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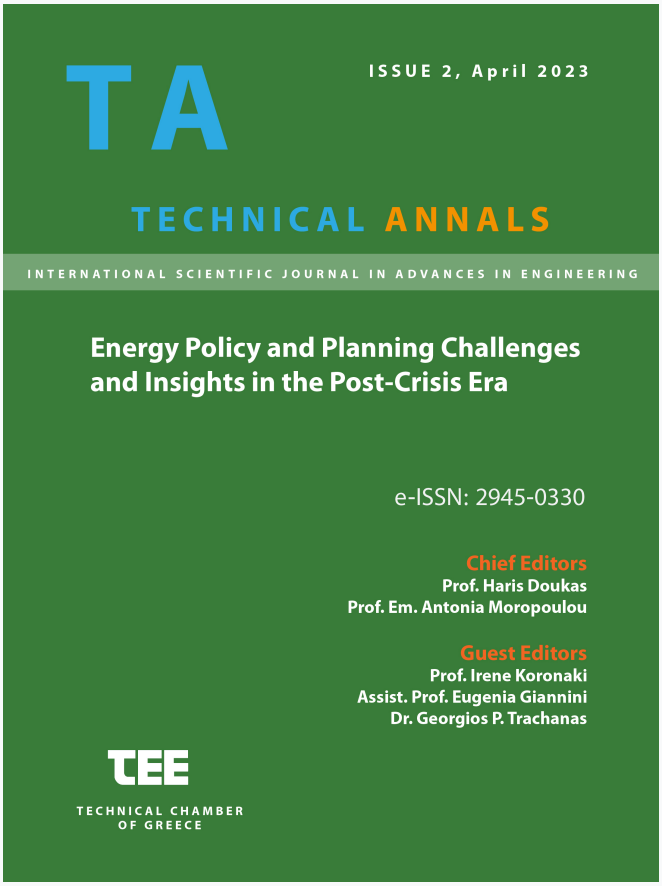


# Revitalising Small Historical Villages through Social, Economic, Cultural and Energy Efficiency Assets

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# Revitalising Small Historical Villages through Social, Economic, Cultural and Energy Efficiency Assets.

## Italian Examples and Methodological Approaches.

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**Abstract.** Cultural heritage and historical buildings, accounting for over 30% of the overall European building stock, need to be preserved as much as possible, on account of their role in representing the cultural identity of a community, and to be renovated in response to the sociocultural need to maintain historical cities and the environmental need to reduce the global energy demand of existing buildings.

Small historical villages, and in particular those with fewer than 5.000 inhabitants, are undergoing a declining process, due to the lack of infrastructure, services, cultural attractiveness and because of the inadequate actions aimed at their valorisation. They are often underused, abandoned or neglected, thus risking being affected by severe degradation. For this reason, European and national directives strongly encourage actions targeting the revitalisation of small villages, in order to preserve their historical heritage and improve their energy efficiency. This study aims at investigating Italian examples of the revitalisation of small historical towns, showcasing what strategies they employed for the maximisation of social engagement and inclusion, reduction of the environmental impact and energy efficiency improvement. This paper will propose a methodological approach leading towards the creation of Energy Communities within small historical villages, not only addressing the need for clean energy supply and environmental impact mitigation, but also respecting and preserving the heritage value and covering the social, economic, and cultural aspects of the revitalisation.

**Keywords:** Small historical villages, Cultural heritage renovation, Energy Communities.

**List of Abbreviations**

| | |
|---|---|
| ANCI | Italian National Association of Municipalities |
| CE | Circular Economy |
| CH | Cultural Heritage |
| EC(s) | Energy Community(s) |

| | |
|---|---|
| EED | Energy Efficiency Directive |
| EMI | Directive on common rules for the internal market for electricity |
| EPBD | Energy Performance of Buildings Directive |
| ESCO | Energy Service Company |
| EU | European Union |
| NRRP | National Recovery and Resilience Plan |
| RED | Renewable Energy Directive |
| RES | Renewable Energy Sources |
| SME(s) | Small and medium-sized enterprise(s) |

## 1. Introduction

Within the European context, historical centres represent a core part of the anthropic environment, comprising the most extensive concentration of cultural heritage (CH) and historical buildings, thus representing the cultural identity of a community. As suggested since the *World Heritage Convention* in 1972, such cultural and historical heritage needs to be preserved as much as possible, on account of its potential role in enhancing societal cohesion and development, and pursuing peace and justice.

The fundamental role of small urban areas has already been widely acknowledged on account of their cultural value, historical legacy, environmental role, endogenous features, connection with landscape and potential as alternative models to cities [1]. In fact, small historical villages commonly maintain the vernacular heritage of a population, thus representing the cultural expression of a community, of its diversity and of its relation with the surrounding territory [2], which has to be protected and preserved. Small villages are part of our past and present history, constitute our identity, retain the valuable cultural heritage and therefore deserve our most attention and care. Hence, there is a need to generate initiatives to protect the memory and heritage of former communities and residents.

In Europe, historical buildings account for over 30% of the overall building stock [3], with higher percentages in some countries, such as Italy, where architectural heritage constitutes at least 46% of the entire built environment [4].

On the other hand, such a relevant number of aged buildings significantly contributes to the national final energy consumption. Besides the high costs and emission levels, the low performance of historical buildings often results in the poor environmental quality of indoor spaces, with severe consequences on users' comfort and perception (e.g., low thermal performance, moisture-induced building pathologies, etc.).

For these reasons, the importance of operating on such heritage is twofold: the socioocultural need to preserve and maintain historical cities and their individual values, so as the environmental need to reduce the global energy demand of the existing building stock.

This study aims at investigating some Italian examples of the revitalisation of historical centres through the creation of Energy Communities (ECs), showcasing what strategies they employed for the maximisation of social engagement and inclusion, the reduction of the environmental impact and the improvement of CH energy efficiency. The most

effective and replicable experiences will be presented, providing insight into the suitable strategies that could be applied to future interventions.

## 2. Materials and Methods

The research is based on a significant work of data collection, mainly through: (i) literature review processes, to define the state-of-the-art concerning the renovation of small historical villages with respect to current approaches; (ii) review of European and national directives; (iii) analysis of Italian examples and best practices.
At the initial stage, the analysis of documents and literature – conducted through the search on the main reliable databases (such as Scopus, Researchgate, Google Scholar, etc.) as well as on official websites of the main international organisations involved in CH and small villages (UNESCO, ICOMOS, etc.) – served the purpose of attaining a clear and univocal definition of "small historical village". In addition, the objective of this review, coupled with the analysis of existing best practices, was to identify the main issues and risks affecting small historical villages, especially in relation to their currently increasing abandonment trend, as key concepts for a better and deeper understanding of the topic.
The review of European and national directives was oriented towards the understanding of current and future opportunities, and financial instruments for the development of regeneration strategies for small historical villages. The data gathering process was also applied to the identification of the current approaches to the renovation of small historical villages, in order to determine possible research gaps, which involved: (i) the review of parameters, across several references, influencing the regeneration interventions; and (ii) the recognition of challenges and obstacles of such actions. This analysis led to the detection of a scarcity of cohesive national revitalisation strategies for small towns, as most of the approaches are still based on "individual" solutions applied at the building scale, rather than more holistic large-scale methodologies. To support the validation and description of multi-scale and community-based approaches to the revitalisation of small towns, as well as the advantages they confer to the optimisation of this regeneration process, some Italian examples were chosen as "good practices".
A search on the main databases and on the available reports and mappings of Energy Communities in Italy (such as those provided by Legambiente) was carried out to study the progress of renovation and implementation of ECs within small historical villages. The examples were selected prioritising those that met the following criteria: (i) compliance with the definition of small historical village; (ii) application of regeneration intervention at the town scale; (iii) implementation of ECs[1]; and, when possible, at least one among the following: (a) involvement of the local community; (b) adoption of compensation strategies at the town-scale; (c) capitalisation of the features and assets that

[1] With the exception of the first example (Torri Superiore) which includes energy-saving and low-impact solutions but does not "formally" match this criterion. However, it was selected because of its peculiarity of being a completely abandoned village prior to the renovation interventions.

are typical of a specific territory. Among the eligible examples, the most aligned with the strategies proposed in this contribution were selected, prioritising those characterised by differences and peculiarities (in relation to the abovementioned parameters that affect the regeneration actions), in order to provide evidence of the feasibility of the proposed approach in different contexts.

## 3. Results and Discussion

### 3.1 Historical Villages: Depopulation and Energy Performance-Related Risks

Small historical villages[2] are often defined as settlements that have maintained the recognisability of their structure and the continuity of their historical building fabric – where their original typological and morphological characteristics are evident – and identified by high historical-artistic, architectural or landscape value [5].

Although national definitions of "towns" differ across countries worldwide, they can generally be assumed as isolated historical urban aggregates with a demographic size limit of 5.000 inhabitants. In fact, out of the 100 countries that use the population size threshold as a defining criterion to distinguish between cities, towns and rural areas, 85 use the 5.000 threshold or a lower threshold [6]. Sometimes, instead, the "Degree of Urbanisation" is used as a selection criterion to define the character of an area based on population density, with towns being described as "semi-dense areas which have a population of at least 5.000 inhabitants in contiguous grid cells with a density of at least 300 inhabitants per $km^2$" [7].

For this paper's aim, we intend small historical villages as those where the urban aggregates and their surroundings, whether urban or rural, however dense, are of recognised value from the historical, artistic, scientific, social or ethnological point of view. In some cases (small or very small municipalities) these can even correspond to a number of scattered, albeit mutually related, settlements.

Small historical villages constitute fragile environments, often located in marginal areas isolated from main urban centres, due to their complex orography, their fragile economy, and high environmental risks, recently exacerbated by the effects of climate change. These features led them to progressively face abandonment or depopulation phenomena, due to the lack of infrastructure, services, cultural attractiveness and because of the inadequate actions aimed at their valorisation. These adverse circumstances determined growing socio-economic issues and technological degradation of buildings and infrastructure. In the last decade, the decline of small towns and villages assumed considerable dimensions, with consequences on the conservation and protection of a wide and important cultural heritage.

This negative trend is especially evident in Italy, which has 4,7% of the world's architectural heritage, and where small historical villages involve approximately 22% of its population [4].

Here, the social and economic transformations that occurred in the last sixty years have had great consequences on the depopulation of small urban centres, leading to more

[2] The terms villages and towns will be used interchangeably here.

than 80% of the national population living in few larger cities, with concurrent disuse of large parts of the territory that are no longer maintained and therefore in a state of advanced abandonment. However, in Italy, 70% of Municipalities have fewer than 5.000 inhabitants, covering 55% of the overall national territory and accounting for almost 10 million residents (Fig.1). Among these, over 2.830 are at risk of disappearing, due to major collapse as a result of neglect, despoliation by local populations, ordinary natural events (e.g. rainfall, temperature fluctuations, etc.) and extraordinary events (e.g. floods, earthquakes, etc.) [8].

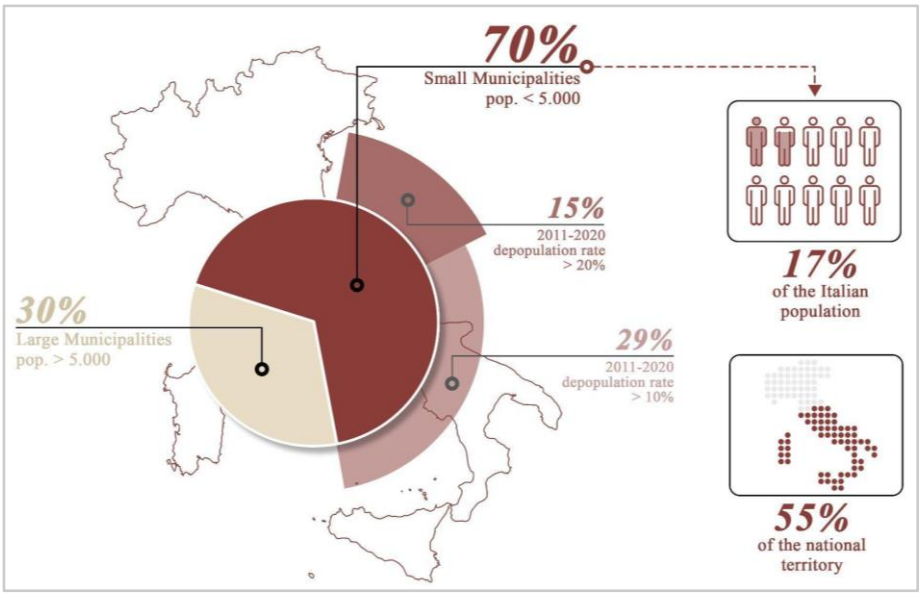


**Fig. 1.** Distribution of small and large Municipalities in Italy and percentage of small Municipalities undergoing a > 10% or > 20% depopulation rate (source: authors' own elaboration).

As small towns are underused, abandoned or neglected, and their tangible cultural heritage is threatened to be affected by degradation, the major risk to be faced is the permanent loss of their intangible cultural value. Intangible cultural heritage includes all expressions that communities and groups recognise as part of their cultural heritage, constantly recreated in response to their environment, their interaction with nature and their history, which provides them with a sense of identity and continuity, thus promoting respect for cultural diversity and human creativity [9].

On the other hand, it must be considered that the share of buildings dating prior to 1945 represents an average of 26% of the whole building stock in European countries [10]. Such a relevant number of aged buildings significantly contributes to the national final energy consumption. It has been estimated that, in relation to different European countries, such value may vary between 27% and 42% of the overall energy demand [11]. In fact, historical buildings, and in particular those built before 1945, are usually low-performance by definition [12]. Besides the high costs and emission levels, the low

performance of historical buildings often results in poor environmental quality of indoor spaces, with severe consequences on users' comfort and perception (e.g., low thermal performance, moisture-induced building pathologies, etc.).
However, the renovation of historical built environments is a challenging task, as often the need to maintain the aesthetic value does not allow to apply standard packages of solutions. Energy retrofit and renovation techniques for high-quality design and construction, able to preserve the cultural value of heritage buildings, have to consciously balance different requirements, and retrofitting technologies have to be weighted on their reversibility or invasiveness, considering the whole environmental impact of each solution [13].
On such occasions, renovation strategies must preconceive and evaluate the compatibility of renovation measures and establish their respectful implementation, which has reportedly proven to be feasible and consistent with energy efficiency improvement. In fact, completed projects have shown that reducing the building's energy demand by 75% may be possible for historical buildings, while preserving their heritage value [14].

### 3.2 European and National Directives Promoting Preservation and Revitalisation of Small Historical Villages

European and national directives are strongly encouraging actions that target the revitalisation of such villages, in order to preserve their historical heritage and improve their energy efficiency.
The European Union (EU) coordinates and supports policies, measures and investments around the preservation of cultural heritage with growing interest since the Treaty of Maastricht (1992). In 2005, the Faro Convention (Framework Convention on the Value of Cultural Heritage for Society) cast light on the socio-economic advantages of preserving cultural heritage while, in 2014, the CoE Parliamentary Assembly adopted Recommendation 2038, "Europe's endangered heritage", seeking to interlink culture, heritage and education to encourage implementation of conservation of cultural heritage and community-led urban strategies in historical towns.
The publication of the "Cultural Heritage Counts for Europe" report, in 2015, opened a door for the improvement of investments in the field, by highlighting the beneficial effects of cultural heritage. 2018 was designated as the European Year of Cultural Heritage by the European Commission, and it represented an opportunity to progress in conservation, especially with the publication of The European Framework for Action on Cultural Heritage, with the aim of setting a common direction for heritage-related activities at European level, primarily in EU policies and programmes.
In general, the European policies and documents about cultural heritage stress its importance in the three main pillars of sustainable development: 1) **economic**, as cultural heritage represents a strong asset in tourism, thus leading to a positive economic impact on job creation; 2) **social**, as cultural heritage can foster integration, inclusiveness, cohesion and participation; 3) **environmental**, as innovative and sustainable use of cultural heritage can enable the sustainable development of European landscapes and environments [15].

In fact, the preservation of historical and cultural tangible and intangible values is a prerequisite for achieving sustainable development. The adoption of the World Heritage Sustainable Development Policy (2015) reminds us of the importance of cultural heritage in the attainment of the UN Sustainable Development Goals, mainly referring to Target 11 "Make cities and human settlements inclusive, safe, resilient and sustainable", to enhance inclusive and sustainable urbanisation and safeguarding cultural and natural heritage.

On the other hand, in many European countries, a sizable proportion of the existing building stock is represented by historical buildings, many of which are inadequately performing in terms of energy consumption and indoor environmental quality. For this reason, and because such heritage can only be preserved if maintained as living space, the interest in the preservation of historical buildings has been shifting towards the identification of compatible energy retrofit solutions, allowing to improve users' comfort, lower energy costs and minimise the environmental impact, while maintaining the aesthetic and cultural values [14]. The latest trends have shown that even historical buildings shall aim to be aligned with the Energy Efficiency Directive (EED) and Energy Performance of Buildings Directive (EPBD) to meet the EU's climate objectives, as well as national building renovation plans [16].

In fact, after the Paris Agreement (2015) set the target of arresting global warming to 1.5° and the European Green Deal and 2030 Climate Target Plan (2019) introduced new measures to achieve carbon neutrality by 2050, in 2020, as a flagship of the Green Deal, the European Renovation Wave directly addressed this need, proposing to double annual energy renovation rates throughout the next 10 years and to encourage deep renovations. In the EPDB novel version revised by the EU Commission in 2021, it was also proposed that public administrations should be required to renovate at least 3% of their total owned building floor area each year.

Given the extent of the renovation requirements, to meet the challenges posed by sustainable development, rural areas offer many opportunities, especially in terms of resilience against climate change, provision of alternatives to fossil fuels and development of Circular Economy (CE) principles. For these reasons, European policies also encourage the development of "smart villages" within the existing ones, defined as those able to use digital technologies and innovations to enhance standards of public services and ensure better use of resources. Their role in providing a balanced territorial distribution of the population – avoiding overpopulation of cities – is crucial, while their quality of life is increasingly valued as is the contribution that the cultural heritage of rural areas makes to sustainable tourism [17].

While the EU provides economic resources for the preservation and rehabilitation of cultural heritage in small towns through several funding programmes (e.g. EU Cohesion Policy, Regional development investments, European Agricultural Fund for Rural Development, etc.), at the national level countries are encouraged to enhance their peculiar historical assets.

In this respect, in Italy, the National Recovery and Resilience Plan (NRRP) paves the way for new intervention lines, directed towards the revitalisation of the relevant number of historical towns, in particular of those with a population of fewer than 5.000

inhabitants. Line A (420 million euros) aims at supporting "pilot projects for the cultural, social and economic regeneration of villages undergoing abandonment or neglect, through the implementation of a limited number of exemplary actions", one for each of the 21 Italian Regions. Conversely, Line B (580 million euros) promotes the "regeneration, valorisation and management of the historical, artistic, cultural and traditional heritage of small towns, both for its protection and for the need of social and economic revitalisation, creation of job opportunities and combating depopulation".
These investments are to be considered as a follow-up to the previously issued Law 158/2017, which aimed at introducing measures to support residents and productive activities within small Municipalities that display at least one of the following parameters[3]: hydrogeological instability; economic hardship; depopulation trend; demographic (due to age, unemployment) and urban disadvantages (rural area); lack of social services; communication struggles (due to lacking infrastructure or distance); low population density; presence of Municipality clustering or previous merging; presence of protected natural areas.
These financial instruments alone are not enough: to achieve the desirable paradigm shift towards small towns that are more attractive, self-reliant and interconnected, on one hand, and more resilient and energy efficient, on the other, there is a strong need for a cohesive national revitalisation strategy, aimed at identifying the specific assets and resources of each area, leveraging them as *drivers* for the reorganisation and development of these "territorial archipelagos" [18].

### 3.3 Current and Proposed Approaches to the Renovation of Small Historical Villages

Within the European context, the identification of strategies for the revitalisation of small historical villages is complicated due to, among other reasons, the diversification of features that, albeit recurring, are noticeably variable, thus motivating that the application of certain solutions is not directly replicable or transferable to other contexts. The following section briefly introduces an overview of the main features leading to possible categorisations of small historical villages.

### 3.4 Main Categories of Parameters Influencing the Renovation of Historical Small Villages

As a general introduction, small villages can be categorised according to several parameters (Fig.2). Some attain the site conditions of the small town's location, others concern the historical period, the architectural background (typological and morphological features) and the construction systems, some others the population living in the village and their primary sources of revenue.

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[3] The Italian Government published the list of the 5.518 eligible Municipalities, and relative parameters, in September 2021: https://www.gazzettaufficiale.it/do/atto/serie_generale/caricaPdf?cdimg=21A05365001000101100001&dgu=2021-09-14&art.dataPubblicazioneGazzetta=2021-09-14&art.codiceRedazionale=21A05365&art.num=1&art.tiposerie=SG.

Among those parameters belonging to the first category, some significant ones could be: 1) **geo-cluster**, based on the usual definition of European climatic zones (Köppen climate classification); 2) **elevation**, which typically refers to their height above sea level and the geomorphological typology of the area (mountain, hill, plain or coastal villages)[4]; 3) **accessibility**, which relates to distance from main urban centres, easy and convenient access to public and private transport, but can be also extended to digital and communication service availability (i.e. access to internet).

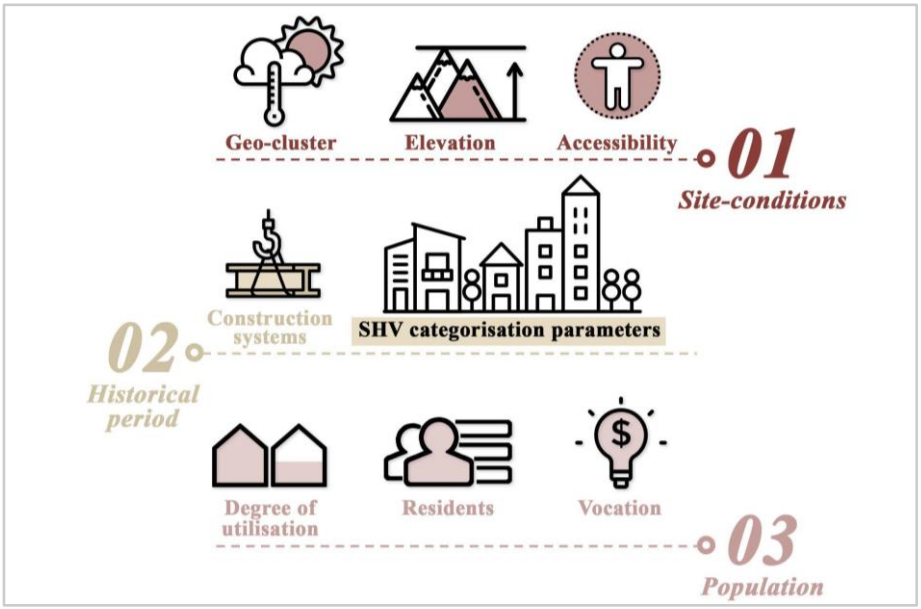


**Fig. 2.** Proposed main categorisation parameters for small historical villages (source: authors' own elaboration).

Some of the parameters that are part of the second category – referring to the villages' historical, architectural, urban and construction background – are strictly related to those regarding their geographical location: the **construction systems** used within historical villages differ significantly according to the history and traditions of a place, which are undoubtedly influenced by climate, available materials and local resources.
Within the third category of parameters, there are some that are worth mentioning: 1) the **degree of utilisation** defines whether the village is fully abandoned, partially abandoned, mostly inhabited, or its residents may have relocated to a new urban aggregate[5];

[4] This categorisation has been used in the "Atlas of Small Municipalities", published in 2012 by the Italian National Association of Municipalities" (ANCI).
[5] This definition has been introduced by a research study conducted since 2006 at the Department of Architecture of Politecnico di Milano, coordinated by Prof. G. Postiglione, "Geografie dell'abbandono".

similar categorisations refer to this parameters as "exodus", "steady" and "counter-exodus", indicating an increasing, stable or decreasing depopulation rate[6]; 2) all that concerns the **residents** influences potential interventions for the revitalisation of small villages (in terms of population age, ethnicity, habits, etc.); 3) primary **vocation** of the village, which is strictly connected to the main employment sector and the activities the residents engage with. Such vocations have been grouped by previous research studies[7] and can be summarised as follows: tourism and real estate; production; socio-cultural; artistic; experimental.

As this introduction shows, the number and the diversification of small historical villages do not allow for general solutions to their revitalisation. Some are still endowed with a certain degree of vitality and dynamism, which might facilitate their regeneration, while others are afflicted by the condition of marginality, which prevents them from possibly being revitalised without external triggers [19]. Other aspects to be considered as potential obstacles, especially regarding the need to improve the energy efficiency and environmental indoor quality within historical buildings, are the need to preserve the aesthetic and architectural value of the cultural heritage (especially for listed buildings) and landscape, as well as the typological and stylistic identity, often in close relation with the buildings' construction techniques derived from a specific historical period. Other recurring challenges are the technical/legal restrictions, the aged infrastructures and non-flexible systems, the need for substantial investments, and other issues concerning ownership and usage patterns, also considering the potential digital divide and energy poverty phenomena.

However, although the requirements differ based on several conditions – compelling to assess them on a case-by-case basis, in relation to preservation requirements, structural and material construction systems, and site-specific climatic conditions – by categorising recurring historical elements and features defining historical built environments, and crossing this information with the site-specific characters of the existing, solutions that have already been implemented can provide a good basis for further planning, by identification of suitable approaches [20].

For all these reasons, the current practice of renovation in such contexts frequently favours interventions on individual buildings, with the actors involved in this process (e.g. Municipalities, owners, private investors, etc.) generally intercepting opportunities whenever possible, thus generating incoherent and inconsistent episodes rather than efficient and farsighted strategies.

However, it is recognised that the methodologies based on individual buildings or stand-alone solutions are not sufficient to overmatch the transition barriers because, among other issues, they do not consider the whole urban system and the synergies that can be created at a community level [21]; acting instead at the "urban" scale, considering building aggregates and related connections and infrastructures, allows to increase

[6] This categorisation, as well as the following one (residents) can be retrieved in the previously mentioned "Atlas of Small Municipalities".

[7] "L'Italia dei borghi. Abbandono e nuove prospettive" by D. Benedini (2020) and "Borghi-reloaded" by G. Postiglione and M. Menconi (2018).

those synergies, speeding up renovation, rehabilitation, and repurposing processes, triggering on compensation strategies among the different involved scales.
As a consequence of this, large-scale renovation actions are crucial to oppose depopulation and gentrification in marginal areas, while retaining the unique identity of small historical villages. Hence, there is an urgent need for the development of multi-scale community-based strategies for wide compatible adaptive reuse, restoration and energy efficiency refurbishment to: preserve and maintain the cultural heritage within small historical villages; valorise their historical identity; improve quality of life and comfort for end-users; reduce the environmental impact towards carbon neutrality and lower emissions; improve resilience of rural areas; and enhance inclusiveness and accessibility of historical sites.

### 3.5 Multi-Scale and Community-Based Approaches to the Regeneration of Small Historical Villages in Italy through the Creation of Energy Communities and Examples

As previously mentioned, the Italian case is representative of the more generalised condition of marginalisation and neglect of small villages, especially when located in rural areas, although they represent a highly valued heritage and, quoting Daniel Libeskind, they "enclose the DNA of humanity" (2016). There are several structural motivations for these "settlement defects", such as demographic weakness (e.g falling birth rates, growing elderly population, etc.), depletion of productivity potential, poor attractiveness and limited appeal to new residents or small enterprises. It was estimated that at least 3.145 small Municipalities, accounting for the 38,8% of the total number, suffer from this condition [22]. In addition, such territories often lack the capacity to promote their tourist identity, albeit their potential, respecting their own vocations and traditions, harnessing environmental, economic and cultural assets.
To oppose this negative trend, several past and recent initiatives were launched by individuals and communities in order to revitalise small historical villages by reanimating their attractiveness.
Most of these initiatives, according to their own objectives and inclinations, advanced and enforced synergies and networking systems at local level, or created collaborative and widely-accepted actions, in order to achieve enhanced liveability, productivity, or tourism, and eventually improved well-being for residents and visitors.
In this respect, it is interesting to note that, in recent years, an increasing number of experiences were activated in order to create Energy Communities within small towns. These are new models arisen from the need to evaluate conservation and adaptation measures from the perspective of Circular Economy but also to foster the decarbonization process in historical urban areas, using innovative approaches of energy management, advanced materials, and applying Renewable Energy Sources (RES) [23]. ECs are defined as legal entities involving citizens' participation as *prosumers* in the future energy system that should integrate social justice principles [24]. They can be organised in various collective forms for the decentralisation and the local operation of renewable energy [25].
Among the strategies towards decarbonisation by 2050 foreseen by the "Clean Energy for All Europeans Package" (2019), the most important directives are: the Renewable

Energy Directive 2018/2001 (better known as RED II); the Directive on common rules for the internal market for electricity 2019/944 (so-called EMI Directive).
The main purpose of the RED II Directive is to increase the share of energy produced from RES in the EU and to increase citizen's involvement in the installation of renewables. In addition, this directive aims at addressing the energy poverty issue by fostering inclusiveness of vulnerable customers in the energy transition pathway. Instead, the EMI Directive shall adapt the EU electricity market to the most recent technological and structural changes, dealing with the production and exchange of electricity – whether from renewable or traditional sources – and the methods of participation in energy services. Although collective self-consumption of energy has already been recognised in some EU national legal frameworks or in pilot projects, this directive offered the opportunity to formally recognise it in legislation at EU level. RED II and EMI Directives provide for the first time an enabling EU legal framework for collective citizen participation in the energy system [26]. This represented a turning point for Energy Communities, as their recognition endorses their creation.
In Italy, the implementation of the abovementioned directives began in 2020, with "Decreto Milleproroghe", introducing for the first time the definitions of "jointly-acting renewable self-consumers" and "Renewable Energy Communities". This was followed by the publication of the ARERA Resolution 318/2020 (August 2020), the MiSE Decree (September 2020) and the technical rules by GSE (December 2020), leading to a pilot phase for the creation of ECs.
Along this period, a rising interest sparked around this legal form of cooperation among citizens that, coupled with the empowerment of individuals within the energy system, enables customers to take a more active role. In fact, ECs stand out as significant facilitators for the participation of individuals and communities in the energy system, promoting self-consumption and contributing to the social acceptance of renewable energy implementation initiatives, allowing for several additional benefits.
Despite the most recent evolutions, it has to be stated that community-based approaches for the sustainable regeneration of small towns had been experienced long before ECs were defined by statute.
This is the case of **Torri Superiore**, a small mediaeval town located at a distance of approximately 10 kms from Ventimiglia, in Liguria. As reported by Briatore [27], before its revitalisation, Torri Superiore was completely abandoned: its depopulation began as early as the 19$^{th}$ century, due to the lack of employment opportunities and the geographical location, which caused the town to witness several changes in the border between Italy and France for over a century. The small village's buildings were divided into several properties, as it often happens in underused areas due to inheritance processes and lack of functional reorganisation. The interventions began in the early 1990s, when the members of the "Cultural Association of Torri Superiore", founded in the '80s, started purchasing part of the properties, up to the acquisition of approximately 90% of the village. The aim of the association was, on one hand, the restoration of the buildings and the recovery of the cultural, architectural and landscape heritage and open spaces: on the other, the development of a different societal model, based on collective and individual economic activities that provide for the inhabitants, enabling them to afford living in the small town [27]. Under the architectural point of view, the recovery

project, often prosecuted by the local population itself, preserved the original features of the urban and building aggregates, while integrating them with modern technologies for comfortable living and for low environmental impact, encouraging the use of natural materials and energy-saving technologies. As for the latter, hot water is produced by solar panels; heating systems consist of low-temperature radiant surfaces (with air temperature does not exceed 18°C) ensuring thermal comfort and energy savings; electricity is supplied by a private company and entirely produced from RES; wastewater is collected and reused within composting systems.

Overall, not only did this ambitious project regenerate the historical heritage of the town, but it recreated a community within it that would share common values and benefits, in the form of "ecovillage", a human-centric settlement striving to pursue sustainable living models in harmony with the environment.

In more recent years, thanks to the implementation of ECs within legal national frameworks, some of these initiatives have resulted in the formal organisation of Energy Communities, some of which have started to advance even within small historical towns. An example of this can be encountered in the **Municipality of Ferla**, located in Sicily and accounting for about 2.300 inhabitants. The origins of this town date back to the mediaeval times, with traces from that period remaining in the urban structure and narrow street recall the architectural traits of old villages (Fig.3).

However, major parts of the town were reconstructed after a destructive earthquake occurred in the 17$^{th}$ century. Here, under the guidance of the illuminated administration, an Association was created with the aim of engaging citizens, SMEs or other stakeholders seated on the municipal territory, both as consumers of clean energy produced by the public photovoltaic installations or as prosumers, placing their renewable energy production systems at everyone's disposal. The Municipality, within the pilot project devised by MULTIPLY (H2020) and in collaboration with University of Catania, installed several solar power systems – for a total capacity of 185 kW – on public properties, some of which within the historical centre, with the endorsement of the bodies responsible for heritage conservation. Thanks to these units, sufficient electrical energy is produced to meet over 40% of the energy demand from public facilities, thus leading to considerable savings for the public administration, as well as receiving significant economic contributions for clean energy production. Environment wise, this means that approximately 292 tonnes/year of $CO_2$ are prevented from being released into the atmosphere [28].

**Fig. 3.** Historical centre of Ferla, Sicily. Clemensfranz, CC BY-SA 3.0, via Wikimedia Commons. http://creativecommons.org/licenses/by-sa/3.0/.

Together with the integration of RES, the Municipality of Ferla promotes measures to improve the waste reduction rate and the distribution of free drinking water. These actions are aimed towards the ecological transition, with the fulfilment of CE and sustainable lifestyles, but also and foremost favourably impact the quality of life and well-being for residents within the village, social cohesion, innovation and fair employment. These side benefits do not come as a surprise: as a matter of fact, the primary purpose of Energy Communities is to provide environmental, economic and social community advantages for shareholders and members, as well as for the local areas where they operate, with the additional contributing factor given by financial profits [29].
In fact, there are several factors, besides all previously mentioned diversities and variabilities among small towns, that represent the common ground for the activation of renovation and energy improvement strategies at the village or district scale, rather than at the building scale. The reported experiences, as well as the motivations and the rationale behind Energy Communities, seize and build upon these opportunities.
More specifically, the advantages to be leveraged when operating on the village altogether are highlighted below.

- Possibility to **engage with the community**. In recent years, some initiatives, striving to transform the town's condition of marginality into an opportunity to revitalise a deep cultural and territorial identity, have shown that spontaneous associations of people are key to develop the re-appropriation, acceptance and

valorisation of values and places[8] [30]. The value of engaging with the community is given by the desire of local populations to carry out actions – driven by innovation and creativity – that are not only "productive" or "promotional", but genuinely aimed at safeguarding the memory and heritage of their past that would otherwise risk being lost. This generates opportunities for communities to be empowered and thrive. In this sense, the community can be intended as either residents or users of inhabited villages, or potential future users and stakeholders of neglected or abandoned towns.

- Possibility to operate both at the building and urban scale, adopting **compensation strategies** aimed at achieving high quality standards of the renovated village – especially in terms of resilience, sustainability and energy efficiency – where restrictions and constraints (e.g. considerable number of listed buildings, density of building blocks, etc.) do not allow to foresee the expected results just through limited actions on individual buildings. This, instead, can be accomplished by additional interventions on connective spaces (e.g. vegetation, ground surface materials, etc.) or even on the surrounding areas of the historical settlement (e.g. installation of photovoltaic panels or use of other renewable energy sources).
- Possibility to **capitalise the assets** provided by each specific site: social assets (e.g diversities within the communities, habits, etc.); cultural assets (tangible and intangible cultural heritage); economic assets (e.g. agricultural/ tourist/industrial activities, local products or goods, etc.); energy assets (renewable energy sources to be used); natural assets (e.g. unique landscape, protected natural areas, etc.).

In order to maximise these favourable aspects, ECs can represent a starting point for the implementation of novel collaborative business models exploiting the cultural/historical assets and resources of a place, while introducing technologies to improve energy performance, conforming to European socio-ecological and climate objectives. In this respect, the opportunities offered by RES usage in historical towns are substantial for the reduction of energy demand and, accordingly, towards achieving net zero energy buildings, especially if solar panels and collectors wisely integrated as to not interfere from an aesthetic perspective, and their installation is reversible [14].

Recent experiences demonstrate the potential of this approach, although the above discussed large-scale operational conditions (i.e. community engagement, compensation strategies and capitalisation of local assets) often appear independently rather than framed in combination for their mutual optimisation.

**Ventotene,** a small island in the Tyrrhenian Sea, with 800 inhabitants, belonging to the Province of Latina, in Lazio, embarked on one of these worthwhile ventures (Fig.4). In October 2021, a small Energy Community was inaugurated, supported by the Municipality, La Sapienza University and Regional funds allocated by the "Vitamina G" project call [31]. In formulating the project, the public and private stakeholders were involved, along and foremost with citizens, conducting a *participatory process* aimed at

[8] In Italy, some initiatives are promoted by associations such as "I Borghi più Belli d'Italia", "Bandiere Arancioni", "Touring Club", some others result from local processes activated by residents that have built a collaboration.

fostering a shared sense of belonging for the community as a whole; these experimentations were integrated with activities aimed at raising awareness and providing education on environmental-responsible behaviours.

**Fig. 4.** Ventotene, small island in the Tyrrhenian Sea. IslandVita, CC BY-SA 4.0 https://creativecommons.org/licenses/by-sa/4.0, via Wikimedia Commons.

In **Biccari** (Province of Foggia, Puglia), registering approximately 2.700 residents, the Municipality – supported by the Region and the EU – has operated several interventions for the valorisation of the natural and built environment. In collaboration with the "ènostra" energy cooperative, the administration intends to finalise the constitution of a Renewable Energy Community, with a threefold objective: to further develop its long running activities to improve landscape quality and environmental sustainability, through which Biccari has already achieved promising results in tourism attractiveness; to address energy poverty issues by installing photovoltaic panels on public housing; to maximise self-consumption on all municipal properties through the acceleration on the generation of renewable energy from RES [32]. One interesting fact is that the municipality has devised the delocalisation of on-site exchange systems, positioning car-parking photovoltaic shelters outside the town centre, adopting this *compensation strategy* in order to overcome the barriers given by the installation of plants within historical buildings.

A different model is pursued within the small Renewable Energy Community associating citizens in the **Municipality of Gallese** – a small town accounting almost 3.000 inhabitants in the province of Viterbo (Lazio) – that owes its setup to the initiative of an existing "Bio-district" association and the EU funded project REDREAM (H2020). The ambition is to acquire a photovoltaic solar power plant, currently estimated at a total power of 200 kW, to be financed by an ESCO (Energy Service Company). This will support and enhance the agricultural enterprises operating on the territory of Gallese, which represent the local economic drive force, as well as the main *cultural*

*and landscape asset*. Over the years, the "Bio-district" has committed to implementing strategies and objectives in the field of recycling waste, biodiversity protection and management of energy resources, thanks to the local farming businesses. All these activities, intertwined within the new EC, will expectedly stimulate the further revitalisation and regeneration of the natural and built environment.

What such experiences have in common is the capacity of being pervasive in the internalisation and embracement of local resources, whether physical, cultural, or even represented by the community itself and its sense of belonging, allowing them to become the catalyst for economic and social development. The key to success of these projects was the capacity of capitalising the main local – internal or territorial – assets, confronting the challenge of turning them into their own peculiar vocations, thus producing added value for the community.

Each of the proposed examples offered appropriate reflections and evidence on the effectiveness and replicability of each initiative, as well as on the possibility to combine different strategies and solutions for the maximisation of their beneficial effects, according to three different focus areas that were analysed in relation to the objectives of this contribution. These main lines are:

- **community engagement**: the relevance of participatory approaches and community engagement emerged from several experiences; the definition of community is extended to both local residents, for inhabited villages, and future stakeholders and end-users, for depopulated ones;
- **environmental impact**: it is intended both as the compatibility of building reuse and interventions in respect of the natural/urban/historical context of the village, as well as the effects produced and observed by the pursued actions on the wider environment, towards decarbonisation and energy efficiency;
- **business venture**: there were several types of enterprise initiative, either funded by private investors, public administrations, from a joint collaboration between private and public actors or from bottom-up approaches.

In this respect, these experiences can be interpreted as an interesting testing ground for the application of cooperative actions based on the "T" elements that can build attractiveness and competitiveness: technology, i.e. the capacity to create innovative products and services; talents, i.e. the intrinsic tangible and, most importantly, the intangible components (e.g. knowledge, values, etc.) of a territory; tolerance, i.e. the capacity to accommodate and create a multi-ethnic and highly socially differentiated society [33].

## 4. Conclusions

When looking at future renovation scenarios, it must be considered that the utmost importance of preserving cultural and historical sites requires them to be prevented from abandonment and neglect, thus maintained as active and lively places. In order to do so with small historical villages, while protecting their legacy as bearers of past collective memories and values, it is necessary to overcome the traditional approach, aimed at restoring individual buildings, rather operating at different scales – territorial, urban, architectural – by performing a broader analysis, investigating their surrounding territory, focusing on their grids, networks, resources and energy potential. This allows to

provide a multi-scale, human-centric and community-based methodological format to capitalise the available resources of targeted sites, aiming at benefiting from the adoption of participatory processes and optimal strategies for the appreciation of the main assets and vocations. Furthermore, this approach contributes to calibrating effective and minimally invasive interventions on the heritage built environment, thanks to the identification of compatible compensation strategies as a synthesis between energy efficiency requirements – deriving from the assessment of performance needs – and conservation priorities for the enhancement and protection of the original, architectural and constructive features.

Thanks to these factors, the valorisation of small towns is a vast field upon which a new idea of collaborative conservation and regeneration can be based, producing added value, attractiveness, growth and rebirth in contexts that are undergoing a depopulation process.

After the implementation of the latest EU and national directives legally recognising and defining certain types of community energy initiatives as Energy Communities, it appears that such collective, open and democratic entities represent an effective strategy to change the organisational and power structures that sustain small historical villages, while maintaining the possibility of heterogeneous organisational models and legal forms [26].

The proposed multi-scale integrated approach, going beyond the traditional building-based vision, conveys a more extensive outlook, allowing to devise and enact more cohesive strategies between conservation and regeneration, maintenance of cultural value and decarbonisation. In this sector, ECs have shown great potential, both in the renovation and improvement of energy efficiency, and in enhancing social cohesion, citizens' well-being, employment opportunities, even though so far they have not yet been extensively implemented within historical environments.

This contribution has strived to demonstrate that, if the benefits of ECs are coupled on one hand with wide citizens' acceptance – obtained through participatory and engagement procedures, improved social, economic and well-being conditions, and enriched collective perception – and, on the other hand, with compatible and respectful technologies for building renovation, as well as combined with compensation strategies at urban/territorial scale, it will be possible to successfully respond through on-site solutions to the key challenges presented by the urgent need for the transition of historical low-performing protected historical contexts towards climate neutrality.

## References

1. Verdini G.: Culture as a Tool for Harmonious Territorial Development. In: UNESCO, Culture Urban Future. Global Report on Culture for Sustainable Urban Development. Paris (2016).
2. ICOMOS: Charter on the Built Vernacular Heritage. Mexico (1999).
3. Blumberga A., Freimanis R., Muizniece I., Spalvins K., Blumberga D.: Trilemma of historic buildings: Smart district heating systems, bioeconomy and energy efficiency. In: Energy 186 (2019). https://doi.org/10.1016/j.energy.2019.07.071.

4. Galatioto A., Ciulla G., Ricciu R.: An overview of energy retrofit actions feasibility on Italian historical buildings. In: Energy, vol. 137, pp. 991–1000, ISSN 0360-5442 (2017). https://doi.org/10.1016/j.energy.2016.12.103.
5. Ricci M., Battisti A., Monardo B. (eds.): I Borghi della salute. Alinea Editrice, Firenze (2014).
6. Dijkstra L., Hamilton E., Lall S., Wahba S.:, How do we define cities, towns, and rural areas?. In: Sustainable Cities (2020). https://blogs.worldbank.org/sustainablecities/how-do-we-define-cities-towns-and-rural-areas#:~:text=Cities%2C%20which%20have%20a%20population,inhabitants%20per%20km2%3B%20and.
7. Eurostat, Degree of urbanisation classification – 2011 revision, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Degree_of_urbanisation_classification_-_2011_revision#Degree_of_urbanisation_classification (2011).
8. Flora N.: Ri-attiva-azioni dei borghi appenninici. Strategie per un abitare policentrico. In: Bellomo M. et al. (eds), Inhabiting the Future, Inhabiting the new/inhabiting again in times of crisis (2nd edition), pp. 236–249. Clean, Naples (2012).
9. UNESCO. Convention for the Safeguarding of the Intangible Cultural Heritage. Paris (2003).
10. Troi A.: Historic buildings and city centres – the potential impact of conservation compatible energy refurbishment on climate protection and living conditions. In: International Conference Energy Management in Cultural Heritage, Dubrovnik (2011).
11. Historical building types and combinations of structural solutions and main driving forces promoting renovation of historic buildings based on case studies. Report. EU project Robust Internal Thermal Insulation of Historic Buildings (RiBuild), Project No. 637268. (2015).
12. Cabeza L.F., De Garcia A., Pisello A.L.: Integration of renewable technologies in historical and heritage buildings: A review. In: Energy & Buildings 177, pp. 96–111 (2018).
13. Mazzarella L.: Energy retrofit of historic and existing buildings. The legislative and regulatory point of view. In: Energy and Buildings (2015). http://dx.doi.org/10.1016/j.enbuild.2014.10.073.
14. EBC ANNEX 76 - SHC TASK 59: Deep Renovation of Historic Buildings Towards Lowest Possible Energy Demand and CO2 Emissions. EBC (2019). https://www.iea-ebc.org/Data/publications/EBC_Annex_76_Factsheet.pdf.
15. European Commission: Getting cultural heritage to work for Europe. Publications Office of the European Union, Luxembourg (2015).
16. European Alliance of Companies for Energy Efficiency in Buildings (EuroAce): Renovation of historic, heritage, and protected buildings: Recommendations & case studies (2022). https://euroace.org/wp-content/uploads/2022/07/2022_06_02_EuroACE_Heritage-buildings-brief.pdf
17. Martinez Juan A., McEldowney J.: Smart villages. Concept, issues and prospects for EU rural areas. PE 689.349 (2021).
18. De Rosa P.: Fondi PNRR e "diritto dei borghi": analisi delle politiche di rigenerazione dei territori tra interventi legislativi e pratiche locali. In: Il diritto amministrativo (2022).
19. Piroddi E.: Si può dare un futuro ai centri storici minori. In: Rolli G.L., Salvare i centri storici minori, pp. 36–37. Alinea Editrice, Firenze, (2008).
20. Buda A., Herrera D., Pfluger R.: Renovation strategies for historic buildings. Report D.C2, IEA SHC Task 59 | EBC Annex 76: Deep renovation of historic buildings towards lowest possible energy demand and CO2 emission (NZEB) (2021).
21. Gregório V., Seixas J.: Energy savings potential in urban rehabilitation: A spatial-based methodology applied to historic centres. In: Energy and Buildings, vol. 152, 11–23 (2017).

22. Confcommercio and Legambiente: 1996/2016 Eccellenze e ghost town nell'Italia dei piccoli comuni. In: report "Italia del Disagio Insediativo" (2008). https://www.confcommercio.it/documents/20126/566895/rapporto-integrale.pdf/e34a3145-2f09-e509-04bb-7a51930bdb68?version=1.1&t=1358269071000.
23. Blumberga A., Vanaga R., Freimanis R., Blumberga D., Antužs J., Krastiņš A., Jankovskis I., Bondars E., Treija S.: Transition from traditional historic urban block to positive energy block. In: Energy 202 (2020). https://doi.org/10.1016/j.energy.2020.117485.
24. Piselli C., Fronzetti Colladon A., Segneri L., Pisello A.L.: Evaluating and improving social awareness of energy communities through semantic network analysis of online news. In: Renewable and Sustainable Energy Reviews 167 (2022). https://doi.org/10.1016/j.rser.2022.112792.
25. Gui E.M., MacGill I.: Typology of future clean energy communities: An exploratory structure, opportunities, and challenges. In: Energy Research & Social Science 35, pp. 94–107 (2018). https://doi.org/10.1016/j.erss.2017.10.019.
26. Caramizaru, A. and Uihlein, A.: Energy communities: an overview of energy and social innovation. EUR 30083 EN, Publications Office of the European Union, Luxembourg, (2020). https://doi.org/10.2760/180576.
27. Briatore S.: Valorizzazione dei centri storici minori. Strategie di intervento. Diabasis, Reggio Emilia (2011).
28. Legambiente, Comune di Ferla (2022), www.comunirinnovabili.it/comune-di-ferla/, last accessed 06/01/2023.
29. REScoop.EU: Q & A: What Are "Citizen" and "Renewable" Energy Communities?. PolicyPaper (2019).
30. Postiglione G.: "Ripartendo dai borghi: la geografia minore dell'Italia futura". In: Corradi E., Massacesi R. (eds.) "Re-Cycle Italy", pp. 157–161. ISBN 9788854891876 (2016).
31. Legambiente, Comune di Ventotene (2022a), www.comunirinnovabili.it/comunita-energetica-di-ventotene/, last accessed 06/01/2023.
32. De Vidovich L., Tricarico L., Zulianello M.: Community Energy Map. FrancoAngeli, Milano (2021).
33. Florida R.: The Flight of the Creative Class. The new global competition for talent. Harper Business, New York (2005).