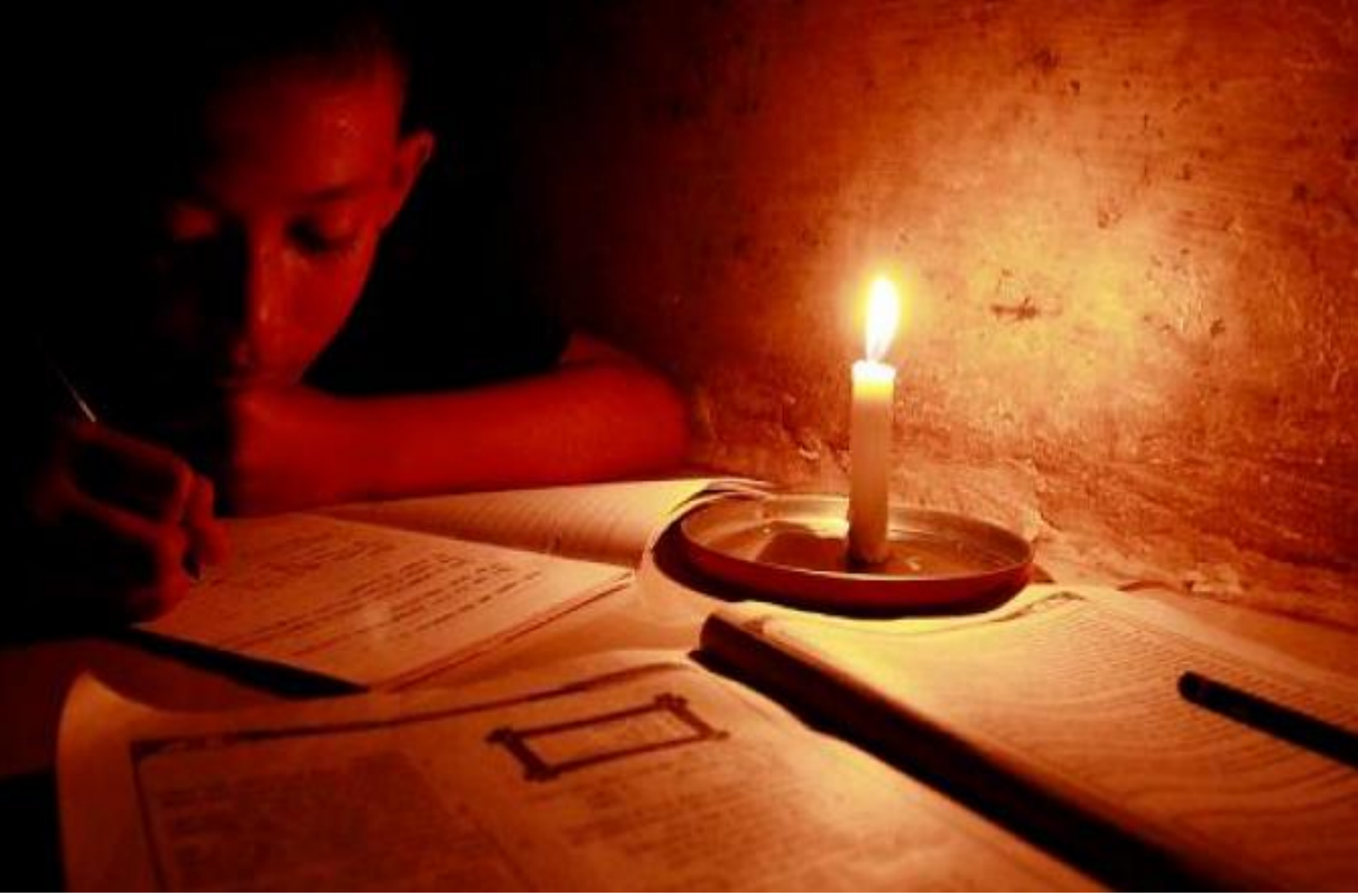

Source of picture: Ahdiat, 2020

Title

‘Just’ access to electricity: Energy justice in Indonesia’s rural electrification (LISDES) program.

Thesis Report

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Summary

Despite the fact that Indonesia's electrification rate reached nearly 100% in 2021, issues such as blackouts, brownouts, and the presence of numerous pitch-black rural areas persist. This study, therefore, used energy justice as an analytical framework to reframe the LISDES program's entrenched issues from the perspective of what would be 'just,' with hopes of improving the program implementation in the future. In this thesis, a qualitative study was used as an approach. Document analysis and semi-structured interviews are the methods selected for data collection. Six documents were analyzed in this thesis, including government documents, reports, one book, and a case summary. In addition, seventeen key actors in the program were invited as informants for this thesis. Using the three core tenets of energy justice, three categories of energy injustices were identified in the LISDES program: distributive, procedural, and recognition injustice. When it comes to distributive injustice, unequal income to pay electricity bills; uneven geographical conditions; and unequal distribution of the population were identified as the elements that hinder an equal distribution of the costs and benefits of electricity in the program. Pertaining to the procedural injustice, inadequate access to informational disclosure on the problems and solutions of the program; lack of meaningful participation of subnational actors; and lack of a comprehensive law and regulatory framework in place to protect private sectors in the program were demonstrated as the elements that handicap a representative and impartial decision-making process in the program. Lastly, a lack of understanding of the various meanings of electricity as the key to public welfare; and non-recognition of distinctive socioeconomic characteristics in various locations in Indonesia were found as the elements of recognition injustice, representing the key elements of the rural communities that have been frequently overlooked by the program. These findings suggest that in order to achieve 'just' access to electricity in the LISDES program, it is critical to address all elements of energy injustices and clearly define long-term goals for the program that go beyond the main quantitative indicators of electrification ratio and the ratio of electrified villages that the program commonly uses to measure its progress.

Contents

List of abbreviations

LISDES program	Rural electrification program
TWh	Terawatt-hour
MEMR	The Ministry of Energy and Mineral Resources
PLN	State Electricity Company
IPP	Independent Power Producer
PPA	Power Purchase Agreement
RUPTL	Electricity Business Supply Plan
IBEKA	People Centered Business and Economic Institute
BUMDes	Village-owned enterprise

Acknowledgements

This thesis report was prepared at Wageningen University & Research's Environmental Policy Group (ENP) and was fully funded by the Indonesia Endowment Funds for Education (LPDP). I truly appreciate all of your assistance throughout the process. I started this thesis project to address the poor electricity services that are still evident, particularly outside of Indonesia's Java-Bali regions. From this problem, I began to investigate other issues, which led to deeper inquiries. This process has facilitated me to examine these issues through a lens of what would be just, using energy justice as an analytical framework.

A thousand-mile journey begins with a single step. I hope that this thesis can serve as a starting point for better addressing the entrenched issues in Indonesia's electricity sector, particularly in disadvantaged, outlying, and frontier areas (3T Region), where electricity poverty is most visible. I'd like to express my heartfelt gratitude to LPDP for helping me realize my dream of attending one of the world's best environmental science schools, Wageningen University & Research. I also want to thank my supervisor, Sanneke Kloppenburg, for her unending and exceptional support throughout this thesis project. I would like to thank the second reader of my thesis project, Kris van Koppen, for his valuable feedback in my research proposal, to help me improve the quality of research that I was about to carry out. Furthermore, I would like to thank my thesis coordinator, Maartje van der Knaap, for her endless and sincere assistance in ensuring the smooth preparation of my thesis project. I would also like to thank the incredible informants I had the privilege of interviewing during the data collection process for this thesis. I am extremely grateful to the Indonesian Student Association in Wageningen (PPI Wageningen), my thesis comrades, particularly Meltem, whom I met while writing my thesis here in Wageningen and with whom I shared many laughs and joy. Last but not least, I'd like to express my heartfelt gratitude to my loving family and my mentor, Muhammad Shidiq. I would not be the person I am today without the contributions of all of these people, and I am pleased to present this thesis report to all of you.

A journey of a thousand miles *begins with a single step*
Lao-Tzu

1. Introduction

1.1. Problem description

1.1.1 Electricity in Indonesia

In one decade, Indonesia has been able to increase the national electrification ratio from 67% (in 2010) to 99.2% (in 2020) (Cahyani et al, 2022; MEMR, 2021). Despite this remarkable achievement, the increasing demand for electricity in the country remains challenging to meet (Malik, 2021). This situation presents numerous challenges. For example, eight out of thirteen electricity systems in Indonesia have negative reserve margins, forcing many regions, including Kalimantan and most areas in Eastern Indonesia, to tolerate blackouts, brownouts, and other peak load issues due to fragile grids in these areas (Maulidia et al., 2019). This example has indicated an unequal distribution of electricity access throughout the country. Furthermore, the government gives a mandate to the state electricity company (PLN) to control the national electricity from power generation to electricity distribution (World Bank, 2005). This arrangement raises the question of whether the decision-making process in Indonesia's electricity sector is representative and impartial. For decades, the Indonesian government has stipulated a lot of programs to mitigate these challenges. However, it remains unclear in what ways and to what extent 'just' access to electricity has been achieved by these programs (ADB, 2016; Setyowati, 2021). It has been argued that this situation is exacerbated by the fact that the concept of justice has received little attention when it comes to the electricity system, particularly in a developing country such as Indonesia (Milchram et al., 2020).

1.1.2 Indonesia's rural electrification (LISDES) program

As presented in **Figure 1**, the household is described as the largest consumer of electricity in Indonesia (Secretariat General National Energy Council, 2019). Furthermore, electricity demand share in households is expected to reach from 49% in 2018 to 58% in 2050 using the business as usual (BaU) scenario, a scenario which uses basic assumptions of GDP growth of 5.6% per year, rate of population growth at 0.7%, and the power plant targets refer to PLN's electricity business supply plan (RUPTL) (Secretariat General National Energy Council, 2019). On the other hand, it has been discovered that at least 500,000 households in Indonesia are without electricity, with the vast majority of them living in remote areas (Main, 2021). Given the presence of unelectrified households in many areas of the country, the government's ability to meet the rising residential electricity demand is called into question.

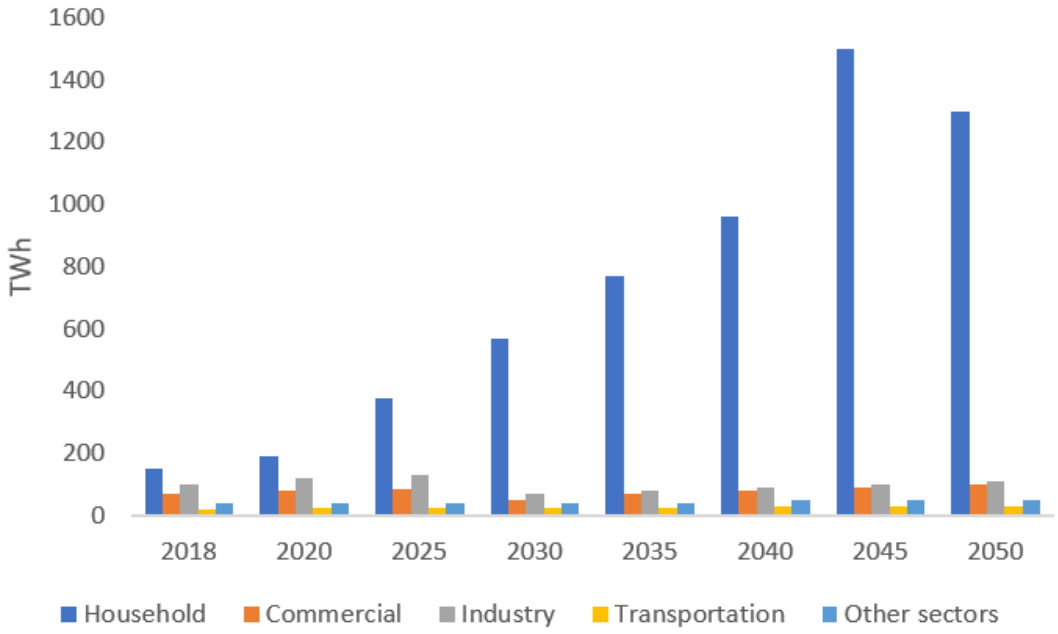


Figure 1. Electricity demand per sector in Indonesia (TWh) from 2018 to 2050 (Secretariat General National Energy Council, 2019).

The rural electrification program, also known as the Listrik Desa (LISDES) program, was launched in the late 1950s to improve public welfare throughout villages of Indonesia (Sambodo, 2015). According to the PLN (2021) annual report, the national electrification ratio in the country for 2021 equaled 99.45%. This figure implies that 99.45% of the total number of households in Indonesia have access to electricity. When it comes to the ratio of electrified villages, by 2021, 99.62% of the total number of villages in the country are already electrified (PLN, 2021). Despite this notable progress, these figures do not reflect that the available electricity access in these electrified households or villages is as reliable as expected. Therefore, a lot of areas in the provinces of Kalimantan still have to endure frequent rolling blackouts (Maulidia et al., 2019). Furthermore, if the disadvantaged, outermost, and frontier regions (*Daerah 3T*) that are mostly located in the province of Papua and the East Nusa Tenggara are taken into account, it was estimated that there are 10.4 million people in this region live with poor electricity access (Vannucchi, 2020). In addition to that, the national government's role is dominant throughout the program's decision-making process, from regulating through the Ministry of Energy and Mineral Resources (MEMR), facilitating, operating via PLN, supervising, and controlling (World Bank, 2005). These findings indicate a possibility of energy injustices or unequal distribution of costs, benefits, and decision-making processes in the LISDES program.

1.1.3 Electricity access, energy poverty, and energy justice

IEA (2017, p. 21) defined electricity access as "a household having reliable and affordable access to electricity, which is enough to supply a basic bundle of energy services initially, and then an increasing level of electricity over time to reach the regional average". A basic bundle of electricity services refers to basic tasks that households obtain from electricity, such as lighting and using small appliances (IEA, 2017). At the regional level, the aggregate of this basic bundle of electricity services may be increasing over time due to population growth, therefore, an increasing level of electricity over time is expected. According to IEA (2017), therefore, the three aspects of electricity access include the physical availability of electricity, the quality of electricity services, and the affordability of electricity services.

The IEA's definition of electricity access was chosen for this study because the emphasis of this thesis is on electricity access for households rather than individuals which were commonly highlighted in most literature until late 2010 (Legros et al., 2009). Furthermore, IEA (2017) introduced a comprehensive definition of electricity access that goes beyond the physical availability of electricity but also includes the quality and affordability of electricity services, both of which are evident issues in the LISDES program. Therefore, this thesis will make use of the definition of IEA (2017) when it comes to electricity access.

A lot of concepts, such as energy poverty and energy justice, have been developed to address issues in electricity access (Shyu, 2021). Energy poverty is measured by "the inability to pay for utility bills" (Fefferman et al., 2021, p. 1). In a broader sense, the International Energy Agency (IEA) delineates energy poverty in three situations: "lack of access to modern energy services, a lack of reliability when services do exist, and concerns about the affordability of access" (IEA, 2017, p. 24). Energy poverty, in this sense, is not limited to groups of people who are unable to pay utility bills but also to those who suffer from poor reliability of energy services, such as blackouts and brownouts that are prevalent in developing countries (Burlando, 2014). When it comes to electricity access, the concept of energy poverty, therefore, implies a hindrance to adequately achieving a balanced combination of the three aspects of electricity access: the physical availability of electricity, the quality of electricity services, and the affordability of electricity services (Shyu, 2021).

Energy justice in the electricity sector, on the other hand, aims to fairly disseminate both the costs and benefits of electricity service; and to ensure that the electricity sector's decision-making process is representative and impartial (Sovacool et al., 2017). "The energy justice concept investigates (a) where

injustices emerge, (b) which affected sections of society are ignored, and (c) which processes exist for their remediation in order to (i) reveal and (ii) reduce such injustices" (Jenkins et al., 2017, p. 631). As a result, energy justice emerges as a critical theoretical framework that functions to restore the moral implications by asking questions 'who bears the costs? who receives the benefits?'.

The concept of energy justice emphasizes the accessibility of electricity, an aspect that is less visible than the aspect of electricity availability in the LISDES program's decision-making process. It stems from the fact that despite the physical availability of electricity in their area, many households in the program do not have equal access to affordable and reliable electricity services (Maulidia et al., 2019). In contrast to energy poverty, energy justice touches upon not only the issues that prevent the LISDES program from achieving a balanced combination of the three aspects of electricity access but also sheds light on them in order to make them more 'visible' for related stakeholders. It is carried out by evaluating the distribution of costs, benefits, and decision-making process in the electricity framework "from a perspective of what would be 'just' " (Vitéz & Lavrijssen, 2020, p. 4).

Energy justice is a nascent concept that has been used for less than a decade (Heffron et al., 2015). Nevertheless, the concept is mostly explored, inter alia, by Heffron et al. (2015), Sovacool and Dworkin (2015), Jenkins et al. (2016), and Sovacool et al. (2019) that used developed countries as the contexts. As a result, studies that emphasize energy justice in the topic of rural electrification in a developing country like Indonesia have been underexplored (Setyowati, 2021; ADB, 2016). To address the aforementioned concerns in the LISDES program and to contribute to the shortage of energy justice studies utilizing developing countries as contexts, this thesis will employ energy justice as an analytical framework to shed light on the issues that emerge from this program.

1.2 Research objective

This thesis seeks to delve into the entrenched issues that impede the LISDES program's ability to provide 'just' access to electricity to rural communities. Accordingly, this research will investigate in what way and to what extent the core tenets of energy justice are observable in the LISDES program. Insights collected from this thesis contribute to the empirical work of the studies in energy justice for developing countries contexts. For Indonesia, this thesis provides insights into issues that impede the LISDES program's ability to provide 'just' access to electricity for rural communities. As a result, the national government of Indonesia, as the prominent actor in the program, may be interested in this thesis because it provides insights that will aid the government with program implementation in the future.

1.3 Research question

1.3.1 Main research question

Drawing from the research objective of this thesis, therefore, the main research question is described as follows:

How do issues arising from the LISDES program affect the program's ability to provide 'just' electricity access to rural communities?

The following sub-questions are proposed to generate knowledge relevant to answering the main research question.

1.3.2 Sub-questions

(i) What role(s) does the national government play in the LISDES program to improve electricity access in Indonesian rural communities?

According to Flaig and Ottoson (2022, p. 70), a role is defined as "a bundle of an actor's vision-oriented actions and intentions in relation to their immediate environment". This sub-question, therefore, aims to generate an understanding of the actions and intentions that Indonesia's national government were mandated to and also to comprehend how the national government interpret their role(s) in the LISDES program. Furthermore, this sub-question is also aiming for understanding the objective(s) and strategies that the national government set in carrying out its role. To answer this first sub-question, document analysis was used as the main source of data to provide an overview of role(s), objective(s), and strategies that the national government plays in carrying out the program.

(ii) What are the perspectives of the key actors on energy injustices that emerge from the LISDES program?

Energy justice has been a contested concept because it encompasses competing values, roles, and narratives that construct an energy system (Castillo Jara & Bruns, 2022). Consequently, it becomes inevitable that different actors may interpret energy justice from diverse perspectives. This second sub-question, therefore, aims to have an understanding of the perspectives of different key actors in Indonesia's electricity sector about energy injustices that emerge from the LISDES program. Energy injustices are the focus of this thesis in order to make them more visible and to provide insights that may help the program improve its planning and implementation in the future. To answer this research question, interviews were

conducted with diverse key actors in Indonesia's electricity sector, particularly those involved in the LISDES program.

(iii.) In what way and to what extent has the LISDES program improved the rural communities' access to electricity?

The third sub-question was developed to examine the implications of the LISDES program's energy injustices on the program's ability to improve rural community access to electricity. Generated knowledge from the first and second sub-question was used as the source of data analysis to generate insights that can answer the third sub-question.

1.4 Outline of the thesis

In this thesis, the various definitions of energy justice and how to operationalize the concept in regard to the LISDES program will be discussed in chapter **2. Conceptual Framework.** In chapter **3. Methodology**, the research design will be delineated including how the data for the thesis is collected and analyzed. With help of theoretical concepts entailed in chapter 2, data collected in the thesis will be analyzed to generate key findings to answer the research questions of the thesis. These key findings will be presented in chapter **4. Results**. The key findings of the thesis will be then further explored in chapter **5. Discussion** to examine whether there are correlations between these findings and external factors. Furthermore, reflections on the methods applied in this thesis and recommendations for future studies will be also discussed in this chapter. Lastly, the conclusions of this thesis along with the recommendations as to how to achieve 'just' access to electricity through the program will be presented in chapter **6. Conclusions and Recommendations.**

2. Conceptual Framework

This chapter will present relevant discussions on the energy justice concept. It begins by demonstrating the breadth of the concept's application when it comes to developing-country contexts. It is then followed by describing the two major definitions of energy justice and the reasons why the function of energy justice as a theoretical framework was selected to become the focus of this thesis. Lastly, this chapter will discuss how to operationalize energy justice as an analytical framework to examine issues that arise from the LISDES program at the national level.

2.1 Energy justice in developing countries

Energy justice is a relatively new concept that emerged in 2013. (Lacey-Barnacle et al., 2020; Sovacool et al., 2017). As compared to the environmental justice concept which has a rich history of global research, the concept of energy justice draws its root majorly from specific parts of the Global North, due to the advanced research resources that these countries have (Lacey-Barnacle et al., 2020). Consequently, the origins of core foundational texts and active networks are built predominantly by western discourses and institutions, such as the United Kingdom, the United States, and Europe (Lacey-Barnacle et al., 2020; Castán Broto et al., 2018).

Applying the concept of energy justice to the Global South then becomes challenging. This is because the concept mostly omits the "non-western traditions of thought" that recognizes the heterogeneity of sociopolitical circumstances and traditional customs that heavily influence the behavior of the societies in these countries (Castán Broto et al., 2018, p. 646). Due to a lack of empirical work on energy justice in the Global South, therefore, energy justice remains underexplored in developing countries (Castán Broto et al., 2018; Setyowati, 2021). It is not surprising that there is a poor archive of case studies drawn from Southeast Asia, Central American, and Sub-Saharan African contexts (Lacey-Barnacle et al., 2020). For instance, in 2018, the Applied Energy journal published papers that investigated recent developments in energy justice studies. The case study and empirical findings on the low carbon energy systems and energy justice were mostly drawn from developed-country contexts. Out of nineteen papers, only two papers featured developing countries in the context of the study (Lacey-Barnacle et al., 2020; Castán Broto et al., 2018). As a result, carrying out studies in energy justice using developing countries as the contexts becomes necessary. This is necessary to enrich the current global discourses of energy justice, in order to be adopted meaningfully both in developed and developing country contexts.

2.2 Energy justice as an analytical framework

In the literature, the energy justice concept is built from two dominant definitions (Lacey-Barnacle et al., 2020). First, energy justice was defined as having the three core tenets also known as a triumvirate of tenets. This definition started to be used in the literature in 2013 (Lacey-Barnacle et al., 2020; Heffron & McCauley, 2017). The three core tenets are distribution (distributional or distributive, which will be referred as to distributive justice in this thesis), procedural, and recognition justice (sometimes also referred as to justice as recognition) (van Bommel & Höffken, 2021; Heffron & McCauley, 2017; Heffron, 2021). Distributive justice refers to "the distribution of benefits and ills on all members of society regardless of income, race, etc.*"* (Sovacool et al., 2017, p. 678). "Procedural justice inspires researchers to explore the ways in which decision-makers have sought to engage with communities" (Jenkins et al., 2016, p. 175). Recognition justice refers to "recognize the divergent perspectives rooted in social, cultural, ethnic, racial and gender differences" (Sovacool et al., 2017, p. 678). Second, it has been argued that much work in energy justice has been drawn from a policy framework that is based on eight core principles (Sovacool et al., 2017). These eight core principles were developed in 2014, and function as a foundation of approaches to energy justice for policymakers (Sovacool et al., 2017; Heffron & MacCauley, 2017). They are availability; affordability; due process; transparency and accountability; sustainability; intra-generational equity; inter-generational equity; and responsibility (Lacey-Barnacle et al., 2020; Sovacool et al., 2017). It has been argued that these definitions complement each other (Heffron & McCauley, 2017). Rather than critically comparing these two definitions of energy justice, this thesis aims to investigate the merit of energy justice as an analytical framework, to shed light on issues that emerge from the LISDES program. Further explanation of operationalizing energy justice as an analytical framework will be described later in this section.

According to Heffron (2021), energy justice serves two primary functions: (1) establishing a theoretical framework and (2) implementing it in practice. In this thesis, energy justice will be used as a theoretical framework to analyze issues that are evident from a program, such as the LISDES program (Sovacool & Dworkin, 2015). A case study that applies energy justice as a theoretical framework begins by examining the core tenets of energy justice to see if they are present in the case (Heffron, 2021). It is then followed up by applying energy justice as an analytical framework, to reframe issues that were identified in the case into energy injustices by examining them from a perspective of what would be 'just' (Heffron, 2021; Sovacool & Dworkin, 2015). As the consequences of a lack of deploying energy justice concept in developing-country contexts (Lacey-Barnacle et al., 2020; Sovacool et al., 2017), this study also hopes

that the use of energy justice's core tenets in examining issues in Indonesia's LISDES program will serve as the foundation for further implementing energy justice as a practice, to improve program implementation in the future.

According to Sovacool et al. (2019), there are three analytical spatial scales to operationalize the energy justice concept in case studies: micro, meso, and macro. Micro scale refers to “injustices that occur within a particular community or household that is located to close proximity to the energy innovation or system involved in the transition” (Sovacool et al., 2019, p. 2). Meso scale is described as “injustices that cover more national level consequences for policy, technology, or markets” (Sovacool et al., 2019, p. 2). Lastly, macro level indicates “injustices that occur and circulate at the regional, transnational, and global scale” (Sovacool et al., 2019, p. 2). Meso scale will be the focus of this thesis because the objective of this study seeks to understand the national level energy injustices that occur in the LISDES program. Using the meso-scale energy justice conceptual framework, questions about energy injustices in the LISDES program will be critically examined. For instance, what are the national unjust impacts associated with this program? who is most affected yet neglected? and how these energy injustices are embedded in Indonesia’s residential electricity system? (Sovacool et al., 2019).

To summarize, in this thesis, using energy justice as an analytical framework to examine issues that emerge from the LISDES program at the meso scale can help (1) comprehend the LISDES program's persistent issues at the national level and the reasons for them; (2) reframe the issues in question into energy injustices in order to make these issues more visible for related stakeholders; and (3) explore pathways that can address the energy injustices in question.

2.3 The core tenets of energy justice

This section begins by elaborating on aspects and discussions derived from literature for each core tenet. It is then followed by descriptions of the key elements that will be used to investigate distributive, procedural, and recognition injustices in the case study of this thesis: Indonesia's rural electrification (LISDES) program.

2.3.1 Distributive justice

"Distributive justice deals with the distribution of material outcomes, or public goods such as resources or wealth, and public bads such as pollution or poverty" (Sovacool & Dworkin, 2015, p. 437). Jenkins et al. (2016) and McCauley et al. (2013) specified this definition of distributive justice for energy sector,

wherein distributive justice refers to both the physical distribution of environmental costs and benefits, as well as the uneven distribution of associated responsibilities. Jenkins et al. (2016) elaborate on the manifestation of distributive justice for the energy sector by emphasizing distributive justice as a call for the equitable distribution of benefits and ills resulting from the physical siting of energy infrastructure on all members of society regardless of income, race, or gender. The benefits are represented by energy access, while the ills may emerge from the risks that come from the energy infrastructure (Sovacool & Dworkin, 2015). Risks in the energy sector are described as the probability of the energy infrastructure can cause adverse effects on health and the environment, such as pollution or occupational safety issues for workers in power plants (van Leeuwen & Vermeire, 2007). According to this school of thought, distributive injustice for the electricity sector includes aspects of unequal distribution of costs (risks) and benefits (access to electricity).

Fan et al. (2022) use rural heating as an example of distributive justice. China's rural household heating energy reform aims to reduce air pollution emissions. It is accomplished by replacing coal with natural gas as the primary fuel in Chinese household heating. Unfortunately, such an intervention has resulted in high heating costs for low-income families. As a result, many low-income Chinese households are unable to participate in energy reforms, leading them to be unable to have access to sufficient, affordable, and reliable heating services. Such a situation demonstrates the unequal distribution of energy access (benefits) in society. When it comes to the distribution of energy risks (costs), Heffron (2021) gives an example of cobalt mining activities in the Democratic Republic of Congo (the DRC). Despite the fact that residents living near mining sites face significant health risks as a result of waste or pollution produced by cobalt mining operations, it is clear that the government is doing little to mitigate such risks. This situation is exacerbated by the fact that the majority of the revenue generated by cobalt mining activities only benefits foreign companies who live far away from the mining spots.

2.3.2 Procedural justice

Procedural justice refers to networks of interaction and deliberation as a result of “a fluidity of movement of people, ideas, and perspectives across the boundaries of institutions and between differentiated elite and lay spaces” (Walker, 2009, p. 627). Walker and Day (2012) describe the three aspects of procedural justice: (1) access to information; (2) access to and meaningful participation in decision-making; and (3) access to legal processes for achieving redress or challenging decision-making processes.

Walker and Day (2012) further delineate procedural justice by giving examples using the case of the UK energy policy. When it comes to information access, statistics that depict the country's fuel poverty situation have been actively captured by the media, keeping the issue of fuel poverty on the public and political agenda (Walker & Day, 2012). In terms of decision-making participation, campaign activities carried out by a diverse range of local groups to ensure proportionate aspirations between actors from the supply and demand sides in the UK energy policy have demonstrated a key example of this aspect (Walker & Day, 2012). For access to legal process, the establishment of the legal standard to ensure the provision of energy in England and Wales can free people from fuel poverty was introduced by FPEEG (the Fuel Poverty and Energy Efficiency Group), which is a coalition of cross-party in the Member of Parliaments (MPs) and industry stakeholders (NEA, n.d.)

2.3.3 Recognition justice

According to Walker (2009, p. 615), recognition injustice can emerge from “the processes of disrespect, insult, and degradation that devalue some people and some place identities in comparison to others”. Schlosberg (2003) describes that these various forms of recognition injustice emerge due to a failure to recognize or misrecognize demeaning behaviors. Fraser and Interruptus (1997), corroborated by Jenkins et al. (2016) describe three key aspects of recognition injustice: (1) cultural domination; (2) non-recognition; and (3) disrespect.

The dominance of Western energy science in the global energy discourse demonstrates a cultural dominance in energy. Because of this dominance, global policy planning and even local policymaking in many Global South countries tend to adopt Western socioeconomic characteristics used as aspects in the formulation of energy planning in Western energy science, which may not be suitable for many Global South countries. (Yazar & York, 2022). Jenkins et al. (2016) use the UK's fuel poverty case study to illustrate the non-recognition aspect of recognition injustice. The failure of the UK government to recognize the motivations behind the energy consumption patterns of vulnerable groups of society, such as elders and chronically ill people, has led the government to incorrectly label fuel poverty as a 'knowledge deficit' problem. In this case, a knowledge deficit refers to a lack of understanding about the importance of energy efficiency. As a result, the government's strategies for fuel poverty include, inter alia, workshops to provide groups of societies with sufficient knowledge about energy efficiency. It was later found out that this vulnerable group of societies has a greater reliance on high room temperature compared to other groups in society has caused them to consume more energy than other groups. Failing

to recognize this finding has resulted in the government framing the situation of fuel poverty in the UK in a less accurate manner. As a result, the strategies that emerge are prone to missing critical insights that will yield more effective results.

Jenkins et al. (2016) use the case of wind power plan generation projects in the UK to illustrate the disrespect aspect of recognition injustice. The travesties of developers and investors labelling local anti-windfarm campaigns as "self-interested and misinformed individuals" exemplify disrespect (Jenkins et al., 2016, p. 177). This disrespect has been attributed to the misrecognition of developers and investors who believe that these campaigns are driven due to the locals' 'knowledge deficit' when it comes to renewable energy development, such as wind power plants in the UK. In contrast, anti-windfarm campaigns are on the rise in the UK, owing to locals' mistrust of corporations, who believe that these projects will only benefit these corporations. Unless and until such a misunderstanding among locals, developers, and investors is corrected, any interventions aimed at increasing local awareness of renewable energy development will be counterproductive.

2.4 The analytical framework of energy injustices in relation to the LISDES program

This section will go over the aforementioned aspects of distributive, procedural, and recognition injustices in greater detail, in order to make them applicable for the LISDES program. In the context of the LISDES program at meso scale or national level, there are two dominant energy injustices that emerge: poor electricity access and unequal electrification ratio between provinces in Indonesia (Sambodo et al., 2021). Poor electricity access refers to a lack of reliable and affordable access to electricity in households to meet basic electricity services and regional average over time (IEA, 2017). Electrification ratio, on the other hand, refers to "the comparison between electrified household and the total household" (Secretariat General National Energy Council, 2019, p. 68).

Drawing from the aspects of each core tenet of energy justice that were discussed before, distributive injustice may emerge from (1) unequal income to pay electricity bills; (2) uneven quality of electricity services; and (3) unequal distribution of risks connected to the electricity infrastructure. When it comes to procedural justice, energy injustices may emerge from inadequate access to informational disclosure on the problems and solutions within the scope of the LISDES program. The domination of PLN "which holds the rights of first refusal on all new electricity generation capacity" also leads to limited meaningful participation from non-state actors, such as private actors, that wish to contribute in the rural electrification program (Setyowati, 2021, p. 5). In terms of access to legal processes for challenging decision-making

processes, Setyowati (2021, p. 6) gives an example of the independent private producers (IPPs) in Indonesia. In providing more electricity access to villages in Indonesia, many small IPPs are being pressured to sign PPA (power purchase agreement) by the government without giving these IPPs enough chance to fully comprehend "their terms or their implications" in the agreement. Thus, procedural injustice in Indonesia's rural electrification program includes elements of (1) inadequate access to informational disclosure on the problems and solutions of the program; (2) lack of meaningful participation; and (3) limited access to legal resources to challenge decision-making process in the program. Setyowati (2021) describes that an inability to recognize power relations and local social structure in an ethnically diverse country like Indonesia can lead the LISDES program failing to recognize who should receive the benefit of the program. With this in mind, recognition injustice in Indonesia's rural electrification program can be identified from (1) cultural domination, (2) non-recognition, and (3) disrespect.

It has been argued that the heart of the debate in energy justice revolves around distributive justice, which is an equal distribution of energy costs and benefits (Walker, 2009; Heffron, 2021). Procedural and recognition justice, on the other hand, delve into the socioeconomic relations that determine in what way and to what extent the distribution in question can be equal. Therefore, in the following figure, the elements of distributive justice are put at the center of the framework with the elements of procedural and recognition justice on the right and left side of it. Drawing from this, an analytical framework of energy injustice in Indonesia's rural electrification (LISDES) program is proposed as follows:

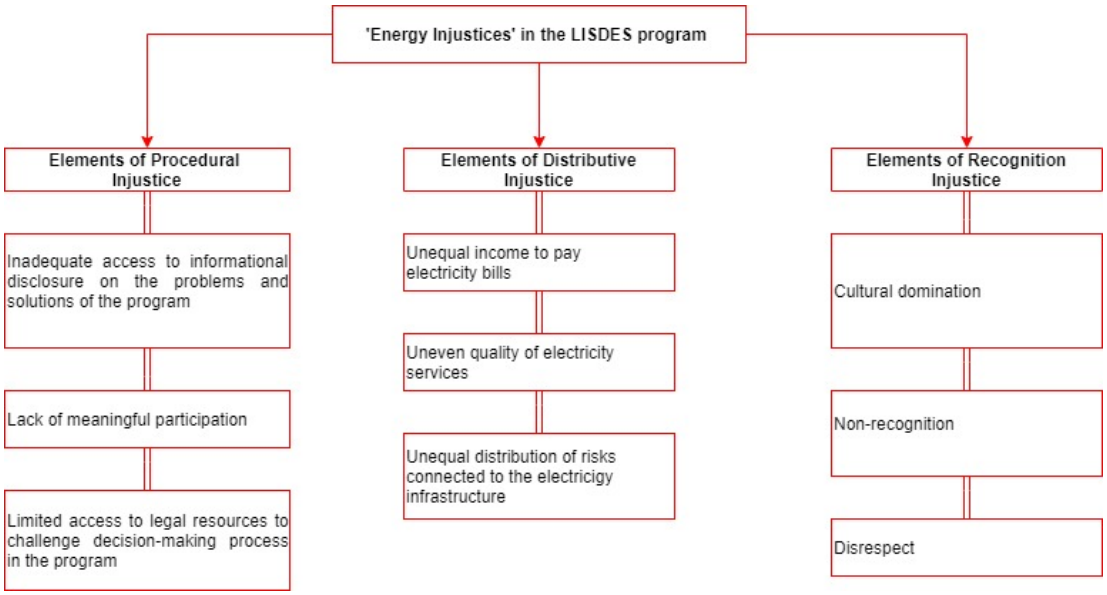


Figure 2. The analytical framework of energy injustices in relation to the LISDES program (Author, 2022).

3. Methodology

3.1 Research design

This chapter presents the data collection and analysis process for generating knowledge relevant to answering this thesis's research questions. Qualitative research was selected as an approach in this thesis because it becomes the focus of this thesis to use energy justice as a concept to examine issues in the LISDES program (Boeije, 2010). The concept of energy justice was used to explain issues that emerge from the program through textual descriptions and key actors' perspectives, without making strong claims about generalizability to other similar cases (Boeije, 2010; Emonds & Tamas, 2021).

In this thesis, document analysis and semi-structured interviews were conducted as the methods to answer the first and second sub-questions. The combination of both methods enables this thesis to maintain a sufficient scope of the required data collection process; while remaining flexible enough to pursue new leads in order to develop key findings relevant to answering the research questions of the thesis. Document analysis aided in systematically discovering valuable knowledge bases relevant to the LISDES program (Kayesa & Shung-King, 2021). This knowledge base was then used as guidance to pursue new leads through semi-structured interviews that were critical to developing key findings. Insights generated from answering the first and second sub-questions were used to answer the third sub-question. Finally, the knowledge generated from answering the sub-questions was used to answer the main research question of this thesis.

3.2. Data collection

3.2.1. Document analysis

Six documents were utilized as one data source in this thesis for constructing interview questions and also generating thesis findings. At the time the thesis data was collected, there were no full publications that provide a detailed description of the LISDES program. Therefore, this thesis relied on six different documents as its data resources, divided into four categories: government documents, reports, one book, and a case summary. The reasons why the aforementioned documents were selected in the thesis are because they provided a more comprehensive analysis of the LISDES program than the findings related to the program that is available in other resources, such as news. Such a selection of documents has assisted the author to develop a thorough understanding of the program's situation, helping the author to sufficiently develop an essential knowledge base to answer the research questions of the thesis. Further,

most of the institutions that prepared the documents used for analysis in the thesis are also directly involved in the LISDES program. Therefore, findings related to the LISDES program collected from these documents demonstrate relatively high confidence.

The government documents were sourced from two prominent state actors in the LISDES program: (1.) the Electricity Business Supply Plan (RUPTL) of PLN for 2021 to 2030 approved by MEMR (2021) and (2.) PLN's annual report (2020). For reports, this thesis used two documents from the World Bank (2005) and EnDev Indonesia (2020) that outline a comprehensive study of the electricity framework in Indonesia, challenges and lessons learned, especially for rural areas. Lastly, due to their overarching explanations of energy injustices, particularly at the community level, a book by Sambodo et al. (2021) and a case summary of IBEKA by Cannon et al. (2020), a leading non-profit organization that advances the LISDES program, were also included in the thesis. Insights generated from document analysis were used to generate interview questions and answered the first sub-question of this thesis: **what role(s) does the national government play in the LISDES program to improve electricity access in Indonesian rural communities?.**

3.2.2. Interviews

As the second method of this thesis, semi-structured interviews were conducted to elicit perspectives from key actors in Indonesia, in order to generate insights into various aspects that may contribute to energy injustices that emerge from the LISDES program. An online setting was found helpful in facilitating both informants and author to get focused, by narrowing down their sight on the screen instead of getting distracted by looking at many things that might occur if the interviews were conducted in person. Interviews were conducted in Indonesian for 60 minutes per informant. A semi-structured method of a length of an hour was sufficient to give enough time for informants to recollect key facts and also construct vital perspectives related to the LISDES program. For instance, the distinctive socioeconomic characteristics among rural communities that heavily rely on daily income, day-to-day expenditure; and also the multidimensional aspects of electricity access for households according to the multi-tier framework by Bhatia and Angelou (2015) were touched upon by some of the informants of the thesis.

The final selection of informants in this study was based on their direct involvement in the program through business, research, and employment. The author extended an invitation email for interviews with potential informants after viewing their profiles on news and documents utilized for analysis in the thesis. The author also sent the invitation email through the author's professional network, such as LinkedIn and relevant mailing lists. Interviews conducted in this study complied with ethical principles as delineated by the Data Management Policy of the Environmental Policy Group, Wageningen University. Therefore, before the interviews, all informants were asked for their consent to record the interviews. To ensure their anonymity, all names of the informants were coded and their statements were presented either in quotes or in processed forms. From the 16th of March to the 24th of April, 2022, 55 invitation emails were sent to key actors involved in the LISDES program. Of this pool, the 17 eventual thesis informants were chosen and were interviewed from the 4th to the 29th of April, 2022. Using a simple random sampling method, each of the 55 invitees had an equal chance of being chosen as the informant for this thesis (Emonds & Tamas, 2021). As a result, data collected from the final list of 17 thesis informants was relatively sufficient to reduce confounding effects caused by the researcher's own bias or missing key informants due to declined interview invitations. The list of informants of this thesis is described as follows:

A.) Government: three informants of the Ministry of Energy and Mineral Resources of the Republic of Indonesia (MEMR) and one informant of the state electricity company (PLN) represent government informants because the state legally mandated these two institutions as the prominent state actors to lead the program (MEMR, 2021). Therefore, facts and perspectives collected from interviews conducted with these two actors helped the author to build fundamental knowledge regarding the program, such as the main actors involved in the program, the funding scheme, the law, and regulation frameworks behind the program.

B.) Secondary actors are those who are affected indirectly by the LISDES program. Nonetheless, the expertise, work experience, and diverse insights that these actors gained from years of direct involvement in the program assisted the author in viewing the program through a comprehensive lens. Of a total of nine secondary actors who were interviewed in this thesis, five informants are academicians; one informant comes from Lentera Bumi Nusantara (NGO); two informants are from the People Centered Business and Economic Institute or IBEKA (NGO); and one informant represents UNDP Indonesia (international donor agency).

C.) Primary actors are those representing rural communities in the LISDES program. These actors included two informants of Patriot Energy who served as the program's facilitators, living in the communities; one informant of BUMDes Bersinar Desaku, the program's beneficiary while also led a village-owned enterprise and had successfully optimized the benefits of a communal solar power plant located in the village of Muara Enggelam, Kutai Kertanegara, East Kalimantan; and one informant of CV Hidro Cipta Parakara, a leading micro hydro contractor in Indonesia.

Interview questions included relevant thematic issues related to the informant's engagement and point of view about the LISDES program. Questions of interviews were also asked to collect informants' perspectives on energy injustices that emerge from the LISDES program, and how these energy injustices affect the program's ability to improve rural communities' access to electricity. For note-taking purposes, interviews were recorded. The interview records were then transcribed and analyzed before being translated to English to generate key findings answering the second sub-question of this thesis: **what are the perspectives of the key actors on energy injustices that emerge from the LISDES program?**.

3.3. Data analysis

Along with interview transcripts, collected data from the document analysis were analyzed by the researcher to assess in what way and to what extent the core tenets of energy justice are observable from the LISDES program. The Atlas.ti program Version 9 was used in this thesis. The collected documents were uploaded in the Atlas.ti program version 9. It was then followed up by theory-informed coding wherein the identified elements from the analytical framework were used as analytical categories to labelling the description of (1) the role(s) that Indonesia's national government plays in the LISDES program; and (2) perspectives from key actors in Indonesia about energy injustices that emerge from the LISDES program. This process aims to ensure insights collected from document analysis and interviews are not influenced by preconceived notions and biases of the researcher in this thesis (Delve, n.d.). In this thesis, The descriptions of the role(s) that Indonesia's national government plays in the LISDES program and perspectives from key actors in Indonesia about energy injustices that emerge from the program were marked and labelled in a descriptive manner in accordance with the elements of the analytical framework. The results of theory-informed coding were examined to see whether there were correlations between codes. This process was carried out by axial coding, which organized the codes from the theory-informed coding in terms of causality, context, and coherence (Vosloo, 2014). A list of categories of codes was generated from the axial coding. Finally, selective coding was used to determine whether there were any

additional correlations or contrasts between categories or if there is an additional correlation with external factors that had not been identified in this thesis (Vosloo, 2014).

3.4. Summary

Drawing from the process of data collection and analysis that have been presented above, a summary of the whole research design that was conducted in this study is presented by **Figure 3**.

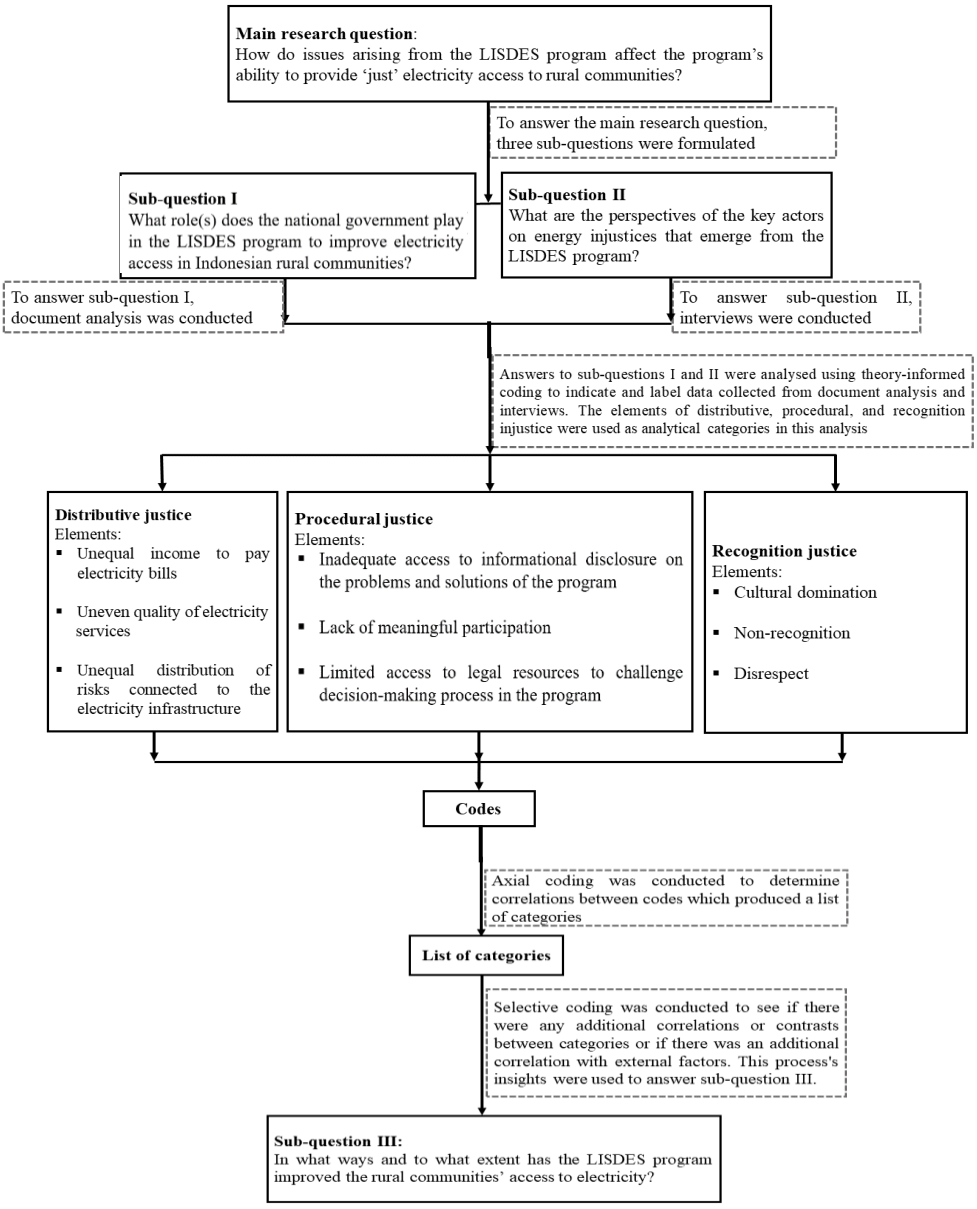


Figure 3. A diagram that summarizes the whole research design that was undertaken in this thesis (Author, 2022).

4. Results

This chapter will discuss the key findings from the research's document analysis and interviews. To address the three sub-questions in this thesis, there are three sections that will be discussed in this chapter. The role(s) that the Indonesian national government plays in the LISDES program is presented in the first section. It is then followed by analyzing the perspectives on energy injustices held by key actors in Indonesia as described in section two. Finally, section three will present in what way and to what extent Indonesia's LISDES program has improved the rural community's access to electricity.

4.1 The role(s) of Indonesia's national government in the LISDES program

4.1.1 Indonesia's national government, the sentinel of the LISDES program

"Indonesia's rural electrification program is a government and PLN program to electrify rural communities. Its implementation is being prioritized in provinces with low electrification rates. The electrification strategy is carried out by extending the existing distribution lines. However, for areas that are still isolated and cannot be served by the existing grid, power plants will be built with a focus on local renewable energy" (MEMR, 2021, p. II-46).

The preceding paragraph was taken from the PLN's Electricity Business Supply Plan (RUPTL) for 2021-2030, which was approved by MEMR (2021). This document describes the special mandate imposed on the government as the sentinel of the program, leading the implementation of Indonesia's LISDES program, as well as the strategies for carrying it out. This sentinel role of government in Indonesia's LISDES program is driven by the grounds that "the state controls production branches that are important to the state and have an impact on people's livelihood" as defined by article 33 of the Constitution of the Republic of Indonesia (Constitution of the Republic of Indonesia, 1945, p.25). The sentinel role of the national government on electricity was further specified by article 3, verse 1, Law No. 11 of 2020 on job creation that replaced Law No. 30 of 2009 on electricity, "the provision of electricity is controlled by the state whose operation is carried out by the central government and local governments based on the principle of regional autonomy in accordance with the norms, standards, procedures and criteria set by the central government" (Job Creation Act, 2020, p. 246).

Furthermore, the national government plays a sentinel role in the LISDES program as a response to the unfeasible business model of the program, which makes the program unattractive to many non-state actors to take a lead. An informant of UNDP Indonesia emphasized this unfeasible business model as an entrenched challenge to Indonesia's rural electrification program: "[…] it is indeed one of the challenges

in the rural electrification program, especially the business model. The demand is small, the location is far away, and the capital is large, but the purchasing power is also limited. The business model is indeed daunting" (UNDP Indonesia, personal communication, April 15, 2022).

Another informant (Academician#1) corroborates the UNDP Indonesia informant's statement by underlining that the LISDES program is unfeasible from a business standpoint due to the challenges that emerge from the complex geographical conditions in many rural areas of Indonesia (Academician#1, personal communication, April 9, 2022). As a result, the LISDES program has been viewed as a 'state endowment' given to fulfil the state's mission of providing equal electricity access across Indonesia, rather than profit-generating activities that may be more appealing to non-state actors (Academician#1, personal communication, April 9, 2022). Given this situation and the obligation of state actors to provide control over public utilities such as electricity, the national government through MEMR must play a sentinel role in the LISDES program (MEMR, personal communication, April 15, 2022). The sentinel role of the government is evident not only in the LISDES program's planning and regulation led by MEMR but also in the program's implementation managed by the state electricity company: PLN. The following section will further explain this matter.

4.1.2 PLN as the driving force of the LISDES program

Prior to 2015, the implementation of the LISDES program was mainly funded by MEMR's budget, however, such arrangements were modified later on. Currently, the major sources of funding for the rural electrification program come from the PLN's budget (APLN), the state equity participation (*Penyertaan Modal Negara* or PMN), and the state budget or APBN Funds of MEMR through the Directorate General of New, Renewable Energy and Energy Conservation (DG NREEC) to support Indonesia' rural electrification program, by building small-scale power plants using local renewable energy resources (MEMR, 2021; MEMR, personal communication, April 15, 2022). The percentage of each funding source was neither specified in the documents used for analysis in this research nor in interviews with government actors.

The aforementioned funding scheme modification was a government's response to their limited capacity to control program implementation down to the sub-villages in Indonesia. By carrying out such an arrangement, the government authorizes more power to PLN, to get more involved in the program planning and further dominate the program implementation. Such a decision stems from the government's recognition of the larger control capacity of PLN as compared to the central government, in managing the

program implementation up to the sub-units of rural areas in Indonesia (Academician#1, personal communication, April 9, 2022).

Despite the aforementioned premise, there are arguments in favor and against such an arrangement. There are two prominent points that were raised by informants of the thesis. First, by delegating more authority to PLN to carry out the LISDES program, MEMR is expected to better distribute its resources to focus on rural electrification-related plans and regulations, while also carrying out other energy programs in Indonesia (Academician#1, personal communication, April 9, 2022). Nevertheless, MEMR also recognizes a concern if such an arrangement shall obscure the regulating role of MEMR due to the 'increasing power' authorized to PLN in the program implementation (Academician#1, personal communication, April 9, 2022). Second, from PLN's standpoint, such an arrangement also adds more complexities to the position of the PLN as an organization. As a business entity, PLN is expected to maintain a 'healthy financial portfolio' to attract investors to fund the projects in the LISDES program (PLN, personal communication, April 10, 2022). These projects often require a large amount of funding due to the logistic transportation costs to reach remote locations of the program. However, as a state company, PLN is also mandated to provide equal electricity services throughout the country, while simultaneously meeting the wide range of demands from the government in the electricity sector. These demands, sometimes, are not in sync, causing the PLN to appear to be a 'single fighter', ensuring the company has enough resources and capacities to meet all demands in Indonesia's electricity sector. The informant of PLN exemplified this wide range of demands as follows:

> "[…]when asked whether electrification is being pursued, (yes) being pursued, that's the focus. Then the issue of climate change is being pursued, it is also being pursued, maybe that's the only thing that becomes a concern, […]how to divide the tasks into sub-units of PLN.[...]maybe starting in 2005, PLN tried to optimize costs by reducing diesel power plants [*Pembangkit Listrik Tenaga Diesel* or PLTD] because the cost was very large. It was replaced by the electric steam power plants [*Pembangkit Listrik Tenaga Uap* or PLTU] generated by burning coal. By multiplying PLTUs, the operational cost can be lower. However, along with the efforts of PLN itself to commit to climate change, now coal will be phased out in 2060. […] of course, this is a very radical change, [...] because what we relied on was that at first, the coal power plant was an effort to reduce tariffs, then that too had to be closed" (PLN, personal communication, April 10, 2022).

As a result of granting the state electricity company (PLN) additional 'authority' to be the driving force behind Indonesia's LISDES program, the government has restated their sentinel role in the program. To a

few thesis informants, such an additional authority conferred to PLN was seen as the state company's dominance, which serves as an additional disincentive for non-state actors to contribute to the LISDES program. However, the majority of informants who participated in this research saw such additional authority on PLN as recognition of the state company's critical role in the LISDES program, with the breadth of PLN's capacity to control program implementation down to the small units of communities in Indonesia being emphasized as the key to the program's success.

4.1.3 The strategies of Indonesia's national government in the LISDES program

According to MEMR's informants, there are 293 villages in Indonesia that are not electrified by PLN, non-PLN, or LTSHE (energy-saving solar lamp) until the first quarter of 2022 (MEMR, personal communication, April 15, 2022). PLN electrification denotes that the villages have already been connected to PLN's electrical grid, while non-PLN electrification indicates that the communities obtain their electricity access from diesel generators, local renewable energy (small-scale solar panels or micro hydropower plants for communal use), or a combination of the two (hybrid) (MEMR, personal communication, April 15, 2022). The energy-saving solar lamp (*Lampu Tenaga Surya Hemat Energi* or LTSHE) was a PLN electrification program carried out from 2017 to 2019, for villages that are up to three years away from being reached by PLN's electrical grid (PLN, 2020). This figure of the pitch-black villages, when expressed as a percentage, as compared to the electrified rural areas, is extremely small, causing the electricity needs of the communities living in these villages to be frequently overlooked. The percentage of non-electrified villages is presented in the following figure**.**

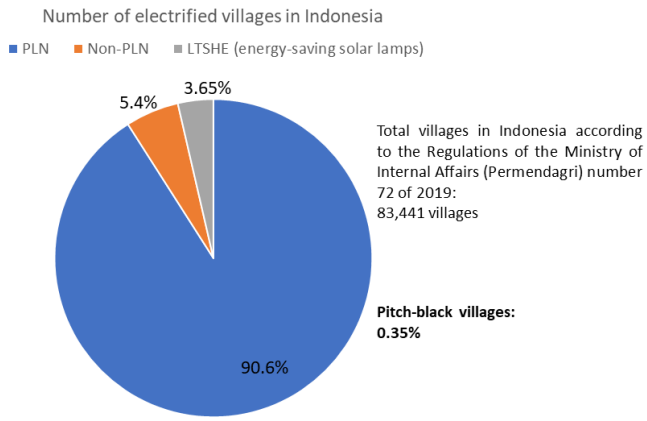


Figure 4. The proportion of the pitch-black villages in Indonesia in comparison to electrified rural areas throughout the country (Author, 2022) [1].

[1] Generated from an interview conducted with informants of MEMR (MEMR, personal communication, April 15, 2022).

The complexity of Indonesia's vast geographical region has been cited by the majority of informants of this thesis, as a major impediment to the government's ability to improve electricity access across Indonesian villages. A PLN's informant describes this situation as follows:

> "[…]there are even areas, such as in West Sumatra. They don't use the village system, they use the *Nagari* system, which is under the sub-district. Under *Nagaris*, there will be *Jorongs*. So, there are villages, there are sub-villages, and there are also other sub-villages under them: hamlets. Now, this is what then poses a challenge for PLN. Therefore, in general, we can say that almost 100% of villages in Indonesia have already been electrified. But if you ask whether all the smallest structures of the communities have access to electricity, it is still difficult […] I myself have found several conditions where it is indeed extremely daunting, both technologically and corporate programs to address these issues, especially when we find areas, such as hamlets, that are extremely remote" (PLN, personal communication, April 10, 2022).

The complexities of Indonesia's geographical conditions and their intricacies, as illustrated by PLN's informant above, become significant challenges that impede the LISDES program's progress. Furthermore, the existence of many hamlets scattered throughout Indonesian villages that are not always clearly identified has added to the program's challenges in improving electricity access throughout Indonesia's rural areas (MEMR, personal communication, April 15, 2022). As a result, it is unavoidable for the government to construct an objective in the LISDES program that is rather simplistic, that is, to immediately provide affordable electricity access to as many villages as possible. Driven by such an objective, the government employs the electrification ratio and the ratio of electrified villages as primary indicators to measure the LISDES program's progress.

According to an interview with MEMR's informants, the electrification ratio describes the number of households that have access to electricity as compared to the total number of households in Indonesia (MEMR, personal communication, April 15, 2022). The ratio of electrified villages describes the number of villages that have electricity access as compared to the total number of villages according to the applicable regulations of the Ministry of Internal Affairs (Permendagri) (MEMR, personal communication, April 15, 2022). The source of electricity used in the electrification ratio and the ratio of electrified villages is either PLN, LTSHE, or non-PLN (MEMR, personal communication, April 15, 2022). An informant (Academician#4) claims that the government's indicators in the LISDES program have sufficiently reflected energy justice. It is because such indicators have helped rural communities to have access to more affordable and accessible electricity as opposed to the pre-LISDES program

conditions, whereby rural communities did not have any access to electricity at all or had access to it at a high cost (Academician#4, personal communication, April 4, 2022).

Unfortunately, the LISDES program's use of the electrification ratio and the ratio of electrified villages to gauge its progress has often caused the program to overlook energy injustices that develop at the community level. It is because such one-dimensional indicators do not sufficiently incorporate the multidimensional electricity need of the rural communities. As the author clarified this situation with informants of MEMR, they confirmed that the government had already recognized the situation. However, due to the disproportionate ratio between the complexities of Indonesia's geographic conditions and the government's limited capacity (funding and expertise) to address the issues, the government is forced to comply with the scale of priorities. MEMR's informants describe this situation as follows:

> "[...] Of course, we want it to be ideal; certainly, that is, electricity is available 24 hours a day, reliable, and there are no difficulties. That's what we keep working on. But, there are constraints; our targets [the number of pitch-black villages] are still numerous. [...] That is why in preparing plans and initiatives; we use a priority scale. Things [electrification targets] that we can achieve right away, we will do it immediately. Better than nothing, right?" (MEMR, personal communication, April 15, 2022).

Thus, in carrying out their role as the sentinel of the LISDES program, Indonesia's national government aims to immediately provide affordable electricity access to as many villages as possible. To achieve this objective, Indonesia's national government set strategies for the program as follows. First, electrifying the 293 pitch-black villages. Second, converting non-PLN customers to PLN customers in order to provide them with more affordable and reliable electricity access as compared to diesel generators, and lastly, improving the quality of electricity services throughout Indonesia (MEMR, personal communication, April 15, 2022). To fairly measure the progress of such priorities, the government employs the electrification ratio and the ratio of electrified villages as indicators in the LISDES program.

4.2 The key actors' perspectives on energy injustices that emerge from the LISDES program

In this section, the analytical framework of energy injustice in relation to the LISDES program as presented in **Figure 2** will be used to analyze the perspectives on energy injustices held by key actors in Indonesia. Such perspectives on energy injustices are divided into three categories: distributive, procedural, and recognition injustice.

4.2.1 Distributive injustice

In this thesis, there are three issues that were identified as distributive injustice in the LISDES program: (1.) unequal income to pay electricity bills; (2.) uneven geographical conditions; and (3.) unequal distribution of population. Those issues were denominated as distributive injustice because they demonstrate violations of the equitable distribution of ills and benefits of electricity access to all members of communities, regardless of income, race, or gender, as described by Jenkins et al. (2016)**.** In comparison to the elements of distributive injustice presented in **Figure 2**, there are differences between the former and the issues identified in this thesis's data collection. Such differences will be further analyzed in **5. Discussion.**

The ills of the LISDES program may emerge from the program's risks to health and the environment. However, because the program is carried out by extending PLN electrical grid or employing local renewable energy, the risks to health and the environment are relatively less significant as compared to the development of new power plants that massively occur in urban areas. Instead, the LISDES program assists in mitigating the environmental and health risks correlated with fires, which typically occur in rural areas where kerosene-fueled Pelita lamps or torches are used for lighting (Sambodo et al., 2021). This is carried out by replacing the aforementioned lighting sources with incandescent light bulbs (Patriot Energi, personal communication, April 4, 2022). As a result, neither the documents used for analysis nor the informants in the thesis identified the program's risks to health and the environment.

Nonetheless, EnDev Indonesia (2020) and Sambodo et al. (2021) described unequal income to pay electricity bills, to sustain the operation and maintenance of the LISDES program, as a critical issue to distribute equal costs of the program at the community level. According to a UNDP Indonesia informant, it is difficult to apply equal electricity tariffs to all households due to income disparities, particularly among the elderly and disadvantaged categories of communities. As a result, in some villages, some households are permitted to pay the electricity tariffs in full, while others are permitted to pay half the amount, or none at all, although living in the same village (UNDP Indonesia, personal communication, April 15, 2022). In some villages, due to the small numbers of poor households in the area, unequal income does not majorly impede the operation and maintenance of the program (UNDP Indonesia, personal communication, April 15, 2022). However, in other villages, income disparities have handicapped the implementation of the program due to a large number of poor households in the village which is not compensated by the program's small revenue (EnDev Indonesia, 2020).

When it comes to the benefits of the LISDES program—access to electricity—the majority of informants and documents used in this thesis highlighted two significant issues: unequal distribution of population and uneven geographical conditions. Sambodo et al. (2021) exemplified these issues using a case of two villages in the province of East Nusa Tenggara, Indonesia: Wewo and Lungar village. Despite the relatively close distance between these two villages to PLN's geothermal power plant (*Pembangkit Listrik Tenaga Panas Bumi* Ulumbu or PLTP Ulumbu), only Wewo village obtained grid electricity access in March 2014, while Lungar village has not yet received grid electricity access (Sambodo et al., 2021). Two major challenges that hinder equal electricity access in both villages are first, the winding and steep geographical conditions of Lungar village which lead the transportation access to the village to become difficult. Consequently, difficult transportation access has also caused the logistic cost of expanding the distribution line of the existing grid from PLTP Ulumbu to the village to be more expensive compared to Wewo village. Second, because of the great distance between households, electricity demand in Lungar villages is not offsetting the operational cost of procuring electrical grid use in the village. As a result, the overall provisional cost of electricity in Lungar village is higher than in Wewo village, making electricity procurement in Lungar Village unfeasible from a PLN standpoint (Sambodo et al., 2021). To meet their electricity demands in Lungar village, communities must rely on the PLN's Super Extra Energy Saving Program (SEHEN) for lighting and diesel generators for other electrical appliances. Due to the village's remote location and difficult transportation access from Lungar village to purchase diesel and pay SEHEN's monthly tariff to the specified location, communities have been saddled with higher overall costs than Wewo village in order to receive equivalent electricity access. Unequal electricity access due to unequal distribution of population and uneven geographical conditions as exemplified by the case of Wewo and Lungar village in East Nusa Tenggara is also prevalently evident in other rural areas of Indonesia. As a result, in the LISDES program, these two issues were identified as elements of distributive injustice.

4.2.2 Procedural injustice

Pertaining to procedural injustice, issues identified from the LISDES program are (1.) inadequate access to informational disclosure on the problems and solutions of the program; (2.) lack of meaningful participation of subnational actors; and (3.) lack of a comprehensive law and regulatory framework in place to protect private sectors in the program. There are differences between the elements of procedural injustice described in **Figure 2** and the issues uncovered during the data collection for this thesis. Such distinctions will be further analyzed in **5. Discussion**.

Asset ownership will be used as a prominent example in this thesis to explain the first two issues of procedural injustice that emerge from the LISDES program. It is because of evident examples of violations of two aspects of procedural justice in the asset ownership issue, that is, a violation of the access to information and meaningful participation in the decision-making process (Walker & Day, 2012; Sovacool & Dworkin, 2015). Unclear asset ownership has been a major impediment to many interventions aimed at sustaining government-owned rural mini-grids in the LISDES program (EnDev Indonesia, 2020). It is because of the poor clarity as to the distribution of responsibilities and resources between actors to sustain the operation and maintenance of the program.

An informant of UNDP Indonesia described that if the budget of the program comes through the MEMR's budget, after the development of the physical infrastructure, the asset will be handed over to the MEMR agencies at the provincial level. Therefore, all financing to operate and maintain the infrastructure will be disbursed from the provincial budget (UNDP Indonesia, personal communication, April 15, 2022). However, if the budget comes from non-state actors, such as donor agencies, the discussions about asset ownership may take some time because they really depend on the assessment of the donor agencies and also the observation data on the field (Patriot Energi, personal communication, April 4, 2022). As a consequence of such a handover arrangement, the emergence of uncertain moments at the subnational level becomes inevitable.

The aforementioned 'uncertain moments' may last up to one year as described by the majority of the informants in this thesis. Such uncertainty has created a 'pause' in the crucial part of the implementation of the LISDES program: determining which actor(s) should be tasked with a monitoring task to ensure the operation and maintenance of the program's infrastructure. This situation is challenging for the subnational actors, such as the regional government agencies because they are less involved in the LISDES program's planning and procurement process than the national actors. It is difficult for them to carry out such a responsibility because it will affect their budget plan, which is also limited. To respond to such an uncertain momentum, the central government tends to prioritize the use of the state equity participation (PMN) in financing the LISDES program over donor aids (MEMR, personal communication, April 15, 2022). As a result, the role of non-state actors in the LISDES program becomes less visible, a role that may hasten the achievement of equal electrical services throughout Indonesia's villages.

Asset ownership has demonstrated procedural injustice from the consequences that emerge from the issue. First, actors at the subnational level have to deal with inadequate access to informational disclosure on the

problems and solutions of the LISDES program because it is not clear to them which actor(s) that should be contacted if they want to consult these matters with them. One of the informants of Patriot Energi described this situation as follows: "[…] at least one poster that shares a contact number of MEMR, should there be any problems [with the rural mini-grids]. It means that there should be a framework or whatever the term is, and the guidelines [about the problems and solutions of the LISDES program]" (Patriot Energi, personal communication, April 4, 2022). Second, asset ownership illustrates procedural injustice because it illuminates the lack of meaningful participation of the subnational actors in the LISDES program. The subnational actors in question include the state and non-state actors at subnational level. Due to the unclarities in terms of who should bear the responsibilities to operate and maintain the program, it becomes unclear for actors at subnational level, as to in what way and to what extent they can meaningfully participate in the program. As the consequences of this situation, two major phenomena will emerge at the community level: stalled projects and thefts (Lentera Bumi Nusantara, personal communication, April 6, 2022). An informant of BUMDes Bersinar Desaku sheds light on this situation as follows:

> "So the government [central government] must pay close attention if they are to build an infrastructure for the LISDES program and consider its long-term sustainability. It means they must plan ahead of time how they will sustain the program's implementation for the next five years, whether through a training program or another funding scheme. We [rural communities] lack the capacity to carry out such tasks if the government leaves everything to the villages. If this matter is not carefully planned, if the infrastructures have problems, the villages are not prepared to deal with the problems, and thus the infrastructure is left unused [stalled projects], or worse, the community steals the infrastructure components" (BUMDes Bersinar Desaku, personal communication, April 13, 2022).

Lastly, lack of a comprehensive law and regulatory framework in place to protect private sectors in the program. "The LISDES program is implemented within the framework of an overall electricity system planning and does not worsen network performance and basic costs of supply" (MEMR, 2021, p. II-30). The aforementioned distribution system development strategy of the LISDES program implied the lack of tailor-made planning with a comprehensive law and regulatory framework in the program. Considering the unusual challenges of the program—complex geographical conditions and distinctive socioeconomic situations—a comprehensive law and regulatory framework specifically made for the LISDES program becomes crucial.

As a result, there are two significant deficiencies in Indonesia's current legal and regulatory framework for the electricity sector that have a direct impact on the LISDES program. First, there is an insufficient law and regulatory framework to protect private sectors competing with PLN in providing electricity access to rural Indonesia (World Bank, 2005). When PLN's grid access finally enters villages, many rural communities shift to become PLN customers because of its more reliable electrical services and cheaper subsidized electricity pricing as compared to the electricity generated by non-PLN producers (private actors). Due to the program's absence of a comprehensive legal and regulatory framework, it is difficult for these private actors to fully comprehend in what way and to what extent they can 'question' the decision-making of the business areas for the electricity sector in Indonesia. Second, existing rules allow PLN to obtain electricity from private sectors that use renewable energy as their source. However, the capacity of a renewable energy generator must be less than 1.0 MW, and the price is only 60% of the PLN supply cost when connected to a low voltage grid, and 80% when connected to a medium voltage grid (World Bank, 2005). A strategy like this discourages large producers from investing in the LISDES program, leaving small producers as the majority of private actors in the program (World Bank, 2005). Unfortunately, the small capacity generated by this scheme (less than 1.0 MW) has made it difficult for small producers to generate significant revenue (World Bank, 2005). Of the aforementioned two prominent deficiencies, the private sectors become incapacitated to sustain the LISDES program, leading some of them to deal with bankruptcy (IBEKA, personal communication, April 7, 2022).

4.2.3 Recognition injustice

From interviews and document analysis that the author conducted in the thesis, recognition injustice was the least indicated category of energy injustice. Nevertheless, similar elements of the analytical framework to examine recognition injustices in the LISDES program, proposed in the **Figure 2**, were observable during the data collection of this thesis. They are (1.) a lack of understanding of the various meanings of electricity as the key to public welfare; and (2.) non-recognition of distinctive socioeconomic characteristics in various locations in Indonesia.

Since 1992, IBEKA has provided electricity access to approximately 54,000 rural communities across the country with renewable energy (Cannon et al., 2020). The informants of IBEKA delineated their strategies in carrying out the LISDES program as follows:

> "[…] electricity is only a tool, only the initial entry point to improving the public welfare. So the welfare in question doesn't mean they have to be more modern […]. We only give communities

more options to help them leverage their welfare if they want to. For example, Baduy people usually don't want electricity. We go there [rural areas], we disseminate [the LISDES program], the important thing is that we have given them a choice. If their choice turns out to be no, we don't need electricity, that's their choice. That's the fairest. […]" (IBEKA, personal communication, April 7, 2022).

This situation applies to some areas in Indonesia, where people choose to live contentedly without access to electricity, such as some of the Baduy people described by IBEKA's informants. However, in other areas of Indonesia, electricity is quite important to not only leverage public welfare but also a key factor to their survival as described by one informant (Academician#5) who spent a lot of years living in the rural communities:

"[…] even the ice cubes that we [urban people] throw away in restaurants, that's a privilege for fishermen, they protect the ice cubes with their shirts, why? Because the ice cubes can increase the selling price of their fish. Because they don't have electricity to produce ice cubes. They also have to travel far away to get the ice cubes, […], therefore they also have to pay for it two times the price in the city. So with electricity, things that are as simple as ice cubes, what we think are simple, but for them [fisherman] are complex. It could increase their capture. In some cases, the ice cubes were used as a payment from the fish cartels to determine the fish price that they will buy from the fisherman" (Academician#5, personal communication, April 26, 2022).

Such viewpoints of IBEKA's informants and Academician#5 have indicated multiple interpretations of electricity as the key to public welfare, as viewed by different social groups in rural communities, ranging from mere options to survival determinants. Such points of view are commonly disregarded, resulting in the LISDES program becoming underutilized by the program's beneficiaries.

For the second element of recognition injustice—non-recognition of distinctive socioeconomic characteristics in various locations in Indonesia—Academician#5 illustrated this issue using tariff collection as an example. Tariff collection has been observed in many cases of the LISDES program as a significant example which overlooks the socioeconomic characteristics of the rural communities (EnDev Indonesia, 2020).

"[...], if we say how much it costs when asked [installation tariff]? Oh, it's only 300-350K IDR...if it is subsidized, communities pay no more than 175-125K IDR. But they don't have money to cover that amount of tariff. This 'they don't have money to cover that amount of tariff', is the mindset of urban dwellers who are familiar with a saving concept. Why do we have the concept of saving?

> Because we [urban dwellers] get monthly income, However, the rural communities rely on their livelihood from nature, so they only understand the concept of daily income. […]. When it comes to tariffs, the communities do not want to pay because they simply don't have the money. Even if they have the money, they do not wish to spend it because of their daily expenditure process. The trick to this problem is to pay in daily instalments. However, the impatience that emerges from it, not because they [the implementers of the LISDES program] are impatient, but because they have to comply with the project timeline, which is what ends up bulldozing all the local aspects [socioeconomic characteristics]" (Academician#5, personal communication, April 26, 2022).

The majority of informants in the thesis identified reliance on daily income and day-to-day expenditure as distinctive socioeconomic characteristics among rural communities. If such particular socioeconomic characteristics are not recognized in the LISDES program's planning, communities will develop a mistrust of the program's implementers. The lack of trust is particularly visible when a financial contribution from communities is required to support the program's operation and maintenance activities (CV Hidro Cipta Prakarsa, personal communication, April 8, 2022). It is due to the community's entrenched view that the LISDES program is government assistance, and thus the community should not pay anything for the program's operation and maintenance (CV Hidro Cipta Prakarsa, personal communication, April 8, 2022). Such a view was also noted by Sambodo et al. (2021) using the case of remote villages in East Nusa Tenggara, Indonesia. In the long run, such mistrust has triggered demeaning behaviors, such as insults and threats, from a few social groups of communities toward the LISDES program's implementers (CV Hidro Cipta Prakarsa, personal communication, April 8, 2022). Rather than being a stand-alone element of recognition injustice as described by Fraser and Interruptus (1997) and confirmed by Jenkins et al. (2016), disrespect in the LISDES program thus emerges as a response of rural communities to the program's implementers, as a consequence of the second element of recognition injustice—non-recognition of distinctive socioeconomic characteristics in various locations throughout Indonesia.

4.3 Improving rural community's access to electricity through the LISDES program

The previous sections have described the sentinel role that Indonesia's national government has played to improve electricity access in Indonesian rural areas. Energy injustices that emerge from the program were also already touched upon by the thesis informants. Lastly, the lessons learned from the document analysis and insights from the informants involved in the thesis are described in this section to discuss in what way and to what extent such government's role and the energy injustices that emerge from the LISDES program have affected the electricity access of the rural communities.

4.3.1 The problematics of the electrification ratio and ratio of electrified villages

PLN has implemented a number of initiatives in the LISDES program, in order to improve rural community's access to electricity, particularly in disadvantaged, outlying, and frontier areas (3T Region) (PLN, 2020). For example, free electricity connections for disadvantaged communities, communal solar power plants, and rechargeable electricity tubes (*Tabung Listrik* or Talis) that harness the potential of available local energy sources such as solar, micro-hydro, or biomass (PLN, 2020). Such a focus on the development of physical infrastructures as PLN's implementation strategy in the LISDES program was also mentioned by PLN's informant in this thesis:

> "We also hope that in the future, the ecosystem will support PLN, making it easier to achieve the vision of the LISDES program. What kind of ecosystem is that? That ecosystem includes the increased ability of the domestic manufacturers, […] and new technologies that are more effective and less expensive" (PLN, personal communication, April 10, 2022).

In a congruent manner, to achieve electricity quality in sufficient quantities, of good quality, and at reasonable prices through LISDES program, the government will also focus on adding more generators, transmissions, and substations (MEMR, 2021). As described in the PLN's RUPTL that accelerating the achievement rate in the electrification ratio will be a major target for Indonesia government when it comes to improving rural communities' access to electricity (MEMR, 2021).

Given that the government's and PLN's primary focus are on physical infrastructure development, indeed, such a strategy has improved community access to electricity quantitatively at the national level, measured by the electrification ratio and the ratio of electrified village. Unfortunately, the ratio of the electrified villages and the electrification ratio are not sufficient to address the energy injustices that occur at subnational level. An informant of Patriot Energi described the problematics of the ratio of electrified village and electrification ratio in the LISDES program as follows:

> "[…]the problem is that the electrification ratio does not describe the quality of and access to electricity per household. […] the data [electrification ratio] is only presented in infographics. It's updated every year, but there's no information about quality, and there's no such thing as a data breakdown of the percentage [...] which means that the electrification ratio does not accurately describe the situation. There are many issues in the area that are not adequately described by a percentage close to 100%" (Patriot Energi, personal communication, April 4, 2022).

When the author asked another informant (Academician#4), the informant stated that the government has recognized such energy injustices that come from the use of electrified villages and the electrification ratio

as indicators in the LISDES program. However, given their limited capacity in terms of funding and expertise, the government perceived such issues as a stagnancy. "[…] It is a 'stuck situation', it [the LISDES program] is very difficult to execute, even though they [government] are given a budget, it is extremely difficult for them to execute the project. This happened about three years ago. Because our electrification ratio was already 99% at the time, so they argued that they have reached the level they can reach […]" (Academician#4, personal communication, April 4, 2022).

Until 2020, the electrification ratio in Indonesia has reached 99.20% (MEMR, 2021). This number indicates that only 0.8% of the total households in Indonesia do not have electricity access. In comparison to Indonesia's electrification ratio (99.2%), this number (0.8%) is extremely smaller. Furthermore, considering the government's priorities in other energy programs, it appears to the government that they have achieved the maximum level that they can in the LISDES program. Consequently, the government starts perceiving energy injustices in the program as a sterile situation that they hardly address. Therefore, the roles of the non-state actors become crucial in the LISDES program (UNDP Indonesia, personal communication, April 15, 2022). The following section will further explain this matter.

4.3.2 The crucial role of non-state actors in the LISDES program

The majority of the non-state actors questioned for this thesis underlined the necessity of understanding the community's socioeconomic characteristics as crucial enablers that determine the extent of the LISDES program may improve the community's access to electricity. One informant of UNDP Indonesia described this situation as follows:

> "When we discuss the ACCESS[2] [Accelerating Clean Energy Access to Reduce Inequality], it also becomes one of our weapons for entering the community level. As a result, we can collaborate [with the rural communities] to create regulations for the use of village electricity, such as tariffs, that take into account appraisals from indigenous peoples, traditional leaders, or embedded local wisdom" (UNDP Indonesia, personal communication, April 15, 2022).

Similarly to the UNDP Indonesia informant, the majority of informants in the thesis confirmed that the socioeconomic characteristics of the communities become significant in the LISDES program because they dictate the development aspirations that the communities wish to attain through the program. Such an emphasis on the socioeconomic characteristics was also raised by informants from IBEKA:

[2] A project that provides equitable and sustainable access to basic services to Indonesia's poorest and most vulnerable communities (ACCESS, n.d.)

> "[…]IBEKA always prioritizes social over technical preparation. It [social preparation] accounts for around 70- 60%, so it is greater than the technical preparation. For example, in the location where the LISDES program will be implemented, there were already engineers there before it was built, usually, social engineers who 'live in' that community. The function of this process is to determine what the community's passion is, and the kind of development that they truly need, dissemination will be gradually built in this manner. Is this truly necessary?, and does the community want to get involved?" (IBEKA, personal communication, April 7, 2022).

Overlooking the socioeconomic characteristics of rural communities in the LISDES program has created disparities at the community level. Such disparities emerge in the form of the community's poor understanding and expertise about the LISDES program, which disables the community to be prepared to sustain the program as a suitable solution for their development challenges. To address the disparities in question, the roles of non-state actors, such as NGOs and donor agencies, become crucial in the program (Academician#3, personal communication, April 29, 2022). Such roles have been demonstrated effective in addressing the disparities in question that emerge from the LISDES program in few rural areas through the development of managerial aspects of the program (EnDev Indonesia, 2020). The formation of a village management team (VMT) as one of the initiatives of the EnDev project (EnDev Indonesia, 2020) has exemplified the non-state actors' role in the development of managerial aspects of the LISDES program.

Village management team (VMT) is an organization at the community level with a legal basis, represented by BUMDes (village-owned enterprises) or cooperatives, to ensure the rural communities can sustain the operation and maintenance of the physical infrastructure of the LISDES program independently (EnDev Indonesia, 2020). In practices, the socioeconomic characteristics of the communities were fully collected through surveys and dialogue, to fully comprehend the aspirations of the development, and in what way electricity can be an effective means to help them achieve such aspirations (EnDev Indonesia, 2020). Training and the selection of VMT members were carried out by adopting the socioeconomic characteristics information collected as above (EnDev Indonesia, 2020). The EnDev program has created positive multiplying effects by focusing on the managerial aspects of the LISDES program. Such positive effects were not only helping the government achieve higher ratios of electrified villages and electrification but also sustaining the quality of electricity access that the community receives. It is carried out by strengthening the operation and maintenance of the infrastructure, through the formation of the Village Management Team (VMT). Unfortunately, development in managerial elements by fully adapting

to the socioeconomic characteristics of the communities is not widespread among the program's other implementers, particularly the government: “However, as I previously stated, not all programs are like this [centered on management development by fully adapting to the socioeconomic characteristics of the communities]. In government programs, it is not their responsibility to do so because their obligation only extends to infrastructure development” (UNDP Indonesia, personal communication, April 15, 2022).

At the community level, it is imperative to facilitate the communities to start recognizing the productive use of electricity. The productive use of electricity refers to expanding the use of electricity beyond lighting and small appliances, such as using electricity to motorize local businesses (EnDev Indonesia, 2020; Sambodo et al., 2021). An example of a village in the LISDES program that successfully optimizes the productive use of electricity to motorize the local economy has been pioneered by BUMDes Bersinar Desaku, a village-owned enterprise located in Muara Enggelam, the Regency of Kutai Kertanegara, East Kalimantan province (EnDev Indonesia, 2020). An informant of BUMDes Bersinar Desaku stated that the productive use of the electricity becomes the key to the success of sustaining the LISDES program in the village: “Thanks to the solar power plant for communal, our village owns six business units. [It means] the more gross income, the greater the income that goes to the village. Finally, the communities can see for themselves that the benefits of the LISDES program are returned to themselves […]” (BUMDesa Bersinar Desaku, personal communication, April 13, 2022).

The role of non-state actors in the LISDES program is crucial because these actors can complement the government’s efforts in the program from managerial aspects. Through management tasks and initiating a team establishment with a legal basis to carry out such a task, such efforts of the non-state actors have been recognized by the majority of informants and documents used for analysis in the thesis as effective approaches to help the government address energy injustices that emerge from the program. The aforementioned efforts are carried out by incorporating the socioeconomic characteristics of rural communities and the productive use of electricity as the anchor of the implementation of the LISDES program. As a result, distributive, procedural, and recognition injustices that have hampered the LISDES program's ability to deliver 'just’ access to electricity,' that is, providing equitable energy access throughout Indonesia's households, can be remedied.

5. Discussion

This chapter is divided into three sections. The first section discusses the study's methodological' merits and drawbacks. The second section contains reflections on the results of the thesis, emphasizing what they signify for the LISDES program. The similarities and differences between the elements of energy injustice generated by the conceptual framework and the data collected for the thesis will also be discussed. The third section will discuss the analytical framework of energy injustice for the LISDES program by critically examining the framework's applicability in light of the thesis findings. Furthermore, section three will also discuss correlations between the elements of energy injustice identified in this thesis and other concepts. Lastly, limitations of the thesis and key insights for future studies will be described in this section.

5.1 Research methods

Due to the lack of full publications about the LISDES program, this thesis used four different types of documents in its analysis: government documents, reports, one case summary, and a book. Because of the use of multiple document sources in this thesis that explain not only the LISDES program but also an overview of Indonesia's electricity sector, the author was able to develop a more comprehensive knowledge base about the program's situations from various perspectives than if the thesis used only one type of document.

When it comes to interviews, the informants in this thesis were chosen solely based on their direct involvement in the LISDES program through business, research, and employment. Interviews are the author's initial encounters with all 17 of the thesis's final informants. As a result, familiarities that might steer perspectives into preconceived notions are relatively less apparent than if the informants and author had known each other prior to the interviews. One interesting thing that occurred during the interviews was that, despite the fact that 17 actors from various backgrounds were invited to participate in the thesis interviews, the facts and perspectives shared by these informants were hardly varied. For example, the majority of informants in this thesis cited the complexity of Indonesia's vast geographical region as a major impediment to the government's ability to distribute electricity access equally across Indonesian villages, so this fact was categorized as one of the elements of distributive injustice. The sentinel role of the government in the program was interpreted by many informants as a dominance of the state actors, leading to procedural injustice in the program by hindering a representative and impartial decision-making process in the program. Furthermore, the program's neglects of the two elements of recognition justice—

understanding of the various meanings of electricity as the key to public welfare; and recognition of distinctive socioeconomic characteristics in various locations in Indonesia—has been emphasized by the thesis informants as the major hindrance for the rural communities to sustain the program.

Different aspects might have emerged if a more diverse range of actors, including the subnational government agencies and rural communities in the disadvantaged, outlying, and frontier areas (3T Region) were invited for interviews. The representatives of subnational government agencies might provide different insights regarding the procedural injustices at the subnational level. The reason why the author did not invite the subnational government actors as informants in the thesis was that the saturation of findings correlated to the government in the LISDES program had been already quite apparent from most responses of informants in the thesis. There were no new insights generated after conducting an interview with the last informant, therefore there were no needs to invite more actors in the interview, such as the subnational government actors. Lastly, due to their remote and isolated locations as compared to other rural areas in Indonesia, rural communities of the 3T Region may describe new insights regarding the recognition injustice that may be quite only applicable in this region. Unfortunately, due to limited internet connection in the 3T Region and a language barrier, rural populations in this region were not invited to participate in thesis interviews. Many communities in this region are more comfortable speaking in their local language than the country's national language: Indonesian. A language barrier could prevent the informant and researcher from properly comprehending the perspectives given during the interview. To alleviate the disparities that may emerge from the aforementioned limitations, actors directly involved in the LISDES program as facilitators and electricity producers in the 3T Region were invited to participate as thesis informants. Their prominent role in the LISDES program for the 3T Region and also their proficiency in Indonesian became incentives for the author to invite them to the thesis interviews.

5.2 Results

5.2.1 The role(s) of Indonesian national government in the LISDES program

As described in **4. Results**, three key findings were discussed. First, the role(s) that the Indonesian national government plays in the LISDES program. During the data collection, it was clear that as the sentinel of the program, Indonesia's national government was mandated by the state to ensure universal electricity throughout Indonesia. Driven by such a role and given the numerous presence of the pitch-black villages in the country, it becomes inevitable for the government to set the following objective, that is, to immediately electrify as many rural areas as possible at affordable costs. Such an objective has provided

‘just’ access to electricity for rural communities according to a few informants of the thesis. These informants emphasized the pre-LISDES program conditions wherein only a few of the rural communities had access to electricity and they had it at a high cost.

Nonetheless, the majority of informants and documents analyzed in this thesis revealed that such an objective has not touched upon the spatial inequality that comes from remote locations and extreme geographical conditions of the 3T Region, the locations where electricity poverty occurs the most in the country (Setyowati, 2021). Due to the isolated and extremely remote locations, off-grid power systems that optimize local new renewable energy resources become viable solutions to the electricity poverty in this region (Wirawan & Gultom, 2021). Unfortunately, off-grid solutions only cover 3% of the total household connections in Indonesia, while the remaining 97% is met by on-grid solutions (ADB, 2016). The price affordability of coal drives the dominance of on-grid solutions in the program compared to renewable energy as an electricity source. It is owed to the massive domestic coal supply in Indonesia given the country's position as one of the world's largest coal producers (Ordonez et al., 2021). Considering the country's vast number of pitch-black rural areas, therefore, affordable solutions such as extending PLN electrical grids that still rely on coal become more feasible in the LISDES program from the government's perspective than new renewable energy development.

Furthermore, the dominance of on-grid solutions in the LISDES program has not aligned with an overarching target that the country strives for, realizing its global commitment to the Paris Climate Agreement, that is, achieving 23% renewable energy in the national total energy mix by 2025 and 31% in 2050 (IRENA, 2017). The program's priority of extending the PLN's electrical grid, which is still dominated by coal-fired power plants, should not be disregarded when it comes to energy injustices. As one of the country's major sources of GHGs, the greenhouse gas emissions generated by extending the PLN's electrical grid will majorly impede the country in reducing its energy externalities associated with the coal-fueled electricity production, that is, “the imposition of negative social and environmental costs on society”, such as air pollution and poor wellbeing (Sumarno et.al, 2022; Sovacool & Dworkin, 2015, p. 438). Thus, as the sentinel of the LISDES program, the government's objective in the program, namely providing universal electricity access at an affordable price throughout Indonesia, have not fully addressed two energy injustices: (1) poor electricity access in the 3T Region, a region where energy poverty is most acute in the country; and (2) energy externalities risks that emerge from high greenhouse gas emissions (GHGs) generated by coal-fueled electricity (Sovacool & Dworkin, 2015).

5.2.2 The key actors' perspectives on energy injustices that emerge from the LISDES program

The second finding of the thesis was about the perspectives on energy injustice issues held by key actors in Indonesia. As described in section **3.3. Data analysis**, the final step of data analysis in the thesis, selective coding, may reveal new elements of each category of energy injustice. As a result, there are differences in the elements of energy injustice for the LISDES program between what had been proposed from the conceptual framework (**Figure 2**) and what was generated from the data collection of this thesis. The summary of such differences is presented in **Figure 5** and the implications of the aforementioned differences are further discussed in the following paragraphs.

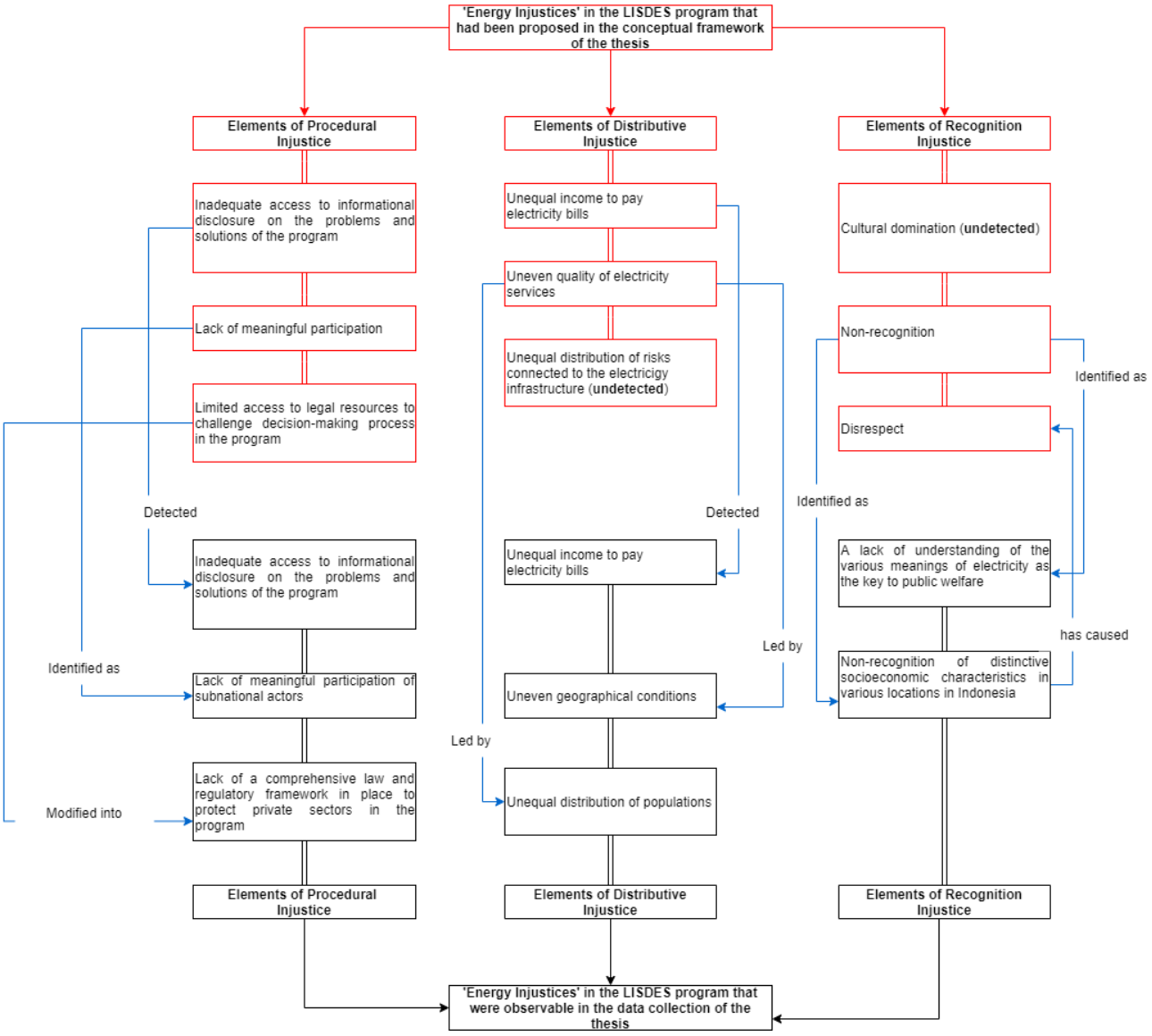


Figure 5. The modified version of the analytical framework of energy injustices in relation to the LISDES program (Author, 2022).

5.2.2.1 Distributive Injustice

When it comes to electricity access, energy poverty is often described as a situation in which households do not have reliable and affordable access to electricity (IEA, 2017). It is a concept that includes interactions between five aspects: electricity tariffs; income; individual electricity needs; electricity efficiency; and climatic conditions (Bagnoli & Bertoméu-Sánchez, 2022). There is a strong linkage between the aspects of energy poverty and the three elements of distributive injustice, leading many households as the program's beneficiaries still not have reliable and affordable electricity access.

First, electricity tariffs. In Indonesia, the electricity subsidies are the results of electricity tariffs set at a level lower than the cost of supplying electricity (Laan et al., 2011). Unfortunately, such assistance is only available to PLN customers (on-grid solutions), which excludes many LISDES program beneficiaries who rely on off-grid solutions as their major source of electricity. Electricity tariffs in the LISDES program are prevalently determined through dialogues between the program's implementers and the rural communities. It typically ranges from IDR 10,000 to 55,000 (EUR 0.66 to 3.64) per kWh (SEforALL, 2020). Electricity tariffs are heavily influenced by logistic costs incurred for the distribution, transmission, operation, and maintenance. The calculation of the logistic costs is extremely dependent on the geographical conditions of rural areas. In most cases, the more remote and isolated the rural areas are, the higher the electricity tariffs are. According to thesis informants, such a dialogue has been found as one of the main challenges in the LISDES program due to a lack of legal foundation and standardized tools that can assist communities in going through this process.

Second, the use of the electrification ratio and the ratio of electrified villages as major indicators in measuring the progress of the LISDES program has led the governments to prioritize short-term quantitative outputs over the program's long-term development impacts, such as the advanced local economy. Therefore, unequal income to pay electricity bills remains evident in many rural areas despite having electricity as a catalyst to advance their local economy. Third, individual electricity needs. It is one of the aspects of electricity poverty that is heavily dictated by one of the elements of distributive injustice indicated in this thesis: unequal geographical conditions. Unequal geographical conditions have led to diverse local economies flourishing in Indonesia. There are rural areas that rely their livelihood on fishery, while others rely on agriculture or carpentry. Because of these various sources of income, different electricity access needs between communities are unavoidable. As a result, some rural communities require electricity access beyond lighting and small appliances as provided by the LISDES program. For

instance, fishermen need large coolers to keep their fish fresh or farmers require machines for rice millings. Failure to capture these individual electricity needs among rural areas has led the program to be underutilized in many rural areas because the communities do not see a meaningful purpose for sustaining the program. Fourth, electricity efficiency. Electricity efficiency prevents communities from using more electricity than is necessary (Healy & Clinch, 2004). When it comes to the LISDES program, once the long-awaited electricity arrives in their villages, many rural communities are compelled to use it more than necessary. Due to the limited daily amount of electricity generated by rural mini-grids, meeting the increasing electricity demand in the villages remains difficult. As a result, despite the presence of the LISDES program in these villages, poor electricity access persists.

Fifth, climatic conditions. Climate conditions become one of the important factors to consider when humans decide where to live and the type of livelihood to strive for (Fatma, 2018). Located between two continents and two oceans, Indonesia is known for its diverse climatic conditions, leading to unequal distribution of population throughout the country. Some rural areas have 15 people per km^2 while others have more than 1000 people per km^2 (Kemendagri, 2022). Such inequalities have led to uneven electricity demands between rural areas in the LISDES program. Since the program prioritizes extending the PLN electrical grid in its implementation, therefore the electricity demands of the rural areas with denser populations frequently come first in the program. It is because the electricity demands of these denser-populated villages offset the operational costs of procuring electrical grid use in the village. As a result, unequal distribution of electricity services remains evident between rural areas in the LISDES program.

5.2.2.2 Procedural Injustice

On average, the electrification ratio and the ratio of electrified villages in Indonesia have achieved almost 100%. This figure indicates that electricity access should be no longer a pressing issue in the country. However, it becomes apparent that there are a lot of problems in the LISDES program that are not captured by such numeric figures. Such problems are long-standing issues, identified in this thesis as procedural injustices by hindering the representative and impartial decision-making process in the program.

In comparison to the elements of procedural injustice for the LISDES program described in the conceptual framework of the thesis, inadequate access to information regarding the problems and solutions for the program was also identified as one of the elements of procedural injustice in the findings of the thesis. The second element, lack of meaningful participation of subnational actors was also identified in the data collection of the thesis. When it comes to limited legal resources to challenge the decision-making process

in the program, private actors are more affected by a lack of comprehensive law and regulatory framework to protect them in the program.

Private sectors, also known as Independent Power Producers (IPPs), account for one-third of all electricity generation in Indonesia (World Bank, 2005). IPPs may build plants up to 50MW for their own use and sell excess power directly to non-PLN customers (SEforALL, 2020; World Bank, 2005). Furthermore, they may construct mini-grids and sell power to PLN via a twenty-year purchase power agreement (PPA), which serves as a contract between IPPs and PLN (SEforALL, 2020). PPA, therefore, governs the applicable electricity tariff, compensation, and procedures before the electricity infrastructures are transferred to PLN at the end of the PPA.

During the data collection of the thesis, there was no tailor-made legal and regulatory framework found specifically enacted for the LISDES program. As a result, the program's strategic planning and implementation are in accordance with Indonesia's overall legal and regulatory framework for electricity. Due to the constant flux of Indonesia's law and regulatory framework for electricity, the ambiguity of the task division between PLN and IPPs in the provision of electricity services in the program remains evident. For instance, in 2002, Law No. 20/2002 was enacted to promote unbundling in Indonesia's electricity sector, by enlarging IPPs' involvement in the country's electricity services (World Bank, 2005). However, this law was nullified because it was in conflict with the Constitution of Indonesia in which article 34, paragraph 3 clearly states that the state is responsible for the provision of appropriate health and public service facilities, such as electricity (Constitution of the Republic of Indonesia, 1945). Nevertheless, in 2020, Act Number 11 of 2020 on Job Creation was enacted to re-promote the unbundling of PLN, aiming to provide IPPs with a larger role in Indonesia's electricity sector. However, the control of the government remains prominent in this law by stating that IPPs can sell their excess electricity for public use after complying with the norm, standards, criteria, and procedures stipulated by the government (Job Creation Act, 2020). Therefore, it remains ambiguous whether private actors can independently contribute to the LISDES program (generation, transmission, distribution, and supply services) without the intervention of PLN (Firmansyah & Karim, 2021). As a result, investing in the LISDES program has been found too risky for many IPPs due to the lack of a comprehensive legal and regulatory framework to protect IPPs' in the program from business failure that may occur due to the unfeasible business model of the program (large capital, low electricity demand).

5.2.2.3 Recognition Injustice

Recognition injustice emerges from "the processes of disrespect, insult, and degradation that devalue some people and some place identities in comparison to others" (Walker, 2009, p. 615). The lack of the program's efforts to incorporate the distinctive socioeconomic characteristics of rural communities show that the program has devalued the needs and aspirations of the communities in favor of focusing on the program's accomplishments: the electrification ratio and the ratio of electrified villages. As described in the conceptual framework of the thesis, the three elements of recognition injustice for the LISDES program are cultural domination, non-recognition, and disrespect. Nevertheless, in the thesis findings, cultural domination was not apparent either between social groups at the community level or between the secondary and government actors. Non-recognition appeared as a lack of understanding of the various meanings of electricity as the key to public welfare; and non-recognition of distinctive socioeconomic characteristics in various locations in Indonesia. From the findings of this thesis, disrespect in the LISDES program emerged as an impact of not recognizing the distinctive socioeconomic characteristics in various locations in Indonesia, rather than as a stand-alone element of recognition justice as described by Fraser and Interruptus (1997), substantiated by Jenkins et al. (2016).

5.2.3 Improving rural community's access to electricity through the LISDES program

The third finding of the thesis touched upon in what way and to what extent Indonesia's LISDES program has improved the rural community's access to electricity. Using the electrification ratio and the ratio of electrified villages as the major indicators to measure the program's progress, the LISDES program has not fully captured the multifaceted nature of electricity access in households (Bhatia & Angelou, 2015). Seven criteria were introduced by Bhatia and Angelou (2015) to examine the household's access to electricity: (1.) capacity (is it adequate?); (2.) duration (is it available for 24 hours?); (3.) reliability (how often do disruptions occur?); (4.) quality (Do disruptions affect the use of appliances); (5.) affordability (Are households able to pay the electricity bills?); (6.) legality (sufficient law and regulation framework); and (7.) health and safety (risks associated with health and environment). Referring to the multi-tier matrix by the Bhatia and Angelou (2015), there are five tiers used to examine households' access to electricity as presented in **Figure 7.** According to this matrix, electricity access generated by the LISDES program is categorized merely up to Tier 2. It means that the electricity supplied by the program only incorporates the first two criteria of a household's access to electricity: capacity (the power is only sufficient for general lighting and small appliances) and duration (electricity is available less than 24 hours a day), neglecting

the other aspects a household's access to electricity that include reliability, quality, affordability, legality, health and safety (Bhatia & Angelou, 2015). In a similar vein, a lot of informants of the thesis also stated that the LISDES program had indeed provided communities with access to electricity; however, the power generated by the program is still far from fulfilling the electricity demand of the rural communities, leaving electricity consumption per capita in the country to be among the lowest compared to other countries in the Southeast Asia (Cahyani et al., 2022).

5.3 Conceptual Framework

5.3.1 The application of the analytical framework

Energy justice as an analytical framework to examine issues in the LISDES program has revealed multifaceted challenges in the program that would not have been apparent otherwise. For instance, the program's failure to capturing the multi-tier nature of electricity access for households and its neglect of the distinctive socioeconomic characteristics in rural communities were not cited as crucial issues in the program's previous studies. Using energy justice as an analytical framework in this thesis has revealed that the multi-tier nature of electricity access for households and the distinctive socioeconomic characteristics are prominent issues that have been overlooked by the program.

Furthermore, as an analytical framework, energy justice through its three core tenets sheds light on the gaps between issues that have been prevalently identified in the LISDES program and what happens in reality, especially at the community level as the program's beneficiaries. Electricity tariff collection, for example, has frequently been interpreted as a procedural issue in the program. As a result, solutions developed to address this issue are limited to procedural innovations, such as streamlining the tariff collection administration process. However, in this thesis, it was found that recognition injustice plays a larger role in the tariff collection process of the LISDES program. It is because the program fails to recognize one of the distinctive socioeconomic characteristics of rural communities: their reliance on daily income and expenditure. Rural communities develop a mistrust of program implementers if such socioeconomic characteristics are not recognized. Therefore, they are demotivated to pay the tariffs even though they have the financial capacity to do so. Using an overarching lens, the analytical framework of energy injustices aims to help the program look at its issues from a comprehensive perspective, leading to more promising solutions.

Another example of the application of the analytical framework comes from one of the elements of distributive injustice, that is, uneven geographical conditions. Unequal distribution of electricity services

in the program does not necessarily reflect the program's major deficiencies in terms of funding to extend its grid solutions as has been often cited by many informants of this thesis. In many rural areas, especially in the 3T Region, it is clear that off-grid solutions offer relatively more 'just' access to electricity to the communities in this region by addressing the inherent spatial inequalities, stemming from the region's remote and isolated geographical conditions. Therefore, rather than generalizing the program planning and strategies to all rural areas of Indonesia as the manifestation of achieving 'just' access to electricity in the program, tailor-made solutions that strive for local approaches, such as optimizing local renewable energy, can offer more promising solutions for addressing energy injustices that emerge from LISDES program.

5.3.2 The analytical framework and its linkage to other concepts

The analytical framework of energy injustice that was generated from the thesis data collection is presented as follows:

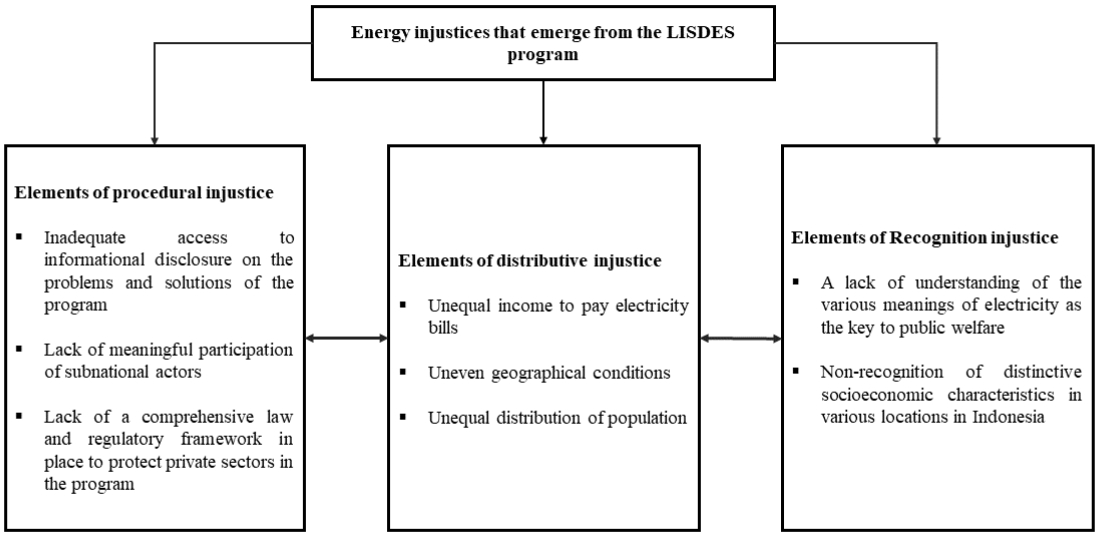


Figure 6. The analytical framework of energy injustices in relation to the LISDES program (Author, 2022)

The elements of energy injustices identified in this thesis serve as entry points to shed light on issues that emerge from the LISDES program. To provide recommendations for addressing these issues, it becomes vital to further analyze the elements of energy injustice as identified in **Figure 6** using other concepts such as the energy trilemma, goal displacement, and cosmopolitan justice.

The energy trilemma has been widely used as a guide for policymakers in transitioning the energy sector to be fair to communities and environmentally sustainable. In practice, the energy trilemma aims to balance the combination of three competing aspects in energy sector: energy security, energy equity, and environmental sustainability (Shirazi, 2022). Looking back to the distribution of electricity access in the LISDES program, of all the aspects of energy trilemma, energy security is most evident. Prioritizing the well-established PLN's electrical grid fueled by coal, indeed, the program has secured electricity supply in most rural areas of Indonesia. Unfortunately, the accessibility and affordability of PLN's electrical grid are mostly applicable merely from the standpoint of the government. It is because, in many rural areas in the 3T Region, PLN's electrical grids are not viable solutions. Due to their remote and isolated location, logistic costs to procure alternative electricity sources such as diesel generators in the 3T Region are typically higher than in other areas of Indonesia. Therefore, to receive the same amount of electricity, the rural communities in the 3T Region frequently have to pay higher overall electricity costs as compared to other areas in Indonesia. The financial burden of electricity in the 3T Region is exacerbated by the fact that these communities do not subscribe to PLN. As non-PLN customers, these rural communities are not eligible to receive electricity subsidies from the government. Thus, if the LISDES program focuses on optimizing local renewable energy development, it will not only help Indonesia mitigate environmental harms predominantly caused by the coal-fueled PLN's electrical grids, but it will also achieve distributive justice in the country's electricity services by providing equal electricity access to areas where the PLN's electrical grids cannot reach.

The elements of procedural injustice presented in **Figure 6** are highly correlated with a concept known as goal displacement. "The tendency of people or organizations to focus on maximizing short-term quantitative output scores, rather than on the outcomes and developmental impacts of a program is commonly known as goal displacement" (Derks & Romijn, 2019, p. 59). Goal displacement has been widely used as a concept to comprehend the persistent governance problems that handicap the performance of rural infrastructure projects, such as the LISDES program (Derks & Romijn, 2019). In practice, the goal displacement is an interaction between these forms: cutting corners, withholding information, and biasing samples (Derks & Romijn, 2019; Bohte & Meier; 2000).

First, cutting corners in the LISDES program is exemplified by the physical infrastructures frequently built by inexperienced contractors using the low-cost infrastructure to pursue higher electrification ratio. Choosing quantity over quality, therefore, components' damages and stalled projects are frequently observable from the program. Second, withholding information. Being one of the crucial public utilities, it becomes crucial for the program implementers to exude a positive image of the LISDES program. Such a positive image is important to maintain voters' support for the politicians who will run for the next election. Therefore, there is a tendency to not disclose the magnitude of the program's problems in reality, especially from the subnational government actors to their superiors at the national level and moreover the public. Lastly, biasing samples. Because of the government's sentinel role in the LISDES program, it is unavoidable for the program to place a greater emphasis on the government's efforts to contribute to the program's success. Unfortunately, such a bias has resulted in the program tending to neglect the small-scale off-grid solutions implemented by subnational actors. As a result, expecting meaningful participation from subnational actors in the program becomes difficult. Such a situation is even more difficult for small IPPs at the subnational level due to the program's lack of a comprehensive legal and regulatory framework to protect them in the program from business failure.

Of all the three core tenets of energy injustice, innovations in procedural justice have been argued as promising solutions to address stubborn challenges that handicap energy justice in the LISDES program (Setyowati, 2021). Procedural innovations in the LISDES program do not always imply the addition of new rules and regulations. Fully understanding the long chains of the decision-making process in the LISDES program to examine which form of the goal displacement emerges, leading the program to start deviating from its goal, can be also a promising approach to address procedural injustices in the program (Derks & Romijn, 2019).

During the thesis data collection, the least common category of energy justice identified was recognition justice. Despite the fact that the LISDES program's primary beneficiaries are marginalized and vulnerable communities, their distinctive socioeconomic characteristics are rarely adopted in the program. It is because the use of a micro lens of recognition justice that (merely) focuses on the voice of the marginalized and vulnerable communities. To broaden the lens of the recognition justice, to make the voice of the marginalized and vulnerable communities be more heard in the program, it becomes intriguing to interpret the elements of recognition injustice as described in **Figure 6** from cosmopolitan justice. Cosmopolitan justice emphasizes a view that all individuals are citizens of the same world, therefore their respective worth and needs should not be disregarded (Heffron 2021; Sovacool & Dworkin, 2015). Extending the

socioeconomic characteristics of individuals as acknowledged by recognition justice into the worth and needs of the world's citizens as interpreted by cosmopolitan justice, is expected to make these local socioeconomic characteristics more visible and relevant from a global perspective. As a result, increased participations from a wide range of actors that can contribute to the program's solutions are likely to happen.

5.3.3 Limitations and future studies

Elements of energy injustice identified in this thesis serve as entry points, for bringing LISDES program issues to the attention of relevant stakeholders. In order to develop recommendations that aid the program's future progress, this thesis investigated the linkages between the elements of energy injustice observed in the LISDES program to other concepts. Consequently, this thesis found that it would be more helpful for future studies to further analyze key findings of the LISDES program as collected in this thesis by looking at them from different concepts. For instance, from the concept of human right, coal-fueled grid solutions that have been prevalently used as the prominent solution in the program can be 'unjust' for wellbeing and environment due to negative externalities that it imposes on societies, such as air pollution (Sovacool & Dworkin, 2015). However, coal-fueled solutions in the program can also be seen as 'just' from the concept of welfare because the solutions address lack of electricity access in many rural areas of Indonesia (Sovacool & Dworkin, 2015). Only by looking at the program's solutions from these two different concepts, local renewable energy becomes more competitive than coal because it offers more pathways to address not only the lack of electricity access in many rural areas of Indonesia but also the negative externalities that electricity supply chain impose.

Looking back to the meso-scale used to examine the issues in the LISDES program, this thesis has provided baseline findings that revealed energy injustices observable from the program at the national level. However, it might be interesting for future studies to narrow down the operationalization scale of the energy justice concept in the LISDES program into micro, which refers to energy injustices that occur in a specific community or households in Indonesia (Sovacool et al., 2019). It is intriguing because such an effort may reveal more distinctive socioeconomic characteristics on a smaller scale yet undetected in the program.

For the government and PLN who serve as the prominent policymakers in the program, it will be more valuable for them if energy justice is used as a decision-making tool. It is carried out by using the following eight core principles as a guide in the decision-making process of energy (Sovacool & Dworkin, 2015).

The aforementioned eight core principles are availability; affordability; due process; transparency and accountability; sustainability; intra-generational equity; inter-generational equity; and responsibility (Sovacool & Dworkin, 2015; Lacey-Barnacle et al., 2020; Sovacool et al., 2017). Thus, empirical studies which adopt the eight core principles in the decision-making process of Indonesia's electricity sector become intriguing to conduct in the future. Furthermore, the concept of energy justice can be a promising approach to examining the entrenched challenges that cause energy policy failure in other energy sectors of Indonesia. Sokolowski and Heffron (2022, p. 1) define energy policy failure occurs when "energy policy does not meet local, national, and international energy and climate goals across the activities of the energy life-cycle and where just outcomes are not delivered". As a result, the author strongly suggests that future research broaden the use of energy justice as an analytical framework to investigate potential reasons for policy failure in another major energy sector in Indonesian households: cooking fuels. The national government of Indonesia enacted a fuel substitution policy in 2007 to encourage people to switch from kerosene to Liquefied Petroleum Gas (LPG) as their primary cooking fuel, because LPG emits fewer pollutants than kerosene (Astuti et al., 2019). To increase accessibility and affordability of LPG throughout households in Indonesia, government use subsidies as a regulatory instrument. However, energy subsidies have been shown to benefit majorly middle to higher income households than the poor who still rely on firewood as their primary cooking fuel (Astuti et al., 2019). Due to unequal distribution of 'just' access to LPG between households in Indonesia, the possibility of policy failure to shift from kerosene to LPG becomes necessary to investigate (Astuti et al., 2019).

Lastly, this thesis presented findings about energy injustice in Indonesia's LISDES program. As a result, the insights gained from the thesis findings are only applicable to the rural electrification program in Indonesia. More studies using energy justice as an analytical framework in other developing countries for similar cases will be required to avoid the generalizability of the thesis findings toward the contexts of these countries.

6. Conclusions and Recommendations

The monopoly system in Indonesia's electricity sector has raised questions if such a system has provided 'just' access to electricity through the rural electrification (LISDES) program, a prominent national program to address energy poverty in the country's electricity sector. Despite the electrification ratio in Indonesia having reached 99.45% in 2021, issues such as brownouts, blackouts, and pitch-black villages remain to persist. As a result, it became an objective of the thesis to investigate the reasons for the entrenched issues that hinder equal electricity access in the LISDES program, using energy justice as an analytical framework.

To implement the objective in question, the main research question was described as follows: "**How do issues arising from the LISDES program affect the program's ability to provide 'just' electricity access to rural communities?".** To answer this question, three sub-questions were formulated to generate relevant findings, relatively sufficient to answer the main research question. To answer the three sub-questions, this thesis conducted qualitative research. Data was collected and analyzed from six different documents and semi-structured interview transcripts with seventeen informants. The key findings that answer the three sub-questions will be delineated separately in the following paragraphs, and a summary of such findings will be used to answer the main research question.

The first sub-question was **"What role(s) does the national government play in the LISDES program to improve electricity access in Indonesian rural communities?".** To answer this question, six documents were used as the major source of data in which two of them are government documents: the Electricity Business Supply Plan of PLN for 2021-2030 (Rencana Usaha Penyediaan Tenaga Listrik PLN 2021-2030) by the Ministry of Energy and Mineral Resources (MEMR) and PLN's annual report for 2020. Throughout the data collection process, it was clear that the national government was acting as a sentinel in the program. Playing a sentinel role in the program, providing universal electricity access at an affordable price throughout the rural areas of Indonesia becomes an objective frequently employed by the national government in the LISDES program. With such an objective, the government is compelled to focus solely on price affordability, such as extending PLN electrical grids that still rely on coal, counterproductive to the country's overarching national targets, that is, achieving 23% renewable energy in the national total energy mix by 2025 and 31% in 2050. Further, due to the remote and isolated geographical conditions of the disadvantaged, outlying, and frontier areas (3T Region), on-grid solutions, such as extending PLN electrical grids, have proven to be unfeasible to implement in many villages located

in this region, where poor electricity access is the most evident in this country. In addition to that, such an objective has also led the LISDES program to have a binary benchmark in interpreting its results—electrified or non-electrified—leading the program to rely on the electrification ratio and the ratio of electrified villages as the indicators to measure its progress. In the program planning, such indicators have led the program to choose short-term quantitative outputs, through the construction of physical infrastructures, over the program's long-term development impacts, leading the rural communities to be incapacitated to sustain the program. As a result, poor electricity access remains evident in many areas of the program's locations.

The second sub-question asked **"what are the perspectives of the key actors on energy injustices that emerge from the LISDES program?"**. To answer this question, interviews with seventeen Indonesia's key actors in the LISDES program were conducted. In this thesis, persistent issues that were identified from the LISDES program were reframed into energy injustices, to bring them to the attention of relevant stakeholders, with hopes of bringing forward fruitful insights to improve the program's deliverables in the future. Using the core tenets of energy justice, persistent issues in the LISDES program were examined and reframed into three categories. First, distributive injustice. When it comes to distributive injustice, three main issues that hinder equal distribution of electricity costs and benefits were observable. They are unequal income to pay electricity bills; uneven geographical conditions; and unequal distribution of population were identified as the main issues. Regarding procedural injustice, inadequate access to informational disclosure on the problems and solutions of the program; the lack of meaningful participation of subnational actors; and the lack of a comprehensive law and regulatory framework in place to protect private sectors in the program were evident as the prominent issues that handicap a representative and impartial decision-making process in the program. Lastly, the main issues of the recognition injustice were identified in this thesis as a lack of understanding of the various meanings of electricity as the key to public welfare; and non-recognition of distinctive socioeconomic characteristics in various locations in Indonesia. These issues represent the key aspects of rural communities that have been frequently overlooked by the program.

The third sub-question investigated **"in what way and to what extent has the LISDES program improved the rural community's access to electricity?"**. Throughout the data collection and analysis for this thesis, it becomes clear that the LISDES program has indeed improved the rural community's access to electricity in comparison to pre-program conditions, when only a few of the communities had access to electricity and at a high cost. Unfortunately, the program's power, which is only adequate for

lighting and small appliances, is still insufficient to meet the increasing electricity demand of the communities. Furthermore, the LISDES program's use of one-dimensional indicators to measure progress—the electrification ratio and the ratio of electrified villages—has not fully captured the multifaceted nature of electricity access in households measured by seven criteria of a multi-tier matrix for measuring access to household electricity supply: (1.) Capacity; (2.) duration; (3.) reliability; (4.) quality; (5.) affordability; (6.) legality; and (7.) health and safety (Bhatia & Angelou, 2015). According to this multi-tier matrix, LISDES-generated electricity access is only classified as Tier 2. It means that the program's electricity only meets the first two criteria of a household's access to electricity, namely capacity (the power is only sufficient for general lighting and small appliances) and duration (electricity is available for less than 24 hours a day) while ignoring the remaining five criteria. As a result, poor electricity access persist in many of the program's locations.

To address distributive injustices that arise from the LISDES program, the program must transition from relying on coal-fueled on-grid solutions to local renewable energy development. Accelerating such a transition will not only assist the program in ensuring energy security in the country's electricity sector, but it will also assist the program in meeting the country's energy equity targets without putting additional strain on the national environmental sustainability targets, due to GHG emissions, which are primarily generated by coal-fueled electrical grid production. When it comes to procedural injustices, as this thesis has demonstrated, procedural innovations in the program can start by fully comprehending the long chains of the decision-making process in the program, to examine which aspects of this process start leading the program to deviate from its goal. Lastly, extending individuals' socioeconomic characteristics as conceded by recognition justice into the worth and needs of the world's citizens as advocated by cosmopolitan justice can help the local socioeconomic characteristics of the rural communities become more compelling from global perspectives. As a result, coalitions between actors in the program are more likely to happen.

To sum up, issues in the LISDES program have prevented the program from resolving poor electricity access in Indonesian rural areas. The current solutions implemented in the program tend to work in silos or in conflict with each other rather than in sync. Insights generated by this thesis have helped the author to conclude that the persistent problems in the program have come down to the program’s inability to explicitly describe the long-term goals that it strives for. The program indeed alludes to the accomplishment of other goals, such as public welfare through improved education and economic opportunities, however, both merely serve as ancillary goals in addition to the high electrification ratio that the program aims for. Therefore, LISDES program reforms could be achieved by formulating clear

long-term goals and aligning the program implementation with these goals, to avoid ad-hoc adjustments that are heavily dictated by short-term outputs and incumbent institutional interests, such as elections.

As the manifestation of the LISDES program reforms, initiations of ecosystems that position rural communities as the catalyst to harmonize the outputs of the physical infrastructure development (majorly carried out by state actors) with the managerial development outcomes (mostly implemented by non-state actors) becomes promising approaches to adopt in the program. The ecosystem in question is initiated by integrating the LISDES program's planning with the rural communities' aspirations for development, by asking questions such as, "what kind of development do the rural communities want to achieve?", and "in what way can electricity contribute to the development in question?". The ecosystem is then strengthened by consolidating the program implementation with Indonesia's overarching national energy targets. For instance, achieving 23% renewable energy in the national total energy mix by 2025 and 31% by 2050 (IRENA, 2017).

7. References

ACCESS. (n.d.). About ACCESS. About Us (accesstoenergy.org)

Ahdiat, A. (2020, February 7). *Tak punya uang, negara minta bantuan swasta pasang listrik di daerah 3T [Having no money, the state asks for private assistance to install electricity in 3T areas]*. KBR. Tak Punya Uang, Negara Minta Bantuan Swasta Pasang Listrik di Daerah 3T - kbr.id

Asian Development Bank (ADB). (2016). Achieving Universal electricity Access in Indonesia. https://www.adb.org/sites/default/files/publication/182314/achieving-electricity-access-ino.pdf.

Astuti, S. P., Day, R., & Emery, S. B. (2019). A successful fuel transition? Regulatory instruments, markets, and social acceptance in the adoption of modern LPG cooking devices in Indonesia. *Energy Research & Social Science*, *58*. https://doi.org/10.1016/j.erss.2019.101248.

Bagnoli, L., & Bertoméu-Sánchez, S. (2022). How effective has the electricity social rate been in reducing energy poverty in Spain? *Energy Economics*, *106*. https://doi.org/10.1016/j.eneco.2021.105792.

Boeije, H. (2010). *Analysis in qualitative research*. SAGE Publications Ltd.

Bhatia, M., & Angelou, N. (2015). Beyond Connections : Energy Access Redefined. ESMAP Technical Report;008/15. World Bank, Washington, DC. https://openknowledge.worldbank.org/handle/10986/24368.

Bohte, J., & Meier, K. (2000). Goal displacement: Assessing the motivation for organizational cheating. *Public Administration Review*, 60, 173e182. https://doi.org/10.1111/0033-3352.00075.

Burlando, A. (2014). Power outages, power externalities, and baby booms. *Demography*, *51*(4), 1477-1500. https://doi.org/10.1007/s13524-014-0316-7.

Cahyani, A. D., Nachrowi, N. D., Hartono, D., & Widyawati, D. (2022). Between insufficiency and efficiency: Unraveling households' electricity usage characteristics of urban and rural Indonesia. Energy for Sustainable Development, 69, 103-117. https://doi.org/10.1016/j.esd.2022.06.005.

Cannon, M., Thorpe, J., & Emili, S. (2020). Economic participation case, IBEKA: Community-owned and managed mini-grids in Indonesia. Institute of Development Studies. Case_18_IBEKA_FINAL.pdf (ids.ac.uk).

Castán Broto, V., Baptista, I., Kirshner, J., Smith, S., & Neves Alves, S. (2018). Energy justice and sustainability transitions in Mozambique. *Applied Energy*, *228*, 645-655. https://doi.org/10.1016/j.apenergy.2018.06.057.

Castillo Jara, E., & Bruns, A. (2022). Contested notions of energy justice and energy futures in struggles over tar sands development in British Columbia, Canada. *Futures*, *138*. https://doi.org/10.1016/j.futures.2022.102921.

Constitution of the Republic of Indonesia. (1945). https://peraturan.bpk.go.id/Home/Download/92288/UUD45_SatuNaskah.pdf

Delve. (n.d.). *How to do open, axial, and selective coding in grounded theory*. How To Do Open, Axial, & Selective Coding in Grounded Theory — Delve (delvetool.com).

Derks, M., & Romijn, H. (2019). Sustainable performance challenges of rural microgrids: Analysis of incentives and policy framework in Indonesia. *Energy for Sustainable Development, 53*, 57-70. https://doi.org/10.1016/j.esd.2019.08.003.

Emonds, V., & Tamas, P. (2021, October 27). Research Methodology in Environmental Sciences: Self-study deck 6 [PowerPoint Presentation]. The Netherlands. Emond, V., & Tamas, P. (2021, October 27). Research Methodology in Environmental Sciences: Self-study deck 1 [PowerPoint Presentation]. The Netherlands. https://wageningenur4.sharepoint.com/:p:/r/sites/course141562/Gedeelde%20documenten/General/Decks/YRM20306%20Deck%2001.pptx?d=wcedd75a110914dc5ac2463f337e5e425&csf=1&web=1&e=gIxpVS.

Emonds, V., & Tamas, P. (2021, December 11). Research Methodology in Environmental Sciences: Self-study deck 6 [PowerPoint Presentation]. The Netherlands. Emond, V., & Tamas, P. (2021, October 27). Research Methodology in Environmental Sciences: Self-study deck 6 [PowerPoint Presentation]. The Netherlands. https://wageningenur4.sharepoint.com/:p:/r/sites/course141562/Gedeelde%20documenten/General/Decks/YRM20306%20Deck%2006.pptx?d=wbfdeaf9c731a4dd1b59b898ff9d2e70f&csf=1&web=1&e=fizkOn.

(Energising Development) EnDev Indonesia. (2020). *A decade of EnDev, from energy access to sustainable energy provision.* A-Decade-Supporting-Rural-Electrification-Program-in-Indonesia-1.pdf (endev.info)

Fan, S., Zha, S., Zhao, C., Sizheng, F., & Li, M. (2022). Using energy vulnerability to measure distributive injustice in rural heating energy reform: A case study of natural gas replacing bulk coal for heating in Gaocheng District, Hebei Province, China. Ecological Economics, 197. https://doi.org/10.1016/j.ecolecon.2022.107456.

Fatma, D. (2018, November 15). *7 pengaruh iklim dan cuaca terhadap kegiatan manusia sehari-hari [7 effects of climate and wheater on human's daily activities].* 7 Pengaruh Iklim dan Cuaca Terhadap Kegiatan Manusia Sehari-hari - IlmuGeografi.com

Fefferman, N., Chen, C. F., Bonilla, G., Nelson, H., & Kuo, C. P. (2021). How limitations in energy access, poverty, and socioeconomic disparities compromise health interventions for outbreaks in urban settings. *iScience*, *24*(12), 103389. https://doi.org/10.1016/j.isci.2021.103389.

Firmansyah & Karim, K. (2021, May 01). *Electricity regulation in Indonesia: overview.* Electricity regulation in Indonesia: overview | Practical Law (thomsonreuters.com).

Flaig, A., & Ottosson, M. (2022). Market-shaping roles – Exploring actor roles in the shaping of the Swedish market for liquefied gas. *Industrial Marketing Management, 104*, 68-84. https://doi.org/10.1016/j.indmarman.2022.04.006.

Fraser, N., & Interruptus, J. (1997). Critical Reflections on the 'Postsocialist'Condition. *Justice Interruptus*.

Healy, J. D., & Clinch, J. P. (2004). Quantifying the severity of fuel poverty, its relationship with poor housing and reasons for non-investment in energy-saving measures in Ireland. *Energy Policy*, *32*(2), 207-220. https://doi.org/10.1016/s0301-4215(02)00265-3.

Heffron, R. J., McCauley, D., & Sovacool, B. K. (2015). Resolving society's energy trilemma through the Energy Justice Metric. *Energy Policy, 87*, 168-176. https://doi.org/10.1016/j.enpol.2015.08.033.

Heffron, R. J., & McCauley, D. (2017). The concept of energy justice across the disciplines. *Energy Policy*, *105*, 658-667. https://doi.org/10.1016/j.enpol.2017.03.018.

Heffron, R. J. (2021). *The challenge for energy justice: Correcting human right abuses.* Palgrave Macmillan Cham.

International Energy Agency (IEA). (2017). *Energy Access Outlook 2017: From Poverty to Prosperity*. IEA. Paris. https://doi.org/10.1787/9789264285569-en.

International Renewable Energy Agency (IRENA). (2017). *Renewable energy prospects: Indonesia, a Remap analysis.* IRENA. Abu Dhabi. Renewable Energy Prospects: Indonesia (irena.org).

Jenkins, K., McCauley, D., & Forman, A. (2017). Energy justice: A policy approach. *Energy Policy*, *105*, 631-634. https://doi.org/10.1016/j.enpol.2017.01.052.

Jenkins, K., McCauley, D., Heffron, R., Stephan, H., & Rehner, R. (2016). Energy justice: A conceptual review. *Energy Research & Social Science*, *11*, 174-182. https://doi.org/10.1016/j.erss.2015.10.004.

Job Creation Act. (2020). https://peraturan.bpk.go.id/Home/Download/153567/UU_Nomor_11_Tahun_2020-compressed.pdf.

Kayesa, N. K., & Shung-King, M. (2021). The role of document analysis in health policy analysis studies in low and middle-income countries: Lessons for HPA researchers from a qualitative systematic review. *Health Policy OPEN*, *2*. https://doi.org/10.1016/j.hpopen.2020.100024.

Laan, T., Vis-Dunbar, D, Tumiwa, F., Lang, K. (2011). *A citizen's guide to energy subsidies in Indonesia*. International Institute for Sustainable Development (IISD). A Citizen's Guide to Energy Subsidies in Indonesia (iisd.org)

Lacey-Barnacle, M., Robison, R., & Foulds, C. (2020). Energy justice in the developing world: a reviewof theoretical frameworks, key research themes and policy implications. *Energy for Sustainable Development*, 55, 122-138. doi:10.1016/j.esd.2020.01.010.

Legros, G., Havet, I., Bruce, N., Bonjour, S., Rijal, K., Takada, M., & Dora, C. (2009). *The energy access situation in developing countries: A review focusing on the least-developed countries and Sub-Saharan Africa*. UNDP and World Health Organization. Layout 1 (undp.org).

Main, A.T. (2021, 21 July). *Half a million Indonesian households are living without electricity, can clean energy be the solution?* BBC News Indonesia. Retrieved on 15 January 2022, from https://www.bbc.com/indonesia/indonesia-57766814.

Malik, C.L. (2021), 'Indonesia Country Report', in Han, P. and Kimura, S (eds.), Energy Outlook and Energy Saving Potential in East Asia 2020, Jakarta: ERIA, pp.102-121.

Maulidia, M., Dargusch, P., Ashworth, P., & Ardiansyah, F. (2019). Rethinking renewable energy targets and electricity sector reform in Indonesia: A private sector perspective. *Renewable and Sustainable Energy Reviews*, 101, 231-247. doi:10.1016/j.rser.2018.11.005.

McCauley, D. A., Heffron, R. J., Stephan, H., & Jenkins, K. (2013). Advancing energy justice: the triumvirate of tenets. *International Energy Law Review*, *32*(3), 107-110.

McCauley, D. (2017). Energy justice: re-balancing the trilemma of security, poverty and climate change. (Palgrave pivot). Palgrave Macmillan. doi:10.1007/978-3-319-62494-5.

Milchram, C., Künneke, R., Doorn, N., van de Kaa, G., & Hillerbrand, R. (2020). Designing for justice in electricity systems: A comparison of smart grid experiments in the Netherlands. *Energy Policy*,147. doi:10.1016/j.enpol.2020.111720.

National Energy Action (NEA). (n.d.). *All party parliamentary, fuel poverty and energy efficiency group*. FPEEG - National Energy Action (NEA)

Ordonez, J. A., Jakob, M., Steckel, J. C., & Fünfgeld, A. (2021). Coal, power and coal-powered politics in Indonesia. *Environmental Science & Policy*, *123*, 44-57. https://doi.org/10.1016/j.envsci.2021.05.007.

PT. Perusahaan Listrik Negara (PLN). (2021). *Laporan Tahunan 2021 [Annual report 2021]*. Laporan-Tahunan-2021.pdf (pln.co.id)

PT. Perusahaan Listrik Negara (PLN). (2020). *Laporan Tahunan 2020 [Annual report 2020]*. https://web.pln.co.id/statics/uploads/2021/02/PLN_AR_2019_Rev_010221_Hires.pdf.

Sambodo, M.T. (2015). Rural electrification program in Indonesia: Comparing SEHEN and SHS program. *Economics and Finance in Indonesia*. *61*(2). 107-118. https://doi.org/10.7454/efi.v61i2.505.

Sambodo, M.T., Negara, S.D., & Fuady, A.H. (2021). *Akses listrik dan kesejahteraan masyarakat [Electricity access and the wealth of society]*. LIPI Press.

Shirazi, M. (2022). Assessing energy trilemma-related policies: The world's large energy user evidence. *Energy Policy*, *167*. https://doi.org/10.1016/j.enpol.2022.113082

Schlosberg, D. (2003). The justice of environmental justice: Reconciling equity, recognition, and participation in a political movement. *Moral and political reasoning in environmental practice*, 77:10.

Secretariat General National Energy Council. (2019). *Indonesia energy outlook 2019*. Ministry of Energy and Mineral Resources of the Republic of Indonesia. DEN_Energi Outlook 2019-COVER_FIN (esdm.go.id).

Setyowati, A. B. (2021). Mitigating inequality with emissions? Exploring energy justice and financing transitions to low carbon energy in Indonesia. Energy Research & Social Science, 71. doi:10.1016/j.erss.2020.101817.

Shyu, C.-W. (2021). A framework for 'right to energy' to meet UN SDG7: Policy implications to meet basic human energy needs, eradicate energy poverty, enhance energy justice, and uphold energy democracy. *Energy Research & Social Science, 79*. https://doi.org/10.1016/j.erss.2021.102199.

Sokolowski, M. M., & Heffron, R. J. (2022). Defining and conceptualising energy policy failure: The when, where, why, and how. *Energy Policy, 161*. https://doi.org/10.1016/j.enpol.2021.112745.

Sovacool, B. K., & Dworkin, M. H. (2015). Energy justice: Conceptual insights and practical applications. *Applied Energy, 142,* 435-444. https://doi.org/10.1016/j.apenergy.2015.01.002.

Sovacool, B. K., Burke, M., Baker, L., Kotikalapudi, C. K., & Wlokas, H. (2017). New frontiers and conceptual frameworks for energy justice. *Energy Policy, 105*, 677-691. https://doi.org/10.1016/j.enpol.2017.03.005.

Sovacool, B. K., Hook, A., Martiskainen, M., & Baker, L. (2019). The whole systems energy injustice of four European low-carbon transitions. *Global Environmental Change, 58*. https://doi.org/10.1016/j.gloenvcha.2019.101958.

Statistics Indonesia. (n.d.). *Number of population results SP2020 by region and gender (people), 2020*. Statistics Indonesia. Retrieved on 17 January 2022, from https://www.bps.go.id/indicator/12/2131/1/jumlah-penduduk-hasil-sp2020-menurut-wilayah-dan-jenis-kelamin.html.

Sumarno, T. B., Sihotang, P., & Prawiraatmadja, W. (2022). Exploring Indonesia's energy policy failures through the JUST framework. *Energy Policy, 164*. https://doi.org/10.1016/j.enpol.2022.112914.

Sustainable Energy for All (SEforALL). (2020). *State of the global mini-grids market report 2020. https://www.seforall.org/system/files/2020-06/MGP-2020-SEforALL.pdf*

The Ministry of Energy and Mineral Resources of the Republic of Indonesia (MEMR). (2021). *Rencana Usaha Penyediaan Tenaga Listrik PT PLN (Persero) [Electricity Supply Business Plan of PLN]*. 38622-ruptl-pln-2021-2030.pdf (esdm.go.id)

The Ministry of Internal Affairs (Kemendagri), Directorate general of village government development. (2022, August 19). *Number of population and head of family*. JUMLAH PENDUDUK DAN KEPALA KELUARGA (kemendagri.go.id)

The World Bank. (2005). Electricity for all: Options for increasing access in Indonesia. The World Bank Office Jakarta. https://documents1.worldbank.org/curated/pt/244891468259478218/pdf/497870WP0v20El10Box341969B01PUBLIC1.pdf

van Bommel, N., & Höffken, J. I. (2021). Energy justice within, between and beyond European community energy initiatives: A review. Energy Research & Social Science, 79. doi:10.1016/j.erss.2021.102157.

van Leeuwen, C. J., & Vermeire, T. G. (Eds.). (2007). Risk assessment of chemicals: An introduction, 1-36. Springer Science & Business Media.

Vannucchi, C. (2020). *Indonesian rural electrification, what is the most sustainable solution?* [Master's thesis, KTH School of Industrial Engineering and Management]. The KTH Publication Database DIVA. FULLTEXT01.pdf (diva-portal.org).

Vitéz, B., & Lavrijssen, S. (2020). The Energy Transition: Democracy, Justice and Good Regulation of the Heat Market. *Energies*, *13*(5). https://doi.org/10.3390/en13051088.

Vosloo, J. J. (2014). Data analysis and interpretation. *Philosophy in movement education*, *354362*.

Walker, G. (2009). Beyond distribution and proximity: exploring the multiple spatialities of environmental justice. *Antipode*, *41*(4), 614-636.

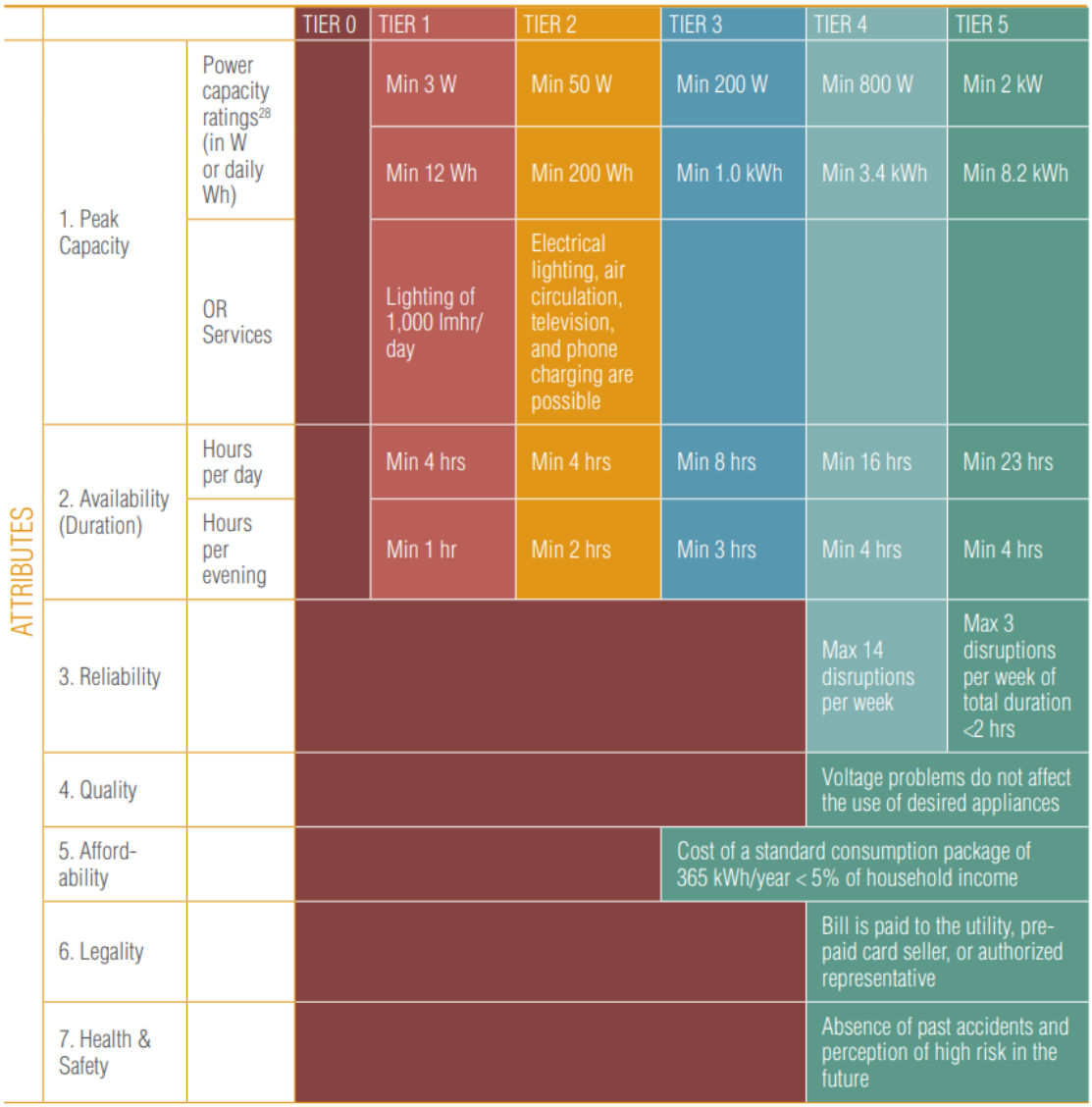
Walker, G., & Day, R. (2012). Fuel poverty as injustice: Integrating distribution, recognition and procedure in the struggle for affordable warmth. *Energy Policy*, *49*, 69-75. https://doi.org/10.1016/j.enpol.2012.01.044

Wirawan, H., & Gultom, Y. M. L. (2021). The effects of renewable energy-based village grid electrification on poverty reduction in remote areas: The case of Indonesia. *Energy for Sustainable Development*, *62*, 186-194. https://doi.org/10.1016/j.esd.2021.04.006.

Yazar, M., & York, A. (2022). Disentangling justice as recognition through public support for local climate adaptation policies: Insights from the Southwest US. *Urban Climate*, *41*. https://doi.org/10.1016/j.uclim.2021.101079.

8. Appendices

8.1 Multi-tier Matrix for Measuring Access to Household Electricity Supply



ATTRIBUTES			TIER 0	TIER 1	TIER 2	TIER 3	TIER 4	TIER 5
	1. Peak Capacity	Power capacity ratings[28] (in W or daily Wh)		Min 3 W	Min 50 W	Min 200 W	Min 800 W	Min 2 kW
				Min 12 Wh	Min 200 Wh	Min 1.0 kWh	Min 3.4 kWh	Min 8.2 kWh
		OR Services		Lighting of 1,000 lmhr/ day	Electrical lighting, air circulation, television, and phone charging are possible			
	2. Availability (Duration)	Hours per day		Min 4 hrs	Min 4 hrs	Min 8 hrs	Min 16 hrs	Min 23 hrs
		Hours per evening		Min 1 hr	Min 2 hrs	Min 3 hrs	Min 4 hrs	Min 4 hrs
	3. Reliability						Max 14 disruptions per week	Max 3 disruptions per week of total duration <2 hrs
	4. Quality						Voltage problems do not affect the use of desired appliances	
	5. Afford-ability					Cost of a standard consumption package of 365 kWh/year < 5% of household income		
	6. Legality						Bill is paid to the utility, pre-paid card seller, or authorized representative	
	7. Health & Safety						Absence of past accidents and perception of high risk in the future	

Figure 7. Multi-tier matrix for measuring households access to electricity supply (Bhatia & Angelou, 2015)

8.2 Interview questions

8.2.1 The Ministry of Energy and Mineral Resources (MEMR)

Thematic issue: Rural electrification program

- First, please explain your role as a [position] in the Ministry of Energy and Mineral Resources of the Republic of Indonesia.
- How would the MEMR describe the **'just outcomes'** of Indonesia's rural electrification program?
- Which **parties (institutions or actors)** are assigned to run this program?
- What is the **key role** of the Ministry of Energy and Mineral Resources in this program?
- From the rural electrification program, what kind of outcomes does the Ministry of Energy and Mineral Resources specifically want to achieve in this program?
- To adequately measure these results, what **indicators** does the MEMR use? (example: 100% electrification ratio; equivalent quality of electricity service. Mention more if not already explained here.)
- The **electrification ratio** according to the **Electricity Supply Business Plan (RUPTL) of PT PLN (Persero) 2021 – 2030** which is legalized by the Minister of Energy and Mineral Resources of the Republic of Indonesia refers to the number of households based on data from the Central Statistics Agency. However, there may be villages that are still undocumented, such as **in disadvantaged, outlying, and frontier areas (3T Region)**. Please comment on this statement.
- What **policies and programs** does the Ministry of Energy and Mineral Resources have specifically to make the rural electrification program a success in Indonesia? (**Examples**: Special Allocation Funds (DAK); Solar Home System (SHS); National Program for Independent Rural Community Empowerment (PNPM-Rural Areas). Please specify others if not listed here
- According to **PT PLN (Persero)'s 2021-2030 Electric Power Supply Business Plan (RUPTL)**, which was approved by the Indonesian Minister of Energy and Mineral Resources, the special allocation fund for rural electricity (DAK) has now been combined into another energy funding program known as the Special Allocation Fund for Energy. If so, what kind of impact and to what extent can this change affect the achievement of the rural electrification program?
- How are the **policies and programs** of the **Ministry of Energy and Mineral Resources** to carry out the rural electrification program **specifically related** to other important policies and programs to achieve a 100% electrification ratio in Indonesia? (**Examples**: PLN SEHEN (Super Extra Energy Saving) Program; Cheap and Efficient Electricity Program (LMH); Fast Track Program 1 and 2; 35 GW program; Energy Saving Solar Lighting (LTSHE); PLN CSR Programs, such as, One Man One Hope; Terangi Negeri; Tube Electricity Program (Talis). Please mention others if not listed here)

- From the perspective of the Ministry of Energy and Mineral Resources, what are the **main challenges** that hinder the achievement of equitable access to electricity through the rural electrification program? (**Examples**: overlapping programs between SEHEN and SHS; delayed programs; stalled projects; geographic and infrastructure constraints; funding challenges; complexity in bureaucracy; structural changes in government agencies; monitoring issues; transfer of knowledge from government to local communities after program implementation; Ownership issues. Please mention more if not already explained here.)
- Based on the **Electricity Supply Business Plan (RUPTL) of PT PLN (Persero) 2021 – 2030** which was ratified by the Minister of Energy and Mineral Resources of the Republic of Indonesia, "*The rural electricity program will be implemented with funding from the PLN Budget (APLN) and the State Capital Participation (PMN) which is programmed based on village data provided by the Ministry of Energy and Mineral Resources. submitted by each province*".
  Can you please explain to me regarding the considerations or reasons behind the funding arrangements in such a way? And what is the ratio of funding issued from APLN and PMN (in %)?
- If applicable, in what way and to what extent do **electricity subsidies** contribute to the problem of congestion in achieving equitable access to electricity for all Indonesian households, especially in **frontier, remote, and underdeveloped areas (Regions 3T)**?
- According to **the PT PLN (Persero) 2021-2030 Electric Power Supply Business Plan (RUPTL)** which was approved by the Minister of Energy and Mineral Resources of the Republic of Indonesia, it was explained that "*In addition to the challenges of building electricity facilities, electricity supply is currently also burdened by an increase in the cost of production which is not accompanied by an increase in the cost of production. selling price. Revenues from customers in the last 2 years cover around 75-85% of PLN's production costs. The difference between production costs and PLN income is the burden of electricity subsidies in the APBN*".
  If applicable, how and to what extent does this situation contribute to the problem of congestion in achieving equal access to electricity through rural electrification programs in Indonesia?
- What is the **future plan or vision** of the Ministry of Energy and Mineral Resources for the rural electrification program in Indonesia? (Example: electricity privatization)

Thematic issue: Core tenets of Energy Justice

[Distributive Justice]

- Do you see any challenges related to an **unequal distribution of electricity access** from current formulation and implementation of Indonesia's rural electrification program? (**example**s: unequal income to pay electricity bills or installation fees; unequal electricity service; unequal risks connected to the electricity infrastructure; unequal competence in electricity provision and maintenance services between government agencies in national and sub-national level. Please mention more if not described here)
- How has your organization **addressed** these challenges?

[Procedural Justice]

- Do you see any challenges related to **engagement between actors**, such as between government in national and non-national level from the **decision making process** in Indonesia's rural electrification program? (**examples**: Inadequate access to informational disclosure on the problems and solutions for the program; lack of meaningful participation; limited access to legal resources to challenge decision-making process in the program)
- How has your organization **addressed** these challenges?
- Based on **the Electricity Supply Business Plan (RUPTL) of PT PLN (Persero) 2021 – 2030 which was approved by the Minister of the Ministry of Energy and Mineral Resources of the Republic of Indonesia,**
  "*There are several other things that affect energy efficiency and conservation, including technology and government policies and regulations. The element of technology is generally related to the efficiency of electrical equipment used by consumers which can save electricity consumption.* ***Meanwhile, government policies and regulations are related to programs and the readiness of government regulations to promote efficiency or conservation. However, these two things cannot be accommodated in the projection of electricity demand***." Please comment on this statement.
- From one of the thesis informants, he said that the village electricity budget is now fully the responsibility of PLN. Please explain when this policy came into effect and what are the implications for the rural electrification program?

[Recognition Justice]

- In the rural electrification program in Indonesia, in your opinion, is the current program implementation sufficient to accommodate input from **grassroots groups**? such as SMEs, cooperatives, and vulnerable, disadvantaged, or indigenous peoples? (**Examples**: Electricity is not only for lighting, but also for the welfare of the community. For example, encouraging local tourism and new businesses for SMEs that would not be visible if electricity was not available).
- How has your organization **addressed** these challenges?
- **Electric Power (RUPTL) PT PLN (Persero) 2021 – 2030** which was ratified by the Minister of Energy and Mineral Resources of the Republic of Indonesia stated that in 2017-2019, the pre-electrification program using Energy Saving Solar Lamps (LTSHE) was implemented for **villages that were difficult to electrify in two up to the next three years. Villages whose LTSHE warranty period has expired (ex-LTSHE) will be electrified by PLN in 2020.**

Can you please explain to me regarding updates or the latest news about ex-LTSHE villages?

Closing

- Is there anything else you'd like to add?
- Would you please provide recommendations for other resource persons, especially from PLN for this research?
- Any question?

8.2.2 State Electricity Company (PLN)

Thematic issue: 100% Electrification Ratio in Indonesia

- First, could you please describe your role as the [position] in PLN?
- According to **the PLN's annual report of 2020**, It indicates that there would be no more households without access to electricity in 2021. However, it also describes that the rural electrification of less than 60% were discovered in the provinces of Papua (22.73%) and West Papua (44.2%). Could you please comment on this?
- When it comes to achieving 100% Electrification Ratio in Indonesia, which **policies and programs** that PLN **specifically has** in place to achieve this goal? (**examples**: PLN's Super Extra Energy Saving or SEHEN *[Super Ekstra Hemat Energi]*, PLN's electricity supply business plan to increase the share of new and renewable energy between 2019 – 2028; Solar-Powered Lamp with Energy Saving (LTHSE); PLN's CSR programs, such as, One Man One Hope program; *Terangi Negeri* program; *program Listrik Tabung or* Electric Tubes program (Talis)). Please mention more if they are not described here).
- How do these **policies and programs specifically relate** to other important policies and programs for achieving 100% electrification ratio in Indonesia?
  (**examples**: *Đana Alokasi Khusus* or the special allocation fund from MEMR; Solar Home system (SHS) from MEMR; National Program for Community Empowerment in Rural Areas (PNPM-Rural) from MEMR; *program Listrik Murah dan Hemat* or affordable and efficient electricity program (LMH)); Fast Track Program 1 and 2; 35 GW program; Solar-Powered Lamp with Energy Saving (LTHSE)).Please mention more if they are not described here.

Thematic issue: Rural electrification program in Indonesia

- Which **actors** have been tasked with carrying out this program?
- What are PLN's **key roles** in this program?
- From rural electrification program, what are the **outcomes (or mandates)** that PLN wants to **specifically achieve** from this program?
- To sufficiently measure these **outcomes**, what **indicators** that PLN uses? (**example**: 100% electrification ratio; equal electricity services. Please mention more if they are not described here).
- From **PLN**, which **departments/divisions** were **involved** in Indonesia's rural electrification formulation and implementation?

- What **strategies or action plan** that PLN has in place to succeed this program?
- Do you see any **major challenges** emerging from this program? (**examples**: overlapping programs between SEHEN and SHS; delayed programs; geographical and infrastructure constraints; funding challenges; complexity in bureaucracy; structural changes in the governmental agencies; monitoring issues; transfer of knowledge from government to local communities after the commission of the program; Ownership issues).
- According to the **MEMR document PLN's electricity supply business plan 2021 – 2030, "***In anticipation of the development of a large IPP power plant and to ensure the future security of supply of electricity, PLN has developed a strategy to include PLN's subsidiaries in the ownership of the IPP, as well as to use the BOT (Build, Operate, and Transfer) scheme, so that the plant will become the property of PLN at the end of the contract period."* Could you please comment on this?
- In 2017-2019, a pre-electrification program using Energy Saving Solar Lamps (LTSHE) was also implemented for villages that will be difficult to electrify in the next two to three years. Villages whose LTSHE warranty period has expired (ex-LTSHE) will be electrified by PLN in 2020. Could you please share with me the updates on this?
- PLN's sales of electricity are strongly influenced by sales growth in Java-Bali, because more than 70% of PLN's sales are for customer needs in Java-Bali. If any, in what way and to what extent this situation may affect the progress of the rural electrification program outside of Java and Bali region?
- From PLN's perspective, in what way '**just outcomes**' should look like in Indonesia's rural electrification program?
- If any, how and to what extent might **electricity subsidies** contribute to bottleneck issues in achieving equal electricity access for all Indonesian households, particularly in **disadvantaged, outlying, and frontier regions (*Daerah 3T*)?**
- According to **the MEMR document PLN's electricity supply business plan 2021 – 2030,** It described "*In addition to the challenges of constructing electricity facilities, the current supply of electricity is burdened by an increase in production costs that is not accompanied by an increase in selling prices. In the last two years, customer revenues have covered approximately 75-85% of PLN's production costs. The burden of electricity subsidies in the APBN is the difference between production costs and PLN income*." If any, in what way and to what extent this situation contribute to bottleneck issues in achieving equal electricity access through Indonesia's rural electrification program?
- What is PLN's **future plan or visions** for Indonesia's rural electrification program? (**example:** electricity privatization)

Thematic issue: Core tenets of energy justice

[Distributional Justice]

- Do you see any challenges related to an unequal **distribution of electricity access** from current formulation and implementation of Indonesia's rural electrification program? (**examples**: Unequal income to pay electricity bills, especially installation fees; unequal electricity service; unequal risks connected to the electricity infrastructure; unequal competence in electricity provision and maintenance services between government agencies in national and sub-national level). Please mention more

if they are not described here.

- How has **PLN** addressed these challenges?
- According to **the PLN's annual report of 2020**, it describes that one of PLN's contribution to the Indonesian economy includes the use of competitive electricity tariffs to attract industry and maintain people's purchasing power. Please explain the considerations that PLN uses to determine this "competitive tariffs".
- According to **the PLN's annual report 2020**, it describes that "Power plant development is pursued optimally with the principle of the **least cost** of electricity supply, while still meeting power adequacy and a reasonable level of reliability in the electric power industry". Please explain the strategies that PLN use to achieve "least cost of electricity supply".

[Procedural Justice]

- Do you see any challenges related to **engagement between actors**, such as between government in national and non-national level from the **decision making process** in Indonesia's rural electrification program? (**examples**: Technical expertise gap; lack of meaningful participation; protocols that sufficiently accommodate the establishment, management, and monitoring process; overlapping permits. Please mention more if they are not described here).
- How has **PLN** addressed these challenges?
- According to **the PLN's annual report of 2020,** It describes "*PLN faces a number of challenges in order to achieve its vision of "Being the Leading Electricity Company in Southeast Asia and #1 Customer Choice for Energy Solutions." Among these are the ability to provide low-cost electricity while also ensuring the safety and reliability of electricity supply, the transition to providing low-carbon electricity and contributing to decarbonization, the ability to provide competitive services and electricity prices that can provide high-value services that are not limited to kWh (electrical energy), and the ability to provide high-quality services and utilize digital technology".* How has PLN harmonized these various demands of being the primary holder of an Electricity Supply Business Permit (IUPTL)?
- According to **the PLN's annual report of 2020**, *"The role of PLN as an electricity provider underwent changes after issuance of Law 30/2009. According to this law, PLN no longer holds a monopoly on electricity supply in Indonesia and no longer plays the role as the Holder of the Authority to Conduct Electricity Business (PKUK) but as the Holder of Electricity Supply Business License (IUPTL)".* In what way and to what extent, has it contributed to the electricity privatization in Indonesia?
- According to **the PLN's annual report of 2020, "***In accordance with the Government's policy to realize the 35,000 MW program, the Government creates opportunities for private investment to participate as fully as possible in the construction of power plants through the mechanism of private power plants or Independent Power Producers (IPP). Aside from the IPP scheme, the private sector can participate in Engineering, Procurement, and Construction (EPC) projects offered by PLN, Public Private Partnerships (KPS), or lease and purchase schemes (build, lease and transfer)".* Could you please describe the outcomes that PLN expects to achieve from these schemes?

[Recognition Justice]

- Do you see any incidents of **poor engagement with local actors** in Indonesia's rural electrification program**?, such as SMEs, cooperatives, and vulnerable, disadvantageous, or indigenous groups** (**example**: Electricity is not only for lighting, it also contribute to local community's welfare. For instance, driving local tourism and new business for SMEs that would not be evident if the electricity is not available).
- How has **PLN** addressed these challenges?
- In terms of **tariffs**, I've often read that the PLN is actually losing money because the electricity tariff is set much lower than the actual operational cost. However, it is mitigated by the profit from electricity subsidies and government compensation. Could you please explain what will happen to the PLN and Indonesia's rural electrification program if the electricity tariff imposed on consumers reflects the actual operational cost?
- Could you please give recommendations on how to address these challenges?

Closing

- Anything else that you would like to share?
- Any recommendations for other interviewees' profiles whose insights you believe will benefit this research?
- Do you have any questions?

8.2.3 Primary and secondary actors

Thematic issue: Residential electricity framework of Indonesia

- First, tell me about your **scope of study or engagement** in Indonesia's electricity, in particular, the residential electricity sector?
- When it comes to residential electricity, which **topics or issues** do you focus on?
- In your perspective, what are the three most important **goals**, when it comes to Indonesia's residential electricity?
- In your perspective, **of existing policies and programs,** which one(s) that are prevalent to achieve these **goals**?

Thematic issue: Rural electrification program in Indonesia

- In your perspective, in what way and to what extent **rural electrification benefits households** in Indonesia?
- In your perspective, which **narratives or strategies that government uses** to carry out this program?
- In your opinion, from the existing government **policies and programs**, which ones are sufficient to accommodate the achievements of this program?, and why?
- In your perspective, which **actors** who dominate the formulation and implementation of this program?
- From your perspective, what are the **main challenges** that hinder the achievement of equitable access to electricity through the rural electrification program?

- (Examples: overlapping programs; delayed programs; stalled projects; geographical and infrastructure constraints; funding challenges; complexity in bureaucracy; structural changes in government agencies; monitoring issues; transfer of knowledge from government to local communities after program implementation; ownership issues). Please mention more if not already explained here.
- How do you **envision** the progress of Indonesia's rural electrification program in the **future**?
- Do you see any **challenges** emerging from this program? (example: conflicting goals or action plan amongst actors).
- Do you see any '**energy injustice' issues** emerging from this program? (example: Based on the Master Plan of Electricity Development 2010–2014 that was issued by the Minister of Energy and Mineral Resources (MEMR) in December 2009, government defined rural electrification as the share of total village with electricity access to total number of village. However, there might be villages that are not well-documented, such as the disadvantaged, outermost, and frontier regions (*Daerah 3T*)).

Thematic issue: Core tenets of energy justice

[Distributional Justice]

- Do you see any challenges related to an unequal **distribution of electricity access** from current formulation and implementation of Indonesia's rural electrification program? (example: unequal income to pay electricity bills or installation fees; unequal electricity service; unequal risks connected to the electricity infrastructure; unequal competence in electricity provision and maintenance services between government agencies in national and sub-national level).
- In your perspective, how effective Indonesia's government has addressed these challenges?

[Procedural Justice]

- Do you see any challenges related to **engagement between actors**, such as between government agencies at the national and subnational levels, from **the decision making process in Indonesia's rural electrification program**? (example: Inadequate access to informational disclosure on the problems and solutions for the program; lack of meaningful participation; limited access to legal resources to the challenge decision-making process in the program).
- Do you see any significant obstacles regarding the division of roles **between the Ministry of Energy and Mineral Resources and PLN** in the decision-making process for the rural electrification program in Indonesia?
- Do you see any significant obstacles related to the division of roles **between the Government and the private sector** (e.g. IPPs or Independent Power Producers) in the decision-making process of rural electrification programs in Indonesia?
- In your perspective, how effective Indonesia's government has addressed these challenges?

[Recognition Justice]

- Do you see any incidents of **poor engagement to non-state actors** in Indonesia's rural electrification program?, **such as businesses and indigenous groups** (example: Cultural domination; non-recognition; disrespect; conflicting vision and needs).
- In your perspective, how effective Indonesia's government has addressed these challenges?
- In terms of tariffs, I often read that PLN is actually losing money because the electricity tariffs are much lower than the actual operating costs. However, this is overcome by the benefits of electricity subsidies and government compensation. What do you think will happen to the rural electrification program in Indonesia if the **electricity tariffs** charged to consumers reflect actual operating costs?
- If applicable, in what way and to what extent do **electricity subsidies** contribute to the problem of congestion in achieving equitable access to electricity for all Indonesian households, especially in frontier, remote, and underdeveloped areas (Regions 3T)?
- What solutions do you propose for the government to address these issues?

Closing

- Anything else that you would like to share?
- Any recommendations for other interviewees' profiles whose insights you believe will benefit this research?
- Do you have any questions?

8.3 List of codes with Atlas.ti program version 9

- Actors
- Benefits of rural electrification program
- Blackout
- Challenges in rural electrification program
- CSR PLN
- Cultural domination
- *Daerah 3T* (disadvantaged, foremost, and outermost areas)
- Disrespect
- Electricity, economy, and public welfare
- EnDev
- Factors that affect the utilization of electricity
- Fossil fuel
- Government's initiatives and strategies related to Indonesia's rural electrification program
- How electricity distributed from Power Plant to Households
- IBEKA
- Inadequate access to informational disclosure on the problems and the solutions for the program
- IPP dan PPAs
- Lack of meaningful participation
- Lessons learned
- Limited to legal resources to challenge the decision making process in the program
- Meter system
- Narrative of Indonesia's rural electrification program
- New and Renewable Energy Potential in Indonesia
- Non-recognition
- Nuclear-fueled Power Plant
- Organizational structure in PLN
- PLN
- Recommendation
- Resources needed to implement rural electrification program
- Risks of PLN
- Rules and regulations relevant to Indonesia's rural electrification program
- SEHEN and SHS
- Subsidies
- Tariff calculation model
- Unequal distribution of risks connected to the electricity infrastructures
- Unequal income to pay electricity bills
- Unequal ratio of electrification
- Uneven quality of electricity services