



Building rehabilitation, sustainable development, and rural settlements: a contribution to the state of the art

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Abstract

The quality of life in rural housing settlements is at the heart of territorial cohesion concerns across Europe and the United Nations' sustainable development goals. However, the gap between urban and rural developments remains substantial, stressing the need to adopt integrated approaches for rural territories. These approaches should include heritage preservation strategies as a priority. Vernacular constructions integrate rural built heritage and comprise a sustainable response of communities in territories, stressing the pertinence of its rehabilitation. The aim of this paper is to raise awareness of this issue through a scoping review since it lacks general frameworks that may contribute towards perceiving rural territories and their constructions as catalysts of territorial cohesion and sustainable development. As a main goal, we provide insights on sustainable development and its importance in the global and European contexts, as well as the role of building rehabilitation towards its three dimensions—environmental, social, and economic. Additionally, the impact of rural settlements on territorial cohesion and global sustainability is stressed, and vernacular construction is highlighted as a component of rural heritage.

Keywords Building rehabilitation · Sustainable development · Vernacular construction · Rural settlements · State-of-the-art review · UN Sustainable Development Goals

1 Background, aim, and objectives

Rehabilitation practices have been used throughout time to maintain or improve the performance of constructions. Besides the effect on the characteristics of buildings, these interventions play a role in their inhabitants' quality of life, along with the development of the area in which they are located.

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The importance of people-centred approaches has been gradually brought to the discussion, mainly regarding the definition of global strategies. An example of this is the 2030 Agenda for Sustainable Development developed by the United Nations (United Nations, 2015), which shifted the paradigm regarding sustainability and brought to the discussion the importance of several aspects that had been neglected until then, such as the development of rural areas and their role in achieving fair territorial progress. In the European context, the European Network for Rural Development (ENRD) can be stressed as an initiative on this matter.

Despite these advances, there are still significant disparities between rural and urban areas, undermining territorial progress and deepening differences between these two realities. Rural territories are experiencing severe out-migration and desertification phenomena (Pola, 2019), which impact their remaining population. Rehabilitation actions towards the improvement of living conditions can have a powerful role in avoiding or reversing this situation.

Parallel to these circumstances, vernacular constructions have evolved throughout centuries of experience of local populations. These buildings are shaped by their cultural, environmental, and social practices (Chandel, 2016), embodying broad wisdom and reflecting a sustainable response to the context they are part of (Nguyen, 2019).

However, since contemporary buildings are still considered the norm, vernacular heritage has been gradually abandoned and lost, with dramatic consequences in terms of territorial cohesion and global development. The general lack of compliance of these constructions with current legal standards also contributes to this state of affairs. Nevertheless, its adaptability has been proven possible, useful, and cost-effective (Barbero-Barrera et al., 2014; Salvador et al., 2021; Itard et al., 2007), indicating that these buildings deserve careful and qualified rehabilitation actions.

1.1 Objectives

The goal of the overview presented in this paper is to raise awareness of the role of building rehabilitation as a vector to sustainable development. Additionally, the critical role of rural settlements for territorial cohesion is stressed, and vernacular construction is highlighted as a crucial component of rural heritage. Studies that link concepts of building rehabilitation, sustainable development, and rural settlements are scarce and do not usually take into consideration the component of vernacular constructions as a vector towards these concerns.

To achieve that objective, the European Union's context regarding sustainable development is first discussed, providing meaningful examples of how this concern was addressed over time. Then, a synthesis of the contribution of building rehabilitation towards sustainable development perspectives (economic, social, and environmental) is presented. Finally, the importance of rural development to territorial cohesion, and the role of vernacular constructions in rural environments, are outlined and highlighted. The research method followed is a scoping review (Grant & Booth, 2009), using secondary data as a primary source of information.

2 European Union and sustainable development

Addressing climate change as an international challenge has been conducted throughout several global and European institutions, which have been joining worldwide efforts and establishing measures to achieve a sustainably developed world.

The concept of "sustainable development" was first defined in the 1987 Bruntland Commission Report of the United Nations (UN) as "development that meets the needs of the

present without compromising the ability of future generations to meet their own needs” (Brundtland, 1987). There are four intertwined and indivisible perspectives on sustainable development: society, culture, environment, and economy. Also, sustainable development is considered the pathway towards achieving sustainability, a long-term goal in which a balance is found between environmental, societal, and economic considerations that ultimately lead to an enhanced quality of life (UNESCO, 2019).

Achieving sustainable development has been the overarching challenge of the UN, which has led its action through the years and especially since the publication of the “2030 Agenda for Sustainable Development” (United Nations, 2015). This commitment compelled the European Union’s (EU) alignment with the UN’s international goals, entailing concrete actions that would bring tangible progress in sustainable development.

Despite the efforts to address this matter through a holistic approach, one of the major challenges identified by the EU has been climate change which, in line with the UN’s 2030 goals, prompted the EU’s ambition of becoming a competitive low-carbon economy in 2050. Key challenges were defined to attain this goal, and long-term strategies in crucial areas such as transport, energy, climate action, or industry were put forward; this represented a first step towards searching for innovative solutions and mobilising investment that cannot be dealt with on a national level alone (European Commission, 2011).

Within this framework, the impact of buildings and, consequently, of the construction sector in sustainable development have been recognised and are currently well known. Buildings are responsible for nearly 40% of total energy use in the EU (International Energy Agency, 2017). Furthermore, they are responsible for 36% of gas emissions, which derive from construction, renovation, usage, and demolition activities (European Commission, 2020). This impact led to the need to better integrate this sector and define specific strategies towards the sustainable, integrated, and decarbonised approach taking part in EU countries.

This matter has been actively discussed and put forward both within the EU and the UN, leading to the publication of several essential documents that shifted the paradigm and laid the foundations for action to take place. Examples of these documents are synthesised in Table 1 and presented in detail in the following subsections, indicating their context, main content, and strategic goals.

2.1 “2050 Low-Carbon Economy Roadmap” (European Commission, 2011)

In 2011, the European Commission defined the “2050 low-carbon economy roadmap” (European Commission, 2011), recognising climate change as a world-scale phenomenon requiring immediate action at an international level. To obtain the intended low-carbon transition (Fig. 1), the EU defined as major goals the reduction of greenhouse gas emissions (GHG) by 80% in 2050 (considering the 1990 emission levels), increasing the share of renewables, and promoting global energy efficiency.

A series of actions were defined to attain this ultimate goal. One of the sectoral perspectives is dedicated to the built environment since it provides short-term and low-cost opportunities to reduce GHG, mainly by improving buildings’ energy performance, whether they are new or existing constructions.

Regarding new buildings, the main goal established was the design of nearly zero-energy buildings (NZEB), where a very low amount of necessary energy should be assured from renewable sources (Erhorn et al., 2015). However, intervening in existing buildings

Table 1 Examples of international documents focusing on decarbonisation and sustainable development in the building sector

Year	Author	Title	Scale	Objective	Highlights
2011	European Commission	A Roadmap for moving to a competitive low-carbon economy in 2050	EU Member states	Show how sectors responsible for European emissions (including buildings and construction) can meet the long-term target of reducing domestic emissions by 80–95% by mid-century	(1) Acting in the building sector as a low-cost and short-term vector to reduce emissions; (2) Possibility of new constructions being NZEB, while refurbished existing building stock is a more complex challenge; (3) Need to prioritise low-carbon electricity and renewable energy as energy consumption sources
2015	United Nations	Transforming our world: the 2030 Agenda for Sustainable Development	UN Member States	Define humanity's roadmap to eradicate poverty in all its dimensions and forms by 2030 while ensuring sustained economic development, reduced inequalities, and improved living conditions; establish 17 sustainable development goals	(1) Need to develop quality, resilient, and sustainable infrastructures (goal 9.1); (2) Scientific research as a vector to global innovation and development (goal 9.5); (3) Promote resourceful migration policies towards safe and responsible mobility of people and protect natural and cultural heritage (goal 11.4); (5) Need to consider rural areas, along with peri-urban and urban areas, to strengthen development planning on regional and national levels (goal 11.a)

Table 1 (continued)

Year	Author	Title	Scale	Objective	Highlights
2018	European Parliament and Council	Directive (EU) 2018/844 of the European Parliament and of the Council	EU Member states	Amend previous Directives on the energy performance of buildings	(1) Support upgrade of existing buildings regarding their energy performance to achieve healthy indoor environments; (2) Research as a tool in finding new solutions that safeguard heritage while improving the technical performance of buildings; (3) Promotion of alternative systems in building renovations that are functionally, technically, and economically feasible; (4) Importance of investing in energy efficiency policies regarding public building stock; (5) Transparent and accessible advisory tools to support efficient renovation actions

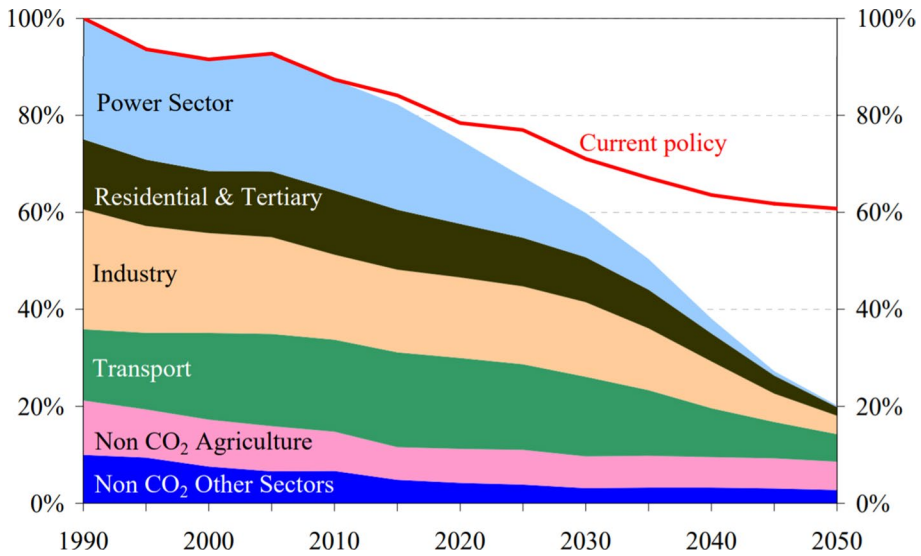


Fig. 1 Pathway towards an 80% emission reduction by 2050 (European Commission, 2011)

is complex, demanding specialised approaches and distinct investments, yet requiring the same level of attention as the one paid to new constructions.

Moreover, this document also stresses the importance of shifting energy sources in building usage towards renewable energy, such as solar heating or biomass, and low-carbon electricity, using storage heaters or heat pumps. Besides environmental reasons, these solutions are socially beneficial since they protect users from the rising prices of fossil-fuel materials and create safe and healthy indoor environments.

Finally, conclusions are drawn concerning the need for all EU Member States to develop their own national roadmaps towards achieving low-carbon economies, ensuring the targets are met within the established deadlines. Also, importance is raised to other strategic documents, such as Energy Efficiency Plans, which are fundamental to encourage the fulfilment of this international roadmap and its goals.

2.2 “Transforming our world: the 2030 Agenda for Sustainable Development” (United Nations, 2015)

The 2030 Agenda for Sustainable Development developed by the United Nations establishes humanity’s roadmap on the way to eradicating poverty in all its dimensions and forms while ensuring sustained economic development, reduced inequalities, and improved living conditions (Gjorgievski et al., 2021). Poverty is identified as the most significant challenge and obstacle to sustainable development, stressing the need to take transformative global action and recognise the people, the planet, and global prosperity as core priorities.

This document was signed by 193 countries, overcoming European borders and establishing a worldwide commitment. It integrates the indivisible dimensions of sustainable development (economic, environmental, and social) and defines 17 Sustainable Development Goals (SDG) along with 169 targets, ensuring the purpose of this new Agenda as

guidance for decision-makers, industry, and academia. These SDGs intend to stimulate action between 2015 and 2030 in areas of crucial importance, laying the foundations for unprecedented progress. Even though all SDGs are interconnected and contribute towards the same goal, there is a group of goals considered to be particularly relevant to the building sector and the construction industry, namely:

- Goal 9. “Build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation” (United Nations, 2015): this goal encourages the development of reliable, competent, safe, and resilient infrastructure, assuring equitable and affordable access to them, as well as the support of social well-being and economic development (target 9.1). Additionally, the need to “upgrade infrastructure and retrofit industries to make them sustainable” is referred to, underlining the importance of sustainable rehabilitation actions (target 9.4). Finally, the role of scientific research and the need for its enhancement is also mentioned, as well as the need to upgrade global technological capacities (target 9.5).
- Goal 10. “Reduce inequality within and among countries” (United Nations, 2015): this goal is meaningful due to its intention to ensure equal opportunities and reduce inequalities of outcome, especially in terms of practices, policies, and laws (target 10.3). This resolution promotes the population’s equal access to opportunities and countries’ development as a whole, considering that sustainable development can only be achieved through regional and territorial equality. This is strengthened by facilitating and responsibly managing people’s migration and mobility (target 10.7), which is coherent with the previous concerns.
- Goal 11. “Make cities and human settlements inclusive, safe, resilient, and sustainable” (United Nations, 2015): this goal encompasses relevant aspects such as ensuring global access to fair, adequate, and safe housing (target 11.1) and recognising its role in society’s quality of life. Furthermore, attention is given to cultural and natural heritage, urging the need to safeguard and protect these legacies (target 11.4). In line with Goal 10 and the importance of territorial cohesion, reference is made to the development of links between urban, peri-urban, and rural areas, stepping up “national and regional development” (target 11.a), eliminating territorial inequalities and building bridges between social cohesion, economic effectiveness, and ecological balance, which is the true meaning of sustainable development (Alexiadis, 2017).

This Agenda also intends to carry out a follow-up until 2030, tracking progress and fully maximising its implementation while ensuring that all countries achieve these goals. The need to operate at a national, regional, and global level is stressed, mobilising efforts to overcome common challenges and exchanging best practices.

Considering the deadline to achieve the SDG, a “decade of Action” was entailed in 2019 during the SDG Summit that took place to boost national efforts to mobilise financing and bolster institutions to achieve these goals by 2030 (United Nations, 2019).

2.3 Directive (EU) 2018/844 of the European Parliament and the Council

In 2015, following the 21st Conference of the Parties to the United Nations Framework Convention on Climate Change (COP 21), the Paris Agreement on climate change furthered the Union’s goal to decarbonise buildings (European Commission, 2019), prioritising its renovation and focusing on its energy efficiency. In line with the previously defined

“2050 low-carbon economy roadmap” (European Commission, 2011), this commitment laid the foundations for fundamental changes among the Member States.

One of these changes was the obligation to undertake measures to fully transform the building stock on a national level, complying with the Union’s major goals of minimising energy use consumption and boosting renewable energy sources in the building sector. The publication of Directive (EU) 2018/844 of the European Parliament and of the Council (European Parliament, 2018), which amended Directive 2010/31/EU on the energy performance of buildings and Directive 2012/27/EU on energy efficiency, was a fundamental step towards this goal. It established requirements and measures to be followed taken by Member States regarding new constructions and existing buildings.

This Directive puts forth a global guideline that intends to guide both Member States and investors concerning policies and strategies that should be followed, establishing general milestones and actions. The Directive also sets the obligation for all Member States to develop a long-term plan regarding their building stock, which outlines specific goals to accomplish in short-term (2030), mid-term (2040), and long-term (2050) periods (European Parliament, 2018), specifying the outputs which should be adapted to each country’s conditions.

Despite these adaptations, and in line with the “2050 low-carbon economy roadmap”, it is established that all Member States should: (1) regarding new buildings, and in line with previous recommendations (European Commission, 2016), certify that all new constructions are NZEB by 2020; (2) regarding existing buildings, safeguard the need to develop 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 their transformation into NZEB; (3) regarding historical buildings and sites, promote test and research for new solutions to improve their energy performance while safeguarding cultural heritage.

3 Building rehabilitation as a vehicle towards sustainable development

Building rehabilitation can be included in the scope of building adaptation processes, encompassing a set of activities that enhance living conditions and effective lives of buildings (Shahi et al., 2020). These activities address multiple scopes of action, including refurbishment, rehabilitation, retrofitting, renovation, or reuse, among others. There is a general lack of clarity regarding the scope of these terminologies, which are frequently interchangeably used. Also, projects can be broad and include different fields of action. Shahi et al. (2020) proposed an example of terminology breakdown in which rehabilitation can be considered a sub-category of building refurbishment, one of two categories in building adaptation (Fig. 2).

For the purpose of this paper, the term “building rehabilitation” adopted is a result of combining several definitions found (Shahi et al., 2020; Alba-Rodríguez et al., 2021; Grimmer et al., 2011), considering it to be the process of enabling a compatible use for an existing building through alterations, additions, and repairs, making it safe and habitable while preserving features which pass on historical, constructive, architectural, or cultural values.

Bearing in mind the goal to fully achieve the UN’s SDG and, ultimately, global sustainability, as it was presented in the subsection above, it is fundamental to consider the wholeness of the building sector towards this. Therefore, this entangles a wide berth of activities,

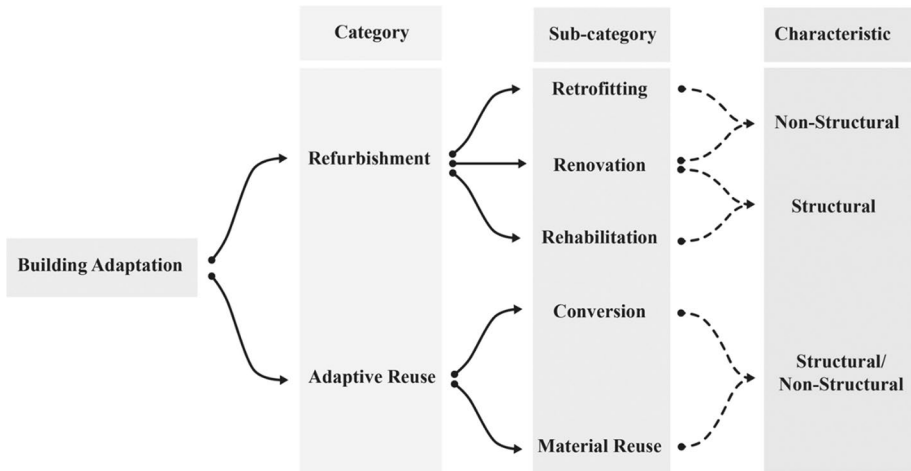


Fig. 2 Example of terminology breakdown of building adaptation into two categories (Shahi et al., 2020)

such as construction, renovation, usage, and demolition work. This means that building rehabilitation is one of the many fields the building sector overarches. Despite proposing a significant number of solutions to mitigate the impact of new buildings in cities and thus pursue sustainable development, little consideration has been given to existing buildings and their adaptation (Sing et al., 2019). This means that their contribution to this goal and their main dimensions (social, economic, and environmental) are unaccounted for. A synthesis of the building rehabilitation action’s contribution to these dimensions is presented in the subchapters below.

3.1 Environmental dimension

The contribution of building rehabilitation towards the environmental dimension of sustainable development has been subject to several studies over the past few years, where significant aspects of the activity have been analysed and compared with other processes.

The construction industry’s impact as a substantial consumer of resources and materials is a well-known fact (World Economic Forum, 2016). Even though this consumption does not always manifest directly and visibly, issues like climate change, desertification, biodiversity loss, or soil erosion are all related to material use. It is estimated that between 30 and 50% of total material use in Europe goes to housing, using materials such as iron, copper, sand, wood, or building stone (Copenhagen Resource Institute et al., 2014).

To address this problem, material efficiency has been included in European sustainability policies related to construction, identifying the role of circular economy procedures in construction to promote material reuse and high-quality recycling (European Environment Agency, 2020). Taking this into account, building rehabilitation practices have been stressed as actively contributing to this matter, considering that pre-existing resources are being maintained or improved. These actions also restore the usage of buildings and reverse their obsolescence, reducing the environmental impacts caused by an alternative demolition and new construction process (Munarim et al., 2016).

However, the frequent need to use new materials in rehabilitation actions questions the feasibility of these processes in terms of their environmental impact. Also, recycling

material processes remain an unexplored practice in many construction activities (Copenhagen Resource Institute et al., 2014), as well as waste management and deconstruction practices (Saéz et al., 2019). This stresses the need to develop more information on material-based approaches in rehabilitation actions, increasing circularity in the sector.

Emissions and embodied carbon are also aspects that are associated with using resources in construction activities. Utilising steel, copper, concrete, or aluminium is responsible for most of the pollutants and climate change emissions stemming from building construction, and the impact is greater during the phases of extracting, producing, and processing (Copenhagen Resource Institute et al., 2014).

Besides this, the demolition of buildings and their disposal, disregarding material reuse or recycling, leads to permanent neglect of products that could substitute the need for raw materials. Thus, managing end-of-life buildings and discussing the possibility of maintaining construction elements has a significant impact on the general use of resources and emissions stemming from construction works (Copenhagen Resource Institute et al., 2014).

Moreover, studies show that the reuse of existing buildings, instead of demolitions followed by new construction, results in a substantial reduction of embodied carbon and construction wastes (Empty Homes Agency, 2009). On top of that, if these activities include utilising suitable locally sourced construction materials, it is possible to reduce transportation-related emissions and boost local economies (Historic England, 2020a).

3.2 Economic dimension

More and more research has been focused on comparing the impact between buildings' rehabilitation, demolition, and new construction. Among other reasons for this, the gradual need to repair the existing building stock and regenerate urban centres stands out. Contrary to what is often assumed, research has shown that building rehabilitation tends to be cheaper than demolition and new construction (Itard et al., 2007), apart from situations where acute damages balance the costs between the two options (Alba-Rodríguez et al., 2017).

Moreover, green stimulus policies, which are frequently associated with rehabilitation actions and conservation works, can be economically advantageous compared to traditional fiscal stimuli since they tend to lead to higher domestic Gross Domestic Product (GDP), employment creation, and domestic improvement conditions (Historic England, 2020b).

However, recognising other important aspects and scales related to the economic impact of building rehabilitation is not new. In 1983, Rakhra (1983) listed the following economic arguments to support building rehabilitation: cash flow and affordability, energy and other scarce resources availability, employment and income creation, and demographic reasons. These other dimensions, surpassing the direct financial costs of this activity, are crucial to consider.

The built environment is intrinsically linked to economic activity, with many financial transactions occurring within it, dependent on it or attracted to it, meaning that investing in its conservation and improvement creates places for businesses to grow (Historic England, 2020b) or attracts permanent inhabitants who contribute to the prosperity of local economies. These investments also enhance the area's value and generate demand, adding to property value and promoting the popularity of otherwise neglected areas.

Refurbishing existing buildings can also help to rejuvenate local economies whenever local provenance construction materials are used (Historic England, 2020a), which, as addressed before, also carries a significant environmental advantage. The

impact of the historic/listed buildings on tourism, a huge source of income for many countries—particularly in Southern and Mediterranean European countries, where the tourism sector was worth more than 234 billion USD in 2019 (UNWTO, 2020)—is also worthy of note here.

Furthermore, encouraging the preservation of the built environment, mainly through rehabilitation actions, will reduce long-term costs associated with works resulting from buildings' decay and promote its ongoing maintenance (Sanfilippo et al., 2008).

3.3 Social dimension

Cities are unique in improving social outcomes and creating ladders of opportunity. Their sustainable management can enhance their social impact by enhancing equity, ending poverty, and boosting the quality of life for all (UN-Habitat, 2020). The social value of urbanisation and cities is a recurring theme in the global development agenda as one of the intrinsic dimensions of sustainable development, acknowledging the importance of urban development in promoting equitable access to physical and social infrastructure for all (UN-Habitat, 2020).

Sustainable territories are recognised as the outcome of good governance. This encompasses integrated urban and territorial planning, which includes the uplifting of the existing infrastructure's sustainability. Therefore, building rehabilitation and its role in maintaining and improving these infrastructures comprises a catalyst towards this end and should be perceived as an instrument to promote urban integration and social cohesion.

Despite operating on the building scale and thus directly improving the quality of life of its inhabitants, building rehabilitation can also trigger urban regeneration, contributing to promoting sustainable development on a broader scale (Gonzalez et al., 2014). This underlines the relevance of not perceiving measures of physical intervention individually but linked to overall planning, scaling up from the building to the neighbourhood or block, towards a city scale (Pedro et al., 2018). Studies have stressed that well-designed and connected urban areas with historic features, which necessarily include existing buildings, promote high-quality liveability standards (Historic England, 2020c; Venerandi et al., 2016). Community fulfilment is also triggered by the aesthetics of buildings and public spaces (Florida et al., 2011).

Furthermore, besides addressing the physical regeneration dimension of building rehabilitation actions and their impact on society, it also acts in terms of political regeneration as a path towards community attachment and social cohesion. The literature refers that the feeling of connection to a certain place has a proactive role in safeguarding its resources (Vaske et al., 2010 *apud* Historic England, 2020c, Scannell et al., 2017 *apud* Historic England, 2020c). These behaviours inspire feelings of fulfilment and joy and foresee general well-being (Wu et al., 2019 *apud* Historic England, 2020c).

Despite the positive contribution of buildings towards the social dimension of sustainable development, mainly through the maintenance and improvement of dwellings from a sectorial perspective, social consequences must be fully addressed at a city scale (Gonzalez et al., 2014). For that matter, considering other infrastructure works or physical accessibility improvements is a fundamental prerequisite to successfully approaching the social sphere and its impact on the quality of life.

4 Rural settlements, territorial cohesion and vernacular construction

Urbanisation and the consequent migration of the population towards cities has been a well-known continuous phenomenon, leading to a world urban population proportion rising from 33%, in 1930, to almost 56%, in 2019 (World Bank Group, 2021). However, the consequent rural decline and its repercussions have received far less attention, despite the weight of the remaining population being around 44%. The process of rural abandonment has been proven to contribute to global dilemmas such as poverty, failure of education, poor land management, or underdevelopment of infrastructure (Yin et al., 2019).

The disparity between urban and rural development raises important questions regarding territorial cohesion—a concept entailing the harmonious development of all territories, enabling its citizens to fully enjoy the inherent characteristics of their habitats (Commission of the European Communities, 2008). This concept expresses concerns that have been at the heart of international and European policies. Territorial cohesion is also a fundamental part of sustainable development, considering its role in building bridges between ecological balance, social cohesion, and economic effectiveness (Alexiadis, 2017; Commission of the European Communities, 2008). These, in turn, actively contribute to the distribution of resources and opportunities, as well as intergenerational equity, which is also a central pillar of sustainable development (Holder et al., 2010).

For this reason, the ongoing migration flux towards cities and consequent abandonment of rural areas abide by serious obstacles to a balanced territorial development of economies and societies on a global scale, threatening international efforts that have been made with the aim of achieving sustainable development. Also, for a long period of time, the concept of rural development was mainly associated with agricultural progress, neglecting other structural measures that contribute to economies in these territories (Pelucha et al., 2017), allowing full exploration of its resources and opportunities.

Awareness of the importance of rural development as a catalyst to territorial cohesion, and hence towards sustainable development, has been shifting globally and on a European level. Two initiatives that have influenced this context and stressed its importance at a global and European level are synthesised below.

4.1 [Global level] World Rural Landscapes Initiative

The World Rural Landscapes (WRLI) is an ongoing initiative launched in 2011 by the ICOMOS-IFLA International Scientific Committee on Cultural Landscapes (ISCCL) to promote international partnership in safeguarding and managing rural environments at different levels (international, national, and regional), establishing a systematic approach to the question of the landscapes' cultural heritage (Scazzosi, 2018).

The objectives of the initiative are: (1) raise awareness; (2) “provide a space for international, public–private and interdisciplinary cooperation”; (3) “support discussion and synergies at a scientific level and between the scientific sector and private and public stakeholders on operational issues and promote tangible actions for the good management of rural landscapes, at a political, administrative, or participative level” (World Rural Landscapes, 2021).

WRLI has been developing research on a worldwide scale, promoting debate and the exchange of different approaches. A multi-disciplinary group in ISCCL was also created, and the first document of “Principles Concerning Rural Landscapes as Heritage”

(ICOMOS, 2017) was published in 2017 and later endorsed as a doctrinal text by the ICOMOS General Assembly (Scazzosi, 2018). This document gathers information regarding definitions, importance, threats, challenges, benefits, and sustainability of rural landscapes, as well as actions that should take place. Reading these later, they were organised into the following groups: “(a) understand rural landscapes and their heritage values; (b) protect rural landscapes and their heritage values; (c) sustainably manage rural landscapes and their heritage values; (d) communicate and transmit the heritage and values of rural landscapes” (ICOMOS, 2017).

This document is particularly important since it sums up the peculiarities and values of rural landscapes that contribute towards their acknowledgement as a resource and an asset towards society’s development, encouraging deep reflection and guidance at all scales and levels (Pola, 2019; Scazzosi, 2018).

Moreover, it is expected that WRLI will hereafter support the development of scientific collaborations between stakeholders, both private and public, and academics (World Rural Landscapes, 2021).

4.2 [European level] European Network for Rural Development

The European Network for Rural Development (ENRD) was created in 2008 by the European Commission as a network to share knowledge in the field of Rural Development. This includes promoting various initiatives, such as policies, strategies, and programmes, with the aim of enhancing rural development and boosting international cooperation (ENRD, 2008). It is conducted by the European Rural Networks’ Assembly and Steering Group, reuniting groups of rural development stakeholders which aim to implement EU Member States’ Rural Development Programmes (RDPs). RDPs are strategies prepared by each EU country to comply with national and regional demands and take into account a framework of EU commitments. RDPs are endorsed by national funds and the European Fund for rural development (EAFRD) (European Commission, 2021a).

ENRD goals for the period of practice 2010–2020 are to: enhance RDPs; support the engagement of new actors in rural development; promote the assessment of RDPs; raise awareness of the importance and role of policies and strategies in rural development (ENRD, 2021).

Also, the ENRD has been developing thematic work in areas such as greening the rural economy, generation renewal, social inclusion, and smart and competitive rural areas. In June 2021, a “Long-term Vision for Rural Areas” was developed with the help of citizens living in rural territories, addressing concerns such as demographic challenges, poverty, and access to opportunities and utilities (ENRD, 2021). This document establishes a common European vision for 2040, stressing four areas of action: “(1) stronger rural areas; (2) connected rural areas; (3) more resilient rural areas that foster well-being; and (4) prosperous rural areas”. This strategy intends to establish a comprehensive rural action plan to help rural businesses and communities reach their full potential in the coming decades (European Commission, 2021b).

Despite the above-described initiatives, there are still very significant disparities between rural and urban areas undermining eventual progress and contributing to deepening the differences between these two realities (Yin et al., 2019). Also, both climate change and the global increase in the human population make rural territories more vulnerable to losses, radical changes, or abandonment (ICOMOS, 2017).

For this reason, future approaches to rural development must surpass plain economic growth and address a transition process where challenges such as social innovation, local participation, demographic and cultural progress, and environmental challenges are fully attended to and considered (Dax et al., 2017; Yanbo et al., 2021). Promoting the conservation, integrity, and authenticity of these territories while perceiving them as valuable resources contributes to sustaining and increasing their adaptation and resilience, consequently assuring their inhabitants' quality of life (ICOMOS, 2017).

Rural built heritage is associated with different types of architecture, underlining popular, traditional, and vernacular as the most common yet distinct concepts. All of them are integrated within the commonly known domain of "architecture without architects", which refers to a community's practical approach related to building practices that arise in a specific geographical and cultural environment (Jorge, 2014). These concepts are particularly relevant in rural settings where, contrary to urban territories and cities, buildings' evolution occurs more slowly.

The term "vernacular" came up in the language domain as the opposite of "vehicular". The second refers to an idiom shared by more than one community, while the first regards a language of a single group of people (Jorge, 2014). The transposition of the word "vernacular" to the architecture field became associated with buildings that are identified with a place. These buildings are the result of a certain society's demands and are built with local materials (Jorge, 2014). This adaptation of vernacular architecture to local nature and climate embodies comprehensive wisdom (Nguyen et al., 2019). As a result, a vernacular habitat changes only in deliberate aspects according to the experience and needs of the dwellers since alterations are based upon the community's experience (Jorge, 2014). Figure 3 summarises examples of Mediterranean vernacular constructions.

Vernacular architecture and construction are characterised by an intrinsic connection to a certain territory, community, and resources. The immediate connection between the buildings and the places where they are located, as well as the use of their materials, showing consistent adaptations to specific geographical agents and climate conditions, are proof of a sustainable response that carefully evolves throughout time, regarding both economic, environmental, and social concerns. In the past years, interest has grown in research studies related to vernacular architecture and construction worldwide (He et al., 2023; Parracha et al., 2021; Wang et al., 2022), which points out the escalating interest in these elements and the territories where they are located.

As mentioned earlier, modern technology is still the norm when it comes to construction, and legal building standards are getting progressively tight, making the rehabilitation of vernacular buildings an increasingly complex task. Vernacular buildings' general lack of compliance with legal standards, which were mainly developed considering new constructions and materials, along with a shortfall of adapted norms and codes that allow these buildings to be improved while maintaining some original features, have led to their profound alterations.

Although these adaptations are demonstrably possible, useful, and cost-effective (Barbero-Barrera et al., 2014; Salvador et al., 2021; Itard et al., 2007; Widera, 2021), there is also a profound lack of knowledge regarding these constructions and depreciation of their testimony as links between the communities and the environment, leading to their consequent damage, abandonment, and loss (Sardaro et al., 2021). To counter this trend, it is fundamental to propose new approaches that actively contribute to a deeper knowledge and understanding of these constructions, allowing a careful and sustained adaptation to contemporary standards, an improvement in communities' quality of life, and the development of the territories that comprise them.

Examples of vernacular construction in Portugal: Viseu region (1); Lousã region (2)



Examples of vernacular construction in Spain: Galicia region (1); Cantabria region (2)



Examples of vernacular construction in Italy: Tuscany region.



Fig. 3 Examples of Mediterranean vernacular construction

Information presented in Sect. 3 shows how building rehabilitation can actively contribute to sustainable development. However, building rehabilitation in rural territories, where vernacular constructions still prevail, can significantly impact this goal in a further manner in two different intertwined scales:

- Building scale, considering the direct impact on improving existing constructions that embody a sustainable response to the environment;
- Territorial scale, considering the investment in the development and improvement of living conditions in rural areas, mitigating the difference between urban and rural development, and thus contributing to territorial cohesion.

These reasons stress the importance of prioritising rehabilitation actions in rural areas, which have a direct impact on territorial cohesion and thus positively influence sustainable development.

For those latter goals to be achieved, Nguyen et al. (2019) identified four major challenges and trends to be strengthened in the upcoming decades:

- Promotion of studies in regions where information regarding vernacular constructions is scarce;
- Establishment of a strong theoretical and practical basis that triggers the effective acknowledgement and recognition of values in vernacular heritage;

- Analysis of the inhabitants' perceptions and expectations regarding the occupancy of vernacular buildings;
- Research on the implementation of modern systems and standards in vernacular constructions, considering the maintenance of their original features and characteristics.

5 Final remarks

This work intends to raise awareness of building rehabilitation as a vector towards sustainable development and call attention to the utmost importance of rural settlements to this global objective. Efforts were made to gather information related to the EU's achievements towards sustainable development and examples of paramount documents that address this objective regarding the building sector in different contexts.

The contribution of rural settlements to territorial cohesion was also stressed, as well as the recognition of its importance to global development. Initiatives that entail rural development as a whole should be prioritised, facing these territories as catalysts of economic and social dynamics.

Additionally, the preservation and improvement of vernacular heritage, a central component of rural territories, should not be neglected. These constructions embody a wise response to the climatic and geographical context in which they are located and are intrinsically connected to the community and the environmental envelope, and the local economy of the place. Therefore, they should be perceived as a proven model of a sustainable response in the built environment.

The following conclusions can be pointed out:

- Climate change is recognised as a world-scale phenomenon requiring immediate action at an international level, mobilising efforts in many areas, including the building and construction sector;
- Sustainable development is also recognised as a distinct yet parallel commitment to climate change and has been addressed over time as a priority on international, European, and national levels. The building sector has been established as an area in need of change in order to achieve established commitments;
- Building rehabilitation can actively contribute en route to the three main dimensions of sustainable development since it promotes environmental and economic savings while contributing to social development, integration, and cohesion;
- Territorial cohesion plays a critical part in fully addressing sustainable development, contributing to a balanced distribution of opportunities. However, rural and urban developments present a compelling gap, stressing the need to adopt integrated approaches for rural territories, including heritage preservation strategies;
- Vernacular architecture and construction comprise a component of rural built heritage, characterised by an intrinsic connection to the territory, the community, and the local resources.

Future steps of work include deepening research on the triad building rehabilitation—rural settlements—sustainable development, contributing towards the current gap of information on the topic. Additionally, promoting new studies focusing on the rehabilitation of vernacular constructions in contexts where information is scarce will act as a tool of awareness towards their improvement and conservation.

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Declarations

Competing interests The authors declare no competing interests.

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