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.

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The cover image shows the building of Kharkiv National University of Civil Engineering and Architecture, destroyed as a result of a missile and bomb attack. March 2022 (Source: STRINGER/Reuters/Forum. https://www.pism.pl/publications/sweden-on-the-russian-aggression-against-ukraine)

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REVIEW NOTES – Urban planning literature review

City vs Energy consumptions: the role of new technologies

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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 four parts. Each section examines a specific aspect of the broader information storage within the main interests of TeMA Journal.
In particular, the Urban planning literature review section presents recent books and journals on selected topics and issues within the global scientific panorama.
This contribution aims at delving into the relationship between urban environments and energy consumption. Cities consume about 75% of global primary energy and emit between 50% and 60% of total greenhouse gases. As drivers of economic and social changes, cities play a key role in reducing energy consumption and increase energy efficiency. For the first issue of TeMA Journal volume no. 16, this Review Notes section is dedicated to books highlighting the role of new technologies in managing good-quality energy data, essential to support reliable decision-makers.

Keywords

Energy crisis; New technologies; Urban energy.

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1. Introduction

Energy consumption and its efficiency have become increasingly important in recent years due to a variety of factors. One of the most pressing reasons is the impact of climate change-related phenomena on cities and communities around the world. Extreme weather events such as heatwaves, floods, and hurricanes are becoming more frequent and severe, causing significant damage to urban infrastructure and putting people's lives at risk. In response, there is an urgent need for concrete solutions to mitigate and adapt urban environments to these extreme events (Batta & Mazzeo, 2022; Guida, 2022).

Another factor that has made the energy issue more urgent than ever is the current energy crisis. Albeit the crisis had a global outbreak with the Russian attack on Ukraine, its roots can be found in late 2021 when the price of fossil-fuels increased sensibly, due to postponed maintenance interventions and financial issues. The still ongoing war has led to a spike in energy and basic commodities prices in Europe and beyond, contributing, among others, to a global supply chain crisis, to unsustainable production in the sectors hardest hit and resulting in runaway inflation spread throughout the world. As a result, this crisis has delivered an unprecedented shock to the industrialised West, leading to power outages, supply chain disruptions, and higher costs of living. It has highlighted the vulnerability of our energy systems and the need for more resilient and sustainable solutions.

Urban areas are significant contributors to global energy demand and energy-related emissions. Cities consume about 75% of global primary energy and emit between 50% and 60% of total greenhouse gases. In the European Union, cities take up only 4% of the land area yet are home to 75% of the population, making their energy footprint significant, particularly in sectors such as buildings and private motorised transport (Sgambati & Gargiulo, 2022).

The IPCC's Sixth Assessment Report (2021) highlights the close linkage between the energy performance of urban environments and their resilience when climatic events occur. The report states that urban areas need to reduce their energy consumption and shift towards renewable energy sources to mitigate the impact of climate change-related events. This is important for complying with the Paris Agreement (UN, 2015) and limiting global temperature increase and addressing the ongoing energy crisis and its impact on urban areas.

Cities are responsible for a significant portion of global energy consumption, and as such, they have the potential to play a critical role in addressing the energy crisis. Sustainable energy solutions are becoming increasingly important as traditional energy sources such as fossil fuels are finite and contribute to environmental degradation, including climate change.

Promoting sustainable energy solutions can help cities reduce their carbon footprint and contribute to the global effort to reduce greenhouse gas emissions. Sustainable energy solutions, such as renewable energy sources like solar, wind, and hydropower, can help cities reduce their reliance on fossil fuels and move towards a more sustainable energy future.

In addition to the environmental benefits, promoting sustainable energy solutions can also bring economic benefits to cities. For example, investing in renewable energy infrastructure can create jobs and stimulate economic growth.

Overall, cities have a critical role to play in addressing the energy crisis by promoting sustainable energy solutions. By taking action to reduce their carbon footprint and increase energy efficiency, cities can contribute to a more sustainable future for all.

One such solution is to increase the use of renewable energy sources such as solar, wind, and hydro power. Urban planning tools may promote the installation of solar panels on buildings, building wind farms on the outskirts, and investing in hydroelectric power plants to generate clean energy. These sources can reduce the reliance on fossil fuels, which not only produce greenhouse gas emissions but also contribute to air pollution, which can lead to health problems.

Another solution is to improve energy efficiency in buildings. Buildings consume significant energy, and improving their efficiency can lead to significant energy savings. This can be achieved through measures such as insulation, efficient lighting, and energy-efficient appliances. Cities can also promote the use of green buildings, which are designed to minimise energy consumption and environmental impact (Papa et al., 2016; Pilogallo et al., 2019).

In addition, cities can encourage sustainable transportation options, such as public transport, cycling, and walking. Private motorised transport is a significant contributor to greenhouse gas emissions and air pollution, and promoting sustainable alternatives can reduce the reliance on cars and other vehicles (Coppola & De Fabiis, 2020). To achieve these goals, cities need to invest in sustainable infrastructure and technologies, and promote policies that incentivise the adoption of sustainable practices. This requires a collaborative effort between government, businesses, and citizens and international cooperation to share knowledge and resources.

For example, Amsterdam is one of the most sustainable cities in Europe, with a long history of promoting sustainable solutions. The city has invested heavily in renewable energy sources, with over 100,000 solar panels installed on public buildings and over 200 wind turbines in the surrounding areas. Amsterdam also has an extensive network of bike lanes and promotes cycling as a sustainable transportation option. In addition, the city has implemented policies to encourage energy efficiency in buildings, such as offering insulation subsidies and promoting green roofs. Another significant example comes from Denmark: Copenhagen has set a goal to become carbon-neutral by 2025 and has implemented a variety of sustainable energy solutions, including wind turbines, district heating systems, and a comprehensive bicycle infrastructure. From other territorial contexts, Vancouver (Canada) and San Francisco (California, US) have set challenging goals. Vancouver has a goal of 100% renewable energy by 2050 and has implemented policies to encourage the use of electric vehicles, green buildings, and renewable energy sources; San Francisco has implemented a range of sustainable energy solutions, including a comprehensive recycling program, a public transportation system that runs on renewable energy, and a goal to achieve 100% renewable energy by 2030.

Promoting sustainable approaches for reducing energy consumption in urban areas is heavily dependent on high-quality data and analysis. However, managing energy data can be difficult from a scientific perspective, given the dearth of reliable sources, excessive data aggregation, and the potential inaccuracy of models. In this issue of the TeMA Journal, the reviewed books center on how technology and artificial intelligence impacts energy consumption and efficiency.

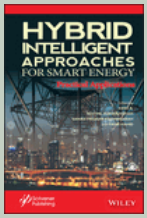
To sum up, the main ways new technologies may collaborate in scientific advancements are:

- *Data Collection*: predicting energy consumption requires data collection, and new technologies are making it easier to collect data on energy consumption. Smart meters, for example, can provide real-time data on energy use, which can be used to predict future energy consumption patterns;
- *Data Analytics*: new technologies such as machine learning and artificial intelligence can analyse energy consumption data to identify patterns and trends. This can help predict future energy consumption and enable energy providers to optimise their energy generation and distribution systems;
- *Energy Modeling*: energy modeling is a method for predicting energy consumption by simulating energy use under different scenarios. New technologies are making energy modelling more sophisticated, allowing for more accurate energy consumption predictions.

As urbanisation continues to accelerate, finding sustainable solutions to meet the growing energy demand is becoming increasingly important. New technologies play a crucial role in addressing the energy crisis in urban areas, as they offer innovative ways to increase energy efficiency, promote the use of renewable energy sources, predict and manage energy consumption, and optimise energy use. By harnessing the power of new technologies, cities can reduce their carbon footprint, improve air quality, and create a more sustainable future for all.

In conclusion, the energy crisis in urban areas is a pressing issue that requires innovative and sustainable solutions. As presented in the reviewed books, new technologies, best practices, and multidisciplinary approaches offer a practical and coherent framework for addressing this challenge. By promoting sustainable energy transition planning, cities can increase energy efficiency, utilise renewable energy sources, and reduce their carbon footprint, ultimately creating a more sustainable future. Policymakers, academics, and practitioners must work together to implement these solutions, creating a net-zero energy balance at the neighbourhood and district level, to ensure a cleaner, healthier, and more prosperous urban environment. Doing so can create a sustainable and resilient urban society that benefits us all.

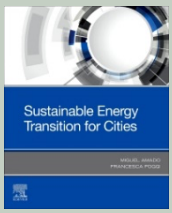
Hybrid Intelligent Approaches for Smart Energy: Practical Applications



Authors/Editors: Mohan, S. K., John, A., Padmanaban, S., & Hamid, Y.
Publisher: John Wiley & Sons
Publication year: 2022
ISBN code: 9781119821243

"Hybrid Intelligent Approaches for Smart Energy: Practical Applications" is a valuable reference book that covers the latest trends in green technologies and efficient energy systems. The book focuses on energy optimisation and consumption prediction and how smart computing technologies such as artificial intelligence, machine learning, deep learning, and IoT are replacing traditional computational methods in these areas.
The book provides solutions to the limitations, issues, and challenges of traditional energy consumption methods by incorporating smart computation techniques. The authors have successfully bridged the gap between traditional power consumption methods and modern consumption methods using smart computation methods. The book is written for engineers, scientists, students, and other professionals in various industries and engineering areas.
It provides practical applications of smart computation technologies in different fields such as distributed environment, healthcare, smart cities, and agriculture.
Overall, the manuscript is a must-have book for anyone interested in staying up-to-date with the latest trends in green technologies, efficient energy systems, and smart computing techniques. It provides a comprehensive overview of the use of smart computation methods in energy optimisation, consumption, scheduling, and usage, and offers practical solutions for various issues in these areas.

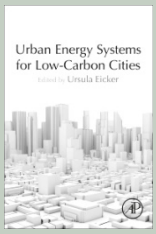
Sustainable Energy Transition for Cities



Authors/Editors: Amado, M. & Poggi, F.
Publisher: Elsevier
Publication year: 2022
ISBN code: 9780128242773

"Sustainable Energy Transition for Cities" is an insightful and comprehensive guide that provides a framework for planning and implementing sustainable energy systems in urban areas.
The book's multidisciplinary approach offers a holistic understanding of the issues and opportunities involved in urban energy transition, making it a valuable resource for academics, practitioners, and policymakers interested in promoting sustainable energy in cities.
The authors provide a range of best practices for sustainable energy transition planning, drawing on empirical and applied research in urban planning and sustainable energy. The book's focus on achieving a net-zero energy balance at the neighbourhood and district level provides a practical and coherent approach for implementing sustainable energy systems in urban areas. The book covers a range of topics, including the use of renewable energy sources, building efficiency improvements, and transportation innovations. It also addresses the challenges and opportunities associated with the transition to sustainable energy systems, providing valuable insights for policymakers and practitioners.
Overall, "Sustainable Energy Transition for Cities" offers practical solutions and best practices for promoting sustainable energy in urban areas. By adopting the multidisciplinary framework presented in the book, cities can work towards achieving a low-carbon urban society and create a more sustainable future for all.

Urban Energy Systems for Low-Carbon Cities



Editor: Ursula Eicker
Publisher: Elsevier
Pubblication year: 2022
ISBN code: 9780128115541

"Urban Energy Systems for Low-Carbon Cities" addresses the challenges associated with urban energy transition, which include analysing energy efficiency options and the potential of renewable energy systems within the existing building stock. As cities become increasingly important actors in the transition towards a low-carbon future, the book introduces indicators for evaluating urban energy performance and discusses monitoring and efficiency valuation schemes. The book covers a range of key topics in the field of urban energy systems, including energy demand and consumption mapping and monitoring, optimisation of design and operation of urban supply and distribution systems, integration of renewable energy, and demand-side management strategies. The book provides case studies from cities such as Vienna, Geneva, New York, and Stuttgart to illustrate these concepts in practice. One of the key features of the book is its use of innovative modelling methods, which provide a bottom-up approach to simulating energy consumption, energy conversion systems, and distribution networks using engineering methods. The book also explores the potential of energy management strategies in urban areas, highlighting their importance in better matching renewable supply and demand and increasing flexibilities. Overall, "Urban Energy Systems for Low-Carbon Cities" is a valuable resource for anyone interested in the field of urban energy systems and the transition to a low-carbon future. The book provides practical guidance on issues related to energy demand, consumption mapping and monitoring, and energy management strategies in urban areas. The case studies and innovative modelling methods used in the book provide real-world examples of how these concepts can be applied in practice to achieve a more sustainable urban energy system.

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