

Editorial

Underutilized Urban Resources.

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Underutilized resources are a squandered opportunity for sustainable development in an urbanizing society. Valuing these resources in a sound and environmentally friendly manner is crucial. This Special Issue of the journal Resources aims to explore viable solutions and challenges related to underutilized resources in urban areas. The combined papers focus on establishing circular economy schemes to valorize municipal garbage and utilizing renewable energy sources. The authors of this Special Issue contribute to a better understanding of how to make cities more sustainable by focusing on the circular economy and renewable resources. To properly manage energy transition and circular economies, stakeholders must have effective regulatory frameworks and policymaking mechanisms that balance their influence. Community engagement has a significant positive impact. Recovering useful materials from household garbage requires more than just technology and infrastructure, but also motivation and public awareness. There is still a need to accurately estimate and characterize recyclable material streams, particularly in areas with expanding populations. This Special Issue's publications provide valuable insights into effective urban resource management, including prospective ideas, difficulties, and research.

Keywords : *Turban resource management, sustainable urbanization, community participation, circular economy, solid waste recycling, urban energy, renewable energy, energy transition, energy governance, and policy-making.*

INTRODUCTION

With over half of the world's population already living in cities and a growing population [1], sustainable development requires effective resource management schemes that are both environmentally and economically viable [2]. This Special Issue aims to study sustainable management of materials in urban environments and their impact on urban activities, with a focus on underutilized resources. The Special Issue had ten pieces that were positively rated. This editorial aims to summarize major findings from the Special Issue publications.

TOWARDS MORE SUSTAINABLE URBAN RESOURCE MANAGEMENT: INSIGHTS FROM THE PUBLICATIONS INCLUDED IN THE SPECIAL ISSUE

Contributions to the Special Issue focused on two primary areas: valuing waste for circular economy initiatives and harnessing renewable energy. Table 1 demonstrates connections between circular economy and renewable energy systems. Seven out of ten papers [3-9] discuss the possibility for solid waste to be used in circular economy programs, including material recycling and energy generation. Source-segregated trash for energetic valorisation is a source of

renewable energy. Four out of seven manuscripts on solid wastes are linked to renewable energy and thus fall under both circular economy and renewable energy categories. Another study investigates the recovery of waste heat from urban environments. Urban infrastructure [10] blends a unique circular economy concept based on heat valorisation with the pursuit of sustainability. Energy strategies. Two contributions aim to increase the use of renewable energy in cities [11,12].

The Special Issue's information website [13] and invitation to submit a paper expressed interest in studies that explore the urban-rural context, but no publications addressed underutilized resources in this context. Only Eades et al. [5] explore the rural sector by comparing urban and rural areas. No other publications examine urban-rural links. The lack of an integrated urban-rural perspective raises concerns that focusing solely on urban issues may marginalize the rural perspective [14]. However, it is important to note that this Special Issue does not cover all aspects of urban resource research. Although not exhaustive, the listed publications provide a comprehensive overview of urban resource management potential and difficulties.

Separating household waste into recyclable fractions is crucial for transforming waste into valuable resources

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while also addressing public health concerns. Babazadeh et al. [3] found that achieving public engagement in source separation programs for household garbage is challenging in underdeveloped countries like Iran. The qualitative research, which included interviews with Tabriz residents, identified four main problems: citizens' lack of awareness about the system, a lack of responsibility, an expectation of incentives, and issues with the collection system, such as inappropriate bins. The study highlights the importance of user-friendly collection systems, but also emphasizes the importance of citizen awareness and motivation to increase participation and recover valuable secondary resources in practice.

Many communities lack basic information on household solid waste quantities and composition, making it difficult to develop waste management and recycling systems as populations rise. Vetter-Gindele et al. [4] chose Da Nang, Vietnam, as their project location. They devised and tested a method to quantify home garbage quantity and composition using geospatial data, surveys, and on-site solid waste analyses. The researchers used satellite pictures to estimate building dispersion across the city after clustering the data by five building categories. The study found that building type can accurately predict socioeconomic status and waste generation.

Not only developing countries lack accurate information about valuable commodities in trash flows. One example is garden trash generated in private residences. Quantifying garden waste is tough due to its huge volume and potential for composting or energy generation.

In Europe, statistics only include property-collected green trash or mixed biowaste streams. However, households can also compost and burn their waste at home. In a survey of 798 households in England, Eades et al. [5] found that approximately 70% of garden garbage is collected by waste management systems. There are significant variations between urban and rural homes. Eades et al. [5] found that urban households mostly used formal collection schemes for garden trash, while rural households used self-sufficient means, such as burning, which is not sustainable. Another issue is the fly-tipping of garden garbage into the local environment.

Polymer products are another valuable source of solid waste. Recycling plastics is crucial for conserving resources and preventing pollution, including marine litter. In their study on polymer recycling in Lagos Metropolis, Nigeria, Akanle and Shittu [6] interviewed stakeholders and conducted a field survey of 400 residents. Polymer recycling helps safeguard the environment and might be significant source of income for entrepreneurs, the potential in Lagos is often underutilized. According to Akanle and Shittu [6], barriers to large-scale polymer recycling include negative social perceptions of waste management, fears of social exclusion,

health risks, insufficient information, and unfavorable government policies. The authors provide recommendations to overcome these barriers. This study supports Babazadeh et al.'s [3] observation that implementing effective solid waste management and recycling schemes requires more than just technology and infrastructure. Motivation, knowledge, and social perception also play a significant role.

Tsai [7] provides a case study on reusing waste cooking oil in Taiwan. Cooking methods for daily meals produce a significant amount of this substance. It is a low-cost feedstock for producing biodiesel and other biobased products. In Taiwan, waste cooking oil became a mandatory recyclable resource in 2015. Legal changes have led to a significant rise in collected and recycled volumes. Effective regulatory frameworks can significantly increase the share of secondary resources.

The author presents an overview of available valorisation methods for waste cooking oil. The findings of this study are not only important to Taiwan, but also applicable to other regions.

Havelt et al. [8] explored a totally distinct material stream. The researchers utilized horse chestnut seed coats, a common byproduct of the pharmaceutical sector that extracts important compounds exclusively from peeled seeds. The researchers effectively retrieved valuable target components from seed coverings. These components can be used as additives in food packaging to enhance its properties and extend shelf life. Various extraction procedures were used and tried. Havelt et al. [8] characterized the extracts they collected. The researchers found that their proposed technique is a cost-effective and environmentally friendly way to manage pharmaceutical waste while adding value.

Zhang et al. [9] aim to improve the characterization of valuable urban materials. Their research focuses on the organic component of municipal solid waste. The authors examine organic waste obtained from mixed municipal solid trash in mechanical-biological treatment (MBT) plants, which undergo several treatments to condition and recover recyclable fractions. The organic portion is used for bioprocessing at the MBT site, such as composting or anaerobic digestion. The study examines how different pre-treatments affect the particle size distribution in organic waste. Particle size has a significant impact on bioprocessing performance.

Ninikas et al. [10] present a different perspective on the Special Issue.

Ninikas et al. [10] explore energy valorisation, namely the use of waste heat in urban wastewater, which is often overlooked compared to the previously discussed contributions on solid material streams. The researchers successfully collected energy from wastewater with a water heat pump and developed a valorisation scheme in Glasgow's subway system. This contributes to reducing primary energy consumption and promoting circular economies in metropolitan areas. The

study suggests that the technique can be replicated in other cities with metro systems. The publication also discusses obstacles in implementing the approach.

Two new papers enhance the focus on sustainable energy systems, emphasizing the need of renewable energy in cities. Sait et al. [11] analyze the uptake of renewable energies in three German cities: Munich, Berlin, and Freiburg. They generalise their findings and use them to create recommendations for managing the energy transition in UK cities following Brexit. The policy system approach to energy governance promotes innovation and responsible governance. The authors emphasize the importance of an integrated framework that takes into account the socio-economic implications of policies. Effective policymaking requires an understanding of stakeholder power dynamics, community participation, and trust [11].

According to Kusch-Brandt's book review [12], renewable energy is widely used in cities around the world. This review summarizes the latest issue of the Renewables Global Status Report, released by the Renewable Energy Policy Network for the 21st Century (REN21) (15). The Renewables Global Status Report, updated annually, is a valuable resource for both academic and non-academic readers seeking current information on renewable energy. The 2019 edition includes a special section on renewable energy in cities, recognizing their growing role in renewable energy deployment. Cities also have significant responsibilities. Over 100 cities globally use renewables to meet at least 70% of their electricity consumption [15]. Many cities have set very aggressive renewable energy targets. REN21 has issued a special report on renewables in cities [17].

CONCLUDING REMARKS

Today, the circular economy and renewable resources contribute significantly to the sustainability of cities. This Special Issue provides valuable insights into promising urban resource management methods, as well as potential obstacles and barriers to implementation.

The publications also suggest future research requirements. This Special Issue aims to accelerate progress towards sustainable development. Readers are encouraged to explore the various papers in detail.

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