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Global warming, ageing of population, reduction of energy consumption, immigration flows, optimization of land use, technological innovation

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TeMA Journal was established with the primary objective of fostering and strengthening the integration between urban transformation studies and those focused on mobility governance, in all their aspects, with a view to environmental sustainability. The three issues of the 2024 volume of TeMA Journal propose articles that deal the effects of global warming, the ageing of population, the reduction of energy consumption from fossil fuels, the immigration flows from disadvantaged regions, the technological innovation and the optimization of land use.

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Editorial correspondence
Laboratory of Land Use, Mobility and Environment
DICEA - Department of Civil, Building and Environmental Engineering
University of Naples "Federico II"
Piazzale Tecchio, 80
80125 Naples

web: www.serena.unina.it/index.php/tema
e-mail: redazione.tema@unina.it

The cover image shows older people climbing Via Raffaele Morghen's stairs in Naples (Source: TeMA Journal Editorial Staff).

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Contents

REVIEW NOTES

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REVIEW NOTES – International regulation and legislation for the energy transition

New trends in energy transition policies: citizens' involvement in the European energy market

Valerio Martinelli

Department of Civil, Building and
Environmental Engineering
University of Naples Federico II, Naples, Italy
e-mail: valerio.martinelli@unina.it
ORCID: https://orcid.org/0009-0007-8703-6573

Abstract
Starting from the relationship between urban planning and mobility management, TeMA has gradually expanded the view of the covered topics, always remaining in the groove of rigorous scientific in-depth analysis. This section of the Journal, Review Notes, is the expression of continuously updating emerging topics concerning relationships between urban planning, mobility and environment, through a collection of short scientific papers written by young researchers. The Review Notes are made of four parts. Each section examines a specific aspect of the broader information storage within the main interests of TeMA Journal. In particular, this section, International Regulations and Legislation for the Energy Transition, explores the challenges and opportunities in the urban context to understand the evolving landscape of the global energy transition. In this direction, the contribution of this review note examines the role of the European Union in promoting the energy transition through citizen participation. The crucial role of cities in achieving the environmental and climate objectives of European energy policy is underlined.

Keywords
Energy transition; Energy communities; European regulations

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1. Introduction

Currently, 55% of the world's population resides in urban areas, a percentage set to grow to 68% by 2050 (UN, 2018). With a projected 30% increase in world population, climate change will have a significant impact on global ecosystems and land use. In Europe, urbanization reaches nearly 74% of the population. Therefore, the European Commission has adopted a long-term strategy that sees cities as ideal laboratories for transformative and sustainable solutions (EC, 2018). Cities account for 60% of global energy consumption and 78% of total global greenhouse gas emissions (UN-Habitat, 2020). As the main driver of economic development and energy consumption, cities play a crucial role in defining strategies to achieve sustainable development goals. A key strategy for pursuing this goal is to reduce dependence on fossil fuels and promote a renewable and sustainable energy system at the urban level. Accordingly, it is imperative to conduct timely assessments of city-scale renewable energy use to identify best practices and opportunities for improvement (Yuan, 2018). The energy transition is one of the main solutions to mitigate the impact of human activities on the environment. The transition from fossil fuels to renewable energy promises to reduce carbon emissions; however, it involves specific challenges and problems that require attention and appropriate solutions. Therefore, the energy transition is commonly recognized as a multidimensional, complex, nonlinear, nondeterministic, and uncertain phenomenon (Blazquez et al., 2020). The complexity of the energy transition phenomenon requires a holistic approach, including objectives and measures of instruments at different levels, as well as the establishment and implementation of public-private partnerships (Capasso & Mazzeo, 2020). Therefore, energy transition is the main solution to reduce the negative impact of human activities on the environment, bringing with it new approaches to energy production and consumption (Usman & Balsalobre-Lorente, 2022). In addition to have a real transition to low-carbon technologies, it is critical that behavioral changes by individuals and companies support this evolution. Achieving the transformation to a zero-carbon economy is not only about technologies and jobs, but also about people, their daily lives, and their behaviors. EU energy policy focuses on three main objectives: security of supply, sustainability, and competitiveness of the energy system.

Therefore, the main challenge is to strike a balance between these three objectives, often described as "the energy trilemma" (Mersinia et al., 2017). This term refers to the contradiction in EU energy policies arising from the need to ensure security of supply, increase competitiveness and promote sustainability simultaneously.

The energy transition is a challenge that, although technically and politically feasible, raises significant questions about economic viability. The key issue concerns access to adequate financing methods and the profitability of investment projects in renewable energy sources. Companies and citizens need solid financial instruments to bear the high costs and risks associated with investments in this sector. Currently, the state is confirmed as the main investor in the renewables market, given the complexity and uncertainty of projects. However, there is growing interest from private parties, driven by the potential offered by renewables and the regulatory policies of the European Union (Ji et al., 2021).

Internationally, the most important steps in the energy transition process have been taken within the European Union, which has established concrete measures over the years such as the EU Infrastructure Investment Plan, Clean Energy for All Europeans Package, or European Green Deal, and the establishment of the Energy Union. The progress made by EU member countries testifies to the importance of legal regulations, as the EU is a leader in managing climate change (Apostu, 2022).

However, much remains to be done. We must continue to develop and implement technological, economic and social policies that can facilitate a gradual transition to a more sustainable and resilient energy system. Only through a joint international effort can we successfully address the challenges of climate change and ensure a secure and sustainable energy future for future generations (Petrović et al., 2021).

2. The Clean Energy for all Europeans Package

The current energy system, based on fossil fuels, has a negative impact on the environment, society and the economy. To address this challenge, the European Union has set targets to reduce CO_2 emissions using renewable energy, aiming for carbon neutrality. Cities play a key role in this transformation, as they must adapt to ensure the development and well-being of the world's population within planetary limits. It is essential to consider the role and responsibilities of citizens in redefining the energy market during this transition. The redefinition is driven by three fundamental processes, referred to as the 3Ds of the transition: decarbonization, decentralization, and democratization. First, the transition to a low-carbon energy system, based on the replacement of fossil fuels with renewable energy sources. Second, there is the transformation of monopolistic and vertically integrated systems into competitive markets. Finally, the shift from a centralized to a decentralized system, where consumers are activated through the development of renewable energy (Huhta, 2019). To achieve these goals, several ambitious initiatives have been taken over the past three decades, including the Kyoto Protocol, the European Union's Climate and Energy Package, and the 2015 Paris Agreement. In addition, in 2019, the European Commission published the Clean Energy Package for all Europeans, a set of legislative acts that revolutionize the energy sector through measures for energy efficiency, renewables and security of supply. Agreement on this new energy regulation was a significant step toward implementing the EU's Energy Union strategy, published in 2015.

The Clean Energy Package for all Europeans targets include reducing greenhouse gases by 40%, covering 32% of European electricity consumption from renewable sources and improving energy efficiency by 32.5% by 2030. By coordinating these changes at the European level, this legislation underscores the EU's leadership role in combating global warming and contributes significantly to the EU's long-term strategy to achieve carbon neutrality by 2050. The package focuses on several key issues. For example, improving the energy performance of buildings is considered crucial, as they account for 40% of energy consumption and 36% of CO_2 emissions in the EU. The EU has also set ambitious targets for renewable energy and energy efficiency, which are considered essential for meeting climate goals.

In addition, the package includes governance regulations to ensure that each EU country develops integrated 10-year energy and climate plans. These plans are key to achieving the EU's energy union goals. Taken together, the Clean Energy Package for all Europeans represents a massive EU initiative to address the energy and climate challenges of the 21st century, with the goal of driving a transition to a more sustainable and resilient future. This package is central to the EU's long-term strategy to achieve carbon neutrality by 2050, based on three pillars: putting energy efficiency first, achieving global leadership in renewable energy, and ensuring a level playing field for consumers. Finally, a crucial part of the Clean Energy Package for all Europeans aims to make the EU electricity market fit for the transition to clean energy, with a new set-up to integrate renewable energy sources and new technologies in a flexible and secure way.

The decarbonisation of the national energy system and the consequent shift to an energy mix largely based on Renewable Energy Sources (RES) is a crucial environmental and economic goal. This change is not only substantially called for by European policies but is also actively supported by directives and policy documents. However, a transformation of this magnitude has significant consequences for the electricity system and the energy market, which must be properly managed to ensure security of energy supply.

The Clean Energy Package for all Europeans also proposes changes in the structure of the electricity market, moving from a centralized model to decentralized, smart and interconnected markets. To facilitate this, it establishes a legal framework for the concept of self-consumption, formally recognizing energy communities in EU legislation for the first time (Horstink, 2021). The Clean Energy Package for all Europeans represents the boldest effort to harmonize EU energy and climate policy, seeking to balance the needs of national sovereignty in the energy sector with European cooperation on the internal energy market, energy security and climate change.

3. Learning from Energy Communities towards a possible transition

The CEP's most relevant legislative acts concerning the energy transition, include the Directive on the Promotion of the Use of Energy from Renewable Sources 2018/2001 EU (RED II) and the Directive on Common rules for the Internal Market for Electricity 2019/944 (IEM). These acts give consumers and their communities the right to consume, store, and sell self-generated energy, enabling them to actively participate in the energy market. The CEP legal framework allows consumers to participate in the market either individually, as "self-consumers of renewable sources," or collectively through "City Energy Communities" or "Renewable Energy Communities".

The RED II Directive was created to promote the production of energy from renewable sources within the European Union by encouraging the active participation of citizens in the energy market.

This directive continues the path set by RED I by raising the collective EU target from 20% to 32% for renewable energy by 2030. However, the means to achieve these targets are left to the discretion of individual Member States. The continued growth in energy production from Renewable Energy Sources (RES) has led to a significant change in the structure of the energy system, influencing business models in the energy sector and leading to the definition of new configurations for energy production.

This includes the introduction of Renewable Energy Communities (RECs), defined as autonomous, member-controlled legal entities that are primarily located near renewable energy production facilities. The shareholders or members of RECs can be individuals, small and medium-sized enterprises or local authorities, and the main objective of RECs is to provide environmental, economic and social benefits to local communities rather than to pursue financial profits. On the other hand, the Internal Market for Electricity Directive focuses on the energy market and establishes rules for electricity generation, transmission, supply and storage.

In particular, it focuses on the role of consumers within the electricity market, with the aim of establishing a more competitive, customer-oriented, flexible and non-discriminatory EU electricity market with free market-based supply prices. The objective stated in the directive is to ensure affordable and transparent energy prices and costs for consumers, as well as to guarantee a high degree of security in energy supply and to facilitate a gradual transition to a sustainable, low-carbon energy system.

It also introduces Citizen Energy Communities (CECs), which manage both renewable and non-renewable energy, while RECs focus only on renewable energy.

The transposition of these global standards, especially those concerning energy communities, requires the development, implementation and dissemination of business models that foster greater consumer participation in all 28 Member States, while enabling co-investment by different actors. Among other necessary actions, Member States must adopt an 'enabling framework' for prosumership, especially for Renewable Energy Communities (RECs). By defining the rights and obligations of citizens, the directive links the concept of prosumership to issues such as combating energy poverty, increasing social acceptance, promoting local development and encouraging energy demand flexibility.

These Directives offer citizens a leading role in the energy market, accelerating the energy transition to a more sustainable and decarbonized system by fostering decentralization and energy sustainability on a local scale. In particular, the RED II Directive clearly highlights, regarding RECs, that their primary foundation lies in the decentralization and territorialization of energy production.

The purpose of these Directives is to specifically support the deployment of renewable energy sources (RES) for energy production, including electricity, and to promote the acceptance of renewable energy among Europeans (Martinelli, 2023).

The creation of energy communities is influenced by a wide range of governance models, including different combinations of innovative organisational and contractual arrangements, local identities and common interests (Baigorrotegui & Lowitzsch, 2019).

4. Urban challenges and opportunities for energy transition

In this regulatory context outlined by the EU, CERs present themselves as new local configurations of energy production and distribution, decentralised and democratic, which are strategic for fostering the integration of renewable energy sources in urban areas and as a new organisational form to promote positive environmental, economic and social returns. It is a transversal sustainability that encompasses technological aspects, the social dimension, regulatory aspects, planning and economic returns, not only of the individual but especially in terms of territorial governance (Cutore et al., 2023).

Energy communities provide an opportunity for consumers to participate directly in the production, consumption, and sharing of energy, especially for those who would otherwise be unable to do so. Regulating these innovative relationships poses a significant challenge for governments as they increase the complexity of the energy system. Cities play a crucial role in achieving RED II goals, contributing to the decarbonization of the energy system and promoting a sustainable energy future. However, the energy transition in cities offers several opportunities and challenges that deserve attention and joint action (Lowitzsch et al., 2020). Achieving Europe's energy goals must ultimately translate into action at the city level. Numerous initiatives around the world are accompanying cities in their efforts toward clean and renewable energy, such as the EU Mission: 100 Climate-Neutral and Smart Cities, launched in 2021 by the European Commission. The goal is to implement at least 100 such cities by 2030 and help them serve as experimental and innovation hubs from which other cities could benefit (EC, 2021). Within ci cities there are numerous opportunities, such as generating clean energy through solar panels and wind farms, reducing greenhouse gas emissions and improving air quality. The energy efficiency of buildings can be enhanced with heat pumps and district heating powered by renewable sources. The use of electric and hybrid vehicles can further reduce emissions and improve sustainability in urban transportation. These initiatives can also stimulate economic development by creating new job opportunities and fostering innovation in the renewable energy sector (Errichiello & Demarco). However, the availability of space for the installation of renewable plants may be limited in densely populated urban areas, and initial investment costs may be high. Integrating these energy sources into the existing power grid requires infrastructural upgrades and retrofits, while the establishment of appropriate policies and regulations is essential to facilitate the adoption and integration of renewable energy in cities (Gaglione & Ayiine-Etigo, 2021). In addition, cities face critical regulatory risks due to limited leeway in renewable energy projects due to conflicting regulations, such as those related to biodiversity and land protection. Often, cities must obtain consensus from other levels of government to implement energy efficiency measures, improve renewable capacity, and promote sustainable energy policies. The geographic, technological, demographic and cultural diversity of renewable projects adds further complications, making it difficult to adopt standardized solutions. Urbanization is a crucial factor to consider, as it will influence energy demand centers and transportation electrification. Energy demand will be closely linked to spatial planning, including the location, shape, and density of industrial, commercial, and residential developments (Hoicka & MacArthur, 2021). Renewable and distributed energy generation presents new challenges in the use of space, requiring closer integration between spatial and energy planning. Cities are exploring new business models, regulations, and technologies and have identified measures in energy communities that could be expanded in the future. The implementation of energy communities is a complex process influenced by a wide range of governance models that include innovative organizational and contractual arrangements, local identities, and common interests (Ulpiani, 2023). Energy communities offer an opportunity to connect the energy sector to a local perspective, where citizens play a crucial role in addressing global challenges through local solutions. The goal of the European Union is to establish an energy market that not only aims to reduce environmental impacts, but also can increase opportunities for economic and social development by taking a long-term perspective for greater sustainability. In sum, successfully addressing the transition to a greater share of renewable energy will require an integrated approach that considers various governance models, the

complexity of renewable projects, spatial reorganization, and urbanization. To achieve the ambitious goal of climate neutrality, it is imperative to intensify efforts, overcome barriers, and effectively implement multi-governance approaches (Gargiulo & Papa, 2021). Addressing these challenges and fully seizing the opportunities presented by the energy transition requires integrated collaboration at the local, national and international levels. We need to work together to develop innovative solutions, promote effective policies and regulations, and ensure equitable and sustainable access to energy for all citizens. Only through a shared commitment can we create greener, more resilient and habitable communities for future generations.

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Author's profile

Valerio Martinelli

He is an engineer, with a master's degree in building Engineering-Architecture at the Department of Civil, Building and Environmental Engineering of the University of Naples Federico II. He is currently a first year Ph.D. student in Civil Systems Engineering at the same department. His research activity focuses on the study of Renewable Energy Communities.