

Critical Analysis of Sustainable Toll Road: Management of Toll Road Services and Green Facilities from The User Perspective

Lala Hucadinota Ainul Amri^{1*}, Muhammad Taali¹, Dinesh Basti Farani¹, Dyah Ayu Kunthi Puspitasari¹, Muhammad Fajar Subkhan²

¹Politeknik Negeri Madiun, Madiun, Indonesia

²Politeknik Negeri Malang, Malang, Indonesia

*Corresponding Author : lalahuca@pnm.ac.id

Abstract - Sustainable toll road development is not only related to environmentally friendly infrastructure and economic benefits but also to public acceptance of environmental issues. However, previous studies indicate that the quality of Green Toll Road services can increase the interest of toll road users through campaigns that support the environment. This study aims to analyze various aspects of sustainable toll roads in-depth, focusing on the management of environmentally friendly services and facilities. In this study, a qualitative method with a survey approach was applied by taking samples from toll road users through incidental quota sampling techniques. Service management indicators include travel satisfaction, road conditions, road infrastructure, and equipment, use of road space, and traffic management related to environmentally friendly facilities. The results obtained from toll road users indicate that ecologically friendly facilities including travel satisfaction, road conditions, road infrastructure and equipment, and traffic management have been met. However, there was a lack of standards among toll road managers, considering that toll road operators are not under the same management. The recommendation from this study is the application of consistent standards for toll road managers related to environmentally friendly aspects.

Keywords: sustainable toll road, services, green facilities

I. INTRODUCTION

Research on sustainable toll roads is essential because transportation infrastructure has a major impact on the environment, society, and economy. The need for this research is driven by traffic growth due to population growth and urbanization, which has led to the demand for more efficient and sustainable toll roads to support the mobility of people and goods (Subkhan, 2023; Putra, 2022).

From an environmental perspective, the construction and operation of toll roads can cause negative impacts, such as deforestation, land degradation, water and air pollution, and fragmentation of wildlife habitats. This research aims to reduce these impacts. In addition, transportation also contributes to greenhouse gas emissions, so this research seeks ways to reduce the carbon footprint and make infrastructure more resilient to climate change (Arganata, 2022).

Public health is also a concern, especially because of air pollution and noise from toll roads that can affect residents in the surrounding area (Faisal, 2022). This research aims to address these issues and improve air quality. In addition, toll road construction can also cause social inequality, such as eviction or restricted access for local communities. This study seeks to find solutions to minimize social inequality and ensure that the benefits are felt evenly.

Sustainable use of natural resources is also a challenge in toll road development. This study seeks to find ways to make resource use more efficient and maintain environmental sustainability. In terms of the economy, sustainable toll roads are expected to provide long-term benefits, including cost savings, increased economic competitiveness, and job creation (Resdiansyah, 2019).

This study aims to develop strategies and technologies that enable the development of environmentally friendly, socially inclusive, and economically sustainable infrastructure. The focus of the study will review the environmental impacts of toll roads and effective maintenance strategies to ensure long-term sustainability (Muatan, 2023). In addition, this study will evaluate toll road management, including aspects of safety, comfort, and operational efficiency. The development of environmentally friendly facilities is also a major concern to create innovative solutions that support sustainable mobility while maintaining ecosystem balance. This

comprehensive analysis aims to provide sustainable solutions for toll road management and development in the future.

II. METHOD

The critical analysis approach used in this study is an approach that emphasizes the exploration, evaluation, and interpretation of data or information in depth and reflectively. The focus of this approach is on understanding specific aspects of a topic, intending to identify the impact, strengths, weaknesses, and implications of research findings. This approach allows researchers to observe problems from multiple perspectives, recognize biases, and consider alternative arguments and interpretations. This method is often used in social sciences, humanities, and cultural studies, where in-depth understanding is essential (Amri, 2022; Ainul, 2022).

The methods used in critical analysis can include text, discourse, policy, and literature analysis, depending on the context and purpose of the research. The ultimate goal is to generate new insights and deeper understanding, as well as promote critical thinking related to the topic being studied.

This research was conducted on the Madiun-Kertosono Toll Road as the main focus, as well as other toll roads on Java Island as supporting studies (Purnomo, 2020). The research lasted for five months in 2024, using qualitative and quantitative data. Primary data was collected through observation and interviews with related parties, while secondary data came from various literature. The data obtained was analyzed qualitatively to present information in the form of descriptions, tables, charts, or images to facilitate understanding of the research objectives. As an additional research method, the limitations of this research can hopefully be improved in further study.

III. RESULT AND DISCUSSION

A. Result

Sustainable toll roads play a vital role in transforming the transportation system towards safety, sustainability, and inclusivity. By considering the environmental, social, and economic impacts as a whole, these toll roads are designed to be more than just a means of connecting regions. Their innovative designs incorporate the use of modern technology and the latest construction practices to reduce carbon footprints, minimize environmental degradation, and protect existing natural habitats. In addition, sustainable toll roads also emphasize the safety and comfort aspects of users. This is realized through the provision of user-friendly facilities such as special pedestrian and bicycle lanes, as well as rest areas equipped with green technology, such as sustainably managed parks and electric vehicle charging points (Subkhan, 2024).

Furthermore, the concept of sustainable toll roads not only focuses on technology and the environment but also encourages local community participation in the planning and decision-making process. This local community involvement allows for a deeper understanding of the needs and expectations of the community so that the infrastructure built can be more responsive to local needs. This also provides opportunities for sustainable local economic growth, such as creating new jobs and supporting an inclusive economy. Thus, sustainable toll roads serve not only as efficient transportation networks but also as tangible symbols of the global commitment to achieving sustainable and inclusive development, which can provide long-term benefits.

The environmentally friendly facilities found on these toll roads reflect a strong commitment to building infrastructure that has a positive impact on the environment and humans. The planning, construction, and operation of these facilities are carried out very carefully to ensure that the impact on the environment can be minimized, and the resulting ecological footprint remains low. For example, the building design used pays attention to energy efficiency, the use of recycled materials, and an effective waste management system. Green technologies such as solar panels, energy-efficient lighting, and other renewable energy sources are also an integral part of these facilities, intending to reduce energy consumption and carbon emissions (Taali, 2024).

Sustainable water management is also a major concern (Supardianingsih, 2024), with a rainwater collection and reuse system and the utilization of energy from renewable sources such as the sun and wind. In addition, the accessibility aspect is also taken into serious consideration, ensuring that these facilities can be used comfortably by all groups, including people with disabilities. To support sustainable transportation, bicycle lanes, wide sidewalks, and electric vehicle charging stations are also well-designed. With all these elements, this eco-friendly facility is not only comfortable and functional but also contributes significantly to global efforts to preserve the environment and improve human well-being.

Service management in the context of sustainable toll roads is a holistic approach that encompasses the management of all aspects related to providing services to users. From careful planning to efficient implementation, as well as continuous monitoring and improvement, this service management aims to provide the

best experience for toll road users. Not only focusing on operational aspects such as inventory management, personnel arrangement, and infrastructure maintenance, this service management also includes innovative marketing strategies, proper performance measurement, staff training, and good interaction with customers. The main goal is to create a positive user experience, which is achieved through efficient and optimal use of resources. With a deep understanding of user needs and preferences, service management allows for the adjustment of services to always be relevant and meet expectations.

In an increasingly competitive and connected environment, a good service management strategy is key to maintaining a competitive advantage, building long-term relationships with users, and ensuring the sustainability and growth of the organization in the future. Effective management not only keeps the infrastructure in optimal condition but also improves overall user satisfaction, which ultimately supports the achievement of long-term sustainability goals.

The Madiun-Kertosono Toll Road is one of the most important toll road infrastructure projects in Indonesia. As a vital part of the toll road network connecting two major cities in East Java, namely Madiun and Kertosono, this project has a strategic role in improving regional connectivity. The construction of this toll road is expected to have a significant positive impact, especially in terms of increasing the efficiency of the regional transportation system. By reducing traffic congestion on the route passed, this toll road has the potential to accelerate the movement of goods and people between the two cities, as well as the surrounding areas (Purnomo, 2020; Utomo, 2022).

The benefits of this toll road are not limited to the transportation aspect alone (Yana, 2019). By improving access to economic and industrial centers around Madiun and Kertosono, this project is also expected to encourage regional economic growth. On a broader scale, the Madiun-Kertosono Toll Road is part of the Indonesian government's efforts to improve the overall national transportation infrastructure. With this project, it is hoped that sustainable economic growth will be created and a more even distribution of benefits throughout the country, which will ultimately have a positive impact on the wider community and support sustainable national development.

B. Discussion

Environmentally friendly facilities that cover various aspects such as travel comfort, quality road conditions, adequate infrastructure, complete road equipment, and effective traffic management have been well met. All of these elements work synergistically to create a driving environment that is not only comfortable and safe for road users but also contributes to environmental conservation efforts.

Travel comfort is ensured through road design that pays attention to smooth traffic flow, reduces congestion, and minimizes disruptions along the route. Well-maintained road conditions, including smooth and damage-free road surfaces, play an important role in maintaining safety and reducing the risk of accidents (Vinayaka, 2017).

Road infrastructure and equipment, such as traffic signs, efficient lighting, and special lanes for pedestrians and cyclists, are also ensured to meet environmentally friendly standards. Green technology, such as solar-powered street lights and energy-efficient lighting systems, are an integral part of these facilities to reduce ecological impacts.

In addition, good traffic management, with the use of intelligent traffic control systems and real-time monitoring, also improves transportation efficiency. This not only helps in regulating the flow of vehicles in a more orderly manner but also reduces vehicle emissions by avoiding prolonged congestion. All these steps support the creation of facilities that are not only environmentally friendly but also provide a better and more sustainable driving experience for all users.

There is a lack of uniformity in standards among toll road operators in Java Island, considering the large number of operators managing toll roads in the region and the fact that each operator is not under the same management. This difference in management causes variations in the implementation of operational standards, infrastructure quality, and user service management.

Some operators may implement best practices in terms of road maintenance, supporting facilities, and traffic management, while others still show shortcomings in these areas. These varying standards can impact the toll road user experience, where on some routes, drivers may enjoy excellent service, while on others, they encounter poorly maintained roads or inadequate facilities (Sulistiani, 2021).

These shortcomings can also be seen in user service management, such as variations in the speed of response to traffic incidents, the quality of rest facilities, or accessibility to information related to road conditions. Therefore, harmonization of operational and management standards among toll road operators in Java Island is important to ensure that road users receive consistent and high-quality services across the toll road network,

regardless of the operator managing it. Efforts to harmonize these standards will improve safety, comfort, and efficiency for all toll road users.

The application of consistent standards for toll road operators in terms of environmentally friendly aspects is essential to ensure that each toll road is operated with sustainability principles that are in line with environmental conservation goals. These consistent standards cover a variety of aspects, from reducing carbon emissions, and energy efficiency, to wise management of natural resources.

In the context of toll road management, this means that each operator must apply uniform environmentally friendly practices, such as the use of green technology in road construction and maintenance, the use of renewable energy sources such as solar panels, and the installation of energy-efficient LED lights throughout the toll road network. These standards must also include efficient water management systems, such as rainwater harvesting for reuse, as well as efforts to minimize impacts on local ecosystems, such as maintaining wildlife habitats that may be affected by toll road construction.

In addition, consistent standards must also include waste management, both solid and liquid waste, as well as air management by reducing pollution levels from passing vehicles. Toll road operators also need to ensure that supporting facilities, such as rest areas, bicycle lanes, and pedestrian paths, are designed in a sustainable and environmentally friendly manner, minimizing the use of hazardous materials and promoting recycling practices.

With the application of these consistent standards, each toll road can contribute significantly to reducing its ecological footprint, improving the quality of the surrounding environment, and providing a positive impact on the community and ecosystem. This also creates a positive image for the operator a toll road operator committed to sustainability, while supporting global initiatives in combating climate change and maintaining the balance of nature.

IV. CONCLUSION

The conclusion of this study shows that the feedback received from toll road users indicates that the environmentally friendly facilities have successfully met various criteria, including travel satisfaction, road conditions, road infrastructure and equipment, and traffic management. However, this study also identified shortcomings in the implementation of standards among toll road operators, which is caused by the fact that each toll road operator does not operate under uniform management.

To address this problem, the recommendation resulting from this study is the importance of implementing consistent standards for all toll road operators, especially in aspects related to sustainability and environmental friendliness. By developing and implementing clear and uniform standards, it is hoped that all toll road operators can work towards the same goal of creating a more sustainable, efficient transportation infrastructure that provides optimal benefits to the community.

These consistent standards will not only improve the quality of services provided to users but also contribute to environmental conservation and reduce the negative impacts of toll road construction. Thus, these strategic steps can facilitate the integration between good infrastructure management and environmental responsibility, creating a positive synergy between transportation needs and ecosystem protection.

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