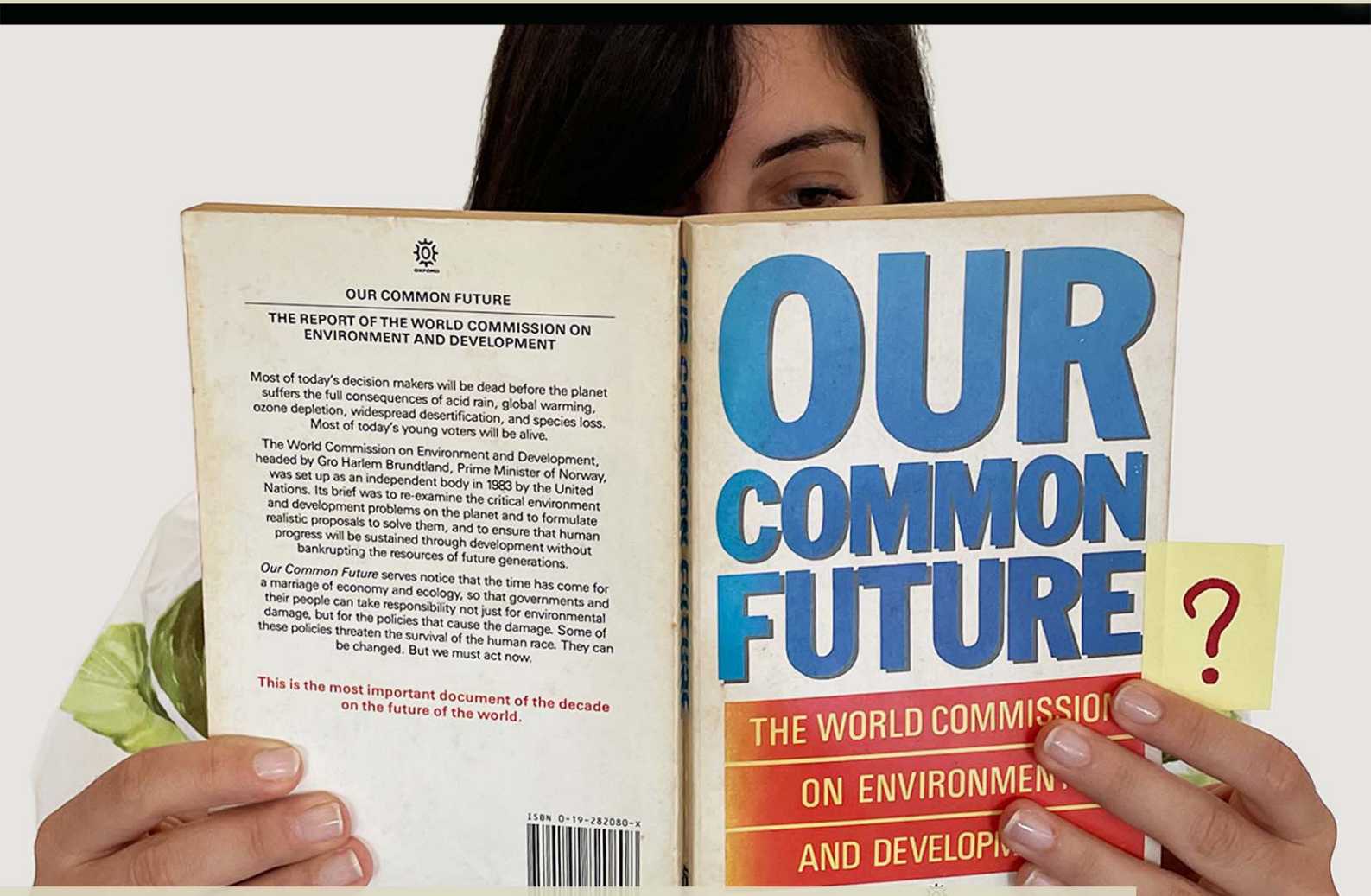
TeMA

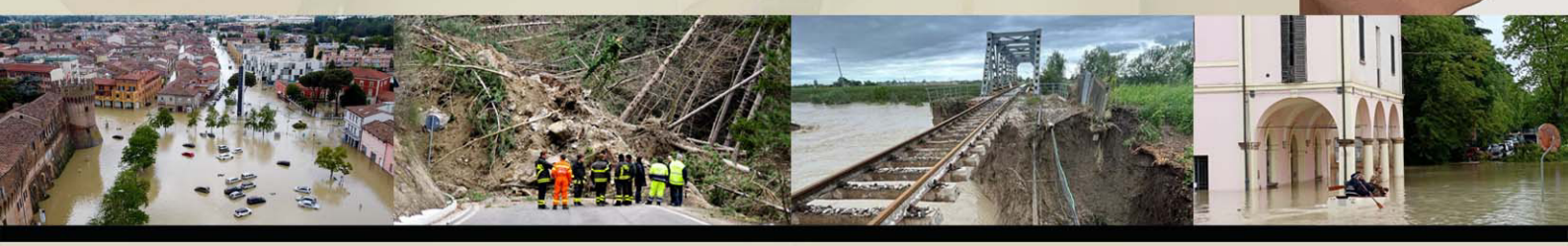
Journal of Land Use, Mobility and Environment

The climatic, social, economic and health phenomena that have increasingly affected our cities in recent years require the identification and implementation of adaptation actions to improve the resilience of urban systems. The three issues of the 16th volume will collect articles concerning the challenges that the complexity of the phenomena in progress imposes on cities through the adoption of mitigation measures and the commitment to transforming cities into resilient and competitive urban systems.

TeMA is the Journal of Land Use, Mobility and Environment and offers papers with a unified approach to planning, mobility and environmental sustainability. With ANVUR resolution of April 2020, TeMA journal and the articles published from 2016 are included in the A category of scientific journals. From 2015, the articles published on TeMA are included in the Core Collection of Web of Science. It is included in Sparc Europe Seal of Open Access Journals, and the Directory of Open Access Journals.



THE CITY CHALLENGES AND EXTERNAL AGENTS. METHODS, TOOLS AND BEST PRACTICES



Vol.16 n.2 August 2023

print ISSN 1970-9889 e-ISSN 1970-9870
University of Naples Federico II

TeMA Journal of
Land Use, Mobility and Environment

THE CITY CHALLENGES AND EXTERNAL AGENTS. METHODS, TOOLS AND BEST PRACTICES

2 (2023)

Published by
Laboratory of Land Use Mobility and Environment
DICEA - Department of Civil, Architectural and Environmental Engineering
University of Naples "Federico II"

TeMA is realized by CAB - Center for Libraries at “Federico II” University of Naples using Open Journal System

Editor-in-chief: Rocco Papa
print ISSN 1970-9889 | on line ISSN 1970-9870
Licence: Cancelleria del Tribunale di Napoli, n° 6 of 29/01/2008

Editorial correspondence
Laboratory of Land Use Mobility and Environment
DICEA - Department of Civil, Architectural and Environmental Engineering
University of Naples "Federico II"
Piazzale Tecchio, 80
80125 Naples
web: www.tema.unina.it
e-mail: redazione.tema@unina.it

The cover image shows a copy of the 1987 UN report “Our Common Future – The report of the world Commission on Environment and Developments”. The picture has been taken in TeMA Lab in July 2023. On the bottom, there is a collage made up of four pictures of recent climate disasters (Source: Google images)

TeMA. Journal of Land Use, Mobility and Environment offers researches, applications and contributions with a unified approach to planning and mobility and publishes original inter-disciplinary papers on the interaction of transport, land use and environment. Domains include: engineering, planning, modeling, behavior, economics, geography, regional science, sociology, architecture and design, network science and complex systems.

With ANVUR resolution of April 2020, TeMA Journal and the articles published from 2016 are included in A category of scientific journals. From 2015, the articles published on TeMA are included in the Core Collection of Web of Science. TeMA Journal has also received the *Sparc Europe Seal* for Open Access Journals released by *Scholarly Publishing and Academic Resources Coalition* (SPARC Europe) and the *Directory of Open Access Journals* (DOAJ). TeMA is published under a Creative Commons Attribution 4.0 License and is blind peer reviewed at least by two referees selected among high-profile scientists. TeMA has been published since 2007 and is indexed in the main bibliographical databases and it is present in the catalogues of hundreds of academic and research libraries worldwide.

TeMA Journal of Land Use, Mobility and Environment

THE CITY CHALLENGES AND EXTERNAL AGENTS. METHODS, TOOLS AND BEST PRACTICES

2 (2023)

Contents

REVIEW NOTES

TeMA Journal of Land Use, Mobility and Environment

TeMA 2 (2023) 443-447
print ISSN 1970-9889, e-ISSN 1970-9870
10.6093/1970-9870/10040
Received 19th May 2023, Available online 31st August 2023

www.TeMA.unina.it

REVIEW NOTES – Urban practices

City vs Energy consumptions: Energy Communities in Italy

Carmen Guida

Department of Civil, Architectural and Environmental Engineering
University of Naples Federico II, Naples, Italy
e-mail: carmen.guida@unina.it
ORCID: https://orcid.org/0000-0002-8379-7793

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, the Urban Practices section aims at producing, analyzing and reporting data on recent and relevant policies in the urban domain.

This contribution aims at delving into the Energy Community paradigm and its application into the Italian context. The concept of energy communities has gained significant attention and recognition in both the European and Italian contexts. These communities are based on the idea of decentralizing energy production and fostering local participation in the transition to renewable energy sources. Since only recently the legislative panorama provided a set of limits and opportunities to the implementation of energy communities, this note is dedicated to some of the most interesting spontaneous experiences recently born in Italy, to highlight their strengths and weaknesses.

Keywords

Energy crisis; New technologies; Urban energy.

How to cite an item in APA format

Guida, C. (2023). City vs Energy consumptions: Energy Communities in Italy. *TeMA. Journal of Land Use, Mobility and Environment*, *16* (2), 443-447. http://dx.doi.org/10.6093/1970-9870/10040

1. Introduction

Urban planning plays a crucial role in addressing the pressing issue of energy consumption and efficiency in cities. With the increasing impact of climate change-related events and the ongoing energy crisis, it is imperative for urban planners to incorporate concrete solutions to mitigate risks and promote sustainability (Papa et al., 2014; Fasolino et al., 2020). One key aspect of sustainable urban planning is the integration of renewable energy sources (Al-Thani et al., 2022; Derkenbaeva et al. 2022).

On this issue, the potential impacts of energy communities are gaining much more interest, not only in the scientific panorama, but also in international agendas and research-and-development departments of industrial companies.

Energy communities (also known as Renewable Energy Communities – REC) are collective initiatives that enable individuals, businesses, and local organizations to participate in the production, consumption, and management of energy resources, primarily focusing on renewable energy. These communities aim to decentralize energy production, foster local self-sufficiency, and empower community members to actively engage in the clean energy transition. By prioritizing renewable energy sources, energy communities contribute to mitigating climate change and reducing environmental impact. They help decrease greenhouse gas emissions, air pollution, and reliance on non-renewable resources (Pilogallo et al., 2019; Shirgir et al., 2019). The localized energy production and reduced transmission losses also improve overall energy system efficiency (Papa et al., 2016; Gargiulo et al., 2023).

More generally, thanks to the promotion of active involvement and decision-making by local stakeholders, energy communities encourage citizens, businesses, and local authorities to come together and collectively own, develop, and manage renewable energy projects. This participatory approach enhances energy democracy, giving individuals a say in shaping their local energy systems. Moreover, they prioritize the production of energy from renewable sources, such as solar, wind, hydro, and biomass. They often install renewable energy systems within their community, ranging from solar panels on rooftops to small wind turbines or community-owned solar farms. This localized generation reduces dependence on centralized fossil fuel-based power plants and contributes to carbon emissions reduction. Energy communities are designed for self-consumption and energy sharing: they prioritize the use of locally produces energy, meaning that community members consume the renewable energy produced within the community, reducing reliance on grid electricity. Excess energy is usually shared within the community or fed back into the grid, enabling energy sharing and supporting the overall energy transition. Form the energy efficiency side, communities promote measures to reduce energy consumption. They often implement energy-saving technologies, such as smart meters, energy management systems, and building retrofits. Furthermore, communities can adopt demand-response mechanisms, adjusting energy consumption patterns based on supply and demand dynamics, to optimize energy usage and reduce peak loads. For what concerns economic and social benefits, energy communities offer various advantages (Ceglia et al., 2022; Lode et al., 2022).

Locally generated energy contributes to job creation, stimulates local economies, and retains energy spending within the community. Community members may experience reduced energy costs through group purchasing or benefit from financial incentives for renewable energy production. Energy communities also foster social cohesion, knowledge sharing, and community resilience. In order to be effective, energy communities need a widespread technological support: they often adopt smart grid technologies, energy storage systems, and flexible demand management solutions. This enables better integration of intermittent renewable sources, optimizes energy distribution, and enhances grid resilience.

The most interesting aspect of energy communities is their potential to foster social innovation and community empowerment beyond the energy sector.

Energy communities have the power to transcend their primary focus on renewable energy and become catalysts for broader community development. By involving citizens, businesses, and local organizations in

decision-making and project implementation, energy communities can create a sense of ownership and empowerment among participants. This engagement can extend to other areas such as sustainable transportation, waste management, local food production, and environmental conservation. Energy communities can thus become drivers of holistic, sustainable development within their communities, promoting a deeper connection to the environment and fostering a sense of pride and resilience.

For example, an energy community may initiate projects like community gardens, eco-tourism initiatives, or educational programs on sustainable practices. By expanding their scope beyond energy, these communities can address multiple social and environmental challenges, leading to improved quality of life, enhanced social cohesion, and a stronger sense of community identity. This holistic approach not only strengthens the overall impact of energy communities but also opens doors for collaboration with other local stakeholders, including educational institutions, non-profit organizations, and local governments. Together, they can create a more sustainable and thriving community while inspiring others to adopt similar initiatives.

In summary, energy communities have the potential to go beyond their energy-focused objectives and act as platforms for social innovation and holistic community development. By empowering individuals and fostering collaboration, these communities can bring about transformative change and inspire sustainable practices beyond the energy sector.

Although energy communities represent undoubtedly an opportunity to boost green energy transition, the regulatory framework for the implementation of these solutions is still weak and lacks operational guidance to incentivise transformations. For the Italian context, the Milleproroghe Decree of 2019, which brought RECs to Italy, opened the door to the concept of collective self-consumption. Initially, the scope of sharing was that of the secondary electrical substation in line with the principle of physical proximity. In other words, community members had to live in the same building or use the same premises. Furthermore, the maximum total power of the renewable plant was 200 kilowatts, so only small installations were allowed.

The subsequent Legislative Decree 199 of 2021 went beyond this regulation: the option to go up to 1 megawatt of power for each individual plant was introduced, thereby reaching energy capacities comparable to those of industrial power plants. At the same time, the scope of sharing shifted to the primary electrical substation: as a result, it became possible to share energy between neighbourhoods, individual citizens, or even small neighbouring municipalities. So, nowadays, community members no longer have to live in the same building to share energy, nor do they have to be in neighbouring buildings. Indeed, the basic idea behind the adjustments to the regulations is to encourage the active involvement of citizens so that the energy sharing system becomes increasingly efficient. For more information, the "Town Planning International Rules and Legislation" section of this issue's Review Notes delves into the developing regulatory framework of energy communities and districts.

Only more recently has the single text been approved, which regulates the modalities for enhancing diffuse self-consumption, with clear indications and procedural simplifications. The expected outcome of these regulatory innovations is the exponential increase of RECs in Italy: a study by the Politecnico di Milano (Electricity Market Report) estimates that by 2025 Italian energy communities will number around 40,000 and will involve around 1.2 million households, 200,000 offices and 10,000 SMEs (Small and Medium-sized Enterprises).

In spite of the innovations introduced by legislation, a number of virtuous energy communities have emerged in Italy in recent years, which have quickly become best practices.

The first urban planning practice analysed in this contribution is from a working-class neighbourhood on the outskirts of Naples, Italy. This experience is one of the first developed energy communities in Italy and it was selected for this Review Notes section due to its several social benefits.

The second urban planning practice comes from Emilia Romagna Region. This case-study was selected because it promotes the installation of a wide range of technologies (rather that only solar plants) to generate and distribute renewable energy among the community.

By drawing on the experiences and practices of urban energy communities, we can better understand the unique challenges and opportunities of implementing energy communities in urban settings. This knowledge can inform the development of effective policies, strategies, and approaches for creating sustainable, resilient, and inclusive urban energy systems.

Comunità Energetica e Solidate di Napoli Est

San Giovanni a Teduccio is a working-class neighborhood on the outskirts of Naples, Italy. Once an industrial center, today it's home to abandoned factories that sit in ruins by the sea. But the rooftop of a former orphanage points to new beginnings for the community. There, the sun shines onto the deep blue surface of 166 solar panels that provide low-cost, clean energy to 20 neighboring families, placing San Giovanni at the helm of an equitable energy transition. San Giovanni, which launched in 2021, is one of at least 35 renewable energy communities across Italy, according to Legambiente Campania, a leading environmental nonprofit that helped create the entity and install the panels. The project is part of a national effort to get households, businesses and local authorities to jointly generate and distribute energy from renewable sources. Proponents say it's a model not just for transitioning economies away from fossil fuels, but also for lifting people out of poverty.

The project required an investment of about 100,000 euro, financed by the Fondazione con il Sud, promoted by Legambiente and the local community, starting with the fundamental role of the Fondazione Famiglia di Maria and the 40 families with social disadvantages involved in the energy community, who will enjoy the benefits of this new energy system. A project that will also see the families involved in a path of awareness-raising and greater awareness of energy issues, in order to make the benefits of the community more efficient.

Serving the energy community is a 53 kW photovoltaic system built on the roof of the Family of Mary Foundation, capable of producing about 65,000 kWh/y of electricity, partly consumed by the structure itself and partly shared with the 40 families involved. It is also estimated to be able to generate real savings, in terms of less electricity consumed by all REC members, of around 300 thousand euro in 25 years.

GreenVulcano

GreenVulcano is an energy community initiative based in the Emilia-Romagna region of Italy. It focuses on the development of local renewable energy projects, aiming to foster sustainable energy production, community engagement, and economic growth. GreenVulcano operates as a cooperative, actively involving farmers, landowners, and local businesses in the production and distribution of clean energy. The initiative emphasizes collaboration and synergy among different actors within the community. By leveraging local resources and expertise, GreenVulcano seeks to create a sustainable and resilient energy system. It aims to reduce dependence on non-renewable energy sources, lower carbon emissions, and promote environmental sustainability.

The renewable energy projects developed by GreenVulcano include wind farms and biogas plants. Wind farms harness the power of wind to generate electricity, while biogas plants utilize organic waste materials to produce biogas for electricity and heat generation. These projects contribute to the local energy supply, decrease reliance on fossil fuels, and support the transition to a cleaner and more sustainable energy mix. Additionally, GreenVulcano fosters economic development and job creation within the community. By engaging local businesses and farmers, it promotes a circular economy approach, maximizing the utilization of local resources and supporting local entrepreneurship.

The initiative aims to strengthen the local economy and retain energy spending within the community. GreenVulcano serves as an example of how energy communities can drive the renewable energy transition at the local level. It showcases the potential for collaboration, innovation, and collective action to achieve sustainable development goals. By empowering community members and promoting renewable energy projects, GreenVulcano contributes to the social, economic, and environmental well-being of the Emilia-Romagna region.

References

Al-Thani, H., Koç, M., Isaifan, R. J., & Bicer, Y. (2022). A Review of the Integrated Renewable Energy Systems for Sustainable Urban Mobility. *Sustainability*, 14(17), 10517. https://doi.org/10.3390/su141710517

Ceglia, F., Marrasso, E., Pallotta, G., Roselli, C., & Sasso, M. (2022). The State of the Art of Smart Energy Communities: A Systematic Review of Strengths and Limits. *Energies*, 15(9), 3462. https://doi.org/10.3390/en15093462

Derkenbaeva, E., Vega, S. H., Hofstede, G. J., & Van Leeuwen, E. (2022). Positive energy districts: Mainstreaming energy transition in urban areas. *Renewable and Sustainable Energy Reviews*, 153, 111782. https://doi.org/10.1016/j.rser.2021.111782

Fasolino I., Grimaldi M., & Coppola F. (2020). The paradigms of urban planning to emergency-proof. *TeMA. Journal of Land Use, Mobility and Environment*, 165-178. https://doi.org/10.6092/1970-9870/6912

Gargiulo, C., Sgambati, S., Zucaro, F. (2023). The Analysis of the Urban Open Spaces System for Resilient and Pleasant Historical Districts. In: Gervasi, O., et al. *Computational Science and Its Applications – ICCSA 2023 Workshops. ICCSA 2023. Lecture Notes in Computer Science*, vol 14106. Springer, Cham. https://doi.org/10.1007/978-3-031-37111-0_39

Lode, M. L., Te Boveldt, G., Coosemans, T., & Camargo, L. R. (2022). A transition perspective on Energy Communities: A systematic literature review and research agenda. *Renewable and Sustainable Energy Reviews*, 163, 112479. https://doi.org/10.1016/j.rser.2022.112479

Papa R., Gargiulo C., & Zucaro F. (2014). Urban Systems and Energy Consumptions: A Critical Approach. *TeMA. Journal of Land Use, Mobility and Environment*. https://doi.org/10.6092/1970-9870/2552https://doi.org/10.1016/j.rser.2022.112479

Papa, R., Gargiulo, C., Zucaro, F. (2016). Towards the Definition of the Urban Saving Energy Model (UrbanSEM). In: Papa, R., Fistola, R. (eds) *Smart Energy in the Smart City. Green Energy and Technology*. Springer, Cham. https://doi.org/10.1007/978-3-319-31157-9_9

Pilogallo A., Saganeiti L., Scorza F., & Murgante B. (2019). Ecosystem Services' Based Impact Assessment for Low Carbon Transition Processes. *TeMA. Journal of Land Use, Mobility and Environment*, 12(2), 127-138. https://doi.org/10.6092/1970-9870/6117

Shirgir E., Kheyroddin R., & Behzadfar M. (2019). Defining urban green infrastructure role in analysis of climate resiliency in cities based on landscape ecology theories. *TeMA. Journal of Land Use, Mobility and Environment*, 12(3), 227-247. https://doi.org/10.6092/1970-9870/6250

Author's profile

Carmen Guida

She is an engineer, Ph.D. in Civil Systems Engineering and Postdoctoral Researcher at Department of Civil, Architectural and Environmental Engineering of University of Naples Federico II. Her research activities concern adaptation of urban environment to climate change-relates hazards and accessibility to urban services for elderly people, with the aim of minimising social exclusion and inequalities within urban areas.