

Mitigating the Impact of Urban Sprawl: Strategies and Solutions

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Abstract

This paper explores the challenges cities face when dealing with urban sprawl and the strategies that can be implemented to mitigate its impact. The importance of preserving cultural spaces and making the most of available land potential is emphasized. The paper discusses various strategies, such as redeveloping industrial areas and former military sites, retrofitting existing structures for mixed-use developments, and promoting sustainable urban growth. The need using the already existing urban planning expertise and awareness among decision-makers is highlighted. The key focus areas of the paper include urbanization, urban sprawl, brownfield redevelopment, grey energy, and sustainability. Overall, by implementing these strategies, cities can protect the environment, preserve open spaces, and achieve sustainable urban development.

Keywords: Urbanisation; Urban Sprawl; Brownfield Redevelopment; Grey Energy; Sustainability.

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I. Introduction

Urbanization is an unstoppable process that increasingly pushes the world's population into cities . The fate of humanity lies – statistically speaking – in the city. More than 50 percent of the world's population already lives in urban centers; by 2050 it is expected to be at least 70 percent. This development presents both opportunities and challenges for society, as it fundamentally alters the way we plan, build, and manage our cities. Given the limited resources and the need to reduce the ecological footprint, sustainable urban development is becoming increasingly urgent.

Mistakes have been made in urban development and other areas in the past, these issues are not new and have been addressed by organizations like the Club of Rome since the 1970s.

II. Challenges of Urbanization

A. Resource Scarcity and Environmental Impact of the Construction Industry

The construction industry is responsible for a significant portion of environmental pollution and resource consumption. The production of building materials, transportation of construction materials, and disposal of construction waste contribute to greenhouse gas emissions and the destruction of natural habitats. To minimize these negative impacts, a transformation of the construction industry towards sustainable practices is necessary. This requires not only the development of more environmentally friendly building materials but also the more efficient use of resources and the reduction of waste. Studies show the following numbers regarding the resource

consumption of the building sector: 30% water consumption, 40% energy consumption, 50% emissions, 50% waste generation, 60% resource consumption, 70% space consumption.

It is crucial to find sustainable alternatives to the current excessive use of resources in construction. Nature does not require such vast space, and therefore, it is important to consider the impact of urbanization on the environment and find more efficient ways to build and utilize urban spaces.

B. Sustainability and Change in Urban Planning

Urban planning faces the challenge of creating livable and environmentally friendly urban spaces. Historical neighborhoods like the Werksviertel in Munich or the French Quarter in Tübingen demonstrate that it is possible to preserve existing structures while integrating new, sustainable concepts. These projects demonstrate that a respectful and imaginative approach to urban planning can create a livable environment that considers both historical heritage and modern needs.

C. Spatial Efficiency

The availability of free land is limited, yet large areas are being developed daily. In Germany efforts are being made to reduce land consumption to zero by 2050. This requires a more efficient use of already sealed areas and a more frugal construction method in cities.

According to the federal German government's official area statistics, around 52 hectares were newly designated as settlement areas and traffic areas every day in Germany over the four-year average from 2019 to 2022. This corresponds to an area of around 72 football fields per day.

This means that land consumption has now decreased slightly again after an increase in the same period of the previous year (55 hectares). 37 hectares of new land use occurred in the areas of housing construction, industry and commerce as well as public institutions, 12 Hectares of sports, leisure and recreation areas as well as cemetery areas. Overall, areas for settlement and transport in Germany accounted for 14.5 percent in 2022, i.e. around a seventh of the total area.

In the German Sustainability Strategy, the federal government has set itself the goal of reducing the daily increase in settlement and traffic area in Germany from around 52 hectares per day today to less than 30 hectares per day by 2030 in order to reduce land consumption by 2050 to achieve net zero in the sense of a circular economy. It is also about the protection and preservation of agricultural land.

III. Historical Perspectives, Permanence, and Current Approaches

A. Historical Examples of Environmental Awareness and Sustainability in Urban Planning

The history of urban planning is rich in examples of environmentally conscious planning and sustainable architecture. Thinkers like John Evelyn in the 17th century, with his work "Fumifugium," addressed environmental pollution and resource conservation. Their works laid the foundation for an awareness of the impact of human actions on the environment and influenced the development of modern urban planning. In recent history, numerous examples of architects and urban planners who have intensively engaged with questions of sustainability and efficiency in construction exist. From passive house technology to the reuse of building materials, these innovative approaches have the potential to fundamentally change urban planning and contribute to a more sustainable future.

B. Current Trends and Innovations in Urban Planning

Today's urban planning faces the challenge of finding innovative solutions to meet current and future needs. The big question remains: how can we as a society respond to the challenges of future urban planning? The increasing pressure on urban resources requires careful and forward-thinking planning that considers the needs of residents as well as ecological sustainability and social justice. From promoting public transportation to creating green and livable public spaces, there are numerous ways cities can evolve to meet the challenges of the 21st century.

C. All New or Back to Permanence in the Sense of Aldo Rossi?

When considering the city of the future under the influence of climate change, the question arises whether radically new approaches are necessary, as often suggested by futuristic images. These images often depict green landscapes and unusual infrastructures, but their functionality is often unclear. It is important to consider which elements of these visions are meaningful and which are not.

In the spirit of Aldo Rossi's permanence, it is important to consider the qualities of a long-term livable city. Examples like the Colosseum, which has existed for over 2000 years, and the idea of permanence coined by architect Aldo Rossi are mentioned. Rossi views the city as something that changes only in certain areas, while essential landmarks remain. This concept emphasizes the durability of the city and its constant redesign within its basic structures and is based on the understanding of the city as a continuous building process.

This durability in the city should be considered a crucial point in our planning when thinking about urban planning, and a super-relevant point that naturally supports the idea of the permanent is the question of density. Density is

often associated with various problems, but density also has enormous potential because when a city is dense, i.e., when many people live together in a relatively small space, it enables a lot.

D. Retrofitting Existing Structures as Potential

In the long term, renovations in most cases cause fewer emissions than new buildings. One of the greatest opportunities for the climate change in the building sector lies in the post-war buildings of the 1950s and 1970s: These buildings with high energy consumption make up around 40% of the existing buildings and are comparatively easy to renovate into low-energy buildings.

E. Collective Luxury!

A few illustrative examples can show that the city can be quantitatively luxurious, all city dwellers together can have luxury, a communal pool that makes sense because it's worth it. We can all have large gardens if we create them collectively and operate them collectively, for example, the English Garden in Munich. Public transport and their networks only become efficient when used by many people. And together we can also have, so to speak, communal living rooms, city squares that naturally promote communication and togetherness. Therefore, we should see the city as something dense. And in contrast to Archigram but in the spirit of Aldo Rossi as something long-lasting and permanent, and for that, we have to deal with the existing stock, that is, we cannot continue to tear down, for example, stock that is only 20 or 30 years old. We have to take a close look at the stock and consider how we can actually preserve or even improve these existing structures if necessary.

IV. Future-Oriented Urban Planning

A. Adaptation to Climate Change and New Approaches in Urban Planning

The effects of climate change pose one of the greatest challenges for the cities of the future. From rising temperatures to more frequent extreme weather events, the consequences of climate change are already being felt today. To address these challenges, innovative and holistic approaches in urban planning are required. Future-oriented urban planning must not only consider the needs of residents but also prioritize ecological sustainability and climate resilience. Green spaces, vertical gardens, and sustainable mobility solutions can help make cities more resilient to the impacts of climate change while improving the quality of life for residents.

B. Handling Existing Stock and Potentials for Urban Revitalization

Densification and revitalization of existing neighborhoods offer a sustainable way to meet the growing demand for housing without claiming additional land. Historical buildings and industrial wastelands can be transformed into vibrant and attractive residential and workspaces that preserve the character and history of the city. By integrating sustainable technologies and innovative design concepts, such projects can contribute not only to reducing the ecological footprint but also to creating a diverse and vibrant urban environment.

C. Assessment of Needs

It has to be emphasized that it is important to carefully examine the needs, especially regarding urban development and architecture. The increasing living space per person poses a challenge for the energy transition. It has to be considered how to handle the existing space more intelligently to improve energy efficiency and reduce space requirements. An example from Munich, a residential building competition, illustrates this approach. A group of architects called Menu Surprise has designed a building in Munich for a cooperative that allows flexible use. A green layer in the floor plan serves as a multifunctional piece of furniture that can serve various purposes and acts as a partition between residential units. This flexibility allows reducing space requirements while maintaining quality. By integrating built-in furniture into apartments, space requirements can be reduced while creating a durable and high-quality solution.

V. Optimization of Urban Infrastructure and Mobility

A. Efficient Use of Resources and Space in Cities

Efficient use of resources and space is a central aspect of sustainable urban development. Through targeted planning and design, cities can be shaped to meet the needs of their residents optimally while minimizing the ecological footprint. Creating green and livable public spaces, promoting public transportation, and reducing motorized individual traffic are just some examples of measures that can help make cities more efficient and sustainable.

B. Efficient Use of Existing Space and Traffic Planning

Efficient use of sealed surfaces and sustainable traffic planning are crucial for creating livable cities. Successful examples of traffic planning like in Copenhagen and Barcelona show how targeted promotion of pedestrians and cyclists can lead to a reduction in motorized traffic. It is important to improve the availability of public spaces and facilities to enhance the quality of life for residents. Scientific studies have shown that streets with more traffic

tend to allow fewer social relationships between residents. Arguments against restricting car traffic have been refuted by optimizing roads for pedestrians, cyclists, and public transportation. For example, in some cities like Munich, parking spaces in front of cafes were removed to make room for outdoor seating areas, initially leading to protests but ultimately resulting in a livelier and more social atmosphere in the city. These measures have fundamentally changed the cityscape and have been successful. It is essential to recognize and utilize the opportunities of de-individualizing traffic, especially regarding climate change, without necessarily requiring completely new approaches.

C. Promotion of Sustainable Mobility and Traffic Planning

Promoting sustainable mobility is a key element of future-oriented urban planning. By expanding public transportation, creating safe bike lanes, and promoting car-sharing and electromobility, cities can make their transportation sector more environmentally friendly while improving the quality of life for residents. Intelligent traffic planning that considers the needs of all road users is crucial for sustainable and future-oriented urban development.

D. Integration of Green Spaces and Innovative Solutions for Climate Change

The integration of green spaces into urban areas plays an important role in adapting to climate change and improving the quality of life. However, it is important to find cost-effective and versatile solutions that are accessible to all socioeconomic groups. Temporary installations such as stacked forest installations and the use of landscape parks as sewage treatment plants can help make urban spaces more efficient while contributing to adaptation to climate change.

E. High Tech or Low Tech Green and Climate Adaptations?

There are simple and effective methods to integrate green spaces into cities. Examples include wild-growing vines on high-rise facades, which provide natural cooling and air purification, as well as temporary installations like stacked forest installations, which serve as viewing platforms and can be implemented as needed. Another idea is the use of landscape parks as sewage treatment plants, which can simultaneously absorb and divert water during heavy rainfall events. In Rotterdam, for example, there is the "Watersquare," which serves as a sports field and absorbs water during heavy rain to prevent flooding. These solutions are not only cost-effective but also versatile and contribute to climate change adaptation in urban areas.

Cities like Barcelona are implementing innovative solutions to adapt to climate change at various levels. For example, building structures are used to provide shade and promote community. Through clever planning of arcades and shutters, pleasant shading can be achieved while promoting social interactions among residents. It is important to efficiently use limited urban space and make it multifunctional. Studies show that cities still have untapped potential to expand living space. For example, by adding stories to buildings, additional living space can be created without having to change the legal framework. Such measures can help high-density cities continue to grow without fundamentally changing the city's structure.

F. The Fifth Facade as New Potential

It is important to efficiently use limited urban space and make it multifunctional. Studies show that cities still have untapped potential to expand living space. For example, by adding stories to buildings, additional living space can be created without having to change the legal framework. Such measures can help high-density cities continue to grow without fundamentally changing the city's structure. Creating new offerings, such as using vacant spaces for supermarkets or converting roofs into multifunctional areas, contributes to the liveliness and diversity of the city. These additional layers of the city can be used for various purposes, such as sports fields, community gardens, or recreational facilities. Such measures enable residents to better utilize their urban environment and contribute to improving the quality of life. There is great potential to enrich the urban landscape through creative solutions and improve the quality of life in densely populated areas. By deliberately using existing resources and creating new opportunities for the use of urban spaces, cities can be made more efficient to meet current and future challenges.

VI. Density, Social Aspects, and Citizen Participation in Urban Planning

A. The Importance of Density and Inventory for Sustainable Urban Development

Density is often associated with various problems, but it also has enormous potential, especially when it comes to using resources efficiently. It is important to see the city as something dense and to preserve the inventory instead of simply tearing it down and replacing it with new buildings. Retrofitting existing buildings is often the cheaper and more resource-efficient option and can help improve energy efficiency and reduce space requirements.

B. Creating Livable and Inclusive Urban Spaces

Creating livable and inclusive urban spaces is a central concern of future-oriented urban planning. Historical neighborhoods like Barcelona and Rome are characterized by their vibrant atmosphere and diverse social

interactions, fostered by the proximity to public squares and attractions. Creating attractive and accessible public spaces that are open to all city residents is crucial for promoting social integration and cohesion.

C. Citizen Participation and Participatory Planning Processes

Involving citizens in the planning process is an important part of future-oriented urban development. Participatory planning processes allow residents to contribute their concerns and needs and actively participate in shaping their city. From citizen workshops to online participation platforms, there are numerous ways cities can involve their residents in the planning process. Open and transparent communication between city administration, planners, and citizens is crucial for successful and sustainable urban development.

D. Creating Vibrant and Social Urban Spaces through Urban Planning Innovations

Creating new squares and public spaces is crucial for promoting social cohesion and the well-being of residents. Successful examples like the "Superblock model" in Barcelona show how targeted redesign of public space can lead to a livelier and more social atmosphere in the city. It is important to actively involve the population in the planning process and showcase positive examples to overcome resistance and build acceptance.

E. Density without Density Stress

Neighborhoods like Regensburg, Germany, are a good example of how short distances to attractive places and sights can create a vibrant atmosphere. Cities like Barcelona and Rome are characterized by their high density of squares and cafes, contributing to a vibrant urban life. The proximity to public squares and attractions makes exploring the city on foot attractive and promotes encounters and social interactions. Interestingly, statistics from Munich show that the most popular neighborhoods are often the densest. In such neighborhoods, important facilities such as schools, shops, and public transportation are often within walking distance, improving the quality of life.

VII. Conclusion and Outlook

Overall, sustainable and future-oriented urban planning is crucial to meet the current and future challenges of urban development and improve the quality of life in urban areas. Through a holistic and integrative approach, cities can become livable and sustainable spaces for their residents. It is important for planners, policymakers, and citizens to work together to shape the cities of the future and develop innovative solutions that integrate ecological sustainability, social justice, and economic prosperity. Only in this way can we ensure that our cities remain livable and viable in the future.

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Conflict of Interests

The Author(s) declare(s) that there is no conflict of interest.

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