the authors address existing international and European policies to mitigate climate change and implement the circular economy for both new construction and renovation of existing ones. The paper summarizes the current targets of the Council of the European Union regarding "The Wave of Renovation" - "Fit for 55". At the same time, attention is paid to all actors involved in sustainable development in order to combat climate effects. In addition, the crisis elements facing humanity in recent times and how they influence the effort to save the planet are brought into focus.

The work demonstrates that the international, European legislative framework is created, so that each component country must adapt its implementation, in order to meet the targets and deadlines established by the Council of Europe. The paper touches on a delicate topic, the durability of historical buildings, which from the point of view of international policies can be deepened and of course, will be customized at the level of each culture and nation.

Keywords: sustainable development, renewable energy, green building, the Wave of Renovation, European directives, Fit for 55, heritage conservation

## 1 Introduction

Since the turn of the millennium, mankind has been preoccupied with obvious climate change. Rising temperatures pose severe risks and irreversible effects for existing systems, for the future of humanity.

The website of the European Environment Agency warns: "Climate change is one of the biggest threats to the environment, the social and economic framework. The warming of the climate system is unequivocal, says the Intergovernmental Panel on Climate Change (IPCC). Observations indicate increases in global average water and ocean temperatures, extensive melting of snow and ice, and global average sea level rise. It is very likely that, for the most part, the warming can be attributed to greenhouse gas emissions from human activities." [1]

One of the important measures that would reduce the risks of the climate transition, is the adaptation to the existing changes. This problem should not be seen as having an immediate solution in the short term, but in progress, balanced and distributed across multiple sectors, in the medium and long term. "Climate resilient development involves questions of equity and system transitions in land, ocean and ecosystems; urban and infrastructure; energy; industry; and society and includes adaptations for human, ecosystem and planetary health." [2]

To combat these disasters due to progressive climate change, governance actions are urgently needed to set a sustainable trajectory for our Planet. Political commitments must have clear objectives, monitored and

periodically evaluated. Actions must be well-defined, with clear targets at any level: international, national, at the level of territorial administrative units, so that institutions, the socio-economic environment, banks, educational and research units such as universities, as well as individuals focus on achieving these targets.

## **2 Legislative context. The evolution of global and European objectives regarding the climate transition and combating its effects through sustainable development**

It is considered that the first action to combat the phenomenon of climate change worldwide took place with "Montreal Protocol on Substances that Deplete the Ozone Layer, adopted in Montreal on 16 September 1987 and as subsequently adjusted and amended." [3]

This was followed in 1988 by "Intergovernmental Panel on Climate Change" established in 1988 jointly by the World Meteorological Organization and the United Nations Environment Programme.

By signing the United Nations Framework Convention on Climate Change, from Rio de Janeiro in 1992, 194 signatory countries agreed to act to reduce greenhouse gas emissions in order to lessen humanity's influence on climate change.

Another important step in the effort to mitigate climate change is the „Kyoto Protocol to the United Nations Framework Convention on Climate Change" signed by the United Nations, namely the 1998 Climate Change Convention. Within it, developed countries undertake to limit and reduce CO<sub>2</sub> emissions by approximately 5%, to make energy efficient relevant sectors of the national economy, to promote sustainable management practices in various economic sectors.

Subsequent studies, based on the actual declared consumptions, concluded that a drastic reduction of CO<sub>2</sub> emissions of at least 50% is required for the year 2050 compared to 1990. Thus, the European Union has successively adopted, unilaterally, various commitments to reduce gas emissions with a greenhouse effect, compared to 1990: in 2007, the European Union committed to a reduction of CO<sub>2</sub> emissions by 20% compared to 1990 and drew up policies to develop solutions to limit the negative consequences of climate change. In 2009, the European Union gave solutions in order to realize the proposed reduction, promulgating the legislative document: "Climate change - Energy" (reduction by 20% of the share of greenhouse gas emissions, increase of the share of renewable energies by 20% of the total consumption energy and at the same time increasing energy efficiency by a percentage of 20%). "The European Commission has published the "White Paper - Adaptation to climate change: Towards a framework for action at the European level", which outlines the approach to the promotion of national adaptation policies and measures, so that at the European level an impact can be ensured minimal negative impact on the economic and social systems and an adequate degree of protection and conservation of natural resources." [1] Later, in December 2012, the United Nations Framework Convention on Climate Change, within the XVIII Conference of the Parties, defined the norms of commitment for 2013-2020, according to the Kyoto Protocol. These, according to the Convention, were to be implemented starting from 01.01.2013.

In order to achieve these targets, in parallel with the United Nations Organization, the Council of Europe has an intense activity, constantly concerned with the promulgation of legislative packages that lead Europe to certain results. It thus launches the "Europe 2020" Strategy, i.e. the 20-20-20 program, which had a major impact on the European economy in the last decade.

In the introduction of the present work, the main actions and objectives of the United Nations organization will be mentioned chronologically in parallel with those of the European Union towards an intelligent and ecological economic development from the perspective of forecasting the energy consumption of the buildings sector, the CO<sub>2</sub> emissions due to their operation as well as increasing the share of the use of renewable energies,

The package of directives no. 2009/28-29-31/EC, starts the major interest in the issue of climate change, setting the 20/20/20 targets.

Directive 2010/31/EU on May 19, 2010 emphasizes the importance of building energy efficiency in the context of geographical climatic characteristics, taking into account environmental performance requirements and the cost-benefit ratio. Directive 2010/31/EU "provides that EU member states will ensure that after 31 December 2018, new buildings occupied and owned by public authorities will be buildings whose energy consumption is close to zero" [4] (nZEB). This document defines the NZEB conditions that imply their particularizations according to geographic zoning.

Going beyond the policies for the year 2020, namely the "Europe 2020" Strategy, the European Parliament on 23 October 2014 launched the objectives for the year 2030: increasing to a percentage of 40% by

2030 in terms of reducing greenhouse gas emissions, compared to the year 1990, proposing a 27% share of renewable energy and a 27% improvement in energy efficiency over forecasts [5].

Paris Agreement of 12 December 2015 at the 21st session of the Conference of the Parties (COP21) to the United Nations Framework Convention on Climate Change (UNFCCC) and the 11th session of the meeting of the Parties to the Kyoto Protocol (CMP11), launches an action plan to combat climate change and keep global warming below 2°. Signed by 55 countries, it refers to the period after 2020. The European Union, on April 21, 2016, signs the Paris Agreement, the UN Council adopting the decision regarding the EU's ratification of the Paris Agreement on October 5, 2016. In Paris entered into force on November 4, 2016. Within it, the financial contributions of the European Union are significant ("In 2016, the total contributions from the EU and its member states amounted to EUR 20.2 billion" [6]).

COP23 or the Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC) held from 6-17 November 2017 in Bonn, the UN Climate Change Conference (COP24) held from 3-14 December 2018 at Katowice as well as the UN Climate Change Conference (COP 25) on 2 December 2019 in Madrid ended with clear conclusions on the implementation of the Paris Agreement, proposing as the main objective a 40% reduction of greenhouse gas emissions until 2030. The procedures and mechanisms absolutely necessary for the implementation of the Paris Agreement, respectively concrete objectives related to financing the fight against climate change, were also stated. During COP 25, the European Union, through its leaders, expressed its position towards "Green Revolution": "As President of the European Council, I have a clear goal: to make Europe the first climate-neutral continent on the planet by 2050. So, we will be the champion of the green transition" [7]. At the same time, Mr. Charles Michel emphasized what this approach entails: "providing sustainable, affordable energy, increasing energy efficiency and building a circular economy." [7].

## **2.1 The European Green Pact**

As part of the European Green Pact (December 2019), the European Union initiates a policy package to achieve climate neutrality by 2050.

The COVID-19 pandemic canceled the UN meeting in 2020. On 10-11 December 2020, the European Parliament approved an updated target by 2030 – domestic reduction of greenhouse gases by at least 55% compared to 1990 emissions. "The package includes initiatives covering the climate, the environment, energy, transport, industry, agriculture and sustainable finance – all of which are strongly interlinked." [8].

On December 17, 2020, the Council of the European Union approves "conclusions entitled "Making the Recovery Circular and Green" in response to the European Commission's "Circular Economy Action Plan for a cleaner and more competitive Europe" [9]. "The Circular Economy Action Plan envisages some 35 action points with a sustainable product policy framework as a key feature encompassing initiatives on design of products, production processes and on empowering consumers and public buyers. Focused initiatives will address key product value chains such as electronics and ICT, batteries, packaging, plastics, textiles, construction and buildings and food. Furthermore, a revision of waste legislation is foreseen. Stepping up action at international/global level is also an important component of the Action Plan." [9].

Significant within the policies of the European Union is the strategy regarding the wave of renovations through which the creation of green buildings is proposed. "Spurring renovations is central to decarbonizing the buildings sector, recovering the economy and tackling energy poverty." [10] The "renovation wave" will be implemented through: "improving buildings' energy performance: increasing energy efficiency, reducing energy use, adopting renewable solutions, decarbonising heating and cooling / focusing on circularity: supporting eco-design and energy labelling, using innovative and sustainable construction practices, promoting the use and reuse of sustainably and locally sourced materials / providing financial support for renovations: combining private and public investments and EU funding schemes, promoting financing options such as green subsidies, green loan incentives, energy saving obligation schemes / recognising the need for flexibility: the EU will support each member state in ramping up renovations in the most cost-effective way, respecting national specificities. The Renovation Wave for Europe initiative aims to reduce greenhouse gas emissions from buildings by 60% by 2030." [10]

On June 28, 2021, the Council of the European Union promulgates and adopts the European Climate Law, transposing in its content the objective of climate neutrality until the year 2050, according to the Paris Agreement. In the context of COP 26 concluded on November 13, 2021 in Glasgow, the United Nations Conference requests the acceleration of investments in combating climate change, respectively the achievement of the goal of USD 100 billion per year by 2025, respectively requests additional actions to limit global warming to 1.5 °C within The Paris Agreement, which would lead to saving our planet from the effects of climate change. Attention has been drawn to the increasingly frequent extreme weather phenomena. A new commitment refers to reducing methane emissions by 30% by 2030.

”Since 2013, Europe has more than doubled the funds raised to help developing countries mitigate and adapt to the impact of climate change”. [11]:

During COP 27 which took place in Sharm el-Sheikh on 7-8 November 2022, the President of the European Council ”stressed the urgency of acting now on climate change while also acknowledging that Russia's war against Ukraine has made matters more complex. He underscored that the EU’s commitment to climate neutrality remains strong, despite the challenges brought about by the energy crisis, which has been exacerbated by Russia’s weaponisation of energy supplies. He further stated that the EU must assume its share of the burden in the transition to net zero greenhouse gas emissions and that EU climate action comes with three obligations: to developing countries, to the next generation and to citizens.” [6].

In the context of the war in Ukraine, a new problem that attracts worldwide attention is the energy crisis that arose as a consequence of it. On December 19, 2022, the EU's Transport, Telecommunications and Energy Council reaches a commitment to eliminate methane emissions. At the same time, European leaders agree to expedite the authorization and implementation of projects for the production and use of renewable energy, respectively for the provision of appropriate equipment in order to increase the share of renewable energy.”The Council confirmed the target of the share of energy from renewable sources in the Union’s gross final consumption of energy, of at least 40% in 2030, as in its general approach on the renewable energy directive adopted in June 2022. This proposal is part of the second batch of proposals under the 'Fit for 55' package that aims to align EU climate and energy laws with the European Climate Law's 2030 targets.” [12]

The ”Fit for 55 package” includes objectives in the following areas: ”EU emissions trading system, efforts sharing regulation, land use and forestry (LULUCF), alternative fuels infrastructure, carbon border adjustment mechanism, social climate fund, RefuelEU aviation and FuelEU maritime, CO2 emission standards for cars and vans, energy taxation, renewable energy, energy efficiency, energy performance of buildings” [13].

Corroborating the targets contained in the European Union directives and explained in [14] for the years 2020-2050, Table no. 1 summarizes the evolution of the European Union's objectives for combating climate change related to the reduction of greenhouse gas emissions compared to the level of 1990, regarding the share of renewable energies and the improvement of energy efficiency:

Table 1. The evolution of the tightening of EU climate change targets 2020-2050

Name of the agreement	Year	Targets		
		Greenhouse Gas Emissions (compared to 1990)	Renewable Energy	Energy Efficiency
The EU Green Deal	2050	Substantially ZERO	Climate neutrality	
The wave of EU building renovations	2030	-60%	-	-
The EU Green Deal	2030	-55%	40%	39%
Directive (EU) 2018/2001, (REDII)	2030	-40%	32%	32.5%
2030 Climate and Energy Policy Framework	2030	-40%	27%	27%
Strategy ”Europa 2020”	2020	-20%	20%	20%

Romania, for its part, developed the "National Energy Strategy of Romania (SENDR)". Its objectives, being in a European context, can be found in the "Integrated National Energy Climate Change Plan 2021-2030", but also take into account the period 2030-2050. For Romania 2030, a 45.9% reduction in emissions compared to the 2005 level is proposed and a reduction of approximately 50% compared to 1990. Regarding the share of energy from renewable sources, the strategy proposal is 30.7 % in gross final energy consumption and a 40% reduction in final energy consumption compared to 2007 is proposed [15] [16]. Regarding the "Wave of renovations", Romania has promulgated by HG 1034 / 2020, "The long-term national renovation strategy to support the renovation of the national park of residential and non-residential buildings, both public and private, and its gradual transformation into -a real estate park with a high level of energy efficiency and decarbonization until 2050" [17]. At the same time, Law no. 101/2020 for the amendment and completion of Law no. 372/2005 on the energy performance of buildings transposes the provisions of Directive 2018/844/EU [18].

The Council of Europe, in the documents of the "Prepare for 55" package [13] draws attention to the fact that "buildings represent, at the level of the Union, 40% of the energy consumed and 36% of the direct and indirect greenhouse gas emissions related to energy. EU states are working to revise the Energy Performance of

Buildings Directive so that buildings in the EU become more energy efficient by 2030 and beyond. The main objectives of the new rules are: all new buildings should be zero-emission buildings by 2030, existing buildings should be converted into zero-emission buildings by 2050" [13]. In this sector, it is obvious that there is a great potential for reducing energy consumption, reducing gas emissions and using renewable energies. Consequently, the European Union will carry out a policy of granting incentives (financial aid, tax reductions, administrative support) to transform existing buildings into buildings with zero greenhouse gas emissions until the year 2050. Table no. 2 summarizes the objectives of the European Union package "Ready for 55" [13]. Legislative regulations are proposed whereby new public buildings will be zero-emission by 2028, and all other new constructions will be zero-emission by 2030. Religious buildings, historical monuments, independent buildings with an area of less than 50 square meters, buildings owned by the armed forces and used for defense purposes, as well as industrial platforms, workshops and non-residential agricultural buildings will be exempted from these regulations. An important place in the legislative package "Prepare for 55" [4] it occupies the installation of green energy production equipment on buildings. It is proposed to equip all new public and non-residential buildings with an area of more than 250 square meters with solar energy production equipment by the year 2027, all existing public and non-residential buildings that are subject to an extensive renovation process (having a usable area greater than 400 sqm) until 2028, as well as all new residential buildings - until 2030.

Table 2. Targets for the UE "Fit for 55" package [13]

Targets for the climate neutrality objective	"Fit for 55" - Existing buildings**		"Fit for 55" - New constructions		
	Non-residential buildings	Residential buildings	Buildings owned by public bodies	Non-residential buildings	Residential buildings
<b>Zero - emission</b>	2050	2050	2028	2030	2030
<b>Energy performance certificates</b>				2030	2030
<b>Minimum energy performance standards*</b>	25 % Year 2034	15 % Year 2030	Min. D energy performance class level year 2033	standards year 2040	
<b>Greener energy for buildings</b>	Useful floor area > 400 m <sup>2</sup> - year 2028			Useful floor area > 250 m <sup>2</sup> - year 2027	2030
<b>Infrastructure for bikes and electric cars</b>	<ul style="list-style-type: none"> <li>- more recharging points</li> <li>- cables in place for an increased number of recharging points in the future</li> <li>- more parking places for bicycles</li> </ul>				
<b>EU incentives to encourage renovations</b>	<ul style="list-style-type: none"> <li>- financial help</li> <li>- tax reductions</li> <li>- administrative support</li> </ul>				
* Maximum amount of energy that buildings could use / mp annually (based on total building stock in January 2020).					
** Exceptions: historical buildings, places of worship and buildings used for religious activities, stand-alone buildings smaller than 50 m <sup>2</sup> , buildings owned by the armed forces and used for defence purposes, industrial sites, workshops and non-residential agricultural buildings.					

United Nations Intergovernmental Panel on Climate Change (IPCC) in the recently developed report: "AR6 Climate Change 2022: Impacts, Adaptation and Vulnerability" points out: "Climate resilient development is enabled when governments, civil society and the private sector make inclusive development choices that prioritise risk reduction, equity and justice, and when decision-making processes, finance and actions are integrated across governance levels, sectors and timeframes (very high confidence). Climate resilient development is facilitated by international cooperation and by governments at all levels working with communities, civil society, educational bodies, scientific and other institutions, media, investors and businesses; and by developing partnerships with traditionally marginalised groups, including women, youth, Indigenous Peoples, local communities and ethnic minorities (high confidence). These partnerships are most effective when supported by enabling political leadership, institutions, resources, including finance, as well as climate services, information and decision support tools (high confidence)." [2]

Accordingly, starting from the Summary for Policymakers - 2022 [2] and taking into account the "Matrix of responsibilities in energy efficiency" [19], Table 3 shows the responsibilities of actors involved in

sustainable development". "Public Authorities are responsible for judicious administrative organization by creating a legal framework for the implementation of energy saving measures and to build sustainable. School, research and companies will provide technical and economic tools and also ensure culture and learn population according to" [19] implementing the necessary measures to live in a healthy and sustainable environment.

Table 3. Matrix of responsibilities in sustainable development [2] [19]

Responsibility Factors involved	Favourable Management and Law	Technical and Economic Tools	People Education, Culture and Knowledge in the Field	Risk reduction	Calendar scheduling	Information and decision support tools
International cooperation	√				√	
Public Administration	√				√	√
Education and Research		√	√	√	√	
Scientific and other institutions		√	√	√	√	√
Banking Institutions		√				
Economic Agents		√	√			
Partnerships with traditionally marginalised groups	√		√			
NGO			√			
Media & Social Network			√			√

## 2.2 The current geo-political context

Recently, the life of the population and nature are put to repeat and various tests: climate change, the COVID-19 pandemic, the crisis of biodiversity, the war in Ukraine, repeated earthquakes. "Through the European Green Pact, the EU has set ambitious objectives for eliminating the causes of these crises - transforming energy systems, reducing dependence on fossil fuels, investing in clean, renewable energy sources, restoring nature, strengthening circularity in the economy - ensuring, at the same time, a just transition where we support those most affected." [20] In table number 4, the vulnerabilities and consequences of these current crises are outlined:

Table 4. Recent events and their consequences on population and nature - the global crisis [2] [20]

Global crisis		Climate crisis	Economic crisis	Biodiversity crisis	Humanitarian crisis	Energy crisis
Events / Consequences						
Climatic changes	Extreme heat**	√	√		√	
	Forest fires					
	Drought*					
	Floods					
	Climate volatility					
Degradation of climatic ecosystems	Pollution		√	√		
	Excessive exploitation					
Pandemic COVID 19 ***	Uncertainty		√		√	
The war in Ukraine	Human suffering		√		√	√
	Inflation					
Earthquakes	Human suffering		√		√	

\* Summer 2022 - the most severe drought in Europe in the last 500 years [20]

\*\* Europe's highest average temperatures [20]

\*\*\* Redefining policy priorities [20]

These interconnected simultaneous vulnerabilities and crises have common causes: unsustainable management / unsustainable exploitation of the environment / resources. It is the moment when it is impetuously necessary to make every effort to build a sustainable future for the planet.

### 3 Relevant Romanian norms for the transposition of directives into calculation / design / conception methodologies - the field of sustainable construction development

Table 5. The evolution of Romanian norms and methodologies

Norms/Law/ Order/ Methodologies	Explanatory documents, details
Law no. 372/2005 [21]	"This law transposes Directive 2010/31/EU of the European Parliament and of the Council of May 19, 2010 on the energy performance of buildings (reform), published in the Official Journal of the European Union, series L, no. 153 of June 18, 2010, as well as Directive 2018/844/EU of the European Parliament and of the Council of May 30, 2018 amending Directive 2010/31/EU on the energy performance of buildings and Directive 2012/27/EU on energy efficiency, published in the Official Journal of the European Union, series L, no. 156 of June 19, 2018." It promotes measures "to increase the energy performance of buildings, taking into account the external climatic conditions and the location, the requirements for internal comfort, of an optimal level, from the point of view of costs, energy performance requirements, as well as to improve the appearance town planning of localities." It is updated along the way.
Law no. 211/2011 [22]	Undertakes the provisions of the Directive 2008/98 / EC which deals with the problem of waste in construction and treats backfilling operations using waste to substitute other materials and the reuse, recycling and recovery of materials from buildings that are safe and from the waste resulting from demolition, in a proportion of at least 75% of their weight.
Law no. 159/2013, [23]	Law no. 159/2013 - amending and supplementing Law no. 372/2005 regarding the energy performance of buildings
Order no. 2641/2017,[24]	Amends and completes the technical regulation "Methodology for calculating the energy performance of buildings"
Law no. 101/2020, [18]	Amends and completes Law no. 372/2005 on the energy performance of buildings
Order no. 16 / 2023, [25]	"Methodology for calculating the energy performance of buildings" indicative MC 001/2022"
GD no. 1575/2022,[26]	Decision no. 1575/2022 regarding the approval of the National Integrated Urban Development Strategy for resilient, green, inclusive and competitive cities 2022-2035 - Romania's urban policy
Order no.3568/2022 [27]	Order of the Minister of Culture no. 3.568/2022 for approval of the Intervention Methodology for the approach non-invasive assessment of energy efficiency in valuable buildings historical and architectural

### 4 Relevant Spanish norms for the transposition of directives into calculation / design / conception methodologies - the field of sustainable construction development

Table 6. The evolution of Spanish norms and methodologies

Norms/Law/ Order/ Methodologies	Explanatory documents, details
Royal Decree 314/2006, of	It developed the Technical Building Code (TBC), aiming to unify the energy efficiency regulations for buildings and introduced many aspects of savings and

March 17 [28]	efficiency in construction. The TBC consists of different basic documents or DB, of which the most representative in terms of energy efficiency are:  DB HE: Basic Energy Saving Document. DB HS: Basic Health Document.
Royal Decree 47/2007, of January 19 [29]	It was the first law on energy certification of buildings and laid the foundations for all subsequent laws on energy efficiency in buildings.
Royal Decree 1027/2007, of July 20 [30]	It approved the regulations for Thermal Installations in Buildings (TIB) and began to outline the efficiency parameters of the air conditioning and domestic hot water equipment used in buildings.
Royal Decree 235/2013, of April 5 [31]	It repealed Royal Decree 47/2007. It developed the Energy Efficiency Directive and applied the transformation required by its European legislation, modifying the provisions relating to energy efficiency certificates. It introduced the need to have an energy certificate that reflects the energy consumption of the home, being necessary for homes that are intended to be sold or rented. In this way, it was intended to promote the purchase or rental of more efficient homes.
Royal Decree 56/2016, of February 12 [32]	It transposed into Spanish law Directive 2012/27/EU on energy audits and certification of energy service providers and auditors. It established, among other aspects, who could carry out energy audits and the companies that were obliged to carry them out.
Royal Decree 736/2020, of August 4 [33]	It regulated the accounting of individual consumption in thermal installations of buildings. Its main objective was to improve energy performance in buildings, basing it on individual consumption.
Royal Decree 178/2021, of March 23 [34]	This TIB update set the energy efficiency and safety requirements that thermal installations in buildings had to meet, and contributed to achieving the climate objectives established in the National Integrated Energy and Climate Plan 2021-2030 (NIECP). Specifically, the objective of improving energy efficiency through the reduction of primary energy consumption by 39.5% in 2030 and of final energy by 36,809.3 tons of oil equivalent (Ktep).
Royal Decree 390/2021, of June 1 [35]	It updated the regulations on the basic procedure for certifying the energy efficiency of buildings. Its purpose was to achieve the decarbonization target set in Spain for 2050.
Royal Decree 691/2021, of August 3 [36]	It regulated the subsidies to be granted for energy rehabilitation actions in existing buildings, in execution of the Energy Rehabilitation Program for Existing Buildings in Municipalities with a Demographic Challenge (ERP 5000 Program), included in the Regeneration and Demographic Challenge Program of the Rehabilitation and Regeneration Plan of the Recovery, Transformation and Resilience Plan, as well as its direct concession to the autonomous communities.
Royal Decree-Law 14/2022, of August 1 [37]	It established the plan for energy saving, energy efficiency and reduction of energy dependence on natural gas, as well as the use of renewable energy. This Law was framed in the National Energy Efficiency and Saving Strategy 2030 and established a series of measures to facilitate energy savings, among others, in the residential sector.
Royal Decree 36/2023, of January 24 [38]	It regulated a system of Energy Saving Certificates. The purpose was to contribute to the fulfillment, by the year 2030, of at least the objective of accumulated final energy savings established in article 7 of Directive 2012/27/EU from the European Parliament and the Council, of October 25, 2012, regarding energy efficiency.

## 5 Example of implementation in Romania of European policies related to the "Renovation Wave"

Through component C5 – The Wave of Renovation, the improvement of the built stock will be pursued through an integrated approach to energy efficiency, seismic strengthening, fire risk reduction and the transition to green and smart buildings, giving due respect to its aesthetics and architectural quality, the development of appropriate mechanisms for monitoring the performance of the built fund and ensuring the technical capacity for the implementation of investments. [39]



## **5.1 Works to improve the energy efficiency of the existing built stock. Works to improve the energy efficiency of the existing built stock**

In 2022 in Romania, within the framework of the National Recovery and Resilience Plan - Wave of Renovation - calls for energy efficiency and seismic consolidation are launched which refer to: Moderate or deep energy renovation of residential buildings / Moderate or deep energy renovation of public buildings, respectively integrated renovation of public buildings (energy efficiency and seismic strengthening).

Through this operation, activities/actions specific to the realization of investments to increase the energy efficiency of existing buildings are supported, respectively: Thermal rehabilitation works of the building envelope elements; / Thermal rehabilitation works of the heating system/of the domestic hot water supply system; / Installation of alternative electricity and/or thermal energy production systems for own consumption; the use of renewable energy sources; / Installation/rehabilitation/modernization of air conditioning and/or mechanical ventilation systems to ensure indoor air quality; / Rehabilitation/modernization works of lighting installations in buildings; / Integrated energy management systems for buildings; / Intelligent shading systems for the warm season; / Modernization of the technical systems of the buildings, including in order to prepare the buildings for intelligent solutions; / Works to equip charging stations for electric cars, according to the provisions of Law no. 372/2005 on the energy performance of buildings, republished / Other types of works; / Installation of fast charging stations for electric vehicles related to buildings (power over 22kW), with two charging points/station. / [40]

The financing rate granted through the PNRR is 100% of the value of the project's eligible expenses. Moderate renovation implies primary energy savings between 30-60%.

The in-depth renovation implies primary energy savings of over 60%. [40]

## **5.2 Proposed investments [40]**

Considering that through component C5 - Renovation Wave, two reforms (R1, R2) are aimed at:

R1. - Creation of a simplified and updated regulatory framework to support the implementation of investments in the transition to green and resilient buildings

R2. - The strategic, normative and procedural framework to support the seismic resilience of the built environment,

The investments (I2-I4) proposed to be launched through this program are:

I2. – Creation of the National Building Register, georeferenced IT system (logbook according to the Renovation wave strategy) and the gradual implementation of the energy passport of buildings

I3. - Strengthening the professional capacity of construction specialists and workers by developing training courses on the energy efficiency of constructions

I4. - Circular economy and increasing the energy efficiency of historic buildings

I4.a Supporting energy efficiency through the development and testing of new materials and technological solutions of historic buildings

I4.b Development of professional skills in order to intervene on historical buildings

I4.c Supporting the circular economy by creating a pilot center for the collection and reuse of historic building materials from legal demolitions

I4.d Support the circular economy by ensuring the regular maintenance of historic buildings.

### **5.2.1 Sustainability - a tool for heritage conservation**

There is a growing concern at the international and national level about historical monument buildings as well as those with historical or architectural value that are not officially protected. In the end, the protection of the environment, the built environment, its conservation, the restoration with historical and ecological materials of historically valuable buildings are components of sustainable development, viewed from the perspective of the legacy left to the next generations. The discerning use of the potential of historic buildings, of old industrial buildings with historical or architectural value by including them in the real estate circuit at the expense of their demolition, can mean a sustainable solution. "Applying the principles of the circular economy also in the case of renovation works can improve sustainability. By combining energy and material use, quality and adaptability, the overall sustainability of heritage buildings can be measured. At the same time, we should also consider social and economic sustainability in the case of built heritage. Heritage and sustainable development are therefore very closely linked. Understanding heritage helps us better understand cultural and social systems, so the sustainability is an important tool for heritage conservation today." [41]

## **6 Actions adopted in Spain to improve energy efficiency in buildings**

The following is an explanation of some actions adopted in Spain to improve energy efficiency in buildings.

### **6.1 State Housing Program (SHP) 2018-2021 for Spain**

This program [42] included promoting the improvement of energy efficiency and sustainability in housing among its measures, including in its aid regulation works to improve energy efficiency and sustainability of single-family homes and collective residence buildings. The plan was applicable to the owners of single-family homes isolated or grouped in a row and of existing buildings of a residential type of collective housing, as well as their homes, whether they are natural persons or have legal personality of a private or public nature. It also considered as possible beneficiaries the Public Administrations and organizations and other entities governed by public law, as well as public companies and commercial companies wholly or majority owned by the Public Administrations that own the properties.

### **6.2 Long-term Strategy for Energy Rehabilitation in the Building Sector in Spain (SERBSS 2020)**

The article 2 bis of Directive 2010/31/EU of May 19, 2010 on the energy efficiency of buildings, as amended by Directive (EU) 2018/844, established that each Member State would develop a long-term strategy to support the renovation of its national stocks of residential and non-residential buildings, both public and private, transforming them into highly energy-efficient and decarbonised building stocks by 2050, facilitating the economically profitable transformation of existing buildings into near-zero energy buildings. In compliance with this mandate, Spain developed the SERBSS 2020: 2020 Update of the Long Term Strategy for Energy Renovation in the Building Sector in Spain (SERBSS). For the preparation of the SERBSS 2020 [43], a public information process was carried out and various Support Studies and Reports were carried out on specific topics (energy demand in homes, types and prospective of heating systems in residential and tertiary, potential solar, financing and innovative practices in Europe and Spain, macroeconomic impact, etc.). The SERBSS 2020 has been evaluated by the BPIE Buildings Performance Institute Europe as the best of the national strategies presented to the EU in compliance with the mandate of Directive 2010/31/EU. The previous Strategies, presented in 2014 and 2017 were the SERBSS 2014 and the SERBSS 2017 respectively.

### **6.3 The Energy Rehabilitation Program for existing buildings in municipalities with a demographic challenge (ERPB 5000 Program)**

The ERPB 5000 Program [44] was approved by the Council of Ministers, at the proposal of the Ministry for the Ecological Transition and the Demographic Challenge, on August 3 through Real Decreto 691/2021, which regulates the subsidies to be granted to actions energy rehabilitation in existing buildings. The Program formed part of the Energy Rehabilitation Program for existing buildings in municipalities with a demographic challenge and it was included in the Regeneration and Demographic Challenge Program of the Urban Rehabilitation and Regeneration Plan of the Recovery, Transformation and Resilience Plan. According to the Institute for Diversification and Energy Saving, dependent on the Government of Spain, the Spanish building stock currently consumes 30% of the final energy and there is a housing stock that is not equipped with a heating installation [45]. Therefore, it has a significant potential for savings and the incorporation of renewable energies.

A notable aspect of the ERPB 5000 Program, in addition to its positive effects on improving energy efficiency and the environment, was its social scope, since special attention is given to granting aid to carry out rehabilitation actions in those buildings that welcome vulnerable groups and those affected by Energy Poverty.

### **6.4 The National Plan for Adaptation to Climate Change (NPACC)**

The NPACC 2021-2030 [46] was one of the commitments established in the agreement of the Council of Ministers on January 21, 2020, which approved the Declaration of the Government of Spain before Climate and Environmental Emergency. The NPACC 2021–2030 aims to respond to the growing needs for adaptation to climate change in Spain, as well as international commitments in this field. The Plan establishes the bases to promote a more resilient development to climate change throughout the next decade and tries to increase energy security and inclusiveness in the Country. For the first time, within the framework of the NPACC, strategic

objectives were established and a system of indicators of impacts and adaptation to climate change was defined, as well as the preparation of risk reports.

The NPACC in its line of Action 8.2 on the integration of adaptation to climate change in territorial planning (city, urban planning and building), establishes the following fundamental aspects:

- Integrate adaptation to climate change in territorial and urban planning, developing governance for democratic risk management, with the involvement of all interested parties in planning and management.

- Integrate adaptation to climate change in the building sector, advancing in regulations to improve the energy behavior and water behavior of buildings, in line with the climate scenarios projected for the future.

- Consider scenarios and projections of future climate change in the following reviews of the Long-term Strategy for energy rehabilitation in the building sector in Spain.

### **6.5 UNE-EN 16883 Standard. Guide for improving the energy efficiency of historic buildings**

The UNE-EN 16883 Standard [47] provides guidelines for the sustainable improvement of the energy efficiency of historic buildings, such as buildings with historical, architectural or cultural values, respecting their heritage interest. The use of this standard is not limited to buildings legally declared as heritage, but is applied to historic buildings of all types and age. It presents a regulatory work procedure to select measures to improve energy efficiency, based on research, analysis and documentation of the building, including its heritage interest. The procedure evaluates the impact of those measures in relation to the conservation of the characteristic elements of the building. The general considerations that the standard takes into account to carry out the procedure are principles of conservation of buildings; qualification requirements; sustainable management of historic buildings; existing building envelope and technical systems; and user behavior.

## **7 CONCLUSIONS**

The paper demonstrates that the international, European legislative framework is being created in terms of sustainable development and future actions to mitigate climate change. In this sense, the authors summarized in a table the evolution of the targets proposed by the European Union up to now for the period 2020-2050. Changes to the directives over time call for their updating.

From the point of view of the actions included in the "Renovation Wave" the European Union objectives of the "Fit for 55" / "Prepare for 55" / "Ready for 55" package are centralized. In this sense, the authors of the paper develop a "matrix of actors involved" in achieving these objectives.

Among other aspects of Spanish legislation, the standard applicable to rehabilitation and energy improvement of historic buildings obliges us to consider each building as a particular case. Consequently, sufficient specific research and documentation must be undertaken and the heritage interest of the building will have to be carefully assessed considering its regional, national and international cultural context.

Taking into account the recent events that have shaken humanity, the current geo-political elements of crisis are highlighted and centralized in a table. The importance of the collective effort to cross them is emphasized, as well as the need to adapt the legislative instruments to them.

The paper touches on a delicate but very topical subject: the durability of buildings with historical and architectural value, which from the point of view of international policies can be deepened and, of course, will be customized at the level of each culture and nation. It is emphasized that the principle of sustainability applied to them represents today an important tool for heritage conservation.

In the paper, the evolution and adaptation of the legislation to the European one is particularized for Romania and Spain in order to reach the targets and deadlines. The authors of the paper exemplify the way in which it is implemented through component C5 - "Renovation Wave" within the National Recovery and Resilience Plan - Pillar I - Green Transition, which is ongoing, as well as other Spanish actions,

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