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ANALYSIS OF INNOVATION IN PUBLIC TRANSPORT SERVICES MANAGEMENT BASED ON PLASTIC WASTE IN SUPPORT OF THE SDGS
(A Study of Trans Semanggi Suroboyo)

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Abstract

This study examines the innovation of public transport service management through a platic waste-based payment in the Trans Semanggi Suroboyo (TSS) service in Surabaya City. The study aims to analyse the effectiveness of this innovation in supporting sustainable urban transport development, particularly in relation to Sustainable Development Goals (SDGs) 11. A qualitative descriptive approach was employed, using secondary data collected from scientific literature, official reports, and regulatory documents. The analysis was conducted using George C. Edward III's policy implementation framework, focusing on communication, resources, disposition, and bureaucratic structure. The finding indicate that this innovation contributes positively to environmental management and promotes public participation in waste reduction while improving transport accessibility. However, its implementation faces several challenges, including limited fleet availability, inadequate infrastructure, fragmented communication, and key to integrity between payment system. These constraints affect service efficiency and user satisfaction. Therefore, strengthening policy coordination, improving infrastructure, enhancing human resource capacity, and optimizing public communication are necessary to support the sustainability and effectiveness of this innovation. This study highlights that integrated and adaptive public transport innovations are essential in achieving inclusive, efficient, and sustainable urban mobility in line with SDGs 11.

Keywords: *Bureaucratic Structure;; SDGs 11; Smart Mobility; Waste-Based Payment System.*

1. INTRODUCTION

Public transsport is a crucial component of public services, severing to facilitate the movement of people and enchance the efficience the efficiency of activities in urban areas. A proper transportation system not only facilitates citizen mobility but also helps reduce congestion, curbs the use of private vehicles, and supports sustaianable development. s

economic growth, urbanisation and population growth in urban areas accelerate, transport issues are becoming increasingly complex and urgent. The city of Surabaya, as one of Indonesia's largest metropolitan cities, is grappling with critical challenges such as severe traffic congestion, a surge in the number of private motor vehicles, and inadequate public transport infrastructure (Fernando et al., 2020; Putra et al., 2023). ese conditions not only discourage the public from switching to public transport but also degrade the overall quality of urban mobility, increasing carbon emissions, travel times, and very high socio-economic costs. Therefore, a breakthrough in the transport system is needed to improve operational efficiency and enhance the quality of inclusive and environmentally friendly services for the community.

In response to these challenges, the local government has introduced a service innovation through the Trans Semanggi Suroboyo programme as part of the smart mobility concept. This concept aims to create a safe, comfortable, efficient and sustainable transport system through the application of innovation in public transport management (Fadilah et al., 2025; Putra et al., 2023). he highlight of this program lies in its revolutionary payment method based on plastic waste, which not only serves as an innovative ticketing system but also functions as a multifunctional strategy for environmental management, reducing the volume of plastic waste at landfill sites, and raising public awareness of the need to protect the natural environment. Furthermore, this initiative promotes a circular economy by transforming waste into valuable economic assets, as well as increasing community involvement in creating an inclusive, environmentally friendly city. This innovation also demonstrates a tangible contribution to supporting the achievement of Sustainable Development Goal 11 through the development of a more inclusive and sustainable public transport system.

However, the implementation of these innovations is still hindering by various significant structural constraints, such as a lack of an adequate fleet, as well as a payment system that is not yet fully practical for all sections of society. This indicates a gap between the objectives of the innovation and the reality of its implementation on the ground (Pradana, 2020; Setyowati et al., 2022). This not only leads to user dissatisfaction but also shows a striking disparity between the ambitious goals of the innovation and the reality of its implementation on the ground, which remains fraught with friction. Therefore, this study aims to conduct an in-depth analysis of public transport service management innovations in the City of Surabaya, specifically evaluating the effectiveness of the plastic waste-based payment system on the Trans Semanggi Suroboyo service. Through this approach, the study is expected to generate strategic recommendations to enhance the quality of public transport services, making them more optimal, inclusive, environmentally friendly, and sustainable in the long term. Consequently, the development of an effective and sustainable public transport system is a vital component in supporting urban development, as reflected in SDGs

11 Cities and Communities which emphasises the importance of safe, affordable, and sustainable transport access for all members of society.

2. RESEARCH METHOD

This study employs a qualitative, descriptive approach to explore in depth the innovation in management at the Trans Semanggi Suroboyo (TSS) service. The primary focus of this study is on the analysis of a plastic waste-based payment system as a form of integration between public transport policy and environmental conservation. This approach was chosen as it provides a systematic overview of the complexities of policy implementation in the field, while also allowing researchers to examine the causal relationships between management variables qualitatively. This approach also considers the relevance of innovation to the development of sustainable public transport as outlined in SDGs 11.

The research process was carried out through three systematic stages. First, the problem-identification process, which emphasised the importance of innovation in management to address urban transport issues and plastic waste in the City of Surabaya. Second, the information-gathering process, carried out through a literature review by collecting secondary data from scientific articles, official reports from relevant institutions, and reliable regulatory documents (Fernando et al., 2020; Setyowati et al., 2022). Third, the information analysis process utilised the Miles and Huberman interaction model, which encompasses data reduction, the presentation of information in narrative form, and logical conclusion-drawing.

Subsequently, the analysis was conducted using George C. Edward III's policy implementation theory, which encompasses the aspects of communication, resources, disposition and bureaucratic structure as indicators for assessing the effectiveness of public transport service innovations (Edward III, 1980). This stage ultimately led to conclusions that were used to provide an overview and recommendations for improving the quality of public transport services.

3. RESULTS AND DISCUSSION

3.1 The Implementation of Payment Innovations in Public Transport Services

The development of the public transport system in Surabaya has seen significant changes towards more advanced, responsive and environmentally friendly services. These changes have been driven by local government policies aimed at improving the quality of public services, particularly in the field of urban transport. In this regard, the Surabaya government has implemented various innovations that not only focus on improving public mobility but also incorporate environmental factors into the transport service system. One outstanding innovation is the implementation of a plastic waste-based payment system

integrated with the Suroboyo Bus service. This system allows the public to exchange plastic bottles for travel tickets, thereby creating an incentive mechanism that encourages active public participation in waste management. This innovation holds significant strategic importance as it not only addresses transport issues but also offers a solution to environmental challenges, particularly regarding the reduction of plastic waste in urban areas (Nadhifah & Juliardi, 2022; Salsabil & Purnomo, 2021). It also reflects a contribution to SDG 11 in the effort to realise a sustainable and inclusive public transport system in urban areas.

In practice, the plastic waste-based empowerment scheme is not implemented directly on board the buses, but rather through an exchange mechanism at specific locations such as Joyoboyo Terminal, Bungurasih Terminal and Kasuari Terminal. Members of the public are required to exchange eligible plastic bottles which must be clean, label-free and compactedto receive vouchers or points that can be used as travel tickets. This policy has been adjusted since 1 May 2022, with direct exchanges within the fleet being discontinued to maintain cleanliness and passenger comfort during journeys. Furthermore, the system includes a component for user verification. For instance, the use of an Identity Card (KTP) during the exchange process indicates an effort to monitor and validate within the service system. Even so, this relatively lengthy procedure has the potential to reduce service efficiency, particularly for users who desire a more practical and faster payment system. This highlights a trade-off between environmental objectives and service efficiency in the implementation of this policy.

This situation shows the challenges involved in achieving an optimal transport system, as emphasised in SDGs 11. In addition to eco-friendly payment systems, innovation is also evident in the implementation of digital payment systems via QRIS TAP and QRIS CPM on the Trans Semanggi Suroboyo service. The use of this digital technology reflects a transformation towards a smart mobility-based transport system, which emphasises efficiency, ease of access, and service integration. This policy is also in line with the national policy direction regarding the digitalisation of payment systems and the improvement of technology-based public services (Ministry of Transport Regulation No. PM 9 of 2020).

The integration of waste-based payment mechanisms with digital systems reflects a dual innovation approach. This approach does not merely pursue operational efficiency, but also extends accessibility to communities not yet fully reached by digital infrastructure (the digital divide). By combining ecological methods with financial technology, Surabaya is striving to deliver inclusive and adaptive public services. However, the effectiveness of this innovation still faces several challenges regarding policy fragmentation. There are differences in the mechanisms between the waste-based system (which operates procedurally and manually) and the digital system (which is fast-paced), which can create confusion for service users. This indicates that while the innovation has started on the right foot, strengthening aspects of procedural synchronisation and policy consistency is crucial

to establishing a truly integrated and efficient service ecosystem (Setyowati et al., 2022). These conditions indicate that the implementation of this service innovation is influenced not only by policy design but also by implementation factors such as communication, resource availability, the attitudes of implementers, and bureaucratic structure. This statement emphasises that the success of innovation in public transport services is a crucial element in supporting the realisation of SDG 11.

Table 1: Comparison of Payment System

Sistem	Mekanisme	Kelebihan	Kelemahan
Botol Plastik	Tukar di halte	Ramah lingkungan	Tidak Praktis
QRIS	Scan digital	Cepat dan efisien	Butuh device
Kartu E-Money	Tap kartu	Mudah	Harus isi saldo

3.2 Analysis of Policy Implementation Based on Transport

Communication Aspects

In the context of policy implementation, communication is a fundamental factor determining the success of a programme. Based on George C. Edward III's policy implementation model, communication serves as a means of conveying the objectives, mechanisms and benefits of a policy to the public (Edward III, 1980). The Surabaya City Government has conducted public awareness campaigns regarding the plastic waste-based and digital payment system through various media accessible to the public, including social media and information displayed at bus stops. From George C. Edward III's perspective, the communication variable requires clarity and consistency.

This situation shows that policy communication serves not only as a means of conveying information, but also as a strategic instrument in shaping public understanding and behaviour towards transport service innovations. There is a lack of integration of information regarding more flexible payment systems, such as simplifying messaging, improving digital literacy, and maximising the use of more interactive communication channels. Therefore, strengthening communication elements will not only enhance the effectiveness of policy implementation but also expedite public adoption of public transport service innovations. This is crucial for realising an inclusive, accessible, and sustainable transport system, as emphasised in SDGs 11.

Resource Aspects

Resources are a crucial determinant in ensuring the sustainability and success of public policy implementation. In the area of public transportation in the City of Surabaya, resource factors include the availability of a sufficient and adequate fleet, the reliability of digital payment systems, and the capabilities of the workforce on the ground. In addition to the fleet, the Facility Resources aspect of the payment system has shown progress through

the integration of contactless card readers and real-time applications. However, the effectiveness of these resources is highly dependent on the ratio of waste collection points (drop boxes) available, which must be proportional to the number of existing bus stops. The optimal utilisation of these resources supports improved accessibility and convenience of services, which are the primary guidelines for achieving Smart Mobility in the City of Surabaya (Fadilah et al., 2025).

However, the limited size of the fleet and the scarcity of plastic waste collection points remain major obstacles to the implementation of the policy. These limitations result in sub-optimal service, such as waiting times that do not align with schedules and restricted access for residents in certain areas. Furthermore, the readiness of infrastructure to support digital payment systems also needs to be improved to ensure equitable coverage for all users. This situation highlights that the optimisation of resources is a key factor in realising an inclusive, efficient, and sustainable transport system, as emphasised in SDGs 11.

Disposition (Implementers' Attitude)

Disposition in policy implementation reflects the psychological tendencies, commitment and consistency of implementers in translating innovation objectives into operational actions. In the context of the Trans Semanggai Suroboyo (TTS) service, implementation demonstrates productive collaboration between various parties, involving the Central Government through the use of the Buy The Service (BTS) program, the Surabaya City Government, and operators such as PT Seduluran Bus Suroboyo and Perum DAMRI (Setyowati et al., 2022; Directorate General of Land Transportation, 2022). The involvement of state-owned and private companies reflects a strong commitment to implementing better and more transparent minimum service standards (SPM). This collaboration between public and private sector entities reflects a strong commitment to implementing better and more transparent minimum service standards (MSS).

However, differences in payment systems across services require a high level of coordination and awareness from the operators. As payment methods become increasingly diverse and advanced—ranging from plastic bottle exchanges and GoBis loyalty points to digital payment systems such as QRIS and electronic cards—operators are required to maintain a solid technical readiness in the field. Although the survey indicates that 59% of respondents prefer exchanging plastic waste for tickets, the overall effectiveness of waste reduction on specific routes, such as the Timu Route (Merr), remains relatively low (Nadhifah & Juliardi, 2022). Without adequate infrastructure and responsive implementers, this innovation risks declining service quality and reduced public satisfaction. The synergy between operational readiness and managerial commitment is an absolute prerequisite for the success of this innovation. This serves not only as a benchmark for the effectiveness of local policies but also as a tangible manifestation of efforts to achieve SDGs 11 targets in creating an inclusive and sustainable transport system.

Aspects of Bureaucratic Structure

The bureaucratic structure is a key factor governing the mechanisms of coordination and the distribution of authority amongst institutions in policy implementation. In the context of public transport in Surabaya, this structure reflects a collaborative management model involving the Ministry of Transport as the primary regulator, the Surabaya City Transport Agency as the local administrator, and technical operators such as PT Seduluran Bus Suroboyo and Perum DAMRI. The management of Trans Semanggi Suroboyo (TSS) using the Buy The Service (BTS) scheme demonstrates a clear separation of functions for urban transport development at the national level (Ministry of Transport Regulation No. PM 9 of 2020).

However, the effectiveness of this bureaucratic structure still faces various challenges relating to the distribution of authority in the integration of payment innovations. Although the transport system is already fairly stable, the operational procedures for exchanging plastic waste as a means of payment involve a number of bureaucratic processes across different sectors, namely between transport management and waste management within the Environmental Agency. The existence of Standard Operating Procedures (SOPs) that are not yet fully and seamlessly integrated between the central government's digital ticketing system and local waste collection points has the potential to lead to bureaucratic inefficiencies (Salsabil & Purnomo, 2021; Pradana, 2020). By integrating waste management into the smart mobility ecosystem, the City of Surabaya can serve as a model for other cities in achieving sustainable settlement targets in line with SDGs 11.

Based on an analysis of the four aspects of policy implementation namely communication, resources, disposition, and bureaucratic structure findings have been identified that influence the effective implementation of a payment innovation within public transport services in the City of Surabaya. To explain this analysis more clearly, the following presents a summary in tabular form containing the most significant findings and potential solutions that can be implemented.

Aspek	Temuan	Solusi
Komunikasi	Sosialisasi belum merata, pengguna masih bingung sistem pembayaran	Tingkatkan sosialisasi terpadu dan edukasi penggunaan sistem
Sumber Daya	Titik penukaran terbatas dam sistem yang belum terintegrasi penuh	Perluas titik layanan dan integrasi sistem pembayaran
Disposisi	Kesiapan teknik pelaksana belum optimal	Pelatihan dan peningkatan kualitas pelayanan
Struktur Birokrasi	Koordinasi antar lembaga belum sebnuhnya sinkron	Perkuat koordinasi dan penyederhanaan prosedur layanan

Source: *Data Processed, 2026*

4. CONCLUSION

The study concludes that the innovation of a plastic waste-based payment system in the Trans Semanggi Suroboyo services represents a strategic effort to improve public transport quality while addressing environmental issues. This innovation supports the development of a more inclusive, efficient, and environmentally friendly transport system in line with the objectives outlined in SDGs 11. However, its implementation has not yet been fully optimal due to several constraints, including limited resources, fragmented communication, varying readiness of implementers, and bureaucratic complexity. Therefore, strengthening policy integration, improving infrastructure and human resource, and enhancing public communication are essential steps to optimize service delivery and ensure the sustainability of this innovation in the future.

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