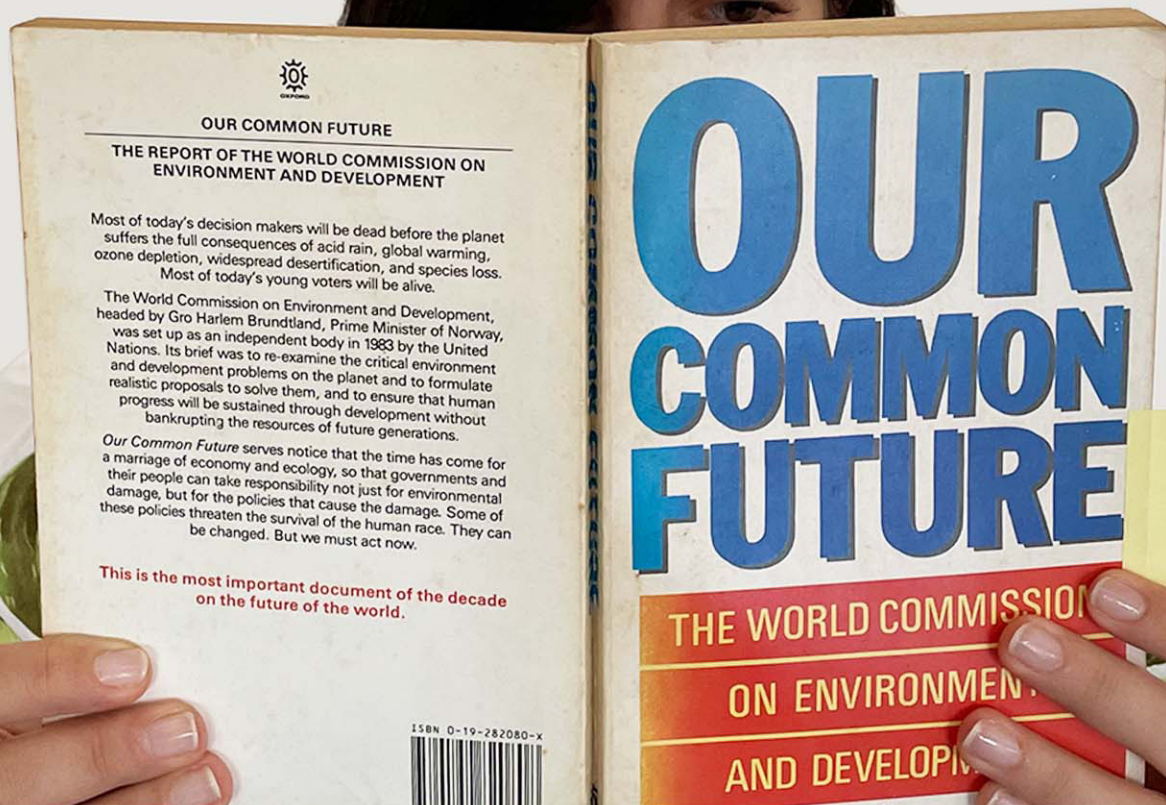


# TeMA

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



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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)

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# TeMA

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## **REVIEW NOTES – Methods, tools and data for the city energy governance**

### **Energy transition: pinning down the gaps between theory and practice**

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#### **Nicola Guida**

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#### **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 five parts. Each section examines a specific aspect of the broader information storage within the main interests of TeMA Journal. In particular, the Methods, tools and data for the city energy governance section focuses on the challenges that urban energy planning commonly faces, providing food for thought to readers and fellow researchers. This contribution aims at examining these challenges and the solutions proposed in the scientific literature. For the second issue of TeMA Journal volume no. 16, this section is dedicated at identifying the gaps between the theoretical scientific progress and their actual practical implementation.

#### **Keywords**

Urban Energy Planning; Energy transition; Spatial energy planning.

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## 1. Introduction

Cities are increasingly recognized as crucial actors in the global energy transition (Grubler et al., 2012). Hosting almost two-thirds of the world inhabitants and generating more than 80% of global GDP, their dense populations and concentrated economic activities account for about 75% of the global energy use and between 50% and 60% of greenhouse gas (GHG) emissions (World Bank, 2023). As urban areas continue to grow, their impact on energy demand, GHG emissions, and resource depletion will become even more pronounced. At the same time, cities have the potential to lead the way towards a sustainable, low-carbon, and resilient future and are expected to play a pivotal role in the energy transition (Pilogallo et al., 2019).

Starting from the first studies on the relationship between energy systems and urban characteristics, spurred by the oil crisis of the 1970s (De Pascali & Bagaini, 2018), researchers have gradually shifted their focus from the building to the urban scale (Zanon & Verones, 2012), recognising the opportunities and the positive long-term impacts that a broader perspective offers (Ko, 2013). However, this can hardly be achieved by simply applying traditional planning strategies and tools, whose limitations have been widely recognised by the scientific community for many years, requiring the formulation of new comprehensive and holistic approaches (de Almeida Collaço et al., 2019). In this sense, several methods and tools have been developed in the last decades to properly assess and manage cities' energy use (Gargiulo & Russo, 2017), giving rise to a number of conceptual frameworks, such as Integrated Spatial and Energy Planning (Stoeglehner et al., 2016) and Integrated Energy Planning (Gholami et al., 2020), among others. Since cities are dynamically complex systems (Gargiulo & Papa, 2021), their study, from an energy point of view, needs to take into account many different features that are closely interrelated, as illustrated in the following scheme (Russo, 2017).

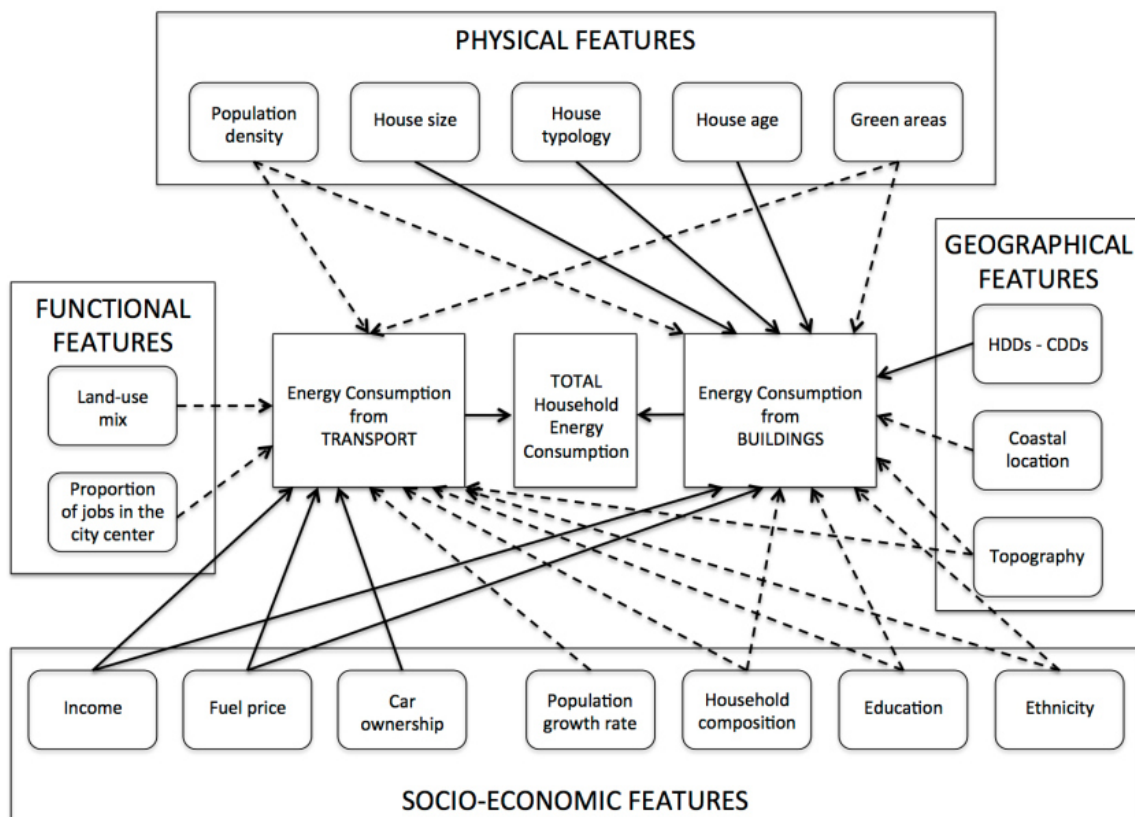


Fig.1 Key relationships between urban features and energy consumption (Russo, 2017)

Despite significant scientific progress, coordinated strategies between urban planning and energy planning are still not a widely established practice. Their effective implementation is hampered by several obstacles, which together constitute a “wicked” problem, characterised by multiplicity, heterogeneity, and uncertainty (Cajot et al., 2017).

Major factors limiting the transition from theory to practice in city energy governance include:

- *Policy and regulatory barriers*: existing policies and regulations in some regions may not be aligned with the goals of integrated urban energy planning, creating barriers to the adoption of sustainable energy practices. To address this, policy makers should review and update existing regulations to support the integration of renewable energy sources and energy efficiency measures. The introduction of new policy instruments, such as feed-in tariffs and tax incentives, can encourage stakeholders to adopt innovative energy technologies. Establishing clear and supportive policies that prioritise energy efficiency and renewable energy will provide a framework for sustainable urban development.
- *Institutional inertia*: established practices and organisational structures can be resistant to change. Overcoming this challenge requires strong leadership and the promotion of a culture of innovation. Leaders need to communicate the benefits of sustainable energy practices and create cross-departmental collaboration to promote a holistic approach to energy planning. Training and capacity building programmes should be provided to employees to enhance their skills and understanding of sustainable energy practices.
- *Funding and financial constraints*: the adoption of new strategies and tools for integrated urban energy planning may require significant upfront investments, leading to hesitancy among stakeholders to commit resources. To address this challenge, cities can explore innovative financing mechanisms, such as public-private partnerships and green bonds, to secure funding for sustainable energy projects. Developing business cases that demonstrate the long-term economic benefits, including cost savings and increased resilience, can further encourage stakeholders to invest in sustainable energy initiatives. Advocating for national and international funding opportunities will also support energy transition projects in cities.
- *Lack of awareness and capacity*: in smaller municipalities and less developed regions, stakeholders may be unaware of the benefits and possibilities offered by integrated urban energy planning. To overcome this challenge, cities can conduct awareness campaigns and educational programs to inform stakeholders about the advantages of sustainable energy practices. Technical assistance and support should be provided to help build capacity for energy planning in these regions. Partnerships with research institutions, universities, and industry experts can also be fostered to access technical expertise and knowledge.
- *Data availability and quality*: the lack of robust and accurate data poses a challenge to successful urban energy planning. To address this, cities can invest in data collection and management systems to ensure that reliable and up-to-date energy data is available for planning and decision-making. Collaboration with utility companies, research institutions, and data providers will allow access to relevant and accurate energy data. Utilizing advanced data analytics and modelling tools will enable cities to analyse energy trends, identify opportunities for efficiency improvements, and forecast future energy demand.
- *Stakeholder engagement challenges*: integrated urban energy planning involves multiple stakeholders with diverse interests and priorities, making effective stakeholder engagement critical. To address this challenge, cities can establish a participatory and inclusive approach to urban energy planning, involving all relevant stakeholders in the decision-making process. Regular workshops, public consultations, and focus groups can be organized to gather input from the public and key stakeholders. Clear communication strategies should be developed to convey the benefits of integrated urban energy planning and address concerns or conflicts among stakeholders.
- *Long planning cycles*: urban planning and infrastructure projects often have long planning and implementation cycles, which can slow down the integration of new strategies and technologies. To



overcome this challenge, cities can streamline planning processes and decision-making to expedite the integration of sustainable energy strategies. Developing flexible and adaptable energy plans will allow cities to accommodate changes and advancements in technology over time. Collaboration between different levels of government will ensure coordinated efforts and reduce bureaucratic delays.

- *Technology and market maturity*: the availability and maturity of certain technologies and markets can impact their adoption in urban energy planning. To address this, cities can encourage research and development in emerging renewable energy technologies to accelerate competitiveness. Implementing pilot projects will demonstrate the feasibility and benefits of new technologies, gaining stakeholder confidence and encouraging broader adoption. Collaborating with industry leaders and stakeholders will help identify barriers to technology adoption and work towards solutions.
- *Political will and leadership*: the commitment of political leaders is crucial in overcoming barriers to integrated urban energy planning. Advocating for sustainable energy initiatives at all levels of government and engaging with political leaders will gain their support for sustainable energy projects. Demonstrating the potential political and public support for sustainable energy solutions through public campaigns and opinion polls will strengthen the case for action. Establishing clear energy goals and targets that align with broader environmental and social objectives will create a compelling vision for sustainable urban development.

Tackling all these different issues is not an easy task but progress is being made in many regions, and successful examples are increasingly appearing across the world (Guida, 2022). By combining coordinated solutions and tailoring them to specific urban contexts, cities can pave the way for effective integrated urban energy planning, leading to more sustainable, resilient, and low-carbon urban energy systems. As awareness of the importance of sustainable and resilient urban energy systems grows, and as success stories and best practices become more widely known, the adoption of these strategies and tools is expected to gain momentum in the future.

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