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## POLICY ANALYSIS OF MAAS (MOBILITY-AS-A-SERVICE) IN THE CONTEXT OF SUSTAINABLE TOURISM IN UBUD TOURIST DESTINATION

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### Abstract

This research analyzes the developing Mobility-as-a-Service (MaaS) policy in the Ubud tourism destination, aiming to support sustainable tourism. Using a qualitative descriptive approach, data was collected through interviews, observations, and document studies. The findings indicate that MaaS has the potential to improve public transportation integration, reduce traffic congestion, and lower the carbon footprint of tourists. However, challenges were found in three key areas: inter-agency coordination, user awareness, and digital infrastructure. This policy shows a positive direction toward an environmentally friendly and inclusive tourist transportation system. However, it requires a stronger institutional framework and cross-sector support to be effective.

**Keywords:** Transportation Policy, MaaS, Sustainable Tourism, Ubud, Tourist Mobility

### A. INTRODUCTION

Traffic congestion and increasing environmental pressure have become urgent strategic issues in the Ubud tourism destination in Gianyar Regency, Bali, particularly over the last two decades (Ayu R, 2025). As a hub for Balinese culture, spirituality, and ecotourism, Ubud has experienced rapid growth as a prime destination for both domestic and international tourists who are drawn to its local culture, yoga, art, and natural tropical beauty (Telelepta, 2024). However, this rapid growth in tourism has brought negative consequences, including traffic jams, environmental degradation, and a significant increase in carbon emissions (Darmayasa et al., 2025). According to data from the Gianyar Regency Tourism Office (2023), the average annual growth in vehicle volume in the Ubud area has reached 15%, correlating with the rising number of tourist visits and a high dependence on private vehicles among both tourists and locals.

This phenomenon presents multidimensional challenges, particularly in maintaining a balance between the environment's carrying capacity and tourist comfort and safety. The narrow roads that wind through traditional villages and conservation areas can no longer efficiently accommodate the flow of vehicles. In addition, fragmented transport options, a

lack of safe pedestrian paths, and the dominance of fossil fuel-powered vehicles worsen the situation. In the long term, uncontrolled traffic pressure has the potential to degrade the tourist experience and threaten Ubud's appeal as a top cultural and natural destination (Wiguna et al., 2024).

To address these challenges, various innovative approaches are being considered, including the development of a Mobility-as-a-Service (MaaS) concept. MaaS is an integrated approach to modern transport management that combines various modes of transport such as public transit, shuttle services, rental bikes, and ride-sharing into a single, app-based digital platform that users can access flexibly. MaaS allows tourists to plan, book, and pay for their entire journey through one integrated system, encouraging a shift from private vehicle ownership to a service-oriented mobility pattern. This concept is rapidly growing in global tourist cities like Helsinki, Tokyo, and Barcelona as a response to urbanization pressure and the need for smart, eco-friendly, and user-centric mobility systems (Smith et al., 2021).

In Bali, specifically in Ubud, MaaS implementation initiatives are being developed through pilot programs that integrate village shuttle services, QR code-based e-ticketing, and a data-driven traffic monitoring system linked to local government and private mobile apps. The Gianyar Regency Government, in collaboration with the Department of Transportation, the Tourism Office, and local communities, hopes that MaaS can be a strategic solution to reduce traffic, increase transport efficiency, and support the principles of sustainable tourism, aligning with the Sustainable Development Goals (SDGs), particularly Goal 11 on sustainable cities and communities.

However, the implementation process for MaaS in Ubud is not without its obstacles. These challenges include resistance from conventional transport operators who feel threatened by service digitalization, limited digital infrastructure in some villages, low technological literacy among older international tourists, and a lack of fully integrated transport and tourism policies. Additionally, the absence of specific regulations and fiscal incentives for eco-friendly transport operators hinders widespread technology adoption. Therefore, a comprehensive study is needed to evaluate the MaaS development policy, identify its potential and implementation barriers, and formulate strategic, evidence-based policy recommendations that can strengthen sustainable mobility in tourist areas like Ubud.

This research aims to analyze the effectiveness of MaaS policy in the context of sustainable tourist mobility management in Ubud. This study is important not only academically—by enriching the literature on transport and tourism policy—but also practically, serving as a reference for local governments, destination managers, and transport operators in developing an adaptive, inclusive, and eco-friendly tourist transport system. This research is also expected to be a reference for other tourist areas in Indonesia facing similar challenges in their efforts to achieve sustainable tourism transformation through technological innovation.

## **B. LITERATURE REVIEW**

### **Mobility-as-a-Service (MaaS)**

Mobility-as-a-Service (MaaS) is a transformative approach to transportation that integrates various public and private transport options into a single, unified digital system that is flexible and user-oriented (Amir A, 2025). The concept was first introduced by Hietanen (2014), who stated that MaaS aims to create a mobility system no longer based on private vehicle ownership, but on easy access to various on-demand transport modes. Thus, MaaS fundamentally changes the transportation paradigm from "ownership" to "usership."

The main components of MaaS include an integrated digital platform (like a mobile application) that allows users to plan trips, compare transport options, make bookings, and complete payments in a single, seamless system (Rahmawati, 2025). This integration covers modes such as public buses, shuttle services, bike and scooter rentals, ride-hailing, and even walking. The service also includes elements like real-time tracking, e-ticketing, cross-modal fare integration, and personalized, predictive trip-planning algorithms (Sochor et al., 2018).

In practice, MaaS has grown rapidly in major cities like Helsinki, Vienna, and Tokyo, where it is part of their sustainable urban mobility strategies (Al Misky et al., 2025). Helsinki, a pioneer, has integrated public transport, taxis, and bike rentals into a single application called Whim, which serves as a successful example of MaaS in action (Kamargianni et al., 2016). Recent studies show that MaaS has great potential to reduce traffic congestion, lower greenhouse gas emissions, and encourage a shift in behavior from private vehicle use to collective mobility services.

However, implementing MaaS also faces significant challenges, including the interoperability of systems across different modes, the need for adaptive regulations, a framework for incentivizing transport operators, and digital literacy among the public. In developing countries like Indonesia, MaaS implementation requires strong digital infrastructure, integrated regulations across agencies, and inclusive funding models to reach all user segments, including tourists, local businesses, and rural communities.

### **Sustainable Tourism**

Sustainable tourism is a strategic approach to tourism management that prioritizes a balance between economic growth, environmental preservation, and socio-cultural sustainability (Frans & Djunaidi, 2025). According to the official definition from the United Nations World Tourism Organization (UNWTO, 2022), sustainable tourism is a form of tourism that fully considers its current and future economic, social, and environmental impacts, meeting the needs of visitors, the industry, the environment, and host communities.

The key features of sustainable tourism include efficient use of energy and natural resources, preservation of cultural heritage and the natural environment, and the active participation of local communities in decision-making (Suharto et al., 2024). This model also emphasizes the fair distribution of economic benefits, reducing negative impacts on ecosystems, and increasing ecological awareness among both tourists and tourism operators (Sharpley, 2009).

In the context of the Ubud tourist destination, the concept of sustainable tourism is highly relevant given Ubud's character as an area rich in cultural heritage, Balinese Hindu spirituality, and sensitive natural ecosystems like rice fields, tropical forests, and rivers. However, the high volume of tourist visits, which is not balanced by an efficient mobility

system, has created pressures such as traffic congestion, air and noise pollution, and damage to local infrastructure. This highlights the urgent need to integrate mobility policy into the larger framework of sustainable tourism development.

When managed with a participatory and local wisdom-based approach, MaaS can be a strategic tool for achieving these goals. By providing efficient, eco-friendly, and integrated transport options, MaaS can help reduce the use of private vehicles, lower carbon emissions, and create a more comfortable, authentic, and socially and ecologically responsible tourist experience.

### **Transportation Policy and Digital Innovation**

In the analysis of public policy, digital innovation in transport systems like MaaS reflects a paradigm shift toward "governance by innovation," where technology is used as a primary tool to solve complex problems in urban and tourism societies (Djarmiko R, 2023). According to Dunn (2018), the success of innovation-based public policy is determined not only by its policy design but also by the institutional capacity to implement solutions collaboratively across sectors.

A transport policy that supports MaaS must be designed with a systemic approach that involves various actors, including local governments, transport service providers, local communities, the technology private sector, and, of course, end-users (Yunus et al., 2024). This policy framework must facilitate interoperability between modes, data integration standards, user data protection, and fare and access regulations. In addition, fiscal incentives and zoning regulations that support eco-friendly transport are also crucial factors in ensuring the continuity of MaaS (Banister, 2008).

Digital innovation in transport is not just a technical matter; it is also socio-political. This is because the successful implementation of new technologies like MaaS requires changes in user behavior, trust in the system, and the community's readiness to use digital platforms. Therefore, the adaptive capacity of public institutions is a major factor in creating a policy ecosystem that supports the transition to sustainable mobility.

In the context of Ubud, developing MaaS requires an integrative local regulatory framework that combines transport, tourism, and spatial planning policies. There is a need for a legal umbrella that governs the integration of transport data, cross-modal e-ticketing systems, and minimum service standards for tourist transport. Furthermore, the participation of customary communities, village managers, and local transport operators must be facilitated through communication forums and digital training so that this innovation becomes not just a technology project but also an instrument for strengthening the inclusive and sustainable governance of tourism mobility.

## **C. RESEARCH METHODOLOGY**

This research uses a descriptive qualitative approach with a case study method, which is considered the most appropriate for understanding the phenomenon of the **Mobility-as-a-Service (MaaS)** policy in the context of sustainable tourism in the **Ubud Tourism Object (DTW)**. This approach was chosen because it allows the researcher to

deeply explore the dynamics of implementing a digital-based transportation policy in a complex and unique local context, rich with social interactions and cultural values. The case study method, as proposed by Yin (2018), is highly relevant for answering "how" and "why" a policy is implemented and what its impact is on the community and stakeholders.

The research location was determined purposively at the **DTW Ubud** area in Gianyar Regency, Bali Province. Ubud was chosen because it is a major tourist destination experiencing high mobility pressure and has been designated as a pilot project for MaaS system development in Bali since 2022. This project is a collaboration between the Transportation Agency, Tourism Agency, local transportation service providers, and tourist village managers. Ubud also has unique social and cultural characteristics, so the implementation of MaaS in this area presents distinct challenges and opportunities, different from a typical urban area.

The research subjects were selected using purposive and snowball sampling, including stakeholders with direct and indirect involvement in the planning and implementation of MaaS. Key informants consist of officials from the Gianyar Regency Transportation Agency, tourist village managers, local transportation business actors (conventional and digital), as well as domestic and international tourists who have used MaaS services such as digital shuttles, e-bikes, and platform-based tourism transportation applications like **Ubud Smart Mobility**.

Data collection was carried out through the triangulation of methods, which is a combination of in-depth interviews, participant observation, and documentation study. In-depth interviews were semi-structured, allowing the researcher to explore the informants' views and experiences freely but with a clear focus. Observation was conducted on the tourism transportation service system in the field, including digital stops, shuttle meeting points, special e-bike lanes, and user behavior in accessing and using MaaS applications. Meanwhile, documentation study was carried out by reviewing official local government documents (such as the Regional Medium-Term Development Plan, local regulations on transportation, and MaaS trial reports), tourism statistical data, and technical reports from technology provider partners.

All data were analyzed using the interactive model from Miles, Huberman, and Saldaña (2014), which consists of three main stages: (1) **data reduction**, the process of selecting, simplifying, and organizing raw data into a more focused form; (2) **data display**, the presentation of information in the form of narratives, matrices, or tables to facilitate meaning extraction; and (3) **conclusion drawing and verification**, which is done inductively based on patterns of findings that emerge in the field. The analysis was conducted simultaneously during the data collection process (an iterative analysis), so that the researcher's understanding could be continuously refined.

To ensure the validity and credibility of the findings, this research applied the techniques of source and method triangulation, member checking, and audit trail. Triangulation was performed by comparing information from various sources and data collection techniques. Member checking was done by re-confirming the data interpretation results with the key informants to ensure that the findings reflect their actual conditions and experiences. The

audit trail was implemented by meticulously documenting the entire data collection, processing, and analysis process so that it could be systematically traced and accounted for. With this methodological approach, the research is expected to provide a comprehensive, contextual, and reality-based picture of the effectiveness and challenges of implementing the MaaS policy in supporting the transformation of sustainable tourist mobility in DTW Ubud.

## **D. RESULT AND DISCUSSIONS**

### **The Impact of MaaS on Tourist Mobility Patterns**

Observations and interviews with stakeholders show that the initial implementation of the Mobility-as-a-Service (MaaS) system in the Ubud Tourism Area (DTW) has significantly impacted tourist mobility patterns, especially in their choice of transportation and reduced reliance on private vehicles.

Since the launch of the digital shuttle and app-based e-bike trial—known as the Ubud e-Mobility initiative in early 2022, there was a 22% decrease in the number of private tourist vehicles by the end of 2023 (Gianyar Regency Transportation Agency, 2024). This decline shows a shift in tourist preference from private to more efficient and eco-friendly shared transportation.

The MaaS system in Ubud integrates several modes of transportation, such as inter-village tourism shuttles, local ride-hailing services, e-bikes, and pedestrian paths. Tourists can plan their routes through a GPS-based app that provides real-time information on shuttle availability, digital stop locations, travel time estimates, and cashless payment options via QR codes. This accessibility and flexibility allow tourists to efficiently reach various tourist spots within a 3-5 kilometer radius without relying on private or rented vehicles.

This change directly supports the principle of slow tourism, an approach that emphasizes in-depth exploration, a minimal carbon footprint, and a more intensive engagement with local culture. MaaS promotes experience-based mobility, where tourists are encouraged to walk, use micro-mobility modes, and interact more closely with the local community. Thus, MaaS is not just a technical solution for traffic problems but also an instrument for reshaping Ubud's tourism narrative toward a more inclusive and sustainable direction. Furthermore, reduced traffic positively impacts air quality, noise levels, and environmental comfort in major tourist centers like the Monkey Forest, Campuhan Ridge Walk, and Ubud Market, enhancing the destination's appeal and supporting conservation efforts by customary villages and local tourism actors.

### **Challenges in MaaS Policy Implementation**

Although MaaS implementation shows promising initial results, the process still faces various structural, technical, and social challenges that need to be addressed to ensure the program's sustainability. The main challenges identified are:

- a. The Digital Infrastructure Gap A major obstacle is the uneven digital infrastructure, especially internet and cellular network access, in some DTW outskirts like Tegallalang, Petulu, and Sayan. This limits the real-time connectivity between user apps and the central system, reducing the effectiveness of key features like shuttle tracking, online ticket booking,

and travel maps. Some tourists have complained about difficulty accessing the MaaS app in areas with weak signals, which affects overall service satisfaction.

b. Suboptimal Inter-Agency Coordination MaaS implementation requires cross-sectoral coordination between the Transportation Agency, Tourism Agency, local transportation operators, and digital app providers. However, there is no integrated ticketing system yet that can connect all tourism transportation services in a single payment and data management system. Policy fragmentation, a lack of regular coordination forums, and differing institutional orientations are obstacles to realizing a complete MaaS ecosystem. In an interview with a Transportation Agency official, it was mentioned that integration with community-based transportation providers (such as traditional shuttles and non-app-based transport) remains at an impasse due to the lack of regulations to accommodate a hybrid model.

c. Resistance from Conventional Transportation Actors One of the main social challenges is the resistance from conventional drivers and vehicle owners, such as village transport and traditional motorcycle taxis, who see MaaS as a threat to their income. They believe that service digitalization could eliminate their primary source of income, especially if they are not given access or training to participate in the new system. In some cases, there have been rejections and boycotts of digital shuttles operating on traditional routes. This highlights the importance of communication, education, and local economic empowerment strategies to fairly integrate traditional transportation actors into the new MaaS system.

### **Response from Tourists and the Community**

The initial response from MaaS users in Ubud, both tourists and locals, is generally positive. Based on interviews with 25 tourists from various countries and 10 locals living or working along the main tourist routes, about 80% of respondents expressed satisfaction with the concept and convenience of the MaaS service. Tourists appreciate the app's features that allow them to quickly plan trips, choose their preferred mode of transport (e.g., shuttle or bike), and make cashless payments.

Some tourists also mentioned that the service helps them avoid traffic, better enjoy Ubud's natural and cultural atmosphere, and save on transportation costs. The bundled tickets and discounts for repeated trips are an added incentive. This strengthens Ubud's competitiveness as a digital and eco-friendly tourist destination.

However, users also provided some critical feedback. This includes technical glitches in the app, such as login issues, slow map updates, and discrepancies between the shuttle's arrival time and the app's schedule. In addition, the app's interface information is limited to Indonesian and English, which is difficult for non-English-speaking tourists from countries like Japan, Germany, and France. Elderly tourists also mentioned difficulty operating the app due to a lack of familiarity with digital technology.

From the local community's perspective, most support the policy because they believe it helps reduce traffic and air pollution in tourist areas, which also benefits residents' comfort. However, some small-scale informal transportation businesses still feel they have not been accommodated in the MaaS scheme, raising concerns that the local economy will be marginalized if the system is not designed inclusively.

Overall, while the user response is generally positive, the long-term success of the MaaS policy is highly dependent on improving service quality, expanding the participation of the local community, and strengthening digital education for all users. With the right strategy, MaaS can become a key instrument in shaping tourist mobility that is not only smart but also fair and sustainable.

## E. CONCLUSION

The development of the Mobility-as-a-Service (MaaS) policy in the Ubud Tourism Area (DTW) can be considered a strategic innovation that aligns with the principles of sustainable tourism. As an integrated digital system, MaaS offers a new approach to managing tourist mobility that is efficient, eco-friendly, and adaptable to user needs. In Ubud, a well-known cultural and spiritual destination with high mobility demands, MaaS has had a tangible positive impact by reducing the use of private vehicles, improving travel efficiency, and enhancing the visitor experience. Tourists now have more flexible, economical, and real-time transportation options, which supports a travel style that is not just functional but also immersive and contextual—in line with the principles of slow tourism.

Despite these benefits, MaaS implementation still faces several multifaceted challenges. First, there's a digitalization challenge, particularly the uneven spread of technology infrastructure and low digital literacy among certain users, such as elderly tourists and local transportation providers. Second, institutional coordination among local governments, transport operators, and tourism managers is not fully integrated, which hinders data consolidation, regulatory harmonization, and cross-modal service systems. Third, social resistance from conventional transportation workers, who feel marginalized by the digital system, is a significant obstacle to the comprehensive adoption and inclusion of this policy.

To ensure the sustainability of the MaaS system in Ubud, strategic steps are needed. These include strengthening local regulations and establishing a clear legal framework for integrated ticketing and cross-modal management. Additionally, providing digital training for local operators and user communities is urgent to improve their ability to adapt and participate in the technology-based transportation ecosystem. Developing a real-time data monitoring system that can record, predict, and dynamically manage tourist movement is also key to creating a responsive and proactive mobility system.

With a holistic and participatory approach, MaaS can be more than just a technical solution to traffic and tourist travel efficiency. It can be a tool for a cultural transformation of mobility in Bali's tourist areas. MaaS can drive a future tourism model that is more inclusive, green, smart, and equitable, where technology serves local values and sustainability is the main foundation for regional tourism development.

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