Research on Improving Environmental Quality by Addressing Imbalances in Urban Development

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Abstract. This article explores the connection between social issues caused by urban development imbalance and environmental problems in cities. By referencing magazines and academic papers, the study focuses on three major challenges resulting from urban development imbalance as uneven population distribution, single-industry economies, and disparities in community development. It investigates the relationships between these factors and their impact on environmental issues. Through case studies of Madison, Detroit, northeastern China, and Pittsburgh, this article examines the relationships among urban economies, industries, education, and the environment. Additionally, it provides a detailed analysis of industrial, agricultural, educational, and energy patterns in two cities of different scales in southern China as Hangzhou and Fu'an. Based on these analyses, the paper identifies the strengths and challenges of both cities. By comparing the developmental issues of these two cities, the article concludes that cities at different stages of development can address environmental challenges and alleviate urban development imbalances through policies, industrial transfers, remote education, and energy agreements.

Keywords: Environment; Urban Development Imbalance; Comparative Study.

1. Introduction

The disparities in urban development have precipitated a multitude of social challenges, both directly and indirectly, which exert a significant impact on the urban environmental matrix, encompassing the natural ecosystem, residential habitats, and the built architectural milieu. These environments are closely related to the health and quality of life of urban residents. Furthermore, the deterioration of the urban environment acts as an impediment to the progression of urban development, thereby intensifying the disparities in urban expansion and perpetuating a cycle of uneven growth.

Many researchers have investigated the relationship between imbalanced urban development and environmental issues. The academic attention paid to urban climate and green infrastructure in terms of research and publication volume are analyzed and the results reveal that while there is growing interest in the relationship between the natural environment and urban areas, small cities and peripheral regions have been ignored in academic research [1, 2]. Cases of New Zealand cities are compared for the per capita availability of natural resources between large and small cities. The results show that the residents of smaller cities have less access to natural resources, such as urban green infrastructures, parks, and forest. The study also proposes solutions, including the creation of rooftop gardens and vertical green spaces, adding more vegetation and plants to the concrete city [3]. A Systemic Review analyzes urban living environments and highlights the inequitable treatment of vulnerable groups in resource allocation. This includes limited access to parks, green spaces, and water resources, as well as inadequate access to safer and cleaner living conditions. In fact, the vulnerable groups in the city are often been ignored, showing the importance of building a fairer Urban Environment [4]. On existing policies addressing environmental problems and urban development imbalances through environmental taxation, one research evaluates the pros and cons of environmental taxes. It argues that current environmental taxes disproportionately target the middle class and advocate for higher taxation on the social elite, who dominate urban development and the city resources. Furthermore, it emphasizes the importance of transfer payments to small and medium-sized cities [5]. Some other research further explores disparities in natural resource

allocation and reiterates solutions, such as rooftop gardens and vertical green spaces, to enhance vegetation availability for urban residents [6].

In the developed nation like United States, the University of Michigan have expressed concerns about the natural environment in Rust Belt cities. They point out that these once-thriving industrial cities are now suffered from wastewater and toxic air pollution. Meanwhile, UN-Habitat and other international organizations have warned that rapid urbanization in developing countries could lead to a series of social issues in megacities [7].

In fact, both newly emerging megacities and declining old industrial cities face similar environmental challenges. At the same time, they also struggle with issues related to urban development imbalances, such as industrial decline, population shifts, and community instability. This paper aims to explore the relationship between urban development imbalances and environmental conditions. Additionally, it looks to examine whether cities with such imbalances can address these challenges by implementing policy incentives, fostering industrial collaboration, and using remote education, all while protecting the natural environment.

2. Imbalance in urban development and its impact on population distribution

2.1. The problems arising from the excessive concentration of population

One significant issue caused by imbalanced urban development is the uneven distribution of population. During urbanization, there is a pronounced concentration of resources-including labor, capital, and technological assets-in more developed and prosperous metropolitan regions. To illustrate, Tokyo accommodates 11.3% of Japan's populace, a figure that pales in comparison to Seoul, where a staggering 50% of South Korea's population is concentrated within the metropolitan area for both residence and employment. This high population concentration leads to uneven allocation of housing and other problems, as well as environmental challenges such as wastewater treatment and waste disposal.

The situation in developing countries is even more concerning. In India, overcrowded cities like New Delhi and Mumbai face severe air pollution problems, including persistent smog. As developing countries continue to develop, we human still face a period which rapid urbanization happened, and therefore making the environmental impact of uneven distributed population a critical issue.

2.2. Population decline and its adverse effects

A declining population can ease environmental pressures. Reduced population means less resource consumption, which can help restore a city’s natural environment. In some cases, abandoned urban structures have been reclaimed by nature, with plants taking root and thriving on human-built concrete walls. These structures, particularly those on the urban fringe, have become habitats for vegetation and animals to flourish.

Although population decline may contribute to the restoration of the natural environment, it can also harm the urban landscape. A shrinking population results in reduced tax revenue, causing huge pressure on municipal administrative systems. This, in turn, impacts a range of public services, including park renovations, river quality monitoring, lake management, street cleaning, community governance, and environmental restoration. These further influence the city environment and people’s lives.

The Rust Belt gives a compelling example. Once home to thriving industries, the region has experienced significant economic decline. However, pollution caused by heavy metals, toxic gases, and fossil fuels persists. Despite calls from organizations like Belt Magazine, the restoration of the Rust Belt‘s natural environment, fiscal challenges continue to hinder government action.

In fact, the declining population dose not lead to only financial difficulty for governmental systems, but also effluence the city’s wider range of economy. The ongoing population outflow has negatively affected industries such as real estate, agriculture, and technology. Vacant homes and abandoned

malls not only become landfills that worsen environmental problems but also serve as breeding grounds for crime, organized gangs, and gun violence [8].

In Allmendingergehe author expresses concerns about the megacities emerging from rapid urbanization in the 21st century. These cities, often located in developing countries, are gradually becoming economic, political, and cultural centers. However, these rapidly growing cities struggle to provide adequate housing and matching resources, while the overwhelming population places a significant burden on the environment.

Take New Delhi as an example. While it has risen as an economic star in India, it has also drawn attention for its serious smog problems. The city continues to rely on polluting coal-fired power plants and lacks effective measures to manage vehicle emissions. Additionally, garbage and wastewater have deteriorated the city's sanitary conditions.

All these issues reflect the lack of effective planning, policies, budgeting, and management capabilities in these rapidly growing cities as they face large population inflows. This leads to the degradation of the urban environment.

2.3. Industrial economy and urban development: the importance of diversification

The industrial economy, a key indicator of urban development, reflects a city's growth potential, risk resilience, and social vitality. Large cities often attract more talent and businesses, resulting in a more diversified industrial structure. In contrast, smaller cities lose their workforce and resources, leading to more singular economic structures. This trend of industrial distribution within the context of imbalanced urban development affects the environment and further exacerbates urban development disparities.

2.3.1. Building a balanced and resilient industrial structure

A robust and balanced industrial structure is not only a benchmark for evaluating urban development but also a critical factor in protecting city's environmental. The city of Madison, Wisconsin, is a prime example. Renowned nationwide and even globally for its dairy industry, Madison faces the challenge of eutrophication in its two major lakes, Mendota, and Monona. The vast vegetation required for livestock and agriculture relies heavily on industrial fertilizers. Nitrogen (N) and phosphorus (P) from these fertilizers infiltrate the soil and enter the lakes through groundwater systems, ultimately leading to algae blooms. This issue has drawn attention from the state government and the University of Wisconsin, but addressing it remains a challenge due to the scale of the dairy industry.

2.3.2. Vulnerability of single-industry cities

Madison is not the only city facing such challenges. Cities with single-industry economies tend to have weaker economic resilience and are thus more vulnerable to environmental issues. Detroit, once the automotive capital of the world, now faces a challenging path to urban revival. Detroit's history reveals that the city's economy was dominated by automotive giants like Ford and General Motors. When faced with competition from international rivals and the wave of automation, Detroit lacked other industries to mitigate risks, and finally leading to its decline. At the same time, the heavy reliance on a single industry caused significant environmental pollution, making Detroit one of the most air-polluted areas in the United States today [9].

A similar example is found in northeastern China. This region, rich in mineral and oil resources, became the core of China's heavy industry in the last century due to its geographic and resource advantages [10]. Soviet aid and a state-planned economy help the region establish a massive heavy industrial structure, including shipbuilding, automotive, and oil extraction industries. However, the heavy industrial demand for natural resources damaged forests and soil. Besides, the reliance on coal-fired heating caused severe air pollution in winter. With the collapse of the Soviet Union and the challenges of economic reform, northeastern China gradually lost its competitive edge in the market economy. Many factories closed, resulting in mass unemployment. The weakened economy left the

region unable to invest in restoring damaged forests, water sources, and wildlife habitats. The remaining heavy industrial systems continue to strain the environment and hinder development.

The cases of Wisconsin, the Rust Belt, and northeastern China highlight the importance of building cities with diversified and balanced industrial structures for environmental protection. These cities and regions once thrived due to their industries but now face decline and degradation. This highlight the close relationship between urban development, prosperity, and the environment: cities with diversified economies are more likely to address and improve environmental issues. A diversified industrial structure supports stronger social oversight and environmental management, reflecting the importance of sustainable urban development and the urgency of building resilient cities.

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2.3.3. Solutions to promote the synchronous development of cities and industrial economy

Governments should attract and encourage enterprises and entrepreneurs through policies such as tax incentives and venture capital funds. This approach helps establish a vibrant economy and increases tax revenues, enabling governments and communities to allocate resources to improve the urban environment. The new technology can improve the environment and create job opportunities. In fact, Detroit is collaborating with Ford and Google to develop autonomous driving and renewable energy technologies. Leveraging the region's strong automotive industry foundation, these initiatives can generate more employment opportunities and industrial advantages. By building a more efficient and cleaner industrial base, cities have the opportunity to repair and improve their environments. Taking Pittsburgh and Carnegie Mellon University as examples, investment in education contributes to industrial revitalization. The collaboration between Carnegie Mellon University and the city of Pittsburgh has brought high-tech industries and numerous entrepreneurs to the city. This has helped Pittsburgh, a Rust Belt city, build a more diversified economy.

3. Effects of community development on the urban environment

The community has long been regarded as a fundamental unit of human society. As a grassroots governance organization, communities often mobilize residents and provide essential services effectively. Urban development significantly influences the development of communities: in highly developed urban areas, communities tend to be wealthier, better organized, and play a more prominent role in society. These communities are commonly seen in developed countries. However, in developing countries, the history of community is relatively short, and communities often lack management capabilities. In the 21st century, characterized by rapid urbanization in developing countries, how to develop communities and leverage them to protect the urban environment has become an important topic.

3.1. The impact of community activities on residents' environmental awareness

In well-established and affluent communities, regular or occasional community activities help enhance residents' environmental awareness. Since communities are integral to daily life, such activities significantly influence residents' daily behaviors. Moreover, these activities often involve families, meaning parents and children can participate together. Raising children's awareness of environmental protection helps foster long-term environmental protection and instills an early sense of responsibility for the environment.

3.2. The impact of community management on residents' environmental awareness

As a form of grassroots governance, communities can promote environmental awareness through initiatives and regulations. In a well-structured community system, residents adhere to community

guidelines and rules. For example, in a community in Shanghai, garbage sorting regulations were established as part of the community charter. Residents voluntarily followed these rules, reducing resource consumption and protecting the urban environment.

3.3. The relationship between cities and communities-how urban development imbalances affect community growth

In a large city, the connection between cities and communities is stronger. Large cities often have sufficient funding to encourage and support community activities. They also have access to richer educational, academic, technological, and cultural resources, facilitating collaborations between communities and other organizations, including businesses, schools, and government agencies. Additionally, the high population density in highly urbanized areas physically reduces the distance between residents, providing more opportunities for interaction and communication.

However, in large cities, income inequality and racial discrimination have turned some communities into hubs of crime, theft, drug abuse, and gun violence. These communities are often composed of low-income populations and lack access to social security, education, healthcare, and employment opportunities. Compared to wealthier communities, they frequently face poorer sanitation situation and are often overlooked by administrative systems. This reflects the neglect of resource allocation and equity issues during urban development in large cities.

3.4. Bridging the gap between developing and developed countries-enhancing community effectiveness in developing nations

Community development is closely tied to urban and national development. In developed countries, communities have a long history, with more mature and advanced management experiences, as well as larger budgets and funding to support growth. In contrast, communities in developing countries are in their infancy, with weak public awareness and limited residence participation. Budget and resource constraints further hinder the development of communities in these regions.

3.5. Solutions for developing a better community in developing countries

Developed countries can share their advanced community management practices with developing nations. Organizations like UNDP and UN-Habitat can help community building by implementing urban revitalization plans and Sustainable Development Goals (SDGs). The World Bank Group also support community development through loans and grants, such as Community-Driven Development (CDD) projects. Governments in developing countries can use administrative measures to set up more robust community structures. Inter-community connections and exchanges can maximize the use of limited resources. Donations and volunteer activities from businesses and individuals can significantly strengthen communities. This additional support can enhance the resilience and effectiveness of community systems.

4. How urban development imbalance and environmental issues are closely connected-case study of Fu’an and Hangzhou

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4.1. Fu‘an

Fuan is a small city in the mountains along the southeastern coast of China. Located at high altitude with long hours of sunlight, Fu’an still relies on coal-fired power generation due to a lack of funding and technology, causing significant pollution. Besides, the city lacks emerging industries and relies heavily on traditional industries like shipbuilding and motor manufacturing, which are facing competitions with large enterprises. Due to outdated technology, these industries contribute significantly to environmental pollution. Fuan has a long history of grape cultivation. However, the

agriculture development is lagging, with limited sales channels and low technical farming, leading to environmental degradation. Compared to big cities, the community and education resources of Fuan are underdeveloped, with low levels of education and weak environmental awareness among residents.

4.2. Hangzhou

Hangzhou is a large city on the eastern plains of China. The city is home to many tech startups, but their small scale makes it difficult to compete with larger enterprises. Know for the tech giants like Alibaba and Netease, Hangzhou hosts major internet companies and e-commerce platforms. Besides, as the largest city in Zhejiang Province, Hangzhou has abundant educational resources, including Zhejiang University. A large population and expansive market create strong demand for agricultural products. However, the surrounding over-cultivated lands cannot meet these demands. Excessive land use has repurposed wetlands and hillsides for agriculture and residential purposes, depleting resources. At the same time, the large population also causes severe traffic congestion, with vehicle emissions significantly influencing air quality.

4.3. Analysis of complementary advantages

Different levels of urban development often bring complementary strengths. By leveraging these, cities like Fu'an and Hangzhou can address both environmental issues and developmental imbalances.

4.3.1. Rebuilding Fu'an's Energy System

With advanced technology and funding from Hangzhou, Fu'an could rebuild its power system to adopt more efficient and cleaner energy sources. This would help restore Fu'an's air quality and damaged forest resources. In return, Fu'an could generate economic returns for Hangzhou by signing energy agreements where clean energy profits are shared between the two cities. Additionally, orders from Fu'an could provide startup capital for Hangzhou's emerging enterprises.

4.3.2. Integrating Hangzhou's Innovation with Fu'an's Heavy Industry

Hangzhou's innovative companies could collaborate with Fu'an's traditional heavy industries to maximize the strengths of both. Hangzhou's startups could help modernize Fu'an's industries with technology and inventions, while Fu'an's heavy industries could provide opportunities and platforms for Hangzhou's startups. By establishing a clean and innovative industrial framework, Fu'an could move away from environmentally harmful heavy industries while simultaneously achieving greater economic benefits and development potential.

4.3.3. Promoting Online Education and Community Sharing

Online education could enable residents of Fu'an to connect with those in Hangzhou, allowing students and community members in Fu'an to access Hangzhou's resources. This would provide Fu'an's residents with opportunities to learn about environmental protection and develop related skills.

4.3.4. Leveraging E-commerce Platforms for Agricultural Growth

Hangzhou's e-commerce platforms could create sales channels for Fu'an's agricultural products, increasing local farmers' incomes and enabling them to adopt advanced farming techniques. More efficient agricultural practices would reduce environmental damage, while agricultural products from Fu'an could meet Hangzhou's urban demand.

Through the case studies of Fu'an and Hangzhou, it is evident that urban development imbalances are closely linked to environmental issues. Additionally, cities at different stages of development have the opportunity to collaborate on economic, technological, educational, and community levels to protect the environment and address development disparities.

5. Conclusion

By analyzing the impact of population, industry, and community on the environment, this study reveals the relationship between social and environmental issues caused by urban development imbalances and proposes corresponding solutions. The case studies demonstrate that cities at different stages of development can use policies, industry collaboration, and educational exchanges to tackle urban imbalances while protecting the environment. With the help of the internet and emerging technologies, we could redistribute resources in unevenly developed cities, paving the way for a fair, efficient, and sustainable urban future.

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