Analysis on the Diffusion Mechanism of Electrification of the Transjakarta Bus Policy in Jakarta

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Abstract
This research aims to analyze the roles of international actors, state actors, and non-state/private actors in the diffusion of electric bus policies within the context of public-private collaboration. The selected case is the electrification of the Transjakarta Bus units. The urgent need to address climate change is driving the transition towards environmentally friendly transportation systems, particularly in urban centers like Jakarta. One significant source of air pollution stems from vehicles that rely on fossil fuels. To tackle this challenge, the DKI Jakarta Provincial Government has mandated Transjakarta, the city's bus rapid transit system, to lead the shift towards battery-powered electric vehicles as part of its public transportation fleet, in accordance with Governor's Decree Number 1053 of 2022. Using a qualitative descriptive case study approach, supported by interviews and literature review, the study applies the framework of international diffusion mechanisms to understand how these actors contribute to the electrification of Transjakarta. The findings suggest that international, national, and private actors play different roles in promoting and facilitating the policy diffusion process of electrification policy, each contributing through a combination of expertise, funding, and technological innovation. This collaboration is seen as essential for achieving sustainable development goals in Jakarta's public transportation sector.

Keywords: policy diffusion mechanism, electric bus, Transjakarta, sustainable development

1. **Introduction**

The Sustainable Development Goals (SDGs) were globally agreed upon on September 25, 2015 by the member states of the United Nations (UN) [1]. The SDGs consist of 17 goals and 169 targets focusing on sustainable social, economic and environmental development until 2030, replacing the *Millennium Development Goals* (MDGs) [2]. Indonesia officially adopted the SDGs through Presidential Regulation (Perpres) No. 59/2017 on the Implementation of Achieving the Sustainable Development Goals [3], which was later updated with Presidential Regulation No. 111 of 2022 on the Implementation of Achieving Sustainable Goals [4], which regulates the implementation of the SDGs at the national level by involving the government, private sector, academia, and civil society. The SDGs are also integrated in the 2020-2024 National Medium-Term Development Plan (RPJMN) to ensure alignment between national development and the global agenda [5].

In recent decades, sustainability and climate change mitigation have become global priorities, aligning with SDG targets, particularly in rapidly urbanizing cities like Jakarta. Large cities face significant challenges in reducing transportation-related greenhouse gas emissions, and bus electrification has emerged as a key solution. By reducing fossil fuel dependency and improving air quality, Jakarta's Transjakarta bus electrification policy exemplifies the city’s commitment to environmentally friendly innovations. This research examines the policy’s diffusion, focusing on the roles of international, state, and non-state actors in its implementation and spread.

Since adopting the SDGs, Indonesia has made strides in several areas. For SDG 1, the Family Hope Program (PKH) and Direct Cash Assistance (BLT) have been pivotal in poverty reduction, though the COVID-19 pandemic posed setbacks. In SDG 4, government education assistance programs have boosted primary

and secondary school participation. In SDG 7, the government's commitment to renewable energy is evident through various solar and wind projects, despite implementation challenges. Emission reduction efforts continue, but obstacles slow the achievement of sustainability goals [6,7]. Despite progress, Indonesia faces significant challenges in achieving SDGs due to social and economic inequality, especially in eastern regions with limited access to infrastructure, education, and health services. Coordination is hindered by differing regional priorities, and funding, particularly from the private sector, remains an issue. The COVID-19 pandemic further exacerbated unemployment and poverty, slowing the achievement of SDGs [8].

The study of public policy is a complex and multidimensional discipline concerned with the ways in which governments formulate, implement, and evaluate policies to solve society's problems [9–11]. In recent decades, the mapping of research sub-disciplines within public policy studies has become the main focus of researchers. The policy diffusion sub-discipline in public policy studies is a field of study that examines how public policies spread among different policy entities, whether at the local, regional, national, or international levels. This policy diffusion study includes an analysis of the mechanisms, patterns, and factors that influence the process of policy dissemination from one policy entity to another [12].

In the study *Domestic Politics and the Diffusion of International Policy Innovations: How Does Accommodation Happen?* by Sophie Biesenbender and Jale Tosun, it is discussed how international policies are implemented and adapted within national politics. The research explores how policies spread from one country to another and how they are modified to fit domestic contexts. Both international pressures and internal factors, such as political institutions and local interests, are crucial in policy adoption and change. Making existing policies more stringent is often more challenging than adopting new ones. This research highlights the differing patterns in initial policy adoption and subsequent modification [13].

The journal study *Diffusion of Global Climate Policy: National Depoliticization, Local Repoliticization in Turkey* written by Mahir Yazar, Irem Daloglu Cetinkaya, Ece Baykal Fide, Håvard Haarstad, explores how global climate policy is implemented and adjusted at the national and local levels in Turkey. The research found that Turkey's national government uses climate policy diffusion to assert its political agenda by creating temporary climate coalitions and restricting local climate action, while metropolis local governments repeat nationally accepted climate goals, and local governments adapt ambitious climate norms and re-politicize them through local climate figures and citizen action. This research highlights the importance of understanding how climate policy diffusion can produce different political outcomes in achieving global climate goals [14].

The journal *Factors Influencing the Adoption of Zero-Emission Buses: A Review-Based Framework* by Avenali, Catalano, Giagnorio, and Matteucci, explores factors affecting the adoption of zero-emission buses, presenting a comprehensive framework. Technological, economic, and managerial factors inhibit large-scale adoption, while social, environmental, and institutional factors promote it. Advances in technology and management can mitigate some barriers. The framework highlights key factors and identifies areas needing further research [15].

Policy diffusion mechanisms, or the process of how an innovation is adopted and spread to different levels of government and society, are very visible in the context of Transjakarta bus electrification. One model of policy diffusion that is often used is the *policy transfer* model where policies that have been implemented elsewhere are adapted in new places. In Jakarta, the electrification adoption process was

influenced by a combination of global and national initiatives, as well as local demands related to air quality and congestion issues. In this case, the initiative to adopt electric buses in Jakarta is influenced by international policies related to climate change, such as the 2015 Paris Agreement, *Conference of the Parties 26th* (COP 26) which gives influence to developing countries to reduce carbon emissions [16].

The influence of the policy diffusion subdiscipline on the study of political science is significant as it provides a deeper understanding of how political decisions are made, adopted, and implemented by various policy entities. By understanding the policy diffusion process, political scientists typically analyze how new ideas and policies spread among states, local governments, or other political institutions. The study of policy diffusion also provides insights into the interactions between political actors, government institutions, and external factors that influence the spread of policies [12].

As part of Indonesia, Jakarta is part of a national commitment to reduce greenhouse gas emissions. Electrification of transportation, including Transjakarta buses, is considered one of the key strategies. This transportation system electrification policy has been mandated in the DKI Jakarta Governor Regulation (Pergub) Number 90 of 2021 concerning the Climate Resilient Regional Low Carbon Development Plan [17]. And Governor Decree (Kepgub) Number 1053 of 2022 concerning Guidelines for Accelerating the Program for the Use of Battery-Based Electric Motorized Vehicles in Transjakarta Transport Services [18]. This is also in line with Presidential Regulation Number 55 of 2019 concerning the Acceleration of the Battery *Electric Vehicle* Program for Road Transportation [19].

Studies from other cities around the world that have successfully adopted electric buses, such as Shenzhen in China [20], are also important references in developing this policy. However, the adaptation of this policy in Jakarta is not linear. The city has unique challenges, including financial issues, technological capacity, as well as unprepared infrastructure. To accelerate adoption, the Jakarta government is partnering with various actors, both from the public and private sectors, which are crucial in this process.

There are several main actors who play an important role in the diffusion of Transjakarta electrification policy. First, the local government of DKI Jakarta as the main regulator that has the authority to formulate and implement transportation policies at the local level. The central government, through the Ministry of Transportation and the Ministry of Energy and Mineral Resources, also plays an important role in providing regulations and incentives, such as tax breaks for electric vehicles. In addition to state actors, non-state actors such as the private sector also play a significant role.

In the context of Transjakarta, companies providing electric buses and supporting technology such as charging infrastructure are key. One example of collaboration is between the Jakarta government and BYD, a Chinese automotive company that has experience in producing electric buses. BYD's adoption of technology demonstrates how partnerships with international actors can accelerate the diffusion of new technologies in Jakarta. Local companies are also starting to get on board, such as PT Mobil Anak Bangsa which produces electric buses domestically [21].

As a comparative example, the Chinese city of Shenzhen successfully converted its entire city bus fleet to electric buses within a decade, and this process is often referenced in policy development in other cities, including Jakarta. The study of Shenzhen shows that full government support, heavy investment in charging infrastructure, and strategic partnerships with the private sector were key success factors. The Shenzhen government heavily subsidizes and reduces regulatory barriers for electric bus companies [22].

To better understand the government's strategies for sustainable policies, this research focuses on the electrification of Transjakarta buses, aiming to reduce emissions and enhance energy efficiency in public transport, so this research aims to answer the following questions:

- What are the diffusion dynamics of SDGs norms in Indonesia when viewed from the electrification of Transjakarta buses?

2. Method

The research method is a series of steps or processes used to obtain scientific knowledge. It is a structured and systematic way designed to structure science. Research techniques, on the other hand, are the practical steps in the application of these research methods [23]. In the context of academic research, research methods are often used to test hypotheses or theories being studied. The research strategy in this method describes the approach to be taken, including the selection of appropriate methods during the research process [24]. In this research method study, researchers used a qualitative method with a descriptive approach.

Qualitative research methods with a descriptive approach will describe how collaboration between state actors, international actors, and non-state actors plays a role in encouraging the diffusion mechanism of public transportation electrification policies in Jakarta, especially in the context of Transjakarta buses. John W. Cresswell explains that qualitative research methods are used to explore and understand the meaning of phenomena in the context of a particular environment involving individuals or groups [25]. This approach is suitable to answer the topic of this research, which discusses the dynamics of actor collaboration in the diffusion of the Transjakarta bus electrification policy as part of the implementation of SDGs in Indonesia. The qualitative method provides space for researchers to deeply understand the problems and relevance in collecting data that is suitable for this research. This type of research includes case studies that allow researchers to examine certain events, situations, or conditions to provide insight into how and why these events or conditions occur.

Case study research is also often considered a flexible and frequently used methodology in the social sciences [26]. The data collection technique in this study uses secondary data. According to Amirin, secondary data is a data collection technique that does not come directly from the main source of research [27]. This research aims to understand the dynamics of collaboration between state and non-state actors in the Transjakarta bus electrification policy. The literature used to support this research includes journals, books, theses, and various other publication media that assist in the research process.

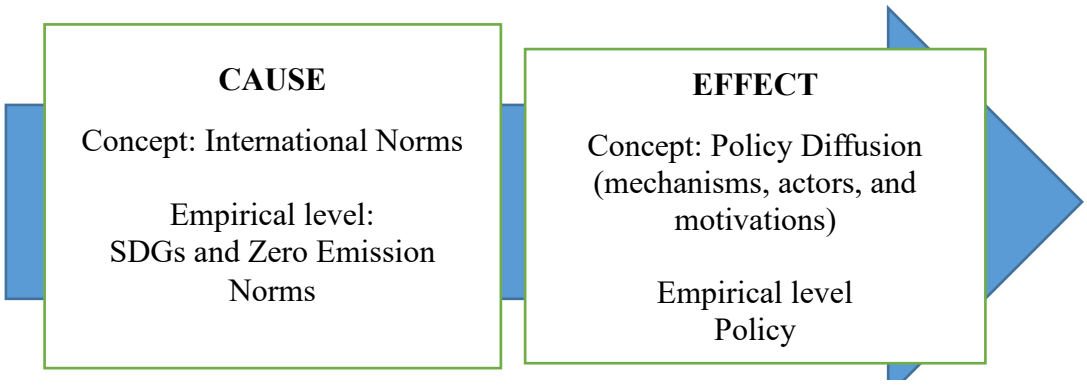

Chart 1 Conceptual Diagram

International norms are a set of rules, both written and unwritten, that the global community recognizes and abides by. These rules aim to shape the behavior of international actors in a variety of areas, including human rights, trade, environment, security and climate change. These norms can be formal, enshrined in international treaties or conventions, or informal, born out of mutual agreement and understanding between states [28].

International (Interstate) policy diffusion at the international level involves the spread of policies, norms, or innovations from one country or international entity to another. This process usually occurs through multilateral interactions, cooperation between countries, international treaties, or the influence of international organizations such as the UN, IMF, or World Bank. One example of its application is the spread of human rights standards through the Universal Declaration of Human Rights, which was later adopted by various countries [29]. Intra-National (Within Countries) Policy diffusion can also occur within a country, where policies implemented at the national level spread to the local level (province, city, or community). This can be through decentralization, where central policies are implemented or adapted by local governments or by the private sector [30].

Key theoretical concepts in policy diffusion studies that have been researched from experts [31-36] highlight various mechanisms that facilitate policy diffusion among countries. The first mechanism is learning, where policymakers observe and consider the consequences of policies implemented in other countries. This process allows them to learn from other countries' experiences in dealing with similar challenges and adapt their policies more effectively. Furthermore, the competition mechanism refers to policymakers' response to successful policies from other countries, by trying to attract similar resources and investments to their own country.

On the other hand, the emulation mechanism highlights the importance of the social legitimacy of a policy in increasing the likelihood of adoption by other countries. When a policy is deemed successful and enjoys widespread support from the public and stakeholders, other countries are likely to adopt similar policies in response to public pressure and expectations. Finally, coercive mechanisms emphasize top-down influence, where countries may respond to pressures or requirements set by international organizations or other international institutions. This can include legal requirements or international standards that force countries to adopt or adjust their policies in accordance with agreed international norms.

The relationship between cause and effect variables from the conceptual diagram above is that, in the context of globalization and rapid environmental change, international norms play an important role in shaping the direction of national and local policies. These norms can be rules written in international treaties or global agreements, or they can be understandings that grow out of shared practices and values. In the field of environment and sustainable development, one of the most influential international norms is the SDGs and the commitment to *Zero Emission*. These norms are designed to guide countries in their efforts to reduce the impacts of climate change and maintain environmental sustainability. At an empirical level, such international norms provide a framework for governments in different countries to formulate policies that are aligned with global goals.

Indonesia, including the DKI Jakarta Provincial Government, is actively implementing norms to reduce transportation sector carbon emissions, with a focus on electrifying public transport. As the capital and economic hub, Jakarta prioritizes reducing emissions through Transjakarta bus electrification. This

aligns with SDGs and Zero Emission principles, addressing local challenges like air pollution and congestion while meeting international commitments.

3. Results and Discussion

3.1. Dynamics of SDGs Norm Diffusion through Transjakarta Bus Electrification Policy

In an interview with Mr. Hendra as Staff of the Road Transport Division of the DKI Jakarta Provincial Transportation Agency, the diffusion of the Transjakarta bus electrification policy cannot be separated from the dynamics of the SDGs norm in Indonesia. This policy emerged in the midst of international urgency related to climate change mitigation emphasized at COP 26, as well as domestic pressure due to the air pollution crisis which made Jakarta the city with the highest pollution level in the world [37]. In this context, collaboration between international, national, and local actors is crucial in driving the transition to environmentally friendly public transportation.

The central government and DKI Jakarta Province facilitate this policy by issuing a number of regulations that support the transition to clean energy, such as Presidential Regulation Number 55 of 2019 concerning the Acceleration of the Battery-Based Electric Motor Vehicle Program [19], and Pergub Number 90 of 2021 concerning the Regional Low Carbon Development Plan [17]. The follow-up can be seen in Gubernatorial Decree Number 1053 of 2022 [18], which was later updated with Kepgub Number 576 of 2023 [38].

These regulations not only serve as a legal framework, but also provide a strong signal for various parties to participate in the transition process. For example, the automotive industry has responded positively by increasing production of electric buses and building supporting infrastructure [39]. This collaboration between various actors shows that the norms in the SDGs related to clean energy and sustainable cities have been integrated into public policies and practices at the local level.

The implementation of the Transjakarta bus electrification policy has a significant potential impact on the achievement of SDGs in various aspects. In addition to playing a role in climate change mitigation, this policy can also improve air quality, and encourage more environmentally friendly economic growth. In addition, electrification of public transportation can increase public access to safe, comfortable, and affordable transportation services [40].

3.2. The Role of Actors in Policy Diffusion

3.2.1. *International and Transnational Actors*

International actors such as the UN play a role in promoting global norms related to sustainability and renewable energy through the SDGs. In addition, transnational actors such as the C40 Cities Climate Leadership Group (C40), GIZ (*Gesellschaft für Internationale Zusammenarbeit*), ITDP (*Institute for Transportation and Development Policy*), ICCT (*International Council on Clean Transportation*), and the World Bank provided technical support in the form of research that enabled Jakarta to adopt transportation electrification policies [41,42]

3.2.2. *National and Local Actors*

The central government through Presidential Regulation No. 55/2019 is the main motor in accelerating the adoption of electric vehicles. Meanwhile, at the local level, the Provincial Government of DKI Jakarta, through the Department of Transportation and BUMDs such as PT Transjakarta, plays the role of policy executor. Other local actors

including Asperkue and bus operators also play an important role in technical implementation on the ground.

3.3. Diffusion Mechanism: Coercion and Learning

3.3.1. *Coercion*

The internationalization of climate change issues, especially through COP 26, creates pressure for developing countries, including Indonesia, to immediately adopt energy transition policies. This pressure can be seen in Indonesia's commitment to net-zero emissions by 2050, which encourages the implementation of transportation electrification policies in Jakarta.

In addition, Indonesia's ratification of the *Paris Agreement* and commitment to the *United Nations Framework Convention on Climate Change* (UNFCCC) further emphasizes the need for collective efforts in addressing climate change issues. By ratifying the agreement, Indonesia affirms its intention to contribute to global efforts to mitigate climate change and encourage the implementation of policies that are in accordance with international norms.

In this context, coercion diffusion mechanisms play an important role, where the adoption of innovations, such as the use of electric buses, is not solely driven by individual or group initiatives, but rather by external pressures that force change. In Jakarta, this is reflected through Presidential Regulation No. 55/2019 on the Acceleration of the Battery-Based Electric Motor Vehicle Program [18] and Pergub No. 90/2021 on the Regional Low Carbon Development Plan [16], which provide a strong legal foundation in encouraging industries to switch to environmentally friendly technologies.

Both regulations set ambitious targets, provide a structured framework, and incentivize industry players. Pressure from the international community, especially related to Indonesia's commitment to achieve carbon neutrality, has further strengthened the government's steps in reducing greenhouse gas emissions, especially in the transportation sector.

PT Transjakarta, as the largest public transportation operator in Jakarta, plays a strategic role in this effort by replacing its conventional bus fleet with electric buses. This policy was supported by Kepgub Number 1053 of 2022 [17], and later renewed by Kepgub Number 576 of 2023 [28], which reinforced PT Transjakarta's commitment in leading the electrification process of public transportation in Jakarta.

3.3.2. *Learning*

The DKI Jakarta government has learned a lot from the experiences of other cities that have successfully implemented similar policies, such as Shenzhen in China. Focus group discussions conducted between the local government and various stakeholders, both from international and local actors, are a means to understand the challenges and opportunities in implementing this electrification policy [41].

The discussion serves as a means to share experiences and best practices, as well as explore challenges and opportunities that may occur during electrification implementation. In addition, the electrification policy in Jakarta is further strengthened

by the existence of regional regulations such as Kepgub Number 1053 of 2022 [17], which was later refined through Kepgub Number 576 of 2023 [28].

This indicates that the policy continues to evolve based on learning from international practices. This policy diffusion mechanism is not only *top-down*, but also involves cross-level dialog and collaboration, thus encouraging policy implementation based on learning from outside experiences and adaptation to developments in the field.

3.4. New Findings: Three Levels of Implementation Process

3.4.1. Level of DKI Jakarta Provincial Government and DKI Jakarta Provincial Transportation Agency

At this level, policies and regulations are made, and macro planning related to electrification is carried out. The DKI Jakarta Transportation Agency plays a role in developing the regulatory framework and coordination with PT Transjakarta as the main operator.

3.4.2. Level of DKI Jakarta Provincial Transportation Agency with PT Transjakarta

This level involves technical planning, such as procuring a fleet of electric buses and developing charging infrastructure. PT Transjakarta as a regionally-owned enterprise works closely with the Transportation Agency to ensure smooth implementation in the field.

3.4.3. Level of PT Transjakarta with Bus Operator

PT Transjakarta is working with bus operators to ensure the operationalization of electric buses on the streets of Jakarta. The bus operators are responsible for fleet management and maintaining the sustainability of electric transportation services.

3.5. Implications for the Diffusion of SDG Norms

The Transjakarta bus electrification policy reflects the integration of SDGs norms in local public policy. Through international coercion and learning processes, this policy demonstrates the importance of collaboration across actors and levels of government in achieving SDG targets, particularly in the areas of clean energy and sustainable transportation. This innovation and collaboration not only helps reduce greenhouse gas emissions in Jakarta but also sets an example for other cities in Indonesia that want to transition to green transportation.

4. Conclusion

This research shows that the Transjakarta bus electrification policy is a crucial step in reducing emissions and increasing energy efficiency in the public transportation sector. This policy also illustrates the dynamics of *SDGs* norm diffusion in Indonesia. The results of the analysis show that cooperation between various actors - at the international, national and local levels - plays an important role in encouraging the transition to a more sustainable public transportation system. The regulations issued by the central government and DKI Jakarta Province provide a solid legal framework and convey a positive signal for the automotive industry to participate in this policy.

Currently, the number of electric buses already operating in the corridor is 100 buses [43]. The plan is to add 200 electric buses by the end of 2024, totaling 300 buses. The implications of these findings indicate that electrification policies not only contribute to climate change mitigation, but also have the potential to improve air quality and sustainable economic growth, as well as expand public access to safe

and affordable transportation services. However, this study also recognizes limitations, particularly related to the timing and scope of the analysis, which may not cover all aspects of policy implementation.

Therefore, further research is needed to explore the long-term impact of this policy and assess the effectiveness of its implementation in other parts of Indonesia. Future research is also recommended to consider social and economic factors that may affect the success of electrification policies, as well as analyze other cities' experiences in implementing green transportation systems. This will provide a more comprehensive understanding of the diffusion of SDGs norms and their impact on public policy in Indonesia.

5. Conflict of Interest

This research is in line with the principles of *good governance*, where integrity, transparency and accountability are key in producing quality public policies. Through the implementation of proactive conflict of interest mitigation measures, this research contributes to efforts to realize good governance in the environment and transportation sectors.

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