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Address: IIASA, Schlossplatz 1, A-2361 Laxenburg, Austria
Email: repository@iiasa.ac.at **Telephone:** +43 (0)2236 807 342

YSSP Report
Young Scientists Summer Program

Developing urban public transport niches toward low carbon mobility transitions: an analysis of policy instrument mixes in Indonesia (2004 – 2020)

Ramanditya Wimbardana Wimbadi

ramanditya@student.unu.edu / ramanditya.wimbardana@rdi.or.id

Approved by

Supervisor: Dr. Paul Kishimoto

Program: ENE-TNT

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Abstract

Urban public transport has potential roles in integrating approaches, from technology advancement to behavior shift, to decouple CO_2 emission from mobility. Cities in the developed world have adopted various policy instruments to develop public transport niches, but knowledge is still limited to explain how fast-growing cities in developing countries take a similar step. We aim to analyze the ways a mix of policy instruments in Indonesia are designed to facilitate urban public transport niche development for the transitions. We combine the framework of shielding, nurturing, and empowerment (S/N/E) for niche development with the policy mix concept to examine 62 regulations from the national to the city level in which Jakarta is selected as a case study. We discover that existing regulations are not deliberately set up as an integrated package to help the niche development amidst ample enabling instruments for the transitions. The promotion of the Electric Vehicle Program (EVP) is not yet fully aligned with other public transport measures in Jakarta to target emission reduction or energy conservation. Our results reflect a need to make the transitions relevant for policymakers at the sub-national level that can be done through sustained collective policy learning during the niche development.

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About the authors

Ramanditya Wimbardana Wimbadi is a doctoral candidate in Sustainability Science from the United Nations University Institute for the Advanced Study of Sustainability (UNU-IAS), Tokyo, Japan. He is also a researcher and co-founder of Resilience Development Initiative (RDI), a think-tank based in Bandung, Indonesia, where he researches climate change adaptation and disaster risk management. In 2015 – 2017, he received the Fulbright Scholarship to support his postgraduate program in urban planning at the University at Buffalo, the State University of New York (SUNY), the USA. He has previously worked for several consultancy projects in climate change adaptation and sustainable development issues with local governments and non-governmental organizations in Indonesia. He is currently developing his research interest in low carbon transition, sustainable transport, and urban governance. (Contact: ramanditya@student.unu.edu or ramanditya.wimbardana@rdi.or.id)

1. Introduction

Like other energy sectors, the transport sector needs to embrace decarbonization to limit the increase of global average temperature to well below 2°C and 1.5°C above the pre-industrial level as mandated in the Paris Agreement. It is currently locked in carbon-intensive pathways because of limited alternative fuels and existing policies that tend to maintain practices to increase CO_2 emissions from mobility (e.g., low-density development and highway expansion). Scholars suggest that a set of policies needs to support the sector's rapid and deep decarbonization, particularly to reducing the energy intensity of transport modes and increasing the modal share of mass transport by 2030 (Gota, Huizenga, and Peet 2016, Rogelj et al. 2018). OECD/ITF (2018) urges that it shall stimulate technological innovations to cut CO_2 emissions significantly, but it also needs to shift people's mobility to public transport. Therefore, one crucial role of policy is to spur innovation to yield integrated decarbonization options to augment those currently exist.

Cities must be at the center of stakeholders' attention in this pursuit. OECD/ITF (2018) estimates that urbanization trends will continue to increase the fuel-burn emissions of CO_2 from significantly the mobility of people and goods. Cities in the developed world have shown progress to move toward low carbon mobility transitions. In Europe, many cities have enforced policy instruments to foster energy-efficient modes of transport, to advance public transport systems, and to limit motorized mobility (i.e., zoning regulations), such as in the Netherlands (Bakker and Konings 2018), Poland (Pietrzak and Pietrzak 2020), and Norway (Haarstad 2016). Also, the European Union (EU) has a policy transfer to diffuse best practices across different cities in the region through collaborative research and initiatives (European Comission 2017). In Canada, the federal government and several municipal governments have performed various policy measures to promote sustainable transport since it ratified the Kyoto Protocol (MacIsaac 2009).

However, only a few studies could explain whether and how low- and middle-income countries take similar transition processes. As their economic activities grow significantly, their cities are urbanizing rapidly with rapid population growth and physical built environment expansion. The trends could increase transport demand, particularly from passenger transport, leading to increased traffic congestion and CO_2 emissions (OECD/ITF 2018). Previously, some researchers have captured how cities in China take steps for low carbon mobility, such as Shenzhen that enforces the Emission Trading Scheme (ETS) for public transport (Jiang et al. 2016), and Hong Kong that started using electric buses (Tong 2019). Nonetheless, these studies focus only on a specific policy instrument. Bakker et al. (2017) review different policy instruments for low carbon transport in four Southeast Asia countries. Nevertheless, they did not describe the potential interaction of existing policy instruments between the national and the local levels to facilitate innovative measure development.

A transition needs to embrace the emergence of such innovations. According to the sustainability transition theory, innovations emerge from niches or 'protected spaces' where experimental activities develop alternative or new sustainable practices (Kivimaa and Kern 2016, Geels 2018). Policy measures can stimulate niche actors to experience learning, networking, and visioning processes in developing niches (Raven et al. 2016). The instrument design shall enable niches to stimulate technology improvement, infrastructure investment, or personal mobility behavior changes. On the other hand, transport scholars call for integrating cross-sectoral policies from national to local levels to decouple emissions from urban mobility (Givoni and Banister 2013, Lah 2017). Although local-level interventions are usually effective in shaping mobility, some policies from other governance levels can also influence it, such as energy and climate policies (Gota, Huizenga, and Peet 2016, Lah 2017). Therefore, it is essential to ensure synergy among policy instruments across sectors and governance levels to develop niches for low carbon mobility. In recent years, researchers have called for using the concept of policy mixes to analyze a bundle of policies designed to support technological innovations for sustainability transitions (Huang 2019, Kivimaa and Virkamäki 2014, Rogge, Pfluger, and Geels

2020). However, there is still limited literature to combine both niche development and policy mix concepts.

In this research, we aim to analyze the extent of Indonesia's policy mixes arranged to develop urban public transport niches for low carbon mobility transitions. Indonesia has been experiencing the fastest urbanization rate among Eastern Asian countries after China since the 1970s (World Bank 2012). Continuing urbanization has raised the number of middle-class households living in these cities, especially in large metropolitan and medium-size cities in Java and Bali island (World Bank 2018). A significant increasing trend of vehicle ownership has become apparent due to household income growth and easy credit process for purchasing vehicles (Soehodho 2017). Meanwhile, large and middle-cities still have inadequate public transport access and service. Subsequently, the trends can increase transport demand and traffic congestion in these cities and energy consumption and CO_2 emissions production from mobility significantly (Climate Action Tracker 2019). The transport sector CO_2 emissions in the country have increased steadily compared to other energy sectors since two decades ago due to rapid motorization (Kaneko 2016). Therefore, we focus on niche development in urban areas, particularly for public transport, because it is in-line with the urgent need for energy efficiency in modes of transport and shift to mass transport to achieve the 2°C and 1.5°C targets. It could also allow city stakeholders to realize access inclusion and other non-climate or environmental benefits of improved public transport service.

The structure of this paper is as follows. Following the introduction, we set the second section as literature reviews on low carbon mobility and policy mixes in the sustainability transition theory. We explain the methods applied to conduct this research in the third section. The fourth section presents the policy instruments, their inter-relationship related to low carbon mobility objectives, and the policy design features for developing the niches. In the fifth, we discuss the research significance, policy gaps, and potential future research opportunities.

2. Theoretical Review

2.1. Low Carbon Mobility Transition and Niche Development

Low carbon mobility is often associated with transport technology measures to minimize CO_2 emissions, such as energy-efficient vehicles or less carbon-intensive fuel (e.g., electricity and bioenergy). Academics and policymakers who advocate sustainable transport consider such approaches as the *Improve* measure (Bongardt et al. 2013). The progress of technology uptake may vary among countries, depending on their research and development (R&D) program, technology transfer, tax incentives, and public procurement regulations (Nakamura and Hayashi 2013, Lah 2015). Nevertheless, mobility is also a socio-spatial experience, so social norms or constraints determine the means of people and goods movement (i.e., modal choices). Thus, the *Avoid* measures intervene in the demand side of transport by limiting motorized mobility, for example, promoting compact and high-density land development to reduce the total travel demand. The *Shift* measures focus on boosting the ridership of low emissions transport modes by improving the convenience of using public transport (e.g., feeder transport and pedestrian facilities) and limiting private automobility (e.g., road pricing). New mixed-use development around transit service could encourage people to walk for short trips and shift to public transport. Additionally, Givoni and Banister (2013) argue that the production, distribution, and consumption of goods and services need to be optimized at the regional scale to limit their mobility to decouple GHG emissions from economic growth.

Hence, pursuing low carbon mobility entails changes in a system that could shape societal functions to push CO_2 emissions production as low as possible. Such transitions involve a co-evolution process to change socio-technical systems toward sustainability pathways (Givoni and Banister 2013). It entails cognitive development activities and interaction among multiple actors to envision desired sustainable objectives (Geels 2018). The Multi-Level Perspective (MLP) framework describes the

interactions of coordinated elements, including technology (artifacts), knowledge, user practices and markets, regulation, cultural meaning, infrastructure, and network. The transition process into three analytical levels, *regime, landscape,* and *niches.* Socio-technical regimes consist of formal, normative, and cognitive rules shared among social groups to steer established practices (Geels 2018). The interaction of the rules is semi-coherent due to the co-evolving interaction overtime. A set of exogenous trends at the landscape level could pressure the regime actors and destabilize their current practices. However, they have limited capability to control the pressures directly due to the scale of magnitude and impacts, such as rapid shocks (e.g., oil prices) or socio-economic trends (e.g., aging population and globalization) (Schwanen 2013). These interactions might provide a window of opportunities for a transition as the regime cope with the pressures.

Niches consist of small networks of actors conduct experimental activities to develop path-breaking technology, measures, or practices before entering markets or existing stable systems (Geels 2018). The spaces could include R&D project, demonstration program, pilot project, or other experimental-type projects (Smith and Raven 2012, Geels and Schot 2007). Inside the niches, there are internal processes to adopt novelties, including learning, networking, and visioning toward sustainable pathways (Schot and Geels 2008). As new practices, niche innovations at the early stage are often unstable and lacking the capacity to compete with established technologies or practices. Hence, the more niche innovations are connected, the more likely they pressure the regime actors to open up window opportunities for novelties (Geels et al. 2017).

Aside from the momentum created internally by niche actors, novel innovations could replace the existing one when there are intentional efforts to destabilize the regime (Schot and Geels 2008, Kivimaa and Kern 2016). Schot and Geels (2008) propose a framework to help niche development externally: shielding, nurturing, and empowerment (S/N/E). *First,* shielding niches defers pressures from selection environments embodied in the regime structure that hinder niche development (e.g., dominant user practices, existing technologies, and political power). Shielding niches can be "active" when it forms a supportive environment deliberately for experimentation by mobilizing resources (e.g., subsidies and tax exemption) and changing user preferences (e.g., market segmentation and public purchasing). Passive shielding advocates similar mobilization for those already in pre-existing spaces that require support due to underperforming and costly innovations (e.g., remote locations). *Second,* nurturing niches allows shielded innovations in niches to flourish in technological and economic performance by sharing expectations, learning, and building actor networks. *Third,* empowering niches ensures the adopted innovations fit and conform to a regime by increasing their competitiveness. Empowerment is also to stretch and transform structure in a regime to facilitate potential changes induced by innovations. Thus, the innovations become institutionalized and embedded in the current practices. In other words, empowerment enables the innovations to sustain or scale up their operation once shielding measures are loosened. Policies could play crucial roles in inducing the external process niche development by providing those functions, such as offshore wind development in the Netherlands (Verhees et al. 2015) and an energy transition with smart grids in Ontario, Canada (Winfield and Weiler 2018). Nevertheless, there is still limited knowledge of how policies are arranged for low carbon mobility transitions.

2.2. Policy Mixes for Low Carbon Mobility Transition

The policy mix concept can help analyze the interaction, formulation, and characteristics of policies to facilitate transitions. Rogge and Reichardt (2016) define it with three building blocks. First*, policy elements* consist of (a) policy strategy with its objectives and principal plans, and (b) a mix of instruments that their interaction is designed to contribute to the objectives. Second, *policy process* refers to the policymaking cycle (i.e., problem identifications and policy evaluation) in which concerned social actors, along with the political process, determine the elements of the policy mixes.

Third, policy mix c*haracteristics*[1] reflect the extent of policies arranged to affect the desired goal achievement. They also suggest considering dimensions in the analysis, including policy field, governance level, geographic level, and time when analyzing these building blocks.

Analyzing the whole extended concept could help to avoid a fragmented understanding of policy gaps and challenges. However, in this paper, we focus on the elements and their coherence to understand policy instrument mixes' current status and synergy. A policy instrument refers to an authorities' concrete set of tools or measures to intervene in specific public problems and steer society's behavior toward the desired state (Henstra 2016, Rogge and Reichardt 2016). It has overarching long-term *objectives* with measurable targets or often abstract visions. The formulation considers existing *principal plans* that frame policy design and guide the implementation, such as framework convention, strategic plans, or roadmaps (Rogge and Reichardt 2016).

Each instrument has three kinds of attributes: *goals, types,* and *design features.* Rogge and Reichardt (2016) define instrument goals as specific intended effects or outcomes that contribute to overarching objectives. There are different ways to categorize instruments, based on their functions (e.g., economic and regulatory instruments) or expected immediate outputs after the adoption (e.g., demand-pull and technology-push instruments) (Rogge and Reichardt 2016, Borrás and Edquist 2013). A policy instrument consists of design features that include legal forms, target actors, implementation timeframe, and activity scope. It also contains abstract features describing instrument stringency, level of support, and specificity of the measures (e.g., technology requirements and geographical locations).

Since each instrument could have different objectives, achieving the overarching objectives is then determined by the interaction of policy instruments. Stakeholders might use different existing instruments to fulfill their sectoral targets and, thereby, coherence between instruments is crucial to pursue shared common objectives. Policy coherence reflects the interconnection of their attributes to create synergies and minimize trade-off and conflict to pursue an agreed objective (OECD 2019, Rogge and Reichardt 2016, Ohlhorst 2015). It also helps better resource efficiency (e.g., joint budget allocation). Rogge and Reichardt (2016) stress that the synergy can be addressed deliberately and explicitly in the policymaking and implementation process. Similarly, OECD (2019) promotes policy coherence in the processes through institutional approaches, such as shared long-term visions, stakeholders participation, leadership, and commitment.

Policy integration is a tool to improve policy coherence through synergetic and systematic coordination across different policy fields and governance levels toward particular policy objective(s) (Rogge and Reichardt 2016). It has been suggested for the context of low carbon mobility to provide opportunities for potential co-benefits and synergies among stakeholders (Lah 2017, Bakker et al. 2014). Therefore, it is essential to examine the existing policy instrument coherence to provide a basis to integrate policies that could redirect the current pathways and foster the emergence of novel measures at the same time. To our knowledge, there is still a lack of adequate understanding of policy instruments' interactions across sector and governance levels for low carbon mobility.

2.3. Analytical Framework

Bringing those key concepts together, we propose a framework to guide our analysis (Figure 1). We recognize that policy is among the elements that shape a socio-technical system for low carbon mobility transitions. Once a pathway is set or planned, there should be a mix of policies deliberately

[1] Policy mix characteristics is used for ex-ante assessment criteria instead of ex-post assessment criteria applied to evaluate the performance of policy mixes at the implementation stage. There are four type of characteristics, including coherence, consistency, credibility, and comprehensiveness.

designed to develop niches. Nevertheless, each instrument may have different overarching objectives that can hinder the transitions. In this research, our analysis focuses on the coherence of policy instruments to reflect the extent to which policymakers have put their efforts to build synergy in the policymaking outputs. Furthermore, once they are coherent, policymakers must ensure that the instruments' design features have functions to facilitate niche development through shielding, nurturing, and/or empowerment. Based on the background of this study and the literature review, we formulate a hypothesis:

Hypothesis: Indonesia's existing mix of policy instruments across multiple sectors are already designed coherently to facilitate the niche development of urban public transport for low-carbon mobility transitions.

We apply the framework to address the hypothesis, and we specify the research aim into three objectives: 1) to identify policy mix instruments to promote the role of public transport for low carbon mobility transitions; 2) to analyze to what extent those policy mix instruments are coherent to facilitate niche development; 3) to identify how the design of those instruments develop the niches. Where our analysis identifies gaps, the analysis can then suggest which policy elements need to be revisited, coordinated, or integrated at the operational level. We focus on Jakarta as an empirical illustration of the urban context; the geographical context is further explained below.

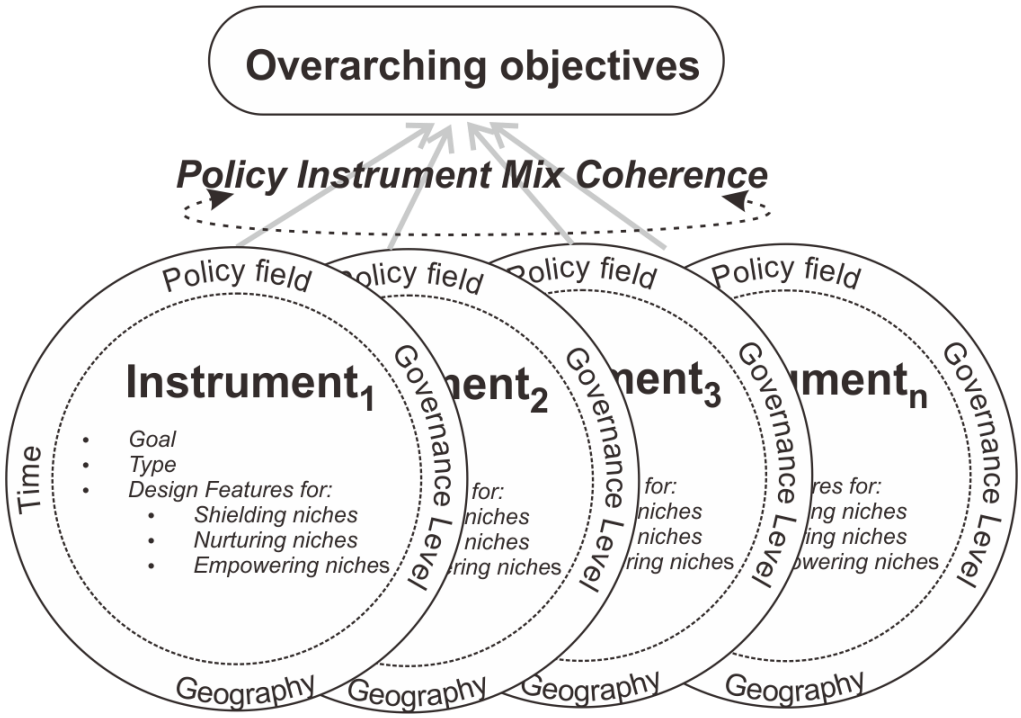


Figure 1 The Analysis Framework (adapted from Rogge and Reichardt (2016) and Smith and Raven (2012))

3. Methodology and Study Area

3.1. Data Collection

We collected formal regulations across different levels that shape policy instruments imposed by authorities in Indonesia. Those are based on the country's law on legislation hierarchy, as follows: Laws (L), Government Regulations (GR), Presidential Regulations (PR), and Local Regulations (LR). Also, we include Ministerial Regulations (MR) and the Governor Regulations (GovR) in the analysis, although both are not considered in the legislation hierarchy law. However, both become the basis for ministries and governors to run their sectoral and local policies, respectively. We also gathered the

regulations enacted by the OJK (*Otoritas Jasa Keuangan* – the Financial Service Authority)[2]. The government also has relevant policy documents that are not passed as regulations, such as the ICCSR (Indonesia Climate Change Sectoral Roadmap), but we do not include such policies in the analysis due to that status.

Accordingly, we set our analysis boundaries. We include regulations from seven relevant policy domains: transport, environment, energy, research and technology, spatial planning, finance, and decentralization. Thus, we include regulations from the Ministry of Transport (T), Ministry of Energy and Mineral Resources (EMR), Ministry of Environment and Forestry (EF), Agrarian and Spatial Planning (ASP), Ministry of National Development Planning (NDP), Ministry of Finance (F), Ministry of Public Works (PW), Ministry of Research and Technology (RT), and Ministry of Home Affairs (HA). The regulation must entail policy elements (i.e., objectives, goals, and design features) related to climate change mitigation, public transport provision, and energy system transformation[3]. Additionally, we collected the existing and previous national and local mid-term development plans[4] because they reflect the elected president's, governors', or mayors' vision and missions. The mid-term plans are also the primary reference for the annual governments' work plans and budgets. In this way, we expect to identify how governments' priorities in addressing GHG emissions evolve overtime. Our scope includes road transport and rail-based transport for transport modes, but we omit water transport and air transport regulations. In temporal scope, we collect regulations enacted after the Kyoto Protocol (1997), taking this as the first set of climate change policies that affected the Indonesian policy landscape. We exclude regulations that have been retracted by the authorities. To operationalize our analytical framework on niche development at the urban level, we focus on policies enacted by the Special Capital Region of Jakarta provincial government and the national government because of their leading roles in steering and developing the transport system in the megapolitan region (see 3.3. Study Area)[5]. It often becomes a role model for other cities in Indonesia in developing public transport systems. Using those parameters, we gathered 62 regulations on 30th June 2020.

3.2. Data Analysis

We select content analysis to answer the first and third objectives. The technique allows researchers to make inferences from verbal, visual, and written sources to describe a phenomenon. The analysis results are constructed by meanings and relationships of condensed information (Marshall and Rossman 2014). We analyze the regulation manuscript and, if any, the appendix. First, we build codes from statements written in the regulations that describe policy objectives, goals, and design features. Based on these, we then classify the regulations of different policy instruments and, accordingly, group them into three themes of instruments: core, enabling, and supplementary (Table 1). Second, we recognize that each regulation may have multiple objectives. Accordingly, we generate categories for each objective later used in DNA. Third, we analyze how the instrument

[2] OJK is an autonomous agency outside the executive governmental structures who regulates the capital market and financial institutions.
[3] We refer energy system transformation to a process that allows the system to eliminate CO_2 emissions through reducing carbon intensity of primary energy (decarbonization) and energy efficiency (IRENA 2019).
[4] The Indonesia development planning facilitate governmental agencies to incorporate and to synchronize their development programs across all sectors, such as environment and transport. The process involves vertical and horizontal coordination to align the programs. There are three development plan types, including long-term plan (20 years), mid-term plan (5 years), and short-term plan (annually) (Law No 25/Year 2004 on National Development Planning).
[5] Within the administrative boundaries of Jakarta Province, there are five municipalities and one regency but they have limited authorities in enacting policies.

design feature (i.e., policy measures or rules inscribed in a regulation article) could facilitate niche development, and we group them into three categories: shielding, nurturing, and empowerment (

Table 2). We also use timeline analysis to describe how the policy instruments have been involved over time.

Table 1 Types of Policy Instruments

Type / Policy Elements	Core Policy Instruments	Enabling Policy Instruments	Supplementary Policy Instrument
Policy Objectives *(Outcomes)*	To support the reduction of GHG emissions (i.e., CO_2) or fossil fuel consumption		Other objectives than the reduction of GHG emissions and fossil fuel consumption
Policy Goals *(Outputs)*	To enhance the role of urban public transport in GHG emissions reduction (i.e., CO_2)	To push the implementation of climate change mitigation across sectors or energy system transformation	To facilitate urban public transport development and provision in general
Design Features:	Containing measures to strengthen the ways of urban public transport in GHG emissions reduction (i.e., CO_2)	Containing measures to facilitate climate change mitigation across sectors or energy system transformation	Containing measures to promote the development and provision of urban public transport in general

Table 2 Criteria for Categorizing Policy Design Features for Niche Development

Policy Function Category	Purpose	Look for explicit inscribed evidence of a policy measure that regulates or enable
Shielding	Defer pressures from selection environments (*passive shielding*)	• The mobilization of resources (e.g., subsidies and tax exemption) to pre-existing spaces in specific locations
	Create space for experimentation (*active shielding*)	• The provision of incentives to initiate early research or other experimentation activities (e.g., pilot- or demonstration project)
Nurturing	Improve technological or economic performance of innovative measures	• The facilitation of diverse social network formation • The promotion of shared and specific expectation • The facilitation of learning process
Empowering	Scale up the use of innovative measures and remove shielding gradually (*fit and conform*)	• The promotion of innovative measure adoption (e.g., standards and incentives for scale-up)
	Institutionalize or integrate innovative measure in the incumbent practices (*stretch and conform*)	• Institutional and infrastructural reform to accommodate the innovative measures

Source: Adopted from Verhees et al. (2015)

We apply DNA to address the second and third objectives. It entails a combination of techniques in content analysis and social network analysis to provide insights into the formation of policy and

political discourse among stakeholders (Leifeld 2016). It offers a visual representation of social actors' network and their (dis)agreement over arguments (or the "concept") connected via edges. In this research, we use the regulations and their objectives as the network nodes. We utilize 18 themes of policy objectives previously identified in the content analysis. The relations between the regulations and their objectives are weighted in a matrix. We give value 1 for an agreement between them and 0 for the opposite. The matrix was imported into the NODEXL software to construct the visualization. We also use the degree of centrality[6] to reflect which overarching policy objectives are considered the most critical issues in the policy discourse.

3.3. Study Area

Jakarta, the capital city of Indonesia, is the hub of economic activities in the country. It has become a megapolitan area sprawling beyond the administrative area of the Special Capital Region of Jakarta Province. Residential areas and manufacturing activities have been growing extensively to its neighboring municipalities for the past couple of decades, including Tangerang (under Banten Province), Bogor, Bekasi, and Depok (under West Java Province)[7]. About 11 million residents currently reside within the capital city boundaries, and its population density reaches about 16,000 people/km^2 (BPS DKI Jakarta 2020).

The urbanization trends pose significant challenges for the city to accommodate people's mobility in the region and cope with its consequences. It is estimated more than 3.5 million daily commuters (BPS DKI Jakarta 2018). In 2012, the total daily trips of road passenger transport in the metropolitan area were dominated by motorcycle (53%), four-wheel private vehicles (18%), and public transport (27%) (JICA 2012). By 2016, about 18 million vehicles had been registered in Jakarta (BPS DKI Jakarta 2018). The city experiences prolonged traffic congestion due to limited road construction and inadequate public transport provision (Susilo and Joewono 2017). Another consequence of increasing motorized traffic is air pollution. The capital was among the top five cities globally, with the highest average PM 2.5 during 2019 (IQAir 2020). The transport sector is the largest contributor to CO_2 emissions, and it has increased steadily since 2010 (Studio Cilaki 45 and Environmental Affairs Agency of DKI Jakarta 2018). It emitted about 7.7 million tons of CO_2e in 2017.

Jakarta has improved its public transport systems for the past two decades in order to tackle these problems. In 2004, the Jakarta provincial government launched a Bus Rapid Transit (BRT) system called the *TransJakarta*. The BRT system has been expanded over time, including the extension of service routes (from 13 km in total corridor length at the early stage to 204.2 km in 2019) and the addition of bus fleets (ITDP 2019). The management has undergone institutional reform and extended partnership with private bus and minibus operators to increase the ridership. The city has recently completed the early phase of a Mass Rapid Transit (MRT) and a Light Rail Transit (LRT) system. Along with improving the regional commuter train, the government is now promoting the intermodal integration of these existing public transport systems and extending the MRT and LRT services to its neighboring municipalities.

4. Findings

4.1. The policy instruments

[6] Degree centrality is a simple count of the total number of edges linked to a node. It can be considered to measure popularity of social actors or ideas in a network (Hansen, Shneiderman, and Smith 2011).
[7] More recently, the metropolitan area has been expanded in the policymaking by adding other two regions, including Puncak and Cianjur (West Java) (e.g., PR 60/2020).

We arrange this sub-section into three parts: the enabling policy instruments, core policy instruments, and supplementary instruments. We provide a timeline indicating the enactment year of their supporting regulations to give contextual background about the instruments (Table 3). Given government changes at both the national and Jakarta levels within the last two decades, we also consider which government administration issued the regulations. Due to length limits, we focus on the instruments with relevant design features to develop niches.

Enabling Policy Instruments

We identify four enabling instruments that provide any basis, mandate, or target to realize climate change mitigation across sectors and transform the energy system, particularly to envision low carbon mobility transition. The first law to CCMA (Climate Change Mitigation Acts) is the Kyoto Protocol ratification (Law No. 17/Year 2004, hereinafter abbreviated as L-17-04). It outlines Indonesia's commitment to the international joint-effort for GHG emissions reduction despite no specific emissions reduction targets because it did not have any obligation to mitigate the emissions. Under President Yudhoyono's administration, the national government issued the national GHG emissions reduction action plans (PR-61-11). It comprises indicative policies to reach its first commitment targets for GHG emission reduction by 26% voluntarily by the year 2020 compared with business as usual (BAU) level[8]. The transport sector's policies include switching to cleaner fuels, clean technology for various transport modes, and mass transport development. Those are supported by policy implementation for vehicle testing, CO_2 emissions standards for passenger vehicles, CO_2 labeling of passenger cars, speed limit enforcement, and CO_2-emissions-based car taxation. A year later, the Governor of Jakarta issued a local-level action plan for GHG emissions reduction (GovR-131-12), indicating a commitment to reduce 30% of the emissions by 2030. The municipal government focuses on increasing its BRT's modal share, promoting cycling, and switching its BRT fleets' fuel to the Compressed Natural Gas (CNG) to reduce its transport sector emissions.

Development planning is an instrument for governmental entities to determine their development priorities for specific periods and incorporate the indicative supporting policies. The 2010 - 2014 national development plan is the first one that sets specific objectives and explicit strategies for GHG reduction. It elaborates policies to help the 26% GHG emissions reduction target, including policies for the transport sector, such as the promotion of fuel switching, non-motorized transport, and land use planning for mitigation. Following the Paris Agreement ratification (L-16-16), the government under President Joko Widodo's second term had already set strategies to meet their pledge on the unconditional reduction to 29% by 2030 into the current mid-term development (PR-18-20). The plan lays out explicitly the country's efforts to embrace low carbon development transitions by setting up annual GHG reduction targets up to 2024. The primary measure to meet the target for the transport sector is biofuel utilization. Meanwhile, the Jakarta provincial government set activities to monitor and evaluate the implementation of its GHG emissions reduction plan in its 2013 – 2017 mid-term development plan. Nonetheless, the current applicable plan (LR-1-18) does not indicate whether Governor Anies Baswedan's administration continues similar steps.

[8] President Yudhoyono introduced the target during the G20 meeting in Pittsburg in 2009 and it was later submitted to the UNFCCC (United Nations Framework Convention on Climate Change) during the COP 15. With international assistance, the government pledged to achieve higher reduction of 41%.

Table 3 Timeline for Policy Instruments and Their Supporting Regulations Enactment

Indonesia President		**Megawati S.**	**Susilo Bambang Yudhoyono**										**Joko Widodo**						
Jakarta Governor		**Sutiyoso**				**Fauzi Bowo**					**Joko Widodo**		**Basuki T.P. – Djarot S.H**			**Anies Baswedan**			
Instruments		**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**Year →**
Enabling	**CCMA**	**L-17-04** Kyoto Protocol Ratification																	
							L-32-09 Environmental Protection and Management												
									PR-61-11 National Action Plan on GHG Reduction										
										MR_PW-11-12 Ministry of Public Works Climate Change Mitigation and Adaptation Action Plan									
										GovR-131-12 Jakarta Action Plan on GHG Reduction									
														L-16-16 Paris Agreement Ratification					
	DevPlan	**PR-7-05** - National Mid-Term Development Plan (2004-2009)						**PR-5-10** - National Mid-Term Development Plan (2010-2014)					**PR-2-15** - National Mid-Term Development Plan (2015-2019)					**PR-18-20** – National Mid-Term Development Plan (2020-2024)	
						LR-1-08 - Jakarta Mid-Term Development Plan (2007-2012)					**LR-2-13** – Jakarta Mid-Term Development Plan (2013-2017)					**LR-1-18** – Jakarta Mid-Term Development Plan (2018-2022)			
	ECRA						**GR-70-09** – Energy Conservation												
												GR-79-14 - National Energy Policy							
															PR-22-17 – National Energy General Plan				
	MRV								**PR-71-11** – GHG Inventory Implementation										
															MR_ENV-72-17 – MRV Guideline for Climate Change Actions				
															MR_ENV-73-17 – National GHG Inventory Guideline				
																	MR_ENE2219 – GHG Inventory and Mitigation Guideline in Energy Sector		
Core	**EVP**																**PR-55-19** – BEV Acceleration Program		
	NFisc															**MR_DP-2-18** – Indonesia Climate Change Trust Fund			
															OJKR-60-17 – Green Bonds				
	PTP											**LR-5-14 -** Transport							
Supplementary	**Biof**												**MR_ENE-12-15** – Biofuel Supply, Utilization, and Commerce						
	BRT/ PB											**LR-10-14** – Bus Rapid Transit System Management							
														GovR-160-16 – Free Fare for *Transjakarta* and Public Bus Service					
														GovR-79-16 – Public Bus Fare					
																GovR-96-18 – Feeders and BRT System Integration			
																	GovR-20-19 - Assignment to *Transportasi Jakarta LC.* for Transport Infrastructure Integration		
	Decen					**GR-38-07** – Division of Government Affairs between National, Provincial, and City/Regency Government													
								MR_HA-57-10 – Urban Standard Service Guideline											
												L-23-14 – Local Government							
															GR-54-17 – Local Government-Owned Enterprise				
	EVP																	**GovR-3-20** – BEV Tax Incentive	
	Fisc		**GR-55-05** – Balancing Fund																
														GovR-62-16 – Subsidies for PT. Jakarta Transportation					
																	GR-12-19 – Local Finance Management		

Indonesia President		Megawati S.	Susilo Bambang Yudhoyono										Joko Widodo						
Jakarta Governor		Sutiyoso				Fauzi Bowo					Joko Widodo		Basuki T.P. – Djarot S.H			Anies Baswedan			
Instruments		04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	Year →
																		MR_T-9-20 – Urban Public Transport Subsidies	
	LUIP				**L-26-07** – Spatial Planning														
							MR_PW-17-09 – City Spatial Plan Formulation Guideline												
								GR-15-10 – Spatial Plan Implementation											
									MR_PW-20-11 – City/Regency Detailed Spatial Plan Formulation and Zoning Regulation Guideline										
										LR-2-12 – Jakarta Spatial Plan 2030									
												LR-1-14 – Jakarta Detailed Spatial Plan and Zoning Regulation								
															MR_ASP-167-17 – TOD Guideline					
																	GovR-67-19 – TOD Implementation			
																		PR-60-20 – Spatial Plan of Jakarta, Bogor, Depok, Tangerang, Bekasi, Puncak, dan Cianjur	
	MRT/ LRT												**GovR-213-15** – Light Rail Transit Infrastructure Development Acceleration						
																	GovR-34-19 – MRT and LRT Fare		
																	GovR-95-19 – MRT and LRT Minimum Standard Service		
	MRV															**MR_T-33-18** – Vehicle Testing			
	NFisc								**GR-1011** - Procedures for borrowing foreign loans and receiving grants										
										GR-2-12 – Local Grant									
	PTP				**L-23-07** – Rail Transport														
							L-22-09 – Road Traffic and Transport												
									GR-37-11 – Road Traffic and Transport Forum									
										GR-55-12 - Vehicle									
										MR_T-10-12 – Road Mass Transport Minimum Standard Service									
											GR-79-13 – Road Transport Network								
												GR-74-14 – Road Transport							
													GovR-17-15 - Jakarta Public Transport Service Procurement						
																PR-55-18 – Transportation Master Plan of Jakarta, Bogor, Depok, Tangerang and Bekasi 2018 - 2029			
	R&D																**MR_RT-29-19** – Measuring Innovation Readiness Level		
																	MR_RT-38-19 – National Research Priority 2020 - 2024		
	TM								**GR-32-11** – Traffic Management										
																	GovR-88-19 – Odd-Even Plate Policy		

Notes: Applicable Regulations Previous Regulations; **Biof:** Biofuel Program; **BRT/ PB:** Bus Rapid Transit; **CCMA:** Climate Change Mitigation Acts; **Decen:** Decentralization; **DevPlan:** Development Plans; **ECRA:** Energy Conservation and Renewables Acts; **EVP:** Electric Vehicle Program; **Fisc:** Fiscal Instruments; **LUIP:** Land Use and Infrastructure Planning; **MRT/ LRT:** Mass Rapid Transit / Light Rail Transit; **MRV:** Measurement, Reporting, and Verification; **NFisc:** Non-Fiscal Instrument; **PTP:** Public Transport Provision; **R&D:** Research and Development Program; **TM:** Traffic Management

ECRA (Energy Conservation and Renewables Acts) instruments guide stakeholders to pursue energy system transformation through energy efficiency and renewable energy use. These instruments address not only GHG emissions reduction but also energy independence and energy security. In 2014, the national government enacted a regulation on the National Energy Policy that established strategies to boost the share of renewable energy consumption in the country's primary energy supply mix to at least 31% by 2050. The regulation includes two main strategies for the transport sector, including fuel switching (e.g., biofuel, CNG, and electricity) and shifting to urban public transport to improve energy efficiency. These are further elaborated into specific programs up to 2050 and their institutional arrangements in the National Energy Masterplan (PR-22-17). For instance, the government indicates developing MRT, LRT, and trolley systems in 13 urban areas.

Core Policy Instruments

Core policy instruments in Indonesia promulgate the adoption of the Low Emission Vehicle (LEV), including for public transport fleets. In 2014, the Jakarta provincial government enacted a regulation containing general rules and directives for transport management within the capital, including its Public Transport Provision (PTP) (LR-5-14). One of its objectives is to promote the practices for environmental practices and energy saving. It obliges public transport fleets to use alternative fuels, such as natural gas, electricity, hybrid, biofuel, or other fuels that meet the Euro 3 standards or above.

Meanwhile, at the national level, the national government under President Widodo launched the Electric Vehicle Program (EVP) in 2019 by signing a regulation on the Battery-Powered Electric Vehicle (BEV) Acceleration Program for Road Transport (PR-55-19). The policy covers the production of two-wheel to four-wheel (or more) BEVs. This regulation stipulates incentives to boost the EV industry and requirements to provide the necessary infrastructures (e.g., charging stations) to expand EV adoption. The manufacturers have to meet standards for the share of domestic components that increase over time.

Indonesia also has two core financial instruments to provide non-fiscal sources for climate change mitigation in the transport sector. The Indonesia Climate Change Trust Fund (ICCTF) is a nationally driven entity to manage blended funding from the state budget and international donors for climate change mitigation and adaptation. Introduced in 2009, it has been through institutional rearrangement since then (MR_DP-2-18). The overall objective of ICCTF to aid the government efforts to reduce GHG emissions toward low carbon development. It seeks and channels the fund in grants and capacity building for government agencies, non-governmental organizations, and higher education institutions for developing innovative practices or technologies across the relevant sectors, including transport.

Another non-fiscal instrument identified as a core instrument is the Green Bond (OJKR-60-17). It aims to finance activities that attempt to realize sustainable development through the roles of the capital markets. The OJK stipulates 11 eligible environmental-themed activities for the financing, including LEV development for public transport. The regulation sets 70% of the total bond proceeds to be used to finance the projects. It also lays out mechanisms for issuers and holders of the bond to manage and report the use of the proceeds.

Supplementary Policy Instruments

We identify 13 supplementary policy instruments to complement the core instrument implementation. There are two *Improve*-type interventions in supplementary instrument regulations at the national level. First, the national government promotes its biofuel program to cut GHG emissions as outlined in the CCMA instruments and the NDC (Nationally Determined Contribution) for the Paris Agreement.

The Ministry of Energy and Mineral Resources issued the latest regulation[9] (MR_ENE-12-15) that sets a mandatory target of biodiesel and bioethanol blend consumption until 2025. Nonetheless, in this regulation, this policy's objectives are intended to support macro-economic policy, reduce fuel import, and save the country's foreign exchange. Second, the Ministry of Research and Technology stipulates LEV development as one of the national research priorities 2020 – 2024 (MR_RT-38-19).

Given differences in local challenges, the sub-national governments could enact policy instruments to meet their own needs. Indonesia has decentralization policies that arrange government affairs between government levels, including sub-national governments' responsibility to provide public transport as a basic service. Meanwhile, the national government sets universal regulations to regulate PTP implementation across the regions, such as the vehicle and infrastructure specification (e.g., GR-74-14) to minimum standards services (e.g., MR_T-10-12). The government has fiscal and non-fiscal instruments that can be the funding source for public transport development and provision. For example, the Special Allocation Fund helps local governments financially for specific activities corresponding to national priorities[10] (GR-55-05).

In Jakarta, the provincial government has instruments that can be considered as supplementary ones, including the EVP, BRT/Public Bus (PB), MRT/LRT, and Traffic Management (TM) regulations. In early 2020, the governor signed a tax exemption regulation for BEV ownership for private and public vehicles (GovR-3-20). Unlike that BEV policy at the national level, it has an objective to air pollution abatement[11]. The city also has policy instruments to run and improve its BRT, LRT, and MRT systems to improve public transport ridership. The Jakarta government promotes the integration of BRT and public bus service run by private companies (LR-10-14), allocate subsidies for the fares (e.g., GovR-160-16), and develop a feeder system (GovR-96-18). Additionally, an odd-even plate policy for private cars during weekdays is imposed to increase public transport ridership and reduce traffic.

The future development of urban public transport is formulated through Land Use and Infrastructure Planning (LUIP) instruments. According to Indonesia's spatial planning legislation, the sub-national government must have twenty-year spatial plans, and they have to issue zoning regulations for urban areas. The Jakarta Provincial Government layout its future infrastructure expansion of BRT and rail-based transport systems and its integration through the land use plan in its spatial plans (i.e., LR-2-12 and LR-1-14). One of the on-going measures is Transit-Oriented Development (TOD). This strategy is also promoted in the Jakarta metropolitan area spatial plan (PR-60-20) and its transport master plan (PR-55-18).

4.2. The policy instrument coherence

Figure 2 shows a policy discourse network between the 62 supporting regulations of the instruments and their policy objectives. In total, we identified 18 policy objective themes, illustrated by red triangles. We depict the regulations with different colors and symbols based on their instrument types and governance levels. Since our study focuses on niche development, we examine the extent of the core instruments aligned with other instruments to target objectives related to low carbon transitions (i.e., GHG emission reductions and energy conservation).

We found that GHG emissions reduction is not the sole critical objective that needs to be considered in the policy discourse (Figure 2). Among all of the identified objectives, we highlight the top three

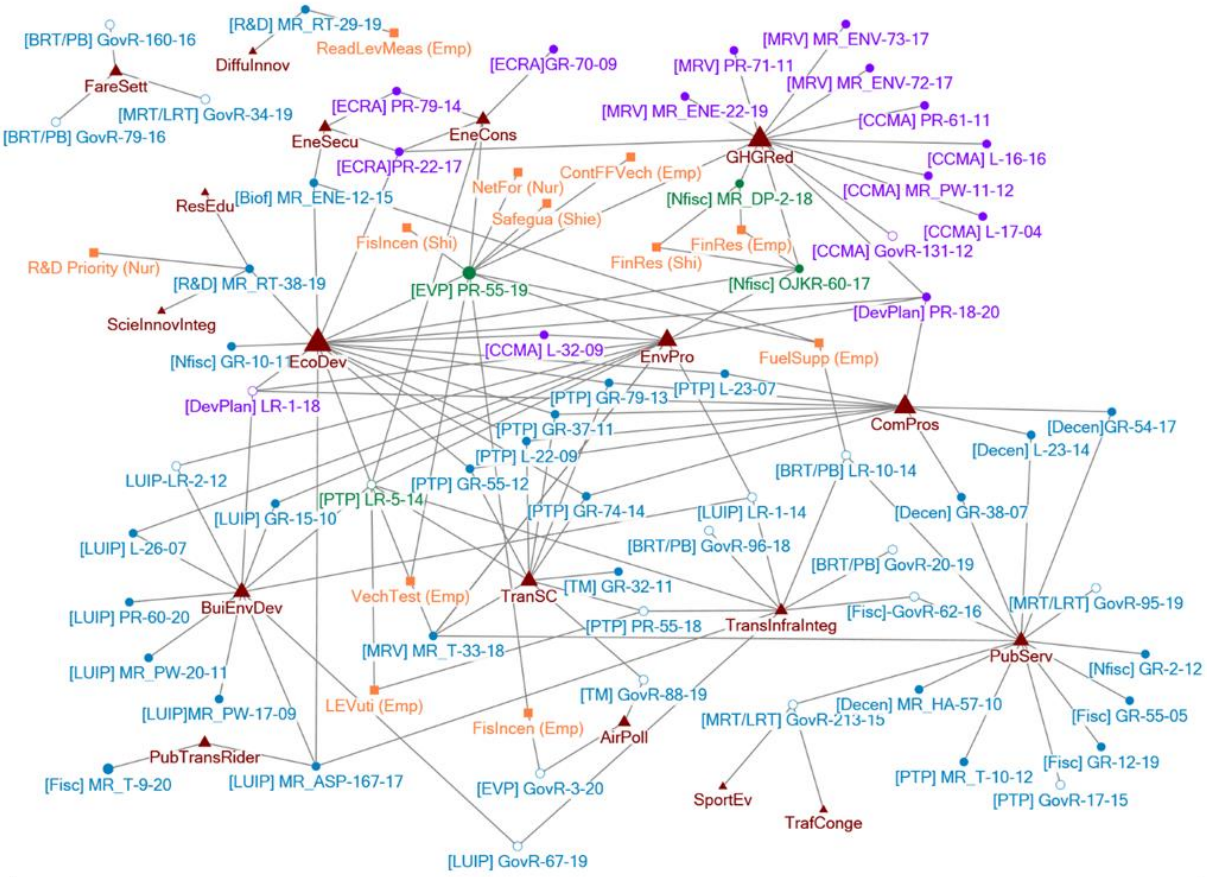
[9] The biofuel program was initially launched in 2006 to meet the domestic fuel demand and to decrease fuel imports. The supporting regulations have been updated since then.
[10] The fund is particularly to aid the local governments to meet basic public service and infrastructure provision due to their financial limitation.
[11]The regulation does not specify any kind of pollutants that they target to reduce.

policy objectives that have the highest degree of centrality in the network, including economic development (17 edges), GHG emissions reduction (14 edges), and public service provisions (13 edges). Aside from the three core instruments, the objective of GHG emissions reduction is mostly derived from the CCMA and MRV regulations. Another regulation that supports this objective is the National Mid-Term Development Plan (2020 – 2024). Meanwhile, the energy conservation objective is associated with three ECRA regulations, the BEV acceleration program (PR-55-19), and the Jakarta PTP regulation (LR-5-14). However, only the BEV acceleration program and the National Energy General Plan (PR-22-17) are arranged side by side with any CCMA regulations to target GHG reduction.

Hence, among the core instruments, the national BEV acceleration program holds a central position to pursue low carbon mobility transitions. It is arranged to support multiple objectives, including GHG emission reduction, economic development, energy conservation, and environmental protection. The Green Bond also has more objectives other than GHG emission reduction because it is also for financing activities associated with environmental protection and economic development. Nevertheless, the network indicates that the national BEV acceleration program is not aligned with the national PTP instrument to achieve GHG emission reduction nor energy conservation. Most of the PTP supporting regulations at the national level set economic development as their common objective, but none of them explicitly targets GHG emissions reductions or environmental protection. The national BEV acceleration program is only aligned with the PTP regulation enacted in Jakarta (LR-5-14 on Transport) for environmental protection and energy conservation. Nevertheless, it does not outline any compulsory direction on how to reach the Jakarta GHG emissions target. We also recognize that the EVP instrument regulations are not associated with the objectives related to changing mobility behavior (e.g., public transport ridership or traffic congestion) or transforming built-environment to accommodate EV uptake implications.

The national agenda for GHG emissions reduction is not yet thoroughly followed by policymakers in Jakarta. Although there is a compulsory mandate for its public transport to use LEV fleets (LR-5-14 and PR-55-18), the provincial government has not deliberately set other public transport policy instruments to facilitate the city's target for GHG emissions reduction. For example, the LRT development was initially accelerated to support the mobility needs during the 2018 Asian Games (GovR-213-15). Moreover, although it already has an action plan for GHG emissions reduction, there is no indication outlined in the Jakarta mid-term development plan that its current administration would continue pursuing that objective until 2022. Nor do its spatial plans mention GHG emissions reduction as a policy objective; they are solely designed to facilitate transport infrastructure integration and public service provision. There are also different narratives for the EVP instruments' objectives between the national and Jakarta provincial government. The current national EVP regulation (PR-55-19) is intended for GHG emissions reduction, while the Jakarta EVP regulation (GovR-3-20) is intended for air pollution abatement.

We also examine how the Biofuel program, the national government's selected measure to cut the emissions for transport, is arranged to realize the GHG reduction or energy system transformation. The ECRA upper-level regulation (i.e., GR-79-14 on National Energy Policy) has considered the program for reducing fossil fuel consumption. At the ministerial level, nonetheless, the Biofuel program's latest regulation (MR_ENE-12-15) is intended to ensure energy supply domestically and support economic development.



Legend

Policy Objective

AirPoll: Air Pollution
BuiEnv: Built Environment Development
ComPros: Community Prosperity
DiffuInnov: Diffusion Innovation
EcoDev: Economic Development
EneCons: Energy Conservation
EneSecu: Energy Security
EnvPro: Environmental Protection
FareSett: Fare Setting
GHGRed: GHG Emission Reduction
PubServ: Public Service Provision
PubTransRider: Public Transport Ridership
ResEdu: Research and Education Capacity Development
ScieInnovInteg: Science-Innovation Integration
SportEv: Supporting Sport Events
TrafConge: Traffic Congestion
TransInfraInteg: Transportation Infrastructure Integration
TransSC: Transport Safety and Convenience

Design Features

ContFFVech: Controlling Fossil-fuel Vehicles
FuelSupp: Fuel Supply
FinRes: Financial Resources
FisIncen: Fiscal Incentives
LEVuti: Low Emission Vehicle Utilization
StaNetFor: Stakeholder Network Formation
Procu: Procurement Mechanism
ReadLevMeas: Readiness Level Measurement
R&D: Research and Development Priority
Safeguad: Safeguard Mechanism
VechTest: Vehicle Testing

Core Policy Instrument - National
Core Policy Instrument - Jakarta
Enabling Policy Instrument - National
Enabling Policy Instrument - Jakarta
Supplementary Policy Instrument - National
Supplementary Policy Instrument - Jakarta

Biof: Biofuel Program
BRT/ PB: Bus Rapid Transit / Public Bus
CCMA: Climate Change Mitigation Acts
Decen: Decentralization Regulation
DevPlan: Development Planning
ECRA: Energy Conservation and Renewables Acts
Fisc: Fiscal Instruments
LUIP: Land Use and Infrastructure Planning
MRT/ LRT: Mass Rapid Transit / Light Rail Transit
MRV: Measurement, Reporting and Verification
NFisc: Non-Fiscal Instrument
PTP: Public Transport Provision
R&D: Research and Development Program
TM: Traffic Management

Regulation Labeling:
[Type of Regulation]-(Regulation Number)-(Year of Enactment)

Figure 2 The Policy Instrument Mix Coherence

4.3. The design features of the policy instruments for niche development

Most of the policy design features that contain measures to help niche development are identified in the core instruments. In general, those promote the adoption of LEV for public transport, particularly BEV. While PR-55-19 outlines the national government's various measures to accelerate BEV adoption for all road transport types, the Green Bond regulation is set explicitly for LEV public transport as one of the activity targets. However, they have different features to enable niche development.

The EVP, Green Bond, and ICCTF have features to shield niches, especially to create initial research, initiatives, or pilot projects for electric vehicle adoption (Figure 2). PR-55-19 affirms the government to offer manufacturers, universities, or research institutes financial incentives for BEV research and development. The regulation also features a policy to safeguard the BEV R&D and manufacturing activities (i.e., logistic mobilization). Meanwhile, an issuer of Green Bonds could use the loan to finance LEV initiation activity. The ICCTF regulation also stipulates transport projects targeting GHG emission reduction as one of the fund beneficiaries, but it does not specify what kind of transport could be financed with the fund.

Two policies are set to nurture LEV niches, including research programs and the facilitation of stakeholder networks. The Ministry of Research and Technology stipulates LEV development as one of the national research priorities until 2024 (MR_RT-38-19). Although it does not indicate any dedicated LEV research grants, it calls for synergy between relevant governmental bodies and other stakeholders to allocate their budget to support the R&D program. Another explicit nurturing policy can be found in PR-55-19 by facilitating stakeholder networks to support the BEV acceleration. It outlines a coordination arrangement among relevant ministries, and it corroborates cooperation among governmental bodies, manufacturers, universities, and research institutes for the BEV R&D.

Six empowerment policies for LEV niche development include financial resources, fiscal incentives, fossil-fuel vehicle control, LEV mandatory utilization, fuel supply, readiness level measurement, and vehicle testing. The Green Bond and ICCTF offer financial resources not only for the initiation but also for on-going activities. Nevertheless, both regulations do not mention any detail of empowerment activities that can be financed by the fund. In addition to the fund, both the national and Jakarta provincial governments offer fiscal incentives, including tax exemption and deduction, to accelerate BEV adoption. In this way, the national government mulls to reduce fossil-fuel vehicle growth gradually (PR-55-19). In Jakarta, it is also further strengthened by the objective to push mass transport integration and development in which LEV adoption for public transport fleets takes part in the process (i.e., PR-55-18 and LR-5-14). The existing regulations ensure fuel supply for the LEV public transport fleets, including charging stations (i.e., PR-55-19 and LR-5-14) and biofuel supply (MR_ENE-12-15). There are some instruments to measure the performance of innovations before entering the market. The Ministry of Transport requires LEVs to pass vehicle testing, including their fuel emission, while the Ministry of Research and Technology has an instrument for determining the readiness of innovations toward commercialization. However, the last-mentioned one is out of the policy discourse network.

5. Discussions and Conclusion

To our knowledge, this is the first research that explores the arrangement of policy instrument mix to develop urban public transport niches for low carbon mobility transitions. Having a comprehensive depiction of the current policy discourse network, we can reflect that there is still no deliberate creation of a policy instrument mix as a dedicated package to support this notion, even though the existing instruments provide some niche development features. Amidst ample enabling instruments providing indicative strategies, the core instruments and PTP instruments remain scattered, and they are not jointly linked to GHG emission reduction targets or the objectives related to mobility (e.g., transport infrastructure integration and public transport ridership). The BEV acceleration program

does not provide an explicit compulsory mandate for sub-national governments to adopt BEV for public transport fleets. None of the national PTP regulations is explicitly directed to achieving GHG emission reduction, as some of them had been enacted before the national GHG reduction action plan was issued. Meanwhile, Jakarta has the instruments to push LEV adoption for public transport fleets, but it is not directly aligned with the effort for its GHG reduction target. Additionally, we also identify that the on-going mass transport development (e.g., BRT, LRT, and MRT) and other measures to integrate them (e.g., TOD) are, by design, not envisioned for such objectives.

Our research also contributes to the incorporation of the S/N/E framework as proposed by Schot and Geels (2008) into the policy mix concept for sustainability transitions coined by Rogge and Reichardt (2016). Our analysis provides significant findings on whether each instrument is systematically aligned to help niche development externally for transitions. We found that Indonesia's current core policy instruments already have design features to shield and empower niche development in different ways. Nevertheless, only a few policy instruments can help stakeholders to learn and envision carbon mobility, and those are not aligned with the regulations that have features for shielding and nurturing the LEV niche development. As identified in other cities, LEV adoption (i.e., BEV) for public transport fleets could bring some implications such as timetabling, route design, operation cost, and infrastructure provision (Bakker and Konings 2018, Mohamed, Ferguson, and Kanaroglou 2018). While niches' internal process could facilitate learning regarding the technological aspects of innovations (e.g., mode of transport and their infrastructure), such changes must be captured through policy learning to anticipate their long-term effects on people's mobility and city development. In the case of Indonesia and Jakarta, our results show there is still no policy instrument that can ensure policy learning related to the urgency of low carbon mobility transitions (e.g., development planning or spatial planning). As well, the provincial government does not strategically advocate low carbon mobility in other regulations. Thus, no current policy instrument exists to ensure policymakers learn from the niches as they are nurtured. Mainly, policymakers are not directed by existing instruments to envision transitions and systematically integrate selected measures and on-going public transport measures to provide co-benefits for city development.

Of course, our results only reflect the coherence of what has been written in the regulations. Nevertheless, those are the main references and basis for Indonesia's public authorities and other stakeholders to understand and carry out their functions and responsibilities. Hence, those could become media to communicate and synchronize policies across governance level since not all of them are involved directly in the climate change policymaking process. The lack of policy coherence for climate-related targets discovered in this study is in line with what Sulistiawati (2020) reveals: that there is a lack of substantial understanding and visions for sub-national stakeholders to pursue the national NDC targets. Little policy interpretation clarity and limited direct information exchange pose a significant challenge to making climate change targets relevant and prioritized at the local level. Our finding is analogous to Ohlhorst's (2015) that Germany's *Energiewende*—a policy mix deliberately designed to push energy transition through decentralized supply structure—still finds difficulties in aligning national and sub-national priorities for supporting the transition. Thus, capturing actors' interaction in the policy process is crucial, as Rogge and Reichardt (2016) suggested.

The data for our analysis has some limitations, namely that the policy regulation documents do not include the policymaking process. Subsequently, we cannot capture policymakers' implicit motivations or ways in which the instruments are (re)shaped by the political process. Consequently, we cannot clarify some inconsistencies why some regulations set similar instruments, yet link them to different objectives. The national government has assigned the Biofuel Program as one of the measures to address GHG emission reduction in the transport sector since enacting the national GHG emission reduction action plan (2012), and it had been re-introduced in the NDC (2016). Nonetheless, in 2015, the Ministry of Energy and Mineral Resources did not include this objective when stipulating the supporting regulation. Similarly, we recognize different narratives for the EVP in which the national

government perceives the BEV acceleration to reduce GHG emissions while the Jakarta provincial government sees it as a way to abate air pollution. Future research could reveal stakeholders' involvement and influence in designing the instrument regulations as keys to understanding the potential policy integration.

To conclude, we discover no systematic and deliberate policy instrument mix in Indonesia designed to help urban public transport niche development amidst ample enabling instruments for the transitions. The current policy instrument network is not coherent yet to support low carbon mobility as it focuses more on building niches on mode technology and alternative fuels. Nevertheless, both instruments are not aligned with urban public transport measures to ensure a strategic shift from or avoid private auto-mobility. Those that offer features for developing transport technological niches are not arranged along with other instruments that promote shifting to urban public transport to jointly achieve the country's GHG emissions reduction target. Thus, the hypothesis is rejected.

Based on this study's results, we recommend an instrument or a platform that can facilitate sustained collective policy learning, especially at the sub-national level, during niche development. Non-governmental organizations and international development organizations can also act as intermediaries to facilitate this key process and ultimately accelerate transitions. The learning contents should emphasize how the transitions are relevant and urgent for future city development and how to integrate novel innovation to existing policy measures. This process would help re-coordinate the policy mix and even mainstream low carbon mobility across relevant sectors for better policy integration.

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