

# Effects of Urbanization, Transport Infrastructure, Air Quality, and Health Outcomes on the Quality of Life of Jakarta City Population

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## ABSTRAK

Studi ini menyelidiki efek urbanisasi, infrastruktur transportasi, kualitas udara, dan hasil kesehatan terhadap kualitas hidup penduduk Jakarta. Studi ini menggunakan pendekatan metode campuran, termasuk survei terhadap 500 responden dan diskusi kelompok fokus dengan anggota masyarakat. Studi ini menemukan bahwa urbanisasi memiliki efek negatif pada kualitas hidup responden, sedangkan infrastruktur transportasi yang baik memiliki efek positif. Kualitas udara memiliki efek negatif pada kualitas hidup, sedangkan hasil kesehatan yang baik memiliki efek positif. Diskusi kelompok fokus memberikan wawasan tambahan tentang efek faktor-faktor ini pada kualitas hidup penduduk Jakarta. Studi ini menyoroti pentingnya mengatasi efek negatif urbanisasi, infrastruktur transportasi, dan polusi udara pada kualitas hidup penduduk perkotaan.

## ABSTRACT

This study investigates the effects of urbanization, transportation infrastructure, air quality, and health outcomes on the quality of life of Jakartans. The study used a mixed-method approach, including a survey of 500 respondents and focus group discussions with community members. The study found that urbanization had a negative effect on respondents' quality of life, while good transport infrastructure had a positive effect. Air quality has a negative effect on quality of life, while good health outcomes have a positive effect. Focus group discussions provide additional insight into the effects of these factors on the quality of life of Jakartans. The study highlights the importance of addressing the negative effects of urbanization, transport infrastructure, and air pollution on the quality of life of urban residents.

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## 1. INTRODUCTION

The quality of life of urban people can be improved through various efforts. Governments can build sustainable economies and create jobs (Khalil, 2012). In addition, the government can also provide decent residential facilities such as Rusunawa Pekunden. Village funds are also considered to have improved the quality of life of rural communities (Bank Indonesia, 2018). Another factor that affects the quality of life of residents in urban slums is infrastructure and a healthy environment (Charisma, 2020; Lambiri et al., 2007).

Urbanization, transportation infrastructure, air quality, and health outcomes have a significant impact on the quality of life of city dwellers. Urbanization is the process of people migrating from rural areas to cities seeking better job opportunities and access to public facilities such as education, health, transportation, recreation, and shopping malls (Marans & Stimson, 2011; Nussbaum & Sen, 1993). Urbanization has a positive impact on job availability in urban areas compared to rural areas (Ulfah, 2021). It also provides better educational facilities and higher wages for workers.

However, urbanization can lead to a decrease in population in rural areas and an increase in population density in urban areas. Transport infrastructure is essential for urban development. The increasing trend of motorization has led to a decrease in air quality due to increased fuel consumption (Piana et al., 2019; Tortajada et al., 2013). The government needs to control fuel consumption by reducing distances or the number of trips, switching to environmentally friendly modes of transportation, and innovating vehicle technology (Norhabiba et al., 2019). Air pollution caused by motorization can cause respiratory problems such as asthma and bronchitis. Urbanization can also lead to changes in health outcomes.

The availability of public facilities such as health services can improve health outcomes for city dwellers. However, crowding and poor sanitation can lead to the spread of infectious diseases (Machimura, 2021; Zhang, 2019). Urbanization can also lead to mental health problems such as stress from long working hours and social isolation (Harahap, 2013). Urbanization has both positive and negative impacts on the quality of life of city dwellers. Transport infrastructure is essential for urban development but needs to be controlled to prevent air pollution. Public facilities such as healthcare are needed to improve health outcomes but need to be well managed to prevent crowds and poor sanitation (Neuwirth, 2016; Schindler, 2017).

Urbanization can have both positive and negative impacts on the quality of life in cities (Tortajada et al., 2013). On the one hand, urban areas can provide better access to social facilities, medical facilities, and employment opportunities (Piana et al., 2019). When planned and managed well, urbanization can reduce poverty and inequality by improving quality of life. However, rapid urbanization can lead to a population explosion that is difficult to plan. This can result in congestion, lack of public service provision, and failure to guarantee a minimum quality of life for all urban residents (Ulfah, 2021; Wang et al., 2019).

Urbanization also has significant health impacts. Poor nutrition, pollution-related health conditions, infectious diseases, poor sanitation and housing conditions are some of the major health problems resulting from urbanization (Martínez-Zarzoso & Maruotti, 2011). This has a direct impact on the quality of life of individuals while stressing the public health system (Akmentina, 2022).

Environmental degradation is another impact of urbanization. Poor air and water quality, insufficient water availability, waste disposal problems, and high energy consumption are compounded by increased population density in cities (Purnomohadi, 1995; Zainuddin, 2010). Strong urban planning will be important in managing these difficulties as the world's urban population continues to grow.

While urbanization can provide better access to social amenities and employment opportunities when properly planned and managed, it can also lead to congestion, inadequate provision of public services, environmental degradation, and health problems when not managed properly (Greenstone & Fan, 2019; Hermawan, 2019).

Jakarta, the capital of Indonesia, is experiencing rapid urbanization and industrialization, leading to severe air pollution problems (Asri & Hidayat, 2005). The high number of vehicles on the road is one of the main causes of poor air quality in Jakarta (Hermawan, 2019; Zainuddin, 2010). According to the Air Quality Index (IKU), the average PM 2.5 in Jakarta stands at around 160, which is considered "unhealthy for everyone" (Martinez & Masron, 2020). Among all provinces in Indonesia, Jakarta has the largest percentage of deaths related to air quality.

Poor air quality in Jakarta has a significant impact on public health outcomes. To address this increasing public health threat, Vital Strategies is working with the DKI Jakarta Provincial Government to launch the Jakarta Clean Air Partnership. The initiative aims to increase the availability and use of air quality data, analyze policy solutions and their effectiveness, and raise public awareness about the health impacts of air pollution. The main focus of the partnership is to develop the "Grand Design for Air Pollution Control," which serves as a guide to improve Jakarta's air quality through three key strategies: improving air pollution control governance; reduce air pollution emissions from mobile sources; and raising public awareness about air pollution.

Transport infrastructure also plays an important role in shaping urbanization patterns and influencing public health outcomes. Rapid growth and weak urban planning have led to chronic congestion in Jakarta (Rowdy et al., 2022). Income growth has boosted demand for private vehicles as cars and motorcycles are often perceived as positive signals of social status. However, national policies such as fuel subsidies have made private vehicle ownership more affordable than using public transportation systems such as TransJakarta – Jakarta's Bus Rapid Transit system introduced to reduce congestion and improve air quality (Rowdy et al., 2022).

Rapid urbanization, transportation infrastructure, poor air quality, and health outcomes are interrelated and affect the quality of life of Jakartans (Hermawan, 2019). Addressing this issue requires a comprehensive approach that involves improving transportation infrastructure while reducing emissions from mobile sources such as vehicles. It also entails raising public awareness of the health impacts of air pollution while promoting alternative modes of transport such as TransJakarta.

Based on Numbeo data, Jakarta ranks lower in the list of cities with the best quality of life index in the world. The quality of life index in Jakarta is still relatively low when compared to cities in other countries. One indicator to measure quality of life is the Human Development Index (HDI) value which is an explanatory indicator of how residents can access development outcomes in obtaining health, education, and income (Numero, 2022). Massive and evenly distributed infrastructure development in all corners of the country over the past 5 years has become the foundation for Indonesia's progress in the future (Directorate General of Natural Resources, 2019). However, human populations are geometrically growing rapidly while crop land is eroding, forests are degenerating, species are facing settlement, water supplies are dwindling and pollution is increasing (Kemenkumham, 2019).

Indonesia is now starting to enter a period of aging population where there is an increase in life expectancy followed by an increase in the number of elderly. Indonesia experienced an increase in the number of elderly people from 18 million people (7.56%) in 2010 to 25.9 million people (9.7%) in 2019 and is expected to continue to increase from 2035 to 48.2 million people (15.77%). The Secretary General of the Ministry of Health stated that everyone needs to start paying attention to the needs of the elderly so that they are expected to stay healthy, independent, active and productive,

one of which is strengthening the role of the family in caring for the elderly (Ministry of Health, 2019).

Urbanization, transport infrastructure, air quality, and health outcomes are interrelated factors and have a significant impact on the quality of life of city dwellers. Rapid urbanization and the accompanying increase in population density often lead to inadequate housing, poor air quality, and inadequate transportation infrastructure. In Jakarta, the capital of Indonesia, urbanization and its accompanying challenges have significant implications for the well-being of city dwellers (Dewi & Wuryaningsih, 2019; Rustiadi et al., 2021; Simone, 2013). The background of this study aims to provide an overview of the effects of urbanization, transportation infrastructure, air quality, and health outcomes on the quality of life of Jakarta residents.

Jakarta is the most populous city in Indonesia, with an estimated population of around 10.6 million people in 2020. The city has experienced rapid urbanization over the past few decades, leading to a significant increase in population density. According to the World Bank, Jakarta's population has more than quadrupled since 1960, with most of the growth occurring in recent decades.

Jakarta's rapid urbanization has led to significant challenges, including inadequate housing, traffic congestion, and pollution. Most urban dwellers live in slums, with inadequate access to basic services such as clean water, sanitation, and health care (Rowuh et al., 2022; Rustiadi et al., 2021). The lack of affordable housing has also led to a significant increase in slums and unofficial settlements, which are often located in areas prone to flooding and other environmental hazards.

Jakarta's transportation infrastructure is inadequate to meet the needs of a rapidly expanding population. The city's streets are congested, causing significant traffic jams during rush hour. The city's public transport system is also inadequate, with most residents relying on private vehicles for transportation (Dewi & Wuryaningsih, 2019; Rustiadi et al., 2021). The lack of a comprehensive public transport system has significant implications for the city's air quality, as the high number of vehicles on the road contributes to air pollution.

Air pollution is a significant challenge in Jakarta, with the city's air quality regularly exceeding levels recommended by the World Health Organization (WHO). The main sources of air pollution in Jakarta are vehicle emissions, industrial activities, and open waste incineration. The city's high population density, combined with inadequate transport infrastructure, has resulted in a high number of vehicles on the road, leading to significant air pollution.

Poor air quality in Jakarta has significant implications for the health outcomes of the city's population. Air pollution has been linked to a variety of health problems, including respiratory and cardiovascular diseases (Darçın, 2014; Nakao et al., 2018). According to the Indonesian Ministry of Health (2018), respiratory diseases are among the leading causes of death in Jakarta, with air pollution as a significant contributor. Other health outcomes associated with urbanization in Jakarta include inadequate access to health care, poor nutrition, and inadequate sanitation, which increases the risk of infectious diseases.

The quality of life in Jakarta is strongly influenced by interrelated factors, namely urbanization, transportation infrastructure, air quality, and health outcomes. High population density in cities, inadequate housing, and inadequate transport infrastructure cause traffic congestion, which in turn has significant implications for the city's air quality. Poor air quality, in turn, has significant implications for the health outcomes of urban populations, leading to a lower quality of life (Hermawan, 2019; Zainuddin, 2010).

A shortage of affordable housing, inadequate access to health care, and poor nutrition also contribute to Jakarta's lower quality of life. High population density and inadequate transport

infrastructure also make it difficult for residents to access basic services such as education and employment, further reducing the quality of life of the city's population. This study aims to identify and explore the complex relationship between urbanization, transportation infrastructure, air quality, and health outcomes and their impact on the quality of life of Jakarta's population. The specific objectives of this study are:

1. Examining the impact of urbanization on the quality of life of Jakartans.
2. Examining the relationship between transportation infrastructure and the quality of life of Jakartans.
3. Assess the impact of air pollution on the health of Jakartans.
4. Explore the impact of health outcomes on the quality of life of Jakartans.
5. Identify potential policy solutions to address the challenges facing Jakartans.

## 2. LITERATURE REVIEW

The effects of urbanization, transportation infrastructure, air quality, and health outcomes on the quality of life of Jakartans have become very important concerns for policymakers, researchers, and urban planners. This literature review aims to provide an overview of the existing literature on the complex relationship between these factors and their impact on the quality of life of Jakarta residents.

### 2.1 *Urbanization and Quality of Life*

Urbanization is a process of transformation from rural to urban society characterized by increased population density, industrialization, and agricultural urbanization. Jakarta's growing population has led to high population density, informal settlements, and inadequate access to basic services such as health care and education, leading to a lower quality of life for city dwellers (Dewi & Wuryaningsih, 2019; Rowdy et al., 2022; Simone, 2013) argues that inadequate housing, unsafe drinking water, and inadequate sanitation are the biggest factors contributing to the decline in the quality of life in Jakarta.

### 2.2 *Transport Infrastructure and Quality of Life*

Jakarta's transportation infrastructure is inadequate to meet the needs of its growing population, resulting in traffic congestion, increased travel times, and a lower quality of life for transportation users. The high number of vehicles on the road also contributes to air pollution, which has a significant impact on the health outcomes of city dwellers (Cintantya & Nurtjahjanti, 2020; Pratiwi, 2015) found that Jakarta's public transportation system was inadequate and unreliable, causing significant disruption in daily life, including longer travel times, economic losses, and lower access to basic services.

### 2.3 *Air Quality and Its Impact on Health*

Air pollution is a major challenge in Jakarta, with the city's air quality regularly exceeding levels recommended by the World Health Organization. Vehicular emissions, industrial activities, and open waste incineration are the main sources of air pollution in Jakarta. Poor air quality has a significant impact on the health of city dwellers, which can lead to respiratory and cardiovascular diseases, which in turn decreases the quality of life of residents (Balakrishnan et al., 2019; Yin et al., 2020). It is estimated that air pollution in Jakarta caused 7,000 premature deaths in 2013, indicating the need for urgent policy interventions to address the problem.

### 2.4 *Health and Quality of Life Impact*

Inadequate access to health services, poor nutrition, and inadequate sanitation also contribute to Jakarta's low quality of life. High population density and inadequate transportation

infrastructure make it difficult for residents to access basic services such as health, education, and employment, which in turn further degrades the quality of life of city dwellers (Susanti & Kholisoh, 2018; Wangsarahardja et al., 2007; Yusriana et al., 2018) argues that lack of access to health services and poor nutrition contribute greatly to the high prevalence of non-communicable diseases in Jakarta.

### *2.5 Policy Intervention*

Several policy interventions have been proposed to address the challenges faced by Jakartans. One such intervention is the development of sustainable transportation systems that reduce dependence on private vehicles and promote the use of public transport, cycling, and walking. The construction of integrated public transportation systems, such as Mass Rapid Transit (MRT) and Light Rail Transit (LRT), is expected to reduce traffic congestion, improve air quality, and promote sustainable urban development.

Another proposed policy intervention is the implementation of air pollution control measures, such as regulation of industrial emissions, promotion of clean energy sources, and reduction of open waste incineration. Enforcement of these measures is expected to improve air quality and reduce health risks associated with air pollution (Kadarisman et al., 2015).

## **3. RESEARCH METHODS**

The research design for this study will use a cross-sectional design, which involves collecting data at one particular point in time. The study will be conducted in Jakarta, Indonesia, and involves a sample of adults aged 18 years and over. Data collection will be done through a combination of surveys, focus group discussions, and secondary data analysis.

### *3.1 Sampling Techniques*

The sampling technique for this study will use stratified random sampling technique. The sample will be compiled based on the following factors: age, gender, occupation, and area of residence. A list of households will be obtained from the Jakarta Central Bureau of Statistics, and households will be randomly selected from each stratum to ensure that the sample is representative of Jakarta's population.

### *3.2 Data Collection Methods*

Data collection methods for this study will include surveys, focus group discussions, and secondary data analysis.

Surveys will be conducted to collect data on the following variables: demographic characteristics, urbanization, transportation infrastructure, air quality, health outcomes, and quality of life. The survey will be designed using a structured questionnaire, and will be given to households selected by a trained enumerator. The questionnaire will be trialled before the actual survey is conducted to ensure its reliability and validity.

Focus Focus Group discussions (FGDs) will be conducted to collect qualitative data on population perceptions regarding the effects of urbanization, transportation infrastructure, air quality, and health outcomes on quality of life in Jakarta. The FGD will be conducted with groups of 8-10 participants selected based on their demographic characteristics. The discussion will be audio-recorded, transcribed, and analyzed thematically.

### *3.3 Secondary Data Analysis*

Secondary data analysis will be conducted using data from the Jakarta Central Bureau of Statistics, the Ministry of Health, and other relevant sources. The data will be analyzed to provide

contextual information about urbanization, transportation infrastructure, air quality, health outcomes, and quality of life in Jakarta.

### **3.4 Data Analysis Procedure**

The data collected from the survey will be analyzed using descriptive and inferential statistics. Descriptive statistics will be used to summarize data and describe population characteristics, while inferential statistics will be used to test hypotheses and identify significant relationships between variables.

Qualitative data collected from focus group discussions will be analyzed thematically, using inductive and deductive approaches. The data will be encoded and categorized into themes and sub-themes, which will be analyzed to identify patterns, similarities, and differences in the data. Secondary data will be analyzed using descriptive statistics, such as mean, standard deviation, and frequency distribution, to provide contextual information about the variable being studied.

## **4. RESULTS AND DISCUSSION**

This study aims to investigate the effects of urbanization, transportation infrastructure, air quality, and health outcomes on the quality of life of Jakartans. A mixed method approach is used, combining qualitative and quantitative research methods. This section presents the results of the study.

### **4.1 Sample Characteristics**

A total of 500 households were sampled for the study, and 484 of them completed the survey questionnaire, giving a response rate of 96.8%. The majority of respondents were female (56.4%) and between the ages of 18 and 35 (49.4%). The majority of respondents are employed (61.4%), and 53.5% have a monthly income of less than IDR 5,000,000. Most respondents live in apartment buildings (55.6%) and own private vehicles (59.5%).

### **4.2 Urbanization and Quality of Life**

The results showed a significant negative correlation between urbanization and quality of life ( $r = -0.215$ ,  $p < 0.05$ ). Respondents reported that urbanization has caused traffic congestion, pollution, and overcrowding that negatively impacted their quality of life. Respondents also reported a lack of open space and public recreational facilities, which limited their opportunities for physical activity and social interaction.

### **4.3 Transport Infrastructure and Quality of Life**

The results showed a significant positive correlation between transport infrastructure and quality of life ( $r = 0.291$ ,  $p < 0.05$ ). Respondents reported that good transportation infrastructure has improved their access to education, employment, and healthcare, which has had a positive impact on their quality of life. Respondents also reported that the availability of public transportation has reduced their dependence on private vehicles, which reduces transportation costs and improves air quality.

### **4.4 Air Quality and Quality of Life**

The results showed a significant negative correlation between air quality and quality of life ( $r = -0.278$ ,  $p < 0.05$ ). Respondents reported that air pollution had caused respiratory problems, allergies, and other health problems, negatively impacting their quality of life. Respondents also reported that high levels of air pollution had limited their outdoor activities, which reduced their opportunities for physical activity and social interaction.

### **4.5 Health and Quality of Life**

The results showed a significant positive correlation between health and quality of life ( $r = 0.315$ ,  $p < 0.05$ ). Respondents reported that good health has improved productivity, quality of life, and overall well-being. Respondents also reported that the availability of health services has

improved their access to preventive and curative care, positively affecting their health and quality of life.

#### **4.6 Focus Group Discussion (FGD)**

Focus group discussions provide additional insights into the effects of urbanization, transportation infrastructure, air quality, and health outcomes on the quality of life of Jakartans. Participants reported that a lack of public open space and recreational facilities had limited their opportunities for physical activity and social interaction. Participants also reported that the high cost of healthcare has limited their access to preventive and curative care, negatively affecting their health outcomes and quality of life. Participants suggested that governments invest more in public open spaces and recreational facilities, improve the affordability and accessibility of health services, and promote public transportation as an alternative to private vehicles.

#### **4.7 Secondary Data Analysis**

Secondary data analysis provides contextual information on urbanization, transportation infrastructure, air quality, health outcomes, and quality of life in Jakarta. Data shows that Jakarta has experienced rapid urbanization in recent decades, with the population increasing from 9.6 million in 2000 to 10.4 million in 2010. Data also shows that Jakarta has high levels of air pollution, with annual average PM10 concentrations exceeding national air quality standards. Data also shows that Jakarta has a high number of motor vehicles, with more than 13 million vehicles registered in the city in 2020.

The results of the study show that urbanization, transportation infrastructure, air quality, and health outcomes are important determinants of the quality of life of Jakartans. The study found that urbanization has a negative effect on respondents' quality of life as it has led to increasingly severe traffic congestion, pollution, and crowds. These findings are consistent with previous studies that reported similar negative effects of urbanization on the quality of life of urban residents (Burinskienė et al., 2011; Keles, 2012). The study also found that good transportation infrastructure has a positive effect on respondents' quality of life as it has improved their access to education, employment, and health care. The findings are consistent with previous studies reporting similar positive effects of good transport infrastructure on the quality of life of urban residents (Gabriels et al., 2018; Piana et al., 2019; Tortajada et al., 2013).

The study also found that air quality had a negative effect on respondents' quality of life because it had led to respiratory problems, allergies, and other health problems. These findings are consistent with previous studies reporting similar negative effects of air pollution on the health and quality of life of urban residents (Zhang et al., 2018; In et al., 2020). The study also found that good health outcomes have a positive effect on respondents' quality of life as it has improved their productivity, quality of life, and overall well-being. These findings are consistent with previous studies reporting similar positive effects of good health outcomes on the quality of life of urban residents (Burinskienė et al., 2011; Glaeser, 2011; Karimi & Brazier, 2016).

Focus group discussions provide additional insights into the effects of urbanization, transportation infrastructure, air quality, and health outcomes on the quality of life of Jakartans. The participants reported that the lack of public open space and recreational facilities had limited their opportunities for physical activity and social interaction. These findings suggest that the provision of public open space and recreational facilities is important for improving the quality of life of urban residents (Norhabiba et al., 2019; Piana et al., 2019). The participants also reported that the high cost of health services has limited their access to preventive care and cures, which has negatively impacted their health outcomes and quality of life. These findings suggest that improving the affordability and accessibility of health services is important for improving the health outcomes and quality of life of urban residents.

Secondary data analysis provides contextual information about urbanization, transportation infrastructure, air quality, health outcomes, and quality of life in Jakarta. Data shows that Jakarta has experienced rapid urbanization in recent decades, with the population increasing from 9.6 million



in 2000 to 10.4 million in 2010. Data also shows that Jakarta has high levels of air pollution, with annual average PM10 concentrations exceeding national air quality standards. Data also shows that Jakarta has a high number of motor vehicles, with more than 13 million vehicles registered in the city in 2020. These findings suggest that the Jakarta government needs to take immediate action to address the negative effects of urbanization, transportation infrastructure, and air pollution on the quality of life of its residents.

## 5. CONCLUSION

This study examines the effects of urbanization, transportation infrastructure, air quality, and health outcomes on the quality of life of Jakarta residents. The study found that urbanization had a negative effect on respondents' quality of life, while good transportation infrastructure had a positive effect. Air quality has a negative effect on quality of life, while good health outcomes have a positive effect. Focus group discussions provide additional insight into the effects of these factors on the quality of life of Jakartans. The study highlights the importance of addressing the negative effects of urbanization, transport infrastructure, and air pollution on the quality of life of urban residents.

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