

The Impact of Urbanization on Environmental Quality and Human Health: A Multi - Country Analysis

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ABSTRACT

This study explores the intricate relationship between urbanization, environmental quality, and human health across 20 countries with varying levels of urban development from 2021 to 2024. Using a combination of environmental monitoring data and public health surveys, we analyze how urbanization - driven factors such as air pollution, water contamination, and green space reduction affect key human health indicators including respiratory diseases, cardiovascular disorders, and mental health issues. The results indicate that rapid and unplanned urbanization is strongly associated with declining environmental quality and increased health risks, particularly in developing countries. However, well - designed urban planning strategies, such as improved waste management and expanded green infrastructure, can mitigate these adverse effects. This research provides valuable insights for policymakers to formulate effective measures that balance urban growth with environmental protection and public health promotion.

Keywords: Urbanization; Environmental Quality; Human Health; Air Pollution; Urban Planning; Public Health; Developing Countries; Green Infrastructure

1. Introduction

1.1 Background

In recent decades, the global rate of urbanization has accelerated at an unprecedented pace. According to the United Nations (2022), more than 56% of the world's population currently lives in urban areas, and this figure is projected to reach 68% by 2050. Urbanization brings about numerous opportunities, including economic growth, improved access to education and healthcare, and technological innovation. However, it also poses significant challenges to the environment and human health. The rapid expansion of cities often leads to the overexploitation of natural resources, increased generation of waste, and the emission of large amounts of pollutants, which in turn have detrimental effects on air, water, and soil quality (World Health

Organization [WHO], 2023).

1.2 Significance of the Study

The link between urbanization, the environment, and human health has become a critical issue in global sustainable development. Understanding the mechanisms through which urbanization affects environmental quality and human health is essential for developing effective policies and strategies to address these challenges. Previous studies have focused on specific aspects of this relationship, such as the impact of air pollution on respiratory health in a single city or region. However, there is a lack of comprehensive, multi - country studies that examine the varying effects of urbanization across different levels of economic development and geographical locations. This study aims to fill this gap by analyzing data from 20 countries, including both developed and developing nations, to provide a more holistic understanding of the relationship between urbanization, environmental quality, and human health.

1.3 Research Objectives and Questions

The primary objective of this study is to investigate the impact of urbanization on environmental quality and human health across different countries. To achieve this objective, the following research questions are addressed:

What are the key environmental changes associated with urbanization in different countries?

How do these environmental changes affect various aspects of human health, such as physical and mental health?

Are there significant differences in the impact of urbanization on environmental quality and human health between developed and developing countries?

What urban planning strategies are effective in mitigating the adverse effects of urbanization on the environment and human health?

2. Literature Review

2.1 Urbanization and Environmental Quality

A large body of literature has documented the negative impact of urbanization on environmental quality. For example, studies by Zhang et al. (2021) in China found that rapid urbanization in major cities such as Beijing and Shanghai has led to a significant increase in air pollution levels, particularly fine particulate matter (PM_{2.5}) and nitrogen dioxide (NO₂). These pollutants are primarily emitted from industrial activities, transportation, and residential heating. Similarly, in India, the expansion of urban areas has resulted in the contamination of surface water and groundwater sources due to the discharge of untreated industrial and domestic wastewater (Gupta et al., 2022).

In addition to air and water pollution, urbanization also contributes to the loss of green spaces. Green spaces play a crucial role in regulating the urban microclimate, reducing air pollution, and providing recreational areas for residents. However, as cities expand, green spaces are often converted into residential, commercial, or industrial areas. A study by Jensen et al. (2023) in Europe showed that the average green space per capita in urban areas has decreased by 15% over the past decade, with the most significant losses occurring in rapidly urbanizing regions.

2.2 Environmental Quality and Human Health

The deterioration of environmental quality has a direct and significant impact on human health. Air

pollution, for instance, is a major risk factor for respiratory diseases such as asthma, chronic obstructive pulmonary disease (COPD), and lung cancer. A meta - analysis by Cohen et al. (2021) involving over 10 million participants from around the world found that a 10 $\mu\text{g}/\text{m}^3$ increase in PM2.5 concentration was associated with a 12% increase in the risk of lung cancer. Water contamination is another important environmental health hazard, as it can lead to the spread of waterborne diseases such as cholera, typhoid, and diarrhea. According to the WHO (2022), approximately 2.2 billion people worldwide do not have access to safe drinking water, and waterborne diseases cause an estimated 485,000 deaths each year.

Mental health is also affected by environmental quality. The loss of green spaces and the increase in noise and air pollution in urban areas have been linked to higher levels of stress, anxiety, and depression. A study by White et al. (2023) in the United Kingdom found that residents living in areas with low green space coverage were 20% more likely to report symptoms of depression compared to those living in areas with high green space coverage.

2.3 Urbanization, Environmental Quality, and Human Health: A Multi - Dimensional Relationship

The relationship between urbanization, environmental quality, and human health is complex and multi - dimensional. Urbanization can affect human health both directly and indirectly through its impact on the environment. For example, the increased use of motor vehicles in urban areas leads to higher emissions of air pollutants, which directly affect respiratory health. At the same time, the lack of green spaces in urban areas reduces the opportunities for physical activity, which indirectly increases the risk of obesity and other chronic diseases (Sallis et al., 2022).

There are also significant differences in the relationship between urbanization, environmental quality, and human health between developed and developing countries. In developed countries, where urbanization is more advanced and environmental regulations are stricter, the focus is often on reducing the impact of existing pollutants and improving the quality of urban life. In contrast, in developing countries, rapid urbanization is often accompanied by inadequate infrastructure and weak environmental regulations, leading to more severe environmental problems and greater health risks (UN - Habitat, 2023).

2.4 Gaps in the Literature

Despite the extensive research on urbanization, environmental quality, and human health, there are several gaps in the literature. First, most studies have focused on specific environmental pollutants or health outcomes, rather than examining the overall relationship between urbanization, environmental quality, and human health. Second, there is a lack of longitudinal studies that track the changes in urbanization, environmental quality, and human health over time. Third, few studies have compared the impact of urbanization on environmental quality and human health across different countries with varying levels of economic development. This study aims to address these gaps by conducting a comprehensive, multi - country, and longitudinal analysis of the relationship between urbanization, environmental quality, and human health.

3. Methodology

3.1 Study Design

This study a mixed - methods research design, combining quantitative and qualitative data analysis.

The quantitative component involves the collection and analysis of secondary data on urbanization, environmental quality, and human health from 20 countries over a three - year period (2021 - 2024). The qualitative component includes in - depth interviews with policymakers, environmental experts, and public health professionals to gain a better understanding of the factors influencing the relationship between urbanization, environmental quality, and human health, as well as the effectiveness of existing urban planning strategies.

3.2 Selection of Study Countries

The 20 study countries were selected to represent different levels of economic development, geographical regions, and urbanization rates. The countries include:

Developed countries: United States, Canada, United Kingdom, Germany, France, Italy, Japan, Australia, South Korea

Developing countries: China, India, Brazil, Russia, South Africa, Mexico, Indonesia, Nigeria, Pakistan, Bangladesh, Vietnam

This selection ensures that the study can capture the variations in the impact of urbanization on environmental quality and human health across different contexts.

3.3 Data Collection

3.3.1 Secondary Data

Secondary data were collected from a variety of sources, including:

Urbanization data: Data on urban population percentage, urban population growth rate, and urban land use were obtained from the United Nations Department of Economic and Social Affairs (UN DESA) and national statistical offices.

Environmental quality data: Data on air pollution (PM2.5, NO2, sulfur dioxide (SO2)), water quality (dissolved oxygen, biochemical oxygen demand, total coliforms), and green space coverage were collected from the WHO, the Environmental Protection Agency (EPA) of various countries, and the World Bank's World Development Indicators.

Human health data: Data on mortality rates from respiratory diseases, cardiovascular diseases, and waterborne diseases, as well as prevalence rates of asthma, depression, and obesity, were obtained from the WHO, national health ministries, and the Global Burden of Disease (GBD) Study.

3.3.2 Primary Data

Primary data were collected through in - depth interviews. A total of 60 interviews were conducted, with 3 interviews in each of the 20 study countries. The interviewees included:

Policymakers: Municipal officials responsible for urban planning, environmental protection, and public health.

Environmental experts: Researchers and practitioners working in the field of environmental science and environmental protection.

Public health professionals: Doctors, nurses, and public health researchers working in urban hospitals and public health institutions.

The interviews were conducted either in person or via video conferencing, and each interview lasted approximately 60 - 90 minutes. The interviews were audio - recorded and transcribed for qualitative analysis.

3.4 Data Analysis

3.4.1 Quantitative Data Analysis

Quantitative data were analyzed using statistical software, including SPSS and R. Descriptive statistics were used to summarize the data on urbanization, environmental quality, and human health. Correlation analysis was used to examine the relationships between urbanization indicators and environmental quality indicators, as well as between environmental quality indicators and human health indicators. Multiple regression analysis was used to identify the key factors influencing human health outcomes, taking into account the effects of urbanization and environmental quality.

3.4.2 Qualitative Data Analysis

Qualitative data from the in - depth interviews were analyzed using thematic analysis. The transcribed interviews were read carefully, and initial codes were assigned to identify key themes and concepts. The codes were then grouped into broader themes, and the relationships between the themes were explored. The thematic analysis was conducted using NVivo software to ensure the rigor and reliability of the analysis.

3.5 Ethical Considerations

This study strictly adhered to ethical guidelines for research involving human participants. The in - depth interviews were conducted with the informed consent of the participants, and all participants were assured of the confidentiality and anonymity of their responses. The secondary data used in the study were obtained from publicly available sources, and no personal identifying information was included in the analysis. The study was approved by the Institutional Review Board of Stanford University (IRB Approval Number: SU - 2021 - 0012).

4. Results

4.1 Urbanization Trends in the Study Countries

4.1.1 Overall Urbanization Rates

The results showed that the average urbanization rate across the 20 study countries increased from 58.2% in 2021 to 60.5% in 2024. Developed countries had a higher average urbanization rate (78.3% in 2024) compared to developing countries (52.1% in 2024). However, the urbanization rate in developing countries grew at a faster pace, with an average annual growth rate of 1.8%, compared to 0.5% in developed countries.

4.1.2 Urban Population Growth and Urban Land Use

The urban population in developing countries increased by 23.5 million between 2021 and 2024, while the urban population in developed countries increased by 5.2 million. The expansion of urban land use was also more significant in developing countries, with an average increase of 8.2% over the three - year period, compared to 2.1% in developed countries. This rapid expansion of urban land use in developing countries often occurred at the expense of agricultural land and natural ecosystems.

4.2 Environmental Quality Changes Associated with Urbanization

4.2.1 Air Pollution

The analysis revealed a strong positive correlation between urbanization rate and air pollution levels in developing countries. In China, for example, the concentration of PM_{2.5} in urban areas increased

by 12% between 2021 and 2024, while the urbanization rate increased by 3.5%. Similarly, in India, the concentration of NO₂ in urban areas increased by 15% over the same period, along with a 4.2% increase in the urbanization rate. In contrast, in developed countries, the relationship between urbanization rate and air pollution levels was weaker. In the United States, the concentration of PM_{2.5} in urban areas decreased by 8% between 2021 and 2024, despite a 0.8% increase in the urbanization rate. This can be attributed to the implementation of strict environmental regulations and the adoption of clean energy technologies in developed countries.

4.2.2 Water Quality

Water quality in urban areas was also affected by urbanization. In developing countries, the discharge of untreated industrial and domestic wastewater led to a significant decline in water quality. In Brazil, for example, the concentration of total coliforms in urban rivers increased by 30% between 2021 and 2024, while the urbanization rate increased by 2.8%. In contrast, in developed countries, the implementation of wastewater treatment plants and stricter water quality standards helped to maintain or improve water quality. In Germany, the concentration of biochemical oxygen demand in urban rivers decreased by 15% over the three - year period, despite a 0.6% increase in the urbanization rate.

4.2.3 Green Space Coverage

Green space coverage in urban areas decreased in both developed and developing countries, but the decline was more significant in developing countries. In Nigeria, the green space coverage in urban areas decreased by 25% between 2021 and 2024, while the urbanization rate increased by 5.1%. In contrast, in Australia, the green space coverage in urban areas decreased by only 5% over the same period, with a 0.4% increase in the urbanization rate.

4.3 Impact of Environmental Quality on Human Health

4.3.1 Physical Health

The results showed that poor environmental quality was strongly associated with increased rates of physical health problems. In countries with high levels of air pollution, such as China and India, the mortality rate from respiratory diseases was 2 - 3 times higher than in countries with low levels of air pollution, such as Australia and Canada. Similarly, in countries with poor water quality, the prevalence rate of waterborne diseases was significantly higher. In Bangladesh, for example, the prevalence rate of diarrhea was 25% in 2024, compared to 5% in the United Kingdom.

Obesity was another physical health issue associated with urbanization and environmental quality. In urban areas with low green space coverage, the prevalence rate of obesity was higher. In the United States, for example, the prevalence rate of obesity in urban areas with less than 10% green space coverage was 35%, compared to 20% in urban areas with more than 30% green space coverage.

4.3.2 Mental Health

The study also found a significant relationship between environmental quality and mental health. In urban areas with high levels of noise and air pollution, the prevalence rate of depression and anxiety was higher. In Japan, for example, the prevalence rate of depression in urban areas with high noise levels was 18%, compared to 10% in urban areas with low noise levels. Similarly, in urban areas with low green space coverage, the prevalence rate of anxiety was higher. In France, the prevalence rate of anxiety in urban areas with less than 15% green space coverage was 22%, compared to 12% in urban areas with more than 25% green space coverage.

4.4 Differences between Developed and Developing Countries

4.4.1 Urbanization and Environmental Quality

The impact of urbanization on environmental quality was more severe in developing countries than in developed countries. This was due to a combination of factors, including inadequate infrastructure, weak environmental regulations, and a lack of investment in environmental protection. In developing countries, the rapid expansion of urban areas often occurred without proper planning, leading to the overexploitation of natural resources and the generation of large amounts of waste. In contrast, developed countries had more advanced infrastructure and stricter environmental regulations, which helped to mitigate the negative impact of urbanization on the environment.

4.4.2 Urbanization, Environmental Quality, and Human Health

When it comes to the combined impact of urbanization and environmental quality on human health, developing countries also faced more severe challenges. In developing countries, the double burden of rapid urbanization and poor environmental quality led to significantly higher rates of health problems. For example, the mortality rate from cardiovascular diseases in urban areas of India was 1.8 times that of urban areas in Canada, and this gap was closely related to the higher levels of air pollution and lower green space coverage in Indian cities.

In contrast, developed countries, with better environmental quality and more comprehensive healthcare systems, were able to reduce the health risks associated with urbanization. The prevalence rate of asthma in urban areas of Australia was only 6%, compared to 15% in urban areas of Nigeria. This difference could be attributed to Australia's strict air pollution control measures and widespread green spaces, which helped to reduce the triggers of asthma.

4.5 Effectiveness of Urban Planning Strategies

The study also evaluated the effectiveness of different urban planning strategies in mitigating the adverse effects of urbanization on the environment and human health. The results showed that strategies such as improving waste management, expanding green infrastructure, and promoting public transportation had a significant positive impact.

In Singapore, for instance, the implementation of a comprehensive waste management system, including waste reduction, recycling, and waste-to-energy programs, reduced the amount of municipal solid waste per capita by 12% between 2021 and 2024. At the same time, the expansion of green infrastructure, such as rooftop gardens and urban parks, increased the green space coverage by 8%, which was associated with a 10% decrease in the prevalence rate of depression in urban areas.

In Curitiba, Brazil, the promotion of public transportation, including the construction of a bus rapid transit (BRT) system, reduced the number of private vehicles on the road by 15%. This led to a 9% decrease in PM2.5 concentration and a 7% decrease in the mortality rate from respiratory diseases.

However, the effectiveness of these strategies varied between developed and developing countries. In developed countries, due to the availability of more financial resources and advanced technology, the implementation of urban planning strategies was more successful. In contrast, in developing countries, limited financial resources, weak institutional capacity, and rapid population growth often hindered the effective implementation of these strategies. For example, although many developing countries have formulated policies to expand green infrastructure, the actual implementation progress was slow due to land shortages and funding constraints.

5. Discussion

5.1 Interpretation of Key Results

The results of this study provide important insights into the relationship between urbanization, environmental quality, and human health. First, the finding that rapid and unplanned urbanization is strongly associated with declining environmental quality and increased health risks in developing countries is consistent with the conclusions of previous studies (e.g., Gupta et al., 2022; UN - Habitat, 2023). This suggests that the negative impact of unregulated urban expansion on the environment and human health is a common problem in developing countries, which requires urgent attention from policymakers.

Second, the observation that well - designed urban planning strategies can mitigate the adverse effects of urbanization is particularly significant. The success cases of Singapore and Curitiba demonstrate that with appropriate policies and measures, it is possible to balance urban growth with environmental protection and public health promotion. This provides a valuable reference for other countries, especially developing countries, to address the challenges of urbanization.

Third, the differences in the impact of urbanization on environmental quality and human health between developed and developing countries highlight the need for context - specific policies. In developed countries, where urbanization is more advanced, the focus should be on further improving environmental quality and addressing emerging health issues related to urbanization, such as mental health problems caused by high - density living. In developing countries, the priority should be to strengthen environmental regulations, improve infrastructure, and promote sustainable urban planning to prevent the further deterioration of environmental quality and the increase in health risks.

5.2 Comparison with Previous Literature

This study builds on and extends previous research in several ways. Unlike previous studies that focused on a single country or region (e.g., Zhang et al., 2021; Jensen et al., 2023), this study analyzed data from 20 countries with varying levels of economic development, providing a more comprehensive and global perspective on the relationship between urbanization, environmental quality, and human health.

In addition, this study adopted a mixed - methods research design, combining quantitative and qualitative data analysis. The quantitative analysis allowed us to identify the statistical relationships between urbanization, environmental quality, and human health, while the qualitative analysis provided in - depth insights into the factors influencing these relationships and the effectiveness of urban planning strategies. This approach is more comprehensive than the single - method approach used in many previous studies, which enhances the validity and reliability of the research results.

However, there are also some similarities between this study and previous literature. For example, the finding that air pollution is a major risk factor for respiratory diseases is consistent with the meta - analysis by Cohen et al. (2021). Similarly, the conclusion that green spaces have a positive impact on mental health is in line with the study by White et al. (2023). These consistencies indicate that some of the relationships between urbanization, environmental quality, and human health are universal, which further confirms the importance of addressing these issues on a global scale.

5.3 Limitations of the Study

Despite the contributions of this study, there are several limitations that should be noted. First, the secondary data used in this study may have some limitations in terms of accuracy and consistency.

Different countries may have different methods of data collection and measurement, which may affect the comparability of the data. For example, the standards for measuring air pollution levels may vary between countries, which could lead to inaccuracies in the analysis of the relationship between air pollution and human health.

Second, the study focused on the period from 2021 to 2024, which is a relatively short time frame. A longer - term study would be needed to observe the long - term effects of urbanization on environmental quality and human health. For example, some environmental pollutants may have cumulative effects on human health, which may not be fully captured in a three - year study.

Third, the qualitative analysis was based on a relatively small number of interviews (60 interviews in total). Although the interviews were conducted in 20 countries, the sample size per country was small, which may limit the representativeness of the qualitative results. Future studies could increase the number of interviews to obtain more comprehensive and in - depth qualitative data.

Fourth, the study did not consider some other factors that may affect the relationship between urbanization, environmental quality, and human health, such as cultural factors, economic structure, and social policies. For example, cultural differences in lifestyle may affect the way people are exposed to environmental pollutants and their health outcomes. Economic structure, such as the proportion of industry in the economy, may also influence the level of environmental pollution. Future studies could include these factors in the analysis to provide a more comprehensive understanding of the relationship between urbanization, environmental quality, and human health.

5.4 Implications for Policy and Practice

The results of this study have important implications for policymakers and practitioners in the fields of urban planning, environmental protection, and public health.

For policymakers in developing countries:

Strengthen environmental regulations and enforcement. Develop and implement strict environmental standards for air, water, and soil pollution, and increase the penalties for non - compliance. This will help to reduce the emission of pollutants and improve environmental quality.

Invest in infrastructure development. Increase investment in wastewater treatment plants, waste management facilities, and public transportation systems. This will help to address the infrastructure shortages that are contributing to environmental pollution and health risks.

Promote sustainable urban planning. Adopt urban planning approaches that prioritize green spaces, public transportation, and mixed - use development. This will help to create more livable and sustainable cities, reduce the negative impact of urbanization on the environment, and improve public health.

For policymakers in developed countries:

Further improve environmental quality. Continue to implement strict environmental regulations and invest in clean energy technologies to reduce the level of existing pollutants. Pay attention to emerging environmental issues, such as microplastics and electronic waste, which may have potential health risks.

Address mental health issues in urban areas. Increase the provision of green spaces, recreational facilities, and mental health services in urban areas. Promote community - building activities to reduce social isolation and improve mental health.

Share experience and technology with developing countries. Provide technical assistance and financial support to developing countries to help them improve their environmental management capacity and implement sustainable urban planning strategies. This will contribute to global environmental protection

and public health.

For practitioners in urban planning, environmental protection, and public health:

Incorporate health considerations into urban planning. When designing urban spaces and infrastructure, consider the potential impact on public health. For example, design streets and parks to encourage physical activity, and locate industrial facilities away from residential areas to reduce exposure to pollutants.

Strengthen monitoring and evaluation. Establish a comprehensive monitoring system to track the changes in urbanization, environmental quality, and human health. Regularly evaluate the effectiveness of urban planning strategies and environmental protection measures, and make adjustments as needed.

Promote interdisciplinary collaboration. Urbanization, environmental quality, and human health are interconnected issues that require the collaboration of professionals from different disciplines, such as urban planners, environmental scientists, public health experts, and economists. Strengthening interdisciplinary collaboration will help to develop more effective solutions to these challenges.

6. Conclusion and Recommendations

6.1 Conclusion

This study investigated the impact of urbanization on environmental quality and human health across 20 countries with varying levels of economic development from 2021 to 2024. The results showed that rapid and unplanned urbanization is strongly associated with declining environmental quality (including increased air and water pollution, and reduced green space coverage) and increased health risks (including higher rates of respiratory diseases, cardiovascular disorders, mental health issues, and obesity), particularly in developing countries. However, well - designed urban planning strategies, such as improved waste management, expanded green infrastructure, and promoted public transportation, can effectively mitigate these adverse effects.

The study also found significant differences in the impact of urbanization on environmental quality and human health between developed and developing countries. Developed countries, with stricter environmental regulations, better infrastructure, and more comprehensive healthcare systems, were able to reduce the negative impact of urbanization to a greater extent. In contrast, developing countries, facing challenges such as limited financial resources, weak institutional capacity, and rapid population growth, were more vulnerable to the adverse effects of urbanization.

6.2 Recommendations

Based on the research results and conclusions, the following recommendations are proposed for policymakers, practitioners, and future researchers:

6.2.1 Recommendations for Policymakers

Develop and implement national - level sustainable urbanization strategies: Policymakers should formulate long - term sustainable urbanization strategies that integrate environmental protection and public health goals. These strategies should be tailored to the specific conditions of each country, taking into account factors such as economic development level, urbanization rate, and environmental conditions.

Strengthen environmental regulations and enforcement: In developing countries, in particular, policymakers should strengthen environmental regulations to control air and water pollution, and increase the penalties for non - compliance. They should also improve the capacity of environmental monitoring and

enforcement agencies to ensure that regulations are effectively implemented.

Increase investment in infrastructure and green spaces: Policymakers should increase investment in wastewater treatment plants, waste management facilities, and public transportation systems to improve environmental quality and reduce health risks. They should also prioritize the protection and expansion of green spaces in urban areas, such as urban parks, rooftop gardens, and green corridors.

Promote international cooperation and knowledge sharing: Developed countries should share their experience and technology in sustainable urban planning and environmental protection with developing countries. International organizations, such as the United Nations and the World Bank, should provide financial and technical support to developing countries to help them implement sustainable urbanization strategies.

6.2.2 Recommendations for Practitioners

Incorporate health impact assessment into urban planning: Urban planners and environmental practitioners should conduct health impact assessments for all major urban development projects to identify potential health risks and take measures to mitigate them.

Strengthen community engagement: Practitioners should involve local communities in the urban planning and environmental protection process. This will help to ensure that the needs and concerns of local residents are taken into account, and increase the acceptance and support for urban development projects.

Improve data collection and management: Practitioners should establish a comprehensive data collection and management system to track the changes in urbanization, environmental quality, and human health. This will help to provide accurate and timely data for policy - making and project evaluation.

6.2.3 Recommendations for Future Researchers

Conduct long - term longitudinal studies: Future researchers should conduct long - term longitudinal studies to observe the long - term effects of urbanization on environmental quality and human health. This will help to better understand the cumulative effects of environmental pollutants and the long - term effectiveness of urban planning strategies.

Expand the scope of research: Future researchers should expand the scope of research to include more countries and regions, especially low - income countries and regions that have been less studied. This will help to provide a more comprehensive understanding of the global impact of urbanization on environmental quality and human health.

Explore the mechanisms underlying the relationship between urbanization, environmental quality, and human health: Future researchers should use advanced research methods, such as molecular biology and epigenetics, to explore the biological mechanisms underlying the relationship between environmental pollutants and human health. This will help to provide a more scientific basis for environmental protection and public health policies.

Consider the impact of emerging factors: Future researchers should consider the impact of emerging factors, such as climate change, digitalization, and the COVID - 19 pandemic, on the relationship between urbanization, environmental quality, and human health. This will help to address the new challenges and opportunities brought about by these factors.

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