

Sustainable Mobility and Operational Challenges of Trans Mamminasata Bus in Makassar City

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Abstract: This study examines the operational effectiveness of the Trans Mamminasata Bus as part of the Makassar City government's efforts to encourage environmentally friendly mobility and reduce public dependence on private vehicles. Although this program was initiated as a solution to overcome congestion and air pollution, its implementation still faces various obstacles such as low public awareness, limited integration of routes and fleets, minimal supporting infrastructure, and weak policies on limiting private vehicles. This study uses a qualitative approach through case studies and observations at congestion points in Makassar City. The results of the analysis show that although the Trans Mamminasata Bus has the potential to be an effective mode of public transportation, synergy is needed between government policies, community participation, and strengthening of facilities and infrastructure so that this public transportation can truly function optimally in creating an inclusive, efficient, and sustainable urban mobility system

INTRODUCTION

Public transportation is a vital element in supporting sustainable urban mobility, especially in big cities like Makassar that are experiencing increasing traffic density and air pollution. To address these challenges, the government launched the Trans Mamminasata Bus service as part of the Teman Bus national program that aims to provide environmentally friendly, efficient, and affordable mass transportation.

In the last three years, Makassar City has experienced a significant increase in the use of private vehicles, which has an impact on traffic congestion and urban mobility challenges. In 2023, the number of motorbikes in Makassar reached 1,470,840 units, covering around 37% of the total motorized vehicles in South Sulawesi Province. Data from the Makassar City Transportation Agency in 2024 showed that 75% of the population's movement used two-wheeled motorized vehicles for daily mobilization. The latest study in 2025 revealed that 92% of Makassar residents preferred private vehicles as their main means of transportation. The dominance of private vehicles, especially motorbikes, is the main contributor to congestion that occurs almost every day on various city roads. This condition is exacerbated by the decline in public transportation users from 18% to below 5% in the last decade. This situation highlights the need for a more sustainable and environmentally friendly transportation strategy in Makassar City.

The government presents the Trans Mamminasata Bus public transportation as a strategic effort to improve the quality of sustainable, environmentally friendly, and inclusive urban mobility in Makassar City. The main objective of this program is to reduce public dependence on private vehicles which are the main contributors to air pollution, as well as to provide an alternative to safe, affordable, and efficient mass transportation. Seeing the problems that occur, the presence of the Trans Mamminasata bus is expected to support integration between modes of transportation, expand citizen accessibility to centers of economic and social activity, and increase equality in public transportation services. The targets to be achieved through this program include increasing the number of public transportation users, reducing the volume of private vehicles on the highway, reducing carbon emissions, and realizing a modern transportation system that is oriented towards optimal public services.

The scope of this service seeks to encourage a shift in transportation modes from private vehicles to public transportation and reduce the burden of urban road congestion. The initial stage

of the launch of the Trans Mamminasata Bus operates 81 buses spread across four main corridors with a total of 261 bus stops and an operational schedule from 06.00 to 23.00 WITA. Corridor 1 connects Panakkukang Mall with Galesong Port, passing through important points such as BCA, Grand Maleo Hotel, Trans Studio Mall, and SMK Negeri 1 Takalar. Corridor 2 serves the route from Panakkukang Mall to Sultan Hasanuddin International Airport, via stops such as Hermina Hospital, Makassar Islamic University, and the Airport Departure Terminal. Corridor 3 connects Campus 2 of the Ujung Pandang State Polytechnic (PNUP) with Campus 2 of the Maritime Polytechnic (PIP), with stops in areas such as the BTP Central Market and the Daya Terminal. Meanwhile, Corridor 4 connects the Unhas Gowa Engineering Campus with Panakkukang Mall, via a route that crosses Jl. STTP Gowa and Jl. Sultan Alauddin. This even distribution of bus stops is designed to increase public accessibility to public transportation.

Over time, the dominance of private vehicle use in Makassar City remains high even though the Trans Mamminasata Bus service has been presented as a public transportation solution. The traffic density that occurs shows that the existence of this bus has not been able to significantly encourage a mode shift from private vehicles to public transportation. (Ismiyati, Firdaus, and Arubusman 2016). Instead of being a solution to reduce traffic congestion, some parties believe that the operation of the Trans Mamminasata Bus only increases the volume of vehicles on the road, especially because there is no policy to limit private vehicles simultaneously.

This shows that without a clear integrative strategy and strong supporting policies, efforts to improve the effectiveness of public transportation will be very limited. (Nuryasinta and Pangestika 2025). Without these steps, public transportation will not be able to function optimally in reducing the use of private vehicles, which in turn can reduce congestion and traffic burden in dense urban areas (Ngurah Purnama Jaya 2022). The success of a public transportation system depends on careful planning, collaboration between various parties, and the implementation of supportive policies, in order to create a more efficient and friendly environment for drivers and society as a whole (Hastiani, Sulistiawan, and Isriyah 2023).

Several points in Makassar are often the center of traffic jams, including the Pettarani-Alauddin intersection, the Samata Roundabout, Jalan Dr. Leimena, Perintis Kemerdekaan in front of the UIM and Unhas campuses, Perintis Kemerdekaan Daya, the Antang intersection, and Jalan Urip Sumoharjo. These routes are the main routes used by the Trans Mamminasata bus, which should be able to reduce traffic congestion. However, congestion often occurs at these locations due to the very high volume of vehicles, both private vehicles and public transportation. This congestion is further exacerbated by other factors such as ongoing construction, less than optimal traffic management, and driver behavior that does not obey traffic rules. Thus, even though Trans Mamminasata is present as a public transportation solution, the problem of congestion remains a major challenge that requires more attention in the planning and management of the transportation system in this city (Prasetyo, M. Mazya, and Nurimani 2023).

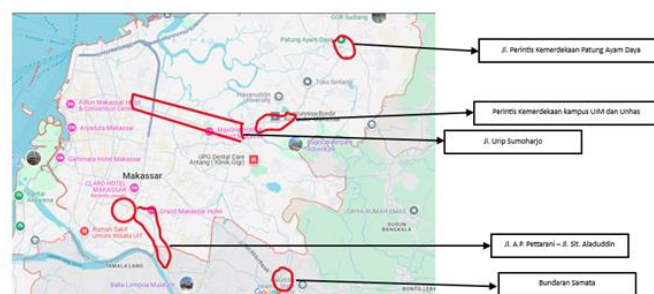


Figure 1. Congestion points in Makassar City, sources managed and accessed through field data and author observations.

Figure 1 shows several points prone to congestion in Makassar City that often experience traffic congestion, especially during rush hours such as in the morning when people go to the office and school, and in the afternoon before going home from work. These points include the Jalan

Perintis Kemerdekaan section, both around the UIM and Unhas campuses and in the Pettuadde (Daya) area, Jalan Urip Sumoharjo, Jalan A.P. Pettarani to the intersection of Jalan Sultan Alauddin, and the Samata Roundabout. These locations are the main routes connecting residential areas, educational centers, industrial areas, and the city center, so that there is a spike in vehicle volume at certain times. In addition to the high mobility of the community, congestion at these points is also triggered by the lack of effective traffic management and the meeting of vehicle flows from various directions that have not been well integrated, although this route is also passed by the Trans Mamminasata fleet which aims to reduce the use of private vehicles (Nuhun et al. 2024).

The non-optimal functioning of public transportation in Makassar City, especially the Trans Mamminasata bus, is a reflection of the weak planning and management system for mass transportation services that should be a solution to the problems of congestion and public mobility. This operational ineffectiveness is marked by the decreasing interest of the public in using the service, which is caused by various factors such as schedule uncertainty, limited routes, and minimal comfort and accessibility. (Ramadhan Dwi Prasetyo and Reza Yoga Anindita 2024). As a result, the Transportation Agency (Dishub) was forced to reduce the number of fleets in operation and reduce pick-up points, which actually worsened the condition of public transportation and reduced the possibility of this system becoming a real alternative to replace private vehicles. This condition creates a negative cycle that hinders the development of public transportation as the main means of mobility in big cities like Makassar.

Although not yet functioning optimally, the Trans Mamminasata bus still has an important role in reducing traffic congestion in Makassar City. To achieve this goal, consistent education is needed for the community about the importance of switching to public transportation, accompanied by supportive policies from the government (April Kurniawan 2025). In addition, the development of an environmentally friendly fleet is also a strategic step in creating a sustainable and efficient transportation system. Previous research and published articles that examine the Trans Mamminasata Bus include those discussed by (N., Haning, and Yunus 2023). by emphasizing the government network through policy makers to make services effective for optimizing Mamminasata Transportation. While, (Ambarwati 2016) reviewing the Simulation of Regional Bond Issuance for Funding the Bus Rapid Transit (BRT) Project at the South Sulawesi Provincial Government.

Through Sustainable mobility, a transportation concept that seeks to emphasize efficiency, inclusiveness, and environmental friendliness, with the aim of meeting the mobility needs of today's society without sacrificing the ability of future generations to meet their needs. In the context of the Trans Mamminasata Bus in Makassar City, sustainable mobility includes the provision of integrated, affordable, and reliable public transportation services, while reducing dependence on private vehicles and carbon emissions. However, the implementation of this concept faces various operational challenges such as limited infrastructure, low public interest in switching to public transportation, inconsistent service schedules, and lack of integration between transportation modes in the Mamminasata area. Therefore, realizing sustainable mobility through Trans Mamminasata requires a holistic, collaborative, and user-oriented approach.

Responding to these challenges by considering the importance of environmentally friendly mobility as part of efforts to realize a sustainable city, the presence of Trans Mamminasata buses in Makassar City should be a strategic solution in reducing dependence on private vehicles and reducing carbon emissions in urban areas. However, various operational challenges such as limited fleet, unintegrated routes, low public interest, and lack of infrastructure support are still the main obstacles in optimizing this service. Therefore, an in-depth analysis of the dynamics of mobility in this city is needed, including the role of public transportation and its transformation efforts towards a more efficient and environmentally friendly system, so that the presence of Trans Mamminasata can truly answer the needs of urban mobility as a whole.

RESEARCH METHODS

This study of environmentally friendly mobility uses a qualitative approach through a case study on the Trans Mamminasata Bus in Makassar City, involving exploration and

understanding of social problems. Qualitative studies lead to the need for limitations based on the focus that emerges as a problem in a study. Therefore, this study focuses on the applicable policies to mobilize the community to reduce the use of private vehicles and switch to environmentally friendly public vehicles through the Trans Mamminasata Bus program. Data were obtained through literature studies and observations at several congestion points in Makassar City. This analysis refers to the high level of vehicle density at certain hours, data adjustments, with reduction and display techniques and determining conclusions or verification. This study also uses qualitative data analysis with the help of NVIVO 12 Plus.

RESULTS AND DISCUSSION

The actualization of the Trans Mamminasata Bus program actually has a positive impact in reducing the level of vehicle density in Makassar City. As one of the public transportation modes designed to divert the use of private vehicles, its presence is able to be a solution to the increasingly complex problem of congestion. However, the effectiveness of this program is not fully supported by consistent and comprehensive policies from the local government (Irianto & Amirya, 2024). The disconnect between planning and policy implementation has resulted in the systemic contribution to bus operations becoming weak, making it unable to compete with the increasing dominance of private vehicles on city streets.

The lack of emphasis on strengthening regulations among the public and the minimal allocation of resources has caused the Trans Mamminasata Bus program to slowly lose its priority in Makassar's public transportation agenda (Ismail 2020). On the other hand, the absence of a firm policy that limits the use of private vehicles, such as the implementation of progressive parking rates, vehicle zone restrictions, or incentives for public transportation users, also weakens efforts to shift transportation modes towards more environmentally friendly ones. In this context, public awareness is greatly needed and must be formed through regulations that not only regulate, but also encourage changes in mobility behavior towards a more sustainable direction (Kadarisman, Gunawan, and Ismiyati 2015). In addition, other challenges arise from the service aspect, especially in terms of providing accurate and easily accessible information to the public. The lack of adequate digital feature displays, such as departure schedules, bus stop locations, or estimated bus arrival times, makes the user experience less than optimal. This also contributes to the low interest of the public in utilizing these services and strengthens the perception that public transportation is not yet able to meet daily mobility needs practically and efficiently.

Public Awareness in Using Public Transportation (Trans Mamminasata Bus)

The community, which is the main target in the actualization of the Trans Mamminasata Bus public transportation program, still chooses to use private vehicles to carry out daily activities. Public awareness is still relatively low and is one of the main challenges in realizing an efficient and environmentally friendly mobility system in Makassar City. This is also because private vehicles are considered more practical, flexible, and fast, although this actually worsens congestion and increases air pollution. The low level of understanding of the long-term benefits of using public transportation, both in terms of economy, environment, and health, is the main reason why interest in the Trans Mamminasata bus is not optimal. Therefore, increasing public awareness must be an integral part of transportation policy, through ongoing education, massive socialization, and incentives that encourage changes in mobility behavior towards a more collective and responsible direction. (Syaiful et al. 2024).

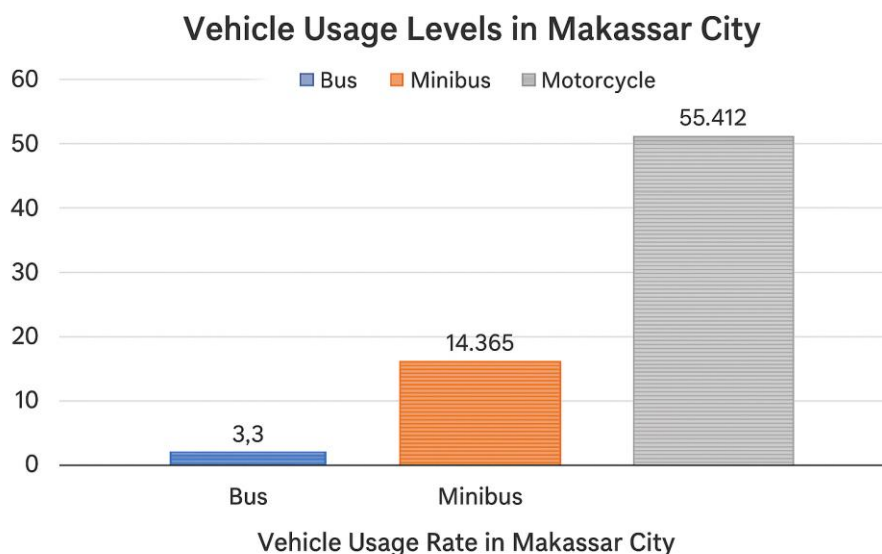


Figure 2. Number of vehicles used in Makassar City in 2023, source accessed through the Central Statistics Agency of Makassar City.

Figure 2 shows a real picture of the mobility patterns of people in Makassar City, where the use of motorcycles dominates significantly compared to other modes of transportation such as minibuses and buses. The high number of motorcycle use shows that people prefer private vehicles which are considered to provide comfort, time efficiency, and ease of access in navigating dense urban streets. On the other hand, the number of minibus users is at a medium level, while the use of buses as public transportation is recorded as the lowest, showing a fairly large disparity in the use of available transportation modes.

This condition indicates that public transportation such as buses is still not the main choice for people in their daily mobility (Arini Sulistyowati 2019). The low number of bus users can be caused by various factors, such as limited fleet, inaccurate schedules, minimal route integration, and lack of information that is easily accessible to users. This is a big challenge for the government and policy makers to conduct a comprehensive evaluation of the existing public transportation system. Efforts to improve services, develop supporting infrastructure, and educate the public about the importance of switching to environmentally friendly mass transportation are crucial steps to change mobility patterns currently still depend heavily on private vehicles, especially motorbikes (Muammar and Mosyofa 2024).

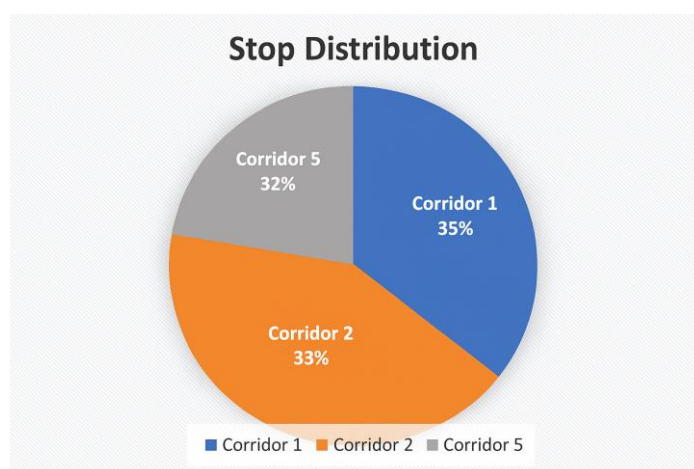


Figure 3. Distribution of the number of bus stops per corridor.
Source: analyzed by the author.

The 3 circles show the distribution of the number of Trans Mamminasata Bus stops in Makassar City which are divided into three corridors, namely Corridor 1, Corridor 2, and Corridor 5. Of the total 40 stops, Corridor 1 gets the largest portion with 35%, followed by Corridor 2 with 33%, and the remaining 32% is allocated to Corridor 5. Figure 3 shows a relatively balanced distribution effort between corridors to ensure equal accessibility of public transportation services in various areas of Makassar City.

Although the distribution of the number of Trans Mamminasata Bus stops in Makassar City can be said to be quite evenly distributed geographically, in reality public accessibility to these stops is still relatively difficult (Wijaya and Nurhajati 2018). Many bus stops are located far from residential areas, do not have adequate pedestrian paths, or are even in locations that are not friendly for people with disabilities and bicycle users (Handoko et al. 2024). This condition makes it difficult for people to reach bus services even though bus stops are available within a relatively close radius. In addition, the lack of integration between modes, such as the absence of direct connections between buses and other modes of transportation such as public transportation, online motorcycle taxis, or bicycle lanes, causes trips to be intermittent and inefficient. This ultimately reduces people's interest in using public transportation, even though basic infrastructure such as bus stops has been provided.

Transformation of Public Interest into Public Vehicles

The rapid growth of private vehicles has contributed greatly to traffic congestion, air pollution and a decline in the quality of life in urban areas (Carolin and Kurniati 2025; Oce Ovalina Yumame, Sapto Pramono, and Ika Devy Pramudiana 2025; Yusrianti 2015). Amidst these challenges, the transformation of public interest towards using public transportation is a strategic step in realizing a more efficient, inclusive, and sustainable transportation system. This change not only reflects increasing environmental awareness, but also marks a shift in people's mindsets that are starting to prioritize collective comfort over individual ownership. The government and stakeholders have an important role in driving this change by providing safe, affordable, and timely public transportation services.

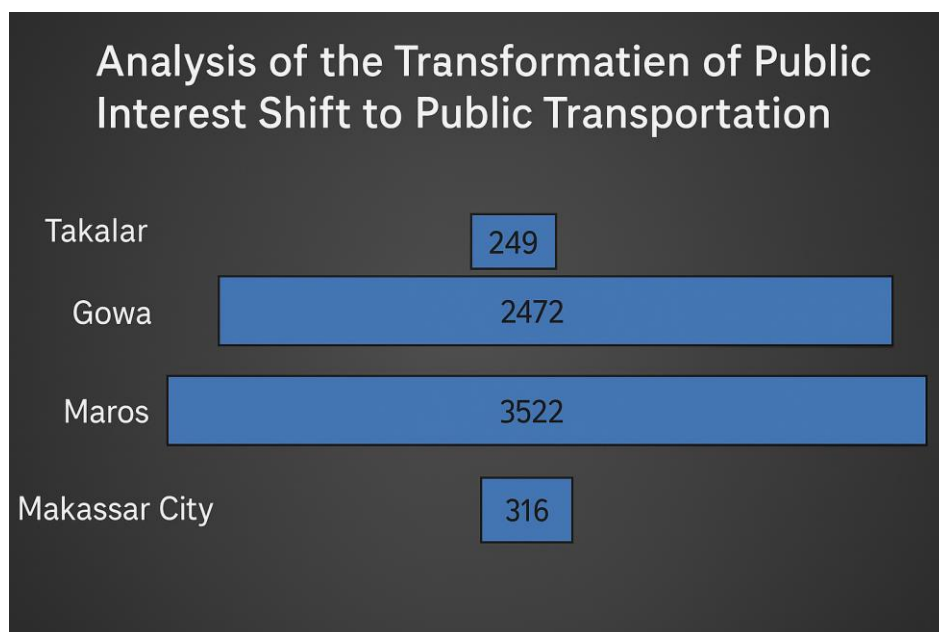


Figure 4. Analysis of Transformation of Public Interest in Public Transportation

Figure 4 is the result of the analysis of the transformation of public interest in public transportation in four areas in the Mamminasata area, namely Takalar, Gowa, Maros, and Makassar City. The graph shows that Maros Regency is the regency/city with the highest public interest in switching to public transportation with a total of 3,532, followed by Gowa with 2,472 respondents. Meanwhile, Makassar City and Takalar showed much lower numbers, with only 316

and 249 people respectively interested in switching to public transportation. This indicates that the interest in transforming to public transportation is higher in buffer areas such as Maros and Gowa, compared to the city center of Makassar which actually has a low adoption rate, possibly because they are used to private vehicles or have a negative perception of the quality of public transportation services available.

The shift in public interest to public transportation did not happen without obstacles. There are still many challenges to be faced, such as negative perceptions of service quality, lack of integration between modes of transportation, and people's habits that have long been accustomed to private vehicles. For this reason, this transformation requires a comprehensive approach, including infrastructure improvements, public education, and attractive incentives so that people feel confident and comfortable using public transportation. If carried out consistently and collaboratively, these efforts can form a more sustainable and adaptive mobility culture for future city developments.

Development of Environmentally Friendly Transportation

The development of environmentally friendly transportation is a strategic step in facing the challenges of climate change and environmental degradation caused by greenhouse gas emissions from the transportation sector (Legionosuko et al. 2019; Malihah 2022). By prioritizing the use of clean energy, fuel efficiency, and the integration of sustainable transportation modes such as electric vehicles, public transportation, and bicycles, these efforts not only contribute to environmental conservation, but also improve the quality of life of the community. In addition, the development of environmentally friendly transportation supports the creation of healthier and more efficient cities.

The development of environmentally friendly transportation is not only limited to urban mass transportation, but also includes innovations in special transportation services such as school buses and electric-based official vehicles. The use of environmentally friendly school buses that use electric energy or alternative fuels aims to reduce greenhouse gas emissions while creating a healthier environment for children and the surrounding community. Likewise, the conversion of government official vehicles to electric vehicles is a concrete step in supporting clean energy policies and operational budget efficiency, because electric vehicles have lower operational costs and minimal maintenance (Syarifuddin 2022). These two initiatives not only demonstrate a commitment to environmental protection, but also provide a concrete example to the wider community of the importance of transitioning to a modern and responsible sustainable transport system.

The Makassar City Government has taken an important step in developing environmentally friendly transportation by launching electric school buses that operate free of charge for students. These buses operate on several main routes, such as Antang-Karebosi and Panakkukang-Karebosi, equipped with modern facilities such as AC, Wi-Fi, and CCTV to ensure the comfort and safety of students. This initiative is part of the "Jagai Anakta" program which aims to ensure the safety of children on their way to school. However, the Trans Mamminasata bus service that serves the main routes in Makassar still uses conventional fuel buses, although the development towards the use of electric buses could be an excellent solution to support environmentally friendly mobility in the city. With the positive experience that has been had with electric school buses, the integration of an electric fleet in Trans Mamminasata could be a strategic step to reduce emissions and create a more sustainable transportation system in Makassar.

Concrete steps are needed to actualize the government's role in providing solutions to current challenges, especially in the context of developing environmentally friendly and sustainable public transportation. The government is not only required to formulate policies that are adaptive to urban and environmental dynamics, but must also be able to implement them effectively through real and measurable programs. In dealing with problems such as congestion, inequality in access to transportation, and air pollution, the government must be present as the main actor that encourages cross-sector collaboration, strengthens infrastructure, and facilitates technological innovation such as the use of electric vehicles. In addition, community involvement needs to be increased so that the policies implemented are not top-down, but are able to reflect the real needs of transportation users. Thus, the role of the government is not only administrative, but also transformative in creating an inclusive and environmentally friendly transportation system.

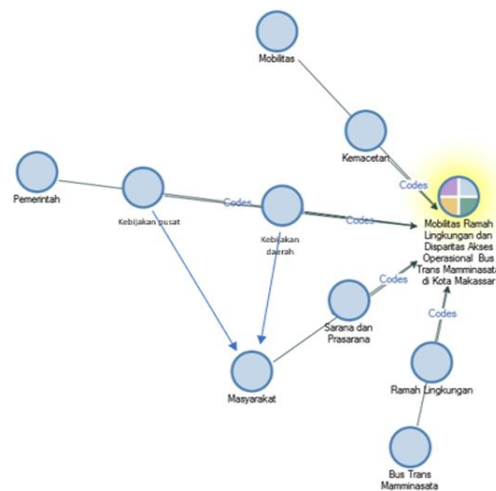


Figure 5. Conceptual Map of the Relationship of Solutions to the Implementation of the Mamminasata Trans Bus, data processed through the NVIVO 12 Plus application.

Figure 5 is a concept map that illustrates the relationship between various elements that influence the issue of Environmentally Friendly Mobility and Disparity in Operational Access of Trans Mamminasata Buses in Makassar City. This concept places the main topic at the center, surrounded by several important factors such as policies, mobility, congestion, facilities and infrastructure, community roles, and environmentally friendly aspects. Each element is interrelated, for example the role of government is reflected in policies that can affect the effectiveness of the transportation system, including in reducing congestion and increasing mobility. Meanwhile, adequate facilities and infrastructure and active community participation are prerequisites for supporting the successful operation of Trans Mamminasata buses as efficient and low-emission public transportation.

From the structure of this concept map, providing reinforcement to the government's role through sustainable transportation policies should be a top priority. The policy should be directed at providing infrastructure that supports an environmentally friendly bus fleet, traffic management that can overcome congestion, and improving services so that public access is more equitable. In addition, public awareness of the importance of public transportation must be increased in order to create a culture of switching from private vehicles to public transportation. With synergy between the right policies, adequate facilities, and community participation, the operational challenges of the Trans Mamminasata Bus can be overcome gradually, so that an inclusive, efficient, and environmentally friendly urban mobility system is created in Makassar City.

Sustainable mobility emphasizes the important role of environmentally friendly technologies in creating a sustainable, efficient, and low-impact transportation system. Electric vehicles (EVs) are considered a strategic solution to reduce greenhouse gas emissions and

dependence on fossil fuels, which have been the main contributors to air pollution and climate change in urban areas. Within the framework of sustainable mobility, the integration of electric vehicles into public and private transportation systems not only offers energy efficiency, but also requires infrastructure support such as adequate charging stations, government incentive policies, and changes in community behavior. However, the adoption of electric vehicles also faces a number of challenges, including relatively high initial costs, limited battery range, and issues with recycling battery waste. Therefore, the implementation of electric vehicles as part of a sustainable mobility strategy requires a multi-sectoral approach that includes technical, social, economic, and regulatory aspects so that the transition to low-carbon transportation can take place effectively and inclusively.

CONCLUSSION

Although the existence of the Trans Mamminasata Bus in Makassar City has been designed as a strategic solution to reduce congestion and encourage environmentally friendly mobility, its implementation has not shown optimal results. This is due to various obstacles, including the low level of public awareness in utilizing public transportation, lack of route integration, limited supporting infrastructure, and weak policies restricting the use of private vehicles. The community's dependence on private vehicles, especially motorbikes, is still a major challenge in efforts to transition to a sustainable mobility system. Therefore, an active role is needed from the government through the formulation and implementation of firm policies, continuous public education, and the development of a modern, inclusive, and clean energy-based transportation system in order to realize an efficient, healthy, and future-oriented Makassar City.

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