

The Economic and Environmental Impacts of Urbanization in China

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Abstract: With a transformation from traditional, agricultural economies to industrial economies, urbanization, the process of people migrating from rural to urban places, has increased substantially in China, particularly after the introduction of the reform and opening-up policies. China's development of the economy has been promoted, while related environmental problems also exist and could hinder social and economic development in China. This paper critically investigated the economic impacts of urbanization, including the changes in GDP per capita, economic output, income level, and urban-rural income gap. Environmental impacts related to the economic growth and urbanization process, such as the impact on temperature, CO₂ emissions, PM 2.5 concentration, water pollution, and environment-related health risks, were also analyzed. Finally, policies and suggestions regarding promoting the sustainable development of urbanization were discussed, such as controlling population growth and the intensity of urban development, adjusting energy and industrial structures, encouraging technological innovation and education, and considering future resource capacity.

Keywords: Urbanization, Economic Development, Environmental Pollution, Kuznets Curve.

1. Introduction

Urbanization, the rural-urban migration, has occurred in many economies. With the development of society and the accumulation of population and capital, there is a transformation from traditional, agricultural economies to industrial economies. This transformation has increased production efficiency and boosted the development of the economy. During that process, there is a decrease in agricultural production and employment, while because of the economy's fast expansion, there is a rise in the need for labor in urban areas. Therefore, as a result of the economic progress, the rural population has relocated to urban regions.

China's urbanization has grown substantially in the last few decades with the introduction of reform and opening-up policies. According to data, from 17.92% in 1978 to 58.52% in 2017, China's urbanization rate has risen significantly, with a roughly 1% yearly growth rate on average. Particularly, from 1995 to 2011, it increased to around 51.3%, and for the first time, the population in urban areas surpassed that in rural areas in 2011 [1]. As of 2021, China's urbanization rate was 64.7%, and by 2035 it was expected to exceed 80% [2].

With the expansion of urbanization, there is a rise in consumer demand, resulting in an increase in various productive activities in multiple areas, such as building, infrastructure, residential services, and medical care. For those production operations, producer services, such as financing, technical help, and transportation services would be required. The interrelation between sectors would result in a rise in income, economic output, and investment within the economic system. Therefore, it was believed that urbanization and economic growth are interconnected processes and urbanization may boost economic development.

However, when the degree of urbanization rises and economic growth is pursued, environmental issues have become increasingly prominent, which can, in turn, restrict the growth of the economy and pose tremendous challenges to the sustainable development of urbanization. A link between urbanization processes and environmental development has been found, and the environment is harmed as a result of urbanization. The urbanization expansion leads to population aggregation, which may put a strain on ecological development and resource availability.

Therefore, investigating the economic and environmental implications of urbanization in China can help understand this rural-urban migration critically. Also, it is essential for Chinese policymakers to formulate effective emission reduction and pollution alleviation policies while ensuring economic growth. This investigation might be useful for other nations when developing strategies to support the sustainable urbanization process.

2. Economic impacts of urbanization in China

There are significant economic impacts associated with urbanization in China. First, urbanization has contributed to GDP per capita in China. According to a study, the correlation coefficient between China's urbanization rate in percentage points and the log of GDP per capita from 1978 to 2012 was as high as 0.99 [3]. Also, according to data from over 30 Chinese provinces during the period from 1997 to 2010, research concluded that for every 1% rise in the urban built-up area, there would be a 0.81% to 0.94% increase in real GDP per capita [4]. Therefore, the urbanization rate is closely related to economic development and urbanization has promoted a rise in per capita GDP in China according to the data.

Second, urbanization impacts economic output. The research found that when urban and rural per capita outputs were compared, the per capita output of urban people was 6.59 times that of rural people. The contribution of the urbanization impact comprised both direct and indirect impacts of urbanization. The rate of contribution for the direct impact was 16.4%, while the rate of contribution for the indirect impact was 83.6%. The direct urbanization impact raised output by around 6,000 billion CNY, accounting for roughly 11% of total output in 2005, while the indirect impact increased output by around 3,000 billion CNY, contributing nearly 56% of total output in 2005. What is more, the study suggests that due to the population aggregation, there was a 1.57% increase in output with every one percent rise in the rate of urbanization [5]. Therefore, it could be seen that urbanization was positively correlated with economic output.

What is more, with urbanization, the income level in China has increased. In 1978, per capita disposable income in China was 332 CNY, which reached 32,189 CNY in 2020, increasing by a factor of 97. In addition, during that period, the urban and rural populations' disposable income per capita increased 132 times and 104 times, respectively [6]. From 1981 to 2015, a causality test was used in a study to assess the relationship between urbanization level and income level in China, which suggested that urbanization is the primary driver of earnings growth in China [7]. Specifically, at the regional level, a one percent increase in urbanization expansion can raise per capita income by around 0.99-1.03 percent in eastern China, 1.17-1.91 percent in central China, and 1.24-1.35 percent in western China, respectively [4].

Moreover, urbanization has a substantial impact on the income gap between the rural and urban populations in China. According to data, from 1978 to 2019, the rate of urbanization in China grew by about 42.7%. The ratio of urban populations' disposable income per capita to that of rural populations grew about 0.83 from 1978 to 2009 and then declined around 0.69 in 2019. The changes in income disparity between the rural and urban populations in China along with urbanization rates fit Kuznets' inverted-U hypothesis [8]. It means that income disparity is likely to rise first and then gradually fall as the economy grows. In the short run, due to the higher income levels in urban regions and a reduction in the workforce in rural places, urbanization can lead to an increase in income inequality, compared to that in rural areas. However, in the long run, as neoclassical convergence theory suggested, factor mobility and transformation will gradually bring about regional balance [9]. A study shows that a one percent reduction in urban expansion correlates to a 0.005%-0.011% decrease in the urban-rural income disparity during the period between 2006 and 2014 [10]. In the long term, the income disparity will gradually diminish with urbanization expansion and economic growth. Therefore, urbanization promotes the Chinese economy through the contribution to per capita GDP, the increment in economic output, the rise in income levels, and the effect of narrowing the income disparity in the long term.

3. Environmental impacts of urbanization in China

On the other hand, with the increase in urbanization rate and the increment of energy demand, environmental issues correlated with urbanization have become prominent, which could hinder social and economic development, and can lead to severe health risks.

First, urbanization has an impact on the emissions of CO₂ in China. According to data, along with the increase in the urbanization rate, the total amount of CO₂ emissions increased from 1,483 Mt in 1978 to 6,896 Mt in 2008, an average annual increase of 5.2% [11]. In the short term, with every one percent increase in the urbanization rate, CO₂ emissions rise by 1.28 percent [12]. Also, it was found that urbanization increases the overall CO₂ emissions through industrialization, construction, and residential consumption. Urban sprawl, related to urbanization, also increases CO₂ emissions from transportation, construction, and industries [13]. Industries may contribute significantly to China's energy usage and CO₂ emissions. Apart from that, regression findings suggest a reversed U-shaped association between urbanization level and carbon dioxide emission intensity in western regions of China. In respect of urbanization, this inverted U-shaped correlation matches the Environmental Kuznets Curve, which means that the emissions of CO₂ increase during the early stages of urbanization while decreasing as the economy and urbanization progress [14].

Second, urbanization also affects the temperature in China. Between 1961 and 2013, China's temperature rose by 1.44 degrees Celsius, and the effects of urban warming accounted for almost one-third of that temperature rise [15]. It's clear that urbanization has significantly exacerbated the trend of warming in China. One specific example is the increasing temperature in Northeastern China. Northeastern China was the largest old industrial base, and with a rapid urbanization process, the minimum temperatures in Northeastern China increased significantly between 1960 to 1989. The urbanization effects on temperature were significant, largely due to the industrialization and urban warming effect, which can further lead to climate change [16].

In addition, in China, PM 2.5 concentrations have been impacted by urbanization, and PM 2.5 contamination and urbanization have a substantial positive association. Statistics show that pollution from PM 2.5 was more severe across 85 eastern urban regions, compared with surrounding rural areas. Also, a positive link between urban PM 2.5 intensity and the urbanization process was discovered by analyzing the urbanization indicators of built-up areas in a city, secondary industrial proportion, and population [17]. Rapid urbanization leads to population growth and economic development, which correlates with an exacerbation of PM 2.5 pollution. Furthermore, there is a clear association between urbanization and health concerns related to PM 2.5 pollutants, which indicates that living in highly urbanized cities is correlated with more serious health risks, such as mortality from cardiovascular and respiratory issues [18].

What is more, water pollution is serious in China during urbanization. According to the results of the 44 major cities' water quality tests, a regression study reveals that population growth rates and sizes have a major impact on the water resources in China. This shows that China lacks sufficient wastewater treatment mechanisms to cope with population size and population growth in urban cities [19]. Furthermore, a study of how the quality of the water in Jinan, China was affected by urbanization demonstrates that between 25 and 40 percent of urbanization results in permanent damage to river quality. Also, when the urbanization level exceeds 40%, with the increase in urbanization rate, urban river pollution becomes more serious [20]. As a result, there may be an increased risk of exposure to infectious and parasitic diseases. The heavy metals and industrial chemicals in water may be digested by humans and cause diseases, such as liver damage, intestinal damage, and cancer. Therefore, urbanization has a significant impact on water quality, which can be a restriction factor in urbanization advancement and lead to increased health risks in China.

4. Suggested policies for sustainable development of urbanization in China

For addressing urbanization-related environmental issues while ensuring economic growth, based on the preceding study of the impacts, policymakers in China can implement the following strategies and policies to support the environmental sustainability of urbanization in China.

Generally, the Chinese government needs to strike a balance between economic growth and environmental sustainability. Instead of only prioritizing the growth of the economy and urbanization process, the intensity of urban development and population growth should be controlled according to the geographical resources and environmental capabilities. There should be a balance between population size and the size of cities in order to maintain an equilibrium with rural-urban migration. Ecological civilization, green construction, optimizing industrial structure, technical innovation, and education, should also be encouraged, which can help relieve environmental issues related to urbanization, drive economic growth, and promote new green urbanization.

Specifically, when managing issues related to CO₂ emissions and PM 2.5 pollutants, First, the Chinese government could implement carbon emission trading and carbon taxation for controlling CO₂ emissions. By creating a market with limited permits for emissions and increasing the opportunity cost of generating CO₂, enterprises that emit a large amount of CO₂ will be motivated to consider approaches to reduce those emissions. Second, emission source treatment, such as adjusting energy structures and industrial structures can help China achieve sustainable development. For example, energy transition from fossil fuel to renewable energy can be applied to promote energy efficiency and reduce air pollution. Outdated production technology and equipment should be eliminated. Technological innovation, education, and research should be encouraged by the Chinese government. Apart from that, there should be an emphasis on promoting the development of the light industry since the heavy industry could be a significant factor in air pollution in China. Also, the Chinese government could encourage real estate to develop green construction, such as applying solar power, geothermal systems, and sustainable materials, which can help reduce CO₂ emissions and PM 2.5 concentration from emission sources and promote sustainable urbanization.

Apart from that, when addressing water pollution related to urbanization in China, the question of whether water treatment systems can dispose of water pollution emitted by population size effectively should be considered by the Chinese government. There should be a balance between the current population size and the current capacity of water treatment systems. Encouraging the development of innovative technologies, such as anaerobic ammonia oxidation skills, updating wastewater treatment systems, and increasing the capacity of municipal sewage treatment facilities can become significant for accommodating the enlarging population size. Those can help improve the efficiency and effectiveness of controlling water pollution and improving water quality. What is more, it is necessary to consider future population growth. Governments need to be prepared for the future increase in population, which helps balance the relationship between the capacity of water treatment systems and population size in the long term.

5. Conclusion

Through an investigation of the economic and environmental impacts of urbanization, it has been discovered that urbanization promotes the Chinese economy through the contribution to per capita GDP, the increment in economic output, the rise in income levels, and the effect of narrowing the economic disparity between rural and urban regions in the long term. However, there are related environmental impacts, including the impacts on temperature, CO₂ emissions, PM 2.5 concentration, water pollution, and environment-related health risks in China. Then, policies and strategies regarding addressing issues related to CO₂ emissions, PM 2.5 concentration, and water pollution have been provided and discussed. Therefore, with the significant growth of urbanization in China, principles of overall planning and coordination should be persisted, and it is vital to balance economic progress and environmental sustainability in the long run.

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