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A Utilitarian Evaluation of Public Transportation's Role in Reducing Air Pollution and Enhancing Societal Well-Being

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Abstract. *This thesis examines the ethical and practical role of public transport in reducing air pollution through the lens of John Stuart Mill's utilitarianism, with a focus on its contribution to public well-being. Using a literature review of academic studies, government reports, and international publications, the research analyzes both quantitative indicators—such as air quality improvements and emission reductions—and qualitative aspects, including public perception of Jakarta's LRT system. The findings show that the LRT produces a significantly lower carbon footprint per passenger compared to private vehicles and is linked to improved physical and mental well-being for users. Although public perception toward affordability is positive, concerns remain regarding safety, comfort, and connectivity, suggesting that the system requires further development and supporting policies to achieve lasting impact. From Mill's utilitarian perspective, public transport aligns with efforts to maximize overall societal happiness by reducing pollution and promoting collective welfare. Nonetheless, structural constraints and mixed public perceptions influence its real-world effectiveness. Despite these challenges, the study concludes that public transport remains a highly promising solution for mitigating urban air pollution and advancing public well-being.*

Keywords: *Air Pollution; Carbon Footprint; Public Transport; Public Well-Being; Utilitarianism.*

1. INTRODUCTION

Air pollution has morphed into a menacing specter haunting our planet. It poses a dire threat to the health and well-being of human populations, casting a long shadow over the delicate balance of the environment. A staggering statistic from the World Health Organization (WHO, 2024) reveals that nearly the entire global population (99%) breathes air that exceeds safe limits.

This toxic cocktail of pollutants disproportionately burdens low- and middle-income countries, exacerbating existing societal inequalities. The ethical implications are profound, forcing us to confront the difficult choices between economic development and environmental protection.

The effects of air pollution are brutal and destructive. Beyond the discomfort of hazy skies, it poses a significant health risk. The presence of harmful pollutants demonstrably hinders breathing, a fundamental human function (UCAR, 2024). This can have particularly detrimental effects on vulnerable groups such as pregnant women, the elderly, and those with existing respiratory conditions (IQAir, 2024). The impact extends beyond the human realm, disrupting the delicate balance of the environment. Research suggests that air pollution can hinder photosynthesis in plants, a vital process for maintaining a healthy ecosystem (Oizom, 2023). Furthermore, it can obstruct visibility, hampering human activities and impacting aesthetics (Mass.gov, 2024). Examples like Jakarta, where PM2.5 concentrations exceed the

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WHO's annual air quality guideline value by a staggering 11 times (IQAir, 2024), reveal the severity of this global crisis.

The roots of air pollution lie in human activities. Transportation is a major culprit, responsible for a significant portion of harmful emissions. Studies by Urban Links (2023) highlight the transportation sector's contribution: 67% of PM2.5 emissions, 58% of PM10 emissions, and a staggering 84% of Black Carbon emissions in 2019. Industries and power plants also play a significant role in releasing pollutants into the atmosphere. These findings underscore the urgent need to address human activities and their impact on air quality.

In the face of this environmental crisis, innovative solutions are essential. Public transportation has emerged as a promising path forward. Historical examples like the odd-even policy, low emission zones, and the implementation of Transit Oriented Development (Simorangkir, 2023) demonstrate the potential of these strategies. Research by Priambada (2023) indicates that a robust public transportation system can effectively reduce air pollution levels, even if the success might be temporary. By encouraging a shift away from private vehicles and towards mass transportation, we can significantly decrease the number of vehicles on the road, leading to a reduction in overall emissions. However, maximizing the effectiveness of public transportation requires a multi-pronged approach. While it offers a solution to one of the major contributors to air pollution, it needs to be accompanied by other initiatives to ensure long-term success.

This thesis delves into the potential of public transportation as a solution to air pollution. Drawing upon the principles of utilitarianism, as articulated by philosopher John Stuart Mill, we can analyze the ethical implications of this approach. Utilitarianism posits that morally correct actions are those that maximize overall happiness and well-being. By evaluating the impact of public transportation on air quality and public health, we can determine whether it aligns with this principle. If expanding access to public transportation leads to a net improvement in societal well-being, it can be considered a morally sound solution.

This research provides valuable insights for policymakers, urban planners, and environmental advocates by highlighting the environmental impact of public transportation, analyzing its ethical and societal implications, and identifying key challenges such as safety, connectivity, and public perception. The findings will offer practical recommendations to improve Jakarta’s public transport system, integrating it into long-term air pollution mitigation strategies and promoting sustainable urban development for a healthier future.

2. LITERATURE REVIEW

John Stuart Mill's principle of utilitarianism asserts that the most morally correct action is the one that maximizes happiness and well-being for the greatest number of people. In the context of public transportation and air pollution, utilitarianism offers a framework to evaluate whether promoting public transport as a solution to air pollution is ethical. If improved public transport leads to cleaner air, it would enhance the well-being and happiness of the population, making it morally justified from a utilitarian perspective.

Mill's approach to utilitarianism was an evolution of the ideas first presented by Jeremy Bentham. Bentham focused on the quantitative side of pleasure—measuring happiness by the number of people experiencing pleasure versus pain. Mill, however, expanded on this by emphasizing the qualitative aspects of happiness. He argued that some pleasures (such as intellectual fulfillment) are inherently superior to others (such as physical pleasures), thereby adding a more nuanced understanding of utility. This distinction between higher and lower pleasures became central to Mill's utilitarianism and is essential when evaluating complex social issues like air pollution.

Mill's motivation for refining Bentham's utilitarianism stemmed from his belief that Bentham's theory, while groundbreaking, was too simplistic. Mill recognized that human well-being cannot be measured purely by the amount of pleasure one experiences. He saw the need to account for the type and quality of pleasure, proposing that intellectual and moral satisfaction contributes more to human happiness than mere physical enjoyment. This shift in focus was not just theoretical but also driven by Mill's personal experiences with mental health struggles and his reflections on the meaning of true happiness.

The root cause of Mill's formulation of these ideas can also be traced to his education. Raised by a father who was deeply influenced by Bentham, Mill was exposed to utilitarian philosophy from a young age. His rigorous education, which included philosophy, economics, and classical literature, laid the foundation for his intellectual development. He was not only taught to accept utilitarianism but to challenge and improve upon it. This background equipped him to see beyond Bentham's focus on quantity and to develop a more humanistic approach to ethics that factored in the complexity of human pleasure and suffering.

While Mill's utilitarianism was influential, it has also faced criticism. Some thinkers argue that his distinction between higher and lower pleasures introduces subjectivity into a theory that should be based on objective measures of happiness. Critics like Friedrich Nietzsche contended that utilitarianism in any form oversimplifies human motivations and reduces ethics to mere pleasure-seeking. Nietzsche argued that pursuing higher ideals often

requires sacrifice and suffering, which utilitarianism fails to account for adequately. Others, such as Immanuel Kant, opposed utilitarianism's focus on outcomes, asserting that morality should be based on duty and intention rather than the consequences of actions.

Another critique comes from the limitations of utilitarianism in addressing issues like environmental sustainability. Some argue that utilitarianism's emphasis on immediate happiness could justify environmentally harmful actions if they result in short-term pleasure, even if they cause long-term ecological damage. In the case of air pollution, utilitarianism might struggle to weigh the short-term costs of transitioning to cleaner public transport against the long-term benefits of improved air quality.

Mill's ideas on utilitarianism evolved over time, particularly in response to the social and political changes of the 19th century. As Mill matured, he began to advocate for social reforms that extended beyond individual happiness to include broader concerns such as justice, freedom, and rights. His later works, including On Liberty and The Subjection of Women, reflect a more complex view of utility, where individual autonomy and social progress are seen as essential components of human happiness.

External factors such as the rise of industrialization, urbanization, and environmental degradation also influenced Mill's thinking. While Mill did not directly address environmental issues in his major works, the principles of utilitarianism could be applied to modern concerns like air pollution. The use of public transportation as a solution to pollution would align with Mill's broader goal of maximizing the long-term well-being of society, as cleaner air would benefit the greatest number of people.

Moreover, as modern scholars revisit Mill's utilitarianism, there has been a shift toward integrating environmental ethics into his framework. Contemporary utilitarians argue that Mill's qualitative approach to pleasure provides a foundation for considering ecological well-being as part of the greater good. The value of a healthy environment could be seen as a higher pleasure, contributing to both individual and collective happiness.

John Stuart Mill's development of utilitarianism, with its emphasis on both the quantity and quality of happiness, provides a robust framework for evaluating ethical solutions to social issues like air pollution. Mill's background, education, and personal experiences shaped his philosophical outlook, leading him to refine Bentham's ideas and place greater importance on intellectual and moral pleasures. However, his ideas have been criticized for their subjective nature and for potentially overlooking long-term environmental consequences. As utilitarianism continues to evolve, its application to modern challenges like air pollution offers valuable insights into how public policies, such as improved public

transport, can contribute to the greatest happiness for the greatest number of people. Mill's utilitarian framework provides a strong ethical foundation for this research by reinforcing the idea that public transport is not just a practical solution to pollution, but also a moral obligation. If public transportation maximizes societal happiness by improving air quality, urban mobility, and public health, then promoting its use aligns with the principle of utility.

3. METHOD

This research aimed to comprehensively assess the effectiveness of public transportation in reducing air pollution in Indonesia through a literature review. The study involved analyzing existing studies, reports, and articles that investigated the relationship between public transportation usage and air pollution levels. Relevant literature was gathered from various sources, including academic journals, government reports, and publications from international organizations such as the World Bank and the Ministry of Environment and Forestry. The research focused on case studies of established public transport systems in Indonesia, particularly the Jakarta Mass Rapid Transit (MRT) and TransJakarta, examining their implementation, ridership statistics, and fuel consumption patterns as documented in the literature.

Additionally, the study compiled findings from research that reported air quality metrics (e.g., PM2.5, NO2, CO2) in urban areas with varying levels of public transport development, highlighting trends and patterns identified over different time periods. Qualitative studies were also explored to understand public perceptions of public transportation and its effectiveness in addressing air pollution, examining themes related to operational challenges, user satisfaction, and socio-economic factors influencing ridership. Finally, the research synthesized the findings from the reviewed literature to draw conclusions about the overall impact of public transportation on air pollution in Jakarta, identifying gaps in the current research and suggesting areas for future study.

4. RESULTS AND DISCUSSION

This study explored the relationship between transportation modes, air pollution, and societal well-being, focusing on the ethical implications of public transportation use in reducing air pollution and improving public health. The findings reveal that public transportation, such as the LRT (Light Rail Transit) and KRL (Commuter Rail), holds significant potential to mitigate carbon emissions while offering an ethical and effective alternative to private transportation. For example, the LRT system can reduce carbon

emissions by approximately 1.5–1.7 tons of CO per day or 534.3–601.1 tons annually if passengers shift from motorcycles to public transportation (Priambada, 2023). This reduction is crucial in addressing Jakarta's air pollution challenges, as the average CO emissions per motorcycle are approximately 13,357 grams per year (Priambada, 2023).

Additionally, public transportation systems such as the LRT and KRL demonstrate a smaller carbon footprint per person compared to private vehicles. According to Ritchie (2022), public transport modes like the London Underground emit 28 grams of CO2 per kilometer per passenger, significantly less than motorcycles, petrol cars, and even electric vehicles. These findings align with broader studies emphasizing the environmental benefits of public transportation.

Health data further substantiates the need for reducing private vehicle usage. The study indicates a significant relationship between transportation mode and exposure to air pollution (sig < 0.001), with private vehicle users experiencing higher levels of air pollution and noise exposure. This heightened exposure is associated with negative health outcomes, including respiratory and cardiovascular diseases, anxiety, and depression (Zulfikri, 2023). Regression analysis also reveals a significant link between air pollution exposure and health status (sig < 0.000), with higher exposure correlating to poorer health (Zulfikri, 2023).

Public perceptions of public transportation provide valuable insights into its strengths and limitations. While systems like the KRL are perceived positively in terms of affordability and convenience, concerns regarding safety and limited connectivity hinder broader adoption (Hidayati, 2023). Addressing these issues can increase public confidence in using public transportation, thereby enhancing its role as a sustainable solution.

The findings of this study can be analyzed through the lens of John Stuart Mill’s principle of utilitarianism, which asserts that the most morally correct action is one that maximizes happiness and well-being for the greatest number of people (Mill, 1863). Public transportation aligns with utilitarian principles because it reduces air pollution, mitigates health risks, and improves overall societal well-being. By decreasing carbon emissions and promoting cleaner air, public transportation benefits not only current generations but also future ones, creating a long-term positive impact on collective happiness.

Mill’s refinement of Jeremy Bentham’s utilitarianism, emphasizing the qualitative aspects of happiness, adds depth to this ethical analysis. According to Mill, higher pleasures, such as intellectual and moral satisfaction, hold more value than physical pleasures (Mill, 1863). In the context of public transportation, this framework suggests that the intellectual and societal fulfillment derived from living in a cleaner environment and experiencing improved

public health outweighs the physical comfort or convenience of using private vehicles.

However, criticisms of utilitarianism also apply to this context. Mill's approach introduces subjectivity when determining what constitutes higher versus lower pleasures, making it challenging to objectively measure the moral superiority of public transportation over private vehicles. Critics like Nietzsche argue that utilitarianism oversimplifies human motivations and fails to account for sacrifices required to achieve higher ideals, such as transitioning to sustainable urban mobility systems (Nietzsche, 1886). Furthermore, Kantian ethics challenges the utilitarian emphasis on outcomes, asserting that morality should be based on duty and intention rather than consequences (Kant, 1785).

This study demonstrates that public transportation offers clear environmental and health benefits, but its adoption is influenced by social perceptions, infrastructure limitations, and external factors such as urban planning and policy. The results highlight a critical need for comprehensive measures to address safety concerns and connectivity gaps, which deter potential users. Additionally, targeted educational campaigns can raise public awareness about the benefits of public transportation, aligning with Mill's emphasis on intellectual and moral development.

Despite its benefits, transitioning to public transportation requires significant investment, policy reforms, and cultural shifts. From a utilitarian perspective, these short-term sacrifices are justified by the long-term benefits, including reduced air pollution, improved health outcomes, and enhanced quality of life for urban populations.

To deepen the understanding of public transportation's role in reducing air pollution, future research should: (1) Conduct real-time emissions studies to directly measure reductions from specific public transportation systems; (2) Explore psychological and cultural barriers to public transportation adoption through qualitative approaches; (3) Analyze the effectiveness of policy interventions, such as subsidies and congestion pricing, in encouraging public transportation use; (4) Assess the long-term health and environmental impacts of sustained public transportation adoption through longitudinal studies.

While Mill's utilitarianism provides a compelling ethical framework for evaluating public transportation, the findings reveal limitations in applying his theory to modern environmental challenges. Mill's focus on maximizing happiness assumes that collective benefits, such as cleaner air, will outweigh individual sacrifices. However, this study suggests that subjective perceptions, such as safety concerns and convenience, play a critical role in determining public behavior. These factors may prevent the widespread adoption of public transportation, even if its benefits align with utilitarian principles. Additionally, the short-term

costs of transitioning to sustainable systems, such as financial investment and urban disruption, challenge the notion of immediate happiness maximization central to Mill's philosophy.

Moreover, environmental ethics critiques utilitarianism's potential to justify short-term environmental harm for immediate satisfaction, which may conflict with long-term sustainability goals. This study supports an integrative approach that combines Mill's emphasis on collective well-being with policies addressing individual concerns and systemic barriers to public transportation use.

In summary, John Stuart Mill's utilitarianism underscores the ethical imperative of promoting public transportation as a solution to air pollution, as it maximizes societal happiness and well-being. However, the findings highlight the complexity of achieving this goal in real-world contexts, where subjective perceptions and structural challenges influence behavior. Addressing these limitations through targeted interventions can enhance the effectiveness of public transportation and ensure its alignment with both ethical principles and practical realities.

5. CONCLUSION

The research has found that the LRT system has a smaller carbon footprint per person than motorcycles or cars, the use of public transport is also linked with better physical & mental well-being, and people view the affordability of public transport as a positive trait. However, there are complaints about feeling unsafe on public transport and public transport as a solution to pollution has to be assisted with other solutions to work long-term. John Stuart Mill's philosophy promotes public transportation as a solution to air pollution, as it maximizes societal happiness and well-being but the findings highlight the complexity of achieving this goal in real-world contexts, where subjective perceptions and structural challenges influence behavior. This shows that public transport has great potential as a solution to pollution.

There are certain implications that this thesis has, such as recommendations to address and improve safety concerns within public transport, recommendations to improve the connectivity in public transport, as well as recommendations for future research. Those recommendations for future researches are to conduct real-time emissions studies to directly measure reductions from specific public transportation systems; explore psychological and cultural barriers to public transportation adoption through qualitative approaches; analyze the effectiveness of policy interventions, such as subsidies and congestion pricing, in encouraging public transportation use; and assess the long-term health and environmental impacts of

sustained public transportation adoption through longitudinal studies.

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