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Investigating “Sustainable Neighbourhoods” in the Italian Context: A Diachronic Approach

Original
Investigating “Sustainable Neighbourhoods” in the Italian Context: A Diachronic Approach / Rotondo, F., Abastante, F., Cotella, G., Lami, I.M. (GREEN ENERGY AND TECHNOLOGY). - In: Urban Regeneration Through Valuation Systems for Innovation / Abastante F., Bottero M., D'Alpaos C., Ingaramo L., Oppio A., Rosato P., Salvo F.. - ELETTRONICO. - Heldelberg; Berlin : Springer, 2022. - ISBN 978-3-031-12813-4. - pp. 141-157 [10.1007/978-3-031-12814-1_9]

Availability:
This version is available at: 11583/2972500 since: 2022-10-21T10:04:47Z

Publisher:
Springer

Published
DOI:10.1007/978-3-031-12814-1_9

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18 November 2026

Green Energy and Technology



Francesca Abastante · Marta Bottero · Chiara D'Alpaos · Luisa Ingaramo · Alessandra Oppio · Paolo Rosato · Francesca Salvo *Editors*

Urban Regeneration Through Valuation Systems for Innovation

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ISSN 1865-3529 ISSN 1865-3537 (electronic)
Green Energy and Technology
ISBN 978-3-031-12813-4 ISBN 978-3-031-12814-1 (eBook)
https://doi.org/10.1007/978-3-031-12814-1

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Investigating "Sustainable Neighbourhoods" in the Italian Context: A Diachronic Approach



Federica Rotondo, Francesca Abastante, Giancarlo Cotella, and Isabella M. Lami

Abstract The chapter investigates the evolution of the "sustainable neighbourhoods" paradigm in Italy, drawing on a selection of initiatives developed through time also as a consequence of the incremental consolidation of a European and national legislation on the matter. The case studies are analysed through a grid developed in the framework of the Erasmus + project LOTUS and properly adapted to the scope of this contribution. The authors identify two main patterns that have characterised the evolution of energy policies and sustainable urban planning practices in Italy in the last 30 years: (i) the shift from a sectoral approach that addresses the production of energy ("silos approach") to the integration of different urban strategies and policies that look at changes in the processes of production, distribution and energy-saving in relation to urban planning transformations ("integrated approach"); (ii) the shift from the localisation of specific interventions concentrated within a defined municipality or urban area to the promotion of diffused actions fostering inter-municipal cooperation under a regime of co-ownership and co-management of energy services. The collected evidence constitutes a useful input for spatial governance and planning activities in the Italian context, supporting initiatives and projects that promote energy transitions towards the decarbonisation of cities.

Keywords Sustainable neighbourhoods · Urban transformations · Energy policy · Spatial governance · Italy

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F. Abastante et al. (eds.), *Urban Regeneration Through Valuation Systems for Innovation*, Green Energy and Technology, https://doi.org/10.1007/978-3-031-12814-1_9

1 Introduction

The challenges generated by the current environmental and climate crisis increase the need to support institutions, organisations, and citizens in the energy transition processes towards the progressive decarbonisation of society [23, 24]. To achieve this goal, it is necessary to mobilise a multitude of public, private, and third sector actors, operating within a complex, multilevel system of institutions and organisations that spans from the local to the national and European level [5, 19, 27] This chapter contributes to shedding some light on this issue, investigating the evolution of the "sustainable neighbourhoods" paradigm in the Italian context. It does so by analysing a selection of projects and initiatives undertaken in various areas of the country in the last 30 years, and elaborating on the impact that the evolution of the European and Italian legislation in the environment and energy fields[1] has had on their development [7, 10].

To this end, the empirical investigation of the selected case studies adopts an analytical grid developed in the framework of the Erasmus + project LOTUS (Locally Organized Transition of Urban Sustainable Spaces)[2] and appropriately integrated to fit the scope of this task. The comparative, diachronic approach adopted by the authors dedicates particular attention to: (i) the spatial resources targeted for the production of clean energy and the implementation of energy efficiency measures; (ii) the actors involved in the decision-making processes and the formal relation between them; (iii) the origin of funding and the financial schemes adopted in the different urban and territorial contexts.

The contribution starts with an introduction of the paradigm of "sustainable neighbourhoods", and of its development through time, also as a consequence of the incremental development and consolidation of a European and a national legislative framework in the fields of energy and the environment. Section 3 presents the analytical approach developed in the framework of the Erasmus + LOTUS project and the way the latter has been fine-tuned for this analysis, and introduces the five case studies under investigation. The fourth section constitutes the core of the chapter: it discusses and systematically compares the evidence collected in relation to the different cases, dedicating particular attention to the three dimensions highlighted above as well as to the role that the evolving European and national legislative framework had played

[1] We are aware that the EU Environmental and Energy legislation extends much beyond the scope of the present article (i.e. through the EIA and SEA Directives, the Nature 2000 Framework, the Birds, Water Framework and Habitat Directives etc.). In this light, our overview is limited to directives and regulations that have had an explicit impact on the development of the sustainable neighbourhood paradigm [28].

[2] The project LOTUS (https://lotus-transition.eu/) is funded by ERASMUS + Strategic Partnership for Higher Education, Call 2019 Round 1 KA2—Cooperation for innovation and the exchange of good practices, contract number 870697. Project's partners include Hochschule Fur Öffentliche Verwaltung Kehl (Germany), Logiville (France), Zapadoceska Univerzita V Plzni (Czech Republic), Politecnico di Torino (Italy), Rigas Tehniska Universitate (Latvia), Université Paris-Est Marne la Vallée (France).

in their inception and development. A conclusive section rounds off the contribution, shedding light on two main patterns that have characterised the evolution of energy policies in relation urban planning practices in the national context in the last 30 years: (i) the shift from a sectoral approach focused only on the production of clean energy ("silos approach") to the integration of different urban strategies and policies that look at the processes of production, distribution and energy-saving in relation to urban planning transformations ("integrated approach") and (ii) the shift from the localisation of specific interventions concentrated within a defined municipal area to the promotion of diffused actions fostering inter-municipal cooperation under a regime of co-ownership and co-management of energy services.

Overall, through this contribution the authors aim at providing a number of preliminary coordinates that may contribute to energy transition policies and practices, in so doing supporting spatial governance and planning activities towards the decarbonisation of cities and societies.

2 Origins and Evolution of the "Sustainable Neighbourhood" Paradigm

Since the 1990s, "sustainable neighbourhoods", "eco-districts" or similar concepts have emerged in response to the incremental acknowledgment of the environmental and climate crisis in the international discourse. Initially, these paradigms placed particular emphasis on energy issues, environmental-friendly solutions, and soft mobility all to be implemented at the neighbourhood scale. As shown by Bottero et al. [4], the scientific literature on the matter presents over the years a variety of theoretical perspectives and approaches to the definition of these concepts. Their characteristics and boundaries are not clearly defined neither theoretically nor in the practice realm, and some authors underline the need for a punctual, empirical investigation that could help to define their distinctive features and elements by building upon theoretical insights and empirical evidence [3, 21].

The concept of sustainable development was firstly introduced in 1987, by the UN World Commission on Environment and Development (WCED) and the publication of the Brundtland Report, which defined what then were considered its three main pillars: the environmental, the social, and the economic dimensions [26]. In the late 1980s, much focus was devoted to the features concurring with the environmental dimension of sustainability, somehow at the detriment of the economic and social aspects [17]. In the 1990s, at a time when energetic issues gained greater attention in the sustainable development and urban policy discourses, the economic dimension come back into play more forcefully, while the social dimension continued to raise lesser attention [2, 17]. Since the new millennium, the tripartition of the sustainability concept started to be questioned from multiple sides, with an increasing number of authors that argued for greater relevance of the social dimension, as well as for the consideration of other dimensions such as the governance and policy dimensions [2].

A recent contribution by Bottero et al. [4] proposes an investigation of the concept of sustainable neighbourhoods based on the scientific literature of the last decade, in so doing individuating a number of exemplary case studies located in the European continent and using them to delimit the semantic field surrounding the concept. More in detail, the authors underline four main characteristics of the *sustainable neighbourhoods* and *eco-districts* concepts related to the fields of energy, socio-economic development, mobility, and urban design. The investigation confirms the pivotal role that the analysed experiences award to energy-related aspects (e.g. energy performance buildings), to mobility aspects (e.g. public and alternative means of transport), and to urban design aspects (e.g. brownfield regeneration or actions focusing on undeveloped areas of the city), at the detriment of socio-economic aspects (e.g. social inclusion in marginalised areas) in the development of sustainable neighbourhoods.

Other literature sources testify a number of main trends in conceptualising the "sustainable neighbourhoods" concept over the last 30 years: (i) the shift from a sectoral approach mainly focused on the technical dimension of new technologies and smart energy and mobility solutions to the call for a more integrated approach that jointly considers a social and governance dimension reflecting upon actors' interactions and decision-making processes [16, 17], (ii) the transition from the initial focus on the neighbourhood scale to the progressive enlargement towards the urban and territorial scale that also take into account upscaling and transferability of good practices [11].

It is important to highlight that this conceptual and practical evolution did not occur either spontaneously or in isolation. On the one hand, it is the outcome of the mentioned evolution of the sustainable development paradigm within the European and international discourse, that has been given a brief account in the above text.

On the other hand, it has been flanked, stimulated, and supported by a growing body of directives and regulations developed at the EU level and then progressively transposed, according to a rather differential process, in all EU member states. As the literature on Europeanisation aptly points out [8, 9], the impact generated by EU rules, regulations, and policies on the various countries is the result of multiple elements, among which the characteristics of the legal and administrative framework of each country play a highly relevant role [20]. As a result, the impact of the same regulation or policy may highly differ from country to country, as a consequence of the domestic interpretation of and reaction to the external stimulus [25]. In order to shed light on the reasons behind the emergence and proliferation of sustainable neighbourhoods in Europe and in Italy, it is therefore important to take into account and explore both the evolution of the legislative framework concerning energy-related issues at European level, as well as how the latter has progressively been transposed in the national legislation [1, 10].

2.1 The Evolution of Energy-Related Legislation at European and National Levels

In the last 30 years, in response to incremental international attention to the ongoing environmental and climate crisis, the European community has developed its legislative activity according to two parallel directions: (i) on the one hand, it defined, through the so-called energy and climate packages, increasingly stringent objectives that affirm the gradual transition from a low-carbon to a net-zero carbon society; (ii) on the other hand, the issuance of these climate and energy packages is concomitant to the development of EU directives and regulations that have at first focused on the promotion of clean energy and, at a later time, on the necessary integration of the latter with solutions characterised by higher energy efficiency.

This legislative action entailed the development and operationalisation of a high number of directives, regulations, and policy packages, an activity that started during the second half of the 1990s and continues to the present day (Fig. 1). The Kyoto Protocol, defined in 1997 by the United Nations Framework Convention on Climate Change (UNFCC), is the only legally binding treaty on the global level for reducing greenhouse gas (GHG) emissions by an average of 5% below 1990 levels. From the 2000s the EU is committed to meeting the UN objectives also through the adoption of energy and climate policy packages that include strategies, directives and regulation [10].

In 2009 the *2020 climate and energy package* requires member states to reduce greenhouse gas emissions before 2020 by 20%, achieve 20% energy dependence on renewable sources, and increase energy savings by 20% compared to 1990 levels.[3] Within this package, the directive 2009/28/EC focuses on the promotion of Renewable Energy Sources (RESs) and cooperative approaches among member states for the translation of EU energy targets. Published some years later, in 2012, the energy efficiency directive 2013/27/EC specifically addresses different energy consumption sectors (e.g. building, transport, industry) and asks the member states to define national energy efficiency targets for the year 2020. In 2014, the European Union sets the *2030 climate and energy framework*, defining the targets for the year 2030 with a reduction of at least 40% in greenhouse gas emissions, the achievement of at least 32% energy dependence on renewable sources, and the increase of at least 32.5% in relation to energy efficiency [14]. Finally, in 2018, Europe presents its *2050 long-term strategy* to become the world's first climate-neutral continent by 2050 [15]. To this aim in July 2021, the EU adopted a number of directives and legislative proposals for better defining the strategies to reach climate neutrality in the EU by 2050. Among the others, the directives 2018/2001/EU (Renewable Energy Directive—RED II) and 2019/944/EU (Internal Electricity Market Directive—IEM) together represent the regulatory reference framework at the European level to enhance energy transition and promote energy communities.

[3] https://ec.europa.eu/clima/eu-action/climate-strategies-targets/2020-climate-energy-package_en.

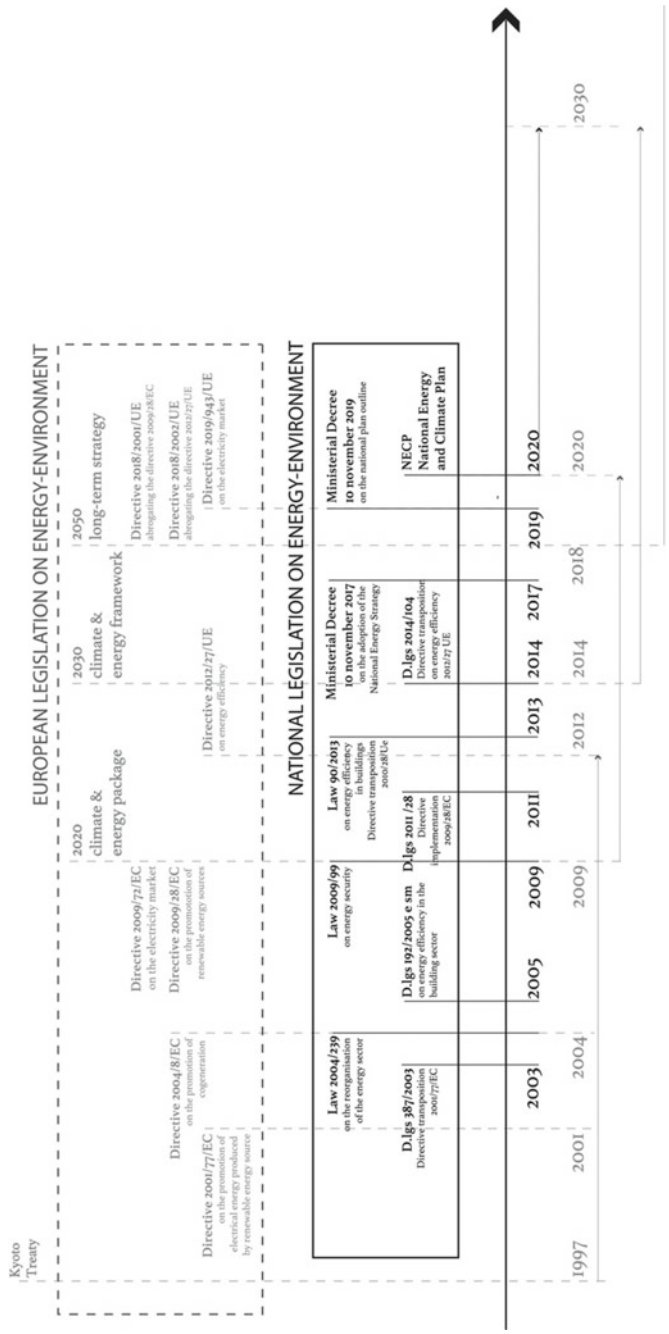


Fig. 1 The evolution of European and national legislation in the field on energy-environment (*Source* authors' own elaboration)

Within the framework defined by the EU energy regulations and policies, each member state is asked to pursue the objectives defined at EU level transposing the EU directives into its own national (and in some cases regional) legislation and setting its specific targets in terms of energy efficiency and production of clean energy, within the ranges and thresholds defined at the EU level. To fulfill this task, the Italian government proceeded in parallel to the guidelines adopted at the EU level, promulgating legislative decrees that implement the European directives and adopting decree-laws that initially addressed the businesses sector exclusively and, at a later time, also encompassed the housing sector. More recently, the country has achieved further progress with the adoption of a National Energy Strategy (SEN) in 2017 and with the outline of the Integrated National Energy and Climate Plan (INECP) in 2019, which defines the national agenda to achieve EU energy and CO_2 targets[4] for the time that runs between 2021 and 2030. The elaboration of the Italian INECP has followed an iterative process of consultation between the European Commission and the Italian ministries, namely the national Ministry of Economic Development (MISE), the Ministry of the Environment and Territory Preservation, and the Ministry of Mobility and Infrastructures.

More recently, in response to the COVID-19 pandemic, the Italian Recovery and Resilience Plan (RRP) has been set in the framework of the Next Generation EU program and its Recovery and Resilience Facility. The RRP devotes more than 30% of the total available resources to strategies and actions aimed at promoting the green revolution and ecologic transition (mission 2), and that dedicates particular attention to renewable energy (M2C2) and to the energy efficiency and renovation of buildings (M2C3).[5] In the last two years the legislation concerning energy community has further evolved at the national level as a consequence of the recent efforts put in place to face the ongoing pandemic and its impact on urban areas.[6]

3 Selection of Italian Case Studies

The main objective of the Erasmus + LOTUS project is to conceive and test new learning tools that will enable future European architects, spatial planners, and public administrators to lead local communities in the implementation of the energy transition towards a greener and carbon-neutral future. To this end, the project partners conceived a dynamic teaching curriculum based on the adoption of innovative teaching means including (i) the city planning role-playing game Urban Energy Management game (UrbEN), which simulates a complex system of urban actors'

[4] An English version is available at https://www.mise.gov.it/images/stories/documenti/it_final_necp_main_en.pdf.

[5] An updated version of the document is available at: https://italiadomani.gov.it/it/home.html.

[6] For a more detailed examination of the impaction that the COVID-19 pandemic may have on cities see: Cotella and Vitale Brovarone [12, 13].

interactions in energy transition processes; (ii) the catalogue of real-word experiences Catalogue of Real Cases (CoRC), that aims at presenting and discussing with students specific energy transition aspects drawing on real-world case studies and (iii) the textbook on urban energy transition processes, that all together should provide a conceptual framework for energy transition-related issues.

The CoRC is particularly relevant for the contents of the present chapter, and it is explored here more in detail. The real-world experiences of CoRC are not necessarily "best practices" or "exemplary cases"; at the same time, they are in one way or another significant in relation to one or more specific aspects of energy and climate governance and planning, with particular reference to the actors, resources and processes that they entail. The scientific partners of the LOTUS project have collectively developed an analytical grid that allows for the direct comparison of the different case studies included in the CoRC. More in detail, this grid is composed of the following elements: (i) the urban characteristics of the contexts within which the initiatives or projects are promoted, (ii) the different types of measures for clean energy production and energy efficiency adopted in each case, (iii) the participation of local actors and citizens in the decision-making process and (iv) the economic and physical impacts generated by the interventions and processes at stake.

Taking inspiration from the LOTUS CoRC analytical grid, the analysis presented in this chapter focuses on the Italian context by considering a selection of five cases located in central-northern Italy and acting at different spatial scales. The selected case studies are compared through an implementation of the initial analytical grid, which allows focusing the attention on spatial governance issues. More specifically, the analysis investigated the following aspects: (i) the spatial resources targeted for clean energy production and energy efficiency measures; (ii) the role and interests of the actors involved in the decision-making process and the relation among them; (iii) the origin of funding and the financial schemes adopted in the different urban and territorial contexts. As it will be further elaborated in the discussion and concluding sections, through the exploration of these aspects it is possible to shed light on some of the infrastructural, economic and procedural barriers that nowadays hinder the application of the European and Italian legislation on energy efficiency and RES [10].

The analysed case studies have been selected through a survey of the existing European research projects and databases that included anticipatory experiences and best practices in the field of urban low-carbon and zero-carbon transition: (i) EU FP MILESECURE-2050 (2013–2015: Multidimensional Impact of the Low-carbon European Strategy on Energy Security),[7] (ii) SMARTEES (2018–2021: Social Innovation Modelling Approaches to Realizing Transition Energy Efficiency and Sustainability[8]) and (iii) EU Covenant of Mayors for Climate & Energy plans and actions database.[9] The cases have been selected based on the following criteria: (i) firstly, the projects or initiatives are developed in the Italian context in a span ranging from the 1990s to the present day; (ii) secondly, they pursue energy-saving and clean energy

[7] https://cordis.europa.eu/project/id/320169/reporting.

[8] https://local-social-innovation.eu.

[9] https://www.pattodeisindaci.eu/piani-e-azioni/buone-pratiche.html.

production objectives; (iii) lastly, they include a plurality of individual and collective actors who are involved in the public arena including owners, managers, users, agencies and local organisations.

The selected cases are listed in Table 1, which provides information concerning their location, the time frame of their execution, and the main objective of the projects and initiatives. Figure 2 displays their geographical distribution in the country territory. The selected projects and initiatives affect a variety of urban (e.g. Bologna and Milan), metropolitan (e.g. Turin), and rural contexts (e.g. Peccioli and Torri Superiore). They developed over a rather large time span that ranges between 1989 and 2020: some of them are characterised by a larger time-frame of about 30 years (e.g. Peccioli and Torri Superiore), while most recent cases concern a time frame of 5 years or less (e.g. Bologna, Turin and Milan). Finally, the analysed case studies target different areas of intervention: the cases of Milan and Bologna concern two districts located in the peripheral areas of the respective cities; the case of Turin is

Table 1 Synoptic presentation of the selected case studies, their time-frames and main objectives

	Location	Time-frame	Main objective	Acronym
Sharing Cities Milano	Milan	2016–2020	To transform the Porta Romana district into a smart and "almost" zero emission district	MI16
Torino together 2020	Turin	2014–2017	To address the need for municipalities to overcome economic and financial difficulties at the local level in the implementation of energy efficiency measures on public property	TO14
PEEP Corticella	Bologna	2012–2014	To reduce CO_2 emissions by 20% by 2020 at the municipal level and to develop an energy community at the district level	BO12
Sistema Peccioli	Peccioli	1997-ongoing	To solve the environmental issue of the village linked to a badly managed landfill, collecting waste from 5 municipalities	PE97
Torri Superiore	Torri Superiore	1989-ongoing	To transform the small abandoned medieval village of Torri Superiore into an Ecovillage with a permanent cultural centre	TS89

Source authors' own elaboration

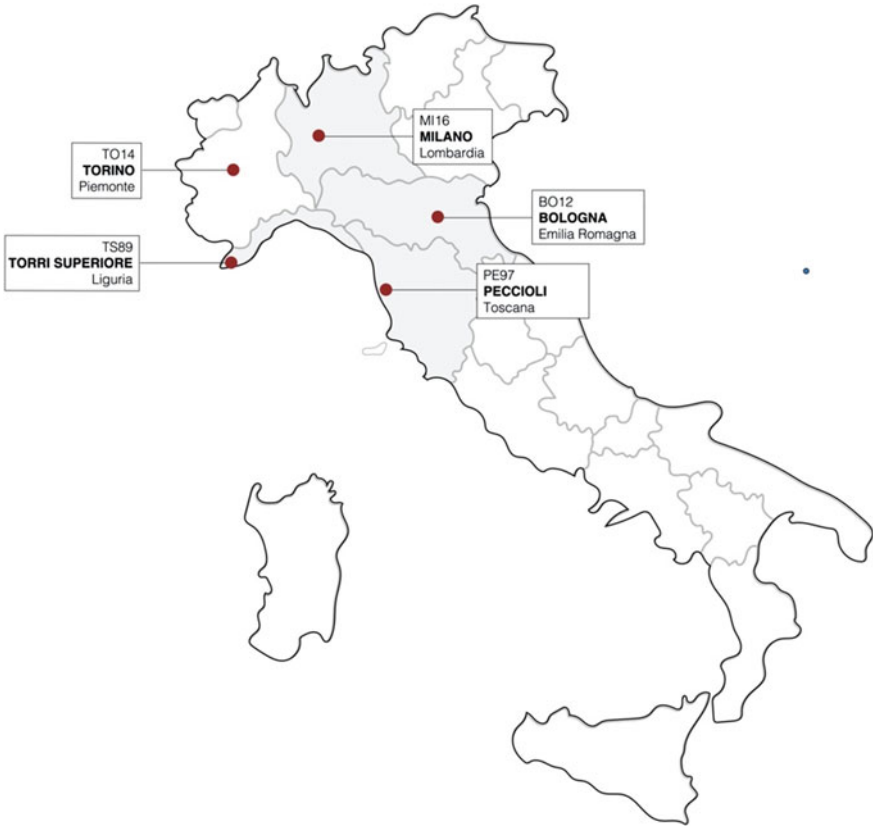


Fig. 2 Geographical distribution and acronym of the selected cases studies (*Source* authors' own elaboration)

addressed to small and medium-sized municipalities in the metropolitan area; the cases of Peccioli and Torri Superiore concern small and medium-size villages.

4 Comparison and Discussion

The following sub-sections present and compare the evidence collected in relation to the selected case studies, in the light of three main aspects: (i) the spatial resources targeted for the production of clean energy and the energy efficiency measures undertaken in each case; (ii) the roles of the actors involved in the decision process and the relations occurring between them; (iii) the origin of funding and the financial schemes adopted in the different contexts. The discussion is further framed by considering the urban characteristics and geographical location of the selected case studies as well as their relation to the evolving European and national legislative framework.

4.1 Energy Solutions and Spatial Scales

All selected case studies include energy efficiency solutions in combination with measures aimed at the production of clean energy in relation to the spatial resources of the specific territory (Fig. 3). Among the solution for clean energy production, the majority of cases (3/5) include solar thermal and photovoltaic systems, especially in the most densely populated contexts (Milan, Turin, Bologna). The initiatives that are carried out in less urbanised areas, characterised by the presence of hills or mountains, include instead the construction of new plants for the production of energy from biogas, biomass, and wind (Peccioli and Torri Superiore). This is also justified by the greater availability of the spatial and natural resources in less densely populated and urbanised areas [18]. Among the interventions for energy efficiency, the most common solutions include the renovation of residential and commercial buildings (both public and private) and, in the case of less urbanised areas, the improvement of waste storage systems and phyto-purification.

Overall, the spatial impacts of the considered cases are concentrated variously along the main infrastructural axes or in punctual areas of varying size, working at the neighbourhood scale (BO12 and MI16), at the municipal scale (PE97 and TS89) or the metropolitan scale (TO14). From the survey of the selected cases, it emerges that the neighbourhood scale lends itself to pilot the experimentation of innovative solutions that, through time, might be then replicated on the larger urban scale as a consequence of the adoption of a more comprehensive, medium to long term vision or strategy. This expedient is particularly useful in the more populous cities, where there is the advantage, also in economic terms, to intervene in a less extensive area to then ponder the implementation of the adopted solution at the larger urban and territorial scale. On the other hand, small and medium-size villages or municipalities (PE97 or TS89) lend themselves to an intervention that takes into account the entire municipal area (smaller in size and, perhaps due to this reason, more easily governable), within a vision of local planning that integrates different strategies and projects. Finally, to intervene at the metropolitan/territorial

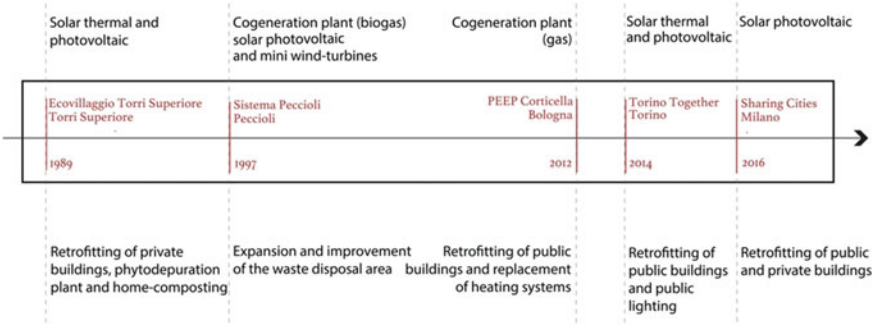


Fig. 3 Energy production (upper part) and efficiency solutions (lower part) of selected case studies (*Source* authors' own elaboration)

scale (TO14) allows for a more comprehensive action that targets clusters of small and medium municipalities ensuring economies of scale as well as fostering rewarding processes of mutual learning and cross-fertilisation [6].

4.2 Actors and Relations

The second aspect under discussion concerns the plurality of the actors involved in the decision-making processes leading to urban and territorial transformations, in combination with the analysis of the adopted contractual forms among different actors (Fig. 4). The collected evidence shows that, since the 1990s, the decision-making arena has opened to an increasing number of actors, interests and competences, not only limited to the involvement of public institutions or agencies but also to the engagement of private companies and third sector actors (e.g. building owners, energy providers, citizens, etc.).

The variety of actors involved in the decision-making processes is partly related to the increasingly fractioned ownership structure of the urban contexts in which the interventions are carried out as well as the variety of the funding sources of the projects (see also Sect. 4.3 *Funding and Financing Schemes*). In this regard, the case of Bologna is exemplary: since the neighbourhood targeted by energy renovation initiatives includes buildings characterised by public, private, and undivided ownership, the actors involved in the process included not only the local administration but also the residents and the local cooperative society. On the other hand, less recent projects feature a preponderant and almost exclusive role of the project promoter as the main source funding: a non-profit organisation composed of local residents in the case of Torri Superiore and an investee company of the municipality involving the municipality itself and local residents in the case of Peccioli. The projects and initiatives developed during the last decade tend towards the progressive of public

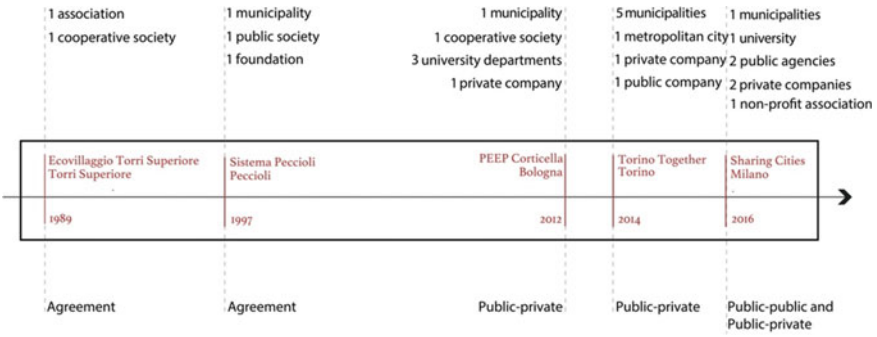


Fig. 4 Involved actors (upper part) and formal partnerships (lower part) of selected case studies (*Source* authors' own elaboration)

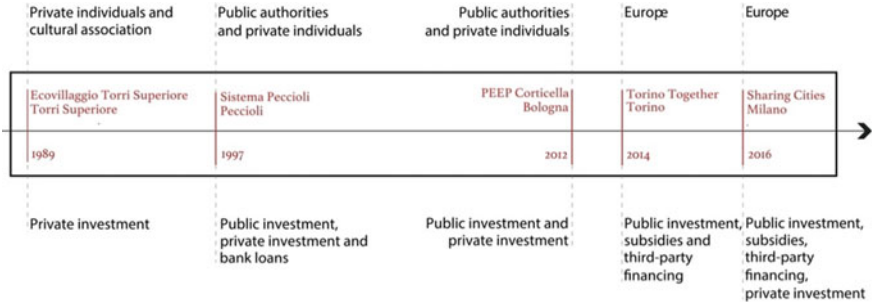


Fig. 5 Funding's origins (upper part) and financing schemes (lower part) of selected case studies (*Source* authors' own elaboration)

supranational funding in parallel with the inclusion of different interests and competences located at the same level of government: for example, the involvement of more than one municipality in the case of Turin and various public agencies in the case of Milan where the targeted buildings are owned by the municipality.

Moreover, the plurality of the actors involved in the decision-making processes is closely linked to the contractual forms activated that range from agreements between the public administration and individual actors (generally private) to public-private partnerships and mixed contracts between public and private actors. In the case of Turin, a single large-scale authority (the Metropolitan City of Turin) acts as a coordinating body among small and medium-size municipalities, in order to achieve economies of scale in terms of energy efficiency and recovery of investments over time and to serve as a platform for knowledge exchange and mutual learning among the involved subjects.

4.3 Funding and Financing Schemes

When taking into account the origin of funding and the financing schemes adopted, the case studies under investigation show increasing use of EU resources, demonstrating the attempt to develop synergies between the sustainability objectives defined at the local and supra-local level with those overarching priorities that influence resources distribution at European and national levels[10] (Fig. 5).

In recent times the most frequent financial schemes (present in 3 cases over 5) involve the combination of both public and private funding. In particular, there has been an increase in the adoption of the so-called Energy Performance Contracts (EPC) which provide forms of financing through third parties. More specifically, in

[10] This phenomenon may be read as a typical example of economic conditionality, whereas the EU attach the delivery of its funding to a number of substantive and procedural conditions, and the domestic actors are required to conform to these conditions in order to access the available resources [8].

EPC a private operator (generally an ESCo-Energy Service Company) finances the energy upgrading of buildings while the owners of the buildings, public or private, only pay to the private party a fee that is commensurate to the actual achievement of performance and energy saving of the building (in turn certified by an external party).

Concerning the origin of funding and activated financial schemes two edge cases are represented by the case of Torri Superiore, where a group of private members of a cultural association literally bought the village and thus intervened with their resources on the entirety of the built heritage, and the case of Milan where the energy renovation of public housing buildings is entirely funded by public resources (constitute by a 10% of EU funds and by 90% of municipal and national funds).

5 Closing Remarks

The chapter discussed a number of Italian experiences in the field of urban transformations and energy transitions, with the aim to shed light on the evolution of the sustainable neighbourhoods paradigm in the country through time, also as a consequence of the progressive consolidation of a legislative framework on the matter at the EU and national levels (Fig. 6). The collected evidence seems to hint that this evolution has been characterised by two main patterns during the last 30 years: (i) the shift from a sectoral approach focused on energy-related issues only to a more integrated approach to be pursued through spatial governance and planning systems; (ii) the move from the focus on punctual interventions of selected neighbourhood or municipal areas to widespread interventions looking at the territorial scale and aimed at the promotion of inter-municipal cooperation and networking.

First of all, there is a tendency towards a cross-sectoral approach, that aims to integrate aspects of a purely energetic nature (production, distribution, and savings) within broader themes such as the recovery and regeneration of urban and rural areas in the process of degradation and abandonment (e.g. the case of Peccioli), or in combination with the safety and renovation of public schools (e.g. the Turin 2020 project). Secondly, a cooperative dimension is highlighted, whereby there is a progressive shift from the direct and exclusive entrusting of the provision and management of energy services to private individuals towards the creation of coordinated cooperation able to involve institutional and non-institutional actors (owners, managers, associations, citizens etc.) and administrative units (metropolitan city, individual municipalities). Overall, the comparative analysis presented in the chapter allows us to outline some prospects in the field of spatial governance and planning and energy policies, in the direction of considering integrated areas of intervention within the local spatial planning and policy frameworks, and take into account the relation between multiple territorial scales in energy saving and the promotion of renewable energy sources (eco-villages, smart districts, energy communities, etc.) [22].

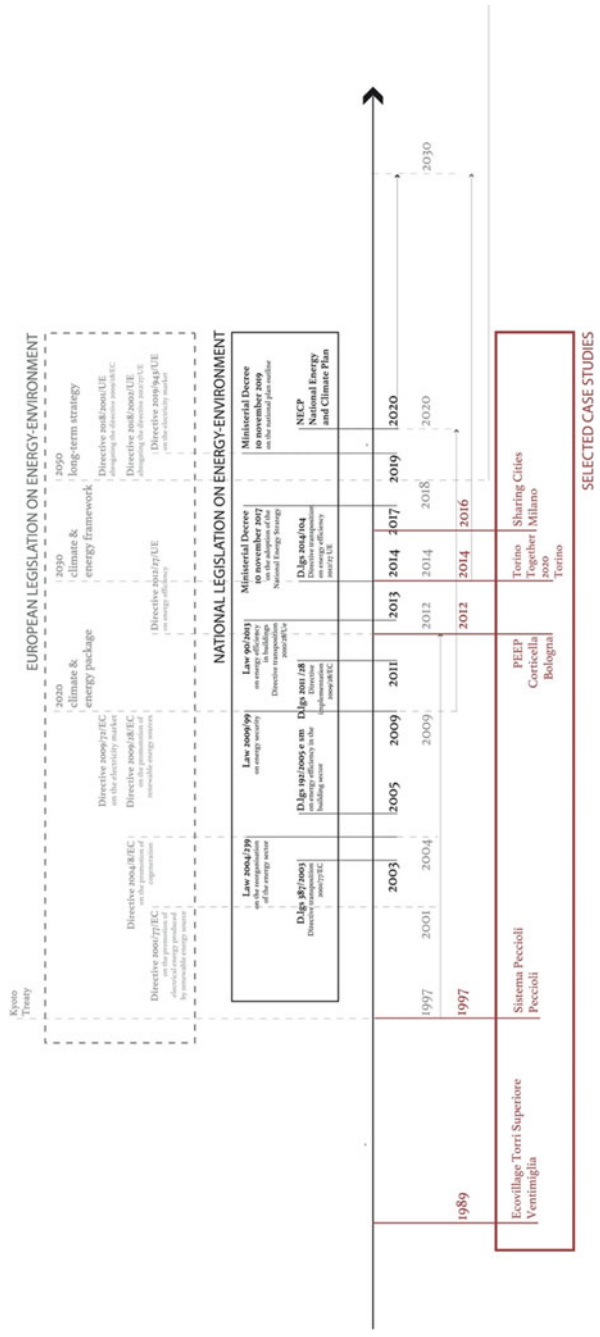


Fig. 6 The evolution of European and national legislation on energy-environment together with the selected case studies (*Source* authors' own elaboration)

We are aware that the proposed research is limited by the low number of cases considered for the analysis, and that the results discussed above need further confirmation and deepening to be pursued through more comprehensive and systematic comparative research. In addition to this, the scalability and replicability of the selected case studies are also hindered by economic and market barriers, infrastructural and grid-related barriers as well as information and social acceptance barriers. Nevertheless, the identified elements outline a number of promising avenues for future research in the field of national and European urban energy transition practices, stemming from the demonstrated supranational and national awareness of the transdisciplinary and multiscale nature of energy and environmental issues.

More in detail, the results of the analysis invite a rethinking of the relationship between environmental and energy issues and spatial governance and planning, to broaden current interpretations into a more comprehensive and integrated perspective. In particular, the shift from a sectoral approach towards more integrated interventions, as well as the promotion of cooperation networks among different urban contexts, highlights the possibility of introducing new configuration of "spatial" policies that act at the multiple territorial scales and foster collaboration and knowledge sharing network among those actors involved in the pursuit of sustainable energy policies, in turn favouring their incremental diffusion on the territory.

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