Lectio Socialis
2024, VOL. 8, NO. 1, pp. 17-34

RESEARCH ARTICLE
DOI: 10.47478/lectio.1396483

Paving the way for climate resilience through sustainable urbanization: A comparative study

Selçuk Gürçam[a]

[a] PhD, Independent Researcher, Ankara, TÜRKIYE.

ABSTRACT

This study explores the crucial role of sustainable urbanization in addressing the climate crisis and fostering socio-economic development. Rapid urban population growth presents cities with unprecedented challenges, including ecological degradation, public health issues, and escalating greenhouse gas emissions. Sustainable urbanization emerges as a pivotal strategy to tackle these challenges by advocating for environmentally responsible practices, enhancing urban resilience, and fostering inclusive economic growth. The article conducts a comparative analysis of sustainable urbanization initiatives in diverse cities, with a focus on their approaches to reducing carbon footprints, enhancing disaster resilience, and improving overall quality of life. Examining case studies from Copenhagen, Curitiba, Singapore, Stockholm, and Melbourne, the research highlights innovative strategies in sustainable transport, renewable energy adoption, waste management, and green space integration. These cities serve as exemplars, showcasing successful solutions such as efficient public transportation systems, robust waste recycling programs, promotion of renewable energy, and prioritization of green spaces. The overarching message of this research underscores the critical need for coordinated, cross-sectoral efforts to unlock the full potential of sustainable urbanization. A holistic approach that integrates environmental, social, and economic dimensions is essential for creating urban environments that are resilient, inclusive, and sustainable. This comprehensive strategy not only addresses the climate crisis but also contributes significantly to achieving global sustainability goals.

ARTICLE HISTORY
Received: 27.11.2023
Revised: 27.12.2023
Accepted: 30.12.2023

KEYWORDS
climate crisis,
sustainable urbanization,
urban governance,
urban development strategies,
environmental security

Introduction

Since the advent of the Industrial Revolution, the global urban population has witnessed exponential growth. Urban centers have turned into attractive centers that attract significant numbers of individuals and families in search of employment opportunities, access to education, and improved quality of life (Chan & Chan, 2022; Vardoulakis & Kinney, 2019, p. 1). As a result, the global urban population is growing at an alarming rate. In 2020, the world population increased by 0.98% compared to the previous year, reaching 7.84 billion. This upward trend continues; It will reach a population of 8.045 billion, with an increase of 0.87% in 2021 (reaching 7.909 billion), an increase of 0.83% in 2022 (reaching 7.975 billion), and then an increase of 0.88% in 2023 (Macrotrends, 2023). High-income countries have predominantly urbanized populations, while low-income countries still have a significant proportion living in rural areas, but this landscape is changing rapidly (Ritchie & Roser, 2019).

CONTACT Selçuk Gürçam selcukgrcm@gmail.com

The United Nations (UN) Population Division reports that the percentage of the world's population living in urban areas has been increasing steadily. In 1950, only 29.6% of the population lived in urban areas. However, by the 2020s, this percentage had surpassed 55%, and it is projected to reach 68.5% by the year 2050 (UN, 2018).

In this context, urban population growth poses various challenges such as deforestation, transportation emissions, air pollution, and biodiversity loss, which have negative impacts on both the environment and human health (Al Mamun *et al.*, 2022, p. 1). The reduction of green areas and forests is one of the major contributors to the climate crisis, as it leads to an increase in carbon dioxide emissions and transportation emissions. This problem is predominantly linked to greenhouse gas emissions and air pollution from sectors like road transport, shipping, and aviation (Cerdas *et al.*, 2018, p. 2; Stere *et al.*, 2022, p. 2). Moreover, urbanization destroys natural habitats, which results in a decline in biodiversity. The urban heat island effect, caused by the retention of heat by materials like concrete and asphalt, increases temperatures in cities compared to rural areas. This effect leads to both health problems due to hot air and respiratory problems due to air pollution (S. T. Li *et al.*, 2016, p. 1; Song *et al.*, 2019, p. 7).

In light of the pressing challenges we face, the urgency of addressing sustainable urbanization cannot be overstated. However, the transformation process towards urbanization must be underpinned by a robust institutional framework, incorporating precisely articulated policies, laws, and regulations. This foundational structure is indispensable for crafting urban cities that are not only sustainable but also resilient.

The 2020 World Cities Report underscores the multifaceted advantages of such solid institutions. These encompass the promotion of inclusive prosperity, enhancement of the quality of life, steering of urban development, maximization of benefits for the majority of residents, fostering equity within cities, and acting as a catalyst for sustainable economic growth (UN-Habitat, 2020). Similarly, the United Nations' 2030 Agenda for Sustainable Development recognizes that cities play a crucial role in achieving sustainable goals. Goal 11, in particular, aims to create cities that are inclusive, safe, resilient, and sustainable.

The focus of this study is to examine the role of sustainable urbanization in tackling the climate crisis. In line with the United Nations' goal (Ritchie & Roser, 2019), it addresses the potential of cities in combating climate change and their role in key areas such as urban planning, resource management, sustainable infrastructure, and energy systems.

When we review the relevant literature, we see that as the impacts of the climate crisis intensify, the issue of sustainable urbanization is becoming increasingly important and academic studies in this field are flourishing. In this comprehensive exploration, a diverse range of studies is considered, providing valuable insights into sustainable urbanization practices across various dimensions, from governance and public participation to economic, social, and cultural aspects.

To illustrate, this study draws upon a rich array of sustainable urbanization policies and recommendations from various sources (de Jong, 2019; Garschagen & Romero-Lankao, 2015; Jones, 2017; Keleş, 2021; Ochoa *et al.*, 2018; Shen & Zhou, 2014; Solly *et al.*, 2021; Xu *et al.*, 2019; Yeyouomo & Asongu, 2023; Zhang, 2016; Zhong *et al.*, 2020; J. Zhou *et al.*, 2015). These encompass insights on the pivotal role of local governments and urban case studies (Abubakar & Dano, 2018, 2020; Schindler *et al.*, 2018; Tan *et al.*, 2016, 2017; Q. Zhou, 2014). The examination extends to environmental governance and public participation (Enserink & Koppenjan, 2007; Fay *et al.*, 2014; Xiong *et al.*, 2020), sustainable development (Liu *et al.*, 2013; Roders, 2014), and economic, social, and cultural dimensions (Abdulai *et al.*, 2023; Boucher, 2015; Drakakis-Smith & Dixon, 1997; Lafortezza & Sanesi, 2019; World Bank, 2014).

These and similar studies investigate the feasibility and consequences of sustainable urbanization at national and global scales. However, this study differs from the existing literature by

addressing the potential of sustainable urbanization in combating the climate crisis from a broad perspective and providing policy recommendations.

Methodologically, this study is a comprehensive investigation into urban sustainability and the climate crisis. It examines successful sustainable city examples, namely Copenhagen from Denmark, Curitiba from Brazil, Singapore, Stockholm from Sweden, and Melbourne from Australia, through secondary resources. The study collects data from online databases, including Web of Science and Scopus. By showcasing successful sustainable city examples, the study illuminates the intricacies of sustainable urbanization. It also provides an in-depth analysis and comparison of a diverse array of exemplary practices. The study argues that this approach is essential in identifying key success factors and prevailing trends in the implementation of strategies for sustainable urbanization initiatives.

The cases selected for this study were based on two sources. The first source is the Sustainable Cities Index, an annual report that focuses on the three pillars of sustainability, which was developed through a collaboration between ARCADIS and the United Nations Human Settlements Program (UN-HABITAT).[1] Its main goal is to establish a comprehensive rating system for the 100 most sustainable cities. Some of the notable cities covered in this study are Copenhagen, Singapore, Stockholm, and Melbourne (Arcadis, 2022). In addition, Curitiba, which was distinguished with the Smart City Award of the Year by the Smart City Expo World Congress in 2023, is recognized for its innovative city strategies, projects, and ideas that are set to impact the lives of citizens and enhance the overall quality of urban living.

In essence, the research not only facilitates a nuanced understanding of sustainable urbanization but also contributes to a collective assessment of a broad spectrum of best practices. The argument put forth suggests that this wealth of information can serve as a valuable tool for recognizing patterns and success indicators in sustainable urbanization cases. Consequently, it is anticipated that this insight will aid in the selection and adaptation of proven strategies to novel contexts, fostering a climate that encourages innovative approaches to sustainable urban development.

Understanding sustainable urbanization

The escalating challenges faced by rapidly urbanizing cities around the world underscore the urgent need for sustainable urbanization. As urban populations burgeon, so too do the environmental pressures, from heightened greenhouse gas emissions to increased strain on natural resources. This surge in urbanization not only intensifies ecological challenges but also presents complex socio-economic issues, including housing shortages, transportation congestion, and public health concerns. It is in this context of growing urban challenges that the need for sustainable urbanization becomes clear. Sustainable urbanization strategies offer a pathway to address these multifaceted problems by promoting environmentally friendly practices, enhancing social inclusivity, and driving economic viability. By transitioning to sustainable urban development models, cities can not only mitigate their environmental impact but also improve the overall quality of life for their inhabitants, creating resilient, livable, and dynamic urban spaces.

In other words, sustainable urbanization is an approach that aims to develop long-term and comprehensive solutions to challenges in cities (Arıcan, 2020, p. 22). This holistic perspective emphasizes an integrated vision and action that combines different aspects of urban development

[1] Sustainability has three main pillars that need to be considered. The Social component includes factors that contribute to the quality of life such as education, work, and health. The Environmental component assesses how environmentally friendly a city is based on factors such as pollution levels, recycling initiatives, and the expansion of green zones. The Economic component is determined by evaluating the city's residents' economic health criteria. A holistic approach is essential as it ensures a comprehensive understanding of a city's sustainability, covering social, environmental, and economic dimensions.

and aims to achieve long-term results. To manage the impacts of urbanization on ecology, human health, and the economy, it is essential to understand the history and dynamics of the urbanization process, particularly land cover and land use changes (Dong *et al.*, 2020, p. 2).

Sustainable urbanization goes beyond green infrastructure and energy-efficient technologies to build resilient and livable cities with high quality of life that can adapt to climate change (M. Li *et al.*, 2020, p. 870). This implies the need to address the complexity of the ecological, health and economic impacts of urbanization.

Understanding the history of urbanization, and in particular changes in land cover and use, is critical for assessing the environmental impacts of urbanization. Urbanization leads to changes in land cover and use patterns in the process of transforming natural landscapes into urban areas. These changes lead to habitat loss, soil degradation, increased air pollution and increased demand for natural resources. Effective urban management, environmental protection, and resource management strategies can be developed by comprehending these impacts (Snieška & Zykiene, 2014, pp. 248–250).

Although sustainable urbanization is increasingly pivotal in our contemporary society, a significant challenge it presents is the risk of eroding cultural and historical heritage in the wake of modernization efforts. Often, the rush to modernize can lead to the neglect of traditional urban layouts and the destruction of areas rich in historical significance (Rodwell, 2008). Consequently, it is essential that sustainable urbanization strategies are thoughtfully designed to preserve and honor the legacy of past generations, as well as to protect the cultural richness cherished by current populations. This approach ensures that progress does not come at the cost of invaluable historical and cultural treasures.

Sustainable urbanization includes a range of strategies and initiatives aimed at creating livable cities that adapt to climate change. Strategies that promote compact and mixed use, improve public transportation systems, implement green infrastructure, and increase the use of renewable energy are the cornerstones of this approach. By implementing these measures, cities can reduce greenhouse gas emissions and air pollution, support biodiversity and create more equitable communities (C. Li *et al.*, 2022, p. 1; Pozoukidou, 2014, p. 7).

The achievements of sustainable urbanization include a reduction in the necessity for long-distance transportation, thereby lowering carbon emissions through the promotion of compact urban development. Simultaneously, sustainable transportation systems are developed, public transportation is encouraged, pedestrian and bicycle-friendly infrastructures are created, and support for cleaner vehicles is emphasized. Through the implementation of these practices, cities can diminish their carbon footprint, alleviate traffic congestion and air pollution, and foster healthy lifestyles for their residents.

The link between sustainable urbanization and the climate crisis

Climate change is a global phenomenon affecting every aspect of urban life. Rising temperatures are leading to rising sea levels, extreme weather events of increasing frequency and severity, and the spread of tropical diseases. These impacts have costly and profound effects on cities' infrastructure, services, housing, livelihoods, and public health. Urban activities are also major sources of greenhouse gas emissions, with cities responsible for around 75% of global CO2 emissions, with transportation and buildings being the sectors with the largest shares (UNEP, 2023).

Urban flooding is a result of the soil's reduced ability to absorb rainwater due to expanding cities and urban infrastructure replacing natural landscapes. The increase in extreme weather events associated with climate change increases the risk of frequent and severe urban flooding. In a world where more than half of the population lives in cities and this proportion is expected to increase in

the coming decades, cities bear the brunt of natural disasters. The world's largest cities, especially along coastlines, rivers, and floodplains, are most vulnerable when natural disasters occur. Scientific forecasts predict that climate change will make millions of people more vulnerable to disasters such as floods, landslides, and extreme weather in the coming decades (Kacyira, 2012).

For example, coastal cities in Asia are at risk of coastal flooding, while other cities may face river flooding and flooding. On a continent where around 1.2 billion people face the threat of flooding and inundation, the impact of these threats is even greater, especially in large cities with populations of over 10 million (Inoue, 2022). In the United States, it is estimated that a one meter rise in sea level in cities such as New York could cause major damage to the US economy by inundating coastal areas, as well as affecting subway systems, treatment plants, power plants and factories.

The contribution of urbanization to climate change leads to various negative environmental impacts such as the urban heat island effect, flooding, and air pollution (Pirouz *et al.*, 2020, p. 2). The urban heat island effect occurs when urban areas retain more heat than surrounding rural areas due to the high density of buildings and pavements. This causes temperatures to rise in cities, increasing energy consumption for cooling and generally raising local temperatures. Increased energy demand contributes to greenhouse gas emissions, exacerbating the effects of climate change. The urbanization process also contributes to air pollution from vehicles, industrial activities, and energy consumption. These pollutants contribute to global warming and have negative impacts on air quality, human health, and ecosystems (Walsh *et al.*, 2013).

Comparing major cases of sustainable urbanization

As we delve into the practical application of sustainable urbanization, we turn our focus to a selection of case studies that exemplify diverse and innovative approaches. The cities chosen for this analysis – Copenhagen, Curitiba, Singapore, Stockholm, and Melbourne – have been at the forefront of integrating sustainability into their urban fabric. These cities inherently prioritize the environment by placing a strong emphasis on maximizing green spaces. Consequently, their goal is to offer a sustainable, long-term solution to urban living that can endure changes over time, with careful consideration given to the needs of future generations.

As shown in Table 1, each city has demonstrated leadership in tackling the environmental challenges unique to their geographical and socio-economic contexts. These case studies were selected not only for their successes but also for the variety of their strategies, offering a broad perspective on how different urban environments adapt to the challenges of sustainability. By examining these examples, we aim to highlight the unique initiatives and policies that have made these cities models of sustainable urban development, providing valuable lessons and inspiration for other urban areas worldwide.

A comparative study in the European Union documented that sustainable urbanization strategies implemented in smart cities improve quality of life by facilitating social interaction and access to services and reduce energy consumption through green building designs and energy efficient solutions (Liang *et al.*, 2017; Zaballos *et al.*, 2021).

In Copenhagen, Denmark, the city has implemented several initiatives to reduce carbon emissions and create a greener and more environmentally friendly urban environment through sustainable urbanization practices. First, 98% of all homes in Copenhagen today are connected to a district heating system. Additionally, by 2022, 68% of hotel rooms in Copenhagen will be eco-certified, and 58% of hotels in the capital have certifications such as Green Key, ISO certification, or The Nordic Swan ecolabel.

Secondly, the Municipality of Copenhagen has an extensive network of 546 kilometers of bicycle lanes. An average of 84 million Danish kroner has been invested each year in cycling initiatives in

Copenhagen over the last 10 years. In 2021, 35% of Copenhageners chose to cycle to work or school every day. Buses in Copenhagen are increasingly going electric; In 2020, all five port buses will be electric, marking the world's first fully electric water-related public transport project.

Table 1. The most successful sustainable city examples

Copenhagen: A Model for Green Urban Living	**District Heating System:** Copenhagen has connected 98% of its homes to a district heating system, significantly reducing carbon emissions. **Eco-Certified Accommodations:** By 2022, 68% of hotel rooms in Copenhagen are eco-certified, with many holding certifications like Green Key and The Nordic Swan ecolabel. **Cycling Infrastructure:** The city boasts 546 km of bicycle paths, with a substantial annual investment in cycling projects, leading to 35% of residents cycling to work or school. **Electric Public Transport:** Copenhagen has introduced electric buses, including the world's first fully electric water-related public transport project. **Innovative Cooling Systems:** One-third of hotel rooms use water from the Port of Copenhagen for cooling, significantly reducing CO2 emissions.
Curitiba: Sustainable Urban Pioneer	**Revolutionary Public Transport:** Curitiba's bus rapid transit system features express lanes and rapid boarding, enhancing efficiency and lowering emissions. **Green Space Expansion:** The city has planted 1.5 million trees and established numerous parks, using green spaces to combat urban flooding innovatively. **Effective Recycling Programs:** Approximately 70% of Curitiba's trash is recycled, with incentives provided for recycling. **Educational Initiatives:** The University of the Free Environment and other educational programs raise awareness and knowledge about sustainability.
Singapore: Island of Sustainability	**Water Scarcity Solutions:** Singapore has developed a groundbreaking wastewater recycling system, reusing 40% of its water. **Circular Economy Approach:** The city is recycling waste into construction material and reducing landfill waste, supported by an extensive public transport and cycling network. **Sustainable Building Practices:** Singapore aims to green 80% of its buildings by 2030, employing techniques like roof gardens and green walls. **Smart Transportation Policy:** Indeed, it contributes significantly to the establishment of a highly sustainable urban transport system.
Stockholm: Green Urban Leader	**Renewable Public Transport:** Stockholm's public transport system, primarily running on renewable energy, significantly reduces emissions. **Cycling Infrastructure:** Investment in cycling infrastructure and bike-sharing systems supports Stockholm's sustainable transport goals. **Energy Transition:** The city aims to eliminate fossil fuels by 2040, with 70% of energy consumption already from renewable sources. **Waste Management and Green Spaces:** Stockholm excels in recycling and green space maintenance, contributing to its sustainable urban landscape.
Melbourne: Innovator in Sustainability	**Sustainable Transport System:** Melbourne's public transport network is powered by renewable energy, reducing greenhouse gas emissions. **Renewable Energy and Waste Reduction:** The city is transitioning to renewable energy and aims for zero waste to landfills by 2030. **Sustainable Building and Green Spaces:** Policies promoting sustainable buildings and the protection of green spaces highlight Melbourne's commitment to sustainability. **Water Resources Management:** Melbourne adopts the integrated water cycle management method, which effectively coordinates all aspects of the water cycle.

Source: Produced by the author.

Third, a significant environmental impact is achieved thanks to the fact that one-third of Copenhagen's hotel rooms (more than 8,000) are cooled with water from the Port of Copenhagen, resulting in a reduction in CO2 of up to 70% compared to standard air conditioners. Similarly, the Royal Danish Theater (Skuespilhuset) in Copenhagen uses port water and thermoactivated structures to cool or heat the building. This initiative is part of the EU-funded project ECO-Culture, which also includes the Amsterdam Library and the New Opera House in Oslo.

Finally, these initiatives, which include strengthening bicycle- and pedestrian-friendly infrastructure, investments in renewable energy, and the development of sustainable waste management systems, have positioned Copenhagen as a global leader in sustainable urbanization (Co, 2022; Liverino, 2023; Urbanlifecopenhagen, 2023).

Curitiba, the capital of the Brazilian state of Parana, has a significant and diverse history. Originally a cultural and economic center surrounded by farmland in the 19th century, the city transformed over time, particularly in the 1940s with the mechanization of soybean farming. This shift led to a doubling of the city's population within two decades, turning Curitiba into a bustling but polluted municipality. The pivotal moment for positive change occurred in 1972 when Jaime Lerner became the mayor and implemented a sustainable city plan, introducing several innovative solutions for sustainable urbanization.

Curitiba has implemented a revolutionary bus rapid transit system that features express lane roads exclusively for buses, buses designed for rapid boarding, and consistent and affordable ticket prices. This system has contributed significantly to maintaining a fast, economical, and low-emission public transportation system. The effectiveness of this system is complemented by the city's pedestrian-only streets and bicycle paths, which further enhance the overall transportation experience.

Curitiba has been actively pursuing green initiatives since the 1970s, planting 1.5 million trees and establishing 28 public parks. To tackle the problem of flooding that used to haunt the city, Curitiba took an innovative approach by surrounding the urban area with grass fields. This helped to avoid the need for expensive and environmentally damaging dams. Interestingly, instead of using machinery to maintain the fields, the city employed sheep which benefited farmers with fertilizer and wool. This not only saved resources but also reduced reliance on oil.

Curitiba has implemented a highly successful recycling program, with around 70% of its waste being recycled. The program offers incentives such as bus tokens, notebooks, and food in exchange for recyclables. This initiative not only helps with environmental conservation but also supports education, increases access to food, and facilitates transportation for the urban poor.

The University of the Free Environment in Curitiba is an important institution in empowering the city's underprivileged population and educating them about sustainability. Through informative boards and signs installed throughout the city, citizens are made aware of its environmentally-friendly design. This emphasis on education helps create a culture of awareness and pride in sustainability, which in turn contributes to the preservation of Curitiba's green spaces.

To sum up, Curitiba's path towards sustainable urbanization highlights creative answers to public transportation, green space management, recycling, and education. These efforts have not only changed the city's environmental impact but also tackled social and economic issues, making Curitiba an exceptional model of sustainable urban development (Berzins, 2020; Cabral, 2022; Gortázar, 2023; Larbi *et al.*, 2022).

Singapore is a small island nation located at the southern tip of the Malay Peninsula with a population of approximately 6 million people. It has now emerged as one of Asia's leading cities in terms of environmental friendliness. The journey towards sustainable urbanization in Singapore was initially faced with pollution, limited resources, and hygiene issues. Despite these challenges, Singapore has made a remarkable transformation and has become a model of sustainability since gaining independence in 1965. The country has allocated around 46.5% of its compact 719 km² territory to green areas. Below, you can find out how Singapore achieved its sustainability goals.

Singapore has been facing water scarcity due to limited resources and a growing population. To tackle this issue, the city has invested significantly in research, development, and innovation over the past 50 years. Despite being one of the most water-stressed countries globally, Singapore has made remarkable progress in addressing water scarcity. It has effectively managed gas emissions and

polluted rivers and implemented a pioneering wastewater recycling system. At present, Singapore residents reuse around 40% of water, which is a significant achievement in overcoming water scarcity.

Singapore's 'Clean and Green' campaign aims to achieve all 17 Sustainable Development Goals (SDGs) by 2030 through circular economy initiatives. One of its primary objectives is to recycle waste into civil construction material, with a target to reduce landfill waste by 30% by 2030. The sustainability of urban areas heavily relies on the presence of an efficient, affordable, and modern public transport system. Despite Singapore's transport network facing limitations in terms of openness to development, the city receives public praise for its commitment to incorporating data in transport planning. This extends from initiatives in electric vehicles to overarching strategies, collectively contributing to the establishment of a highly sustainable urban transport system. Additionally, Singapore has made considerable progress in its use of natural gas and solar energy, making it one of the most carbon-efficient nations worldwide.

Singapore is a densely populated city with many tall buildings, and it aims to make at least 80% of its buildings green by 2030 in line with circular economy principles. To achieve this goal, the city uses various techniques such as installing roof gardens and green walls on all city buildings. Notably, Changi Airport has won the title of the World's Best Airport eight times, which reflects the city's commitment to sustainable building practices.

These points clarify that Singapore has successfully tackled social, economic, and environmental challenges by prioritizing green development. The city-state's commitment to sustainability is evident in its innovative and circular solutions, making it a global example. By encouraging citizens to adopt sustainable practices through biophilic design principles, Singapore has achieved a harmonious balance between human and environmental factors. By keeping sustainability at the forefront, Singapore has not only attained independence, but has also emerged as a global leader in development and environmental responsibility (Curien, 2017; Igini, 2023; Joson, 2022; Singapore Green Plan 2030, 2023; Tavares, 2023; Venkateshwaran, 2021).

Stockholm, the capital of Sweden, has undergone a remarkable transformation towards sustainability in recent years, setting an example for cities worldwide. The city's commitment to environmental responsibility emerged in the 1980s in response to environmental crises, including air and water pollution. Since then, Stockholm has implemented several initiatives to become a green and sustainable city.

Stockholm has made significant investments to reduce emissions and enhance efficiency in its transportation, energy, waste management, and green spaces. Public transport is a key component of this strategy, with the city boasting an extensive metro system, and buses and trains running on renewable energy sources. As a result, public transport now accounts for 80% of all trips taken in the city, significantly reducing traffic congestion and emissions. The city has also prioritized cycling as a sustainable mode of transportation, with investments in dedicated cycling lanes, parking facilities, and bike-sharing systems. These efforts have made cycling a convenient and accessible option for residents.

Stockholm has set an ambitious goal of eliminating fossil fuels from its energy mix by 2040. To achieve this, the city has made substantial investments in renewable energy sources, such as wind and solar power, which currently account for 70% of its energy consumption. The city also promotes sustainable building practices by enforcing strict energy efficiency standards, encouraging the use of eco-friendly materials, and providing financial incentives to building owners to enhance energy efficiency. Green roofs are also encouraged. Stockholm's comprehensive waste management system prioritizes recycling and composting, with a goal to achieve zero waste by 2040. As of 2021, over 99% of the city's waste is recycled. Finally, the city prioritizes green spaces, parks, and nature reserves, providing residents with opportunities to connect with nature and improve overall well-being.

Despite making progress, Stockholm has had to deal with several challenges, including the high cost of sustainable infrastructure and technology. However, the city has successfully tackled these challenges through collaborations between the private and public sectors, seeking funding from international organizations, and offering financial incentives to encourage residents and businesses to adopt sustainable practices. To sum up, Stockholm's approach towards sustainability is holistic, covering transportation, energy, construction, waste management, and urban green spaces. The city's commitment to overcoming challenges and adopting sustainable practices has made it a global leader in sustainable urban development (Adem Esmail *et al.*, 2022; Anna Hult, Jonathan Metzger, 2013; Brokking *et al.*, 2021; EARTH5r, 2023; Jerlmyr, 2021).

Last but not least, Melbourne, the second-largest city in Australia, has been a pioneer in sustainability efforts for a long time. The city has taken significant steps towards reducing its environmental impact, from promoting sustainable transportation to encouraging the use of renewable energy sources. Here are some of the ways Melbourne is leading the charge in sustainability:

Melbourne boasts one of the world's most sustainable transport systems, which emits 70% fewer greenhouse gas emissions than driving. The city has an extensive public transport network that includes trams, buses, and trains powered by renewable energy sources like wind and solar. Melbourne also offers a robust bike-share program and has dedicated bike lanes, making cycling a viable option for commuters. With a goal of reaching net-zero emissions by 2050, Melbourne has taken decisive steps to transition to renewable energy sources. Over 40% of the city's electricity comes from renewable sources like wind and solar, and Melbourne continues to invest in large-scale renewable energy projects. For instance, Melbourne's iconic Flinders Street Station is powered by a 20kW solar panel. Melbourne has implemented several initiatives to reduce waste, including recycling and composting programs. The city's recycling program is among the world's most comprehensive, with over 80% of waste being recycled or composted. Additionally, Melbourne has introduced a ban on single-use plastics such as straws and plastic bags to combat plastic waste. The city aims to achieve zero waste to landfills by 2030. The city has implemented policies promoting sustainable building practices. New buildings must meet stringent energy efficiency standards, and Melbourne invests in renovating existing structures to enhance energy efficiency. Melbourne City Hall 2 is a notable example of a building that utilizes natural ventilation and a trigeneration system to reduce energy consumption. Melbourne is renowned for its green spaces, and the city has policies to protect and enhance these areas. With over 480 parks and reserves, including the Royal Botanic Gardens with more than 8,500 plant species, Melbourne actively promotes green initiatives such as rooftop gardens and green walls to increase urban green space. Melbourne implements integrated water cycle management, coordinating all aspects of the water cycle such as water consumption, rainwater harvesting, wastewater, and groundwater. This comprehensive approach yields various benefits for the broader basin (Frantzeskaki *et al.*, 2022; James, 2014, pp. 15–17; UN-Habitat, 2022; Urban Water, 2023; Yigitcanlar *et al.*, 2008).

To put it briefly, Melbourne's commitment to sustainable practices has not only enhanced the environment but also created a more livable city for its residents. As other cities aim to reduce their environmental impact, Melbourne's sustainability efforts stand as a model for emulation these and other examples highlight the vital role cities play in mitigating the climate crisis and achieving sustainable development goals.

In our comparative analysis of sustainable urbanization, distinct patterns and strategies emerge from the case studies of Copenhagen, Curitiba, Singapore, Stockholm, and Melbourne. While Copenhagen excels in energy efficiency with its district heating system, Curitiba's bus rapid transit system stands out for its innovative approach to public transportation. Singapore's focus on overcoming water scarcity and its investment in circular economy initiatives demonstrate a strong

commitment to resource management, contrasting with Stockholm's extensive investment in renewable energy and public transportation to reduce emissions. Melbourne, on the other hand, showcases a comprehensive approach to waste management and sustainable building practices. These contrasting strategies highlight the cities' adaptation to their specific environmental challenges and resource availabilities. However, a common thread across all these cities is the emphasis on integrating sustainable practices into the urban fabric to improve quality of life while minimizing environmental impact. This comparative analysis underscores that while there is no one-size-fits-all solution to sustainable urbanization, the core principles of resource efficiency, sustainable mobility, green infrastructure, and community involvement are universally applicable. The success of these cities provides valuable lessons for other urban areas striving to achieve sustainable development in the face of climate challenges.

As a general overview, each city has its strengths and innovative ways of achieving sustainable urbanization, which helps climate resilience and improves quality of life. Even though strategies may differ depending on the local contexts and resources, the fundamental principles of sustainable urbanization, such as resource efficiency, sustainable mobility, green infrastructure, community involvement, and innovative solutions, remain consistent across various urban settings.

Potential challenges and solutions for sustainable urbanization

The exploration of sustainable urbanization practices in cities like Copenhagen, Curitiba, Singapore, Stockholm, and Melbourne not only highlights the current achievements but also opens up avenues for future development in this field. These case studies demonstrate that while significant progress has been made, the journey towards truly sustainable urbanization is ongoing and evolving. Looking ahead, the prospects for sustainable urbanization lie in leveraging technological advancements, fostering community engagement, and enhancing policy frameworks. The future will likely see an increased integration of smart city technologies, which could offer more efficient resource management and better quality of life. Moreover, the role of public participation and grassroots initiatives in shaping urban policies will become increasingly crucial. As we move forward, it is imperative that cities continue to learn from each other, adapting successful strategies to their unique contexts and challenges. The next phase of sustainable urbanization will involve not just the expansion of green infrastructure but also a deeper focus on social equity, economic viability, and resilience to environmental challenges, setting a blueprint for future cities to follow.

Sustainable urbanization holds promise in tackling the climate crisis, but it also brings significant challenges. The inadequacy of existing infrastructure, especially old and inefficient systems such as transportation and building networks, is one of the biggest obstacles to these initiatives. Cities can overcome this challenge by renovating existing structures and adding energy efficiency and environmentally friendly solutions.

However, it can be argued that it is not economically viable, particularly in developing countries. The implementation of sustainable urban development strategies often requires significant financial investment, which may not be feasible or a priority for cities that have limited resources or more pressing needs (United Nations Department of Economic and Social Affairs Population Division, 2019). In other words, resource constraints in low- and middle-income countries are another barrier that makes sustainable urbanization difficult. International cooperation and financial support can help these countries overcome these challenges by building their capacities and implementing sustainable practices.

Another barrier is the lack of awareness and understanding of sustainable urbanization among residents and stakeholders. Education and awareness-raising campaigns on the importance of sustainable urbanization can fill this knowledge gap.

Maintaining the balance between economic growth and environmental sustainability is another challenge. Economic growth must be sustained without causing environmental degradation. Effective governance and policy implementation are essential to achieve sustainable urbanization goals. Population growth and urban sprawl, without proper planning and management, can lead to overcrowding, increased pressure on infrastructure and resources, and a decline in quality of life (Yang *et al.*, 2020, p. 2). Explores governance's role in sustainable urbanization is of critical importance. However, political will, corruption, and bureaucratic inefficiencies can impede sustainable urban policy implementation (Anguelovski, 2016, p. 1).

Sustainable urbanization offers an approach that encompasses environmental, social, and economic well-being. Creating inclusive and livable communities, prioritizing affordable housing, access to health and education, and cultural diversity strengthens social equity and economic prosperity. Promoting green job opportunities, entrepreneurship and investment in clean technologies can build a sustainable economy (Iwan & Poon, 2018).

As a result, sustainable urbanization facilitates the development of resilient, inclusive, and sustainable cities that stand at the intersection of environmental progress, economic growth, and social needs.

Conclusion

This study's examination of various approaches to sustainable urbanization in global cities such as Copenhagen, Curitiba, Singapore, Stockholm, and Melbourne has shed light on diverse strategies and their impact on mitigating climate change. While each city offers unique solutions tailored to its specific challenges, they all share a common goal of enhancing urban resilience and sustainability. Examples ranging from Copenhagen's pioneering district heating systems to Curitiba's innovative public transport underscore the potential of urban areas to act as catalysts for environmental and social transformation.

However, the journey toward sustainable urbanization is fraught with challenges. The delicate balance between economic growth, environmental preservation, and social equity becomes particularly pronounced in developing countries where resources are limited. This necessitates a stronger emphasis on international cooperation, technological transfer, and policy innovation to bolster these regions in their sustainability endeavors.

Looking ahead, there is a clear need for further research into the long-term effects of these urbanization strategies. Studies could focus on the scalability of successful initiatives and their adaptability to different socio-economic contexts. Additionally, research into the integration of emerging technologies such as smart city data analytics and artificial intelligence into sustainable urban planning holds promise.

Consequently, despite significant strides in sustainable urbanization, there remains a vast landscape of untapped potential. Future policy formulations should ensure that the path to sustainability is inclusive and equitable, taking into account not only environmental aspects but also socio-economic impacts. As cities continue to grow and evolve, they must be prepared, adaptable, and resilient to the challenges and opportunities of the future in the era of climate change.

The proliferation of sustainable cities is a crucial argument in the fight against the climate crisis. Therefore, the following policy recommendations come to the fore in terms of disseminating sustainable urbanization practices:

Advocacy for Increased International Cooperation: Advocate for increased international cooperation, especially between developed and developing countries, to facilitate the transfer of sustainable urbanization technologies, best practices, and knowledge sharing.

Financial and Technical Support for Developing Countries: Develop policies that provide financial and technical support to developing countries in their sustainable urbanization efforts. This support must address the unique challenges facing these nations, considering the delicate balance between economic growth, environmental protection, and social equity.

Encouraging Policy Innovation: Encourage and support policy innovation at both local and national levels. Governments must create an enabling environment to experiment with new, sustainable urbanization strategies that can solve specific challenges in their regions.

Allocation of Resources for Research: Allocate resources for further research on the long-term impacts of sustainable urbanization strategies. Prioritize studies that examine the scalability of successful initiatives and their adaptability to various socio-economic contexts.

Support for Technology Integration: Support the integration of emerging technologies such as smart city data analytics and artificial intelligence into sustainable urban planning. Invest in research and development to explore the potential benefits and challenges associated with implementing these technologies.

Emphasis on Inclusive and Equitable Policies: Emphasize the importance of inclusive and equitable policies. Future urbanization strategies should not only focus on environmental aspects but also consider socio-economic impacts, ensuring that the benefits of sustainable urbanization are shared by all segments of the population.

Encouragement of Adaptation and Resilience: Encourage cities to develop and implement strategies that increase adaptation and resilience. This includes preparing for both the challenges and opportunities that may arise in the context of climate change and evolving urban landscapes.

Implementation of Awareness and Education Campaigns: Implement awareness and education campaigns to engage citizens in the sustainable urbanization process. Public support is vital to the success of long-term policies, and informed communities can contribute significantly to achieving sustainability goals.

These policy recommendations aim to address the complexities of sustainable urbanization, recognizing the diversity of challenges faced by different cities and regions around the world. The proposed policies prioritize collaboration, innovation, research, inclusivity, and adaptability to ensure a comprehensive and effective approach to sustainable urban development.

Bibliography

Abdulai, I. A., Kuusaana, E. D. & Ahmed, A. (2023). Toward sustainable urbanization: Understanding the dynamics of urban sprawl and food (in)security of indigenous households in peri-urban Wa, Ghana. *Journal of Urban Affairs*, 1–26. DOI: 10.1080/07352166.2023.2224023

Abubakar, I. R. & Dano, U. L. (2018). Socioeconomic challenges and opportunities of urbanization in Nigeria. In Benna, U., & Benna, I. (Eds.), *Urbanization and its impact on socio-economic growth in developing regions*, (pp. 219–240). IGI Global. DOI: 10.4018/978-1-5225-2659-9.ch011

Abubakar, I. R. & Dano, U. L. (2020). Sustainable urban planning strategies for mitigating climate change in Saudi Arabia. *Environment, Development and Sustainability*, *22*(6), 5129–5152. DOI: 10.1007/s10668-019-00417-1

Adem Esmail, B., Cortinovis, C., Suleiman, L., Albert, C., Geneletti, D. & Mörtberg, U. (2022). Greening cities through urban planning: A literature review on the uptake of concepts and methods in Stockholm. *Urban Forestry & Urban Greening*, *72*, 127584. DOI: 10.1016/j.ufug.2022.127584

Al Mamun, A., Hayat, N., Masud, M. M., Makhbul, Z. K. M., Jannat, T. & Salleh, M. F. M. (2022). Modelling the significance of value-belief-norm theory in predicting solid waste management ıntention and behavior. *Frontiers in Environmental Science*, *10*.
DOI: 10.3389/fenvs.2022.906002

Anguelovski, I. (2016). From Toxic Sites to Parks as (Green) LULUs? New challenges of ınequity, privilege, gentrification, and exclusion for urban environmental justice. *Journal of Planning Literature*, *31*(1), 23–36.
DOI: 10.1177/0885412215610491

Anna Hult, Jonathan Metzger, A. R. O. (2013). *Just how sustainable is Stockholm?* Chinadialogue. https://chinadialogue.net/en/cities/6434-just-how-sustainable-is-stockholm/

Arcadis. (2022). The Arcadis sustainable cities index 2022: Prosperity beyond profit. *Arcadis Website*. https://images.connect.arcadis.com/Web/Arcadis/%7Be08e5cda-768d-46a3-91ce-4efe16cbfc05%7D_The_Arcadis_Sustainable_Cities_Index_2022_Report.pdf

Arıcan, M. (2020). Policies concerning urban safety and urbanization in Istanbul. *Annals of Social Sciences & Management Studies*, *5*(2).
DOI: 10.19080/ASM.2020.05.555657

Berzins, R. (2020). Sustainability In Curitiba, Brazil. *The Borgen Project*. https://borgenproject.org/sustainability-in-curitiba/

Boucher, M. (2015). The political economy of sustainable urbanization. *Journal of Integrated Studies*, *6*(1), 1-14.

Brokking, P., Mörtberg, U. & Balfors, B. (2021). Municipal practices for ıntegrated planning of nature-based solutions in urban development in the Stockholm region. *Sustainability*, *13*(18), 10389.
DOI: 10.3390/su131810389

Cabral, P. (2022). Curitiba, Brazil: A sustainable city. *CGTN America*. https://america.cgtn.com/2022/10/10/curitiba-brazil-a-sustainable-city

Cerdas, F., Titscher, P., Bognar, N., Schmuch, R., Winter, M., Kwade, A. & Herrmann, C. (2018). Exploring the Effect of ıncreased energy density on the environmental ımpacts of traction batteries: A comparison of energy optimized lithium-ıon and lithium-sulfur batteries for mobility applications. *Energies*, *11*(1), 150.
DOI: 10.3390/en11010150

Chan, F. K. S. & Chan, H. K. (2022). Recent research and challenges in sustainable urbanisation. *Resources, Conservation and Recycling*, *184*, 106346.
DOI: 10.1016/j.resconrec.2022.106346

Co, G. (2022). Green city goals: 8 reasons why Copenhagen ıs the world's greenest city. *8shades*. https://www.8shades.com/green-city-goals-copenhagen-sustainability/

Curien, R. (2017). Singapore, a model for (sustainable?) urban development in China. *China Perspectives*, *2017*(1), 25–35.
DOI: 10.4000/chinaperspectives.7183

de Jong, M. (2019). From eco-civilization to city branding: A neo-marxist perspective of sustainable urbanization in China. *Sustainability*, *11*(20), 5608.
DOI: 10.3390/su11205608

Dong, Y., Ren, Z., Fu, Y., Miao, Z., Yang, R., Sun, Y. & He, X. (2020). Recording urban land dynamic and ıts effects during 2000–2019 at 15-m resolution by cloud computing with landsat series. *Remote Sensing*, *12*(15), 2451.
DOI: 10.3390/rs12152451

Drakakis-Smith, D. & Dixon, C. (1997). Sustainable urbanization in Vietnam. *Geoforum*, *28*(1), 21–38.
DOI: 10.1016/S0016-7185(97)85525-X

EARTH5r. (2023). A Look Inside Stockholm's Path To Sustainable Development. *Earth5r*. https://earth5r.org/a-look-inside-stockholms-path-to-sustainable-development/

Enserink, B. & Koppenjan, J. (2007). Public participation in China: sustainable urbanization and governance. *Management of Environmental Quality: An International Journal*, *18*(4), 459–474. DOI: 10.1108/14777830710753848

Fay, M., Wang, J., Draugelis, G. & Deichmann, U. (2014). Role of green governance in achieving sustainable urbanization in China. *China & World Economy*, *22*(5), 19–36. DOI: 10.1111/j.1749-124X.2014.12082.x

Frantzeskaki, N., Oke, C., Barnett, G., Bekessy, S., Bush, J., Fitzsimons, J., Ignatieva, M., Kendal, D., Kingsley, J., Mumaw, L. & Ossola, A. (2022). A transformative mission for prioritising nature in Australian cities. *Ambio*, *51*(6), 1433–1445. DOI: 10.1007/s13280-022-01725-z

Garschagen, M. & Romero-Lankao, P. (2015). Exploring the relationships between urbanization trends and climate change vulnerability. *Climatic Change*, *133*(1), 37–52. DOI: 10.1007/s10584-013-0812-6

Gortázar, N. G. (2023). Curitiba: Brazil's sustainable green gem. *Ediciones El País*. https://english.elpais.com/eps/2023-07-02/curitiba-brazils-sustainable-green-gem.html

Igini, M. (2023). How Sustainable cities like Singapore succeed in green urban development. *Earth.org*. https://earth.org/how-sustainable-cities-like-singapore-succeed-in-green-urban-development/

Inoue, K. (2022). Flood risk rises in Asia as cities grow, land sinks. *Nikkei*. https://asia.nikkei.com/Spotlight/Datawatch/Flood-risk-rises-in-Asia-as-cities-grow-land-sinks

Iwan, A. & Poon, K. K. Y. (2018). The role of governments and green building councils in cities' transformation to become sustainable: Case studies of Hong Kong (East) and Vancouver (West). *International Journal of Sustainable Development and Planning*, *13*(04), 556–570. DOI: 10.2495/SDP-V13-N4-556-570

James, P. (2014). *Urban sustainability in theory and practice: Circles of sustainability*. Routledge. https://www.metropolis.org/sites/default/files/paul_james_urban_sustainability_2015.pdf

Jerlmyr, A. K. (2021). What Stockholm can teach the world about green urban development. *World Economic Forum*. https://www.weforum.org/agenda/2021/09/stockholm-teach-world-about-green-urban-development/

Jones, P. (2017). Formalizing the informal: Understanding the position of ınformal settlements and slums in sustainable urbanization policies and strategies in Bandung, Indonesia. *Sustainability*, *9*(8), 1436. DOI: 10.3390/su9081436

Joson, J. (2022). How Singapore is pioneering the way to creating a greener urban environment. *Arch Daily*. https://www.archdaily.com/976437/how-singapore-is-pioneering-the-way-to-creating-a-greener-urban-environment

Kacyira, A. K. (2012). Addressing the sustainable urbanization challenge. *United Nations*. https://www.un.org/en/chronicle/article/addressing-sustainable-urbanization-challenge

Keleş, R. (2021). Sustainable urbanization and its policy implications. The case of Turkey. *Interdependency between Agriculture and Urbanization: Conflicts on Sustainable Use of Soil and Water*, 119–135. https://om.ciheam.org/om/pdf/a44/02001592.pdf

Lafortezza, R. & Sanesi, G. (2019). Nature-based solutions: Settling the issue of sustainable urbanization. *Environmental Research*, *172*, 394–398. DOI: 10.1016/j.envres.2018.12.063

Larbi, M., Kellett, J. & Palazzo, E. (2022). Urban sustainability transitions in the Global South: a case study of Curitiba and Accra. *Urban Forum*, *33*(2), 223–244. DOI: 10.1007/s12132-021-09438-4

Li, C., Zhang, T., Wang, X. & Lian, Z. (2022). Site selection of urban parks based on fuzzy-analytic hierarchy process (F-AHP): A case study of Nanjing, China. *International Journal of Environmental Research and Public Health*, *19*(20), 13159. DOI: 10.3390/ijerph192013159

Li, M., Jie, Z. & Zhu, Y. (2020). Evaluation on the warning-degree of the ecological carrying capacity of Guangzhou city based on the DPSIR model. *WSEAS Transactions On Business And Economics*, *17*, 869–878. DOI: 10.37394/23207.2020.17.85

Li, S. T., Li, J. & Duan, P. (2016). Relationship between urban heat island effect and land use in Taiyuan City, China. *MATEC Web of Conferences*, *63*, 04024. DOI: 10.1051/matecconf/20166304024

Liang, X., Si, D. & Zhang, X. (2017). Regional sustainable development analysis based on information Entropy—Sichuan province as an example. *International Journal of Environmental Research and Public Health*, *14*(10), 1219. DOI: 10.3390/ijerph14101219

Liu, S., Zhang, P., Jiang, X. & Lo, K. (2013). Measuring sustainable urbanization in China: a case study of the coastal Liaoning area. *Sustainability Science*, *8*(4), 585–594. DOI: 10.1007/s11625-012-0193-1

Liverino, G. (2023). Sustainability in Copenhagen. *Wonderful Copenhagen*. https://www.wonderfulcopenhagen.com/wonderful-copenhagen/international-press/sustainability-copenhagen

Macrotrends. (2023). World population growth rate 1950-2023. *Macrotrends*. https://www.macrotrends.net/countries/WLD/world/population-growth-rate

Ochoa, J. J., Tan, Y., Qian, Q. K., Shen, L. & Moreno, E. L. (2018). Learning from best practices in sustainable urbanization. *Habitat International*, *78*, 83–95. DOI: 10.1016/j.habitatint.2018.05.013

Pirouz, B., Arcuri, N., Pirouz, B., Palermo, S. A., Turco, M. & Maiolo, M. (2020). Development of an assessment method for evaluation of sustainable factories. *Sustainability*, *12*(5), 1841. h DOI: 10.3390/su12051841

Pozoukidou, G. (2014). Land use transport interaction models: Application perspectives for the city of Thessaloniki. *Spatium*, *32*, 7–14. DOI: 10.2298/SPAT1432007P

Ritchie, H. & Roser, M. (2019). Urbanization. *Our World in Data.* https://ourworldindata.org/urbanization

Roders, A. R. P. (2014). How can urbanization be sustainable? : a reflection on the role of city resources in global sustainable development. *Architectural History and Theory*, *13*(1), 79–90.

Rodwell, D. (2008). *Conservation and sustainability in historic cities*. Wiley-Blackwell.

Schindler, S., Mitlin, D. & Marvin, S. (2018). National urban policy making and its potential for sustainable urbanism. *Current Opinion in Environmental Sustainability*, *34*, 48–53. h DOI: 10.1016/j.cosust.2018.11.006

Shen, L. & Zhou, J. (2014). Examining the effectiveness of indicators for guiding sustainable urbanization in China. *Habitat International*, *44*, 111–120. DOI: 10.1016/j.habitatint.2014.05.009

Singapore Green Plan 2030. (2023). A City of green possibilities. *Greenplan*. https://www.greenplan.gov.sg/

Snieška, V. & Zykiene, I. (2014). The Role of Infrastructure in the Future City: Theoretical Perspective. *Procedia - Social and Behavioral Sciences*, *156*, 247–251. DOI: 10.1016/j.sbspro.2014.11.183

Solly, A., Berisha, E. & Cotella, G. (2021). Towards Sustainable urbanization: Learning from what's out there. *Land*, *10*(4), 356. DOI: 10.3390/land10040356

Song, F., Yang, X. & Wu, F. (2019). Suitable pattern of the natural environment of human settlements in the lower reaches of the Yangtze River. *Atmosphere*, *10*(4), 200. DOI: 10.3390/atmos10040200

Stere, Şerban, Roşca, E., Roşca, M. & Ruscă, F. (2022). Reorganizing students Acces in University Politehnica of Bucharest Campus and influences on car traffic externalities. *Romanian Journal of Transport Infrastructure*, *11*(2), 1–15. DOI: 10.2478/rjti-2022-0015

Tan, Y., Xu, H., Jiao, L., Ochoa, J. J. & Shen, L. (2017). A study of best practices in promoting sustainable urbanization in China. *Journal of Environmental Management*, *193*, 8–18. DOI: 10.1016/j.jenvman.2017.01.058

Tan, Y., Xu, H. & Zhang, X. (2016). Sustainable urbanization in China: A comprehensive literature review. *Cities*, *55*, 82–93. DOI: 10.1016/j.cities.2016.04.002

Tavares, S. (2023). Green city-state: How Singapore is leading the way in sustainable urban development. *Enterinternational.org Website*. https://www.enterinternational.org/singapore_sustainability/

UN-Habitat. (2020). World cities report 2020: the value of sustainable urbanization. *UN Habitat Website*.

UN-Habitat. (2022). World cities report 2022 envisaging the future of cities. *UN Habitat Website* https://unhabitat.org/sites/default/files/2022/06/wcr_2022.pdf

UN. (2018). World Urbanization Prospects 2018. In *United Nations Population Division*.

UNEP. (2023). Cities and climate change. *UN Environment Program Website*. https://www.unep.org/explore-topics/resource-efficiency/what-we-do/cities/cities-and-climate-change

United Nations Department of Economic and Social Affairs Population Division. (2019). *World urbanization prospects: the 2018 revision (ST/ESA/SER.A/420)*.

Urban Water. (2023). *How does urbanisation impact the water cycle?* City of Melbourne.

Urbanlifecopenhagen. (2023). Sustainability. *Urban Design and Planning in Copenhagen*. https://urbanlifecopenhagen.weebly.com/sustainability.html

Vardoulakis, S. & Kinney, P. (2019). Grand challenges in sustainable cities and health. *Frontiers in Sustainable Cities*, *1*. DOI: 10.3389/frsc.2019.00007

Venkateshwaran, O. (2021). *How Singapore became one of the greenest cities in the world: 5 key reasons*. cities future. https://citiesfuture.com/how-singapore-became-one-of-the-greenest-cities-in-the-world-5-key-reasons/

Walsh, C. L., Glendinning, S., Dawson, R. J., England, K., Martin, M., Watkins, C. L., Wilson, R., McLoughlin, A., Glenis, V. & Parker, D. (2013). Collaborative platform to facilitate engineering decision-making. *Proceedings of the Institution of Civil Engineers - Engineering Sustainability*, *166*(2), 98–107.

DOI: 10.1680/ensu.12.00033
World Bank. (2014). *Urban China: Toward Efficient, Inclusive, and Sustainable Urbanization*. The World Bank. DOI: 10.1596/978-1-4648-0206-5
Xiong, W., Chen, B., Wang, H. & Zhu, D. (2020). Public–private partnerships as a governance response to sustainable urbanization: Lessons from China. *Habitat International*, *95*, 102095. DOI: 10.1016/j.habitatint.2019.102095
Xu, Q., Zheng, X. & Zheng, M. (2019). Do urban planning policies meet sustainable urbanization goals? A scenario-based study in Beijing, China. *Science of The Total Environment*, *670*, 498–507. DOI: 10.1016/j.scitotenv.2019.03.128
Yang, Y., Liu, Z., Chen, H., Wang, Y. & Yuan, G. (2020). Evaluating Regional Eco-Green Cooperative Development Based on a Heterogeneous Multi-Criteria Decision-Making Model: Example of the Yangtze River Delta Region. *Sustainability*, *12*(7), 3029. DOI: 10.3390/su12073029
Yeyouomo, A. K. & Asongu, S. A. (2023). Sustainable urbanization and vulnerability to climate change in Africa: Accounting for digitalization and institutional quality. *Sustainable Development*. DOI: 10.1002/sd.2721
Yigitcanlar, T., O'Connor, K. & Westerman, C. (2008). The making of knowledge cities: Melbourne's knowledge-based urban development experience. *Cities*, *25*(2), 63–72. DOI: 10.1016/j.cities.2008.01.001
Zaballos, I. L., Laurenz, A. & Sádaba, J. (2021). Urban green ınfrastructure as a strategy to address urban energy efficiency and sustainability: A case study of Milagrosa (Pamplona). *Sustainability*, *14*(1), 28. DOI: 10.3390/su14010028
Zhang, X. (2016). Sustainable urbanization: a bi-dimensional matrix model. *Journal of Cleaner Production*, *134*, 425–433. DOI: 10.1016/j.jclepro.2015.08.036
Zhong, L., Li, X., Law, R. & Sun, S. (2020). Developing sustainable urbanization ındex: Case of China. *Sustainability*, *12*(11), 4585. DOI: 10.3390/su12114585
Zhou, J., Shen, L., Song, X. & Zhang, X. (2015). Selection and modeling sustainable urbanization indicators: A responsibility-based method. *Ecological Indicators*, *56*, 87–95. DOI: 10.1016/j.ecolind.2015.03.024
Zhou, Q. (2014). A Review of sustainable urban drainage systems considering the climate change and urbanization ımpacts. *Water*, *6*(4), 976–992. DOI: 10.3390/w6040976 n

Notes on contributor

Selçuk Gürçam holds a PhD in Political Science and International Relations, conducting academic studies on the climate crisis and sustainable urbanization policies.

ORCID

Selçuk Gürçam https://orcid.org/0000-0003-0426-329X

Disclosure statement

The author has declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article. The author has received no financial support for the research, authorship, and/or publication of this article.