
Sustainable Urban Development in the Context of Depopulation and Community Ageing: Selected Examples from the World

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Abstract:

Purpose: One of the key challenges faced by contemporary cities is the impact of adverse demographic processes such as depopulation and population ageing. Modern cities are expected to simultaneously maintain a balance across social, economic, and environmental dimensions. A critical tool to support urban adaptation to these changes is undoubtedly the sustainable development of urban areas. The primary objective of this study is to examine how urban sustainable development strategies can assist local communities in addressing adverse demographic changes, while identifying the most effective measures that authorities can employ to meet the needs of an ageing urban population and mitigate the effects of depopulation.

Design/Methodology/Approach: The research encompasses selected cities across various continents, representing diverse demographic and economic contexts. It examines in detail the sustainable urban development strategies that enable municipal authorities to respond effectively to depopulation and the ageing of local populations. Case study selection criteria included cities significantly affected by depopulation and/or high proportions of senior citizens, cities at various stages of implementing sustainable development strategies, and diverse geographical and cultural contexts. The study's research hypothesis posits that cities implementing comprehensive sustainable development strategies are more effective in addressing demographic challenges, enhancing residents' quality of life, and countering further urban degradation. The research employed qualitative analysis, including a review of the literature to identify the most effective sustainable urban development strategies. It also utilised comparative case analysis of cities that have implemented such strategies in the context of an ageing population and depopulation. This international comparative analysis facilitated the identification of best practices and challenges unique to various regions.

Findings: The main challenges and constraints faced by the studied cities included financial and organisational limitations, conflicts of interest among social groups, data shortages, and difficulties in monitoring the long-term effects of implemented measures. Sustainable urban development concerning ageing populations requires both global approaches and local actions tailored to the unique needs of residents. Combining interdisciplinary research with urban planning practices should contribute to the creation of cities that are sustainable and inclusive across generations.

Practical Implications: Future research should focus on analysing the effectiveness of revitalisation efforts in cities with high depopulation rates, developing sustainable housing

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models for older adults, and examining the impact of revitalisation on intergenerational relationships and local communities. Such studies could ultimately lead to the development of more effective tools to support urban transformation.

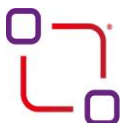
Originality/Value: *The research contributes to a deeper understanding of sustainable urban development and provides specific recommendations for urban policies. The solutions adopted by selected cities located in different parts of the world serve as examples of best practices for other urban areas.*

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1. Introduction

Currently, cities worldwide face complex demographic challenges. Urban authorities are contending with two interconnected phenomena: depopulation and the ageing of local populations. According to estimates, by 2050, over 20% of the global population will be aged 60 or older. This demographic shift necessitates adapting urban spaces to meet evolving social and health requirements, calling for new approaches to urban planning and spatial management (United Nations, 2022).

Many cities grappling with these trends are also experiencing depopulation due to migration to suburban or rural areas. This exacerbates issues such as social stagnation, weakened local economies, the degradation of both social and technical infrastructure, and growing social inequalities.

The principal aim of this study is to examine how sustainable urban development strategies can support local communities in the face of adverse demographic changes and to identify the most effective measures that urban authorities can employ to address the needs of ageing populations and counteract the effects of depopulation.

This goal is addressed through the following research questions:

- Which sustainable development strategies are currently being implemented in cities affected by depopulation and ageing populations?
- What types of urban planning practices and policies most effectively support ageing local communities while mitigating the effects of depopulation?
- Which international examples can be considered as models for counteracting depopulation and supporting ageing populations?

To achieve the outlined objective, the study analyses selected cities across various continents that have implemented innovative solutions in response to changing demographic conditions. The structure and content of the article are shaped by the research hypothesis, which posits that cities adopting comprehensive sustainable development strategies can effectively mitigate the adverse effects of depopulation and ageing populations, thereby improving residents' quality of life and enhancing their economic potential.

Sustainable urban development provides both theoretical and practical frameworks for devising strategies to address these challenges. Cities such as Tokyo, Vienna, Lodz, Detroit, Copenhagen, and Barcelona have proposed diverse approaches to tackling demographic issues.

The research conducted contributes to a deeper understanding of sustainable urban development while offering concrete recommendations for urban policies. The solutions adopted by the selected cities, located across different regions of the globe, serve as examples of best practices for other urban areas. This study may also serve as a foundation for further in-depth research on urban demographics and their adaptation to changing social and economic conditions.

The article is divided into five sections. The second section presents a review of the literature on sustainable urban development and contemporary demographic processes. The third section outlines the research methodology employed in the study. The fourth section discusses case studies of selected cities, focusing on the tools and strategies of sustainable development adopted, while identifying key challenges and limitations. The article concludes with recommendations and directions for future research.

2. Literature Review

The literature review highlights sustainable urban development as a fundamental element contributing to improving societal quality of life and mitigating the adverse effects of ongoing demographic processes. It is also a core component of global initiatives addressing climate change. The interdisciplinary nature of sustainable urban development is emphasised by various definitions of the concept found in English-language literature.

Sustainable urban development is defined as a process harmoniously integrating economic, social, and environmental aspects to maintain balance between these dimensions (UN-Habitat, 2009; Wheeler, 2013; Carmona, 2019). It also entails leveraging advanced technologies to optimise resource management and foster sustainable social development (Bibri and Krogstie, 2017; Tewdwr-Jones, 2018).

Sustainable cities are described as spaces striving for equilibrium between urban needs and environmental preservation (Jenks and Dempsey, 2005). They combine environmental objectives with long-term economic planning (Lombardi *et al.*, 2011) and reconcile contradictions between economic growth, environmental protection, and social equity (Campbell, 1996; Haughton, 1999). These cities apply the *Triple Bottom Line* model, integrating economic, environmental, and social dimensions (Elkington, 1997).

Furthermore, they minimise their ecological footprint, support social integration, and develop according to circular economy principles (Newman and Kenworthy, 1999). Holistic governance characterises such cities, promoting a balance between ecological efficiency and societal well-being (ICLEI, 2011; European Commission, 2021a). They prioritise residents, creating people-friendly public spaces (Gehl, 2010), and implementing efficient, low-emission, and accessible transport and spatial systems suitable for all age groups (Litman, 2021).

Sustainable cities are also expected to be safe and resilient, capable of withstanding global social, economic, and environmental crises (United Nations, 2015; Sassen, 2012). Meeting these expectations necessitates addressing both global environmental challenges and local societal needs (Satterthwaite, 1997).

Depopulation and population ageing, both rooted in local community dynamics, currently represent critical challenges for urban areas. These phenomena significantly impact social structures and cities' ability to maintain functionality and competitiveness (Asian Development Bank and the Inter-American Development Bank, 2014; World Bank, 2023).

The literature attributes contemporary negative demographic trends to factors such as population ageing, deindustrialisation, economic technologicalisation, political neglect (e.g., lack of pronatalist policies), selective urbanisation, internal migration, economic inequalities, globalisation, and climate change (Urban Institute, 2017). These factors pose numerous risks, including weakened local economies, urban space degradation, increased healthcare and social care costs, social fragmentation, reduced local economic innovation, heightened social inequalities, increased crime rates, and diminished investment attractiveness (UN-Habitat, 2009).

These challenging circumstances substantially influence residents' quality of life, local economies, and urban spatial structures. Consequently, it is particularly vital for contemporary cities to develop appropriate adaptive strategies. Such measures

can effectively counteract the adverse effects of population ageing and depopulation while supporting inclusivity, sustainable economies, and improved quality of life for residents (Urban Studies Journal, 2019; Wheeler, 2013)

3. Research Methodology

The study aims to identify effective solutions for urban policy to counteract and/or respond most appropriately to adverse demographic phenomena. To achieve this, an interdisciplinary approach was adopted, combining economic, urban planning, sociological, and ecological analyses. The research utilised, among other sources, statistics on funding for green spaces and housing policies in European cities, including Copenhagen and Barcelona, as available on the Eurostat statistical portal.

Detailed city-level data were derived from compilations such as Urban Audit, which provide urban and regional indicators. These resources included regional statistics on public expenditure in urban revitalisation and social integration. Information about the “Superblocks” project in Barcelona was obtained from the Barcelona City Council and the European Urban Mobility Observatory (Barcelona, Spain). Data on Copenhagen were sourced from the *Copenhagen Sustainability and Climate Action 2021* and official reports from the City of Copenhagen (Copenhagen, Denmark).

Additional data originated from OECD reports on demographic challenges in cities and variations in urban expenditures on revitalisation and technological innovations. These included detailed analyses of technology expenditures in Tokyo and social integration efforts in Vienna. Information from OECD Regional Development and OECD.Stat pertained to investments in green spaces, housing, and technologies across selected cities and regions.

The study also utilised national public sources, such as Japan's Ministry of Internal Affairs, providing data on senior policies and urban revitalisation in the context of population ageing. These data were included in government reports and academic publications (Tokyo, Japan). Further information was obtained from the United States Department of Commerce and publications on urban investments and revitalisation within the private sector, such as reports from the Detroit Economic Growth Corporation (Detroit, USA).

Reports on revitalisation efforts in Lodz were sourced from the City Office, with data on technological solutions derived from the Polish Economic Institute. Housing-related data were obtained from Statistics Poland (Lodz, Poland). Data on intergenerational policies and social housing were drawn from publications by the Swiss Federal Statistical Office (Vienna, Austria).

The study employed qualitative analysis, conducting a literature review to identify the most effective sustainable urban development strategies. A comparative case study method was also used to analyse cities that have implemented sustainable

strategies in the context of an ageing population and depopulation. This analysis of international examples facilitated the identification of best practices and challenges specific to different regions worldwide.

The criteria for selecting case studies included cities experiencing significant depopulation and/or a high proportion of seniors in the population, cities with varying levels of advancement in implementing sustainable development strategies, and diverse geographical and cultural contexts.

As such, the research examined case studies of cities with a substantial elderly population (Tokyo, Vienna, where low fertility rates and increased life expectancy have led to over 29% of residents being seniors), (Ministry of Health, Labour and Welfare, Japan, 2021; City of Vienna, 2022), cities with documented depopulation issues (Detroit, Lodz, which faced mass population outflows following the decline of heavy industry), (Detroit Revitalization Initiative, 2020; Urząd Miasta Łodzi, 2022) and cities that have implemented innovative urban revitalisation and adaptation strategies (Barcelona, Copenhagen, where efforts to attract young, educated individuals to city centres have resulted in depopulation of peripheral areas) (City of Copenhagen, 2021; Barcelona City Council, 2022)

4. Research Results and Discussion

The efficient and effective functioning of cities worldwide is influenced by numerous endogenous and exogenous factors. Among contemporary phenomena significantly impacting this process are depopulation and population ageing. Cities have developed different strategies in response to these challenges. This analysis aims to compare and evaluate the solutions adopted in Tokyo, Vienna, Łódź, Detroit, Copenhagen, and Barcelona, followed by a scientific discussion on their implications.

Table 1. *Strategies adopted by cities in response to demographic challenges.*

City	Key Demographic Challenge	Adopted Solutions	Source
Tokyo	Population ageing and decline	Flexible working hours and support for seniors' continued professional activity.	(Sato and Harada, 2018) (Suzuki et al., 2019) (OECD, 2020) (Asian Development Bank and the Inter-American Development Bank, 2014)
		Development of technologies supporting older adults (e.g., assistive robots).	
		Creation of multifunctional urban spaces catering to all age groups.	
		Promotion of labour migration from outside Japan.	

Vienna		Construction of accessible housing ("Smart Housing Construction Programme") and integrated intergenerational neighbourhoods. A robust social care system addressing senior citizens' needs. Active support for migration as a countermeasure to depopulation. Social integration through intergenerational programmes. Sustainable urban planning (e.g., introduction of ecological zones).	(Pichler-Milanovich, 2017) https://www.wohnfonds.wien.at/ (Urban Studies Journal, 2019) (Habitat International, 2020) (City of Vienna, 2022)
Lodz	Economic emigration due to deindustrialisation	Revitalisation of post-industrial areas—renovating tenement houses and creating recreational spaces. Investment in the local economy and promotion of the city and region to attract younger generations. Family support initiatives, e.g., "Flat" housing programme. Educational programmes for youth and seniors. Support for local businesses.	(Majer, 2019) (Nowak, 2021)
Detroit		Utilisation of abandoned urban land for urban farming. "Right-sizing" strategies to align infrastructure with a smaller population. Investments in culture and art as a tool for urban revitalisation. Attracting investors through tax incentives. Initiatives encouraging new residents, e.g., scholarship programmes. Development of green spaces.	(Detroit Future City Report, 2017) (Gallagher, 2018) (Detroit Revitalization Initiative, 2020) (Urban Land Institute, 2021)
Copenhagen	Internal migration. Urban population challenges	Reduction of living costs through investments in public transport and affordable housing. Green initiatives promoting a healthy lifestyle and social activity. Policies supporting migrant integration as potential new residents. Promotion of green mobility (e.g., cycling). Development of local housing communities.	Danish Planning Institute (2021), Andersen and Lorentzen (2019). (City of Copenhagen, 2021) (European Urban Studies, 2022)
Barcelona		"Superblocks" programme reducing car traffic and transforming city blocks into pedestrian-friendly zones.	(Rueda, 2020), (Ramos et al., 2020)

		Development of affordable housing for young families and seniors.	(Barcelona Urban Studies, 2021) (Barcelona City Council, 2022)
		"Barcelona Activa" programme supporting young talents and economic innovation.	
		Adaptation of urban spaces to accommodate older adults.	

Source: Own elaboration based on the literature indicated in the table.

The data presented in Table 1 illustrates diverse approaches adopted by cities to respond to modern demographic challenges. Tokyo and Barcelona exemplify investment in urban spaces tailored to the needs of both younger and older generations. The "Superblocks" initiative in Barcelona demonstrates how repurposing urban spaces can enhance the quality of life for local communities.

However, the adaptation of these solutions to budgetary constraints and resistance from certain social groups remains an ongoing challenge. Tokyo's incorporation of advanced technologies to support older adults highlights the potential of "smart cities" in addressing demographic issues. Nonetheless, the financial accessibility of such technologies for various social groups poses significant barriers.

Vienna and Copenhagen's migration-supporting policies represent effective yet controversial solutions. Migration, as a remedy for depopulation, introduces challenges such as integrating migrants and ensuring their long-term participation in local socio-economic life.

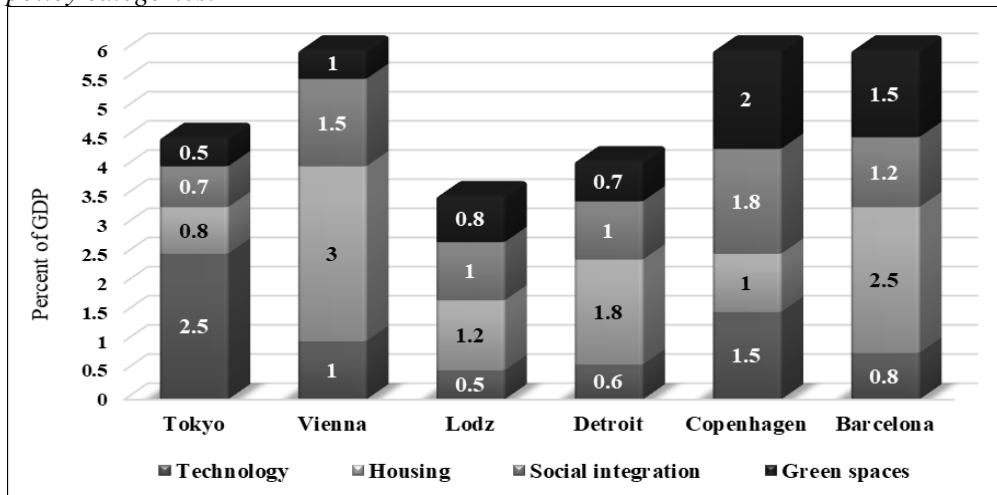
Copenhagen's emphasis on green infrastructure underscores the critical role of environmental quality in retaining residents. Through investments in urban greenery and public transport, the city demonstrates how enhancing the living environment can counteract population outflow.

Lodz and Detroit showcase the potential of urban revitalisation as a tool for addressing demographic and economic challenges. However, the success of such initiatives depends on long-term planning, stakeholder engagement, and substantial initial financial investment. The following bar chart illustrates the percentage of GDP allocated to various demographic policies in the analysed cities. Additionally, it includes a breakdown of investments into key categories: technology, housing, social integration, and green spaces.

The data presented in Figure 1 clearly indicate that Tokyo invests heavily in technological solutions (2.5% of GDP), with a primary focus on projects aimed at supporting the elderly population. The city prioritises smart technologies, such as automated transport systems, that assist senior citizens. Additionally, Tokyo implements policies that encourage the professional activity of older individuals. Urban redevelopment plans emphasise the integration of an ageing population into the city's fabric.

Vienna's demographic policy places a strong emphasis on intergenerational solidarity and social housing, allocating 3% of GDP to these initiatives. Lodz, on the other hand, focuses predominantly on the revitalisation of post-industrial areas, the renovation of tenement houses, and the creation of more recreational spaces for its residents (1.2% of GDP).

Figure 1. *Percentage distribution of GDP for investment in leading demographic policy categories.*



Source: Own elaboration based on: (OECD, 2020a; OECD, 2020b; OECD, 2022; Barcelona Urban Studies, 2021; Barcelona City Council, 2022; Habitat International, 2021; European Environment Agency (EEA), 2023; Eurostat, 2021; Eurostat, 2023a; Eurostat, 2023b; United Nations, 2022; Urban Institut, 2022; Detroit Economic Growth Corporation, 2023; Detroit Revitalization Initiative; 2020 Danish Planning Institute, 2021; GUS, 2021; City of Vienna, 2022)

Equally important are projects supporting the development of local entrepreneurs, young families, and initiatives promoting the education and integration of children and senior citizens. Lodz also fosters entrepreneurial incubators to boost employment and improve the city's economic situation (1% of GDP).

Similarly, Detroit concentrates its investments on the revitalisation of urban spaces. This involves adjusting the scale of infrastructure to accommodate a reduced population, aiming to decrease maintenance costs (1.8% of GDP). Another key focus is social integration (1% of GDP). Detroit has introduced programmes providing affordable housing to attract former residents back to the city. Financial instruments such as scholarships for new residents and tax incentives for investors are also employed.

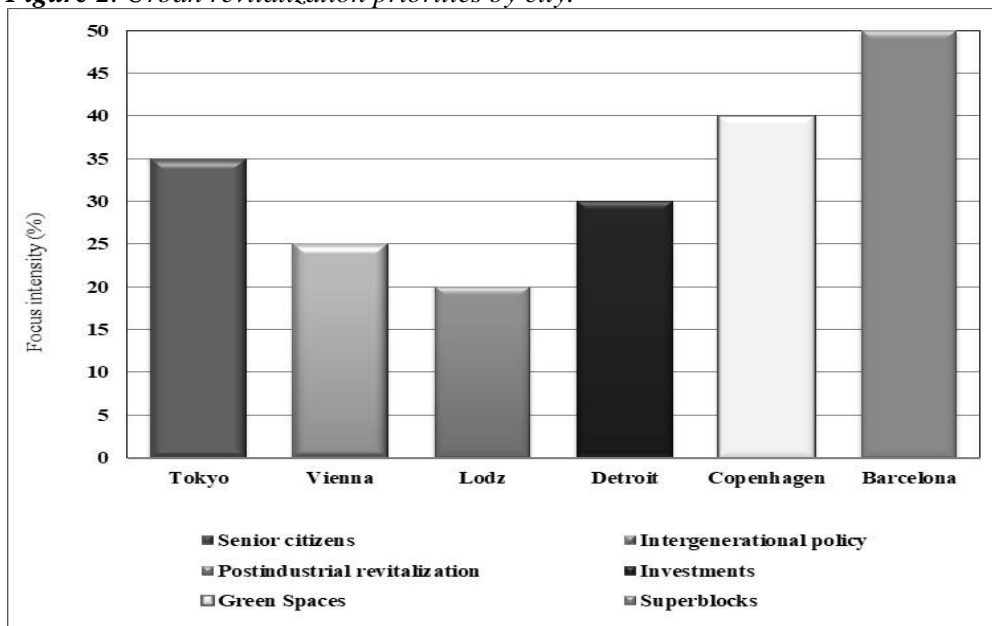
Copenhagen channels the majority of its financial resources (2% of GDP) into projects that expand green spaces, promote healthy lifestyles, and encourage sustainable mobility. The city's advanced cycling infrastructure attracts a younger

population while enhancing quality of life. Another priority is social integration (1.8% of GDP), with significant support directed towards initiatives that foster greater cohesion between migrants and local residents.

In Barcelona, investments are primarily directed towards housing (2.5% of GDP), strongly tied to the "Superblocks" project. This initiative transforms urban quarters into pedestrian-friendly and resident-focused zones. The concept has proven effective, reducing vehicle traffic, emissions, and noise pollution. Barcelona has successfully revitalised abandoned districts, promoting sustainable social and economic development.

Figure 2 illustrates the revitalisation priorities of the analysed cities. The percentage values represent the intensity of efforts in specific areas.

Figure 2. Urban revitalization priorities by city.



Source: Own elaboration based on: (Ministry of Health, Labour and Welfare, Japan, 2021; Ministerstwo Funduszy i Polityki Regionalnej RP, 2023; City of Copenhagen, 2021a; City of Copenhagen, 2021b; City of Copenhagen, 2022; European Environment Agency (EEA), 2023; Eurostat, 2023b; United Nations, 2022; Urban Institut, 2022; Detroit Economic Growth Corporation, 2023; Detroit Revitalization Initiative; 2020 Danish Planning Institute, 2021; GUS, 2021; Eurostat. 2021; European Commission, 2021a; European Commission, 2021b; Barcelona Urban Studies, 2021; Barcelona City Council, 2022; City of Vienna, 2022).

Figure 2 illustrates the diverse objectives prioritised by the studied cities in their revitalisation initiatives. Tokyo allocates 35% of its efforts to supporting senior citizens, promoting modern technologies that enhance the quality of life for older

residents. Vienna, in turn, focuses 25% of its revitalisation activities on social integration, including the development of affordable housing for senior citizens, as part of its intergenerational policy.

Lodz dedicates 20% of its efforts to the reconstruction of its industrial heritage through post-industrial revitalisation. Detroit channels 30% of its initiatives into attracting new capital, investors, and residents to the city. For Copenhagen, ecology and eco-mobility are top priorities, comprising 40% of its activities, closely tied to its migrant integration policies. Barcelona, meanwhile, concentrates 50% of its efforts on urban innovation, particularly through the continuation of the "Superblocks" project.

The strategies adopted by the analysed cities reflect their unique demographic, economic, and cultural circumstances. Tokyo places greater emphasis on advanced technologies, which may serve as an inspiration for other highly developed cities, although this approach could present significant financial barriers for less affluent urban areas.

Vienna sets benchmarks in social integration; however, such policies require substantial financial investments. Lodz and Detroit face similar challenges, but Lodz struggles with limited financial resources, which hinder the implementation of ambitious programmes. Copenhagen integrates ecological concerns with demographic policies, a comprehensive approach that may be difficult to replicate in more densely urbanised cities. Barcelona's approach combines transportation policies with the adaptation of urban spaces, demonstrating the potential for synergy between various strategies.

5. Conclusions, Proposals, Recommendations

Negative demographic trends pose a significant challenge to contemporary cities. Adaptive strategies such as urban revitalisation, technological integration, and the promotion of sustainable development can help mitigate the impacts of these phenomena. It is crucial to tailor approaches to the specific needs of cities while supporting initiatives at both local and supra-local levels.

Although cities employ various strategies to address depopulation and ageing communities, a common thread is the necessity of aligning policies with local realities. Solutions implemented in Tokyo, Vienna, Lodz, Detroit, Copenhagen, and Barcelona offer valuable lessons for future interventions in other urban areas.

The analysed examples confirm that the effectiveness of demographic strategies depends on a multifaceted approach (integrating urban planning, sociology, and economics) and collaboration between the public and private sectors and local communities. Regardless of the solutions adopted, their long-term implementation

and adaptation to the specific needs of a city are essential. Ensuring continuity of projects, regardless of political shifts in city governance, is also imperative.

Additionally, long-term monitoring of the impact of initiatives on local communities, particularly the quality of life for older residents, is crucial. Cities should jointly develop best practices, incorporating local conditions through ongoing experience-sharing. For instance, leveraging new technologies to foster inclusivity in urban spaces could serve as a model. Programmes should be flexible, adapting to changing needs and resources. Technological solutions, such as those seen in Tokyo, can support management processes in other cities grappling with an ageing population (e.g., investments in technology).

However, it is essential to consider the major challenges and limitations faced by the cities studied in implementing sustainable development strategies. These include financial and organisational constraints, conflicts of interest among social groups, data shortages, and difficulties in monitoring the long-term effects of undertaken actions.

Sustainable urban development in the context of an ageing population requires both a global perspective and local actions that address residents' unique needs. Combining interdisciplinary research with urban planning practices should contribute to creating cities that are sustainable and inclusive for all generations.

Future research should focus on analysing the effectiveness of revitalisation efforts in cities with high depopulation rates, developing sustainable housing models for older residents, and examining the impact of revitalisation on intergenerational relationships and local communities. Such studies should ultimately contribute to developing more effective tools for supporting urban transformation.

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