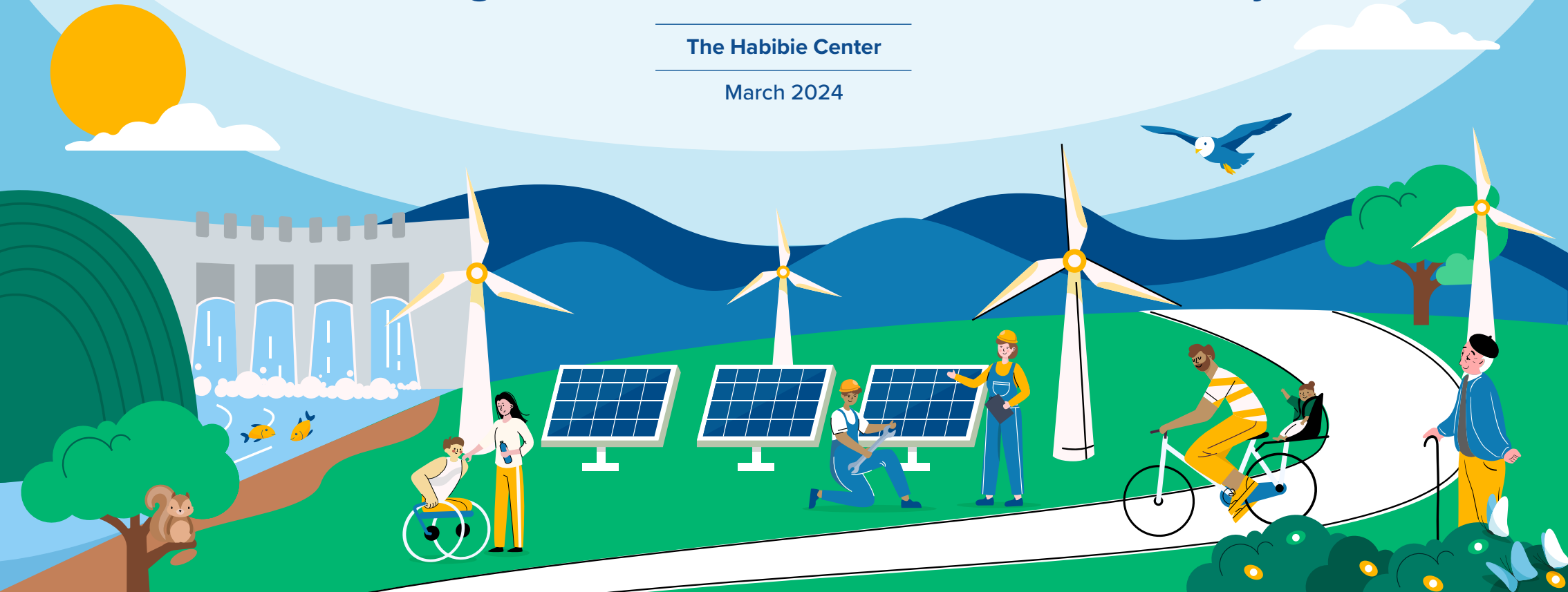


Reenvisioning Indonesia's Just Energy Transition Toward a Regenerative and Democratic Ecosystem

The Habibie Center

March 2024



Reenvisioning Indonesia's Just Energy Transition: Toward a Regenerative and Democratic Ecosystem

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Foreword

Dr. Ilham Akbar Habibie

Chair of the Board of Trustees, The Habibie Center (THC)

With gratitude to the Almighty, the book “Reenvisioning Indonesia’s Just Energy Transition: Toward a Regenerative and Democratic Ecosystem” emerges as a scientific oasis for all levels of society, from policymakers to grassroots communities. The Habibie Center (THC), an independent think-tank rooted in democratic values and human rights, recognizes the importance of in-depth study on a just energy transition that encompasses different perspectives—socio-economic, innovation, and environmental. Through this book, THC emphasizes that justice should be key to the energy transition process in Indonesia. Thus, this book is expected to help direct the commitment, implementation, and achievement of Indonesia’s just energy transition towards its intended meaning—regenerative and democratic.

Prof. Eniya Listiani Dewi, B.Eng., M.Eng., Dr.Eng.

Chair of the Institute for Democratization through Science, Technology, and Innovation,
The Habibie Center

This book invites us to explore the challenges and opportunities of creating a sustainable future, as well as traverse crucial concepts such as just energy transition, ecosystem balance, and economic justice, focusing on the role of local youth and community participation. Through discussions on regional energy targets, community-based economic development, as well as investment and financing in new and renewable energy, we unlock positive economic transformation. To achieve this goal, support for research and innovation, as well as synergy with domestic industries, are key to shaping our envisioned future. Together, we are pioneering change, undergoing social regeneration, and creating sustainable ecosystems for future generations. Let us unite, innovate, and collaborate to achieve the ideals of sustainability and shared prosperity.

Suraya Afiff, P.hD.

Academician, FISIP Universitas Indonesia

The fundamental issue with a just energy transition is the use of the business-as-usual development paradigm, while a just energy transition requires a framework of thinking to design the transformation. There are two key objectives in this book. First, this book offers knowledge related to paradigms, frameworks of thinking, and fundamental strategies to be understood and utilized by all stakeholders interested in promoting a just energy transition in Indonesia. Second, it explores various proven innovations that can inspire those who seek to develop programs related to just energy transition. Perhaps it is not too much of an exaggeration to say that this book is a pioneer, as it is the first to present a relatively comprehensive discussion, offering essential knowledge for all parties who want to see the achievement of a just energy transition in Indonesia.

Agung Budiono

Executive Director, Yayasan Indonesia CeraH

The ideas presented in this book encourage us to think in unconventional ways through a systems thinking approach to revisit one of the discourses of interest to many groups in the energy sector, namely the Just Energy Transition (JET). This theme has increasingly emerged in recent years as countries around the world make collective efforts to overcome the threat of the climate crisis through decarbonization in the energy and power sectors, such as the phasing out of coal-fired power plants. The book attempts to unravel the complex network of the energy landscape in Indonesia by highlighting the issue on the implementation of energy transition from various critical aspects—environmental, social, and economic. Hopefully, this book will become an irreplaceable reading material and guide for policymakers, researchers, and observers seeking to unravel the complexity of energy transition in the dynamic context of Indonesia. Finally, congratulations to The Habibie Center and all the researchers and authors involved in the publication of this book!

Preface

“A Call for Humanity and Sustainability”

May human, nature, and all beings of Indonesia be well, happy, and free from suffering,

The climate crisis is a priority issue that must be addressed immediately through climate policy and a just energy transition. The global temperature rise has exceeded the 1.5°C threshold over a span of just one year, from February 2023 to January 2024. Moreover, there are several anomalies in global temperature data above the 2°C limit. It should be underlined that the world is at risk of failing to meet the Paris Agreement. Every day, people worldwide are increasingly threatened and marginalized by the adverse impacts of the current global boiling. Indonesia is also experiencing the impacts of the climate crisis, including increased sea volume, loss of biodiversity, and increased health risks, all of which are born by the state and society.

Decarbonizing the energy sector is the tipping point for addressing the climate crisis. The energy sector is one of the major contributors to greenhouse gas emissions. From an economic perspective, the development of renewable energy is becoming increasingly competitive compared to fossil fuels, which have always been heavily subsidized. Delaying the energy transition for techno-economical reasons is a sunk-cost fallacy that could lead to many stranded high-value assets in the future. Furthermore, falling behind in the renewable energy market will not only exacerbate the climate crisis, but will also result in lost opportunities to become a major player in the global renewable energy supply chain.

Justice must become the spirit (pillar) in the energy transition process. We need to recognize that current national energy procurement practices are a zero-sum game phenomenon that raises a variety of socio-ecological problems. As an illustration, prolonged droughts or heavy rainfall in various parts of Indonesia are becoming increasingly severe, leading to crop failures, food scarcity, and rising food prices. Residents living near fossil fuel power plants, particularly coal-fired power plants, often suffer from Acute Respiratory Infections (ARIs) due to inhalation of harmful air pollutants. Therefore, the goal of a just energy transition is not just to replace primary energy sources in the energy supply chain, but to create a future energy system that is fair in environmental, social, and economic aspects for all segments of Indonesian society.

Natural and social regeneration is the new ideal reference for Indonesia’s just energy transition.

The global and national energy economies have long had socio-ecological consequences due to their linear and extractive design; thus, there is a need to systematically improve the design of energy economies. It is crucial to understand that decarbonizing the energy sector is just one mission of a larger vision, which is to create an Indonesian society that interprets nature and society through energy systems, economic design, and a civilized social order.

Democratic methods are the key to realizing big dreams for a better future. A just energy transition as a wicked problem—complex, dynamic, and structural—cannot be solved by just a few parties, but requires the commitment and participation of all Indonesians, including state and non-state actors. Social innovations are often created and run with the commitment and sincerity of all stakeholders facing the same problem. Through this *gotong royong* (mutual cooperation), efforts to improve the governance of the national energy economy in a democratic manner will undoubtedly produce results that improve social welfare, encourage independence, and are sustainable.

Finally, I hope you enjoy reading the book. *Salam kemanusiaan dan kelestarian! Rahayu, rahayu, rahayu!*

Jakarta, 7 March 2024

Ronald Julion Suryadi
Lead Author
The Habibie Center

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List of Abbreviations

°C	: Degrees Celsius	DEN	: <i>Dewan Energi Nasional</i> (National Energy Council)
ADB	: Asian Development Bank	DG NREEC	: Directorate General of New Renewable Energy and Energy Conversion
APBD	: <i>Anggaran Pendapatan dan Belanja Daerah</i> (Regional Budget)	DMO	: Domestic Market Obligation
APBN	: <i>Anggaran Pendapatan dan Belanja Nasional</i> (State Budget)	DPR	: <i>Dewan Perwakilan Rakyat</i> (House of Representatives)
B3	: <i>Bahan Beracun dan Berbahaya</i> (Toxic and Hazardous Materials)	NRE	: New and Renewable Energy
BAPETEN	: <i>Badan Pengawas Tenaga Nuklir</i> (Nuclear Power Supervisory Agency)	EITI	: Extractive Industry Transparency Initiative
Bappenas	: <i>Badan Perencanaan Pembangunan Nasional</i> (National Development Planning Agency)	EMR	: Energy and Mineral Resources
BCG	: Boston Consulting Group	RE	: Renewable Energy
BEV	: Battery Electric Vehicle	ETM	: Energy Transition Mechanism
Biru	: <i>Biogas rumah</i> (Home Biogas)	EUR	: Euro (European Union Currency)
BLK	: <i>Balai Latihan Kerja</i> (Vocational Training Center)	FIAR	: <i>Fasilitasi Inovasi Akar Rumput</i> (Facilitation of Grassroots Innovation)
BNPB	: <i>Badan Nasional Penanggulangan Bencana</i> (National Disaster Management Agency)	FOB	: Free On Board
BPD LH	: <i>Badan Pengelola Dana Lingkungan Hidup</i> (Environmental Fund Management Agency)	FPIC	: Free, Prior, and Informed Consent
BPS	: <i>Badan Pusat Statistik</i> (Statistics Indonesia)	Gaikindo	: <i>Gabungan Industri Kendaraan Bermotor Indonesia</i> (Indonesian Motor Vehicle Industry Association)
BRIDA	: <i>Badan Riset dan Inovasi Daerah</i> (Regional Research and Innovation Agency)	GFANZ	: Glasgow Financial Alliance for Net Zero
BRIN	: <i>Badan Riset dan Inovasi Nasional</i> (National Research and Innovation Agency)	GIZ	: Gesellschaft für Internationale Zusammenarbeit
BUMDes	: <i>Badan Usaha Milik Desa</i> (Village-Owned Enterprise)	GHG	: Greenhouse Gas
CAT	: Climate Action Tracker	GW	: Gigawatt
CFPP	: Coal-Fired Power Plant	Hivos	: Humanist and Social Innovation Foundation
CIPP	: Comprehensive Investment and Policy Plan	PR	: Public Relations
COP	: Conference of the Parties	IAP2	: International Association for Public Participation
CPI	: Climate Policy Initiative	IBEKA	: <i>Inisiatif Bisnis dan Ekonomi Kerakyatan</i> (People's Business and Economic Initiative)
CREA	: Center for Research on Energy and Clean Air	IDBP	: Indonesia Domestic Biogas Program
DAK	: <i>Dana Alokasi Khusus</i> (Special Allocation Fund)	IEA	: International Energy Agency
		IESR	: Institute for Essential Services Reform
		ILO	: International Labor Organization
		IRENA	: The International Renewable Energy Agency

IRID	: Indonesia Research Institute for Decarbonization	PIT	: Indonesia Terang Programme
IUPTL	: <i>Izin Usaha Penyediaan Tenaga Listrik</i> (Electricity Supply Business License)	PLN	: <i>Perusahaan Listrik Negara</i> (State Electricity Company)
JET	: Just Energy Transition	PLMD	: <i>Program Listrik Masuk Desa</i> (Village Electricity Program)
JET-P	: Just Energy Transition Partnership	PLTA	: <i>Pembangkit Listrik Tenaga Air</i> (Hydroelectric Power Plant)
K/L	: <i>Kementerian Negara/Lembaga</i> (State Ministry/Agency)	PLTB	: <i>Pembangkit Listrik Tenaga Bayu</i> (Wind Power Plant)
KDPK	: <i>Kerja Sama Daerah dengan Pihak Ketiga</i> (Regional Cooperation with Third Parties)	PLTBm	: <i>Pembangkit Listrik Tenaga Biomassa</i> (Biomass Power Plant)
MoWECP	: Ministry of Women's Empowerment and Child Protection	PLTG	: <i>Pembangkit Listrik Tenaga Gas</i> (Gas Power Plant)
NEP	: National Energy Policy	PLTMH	: <i>Pembangkit Listrik Tenaga Mikro Hidro</i> (Micro Hydro Power Plant)
RFC	: Regional Fiscal Capacity	PLTS	: <i>Pembangkit Listrik Tenaga Surya</i> (Solar Power Plant)
KSDPK	: <i>Skema Kerja Sama Daerah dengan Pihak Ketiga</i> (Regional Cooperation Scheme with Third Parties)	PLTU	: <i>Pembangkit Listrik Tenaga Uap</i> (Steam Power Plant)
KTT	: <i>Konferensi Tingkat Tinggi</i> (Summit)	PMK	: Minister of Finance Regulation
kWh	: Kilowatt-hour	PP	: Government Regulation
LCOE	: Levelized Cost of Energy	PT SMI	: PT Sarana Multi Infrastruktur
LKTL	: <i>Lingkar Temu Kabupaten Lestari</i> (Sustainable District Association)	PV	: Photovoltaic
LPG	: Liquefied Petroleum Gas	RUED	: <i>Rencana Umum Energi Daerah</i> (Regional General Energy Plan)
LTS - LCCR	: Long-Term Strategy for Low Carbon and Climate Resilience	RUEN	: <i>Rencana Umum Energi Nasional</i> (National General Energy Plan)
MTF	: Multi-Tier Framework	RUKD	: <i>Rencana Umum Ketenagalistrikan Daerah</i> (Regional General Electricity Plan)
Musrenbang	: <i>Musyawarah Perencanaan Pembangunan</i> (Development Planning Conference)	RUKN	: <i>Rencana Umum Ketenagalistrikan Nasional</i> (National General Electricity Plan)
MWac	: Megawatt alternating current	RUPTL	: <i>Rencana Usaha Penyediaan Tenaga Listrik</i> (Electricity Supply Business Plan)
MWp	: Megawatt-peak	Satgas	: <i>Satuan Tugas</i> (Task Force)
NDC	: Nationally Determined Contribution	SDGs	: Sustainable Development Goals
NTB	: Nusa Tenggara Barat	THC	: The Habibie Center
NTT	: Nusa Tenggara Timur	TW	: Terawatt
OGI	: Open Government Indonesia	SMEs	: Small and Medium Enterprises
CSO	: Civil Society Organizations	UN	: United Nations
GDP	: Gross Domestic Product	UNECE	: United Nations Economic Commission for Europe
GRDP	: Gross Regional Domestic Product	USD	: The United States Dollar
Perda	: <i>Peraturan Daerah</i> (Regional Regulation)	UU	: <i>Undang-Undang</i> (Law)
Permen	: <i>Peraturan Menteri</i> (Ministerial Regulation)	UUD	: <i>Undang-Undang Dasar</i> (Constitution)
Perpres	: <i>Peraturan Presiden</i> (Presidential Regulation)	WEF	: World Economic Forum
		WWF	: World Wildlife Fund
		YRE	: Yayasan Rumah Energi



About this Book

Executive Summary

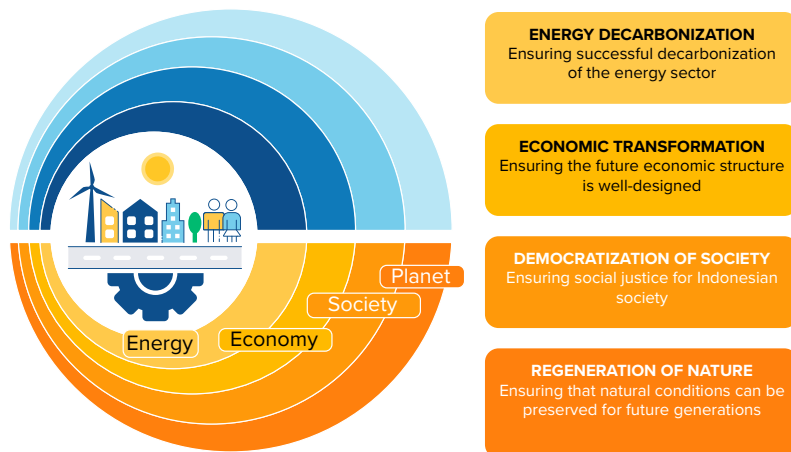


Figure RE1. Illustration of reenvisioning Indonesia's just energy transition toward a regenerative and democratic ecosystem

The energy sector is a tipping point for a change to address the climate crisis and other socio-ecological crises. This is because the energy sector is a significant contributor to greenhouse gas (GHG) emissions and various socio-ecological issues both in Indonesia and worldwide. Additionally, both fossil- and renewable-based energy governance often leads to various zero-sum game phenomena. For instance, energy governance that only focuses on generating economic benefits on one side could result in various socio-ecological problems and unfair practices on the other side. The energy sector must be understood as a sub-system that is integrated with larger systems such as economy, society, and planet (see Figure RE1). The spirit of a just energy transition will be meaningless unless it successfully ensures that no one is left behind in the aspects of recognition, procedure, and substance in all of its processes and results to create an ideal future ecosystem—regenerative and democratic.

Key findings of this book are as follow:

- **The complex, systemic, and dynamic problems in the implementation of just energy transition— also known as the wicked problem—cannot be solved with linear thinking.** This book presents the integration of three alternative thinking frameworks to tackle the complex challenges of just energy transition: systems thinking, doughnut economics, and design thinking. The integration of systems thinking and the doughnut economics framework can be a tool (method) to comprehend the issue of just energy transition, which belongs to the wicked problem category. On the other hand, the design thinking framework can also be used as a tool (method) to design solutions, such as building an ideal ecosystem for the future.
- **Justice is an integral entity of achieving the energy transition.** Simply put, to understand justice, we must first understand injustice from various perspectives: environmental, social, and economic. The environment (nature) and social (society) are entities that often experience injustice from various implementations of energy governance that are heavily biased towards the economic entity. On another note, economic injustice, especially economic inequality, occurs when economic activity (energy) is too focused on achieving economic growth targets. These various injustices have become fodder for Indonesians to reflect on new principles or paradigms for energy governance, namely regenerative and democratic.
- **A regenerative and democratic ecosystem is an ideal reference that can be achieved through Indonesia's Just Energy Transition programs.** In general, it is difficult to define the success of Indonesia's just energy transition landscape. Despite Indonesia's energy decarbonization commitments and strategies, the efforts and outcomes of Indonesia's just energy transition programs have not been able to materialize the meaning of regenerative and democratic. As a start, Indonesia can learn to establish a regenerative and democratic ecosystem from various practices both at home and abroad by applying seven (7) kinds of design thinking frameworks in implementing a holistic and meaningful just energy transition.

Book Description

The writing process of this book begins with the big question “How can we solve the systemic problems of the Just Energy Transition in Indonesia?” with the purpose of assisting the Indonesian society that is capable of regenerating nature and society through Just Energy Transition programs. Through an intensive and lengthy dialogue process with various stakeholders in the Just Energy Transition (see Appendix 1), this book invites readers to reflect on the journey of the Just Energy Transition in Indonesia. It is expected that the launch of this book could create a snowball effect, with new movements, initiatives, and systems breaking down boundaries or barriers together.

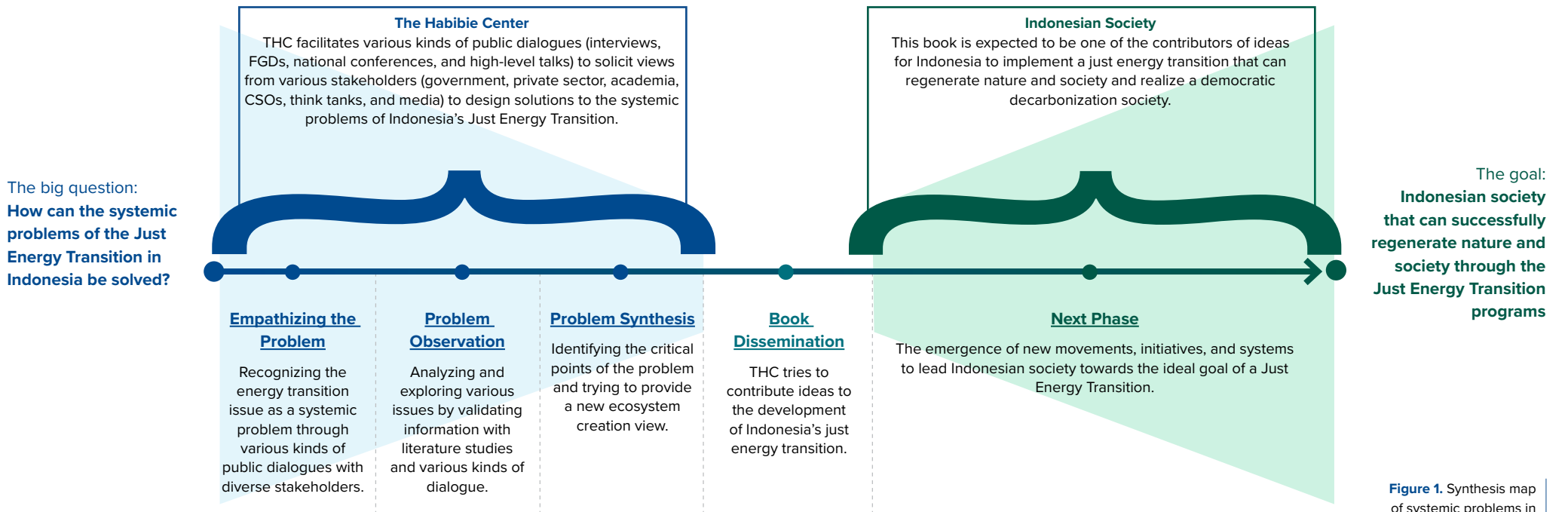


Figure 1. Synthesis map of systemic problems in Indonesia's just energy transition

Book Directory

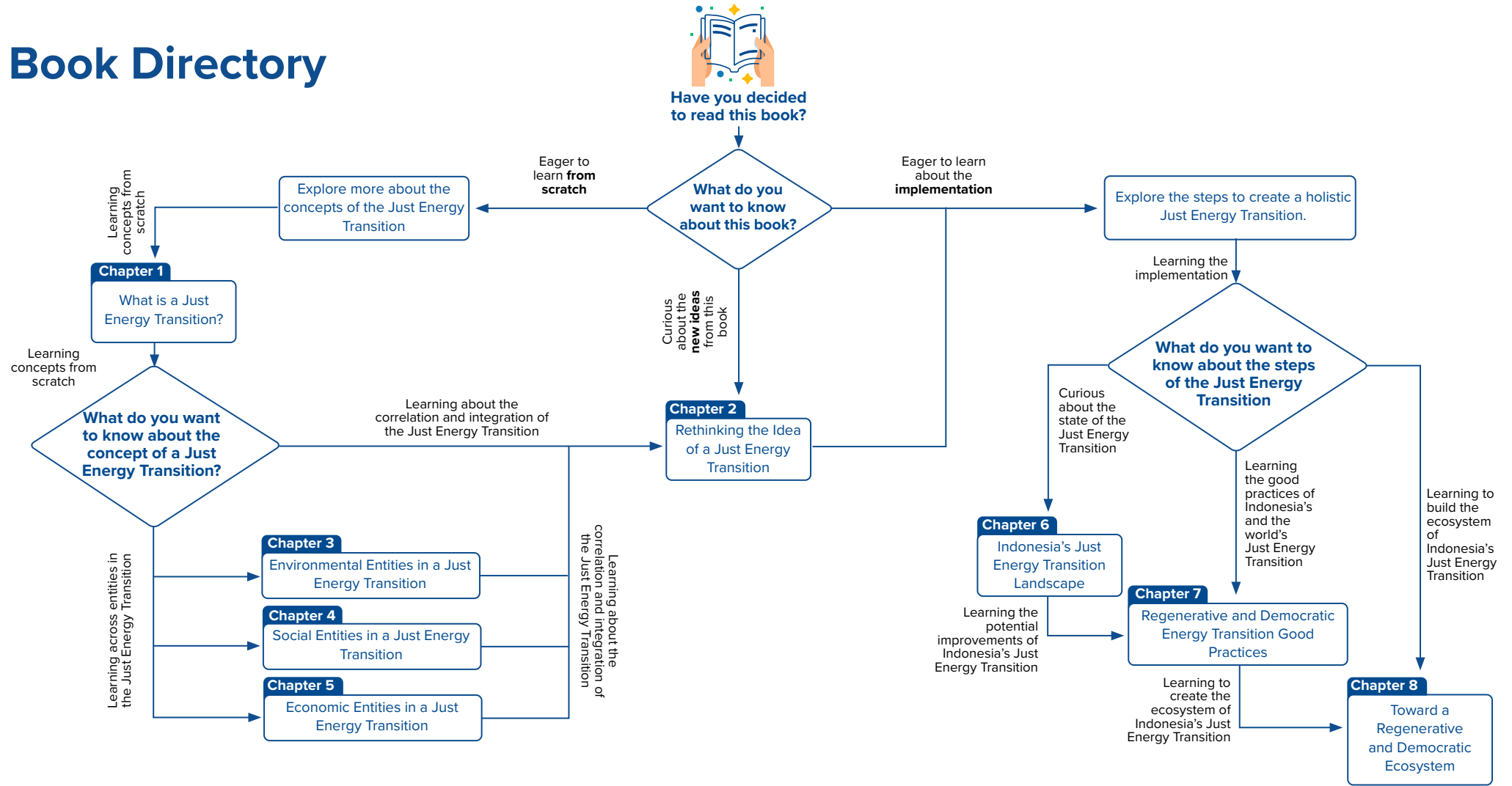


Figure 2. Book reading flow

CHAPTER 1

What is a Just Energy Transition?

This chapter elaborates on the just energy transition through three types of thinking: (1) environmental thinking, (2) social thinking, and (3) economic thinking. These three ways of thinking provide readers with an understanding of the various ways people think when it comes to understanding a just energy transition. Recognizing the various ways of thinking will provide a rich set of complementary perspectives for a broad and deep understanding of a just energy transition.

Further reading:

- Bourdeau, P. (2004). The Man-Nature Relationship and Environmental Ethics.
- Jenkins, K., McCauley, D., Heffron, R., Stephan, H., & Rehner, R. (2016). Energy Justice: A Conceptual Review.
- Stiglitz, J. E. (2015). The Price of Inequality: How Today's Divided Society Endangers Our Future.



Environmental Thinking in the Just Energy Transition

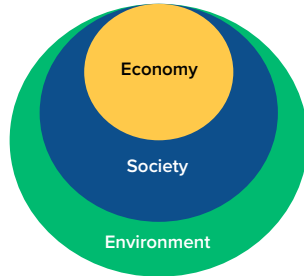


Figure 3. Repositioning of the triple bottom line
(Source: Elkington & Rowland, 1999; Adam, 2006)

Environmental (ecological) justice is crucial in a just energy transition because, in addition to social justice, justice in energy transition also aims to focus on the balance of ecosystems and biodiversity. The environment supports social and economic structures, making it the basis for policy considerations (Adam, 2006). Ecological justice includes recognizing that humans and ecosystems (biotic and abiotic) are interconnected throughout life (White, 2013). Ecological justice in the energy transition is an effort to meet the balance of social and economic needs by considering environmental limits and ecosystem regeneration so that it does not only consider human needs but also the implications on ecosystems and biodiversity.

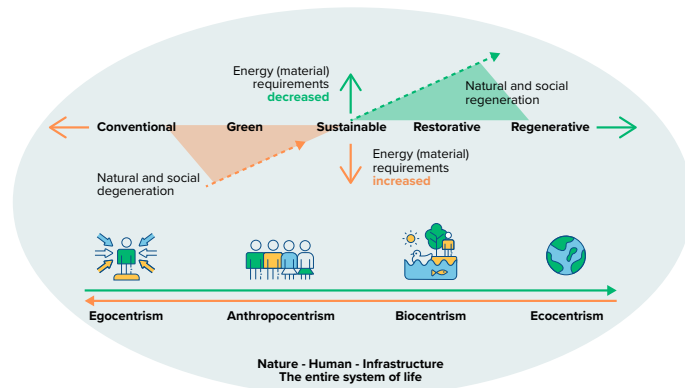


Figure 4. Conceptualizing the regenerative paradigm in living systems
(Source: Bourdeau, 2004; Reed, 2007; THC analysis)

Energy transition must be positively correlated with biodiversity and ensure that it contributes to the protection and restoration of the ecosystem. Biodiversity is declining, with wildlife populations down by around 69% since 1970 (WWF & BCG, 2023). Losses of biodiversity can reduce the ability of ecosystems to function effectively and efficiently, weakening nature’s capacity to support environmental regeneration. The implications of biodiversity loss and ecosystem degradation significantly affect the earth’s natural capacity to regulate, mitigate, and adapt to climate change (Gasparatos et al., 2017). Furthermore, ecosystem degradation has social consequences, such as in food security, water resources, disease control, disaster intensity, and cultural sustainability (Ackerman, 2019).

The regenerative paradigm can be a holistic approach focusing on natural regeneration in implementing energy governance. This paradigm reduces impacts and simultaneously restores environmental and ecosystem functions, thereby increasing ecological regeneration (Reed, 2007). The upstream-downstream energy industry with an egocentric perspective could increase the risk of exploiting natural resources without considering long-term consequences (Bourdeau, 2004); see Figure 4. Renewable energy development can improve the energy system by better-recognizing nature and creating environmental conditions that are sustainable and regenerative for future generations. For further environmental context of the just energy transition, refer to Chapter 3: Environmental Entities in the Just Energy Transition.

Social Thinking in the Just Energy Transition

Table 1. Definition of social justice in the just energy transition

Aspects of Justice	Derivative Aspect	Key Assessments	Implementation Mechanism
Distribution	Maintaining and improving energy security, affordability, and resilience	Resource allocation	Distribution of economic resources (fiscal instruments, infrastructure investment, subsidies)
	Prioritizing universal clean energy access and the elimination of energy poverty	Resource allocation	Distribution of economic resources (fiscal instruments, infrastructure investment, subsidies)
	Ensuring a just distribution of clean energy benefits and avoiding disproportionate risk of negative impacts	Identification of scale of impact	Risk assessment
Procedure	Using social dialogue, strong stakeholder engagement, and policy coordination to deliver better outcomes	Local context, engagement	Grievance mechanism
	Engaging communities through participation and communication	Information access transparency	Social dialogue
Recognition	Incorporating gender, equality, and social inclusion considerations in all policies	Identification of stakeholders	Stakeholder mapping
	Integrating youth voices in decision-making	Institutional representation	Multi-stakeholder dialogue
Restoration	Developing tailored government support for communities and workers and focus on skills and training	Identification of affected actors, compensation for losses to affected parties	Training (Upskilling and Reskilling)
	Ensuring that policies will enhance social and economic development and improve the quality of life for all	Social protection	Social assistance (Direct Cash Assistance, <i>Program Keluarga Harapan</i>)

(Source: Jenkins et al., 2016; IEA, 2021; ILO, 2023; THC analysis)

A just energy transition would be incomplete without efforts to promote social justice and achieve social equality.

Social justice in the energy transition refers to efforts to ensure that changes in the energy system not only provide economic benefits, but also promote equality and justice among various groups of society (Jenkins et al., 2016). In Indonesia, energy justice has actually been manifested in policies that mainstream distribution of access and affordability of energy. However, the procedural and recognition aspects have not yet fully touched upon. This indirectly creates biased policies and policies that leave the vulnerable communities behind (Setyowati, 2021; Sekaringtias et al., 2023). Therefore, the social justice principle is a pivotal foundation to ensure that the energy transition does not leave anyone behind, especially the most vulnerable community groups. Social justice in the energy transition should take these aspects into account: (1) distribution of access and resources, recognition of actors and stakeholders' representation, (3) inclusive decision-making processes, (4) restoration of affected actors, and (5) intergenerational (Fraser, 2009; Sen, 2009; Sikor, 2013; Jenkins et al., 2016).

Restoration plays a crucial role in a just energy transition.

The energy transition does not only change the energy system, but also involves the reconstruction of social structure. Good restoration requires mapping of affected actors and the impact of energy transition to all levels of society, including vulnerable communities. Women and vulnerable groups often bear the greatest burden from poverty and lack of energy access (UN, 2018). In fact, women's access to energy can help women to be more economically empowered. (IESR, 2018). Therefore, a restoration roadmap for affected communities is needed and it should be oriented towards community development aspects such as (1) Decent Protection and Worker Protection, (2) Social and Economic Development, and (3) Community Engagement as active participants (IEA, 2021).

Accessibility and inclusivity are key to supporting procedural and recognition aspects to achieve social justice.

In some cases, a lack of community involvement in decision-making regarding energy projects could lead to resistance or rejection (Liu et al., 2020). Inclusivity is an important aspect to ensure equal access and well-targeted policies. However, there are two major obstacles in the implementation of the inclusivity aspect in the energy transition: the gap between law and its realization, and local renewable energy development programs still face many challenges (Sekaringtias et al., 2023). For further discussion on the social context of the just energy transition, see Chapter 4: Social Entities in the Just Energy Transition.

Economic Thinking in the Just Energy Transition

Concepts of economic justice continue to evolve as social, economic, and environmental structures change. Although the concept of ‘justice’ can be challenging to define in thoughts and actions, ‘injustice’ is more likely to be defined in many situations. Injustice can be considered as the denial of someone’s rights. In the context of climate change and poverty, the most relevant right is the right to development (Sen, 2009). Furthermore, inequality in wealth and income distribution, particularly in a capitalist economic system, negatively impacts social stability and mobility. Thus, addressing inequality is not only of moral importance, but is also critical to ensuring sustainable social and economic prosperity for the global community (Piketty & Goldhammer, 2014). In the case of Indonesia, economic injustice, which is reflected in income and wealth inequality, remains a significant challenge. Economic growth is on the rise. However, the gap between the rich and the poor in Indonesia has been widening and persisting over the past few decades (see Figure 5). This situation creates social injustice and hampers sustainable and equitable development.

The aspect of economic justice is not limited to economic inequality, but also includes inclusive economic growth, social justice, and human rights. Integrating these three aspects aims to generate material wealth and improve welfare and justice for all members of society. A just economy must ensure equitable economic growth and benefits all levels of society by providing equal access to economic opportunities, education, health care, and other basic services. Social justice includes the fair distribution of wealth, income, and opportunities in society to reduce economic inequality that can impede sustainable development and social stability. The right to decent work, fair wages, and political and economic freedom are forms of human rights protection (Stiglitz, 2015).

Challenges such as globalization, technological development, socioeconomic inequality, and the climate crisis necessitate a concept of justice that focuses on humans and the importance of protecting nature. The concept of “Doughnut Economics” proposes an economic paradigm that integrates human needs with limited natural and social carrying capacity. The “doughnut” model visually depicts two main boundaries. The inner ring includes basic human needs, such as access to clean water, food, education, and social justice. At the same time, the outer ring covers the planet’s ecological limits, such as climate change and the availability of clean water. In this context, economic justice means ensuring all individuals have access to basic needs, while preventing human activities from exceeding the planet’s ecological limits (Raworth, 2017). For further discussion on the economic context of the just energy transition, refer to Chapter 5: Economic Entities in the Just Energy Transition.

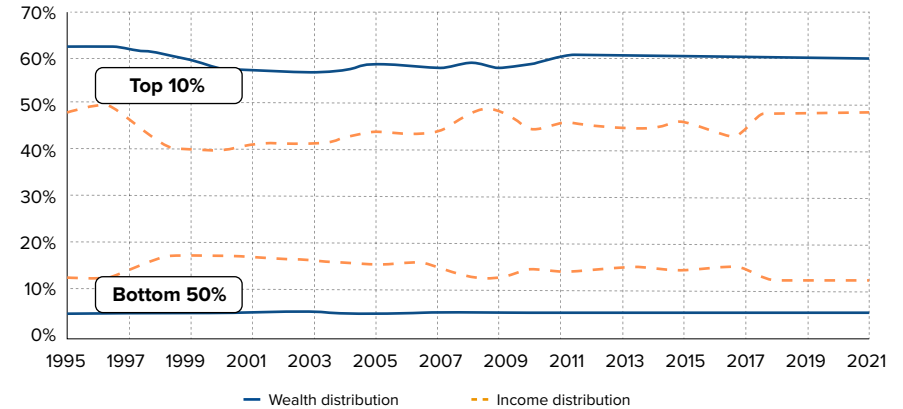


Figure 5. Wealth and income distribution in Indonesia
(Source: World Inequality Lab, 2022, section *Country Sheets* p. 21 & 22)

CHAPTER 2

Rethinking the Idea of a Just Energy Transition

This chapter explains how to interpret a just energy transition systematically and as a solution. There are three types of thinking that can be used to interpret a just energy transition, namely (1) systems thinking, (2) doughnut economics thinking, and (3) design thinking. These three types of thinking will train readers to not only be able to understand various ideas for a just energy transition, but also to be able to design a better future for energy governance.

Further reading:

- Koalisi Bersihkan Indonesia. (2022). Principles and Guidelines for an Equitable and Just Energy Transition in Indonesia.
- Meadows, D. H. (2008). Thinking in Systems: A Primer.
- Raworth, K. (2017). Doughnut Economics: Seven Ways to Think Like a 21st-Century Economist.



A Misconception: Linear Thinking in a Just Energy Transition



Figure 6. Illustrations of linear thinking in the just energy transition

What is linear thinking? First of all, we should be clear that whether it is linear thinking or not is not a classification of whether a certain kind of thinking is right or wrong. In simple terms, linear thinking is a commonly used method of thinking to solve problems by only looking at the symptoms that appear on the surface. Indeed, linear thinking can be used to solve simple problems such as personal decision-making. However, using linear thinking to solve complex problems often leads to decision-making biases, which may have an impact on the emergence of new problems in the future.

Just energy transition cannot be solved using linear thinking. This is because just energy transition is categorized as an extremely complex phenomenon. The energy transition itself is categorized as a super wicked problem, with social, legal, economic, and climate interdependencies (Jakimowicz, 2022). Energy transition refers to a process of gradual changes in the composition (structure) of the total primary energy supply from a certain pattern to another form of energy system (Smil, 2016). Moreover, justice is also an integral element of the energy transition, which has led to the emergence of a new term, namely, just energy transition. Unfortunately, linear thinking in a just energy transition is still often an issue in current discourses, actions, and programs. For example, the perspectives of various stakeholders involved in the issue of just energy transition are often focused on one knowledge domain and their association with entities (other aspects) is limited, as depicted in Figure 6.

The success of a just energy transition can be achieved through multi-stakeholder collaboration that is willing to integrate a variety of thoughts (ideas) to design a better future energy system. The term “just transition” originates from the International Labor Organization (ILO), which advocates for a just transition towards decent and climate-resilient works (ILO, 2017). Indonesia actually has a definition of a just energy transition initiated by a coalition (association) of community organizations, which sets an ideal reference for the changes in energy governance that need to move in a regenerative and democratic direction (Koalisi Bersihkan Indonesia, 2022). The derived principles not only emphasize environmental and social justice, but also seek to provide transformative solutions and recognize other principles of justice such as accountability, transparency, and participatory. This book does not offer a new definition for a just energy transition in Indonesia, but rather reflects on whether the idealistic references that have been embedded in just energy transition programs in Indonesia have been manifested in reality, regenerative, democratic, and become permanent solutions for a better future energy system in Indonesia.

What is Systems Thinking?

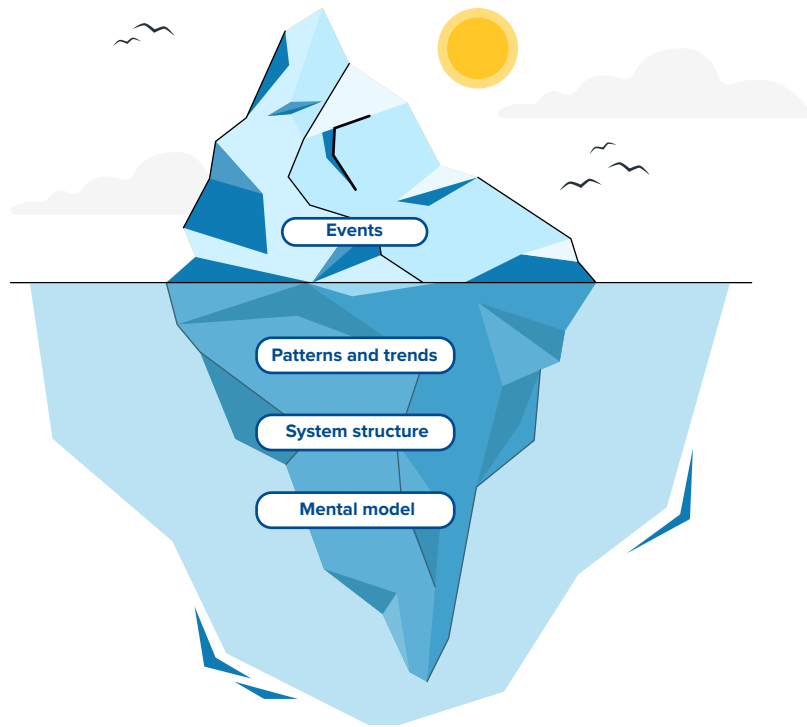


Figure 7. An illustration of iceberg metaphor in systems thinking

Systems thinking is a concept of thinking that attempts to understand the complex world through the correlations between subsystems. The concept originated from an Austrian named Ludwig von Bertalanffy, whose thoughts are still relevant for solving 21st-century problems (Haines, 2010). In simple terms, Bertalanffy explained that there is a reciprocal relationship in a system where a stimulus that enters the system and produces a response can become a reciprocal model for the system. This reciprocal model is common in a biological phenomenon called homeostasis, the response of living organisms to maintain their constant state. For example, homeostasis occurs in the human body to control blood sugar levels by sending work regulations to the pancreas according to the size of the human body's sugar needs (Bertalanffy, 1968).

A discussion of systems thinking would not be complete without a review of the system dynamics thinking of Jay W. Forrester, an engineer in servomechanism and digital computing. Originally, Forrester's systems thinking was discovered from problems in industrial management in his classic book, *Industrial Dynamics*. System dynamics was originally discovered for social (management) problems in search of a management policy and organizational structure. This was followed by the book *Urban Dynamics*, which applied system dynamics to urban issues, especially the development, stagnation, decline, and recovery of many cities. Finally, *World Dynamics* was published, using system dynamics to understand the dynamics of social policies, that is, the dynamics of global development. The adoption of system dynamics challenges public thinking about the interactions between nature, development, pollution, and natural resources (Lane & Sterman, 2011).

Another systems thinking thinker is Donella Meadows, an environmental scientist, who applied system dynamics to the phenomenon of world population growth, which is increasing exponentially in the limited capacity of the earth. The increasing human population is indeed influenced by a positive feedback loop that supports the population growth itself. However, there is a negative feedback loop that retards the growth rate of the human population, one of which is the increase in pollutants, which increases the mortality rate (Meadows et al., 2018). One interesting argument from Meadows is that the formed system dynamics model is affected by limited human understanding of a very complex system, called a mental model (see Figure 7). Another fascinating idea from Meadow's discussion on systems thinking is about leverage point, a tipping point in the system where a small change could lead to a large shift (Meadows, 2008).

What Is Doughnut Economics?

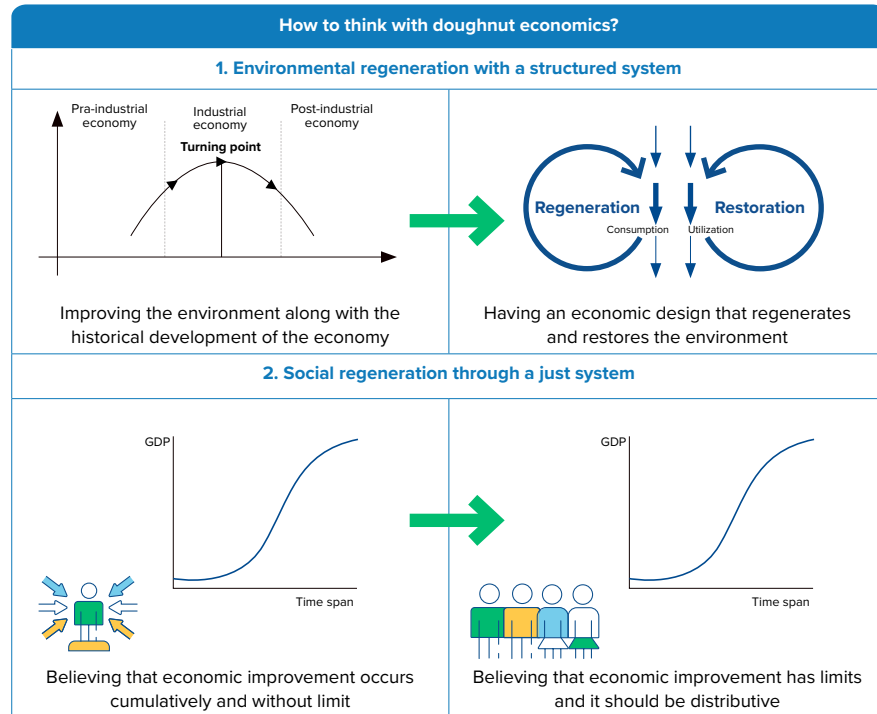


Figure 8. Illustration of unconventional thinking in economics
(Source: Raworth, 2017; THC analysis)

Doughnut economics is a type of economic thought that adopts systems thinking to understand how the economy works and takes a natural capacity limit approach. One of the thinkers behind this is Herman Daly. The doughnut illustration can serve as a moral compass for the 21st century, where security and justice in humanity lie in two important aspects, namely social foundations and environmental boundaries (Raworth, 2017). The economy is actually integrated into a harmonious system in society and nature's systems. However, current economic concepts often detach themselves from nature and society, leading to a self-regulating market economy that causes socio-ecological crisis (Polanyi, 2002).

The current economic model, which separates environmental elements, often results in detrimental outcomes for the environment. The economic pattern that degrades the environment lies in the design error of having a linear economic structure. This results in resources being depleted before nature could recover, while waste from economic activities becomes pollutants and continues to accumulate to this day. If the current economic design remains unchanged, the environment will almost reach a critical point, resulting in a catastrophe that will be difficult to recover from (The Union of Concerned Scientists, 1992). Therefore, it is crucial to rethink economic design, one of which is by minimizing resource use and waste generation like the butterfly economic design (Raworth, 2017) depicted in Figure 8.

Social stability is also disrupted by the latest economic design that often separates social and economic elements. The economic indicator that is often used is Gross Domestic Product (GDP). Aggregate figures in GDP cannot reflect the economic inequality that exists in society. There is also no historical evidence from the trickle-down effect doctrine that poor communities will benefit from economic growth. Moreover, economies with unbalanced liberal market concepts could actually lead to economic crises (Polanyi, 2002). Therefore, an economic design that not only makes economic growth a panacea but also pays attention to distribution issues across all levels of society is needed.

Why does the Just Energy Transition Need Systems Thinking and Doughnut Economics?

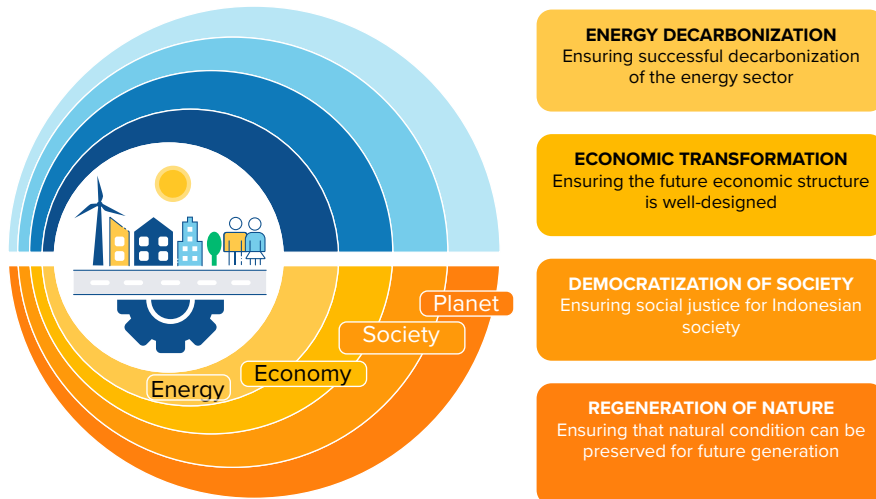


Figure 9. Illustration of the combination of systems thinking and doughnut economics in Indonesia's energy governance

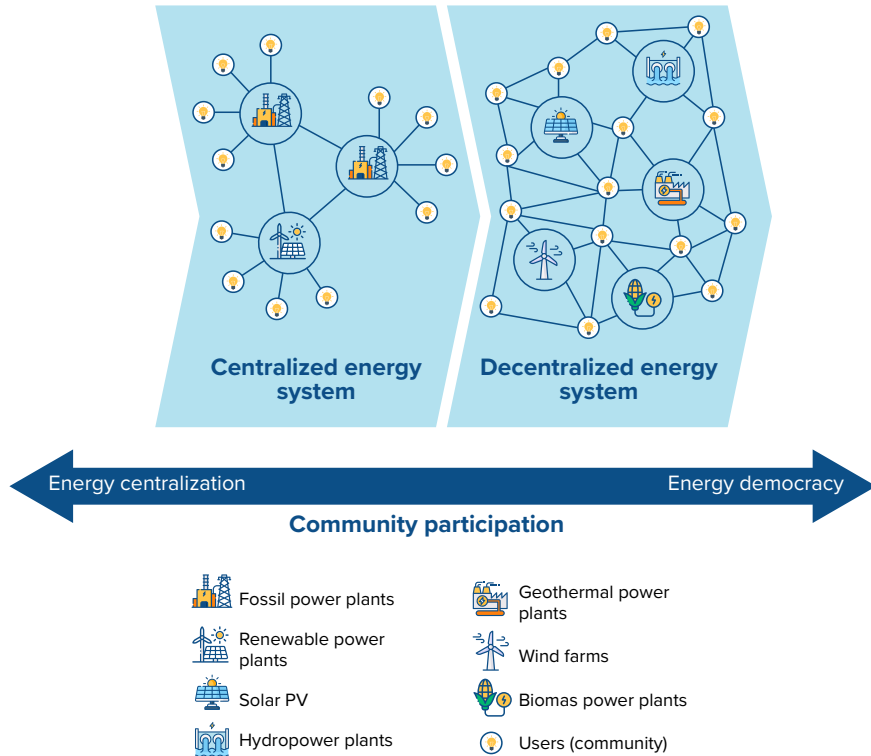
(Source: Boehnert, 2018; IRENA, 2022; Raworth, 2017; THC analysis)

The use of a systems thinking framework in a just energy transition helps understand that various natural symptoms of current energy governance problems, such as global boiling and other socio-ecological crises, are visible events caused by causalities, as illustrated by the iceberg metaphor. Indonesia's energy system, which heavily relies on fossil energy, has indeed formed a structured system. The formation of this energy system is influenced by the mental model of centralized energy governance and the widespread use of thermal combustion technologies to regenerate energy.

Using the doughnut economics framework in a just energy transition helps understand the integration of current energy (economic) governance with other elements such as the economy, society, and nature. Energy is illustrated as a subsystem of larger subsystems (systems)—economy, society, and the planet (IRENA, 2022). Indeed, decarbonization of the energy system to limit the earth's average temperature rises to below 1.5°C is the essence. However, the energy transition has economic and social implications, especially in coal-producing regions. On the other hand, environmental damage only seems to shift from one commodity to another, because extractive activities continue as demand for critical minerals escalates (booming).

The combination of systems thinking and doughnut economics framework helps understand that solutions offered for a just energy transition cannot be modular and temporary and require cooperation from all parties. Nature, as the foundational element of all life, can no longer withstand human production and consumption activities, including the activity of the energy system. The planet is already under severe stress. At least a third of the world's species could become extinct by 2100, risking the loss of medicinal and other benefits to humans. New ethics are needed to address this socio-ecological crisis (The Union of Concerned Scientists, 1992). Therefore, the just energy transition must be carried out by prioritizing ethics that understand the limits of nature and the interrelationships between elements.

Design Thinking: What does Regenerative and Democratic Energy Governance Look Like?



Design thinking is an important framework for solving extremely complex problems (wicked problems), such as the just energy transition. Wicked problems often have little clear solution because the process of identifying the problem is often confusing and the solution is not right or wrong, but better or worse (Jones, 2014). Complex problems usually cannot be solved by a reductionist approach—looking only for solutions to the visible symptoms of the problem. However, wicked problems can be better solved by building an ideal reference design that can address the variety of visible and invisible problem symptoms. Hence, the design thinking approach can also be a complementary thinking technique that can help design the future of regenerative and democratic energy systems.

The ideal design that can be constructed is to create a regenerative energy system. The only solution to decarbonizing the energy system is by regenerating energy from renewable energy sources. However, it is difficult for intermittent renewable energy to overcome the current pattern of energy demand. The solution is a distributed energy system that attempts to capture the availability of energy supply with medium capacity in local areas as close to energy demand as possible (Gui & MacGill, 2018). Additionally, distributed energy systems can help strengthen the local economy, and local power generation can also become a source of livelihood for local communities.

Another ideal reference is the creation of democracy in the energy system. Energy democracy can be an ideal reference for a national energy system, in which society is expected to be an active entity in shaping national energy policy (Wahlund & Palm, 2022). Achieving such an energy system is the task of the Indonesian people and policymakers. Indonesia actually has a good initial capital, because Indonesia's electricity grid can be an opportunity to realize energy prosumers in the energy transition period. Indeed, designing decentralized energy systems requires the participation of a wide range of audience. People who previously only acted as buyers can become producers and sellers of energy in the future, thereby creating energy connectivity that will increase energy reliability.

Figure 10. Designing the future of the energy system

(Source: Chausov et al., 2021; Gui & MacGill, 2018; Wahlund & Palm, 2022; THC analysis)



CHAPTER 3

Environmental Entities in a Just Energy Transition

This chapter further explains the efforts to implement ecological justice in a just energy transition through three main topics, namely (1) holistic paradigm, (2) natural limitations, and (3) intensity of land demand. It is important to emphasize that the environment has limited capacity to respond to current and future energy demands, and therefore it is necessary to improve energy governance patterns to reduce pressure on (natural) ecosystems. This chapter offers a new paradigm that recognizes the ecological aspects needed in energy governance to minimize the negative environmental impacts of energy activities while encouraging regenerative and democratic energy practices.

Further reading:

- Bridgetmck (2022). Earth Crisis Blinkers.
- Nijens, J., Behrens, P., Kraan, O., Sprecher, B., & Kleijn, R. (2023). Energy Transition Will Require Substantially Less Mining than The Current Fossil System.
- Tamang, P. (2005). An Overview of The Principle of Free, Prior and Informed Consent and Indigenous Peoples in International and Domestic Law and Practices.

Holistic Ecological Aspects

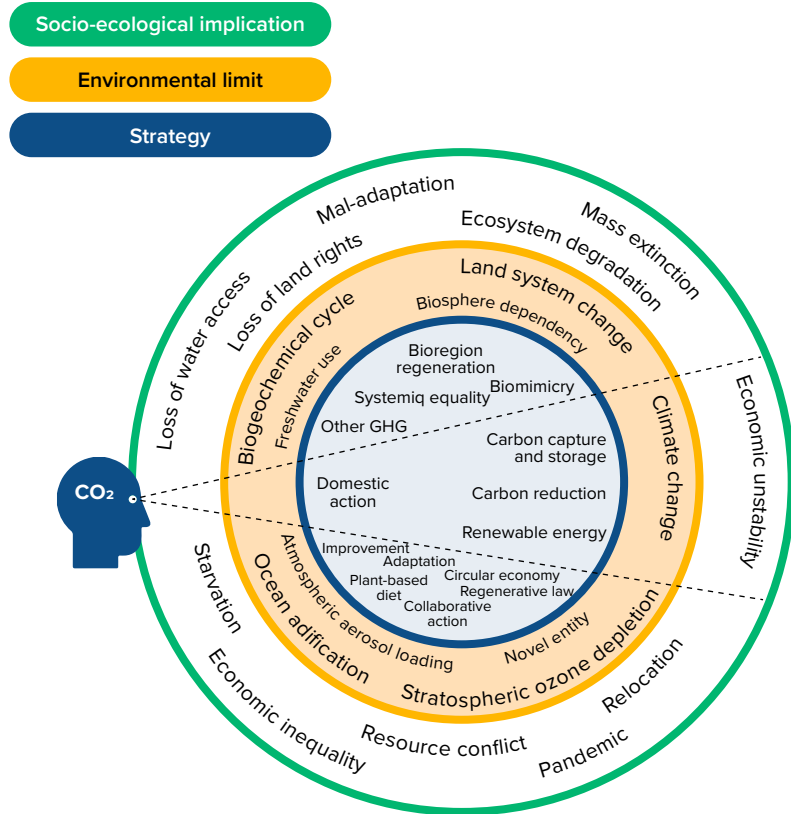


Figure 11. Earth crisis blinkers concept
(Source: Konietzko, 2022; Bridgetmck, 2022)

The ecological crisis is a systemic problem and does not focus solely on climate issues and carbon emissions. The concept of earth crisis blinkers shows a limited focus on specific aspects of the ecological crisis, such as the climate crisis, while ignoring other important factors, such as biodiversity loss and human rights (Konietzko, 2022); see Figure 11. Socio-ecological justice, as recognized in the concept of a just energy transition, can be one of the solutions to overcome the shortcomings of the Earth Crisis Blinkers Concept. In addition to the lack of attention to ecosystem aspects, the current energy transition issues are also closely related to social conflicts in local communities. Social inequalities and injustices arise due to the distribution of environmental inequality in upstream-downstream energy activities.

Energy governance issues often give rise to broader environmental problems, one of which is the waste generated by energy industry activities. The energy industry in the mining sector generates the most significant amount of waste globally in various forms, including overburden, waste rock, and tailings (IRENA, 2023). These types of waste often contain hazardous chemicals, heavy metals, and greenhouse gasses, which pollute the air, water, and soil. Improper waste disposal can lead to ecosystem contamination, loss of biodiversity, and adverse impacts on human health. Over half of renewable energy-related mineral extraction sites are on or near local community lands (Owen et al., 2023). Mining waste harms the environment and local communities, requiring alternative energy systems with minimal environmental risks.

Natural resource extraction and energy governance issues negatively affect different social and economic groups. The higher the level of vulnerability of a community, the greater its exposure to environmental damage caused by climate change, ecosystem degradation, and natural disasters. In this context, vulnerability refers to the susceptibility of community groups to losses caused by environmental degradation. Factors such as poverty, lack of access to resources, inadequate infrastructure, geographical location, and the presence of women, children, and people with disabilities can contribute to the vulnerability of communities. Critical mineral mining is also closely linked to deforestation (Naryono, 2022). Deforestation can impact the imbalance of hydrological aspects, causing decreased environmental quality and increased disasters. The rising trend of hydrological disasters due to the high rate of deforestation in Central Sulawesi has impacted local communities around the mining industrial area (Lahay, 2023).

Limited Natural Capacity in Energy Governance

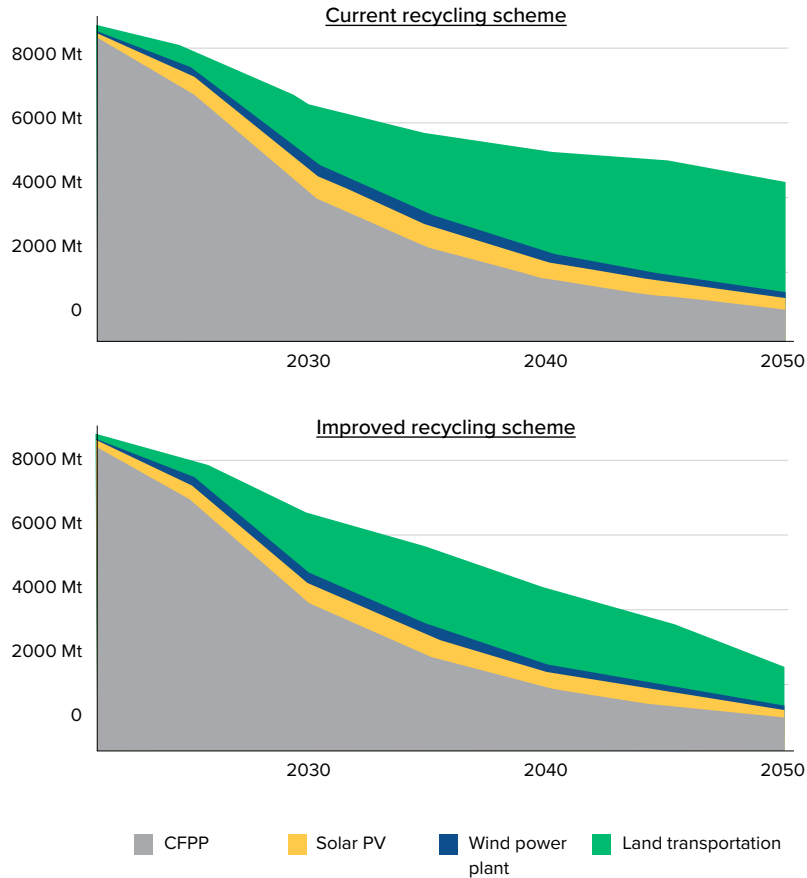


Figure 12. Mineral requirements in the energy transition based on the International Energy Agency's net zero scenario
(Source: Nijjens et al., 2023; Ritchie, 2023)

The environment is limited to absorbing and processing human activities, particularly those related to natural resource use and waste production. Energy systems, which include energy production, distribution, and consumption, depend on natural resources. Unjust exploitation of resources will lead to environmental limit points (Wentworth, 2014). Energy production that exceeds environmental limits can result in consequences such as climate change, loss of ecosystem functions, and resource depletion. Due to mineral mining, China has eroded about 40,000 km² of land, and the area of post-mining land increases by about 330 km² per year (Worlanyo & Jiangfeng, 2021). Poorly managed extractive industries can exceed environmental limits and alter entire ecosystems. While there is uncertainty about where the limits of an environmental capacity lie, the potential risks can be managed by reducing pressure on ecosystems.

The energy transition from fossil fuels to renewable energy helps reduce the extraction of natural resources. Renewable energy governance requires lower mineral extraction than coal-based energy (Nijjens et al., 2023); see Figure 12. In the renewable energy industry, especially solar power, the amount of copper required to generate electricity is 99% less than that required in coal-fired power plants (CFPP) (Bolson et al., 2022). However, the Jevons paradox suggests that technological advances and increased efficiency in resource extraction and utilization can lead to increased resource consumption due to increased demand for those resources and the emergence of new industries (Yu et al., 2022). To reduce the risks of environmental limits, it is crucial to prioritize controlling energy consumption and reducing material intensity when implementing the energy transition.

New industries that emerge from the energy transition can create new jobs for the community; however, there are environmental impacts that need to be mitigated. The battery industry is proliferating in line with the increasing demand caused by the green technology ecosystem. Several factors drive this growth, including the rise of electric vehicles, increased use of renewable energy sources, and the growing popularity of portable electronic devices. Data from the Indonesian Automotive Industry Association (Gaikindo) shows that the sales volume of battery electric vehicles (BEVs) in the domestic market in December 2022 amounted to 2,404 units (Wijaya, 2023). The higher the battery usage rate, the more battery waste will be generated. Therefore, battery recycling management is a future industrial sector that can minimize the impact of toxic and hazardous materials (B3) from batteries on the environment and create new job opportunities for the community.

Land Governance in Energy Implementation

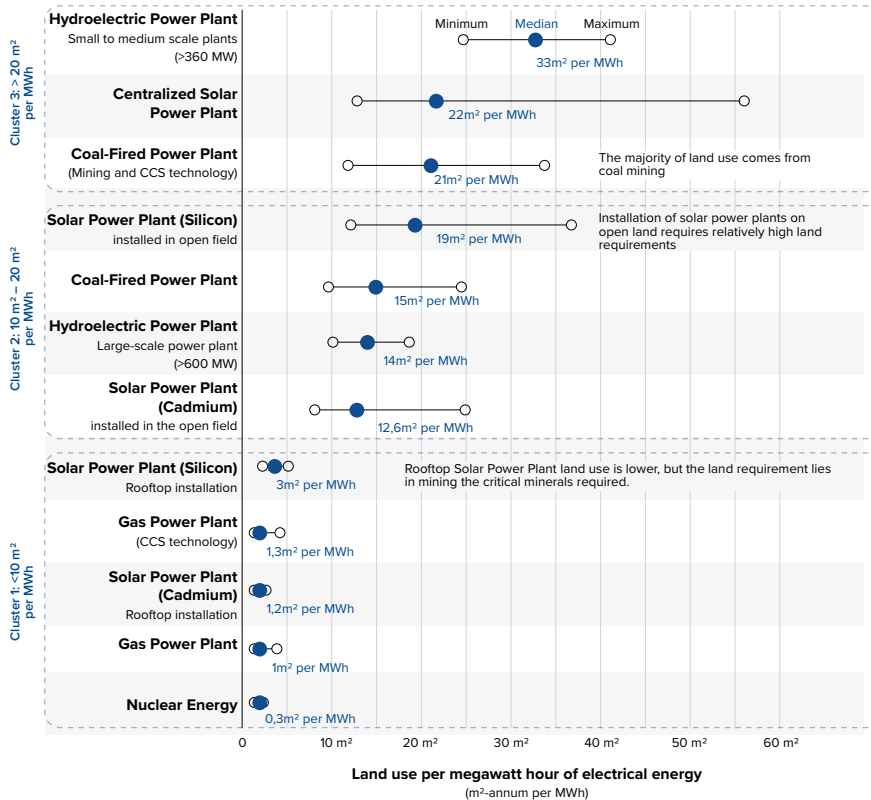


Figure 13. Land use based on the energy capacity of various power plants (Source: UNECE, 2022; Ritchie, 2022; THC analysis)

Energy systems can have a significant impact on land use intensity. This impact can be generated through the raw materials industry and the development and operation of energy infrastructure such as power plants, transmission lines, and renewable energy installations. The intensity of land use depends on factors such as the energy source, the technology used, and the scale of the installation. For example, large-scale solar and wind power plants may occupy large areas, while some fossil fuel power plants require smaller plots of land. Based on data from the United Nations Economic Commission for Europe (UNECE) in 2022, the highest average land use for energy production is hydroelectric power, followed by solar power and coal processing; see Figure 13.

Land use in the upstream-downstream energy transition has social implications for communities. Increasing demand for land associated with energy development has led to agrarian conflicts in local communities. For example, the livelihoods of indigenous peoples or local farmers are directly affected by land acquisition or changes in land use patterns. The construction of integrated solar PV in countries such as India, East Germany, and South Australia has led to land conflicts between private companies and local communities (Goodman, 2024). Relocation of local communities and loss of access to land and resources due to the development of renewable energy projects can have social and economic impacts on affected communities, including loss of livelihoods and customary land (Elliott & Setyowati, 2020).

Energy transition planning that considers land use can minimize environmental impacts and risks, preserve ecosystems, and strive for social equity. Integrating renewable energy development with land-use planning and conservation efforts can optimize land-use efficiency and reduce environmental negative impacts. In addition, to anticipate social conflicts in renewable energy development, a Free Prior and Informed Consent (FPIC) process is needed, which recognizes the rights of indigenous peoples to make decisions about the problems they experience and controls development rights in customary areas (Tamang, 2005). FPIC requires that all relevant information about a proposed project or activity be provided to indigenous peoples and local communities in a form that they can understand before they can give their consent. This information should include the potential impacts of the project or activity on their rights, lands, and resources, as well as the benefits they may receive so that indigenous peoples' rights are fairly and democratically recognized in decision-making regarding their territories.

CHAPTER 4

Social Entities in a Just Energy Transition



This chapter further elaborates on efforts to implement social justice in a just energy transition in three main topics: (1) social impact, (2) energy justice, and (3) community participation in energy governance. It needs to be emphasized that the community's ability to cope with current and future energy needs is limited, so it is necessary to improve energy governance patterns to reduce pressure on the community (social pressure). This chapter offers a new paradigm that recognizes the social aspects of energy governance needed to minimize the negative impacts of energy activities on communities while encouraging regenerative and democratic energy practices.

Further reading:

- Anindarini, G., & Quina Margaretha. (2019). *Partisipasi Publik dalam Perencanaan Ketenagalistrikan*.
- CREA (2023). Health Benefits of Just Energy Transition and Coal Phase-Out in Indonesia.
- Imelda, & Verma, A. P. (2022). Clean Energy Access, Health, and Gender: Evidence from Indonesia.

Social Impact in Energy Governance

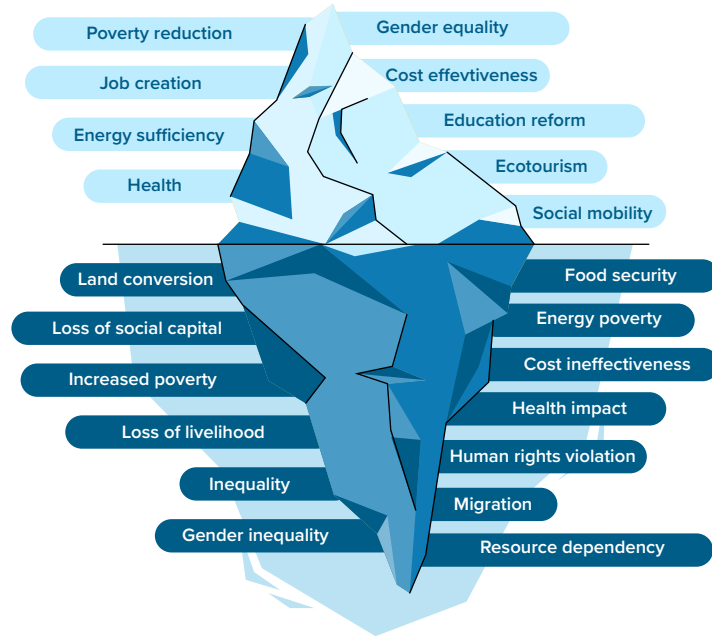


Figure 14. Energy transition impact mapping
(Source: Johnson et al., 2020)

The energy transition's implications include social impacts and risks. The energy transition will indirectly have an impact on poverty, energy sufficiency, green job creation, ecotourism, and social mobility (Johnson et al, 2020). Changes in energy infrastructure and employment can affect the livelihoods and social conditions of local communities and exacerbate economic disparities (Birkmann et al., 2022). Mapping the affected actors and the scale of impact on each actor is key to mitigating risks.







The current energy system has negative social impacts. Social impacts can be seen in the health impacts on society and the cost of these health impacts (IRENA, 2023). The operation of coal-fired power plants is estimated to cost the country IDR 175 trillion (USD 11 billion) per year due to direct health costs and health infrastructure facilities. An energy system that relies on coal has indirectly caused pollution from coal-fired power plants to increase by 110% over the past decade and is projected to increase by 70% by 2030. This coal-dependent energy system has been linked to high mortality rates from air pollution, with the highest rate in West Java (more than 4,000 cases), Banten (2,000 cases), and Central Java (1,700 cases) (CREA, 2023).

The energy transition will have an impact on the workforce, particularly in coal-dependent regions. As of 2023, the mining sector in Indonesia has absorbed around 300 thousand workers (Ministry of Energy and Mineral Resources, 2023). In coal-dependent regions such as East Kalimantan and South Sumatra, mine closures result in economic vulnerability for people working in the mining sector (IESR, 2022). As many as 11% of the population in Kalimantan and 3% in South Sumatra depend on mining activities for their livelihoods. In the coal sector, workers with different skill levels will be affected differently (World Bank, 2023). The coal mining sector offers higher remuneration than most other sectors of the economy. More than 95 percent of jobs in the coal mining sector are formal jobs with above-average education levels, especially those with secondary school education (Bulmer et al., 2021).

Women and vulnerable groups have been the most affected by the energy system. In Indonesia, women are the main users of cooking fuel and spend more time doing household chores. Direct contact with fuel indirectly affects women's health, especially lung capacity. Transforming clean energy for cooking (clean cooking reduces the risk of these adverse impacts. Reduced health risks from clean cooking can better empower women economically (Imelda and Verma, 2022).

A Holistic Energy Justice

Table 2. MTF's detailed criteria

Tiers	Detailed Criteria
 Tier 0	<ul style="list-style-type: none"> There is no access to electricity. Households do not have access to formal electricity.
 Tier 1	<ul style="list-style-type: none"> Energy access is very limited. Households rely on traditional light sources, such as candles or oil lamps. No formal electricity access; there are at least electric lights.
 Tier 2	<ul style="list-style-type: none"> Energy access is limited. Households have limited access to electricity through local power generation. No stable grid access; the community relies on local power sources that are not always available.
 Tier 3	<ul style="list-style-type: none"> Energy access is moderate. Households have better access to a stable electricity grid. Electricity may not be available 24 hours a day, but it is available for most of the day.
 Tier 4	<ul style="list-style-type: none"> Energy access is classified as good. Households have good and reliable access to a stable electricity grid. Electricity is available most of the time with few or no outages.
 Tier 5	<ul style="list-style-type: none"> Energy access is considered optimal. Households have optimal access to a highly reliable and advanced electricity grid. Electricity is available 24/7 with excellent reliability and quality of service.

(Source: Bathia & Angelou, 2015; THC analysis)


The community has not yet had full access to clean energy. Indonesia is committed to achieving energy access justice through the Sustainable Development Goals (SDGs). In its implementation, Indonesia has attempted to fulfill its commitment to SDG 7, i.e., increasing energy access (7.1.1) through the *Program Listrik Masuk Desa* (PLMD) and *Program Indonesia Terang* (PIT). These programs are carried out to increase rural communities' access to electricity. Data shows that the national electrification rate is above 90%, but as of 2021, there are still several provinces where villages are not fully electrified, such as Nusa Tenggara Timur (2,010 villages without electricity), Papua (3,639 villages), and North Sumatra (2,403 villages) (Ministry of Energy and Mineral Resources 2021; Statistics Indonesia, 2021), see Appendix 2. Distribution of Electrification in Rural Areas. This could be a point of concern as there may be challenges in providing access to electricity in these areas.

In evaluating energy accessibility, energy quality is more important than the electrification ratio. Energy quality can be measured using the Multi-Tier Framework (MTF) developed by the World Bank (Bathia & Angelou, 2015). The MTF framework classifies energy access into tiers based on the availability, reliability, quality, and sustainability of energy supply. In the MTF classification, the lower the tier classification of an area, the lower the reliability of energy access in that area. Tier 1 is the lowest tier, which means very limited or no access to energy. Meanwhile, Tier 5 is the highest tier, which indicates adequate and high-quality access (Bathia & Angelou, 2015). In some provinces such as Nusa Tenggara Barat (NTB) and Nusa Tenggara Timur (NTT), the electrification rate has reached 99.98% and 89.01%, respectively (Ministry of Energy and Mineral Resources, 2021), but electricity users in villages in these provinces are still at the low level (0 to 2) in the MTF classification (IESR 2019).

Energy transition planning can be a turning point for expanding universal energy access. In contrast to developed countries, which generally have a good Energy Trilemma Index, the energy transition in developing countries still experiences challenges in increasing equality of access and quality of energy (World Energy Council, 2022). Policy planning in Indonesia should not only focus on electrification rate, but also consider the quality of energy access, which includes (1) availability, (2) reliability, and (3) sustainability (Liu et al., 2022). Mapping clean energy procurement infrastructure is a crucial step to ensure the voltage and frequency of energy flows are stable. The quality of energy access also needs to consider affordability, i.e., access to energy for all segments of society, including rural communities with various social and economic backgrounds.

Space for Community Participation in Energy Governance

Table 3. Spectrum of public participation in policy making



Level of Public Participation	Description
Information Provision	<ul style="list-style-type: none"> Organizers provide information about a project, policy, or decision to the public in a one-way manner. The public is informed, but has no direct influence on the decision- and policy-making process.
Public Consultation	<ul style="list-style-type: none"> Organizers collect input and suggestions from the public, but decision-making power remains in the hands of the organizers. Information collected will be considered in decision-making, but there is no guarantee that it will have a direct impact on the final decision.
Public Engagement	<ul style="list-style-type: none"> The public is actively involved and public input is integrated in decision-making. Organizers work with the public to ensure their views are taken into account. The public's role may include developing alternative solutions and recommendations.
Collaboration	<ul style="list-style-type: none"> The public is a partner throughout the decision-making process, so public aspirations are integrated into decisions. Decisions are made collectively, and the public has considerable influence in shaping the outcomes.
Community Empowerment	<ul style="list-style-type: none"> The public has full decision-making power, so it has control over the process and outcomes. The organizers are committed to implementing what the public decides.

(Source: IAP2, 2018; THC analysis)

The extent of public participation in energy governance remains unclear and limited, although the mechanisms have been regulated in several regulations in Indonesian. In the process of formulating the National Energy Policy (*Kebijakan Energi Nasional/KEN*), the public is allowed to participate through various mechanisms such as public hearings. However, there are restrictions on the participation of people who have competence in the energy sector (Anindarini and Quina, 2019). The National Energy General Plan (RUEN) and Regional Energy General Plan (RUED) have indeed provided space for the public to provide input within 30 days. However, this duration is too short to review the RUEN and RUED documents in detail. While public participation mechanisms such as hearings are provided for in the regulations, broader public participation is not explained in detail. A similar thing also happens in the Electricity Supply Business Plan (RUPTL), where there is no explanation of the public participation mechanism, especially information on how to implement this public participation mechanism in electricity practice, see Appendix 3: Public Participation in Electricity.

A just energy transition requires meaningful participation from affected communities (Johnson et al., 2020). Basically, public participation in policy making can bring many benefits, such as enhancing policy legitimacy, improving decision-making quality, optimizing resource utilization, and strengthening the relationship between government and society (Suboticki et al., 2023). The spectrum of public participation in policy making includes various levels of community involvement in the government policy-making processes, from providing information to empowerment (IAP2, 2018). Therefore, there needs to be a forum that links community input and suggestions to the national level to ensure that the community's needs and aspirations are well represented at a broader level, especially in energy decision-making and policy.

Public participation in overseeing energy policy is an important aspect of reducing information asymmetry. Information asymmetry often stems from a lack of information transparency and can have negative consequences for both the party with the least information and the party with the most information (Clarkson et al., 2007). Lack of public participation in energy policy-making leads to agency asymmetries, which in turn create vulnerabilities and inequalities, especially for more vulnerable groups (Pandey and Sharma, 2021). Participatory forums between local governments and community groups, such as development planning discussions (*Musrenbang*), can also be an effective means of developing and bridging current policy' planning and evaluation.

CHAPTER 5

Economic Entities in a Just Energy Transition



This chapter further elaborates on efforts to implement economic justice in a just energy transition in three topics: (1) the economic implications of the energy transition, (2) the correlation of economic inequality and energy access, and (3) fiscal limitations in the development of renewable energy. It should be emphasized that the economy is often a priority aspect in energy governance, but economic issues are frequently overlooked in discussions of a just energy transition. This chapter offers a new paradigm that recognizes the economic aspects of energy governance needed to minimize the negative economic impacts of energy activities while encouraging regenerative and democratic energy practices.

Further reading:

- Cahyani, A.D. (2021). Measuring Index of Residential Energy Usage Inequality and Analyzing Factors Influencing The Inequality Using Quantile Regression: Indonesia Case Study.
- IESR (2022). Redefining Future Jobs: Implications of Coal Phase-Out to the Employment Sector and Economic Transformation in Indonesia's Coal Regions.
- Samad, H., & Zhang, F. (2016). Benefits of Electrification and the Role of Reliability: Evidence from India.

Implications of the Energy Transition on the National and Subnational Economies

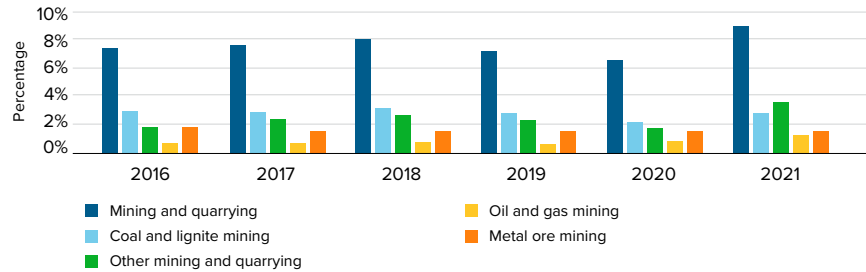


Figure 15. Contribution of extractive industry to national GDP (2016-2021)
(Source: Bank Indonesia, 2024)

The mining and quarrying sector, especially the coal subsector, plays an important role in driving Indonesia's economy. The industry recorded a significant achievement by contributing IDR 603 trillion, or equivalent to 3.55% of the country's GDP, with a growth rate of 6.6% in 2021 (see Figure 15). This figure shows that the coal sector has a large economic impact, including creating jobs and a source of income for the community.

The trend in coal demand is projected to decline. One of the main factors causing this trend is the global community's efforts to reduce greenhouse gas emissions by reducing coal use and developing renewable energy. Notably, 72% of total coal production in 2022 was exported, mainly to China and India (DG NREEC, 2023; Katadata, 2022). Fluctuations in world coal demand and prices will significantly impact the domestic economy, especially coal-producing regions. Although since 2020 there has been a sharp increase in the value of coal exports as a result of COVID-19 and the Russia-Ukraine crisis, there have been high fluctuations in coal prices in the last two decades (Katadata, 2023). Under these circumstances, Indonesia has no choice but to start reducing its economic dependence on the coal industry.

The coal sector plays a vital role in driving the economic development of Kalimantan and Sumatra. According to the coal distribution map, both coal production and exploration areas are concentrated in East Kalimantan, Central Kalimantan, South Kalimantan, South Sumatra, and Jambi provinces, see Figure 16. Research from IESR also shows that the contribution of the coal industry to the GDP of East Kalimantan, South Kalimantan, and North Kalimantan provinces far exceeds its contribution to national GDP, which exceeds 15% of the Gross Regional Domestic Product (GRDP) of each province. In the Paser Regency, the study also found that the coal industry contributed more than 70% of the GRDP in the past decade (IESR, 2022). As a result, a sudden and poorly planned cessation of coal extraction can cause losses and economic turmoil. Therefore, a planned transition is needed, including job creation and economic diversification in these areas.

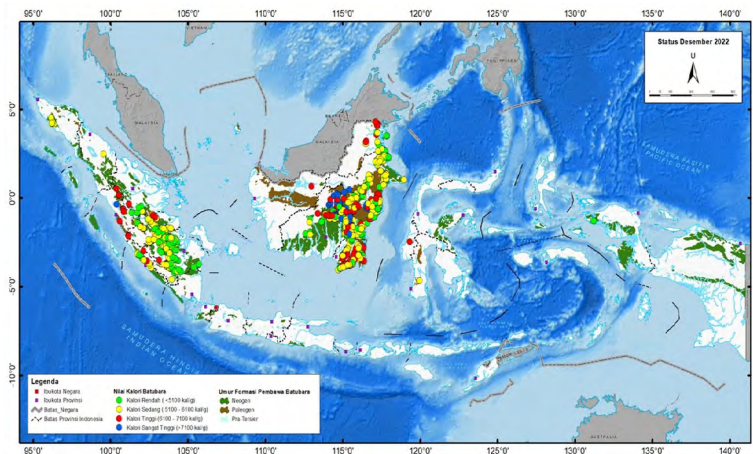


Figure 16. Map of Indonesia's coal location distribution
(Source: Geological Agency of EMR, 2023, p. 197)

The Correlation between Economic Inequality and Energy Access



Figure 17. Night light distribution map in Indonesia and beyond
(Source: ESRI, 2021)

Limited access to reliable electricity is directly proportional to high poverty rates, especially in most parts of eastern Indonesia. Most parts of eastern Indonesia, such as NTT, Sulawesi, Maluku, and Papua, suffer from energy shortages due to insufficient power supply from PLN (*Perusahaan Listrik Negara*, Indonesian state utility company) or limited access to on-grid electricity. In addition, poor households in both rural and urban areas have become vulnerable groups due to limited access to energy. This condition is exacerbated during an economic crisis, where limited access to energy will lower people's standard of living (Cahyani, 2021, p.116).

There is a correlation between limited access to energy and poverty levels. For example, most communities in eastern Indonesia have limited energy access and poverty rates are above the national average, unlike in Java Island, see Figure 17 and Figure 18. Based on the night light distribution map, electric lighting is still concentrated on Java Island and Sumatra Island. Meanwhile, several provinces in the eastern part of Indonesia, such as Nusa Tenggara, Maluku, Sulawesi, and Papua are dark at night. In fact, parts of Indonesia's coal-producing island of Kalimantan still suffer from insufficient lighting (ESRI, 2021). On the other hand, half of the provinces in Indonesia have a higher poverty rate compared to the national average of 9.57 percent in 2022. The five poorest provinces are located in eastern Indonesia, namely Papua, West Papua, Nusa Tenggara Timur, Maluku, and Gorontalo, with poverty rates of 26.56 percent, 21.33 percent, 20.05 percent, 15.97 percent, and 15.42 percent, respectively (Statistics Indonesia, 2023).

The primary purpose of providing access to energy is to reduce poverty and improve living standards. Reliable access to electricity can stimulate economic activity, support the teaching and learning process, improve the healthcare systems, and increase the community's income. Access to reliable electricity can raise incomes in rural communities, with lower-income households benefiting more than higher-income households. In the case of villages in India, electricity connectivity alone is insufficient; reliability of electricity services is crucial to create greater benefits from electrification (Samad & Zhang, 2016). Therefore, policies to eradicate poverty and improve the quality of human resources in Indonesia must be followed by policies to provide reliable access to electricity, considering the renewable energy potential in each region.



Figure 18. Percentage of poor population
(Source: Statistics Indonesia, 2023; THC analysis)

Fiscal Limitations in Renewable Energy Development

Table 4. Mandatory regency/city expenditure

No.	Type of Expenditure	Percentage	Legal Basis
1	Education	20%	1945 Constitution Article 31 paragraph (4); Law No. 20 of 2003 Article 49 paragraph (1)
2	Health	10% (outside of salary)	Law No. 36 of 2009 on Health
3	Village Fund	At least 10% of the balancing fund after deducting the special allocation fund	Law No. 6 of 2014 on Villages
4	Infrastructure and Public Services	At least 40% of total APBD expenditures excluding revenue-sharing expenditures and/or transfers to regions or villages	Law No. 1 of 2022 on Financial Relations between the Central Government and Regional Governments Article 147
5	Regional Employee Expenditure (excluding teacher allowances)	At most 30% of total APBD expenditure	Law No. 1 of 2022 on Financial Relations between the Central Government and Regional Governments Article 146

(Source: THC analysis from various sources)

Fiscal limitations are often an obstacle in implementing the energy transition. Renewable energy development faces fiscal constraints as the central government has to allocate a limited State Budget (APBN) for various sectors such as education, health, infrastructure, defense, and other urgent needs. Although the development of renewable energy is seen as important and a major commitment of the central government, the available budget needs to be increased to meet the funding needs of renewable energy projects to achieve net-zero emissions targets. In this sense, financing renewable energy projects must compete with other pressing needs, making it difficult to carry out a more extensive and intensive development of renewable energy.

In reality, it is difficult for provinces to allocate their regional budget for renewable energy development. Energy affairs are discretionary, and each region has different development priorities. As outlined in the Regional Energy General Plan (RUED) documents published in 30 provinces, financing for the development of new energy and renewable energy comes from the regional budget (APBD) and other sources. According to the Ministry of Finance Regulation No. 84/2023, nearly half of the provinces have regional financial capacity based on predetermined revenues and expenditures, or have low regional fiscal capacity (*Kapasitas Fiskal Daerah/KFD*). Therefore, the government's direction outlined in the Minister of Home Affairs Regulation No. 84/2023 on Regional Budget Management is ineffective in encouraging regional budget allocations for renewable energy development (TEMPO, 2023). Fiscal limitations for renewable energy development also occur in regencies and municipalities. In addition to the almost non-existent authority on energy affairs, reallocating regency/municipality regional expenditures is also challenging.

A multi-stakeholder collaborative approach can address fiscal limitations, as evidenced by NTT Province. Despite having limited fiscal capacity, NTT achieved a 52.15% share of renewable energy in its energy mix in 2021. NTT has launched several flagship programs to accelerate the development of renewable energy through collaboration with the central government, the private sector, and international institutions. For instance, NTT partnered with the private sector to build a 2 GW solar PV and battery storage system worth USD 4 billion (Lewokeda, 2021). In terms of human resources, the NTT Vocational Training Center (*Balai Latihan Kerja/BLK*) has collaborated with Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) to provide basic training on solar energy to the community. Additionally, universities in the region offer study programs related to renewable energy, including chemical, physics, electrical, and mechanical engineering, along with certification programs (IRID, 2023). NTT is also the only province to receive a physical Special Allocation Fund (*Dana Alokasi Khusus/DAK*) for renewable energy infrastructure amounting to 88 billion in the 2024 fiscal year (Directorate General of Fiscal Balance, Ministry of Finance, 2023). NTT's experience emphasizes the importance of proactive collaboration, investment strategies, human capital development, and supportive policies in effectively addressing renewable energy challenges.

CHAPTER 6

Indonesia's Just Energy Transition Landscape

This chapter outlines the current state of energy governance and the implementation of just energy transition in Indonesia. This section discusses several important parts of Indonesia's just energy transition journey, namely (1) the development of renewable energy in the world and in Indonesia, (2) collaboration in a just energy transition, (3) an overview of the laws that support a just energy transition, (4) multi-stakeholder collaboration initiative, and (5) several zero-sum game phenomena in Indonesia's energy transition. The description of a just energy transition in Indonesia is a reflection for readers: Has the development of Indonesia's just energy transition moved toward a regenerative and democratic direction?

Further reading:

- Hivos (2015). A Case Study of Multi-Actor Sumba Iconic Island Initiative.
- Lahadalia, B., Wijaya, C., Dartanto, T., & Subroto, A. (2024b). Nickel Down Streaming in Indonesia : Policy Implementation and Economic , Social , and Environmental Impacts.
- Pemerintah Indonesia (2022). Enhanced Nationally Determined Contributions (NDCs) Republic of Indonesia.



The Development of Renewable Energy in the World and in Indonesia

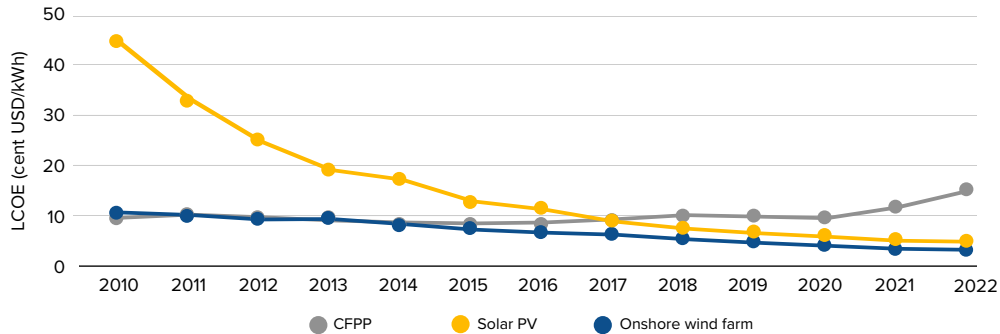


Figure 19. Global trend of LCOE for CFPP, solar PV, and onshore wind farm from 2010 to 2022 (Source: WEF, 2023)

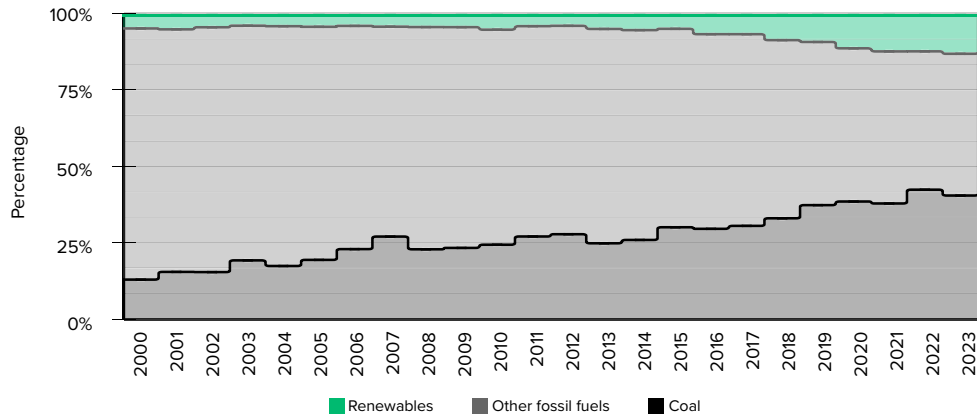


Figure 20. Indonesia's energy mix from 2000 to 2023 (excluding traditional biomass) (Source: MEMR, 2012, 2023, 2024)

The development of renewable energy worldwide is showing an increasingly positive trend.

Significant progress has been made in the decarbonization of the world's energy sector. This can be seen from the increase in the renewable energy mix and global investment in renewable energy, which has exceeded global investment in fossil energy (WEF, 2023). Economically, the Levelized Cost of Energy (LCOE) of renewable energy is now comparable to that of fossil energy. For instance, global solar LCOE has dropped by 89% from USD 44.5 cents/kWh in 2010 to USD 4.9 cents/kWh in 2022. The LCOE of the world's renewable energy, especially solar PV and onshore wind farms, is already lower than the current LCOE of global coal (IRENA, 2023).

In Indonesia, there have been a number of developments in the renewable energy ecosystem.

2023 is a critical year for the development of renewable energy as the national LCOE of renewable energy is already on par with the national LCOE of fossil energy. For example, the (recommended) LCOE of large-scale solar PV in Indonesia ranges from USD 4.09 cents/kWh to USD 10.09 cents/kWh. Additionally, the LCOE of onshore wind farms is becoming attractive, ranging from USD 3.09 cents/kWh to USD 18.77 cents/kWh. Meanwhile, the national LCOE for sub-critical coal, the most common type in Indonesia, ranges from USD 4.7 cents/kWh to USD 11.85 cents/kWh (IESR, 2023).

The development of renewable energy in Indonesia has not been optimal.

Indonesia's renewable energy mix only reached 13.09% in 2023 (MEMR, 2024), significantly below the target set by RUEN 2014, which aimed for a 23% proportion of renewable energy by 2025. This is very unfortunate, as renewable energy sources, whose LCOE is increasingly competitive with that of fossil energy, have not yet optimally utilized. Indonesia actually has enormous renewable energy potential. According to the Ministry of Energy and Mineral Resources (ESDM), there is a potential of 3.7 TW from various sources such as solar, wind, hydro, bioenergy, geothermal, and marine energy (DG NREEC, 2023).

National and International Collaboration in a Just Energy Transition

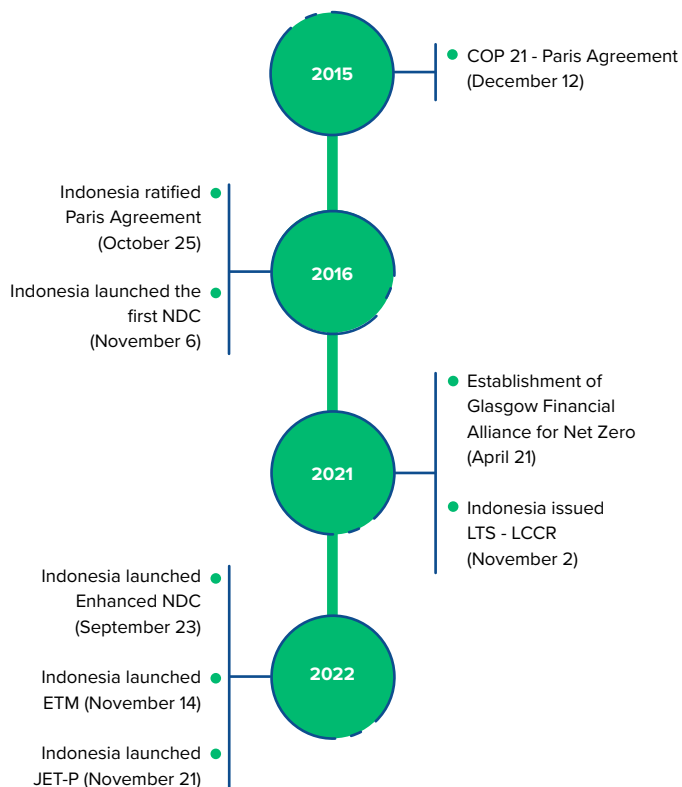


Figure 21. Chronological summary of national and international collaboration
(Source: THC analysis from various sources)

The Paris Agreement, which aims to limit the global temperature rise well below 2°C above pre-industrial levels and pursue efforts to limit it further to 1.5°C, has become a catalyst for global climate collaboration. This agreement began with negotiations at the 21st Conference of the Parties (COP) in Paris, France, at the end of 2015. The Paris Agreement was then ratified by 175 countries, including Indonesia, which ratified the agreement on April 22, 2016, and officially took effect on November 4, 2016. Subsequently, Indonesia launched its own Nationally Determined Contribution (NDC), a country-level emissions mitigation and adaptation strategy that can be updated regularly. Indonesia has set a target through Law No. 16 of 2016 to reduce greenhouse gas (GHG) emissions by 29% with its own efforts and 41% with international assistance by 2030. In Indonesia’s 2021 Enhanced NDC document, the country has increased its ambition in adaptation through programs, strategies, and actions aimed at achieving economic, social, and livelihood resilience, and paying attention to the balance of ecosystem and landscape.

One of the achievements of international collaboration is the consolidation of various world financial institutions to finance the energy transition through the COP. This was evident in the establishment of the Glasgow Financial Alliance for Net Zero (GFANZ) at COP26 in Glasgow in 2021. In general, the establishment of GFANZ has two primary objectives: first, to increase the number of financial institutions committed to achieving net zero emissions, and second, to provide a platform for addressing sector challenges associated with this transition. By facilitating collaboration between financial and private alliances, GFANZ aims to ensure that ambitious goals in the transition process are translated into credible actions. Furthermore, GFANZ facilitates connections between financial institutions, scientists, experts, and civil society to create a comprehensive network to tackle the challenges in the transition to net zero emissions.

Another important international collaboration initiative is the Just Energy Transition Partnership (JET-P). Indonesia’s JET-P was launched in November 2022 during the G20 Summit in Bali. The platform is a collaboration between Indonesia and several international partners, including Japan, the US, Canada, Denmark, the EU, Germany, Norway, Italy, and the UK, with a total financing commitment of USD 21 billion over five years. The main objectives of the initiative are to accelerate the adoption of renewable energy, carry out early retirement of coal-fired power plants, limit emissions to 290 MtCO₂ by 2030, and achieve net zero by 2050 (JETP Indonesia, 2023). In addition, Indonesia launched the Energy Transition Mechanism (ETM) Country Platform in the same year. Through the appointment of PT Sarana Multi Infrastruktur (PT SMI) as the ETM Country Platform Manager, the initiative aims to coordinate and encourage a just and affordable transition in the energy sector. These two initiatives are a momentum of international collaboration and essential to achieve the shared vision of addressing climate change and promoting sustainable development in Indonesia and worldwide.

Quo Vadis Indonesia's Just Energy Transition

Table 5. Development of Indonesian Legislation

No	Source	Content	Note
Target for Renewable Energy Mix			
1	Government Regulation <i>Peraturan Pemerintah</i> (PP) No. 79 of 2014 on National Energy Policy (<i>Kebijakan Energi Nasional</i>)	Achieving an optimal Primary Energy mix (Article 9 point f): 1. New Energy and Renewable Energy: at least 23% by 2025 and at least 31% by 2050 2. Petroleum: less than 25% in 2025 and less than 20% in 2020 3. Coal: at least 30% in 2025 and at least 25% in 2050 4. Natural Gas: at least 22% in 2025 and at least 24% in 2050	This government regulation, especially Article 11 Paragraph 2, still stipulates reliance on coal as the main source of national energy supply and the maximum use of renewable energy while taking into account economic levels.
2	General Plan for Power Generation (<i>Rencana Umum Pembangkit Tenaga Listrik/RUPTL</i>) 2021 - 2030	Indonesia's Projected Energy Mix: 1. Renewable Energy: 23% by 2025 and 24.8% by 2030 2. Petroleum: 0.4% in 2025 to 2030 3. Coal: 61% in 2025 and 59.4% in 2030 4. Natural Gas: 15.6% in 2025 and 15.4% in 2030	The Green RUPTL is still not in line with the recommended energy mix for the power sector under the Paris Agreement, which targets 55-82% renewable energy and 7-16% coal in the power generation mix by 2030 (Climate Action Tracker, 2023).
Incentives and Disincentives			
3	Minister of Energy and Mineral Resources Decree (<i>Keputusan Menteri ESDM</i>) No. 139.K/HK.02/MEM.B/2021 concerning Fulfillment of Domestic Coal Needs	Coal production and export activities must follow the following provisions: 1. Domestic Market Obligation (DMO) of 25% of the annual coal production plan approved by the government 2. Coal selling price for the provision of electricity for the public interest at USD 70 per metric ton Free On Board (FOB) Vessel	In addition to electricity procurement, the coal DMO policy is also applied to the cement and fertilizer industries at a price of USD 90 per metric ton FOB Vessel. The coal DMO pricing policy is a disincentive for renewable energy because it makes it difficult for renewable energy prices to compete with coal energy (IESR, 2022).
4	Minister of Energy and Mineral Resources Regulation (<i>Peraturan Menteri ESDM</i>) No. 2 of 2024 concerning Rooftop Solar PV Connected to the Electricity Network of IUPTL Holders for the Public Interest	Latest rooftop solar PV provisions: 1. The net metering scheme is abolished (no electricity export scheme), but the scheme remains valid for rooftop solar PV installers before this regulation comes into effect.	The net metering scheme, which was actually an incentive for prospective rooftop solar PV installers, no longer exists. In fact, the Minister of Energy and Mineral Resources Regulation No. 26/2021 has made it interesting with the 1:1 scheme, because it was previously using the 0.65:1 scheme in Minister of Energy and Mineral Resources Regulation No. 49/2018. However, there is no consistency in this net metering scheme, which leads to confusion among the public (Wahyudi, 2024).
5	Renewable Energy Bill (<i>RUU Energi Terbarukan/ET</i>) or New Energy and Renewable Energy Bill (<i>RUU Energi Baru dan Energi Terbarukan/EBET</i>)	Not yet ratified.	This bill still has a lot of opposition, including: 1. Is it necessary for the definition of new energy to be included in the RUU EBET? (BAPETEN, 2022; Muamar, 2023) 2. Does the power wheeling scheme need to be included in the RUU EBET? (Hidayatullah & Atmaja, 2023; Commission VII of the House of Representatives, 2023)

(Source: THC analysis from various sources)

Multi-stakeholder Collaboration Initiative for Just Energy Transition

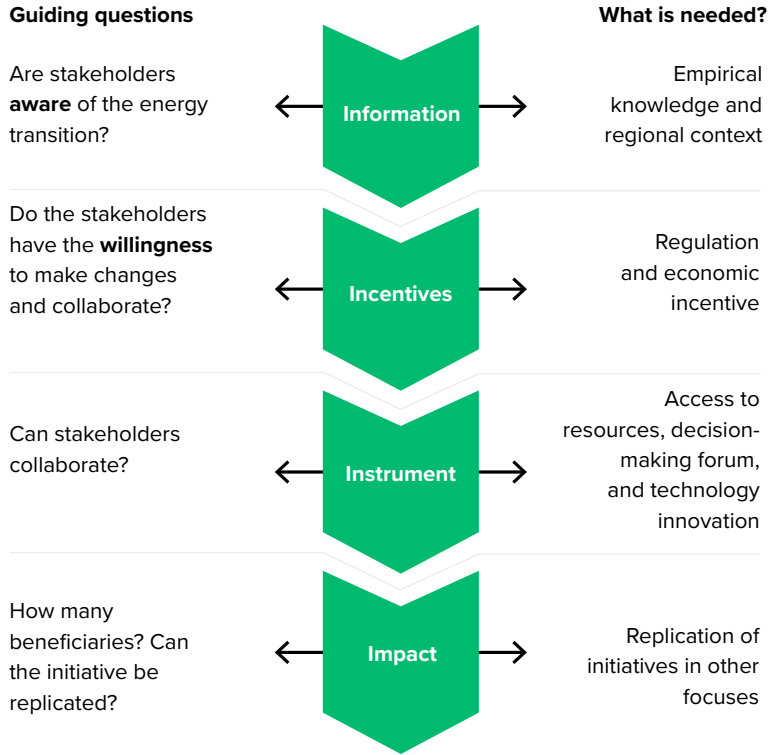


Figure 22. Development flow of renewable energy initiatives at the local level
(Source: World Bank, 2023; THC analysis)

Multi-stakeholder collaboration is an important aspect in supporting a just energy transition in the regions. Several regions in Indonesia have taken collaborative initiatives to support energy access. For example, the Sumba Iconic Island program seeks to support the fulfillment of energy access in NTT Province with the support of collaboration between the Ministry of Energy and Mineral Resources (MEMR), Bappenas, and Hivos. In its implementation, the Sumba Iconic Island Program also seeks to develop management of micro-scale renewable energy business models through Village-Owned Enterprises (BUMDES), cooperatives, and local startups. Many national and local Civil Society Organizations (CSOs) are also involved in the implementation of this pilot project.

Communities in areas with limited energy access can be active actors in driving a just energy transition. Social innovation programs also indirectly help stimulate the economy and strengthen social capital (Houtbeckers, 2016; Nascimento and Salazar, 2020). In the Sumba Iconic Island initiative, there were initial efforts to interact with the community, including through consultations on renewable energy in 44 sub-districts, from the planning stage to the implementation of pilot projects. One of the key community-based partners to date has been a cooperative in Kamanggih, where the IBEKA micro-hydro facility was first piloted in 2013 (Hivos, 2015).

Mobilizing financial support is an important instrument in supporting just energy transition programs. In the Sumba Iconic Island initiative, the Asian Development Bank (ADB) also supports the mobilization of financial support to scale up the initiative. In the program development process, ADB started with an initial investment of USD 1 million in 2013 and then received additional funds totalling around USD 2.5 million from ADB sources and other donors. Despite decreasing funding from the Dutch government, the Norwegian Embassy contributed around USD 1 million to support the ADB program and around USD 800,000 to Hivos, enabling it to host the initiative's secretariat and support renewable energy projects on the ground (Hivos, 2015; ADB 2013).

Zero-Sum Game Phenomena of Indonesia's Energy Governance

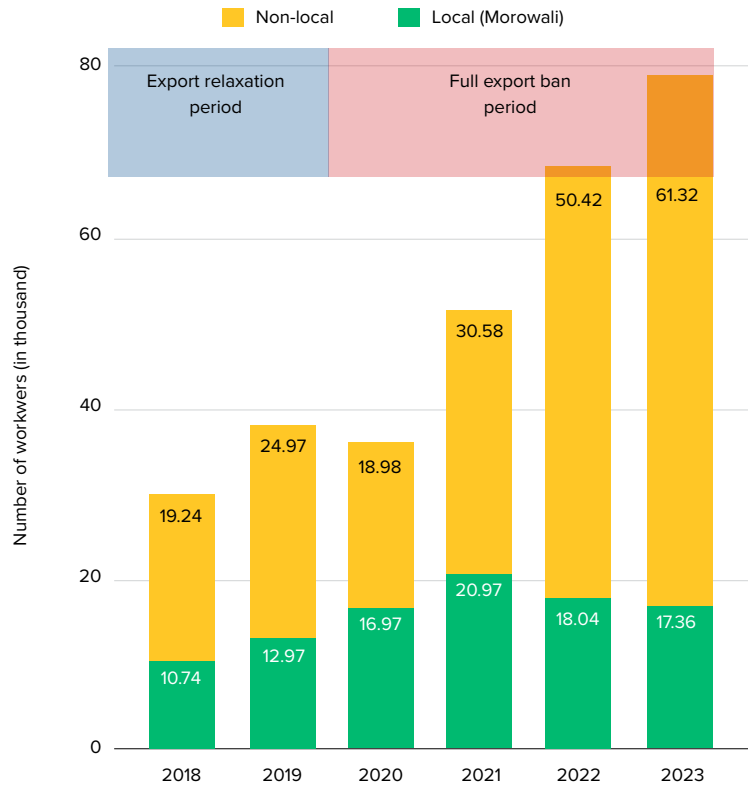


Figure 23. Number of workers of nickel industry companies in Morowali, Central Sulawesi (Source: Lahadalia et al., 2024 p. 955)

As an energy commodity, coal not only brings economic benefits to the country but also brings multiple socio-ecological impacts to the region. Indonesia is the world's third-largest coal producer and plays a significant role in the global coal market. The coal industry is essential to the national economy, contributing to 3.6% of the GDP, accounting for 11.4% of the total export value, equivalent to 1.8% of the national income, and providing employment for 0.2% of the Indonesian population (IESR, 2023). However, coal mining has led to a decline in tropical forest land functions in several areas of Kalimantan. Post-mining land reclamation efforts face complex challenges in restoring the forest to its original pre-mining state (Woodbury & Arbainsyah, 2020). Furthermore, coal extraction and exploitation has raised social issues with indigenous communities who hold customary rights and resources within their territories (Jamin et al., 2023; Subarudi et al., 2016).

Mineral downstream is one of the energy transition solutions and a national strategy to accelerate the country's economy, which provides national economic benefits and becomes challenges for the local community's economy. Indonesia is the world's largest nickel producer and processor, contributing 48.8% to the global nickel industry in 2023 (IRENA, 2023). The massive downstream process made nickel exports an essential contributor to state revenue worth USD 33 billion in 2022. In addition, since the start of the nickel downstream project, the people of Central Sulawesi have lost their livelihoods as farmers and fishermen due to reduced marine and agricultural natural resources. Moreover, the critical minerals mining industry is unable to absorb local workers due to gaps in the required skills (Lahadalia et al., 2024); see Figure 23.

As a potential renewable energy source, geothermal energy still requires in-depth research on mitigating the social and environmental risks it brings. Indonesia's geographic location in the Ring of Fire makes Indonesia the country with the second-largest geothermal potential, after the United States, representing 40% of the world's total thermal energy potential. Indonesia is estimated to have a geothermal power capacity of 23.7 Gigawatts spread across more than 300 locations across the country, making it a potential renewable energy source in the energy transition (Koty, 2022). However, geothermal energy development also has environmental and social impacts while exploring hot steam sources. Geothermal hotspots are often scattered and located in customary forest areas and buffer zones, making them vulnerable to tenure conflicts and environmental issues (Salman et al., 2023). Moreover, geothermal exploration has resulted in the death of five residents in North Sumatra in 2021 from inhaling hydrogen sulfide gas, and 79 residents were poisoned by the gas in 2022 (Chandra, 2024).

CHAPTER 7

Regenerative and Democratic Energy Transition Good Practices

This chapter describes various practices of a just energy transition that can be used as lessons learned for Indonesia to implement a just energy transition in a regenerative and democratic manner. Referring to the initial concept, a just energy transition requires a systematic and comprehensive design that makes energy, economy, society and nature a harmonious system, that is, the recovery of nature and society. There are five stories that can be used as a reflection of Indonesia's just energy transition, namely (1) identification of factors driving the energy transition to renewable energy, (2) the development of community-based economy through the provision of energy access, (3) energy governance with the concept of environmental restoration, (4) learning from the history of economic transformation in other countries, and (5) efficient and equitable land use.

Further reading:

- Agora Energiewende. (2021). Phasing Out Coal in Chile and Germany: A Comparative Analysis.
- Brady, M. A., Sharma, S., Baral, H., & Nasi, R. (2023). Bioenergy Sustainability in the Global South: Constraints and Opportunities.
- Yayasan Rumah Energi. (2021). Indonesia Domestic Biogas Program Annual Report 2021.



Identification of Drivers of the Transition to Renewable Energy

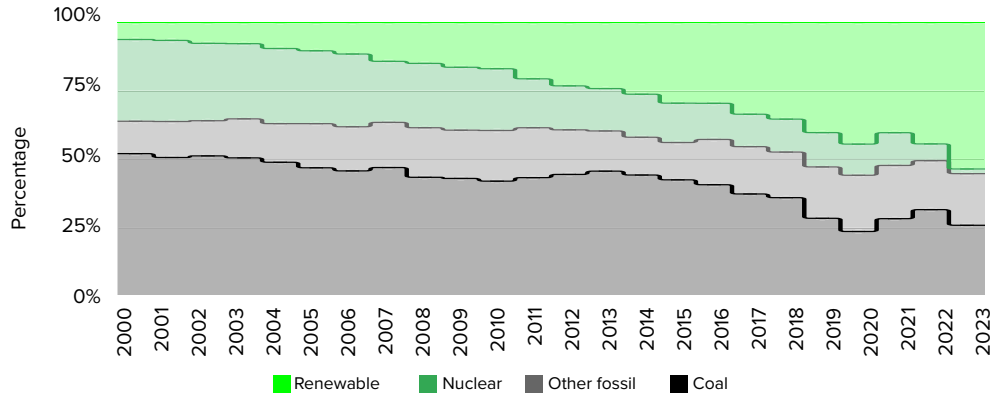


Figure 24. Energy mix for Germany's electricity
(Source: EMBER, 2024)

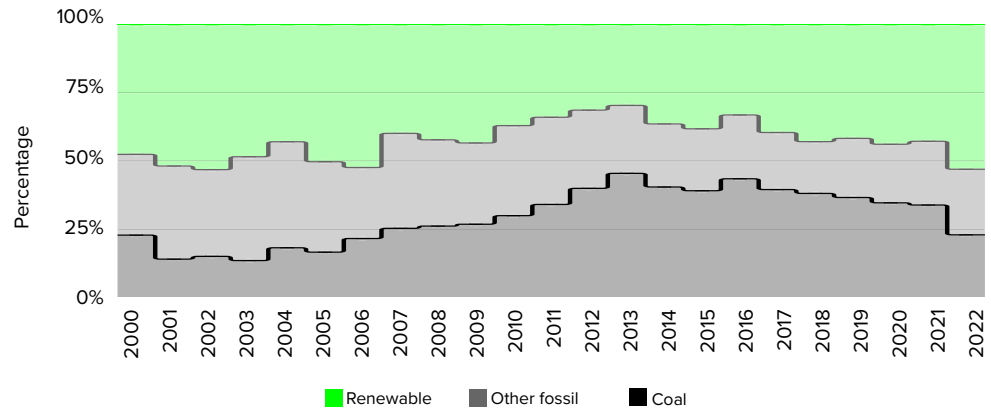


Figure 25. Energy mix for Chile's electricity
(Source: EMBER, 2024)

Reducing the use of fossil energy is one of the priorities in decarbonizing the global power sector. Coal's share of 36% in the global electricity mix in 2022 needs to be gradually reduced to 4% by 2030 and 0% by 2050, in line with the recommended 1.5°C limit of the Paris Agreement (CAT, 2023). Countries such as Germany and Chile have their own successful experiences in reducing coal use. For example, Germany was able to reduce coal's share from 45% in 2012 to 24% in 2020, while Chile was able to reduce coal's share from 41% in 2014 to 23% in 2022 (Jaeger, 2023).

Germany and Indonesia have several similarities in energy consumption and production. Both countries have large populations and their coal is produced in domestic coal-producing regions (Agora Energiewende, 2021; Jaeger, 2023). In practice, Germany has been successful in increasing its renewable energy mix (solar and wind), while simultaneously reducing the nuclear energy mix (Popovich, 2023), and has been proven to be able to push the renewable energy mix to 40% by 2023 (WEF, 2023). This success is due to a number of factors, such as investment in technology development, renewable energy targets, renewable energy incentives, the EU carbon trading system, and integration into the EU grid (Agora Energiewende, 2021; WEF, 2023).

Chile and Indonesia are similar in terms of their increasing energy needs. Chile added 14 coal-fired power plants from 2009 to 2019. However, Chile has successfully reduced the coal mix in the national electricity system from 46% in 2013 to only 23% in 2022 (Jaeger, 2023). The success of Chile's energy transition lies in the high price of energy from imported coal compared to the price of renewable energy (Agora Energiewende, 2021). In addition, the liberalization of Chile's national electricity market, which has made national electricity prices more competitive due to competition from several private energy companies, is one of the drivers for the success of Chile's energy transition (Agora Energiewende, 2021).

The Development of Community-based Economy through the Provision of Energy Access

Community involvement and empowerment in programs to provide energy access in the region is the key to community economic development. According to the community-based economy framework, the development of a region requires proactive community participation. Apparently, community involvement in social entrepreneurship programs in the energy sector can indirectly strengthen social capital (Houtbeckers, 2016; Nascimento and Salazar, 2020). In addition, the provision of energy access in the regions has an interesting characteristic, i.e., the form of energy markets in the regions is different from the form of energy markets in urban areas. Several regions have adopted the energy cooperative model, which is the answer to the need for energy access and a new economy for local communities, by adjusting to the availability of local natural resources and the characteristics of rural communities—*gotong royong* (mutual cooperation).



Figure 26. *Gotong royong* (mutual cooperation) in the construction of a micro-hydro power plant (PLTMH)
(Source: IBEKA)

IBEKA, a community organization that builds society with a community-based economic model, has several programs that can provide important lessons in development. IBEKA has a project to increase energy access in the community through the construction of Micro Hydro Power Plants (PLTMH), especially in remote and inland areas where conventional electricity is difficult to reach. For example, IBEKA has an initiative to build a PLTMH that is owned and operated by rural communities in the Sumba Iconic Island Program in Mbakuhau Village, Kamanggih, East Sumba Regency. With the support from Hivos, the PLTMH installation program is quickly developing and currently it can provide energy with a capacity of 37 kWh. It is worth noting that the initiative is managed by a local cooperative and the facility has been able to electrify more than a hundred households. IBEKA began to consider the option of supplying electricity to the nearby PLN grid and then implemented in 2013 (Hivos, 2015).

The Indonesia Domestic Biogas Program (IDBP), initiated by Yayasan Rumah Energi, can be an important lesson of providing access to energy for cooking because it is managed inclusively and uses circular economy principles. The program aims to provide renewable energy through small-scale domestic biodigester systems, also known as Home Biogas (*Biogas Rumah/BIRU*). The program utilizes biogas technology to convert household organic waste into clean energy that can be used for cooking. A total of 126,234 people have gained access to clean energy for cooking through the construction of 26,818 biodigester units. In 2021, a total of 7,082 people have gained access to clean energy for cooking from 1,661 new installations of biodigester units. Beneficiary communities can reduce expenses and get additional income from reduced purchases of three (3) kg of LPG and chemical fertilizers (Yayasan Rumah Energi, 2021).

Energy Governance with the Concept of Environmental Restoration



Figure 27. Bamboo cultivation management by the community in Mentawai Islands Regency, West Sumatra
(Source: Clean Power Indonesia)

Bamboo biomass has the potential to be a restorative source of renewable energy but requires just and equitable cultivation approach.

Bamboo is a sustainable bioenergy alternative because it proliferates, and its stalks can be harvested yearly. In addition, bamboo has various advantages, including abundant biomass yield, low price, low ash content, high alkali index, and many cultivation opportunities (Lathwal et al., 2023). Bamboo plants are an example of the application of the nature-based solution concept, namely as a forest landscape restoration plant. Bamboo can thrive in severely degraded areas and help restore the land. Bamboo's extensive fibrous root and rhizome system, dense foliage, and leaf mulch can stabilize the soil, control erosion, and retain water (Sharma et al., 2018). However, bamboo plants have the risk of becoming an invasive species because they can replace the native vegetation around them if bamboo plantations are not adequately managed.

As an energy crop, bamboo cultivation can serve as a circular economy model for local communities.

Well-managed bamboo plantations can offer long-term employment for local communities. Bamboo cultivation and other bioenergy processing can be livelihood opportunities for local communities, such as the bamboo cultivation developed by Mentawai communities (see Figure 27). Bioenergy generated from bamboo power plants can catalyze rural economic activities and lay the foundation for poverty alleviation in the region (Baral et al., 2022; Sharma et al., 2018). However, the high demand for bamboo supply often threatens the lands of local communities. Bamboo cultivation as an energy crop requires comprehensive planning and monitoring of land management to mitigate large-scale land clearing that impacts communities (Wiranegara, 2024).

As a raw material for biomass power plants (PLTBm), bamboo faces several priority challenges that need to be addressed, one of which is sustainability.

It is worth emphasizing that the sustainability of PLTBm requires a good investment scheme and a stable supply of raw materials. The PLTBm in Mentawai, which was built in 2018, experienced a decline that led to its shutdown in 2022. This decline was primarily attributed to reduced subsidies from the local government, leaving the plant unable to cover repair costs (Baittri, 2023). Several schemes can be implemented to increase the sustainability of PLTBm programs. First, implement the Regional Cooperation Scheme with Third Parties (KSDPK) so that competent business entities can finance machine repairs. Second, the Environmental Fund Management Agency (BPD LH) should be involved in providing long-term benefits to bamboo-growing communities that have contributed to the environment by planting bamboo for energy/industry. Third, network connections should be established to cities or districts so that electricity is available continuously throughout the day.

Learning from the History of Economic Transformation of Other Countries

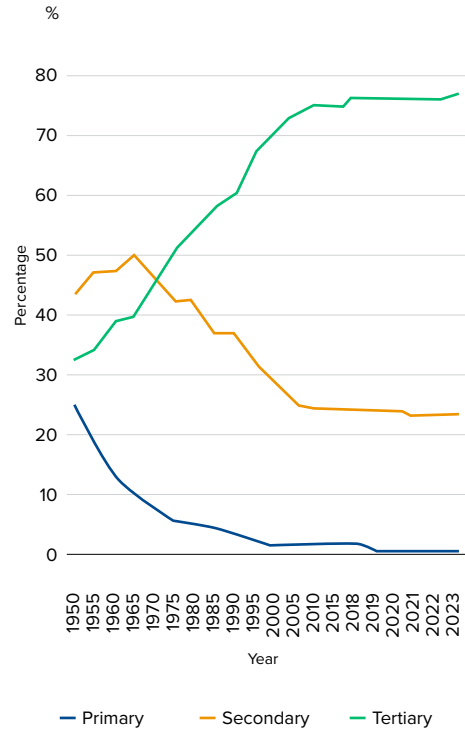


Figure 28. Employment trends by sector in Germany from 1950 to 2023 (in percentage)
(Source: Statistisches Bundesamt, 2024)

Germany’s successful economic transformation can be attributed to the strong commitment of its central government and related parties, including local governments. A comprehensive energy transition plan, although subject to delays, is essential for infrastructure development and the creation of industrial attractiveness. The collaborative “buy-in,” i.e. support from local coal community leaders and key stakeholders to ensure the transition to a greener future, can positively impact all communities (Gearino, 2020). Over the last seven (7) decades, there has been an economic shift in Germany, from a focus on agriculture and manufacturing to a focus on the service sector. This transformation reflects Germany’s adaptation to the global economic landscape, ultimately increasing employment and economic growth (Matt et al., 2014). As of 2023, the percentage of tertiary (services) workers reached 75.3%. Meanwhile, the percentage of workers in the secondary industry (manufacturing/production) and primary industry (agriculture, forestry, and fishery) were only 17.7% and 1.2%, respectively (Statistisches Bundesamt, 2024).

Economic transformation in Germany is supported by the development of an integrated ecosystem. First, investment in research and development in Germany annually reaches 3% of the GDP, or around EUR 100 billion. There are also targeted funds for new and disruptive technologies, innovations, and business models. Second, Germany’s economic policy is based on a socio-environmental economic model, reflected in the establishment of the Ministry for Economic Affairs and Climate Action in 2021. Third, a dual vocational educational system is implemented, that is, an education system that combines theoretical education in vocational colleges with practical training in the workplace. It is worth noting that Small and Medium Enterprises (SMEs) currently account for 99% of total businesses, employing 80% of trainees and apprentices. Fourth, Germany is improving its domestic laws and financial systems to attract skilled foreign workers. Germany is expanding its digital infrastructure and integrating production processes with internet-based communication methods as a step towards a digital economy. Moreover, the German government is also streamlining financial regulations and providing incentives for startups (Fact about Germany, 2024).

Not only nationally, Germany’s coal-producing regions are also experiencing an economic transformation. Ruhr, Saarland, and Lusatia are coal-producing regions in Germany that have successfully carried out economic transformation. Lusatia, a coal-producing region that shares infrastructure similarities with regions in Indonesia such as East Kalimantan, Central Kalimantan, and South Sumatra, provides three important lessons. First, infrastructure improvements, such as the modernization of the railway system, are crucial for enhancing connectivity with major cities like Berlin (Gearino, 2020). Second, the region utilizes natural assets through tourism transformation supported by investment in tourism infrastructure and public and private sector cooperation. In practice, Lusatia has succeeded in repurposing former mine pits into attractive lake destinations for tourists (Lintz et al., 2012). Third, Lusatia’s success also hinges on community engagement to ensure an inclusive decision-making process, as well as involving local leaders and stakeholders from coal communities to gain support for the long-term benefits of the transition to a sustainable industry, including providing education and employment opportunities in the green energy sector (Matern et al., 2023).

Efficient Land Utilization



Figure 29. Scheme of agrivoltaics system with triple land use benefits (power generation, food production, and rainwater harvesting).
(Source: Fraunhofer ISE, n.d.)

Efficient and fair land use in installing renewable energy power plants is essential in improving restorative and regenerative aspects of the current energy system transformation. A total of 68 countries have committed to meeting renewable energy targets by 2050. However, the obstacle is that there needs to be more land for renewable energy development, as is the case in China, Japan, and India (Baruch-Mordo et al., 2019). Efficient land use through the deployment of renewable energy can minimize the ecological footprint produced during the energy transition. Multifunctional land use can help optimize land use and reduce conflicts over land use, which is one of the manifestations of justice in land governance. Interventions such as floating solar PV (photovoltaic) and agrivoltaics systems can reduce the land area dedicated to renewable energy projects.

Floating solar PV systems offer a promising solution for renewable energy development in Indonesia, using land efficiently by utilizing unused water surfaces. Indonesia has an example of a floating solar PV system at the Cirata Reservoir, the largest in Southeast Asia, with a capacity of 145 MWac or 195 MW(p) (Febrian et al., 2023). Installing PLTS (solar PV) on land has an issue with land use since it requires a huge area, while the land available for developing solar PV is limited. Thus, the floating solar PV system is advantageous in densely populated areas with limited land availability. This system allows Indonesia to achieve its renewable energy mix targets through solar energy. The country has the potential to develop floating solar PV systems in 783 water bodies with a total capacity of 28.4 GW, including 27 water bodies with existing hydropower facilities with a total potential capacity of 4.8 GW (Permana, 2023). However, floating solar PV installations require in-depth landscape and ecosystem studies to mitigate the impact of energy technology governance on the environment.

Agrivoltaic systems are another alternative solution for efficient land use. The systems can maximize land use efficiency in renewable energy development while providing additional benefits in the agricultural sector, see Figure 29. For example, agrivoltaic systems and potato cultivation significantly increased land-use efficiency by 186% at the Hegelbach test site (Fraunhofer, 2022). In addition, agrivoltaic systems can help farmers reduce energy costs, as they can use the electricity generated by solar panels to power farm equipment and irrigation systems (Karim et al., 2023). In another successful example, vineyards in India using agrivoltaic systems have increased their yields by more than 15 times compared to conventional farming while maintaining roughly the same quality of grape production (Malu et al., 2017). Moreover, agrivoltaic systems can facilitate rainwater harvesting and prevent drought and soil quality degradation.

CHAPTER 8

Toward a Regenerative and Democratic Ecosystem

This chapter describes a new ecosystem in managing a more just and democratic energy transition. Effective and regenerative energy transition governance requires a holistic perspective involving various aspects, including technological, economic, social, environmental and policy. To present a complete point of view, this section consists of seven (7) topics related to ecosystems, namely (1) regenerative law, (2) collaborative governance, (3) accommodative community participation, (4) regenerative and distributive economy, (5) accessible social innovation, (6) democratic and decentralized energy systems, and (7) innovative research. By considering a holistic perspective in the governance of the energy transition, plans that are comprehensive, sustainable, and able to overcome complex challenges in the energy future can be formulated.

Further reading:

- Ansell, C. & Gash, A. (2008). Collaborative Governance in Theory and Practice.
- Holland, et.al (2016). Bridging the Gap between Energy and the Environment.
- Walls, J. L., & Vogel, L. L. (2023). Regenerative Economy: A Pathway to a Future-Ready, Sustainable Africa.



Toward a Regenerative Legal Ecosystem

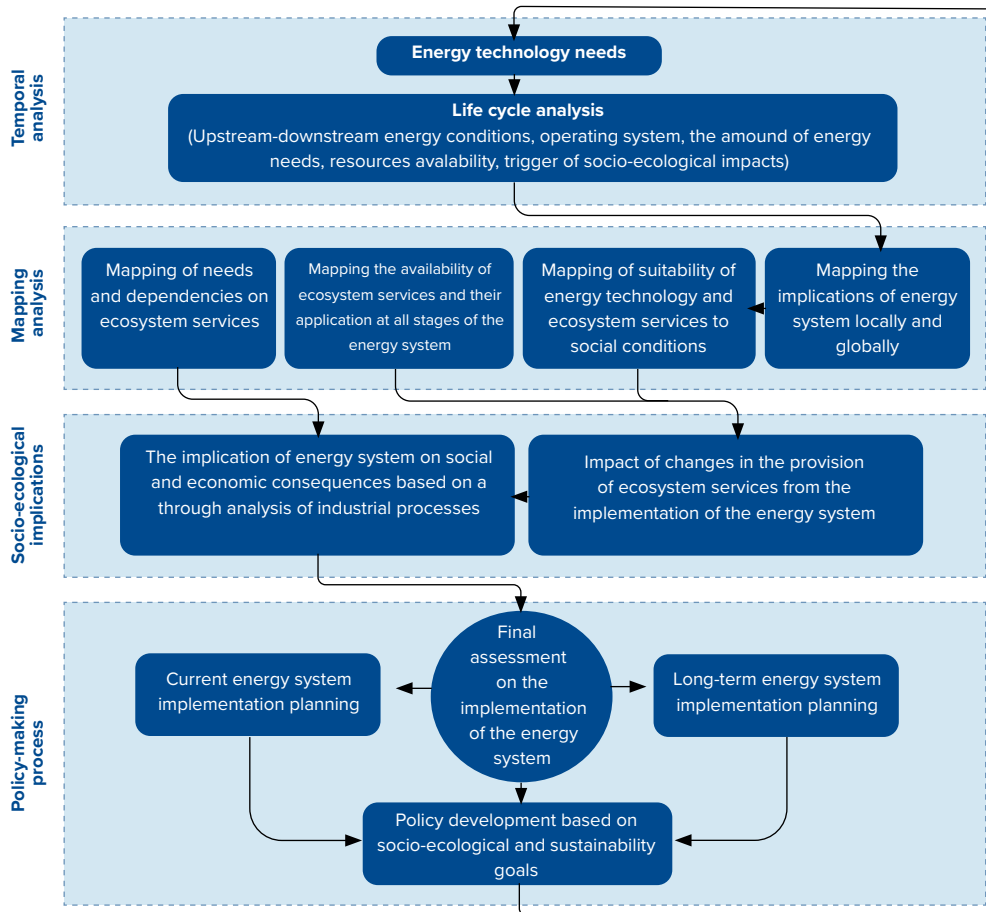


Figure 30. Energy governance considerations based on ecosystem services analysis
(Source: Holland et al., 2016, p. 184)

Indonesia has made progress in considering environmental factors in decision-making, as seen from the existing constitution and legislation. For example, the value of sustainable development in Indonesia has been contained in Article 33, paragraph (4) of the 1945 Constitution (Fourth Amendment), which mandates that every industrial activity must be based on the principles of fair efficiency and a sustainable environment. In addition, Government Regulation No. 33 of 2023 on Energy Conservation also emphasizes the need to implement efficient and environmentally sound energy governance to maintain a sustainable energy supply.

Regenerative principles are needed in Indonesia's energy policy ecosystem. The problem is that regions often suffer the ecological impacts of energy systems, and decisions about energy systems are often made at the national level. Given that climate change is projected to lead to long-term biodiversity loss and ecological damage, policies to address local, short-term negative impacts must be considered as a mechanism to ensure long-term ecosystem sustainability. In practice, the just socio-ecological aspects have begun to be targeted in the 2023 Comprehensive Investment and Policy Plan (CIPP). However, Indonesia still prioritizes economic growth by implementing just energy transition, which impacts environmental exploitation. Regenerative policies must be based on consideration of various ecosystem services to correctly calculate the impacts of energy systems at all stages, from upstream to downstream (Holland et al., 2016); see Figure 30.

Strong political will is needed to realize a regenerative legal ecosystem in energy governance. A regenerative legal ecosystem in energy governance emphasizes the implementation of laws, regulations, and policies that support sustainable energy practices, environmental protection, and the welfare of communities affected by energy production and consumption. Without strong political will, efforts to transition to a more regenerative and just energy system will stagnate or even regress. Therefore, it is necessary to improve regulations on the environment that are more stringent and comprehensive and prioritize community participation through the FPIC process to strengthen the role of the community in environmental monitoring and energy governance decision-making.

Toward a Collaborative Governance Ecosystem

Table 6. Explanation of central-local authority

Regulation	Target	Key points
Law No. 23 of 2014 on Regional Government	Central government, provincial government, and regency/city government	<ul style="list-style-type: none"> • The authority of regency/municipal governments is limited to the issuance of geothermal direct utilization permits; • Provincial governments have authority over waste-to-energy conversion, while regency/municipal governments are limited to waste transporting, processing, and recycling. • Regency/municipal governments have no authority over electricity
Presidential Regulation (Perpres) Number 11 of 2023 on Additional Concurrent Government Affairs in the Field of Energy and Mineral Resources (EMR)	Provincial government	<ul style="list-style-type: none"> • Establishment of a New Renewable Energy subdivision and determination of Additional Concurrent Government Affairs in the field of energy and mineral resources; • Management of biomass and/or biogas provision and utilization of both as fuel at the provincial level; • Management of various renewable energy sources such as solar, wind, and water energies and overseeing energy conservation for permitted activities in the provincial area.

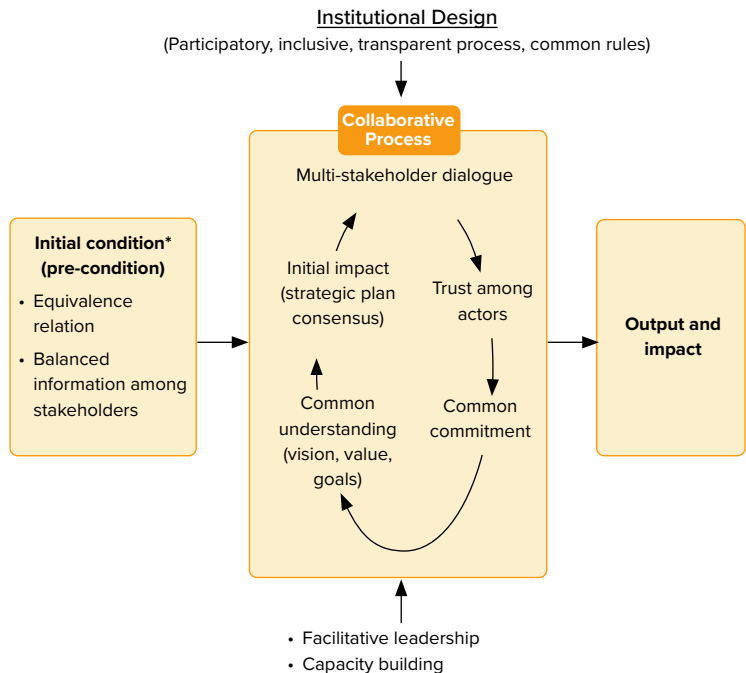
(Source: Law No. 23 of 2014 & Presidential Regulation No. 11 of 2023)

Multi-stakeholder cooperation and collaboration are crucial in formulating policies for urgent issues, including the climate crisis and efforts for a just energy transition in Indonesia. Democratic governance must not only be a one-way process in legislation-making, but also involve a multi-stakeholder approach that accommodates diverse points of view, encourages innovation, and enables large-scale implementation. Through inclusive collaboration, the government can expand the reach of policies and increase the success of their implementation (Verma, 2023). Therefore, just energy transition programs also need to improve the quality and quantity of public dialogue with various stakeholders, from the top to the grassroots, to ensure that the policies developed result in legal products that are permanent solutions.

Local governments play a crucial role in the transformation process. Referring to the success of economic transformation in Germany, the leadership of local governments is vital in the transformation process in society. Local governments can bridge between national policies and local needs while ensuring policy efficacy and responsiveness to local community challenges. At a smaller scale, regency/municipal governments must implement and monitor national policies, ensuring their effectiveness and alignment with local community priorities. However, there seems to be a lack of narrative on the role of Indonesian regency/municipal governments in formulating just energy transition policies in Indonesia.

The authority of regency/municipal governments is one of the driving forces for regional procurement of renewable energy. However, if we refer to Law Number 23 of 2014, the authority of Indonesian regency/municipal governments in renewable energy procurement is minimal. Regulations related to the concurrent jurisdiction of the energy and mineral resources sector issued in 2023 are mandated explicitly for provinces. This leads to restrictions on regency/municipal governments in formulating policies in the renewable energy sector, which also affects their limitations in managing regional budgets for renewable energy development. In fact, collaborative programs between the central government, provincial government, regency/municipal governments, private sector, civil society organizations, and the community have already begun in various regions. However, existing initiatives remain fragmented and face challenges in terms of sustainability.

Toward an Accommodative Community Participation Ecosystem



*Often, a state of equality and balance does not occur

Figure 31. Public collaboration process
(Source: Ansell & Gash, 2008; THC analysis)

The government, particularly the National Energy Transition Task Force, can use a collaborative governance approach. During the implementation process, the Task Force has involved national CSOs as members. However, input from communities and local governments has not been fully channeled. As a solution, a collaborative governance can be adopted to build a more accommodating energy transition policy. Collaborative governance refers to an approach to managing the dynamics of public problems, working cooperatively and collaboratively to achieve common goals (Ansell and Gash, 2008). This approach emphasizes cooperation between the government, private sector, civil society, and other stakeholders in formulating policies and implementing programs. Thus, the government can provide a common space to solve public problems in the energy sector. However, it should be added that collaborative governance requires information transparency and equal power relations among all stakeholders.

The practice of Indonesia’s Open Government Initiative (OGI) in developing a national action plan based on the principle of co-creation can serve as a reference model for collaborative governance. One of the National Action Plans in Open Government Indonesia also includes the Governance of One Data for Natural Resources (Open Government Indonesia, 2023). Another example, in the area of extractive resource governance, the government also works with CSOs through relevant ministries/agencies to develop action plans and monitor and evaluate performance. This principle of collaborative governance also applies to the Extractive Industry Transparency Initiative (EITI), which, through the Minister of Energy and Mineral Resources Decree Number 164.K/HK.02/MEM.S/2021, involves stakeholders from CSOs and mining companies (EITI Indonesia, 2023).

The Development Planning Discussion (*Musrenbang*) can be a starting point for involving women and other marginalized groups in energy policy planning. The integration of various topics, such as energy decisions in *Musrenbang*, can open up opportunities for the community to provide more specific and in-depth input on energy policies proposed or implemented in local development. In addition, women’s involvement in energy policy can also be encouraged through *Musrenbang*. Gender mainstreaming in policy planning needs to consider several aspects: (1) access, (2) control, (3) participation, and (4) benefits (MoWECP, 2018). In practice, several regions have shown commitment by developing derivative regional regulations related to gender mainstreaming in the regions, such as NTT Province, which has issued Regional Regulation No. 5/2022. Furthermore, the incorporation of regional planning documents in the National Energy Transition Task Force can be carried out to create targeted development programs for all levels of society, including women.

Toward a Regenerative and Distributive Economic Ecosystem

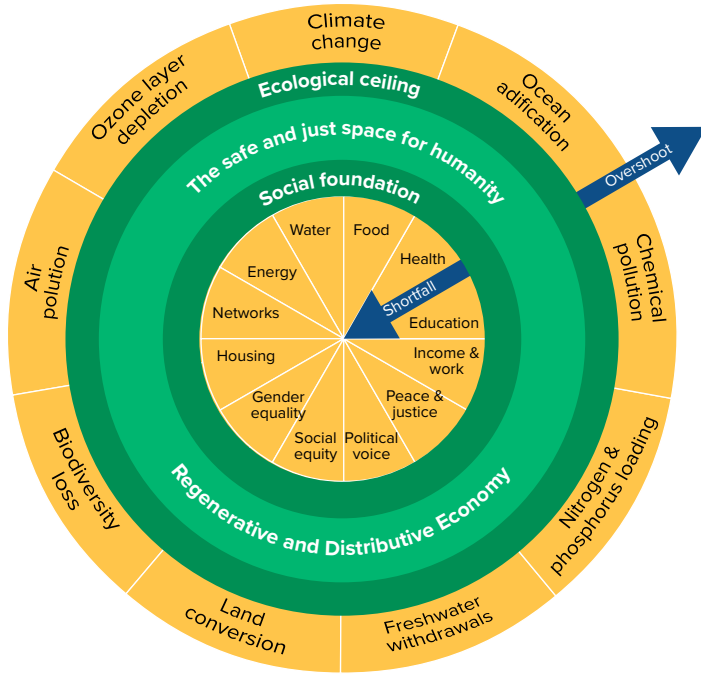


Figure 32. Illustration of the doughnut economics framework (Source: Raworth, 2017, p. 38)

A regenerative and distributive economic framework can be a model for Indonesia’s future economy, which aims to address environmental degradation, economic inequality, and climate change. The regenerative economic model emerges as an effort to achieve net-positive impacts and simultaneously restore environmental, social, and economic systems. This regenerative economic model also emphasizes that economic growth and community welfare must be achieved by moving away from dependence on natural resources (Walls & Vogel, 2023). The distributive economic model is an economic model that ensures a fair distribution of resources and wealth among individuals and communities (Walls & Vogel, 2023). The goal is to ensure everyone has access to resources while maintaining environmental sustainability and upholding justice (Raworth, 2017).

The just energy transition can be a momentum for Indonesia to adopt a regenerative and distributive economic model that aims to achieve ecological and social justice. Focusing on GDP growth as the main goal is no longer relevant, as this approach has been proven to create massive inequality and environmental damage. According to the doughnut economy model, the regenerative and distributive economic approach requires social and structural transformation to inclusively meet basic human needs without violating ecological boundaries, see Figure 32. There are five interrelated supporting elements in the transformation toward a new economy, namely: (1) strategic dialogue and multi-stakeholder collaboration, (2) coordination and cooperation between government agencies, (3) monitoring and evaluation, (4) provision of incentives, and (5) formation of new institutions and strengthening existing institutions (Rodrik & Stiglitz, 2024).

At the regional scale, economic innovation through the development of regional potential can be a compelling entry point for achieving a regenerative and distributive economy. This economic innovation is contained in the vision of a sustainable economy developed by Lingkar Temu Kabupaten Lestari (LKTL) based on the principle of *gotong royong* (mutual cooperation). For example, to increase the added value of local products, community groups, under the guidance of LKTL, process illipe nuts into butter, and cork fish into albumin. These innovations can provide derivative product value directly connected to the market. In addition, the changes are also aimed at achieving a balance between natural extraction and innovation to achieve sustainable growth. In the process, LKTL emphasizes that collaboration with partners and district-level planning are keys to developing an inclusive, scalable economy that upholds justice in resource management.

Toward an Accessible Social Innovation Ecosystem

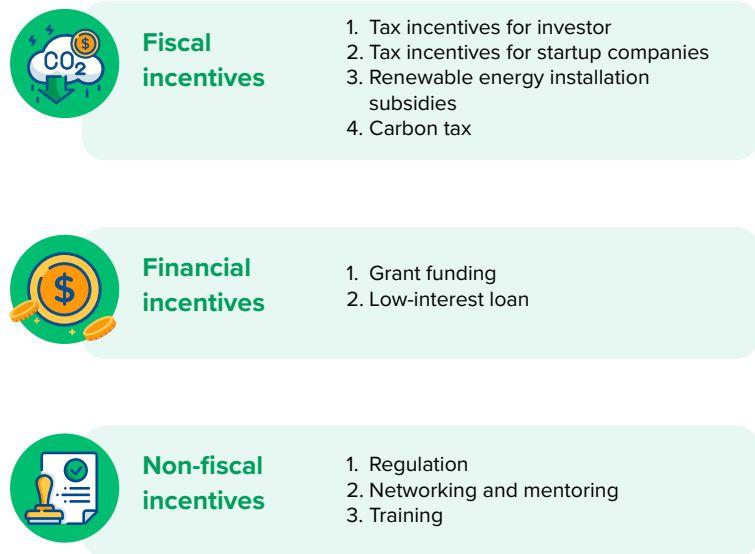


Figure 33. Supporting factors for renewable energy
(Source: Climate Policy Initiative, 2020; New Energy Nexus, 2023; THC analysis)

The main challenge for social innovation in renewable energy in Indonesia is the fact that the social innovation climate in Indonesia is not ideal, especially policies and business spaces often become disincentives. There are two main policy-related challenges, namely: (1) misalignment of national and regional energy policies, and (2) regulations that do not support the development of renewable energy, especially solar PV (PLTS) (New Energy Nexus, 2023). In practice, renewable energy projects in Indonesia are less attractive due to their small scale and dispersion, as well as the high upfront costs, i.e. the main cost of installing energy projects (Climate Policy Initiative, 2020), and take a long time to reach the return on investment (ROI). Therefore, a clear legal umbrella and incentive and disincentive policies are needed to support renewable energy social innovation for individuals, groups, or organizations that develop or use renewable energy technologies (Setyowati 2021, Maulidia et al., 2019), which can answer various needs of new energy industries, as follows: (1) simplified licensing process, (2) improved access to technical resources and expertise, and (3) increased public awareness and support for renewable and innovative energy.

Access to funds can be optimized from various sources, such as innovation in mixed financing mechanisms. However, there needs to be a relaxation in access and interest rates for renewable energy programs (Climate Policy Initiative, 2020). Funding for renewable energy social innovation can also be optimized through funding from venture capital (New Energy Nexus, 2023). Additionally, a database of pipeline projects that are suitable for funding is needed. This will help connect investors or funders and innovators to collaborate on funding and implementing the project. The pipeline project database will also help the government identify areas where more investment or policy support is needed.

Education and training programs play an important role in developing the skills of the workforce to adopt and operate renewable energy technologies. In practice, training and mentoring programs are available, but not specifically tailored to meet skills needs related to renewable technologies (New Energy Nexus, 2023). Existing training platforms such as Prakerja or BLK can be optimized by adapting the materials and skills curriculum to support the energy transition. Incubator programs can also be optimized to support networking and mentoring for renewable energy innovation pioneers.

Toward a Democratic and Decentralized Energy System Ecosystem

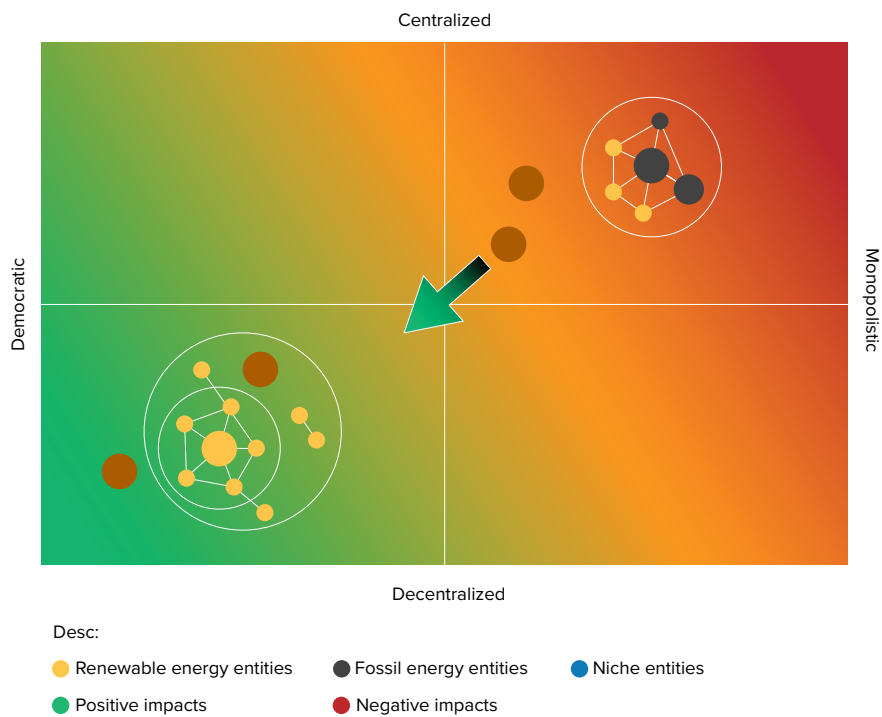


Figure 34. Illustration of the future energy system
(Source: Gui & MacGill, 2018; Thombs, 2019; THC analysis)

The climate crisis is accelerating the global energy transition trend away from fossil fuels and towards renewable energy. The future energy system, which was once dominated by fossil fuels and managed in a centralistic and monopolistic manner, will move toward a decentralized and democratic energy system (Gui & MacGill, 2018). An energy system that adheres to the decentralized and democratic principles will have positive impacts, such as fairer distribution, greater representation, and more accessible decision-making process. The environment will also benefit from reduced energy use and lower greenhouse gas emissions (Thombs, 2019).

Environmental regeneration is an important point in creating a new energy system's ecosystem. First, decarbonization of the energy system can be faster than the government's scenario that targets net-zero emissions by 2060 or sooner. Indonesia indeed needs to pass its peak emissions scenario by 2030, but the majority of energy system emissions can be cut by 2045 and move towards net-zero emissions by 2050 (IESR et al., 2021). Second, natural regeneration can occur with a rapid transition in energy transformation, which has positive impacts, including a 76% reduction in biodiversity loss and a 90% reduction in water pollution from energy production activities (WWF & BCG, 2023).

The selection of an energy system is crucial in creating a future that can regenerate Indonesia's nature and society. Indonesia's future energy system is regenerative and democratic. Hence, a decentralized energy system must be prepared because this system is suitable for accommodating dispersed and intermittent renewable energy sources. The characteristics of a decentralized energy system are also suitable for rural areas that require energy access development (Kaundinya et al., 2009). The selection of a decentralized energy system can also lead to distributively, recognitive, and procedurally fair outcomes, despite its disadvantages such as greater technological complexity compared to centralized energy systems (Thombs, 2019).

Toward an Innovative Research Ecosystem

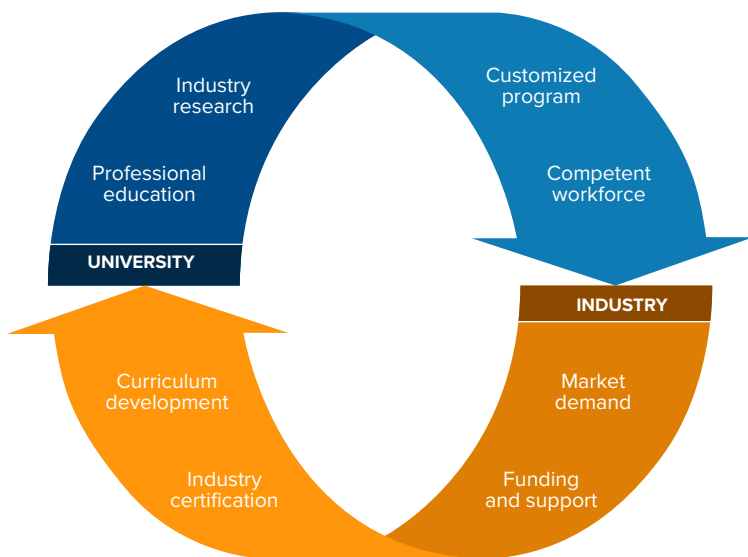


Figure 35. Model of synergy between academics and industries in development
(Source: Junaini et al., 2008, p. 2)

Interdisciplinary research collaboration involving academics from universities and government agencies is needed to provide policy recommendations ranging from energy planning to industrial implementation and collaboration among stakeholders (Junaini et al., 2008), see Figure 35. Through collaboration, academics can help commercialize renewable energy, thus creating a comprehensive energy implementation ecosystem that considers socio-ecological impacts. In addition to academics from government agencies and educational institutions, research and innovation also emerge from Civil Society Organizations (CSOs) whose role is to ensure that the needs and interests of the community, especially those in areas vulnerable to climate change and energy vulnerability, are accommodated. CSOs also serve as a liaison between civil society, government, and the private sector in expressing the needs and aspirations related to clean and sustainable energy.

Regional research institutions can explore the potential of renewable energy sources in their respective areas with a bottom-up approach and analyze the characteristics and energy needs of the local community to design energy solutions that suit the region's conditions. The Regional Research and Innovation Agency (BRIDA) is set up under the National Research and Innovation Agency (BRIN) to carry out regional research by integrating regional agencies responsible for regional development planning or research and development. BRIN also promotes innovations from the community through the Grassroots Innovation Facilitation (FIAR) scheme (BRIN Public Relations, 2023). Through FIAR, the community receives direct guidance and assistance from BRIN, hoping that the technology and innovation produced by the community can be sustainable.

Providing research and development funding to implement the energy transition is crucial for the acceleration strategy. Research funding in this field can come from various sources, such as government grants, private investment, and international collaboration. The government plays an essential role by allocating public funds. BRIN provides several research funding schemes for the public each year. Collaborative partnerships between academics, industries, and the government must be encouraged to foster innovation through knowledge transfer, funding, and development of renewable energy technologies (BRIN Public Relations, 2024). International cooperation and multilateral financing mechanisms can also be strengthened to fund research and development of innovations in the energy transition. Global initiatives, such as the Green Climate Fund and the World Bank's Climate Investment Funds, provide financial support for developing countries to invest in renewable energy and climate-resilient infrastructure.



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Appendices

Appendix 1: Dialogue Map

[FGD] March 16th, 2023

[Program Launching] Multi-stakeholder Strategies and Synergies in Accelerating a Just Energy Transition

- Director General of Politics and Public Administration, Ministry of Home Affairs
- Director General of New, Renewable Energy, and Energy Conservation, Ministry of Energy and Mineral Resources
- PT. Sarana Multi Infrastruktur
- Indonesian Center for Environmental Law (ICEL)
- Bali's Manpower Agency and Energy and Mineral Resources



[FGD] June 21st, 2023

Toward a Just Energy Transition: Identifying Socio-Ecological Challenges and Impacts and Exploring Civil Society Aspirations in National Energy Management

- Department of Anthropology, Universitas Indonesia
- Jaringan Advokasi Tambang (JATAM) Indonesia
- Public Policy and Climate Change Program, International Islamic University of Indonesia (UIII)
- Institute for Essential Services Reform (IESR)
- Wahana Lingkungan Hidup Indonesia (WALHI)
- "Harian Kompas" News



Identification of Challenges and Opportunities for National and Regional Regulatory Aspects in Supporting a Just Energy Transition in Indonesia

- DEN's Development Policy Facilitation Bureau
- Deputy for Development Policy of National Research and Innovation Agency (BRIN)
- Director General of Politics and Public Administration, Ministry of Home Affairs
- Head of Planning Bureau of the Secretary General of the Ministry of Energy and Mineral Resources
- Trend Asia
- MoEF Climate Change Mitigation Directorate

[FGD] May 25th, 2023





[TechTalk] August 9th, 2023

Transportation Electrification in Indonesia: Future Prospects and National Electric Vehicle Strategy

- Deputy for Transportation and Infrastructure, Coordinating Ministry for Maritime and Investment Affairs
- Head of Corporate Planning & Strategy, Mining Industry Indonesia
- Indonesia Country Lead, ClimateWorks Australia

[TechTalk] August 11th, 2023

Indonesia's Energy Technology Management in Achieving Energy Transition Justice

- Board of Trustees, The Habibie Center, and Head of Research and Technology, Indonesian Chamber of Commerce and Industry (KADIN Indonesia)
- Research Professor of Electrochemical Process Technology at National Research and Innovation Agency (BRIN)
- Energy Expert, Presidential Staff Office of the Republic of Indonesia



[Interview] August 25th, 2023

Energy Governance and Inclusive Economic Growth

- Senior Researcher of SMERU

Future Economic Structure

- Senior Economist, Faculty of Economic and Business, Universitas Indonesia

[Interview] August 21st, 2023

Renewable Energy Development in the Region and the Role of Regional Government

- Researcher at the Center for Energy Studies, Gadjah Mada University

[Interview] August 24th, 2023



Improving the Quality of Life of Isolated and Frontier Societies in Indonesia: Solar Power as a Solution to Provide High Quality Electricity

- Program Development Manager for Climate Justice, Yayasan Humanis dan Inovasi Sosial (Hivos Indonesia)

[TechTalk] October 17th, 2023

[Interview] October 26th, 2023

Opportunities and Challenges in the Development of Energy Transition in Bali Province

- Head of Manpower and Energy and Mineral Resources Agency of Bali Province

[Interview] October 30th, 2023

Opportunities and Challenges for the Development of Energy Transition in West Nusa Tenggara Province

- Head of the National Development Planning Agency of West Nusa Tenggara Province

Local Champion: Opportunities for Local Community-Based Clean Energy Technology Development

- Management Board of IBEKA

[TechTalk] October 27th, 2023



[FGD] November 7th, 2023

Identification of Opportunities and Challenges of Community-Based Renewable Energy Development in Vulnerable Areas

- Pusat Studi Hukum dan Kebijakan (PSHK) and Lecturer at Sekolah Tinggi Hukum (STH) Jentera
- Angel Investment Network Indonesia (ANGIN.ID)
- Yayasan Rumah Energi (YRE)
- IBEKA
- Clean Power Indonesia (CPI)



Technological Innovation and Economic Transformation in a Just Energy Transition Process in Indonesia

- Program Manager, Institute for Essential Services Reform (IESR)
- Coordinator, Center for Climate and Sustainable Finance (CCSF), Universitas Indonesia
- Energy Economics and Policy Advisor, Institute for Energy Economics and Financial Analysis
- Human Resources and Environment Research Center, School of Environmental Sciences, Universitas Indonesia
- The Indonesian Institute, Center for Public Policy Research
- Human Resources Development Agency, Ministry of Home Affairs

[Conference] November 22nd, 2023

[Conference] November 22nd, 2023

Environmental and Social Justice in Indonesia's Just Energy Transition

- Chair of Asosiasi Antropologi Indonesia (AAI)
- Executive Director of Indonesian Center for Environmental Law (ICEL)
- Academic, Gadjah Mada University
- Student of Faculty of Law, University of Andalas
- The Center for Energy and Mining Law Studies
- Legaleen Indonesia



Sharing Ideas for a Just Energy Transition: Examining the Ideas and Commitments of Indonesia's Prospective Leaders

- Anies Rasyid Baswedan
- Ganjar Pranowo
- Professor of Gadjah Mada University & Member of National Energy Council
- Director of The Climate Reality Project Indonesia
- Management Board of IBEKA Research Professor in Meteorology & Principal Expert Researcher of the Climate and Atmospheric Research Center of the National Research and Innovation Agency (BRIN)

[Dialogue] November 23rd, 2023

[TechTalk] December 22nd, 2023

Development of Public-Private Partnership (PPP) Scheme in Promoting Energy Transition in Indonesia

- Climate Policy initiative (CPI)



Utilization of Biogas in the Development of Community-Based Clean Energy

- Yayasan Rumah Energi (YRE)

[TechTalk] January 17th, 2024



[Seminar] March 7th, 2024

Indonesia's Just Energy Transition from Women's Perspective

- Working Group on Public Policy Reform, Koalisi Perempuan Indonesia
- Publish What You Pay (PWYP)
- Gender Equality, Disability, and Social Inclusion (GEDSI) Advisor
- Institute of Democracy, Science, Technology and Innovation (IDSTI), The Habibie Center

PLN's view on energy transition

- Executive Vice President of Energy Transition and Sustainability, PLN

[Interview] January 23rd, 2024

Exploring sustainable economic models at the regional level

- Head of secretariat, Lingkaran Temu Kabupaten Lestari (LTKL)

[Interview] February 19th, 2024



Reimagining Indonesia's Just Energy Transition: Toward a Regenerative and Democratic Ecosystem

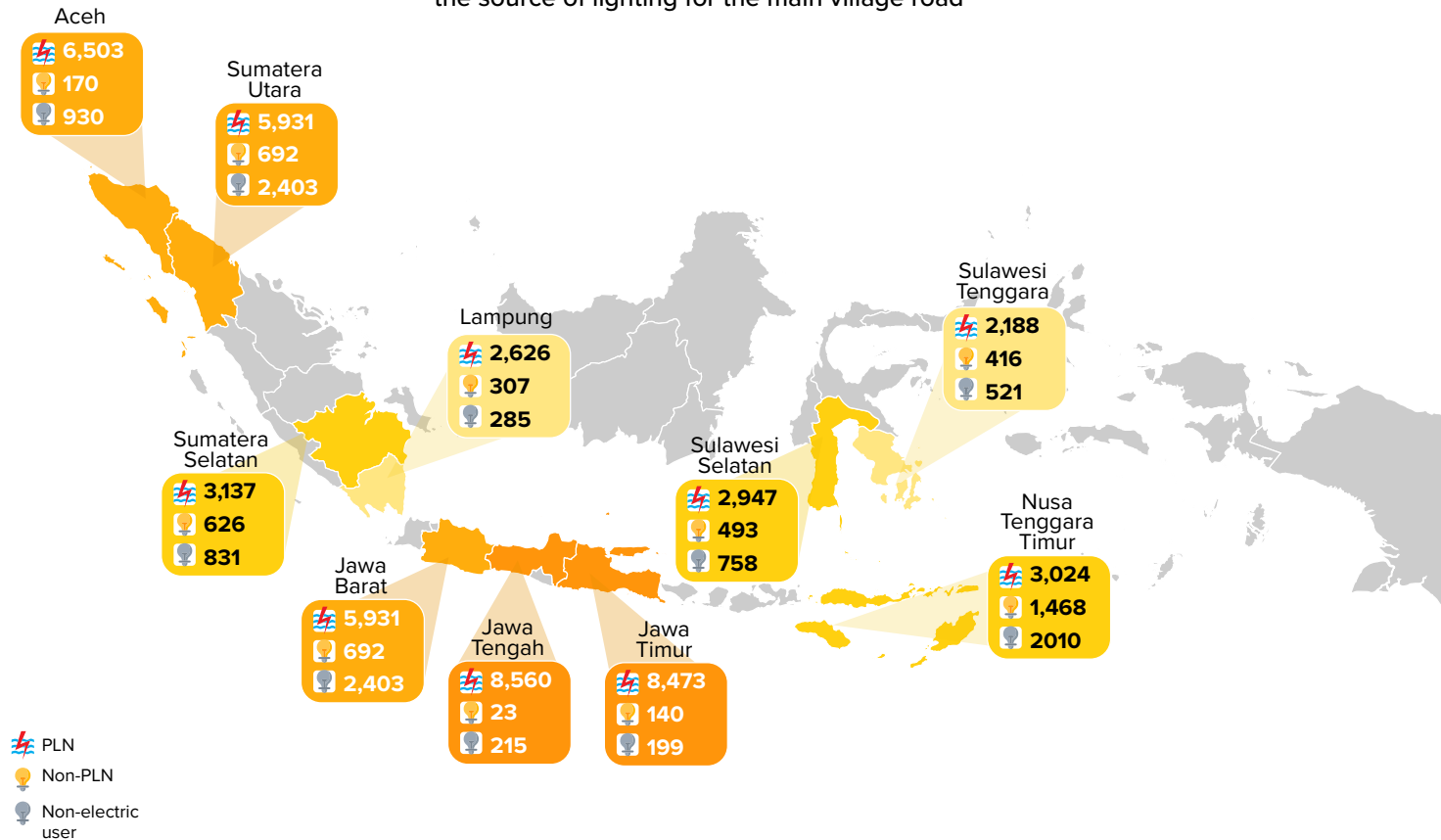
- Various New Renewable Energy and Energy Conservation, Ministry of Energy and Mineral Resources
- Master of Public Policy in Climate Change, Indonesian International Islamic University (UIII)
- National Secretariat of Indonesia's SDGs, Ministry of National Development/National Development Planning Agency

[Dissemination] March 7th, 2024

Appendix 2: Distribution of Electrification in Rural Areas

Province	Electricity use		
	PLN	Non-PLN	Non-electric user
Sumatera Barat	1276	166	546
Riau	1828	646	605
Jambi	1535	324	465
Bengkulu	1511	107	451
Kepulauan Bangka Belitung	393	38	52
Kepulauan Riau	392	141	91
DKI Jakarta	267	0	0
DI Yogyakarta	438	3	12
Banten	1551	14	90
Bali	716	6	22
Nusa Tenggara Barat	1145	45	75
Kalimantan Barat	1612	1010	881
Kalimantan Tengah	1088	775	547
Kalimantan Selatan	1980	229	510
Kalimantan Timur	834	519	231
Kalimantan Utara	295	250	85
Sulawesi Utara	1821	71	214
Sulawesi Tengah	1861	516	818
Gorontalo	725	157	280
Sulawesi Barat	595	271	224
Maluku	918	419	602
Maluku Utara	1005	287	368
Papua Barat	968	961	501
Papua	1258	3453	3639
INDONESIA	75358	14784	19565

Number of village based on the presence of household that use electricity and the source of lighting for the main village road



Source: BPS, Statistik Potensi Desa 2021

Appendix 3: Public Participation in the Power Sector

Planning Document	Plan Preparation	Direction of the Substance	Public Monitoring	Public Participation Mechanism
<i>Kebijakan Energi Nasional (KEN)/National Energy Policy</i>	Dewan Energi Nasional (DEN)/National Energy Council	(a) Energy availability for national energy needs; (b) Energy development priorities; (c) Utilization of national energy resources; and (d) National energy buffer reserves.	1. The stipulation of the KEN requires the approval of Parliament 2. The stipulation of the DEN in the form of a PP is thus subject to the public participation provisions in Law No. 12/2011 on the Formation of Legislative Regulations (Law No. 12/2011)	The public has the right to provide oral and/or written input in the preparation of the KEN. This oral and/or written input can be delivered through: a) Public hearings; b) Working visits; c) Socialization; and/or d) seminars, workshops, and discussions. The public can provide input through the DEN.
<i>Rencana Umum Energi Nasional (RUEN)/ National Energy General Plan</i>	Ministry of Energy and Mineral Resources	(a) Current and future national and regional energy conditions; (b) Determination of national and regional energy vision, mission, goals, and objectives in the form of set targets and targets to be achieved; and (c) National and regional energy management policies and strategies that describe energy development policies, strategies, institutions, policy instruments, and programs.	1. Public participation mechanism as stipulated in Presidential Regulation No. 1 of 2014 on the Procedure for Preparing the General Energy Plan (Presidential Regulation No. 1 of 2014) 2. Public participation mechanism as stipulated in Presidential Regulation No.1 of 2014 3. The stipulation of the DEN is in the form of a regional regulation (PERDA), so it is subject to the public participation provisions in Law No. 12/2011, including public testing	Participation can come from people who have competence in the energy sector as well as the general public. For people who have competence in the energy sector, their opinions and inputs need to be specifically considered in the preparation of the draft RUEN. The public whose opinions and inputs need to be considered are limited to those in energy-related associations, universities, and other members of the public who have competence in the energy sector. This public role is carried out within thirty (30) working days since the Head of the Work Unit or Regional Apparatus Unit that organizes government affairs in the energy sector announces the plan to prepare the RUEN or RUED through the Ministry's website.
<i>Rencana Umum Energi Daerah (RUED)/ Regional Energy General Plan</i>	Energy and Mineral Resources Agency			

(to be continued)

(continued)

Planning Document	Plan Preparation	Direction of the Substance	Public Monitoring	Public Participation Mechanism
<i>Rencana Umum Ketenagalistrikan Nasional (RUKN)/ National Electricity General Plan</i>	Minister of Energy and Mineral Resources	(a) Background of preparation, determination of vision and mission of electricity sector, main points of the NEP, and legal basis of the RUKN or RUKD; (b) Policy and strategy of national electricity management which elaborate national or local electricity sector policy; (c) Development direction of national or local electricity supply; (d) Current condition of national electricity supply; (e) Projection of electricity demand; and (f) Investment needs of national electricity supply.	<ol style="list-style-type: none"> 1. Public participation mechanism in accordance with Minister of Energy and Mineral Resources Regulation No. 24 of 2015 on Guidelines for Preparation of General Plan of Electricity (Minister of Energy and Mineral Resources Regulation No. 24 of 2015) 2. Including local government 3. The stipulation of the RUKN after consultation with the House of Representatives 4. Through the Electricity Planning Forum in accordance with Minister of Energy and Mineral Resources Decree No. 865 K/30/MEM/2003 <p><i>Notes: The stipulation of RUKN is in the form of a Decree, thus it is subject to public participation provisions in Law No. 30 of 2014</i></p>	The mechanism of public participation in the RUKN and RUKD is not explained in the Minister of Energy and Mineral Resources Regulation No. 24 of 2015. However, in practice, the public can participate in the Electricity Planning Forum.
<i>Rencana Umum Ketenagalistrikan Daerah (RUKD)/ Regional Electricity General Plan</i>	Energy and Mineral Resources Agency	Information on the potential distribution of primary energy sources, their magnitude, and the specific districts in which they are located.	<ol style="list-style-type: none"> 1. Public participation mechanism in accordance with Minister of Energy and Mineral Resources Regulation No. 24 of 2015 2. Including all parties directly or indirectly related to the electricity sector in the administrative area 3. The stipulation of the RUKN, after consultation with the Provincial Legislative Assembly 4. Through the Electricity Planning Forum in accordance with the Decree of the Minister of Energy and Mineral Resources No. 865 K/30/MEM/2003 <p><i>Notes: The RUKD is a follow-up to the RUKN</i></p> <p><i>Notes: The stipulation of the RUKD is in the form of a Decree, thus it is subject to public participation provisions in Law No. 30 of 2014</i></p>	
<i>Rencana Umum Penyediaan Tenaga Listrik (RUPTL)/ Electricity Supply General Plan</i>	Applicant for Electricity Supply Business License (IUPTL)	Generation, transmission, distribution, and/or sale of electricity to consumers in a business area	<ol style="list-style-type: none"> 1. There is no mechanism for public participation in the regulation, but there is a draft of Minister of Energy and Mineral Resources Regulation on the preparation of the RUPTL <p><i>Notes: The stipulation of the RUPTL is in the form of a Decree, thus it is subject to the public participation provisions in Law No. 30 of 2014</i></p>	To date, there has not been any mechanism for public participation in the preparation or review of the RUPTL. Even in the draft RUPTL regulation, it is explained that the preparation of the RUPTL is prepared by taking into account the principles of efficiency, transparency, and participation.

(Source: Anindarini and Quina, 2019; THC analysis)

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Ronald is a researcher (thinker) interested in complex, systemic, and dynamic problems. Guided by his unique motto of 'Thinking without the box,' he conducts unconventional and transdisciplinary research to uncover new knowledge. His current research topics, just energy transition, green economy transformation, and community empowerment in Indonesia, have been the focus of his extensive work since he joined reputable organizations in Indonesia: The Habibie Center (THC), Institute for Essential Services Reform (IESR), Parahyangan Catholic University (UNPAR), and Generasi Semangat Selalu Ikhlas (GSSI) Bandung. Ronald's commitment to these topics is evident in his publication of over five notable articles reflecting his research, empowerment, and advocacy career.

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About The Habibie Center



The Habibie Center is a think tank founded by the 3rd President of the Republic of Indonesia, Prof. Dr. Ing. Dr. Sc.h.c. Bacharuddin Jusuf Habibie, along with his family, on Heroes' Day, November 10, 1999. With a vision to advance modernization and democratization efforts in Indonesia based on morality, cultural integrity, and religious values, The Habibie Center has a mission to create a culturally and structurally democratic society that recognizes, respects, and upholds human rights, as well as to study and raise issues of democracy and human rights development, and to advance and improve human resource management and technology dissemination efforts.

The Habibie Center consists of four institutes focusing on democracy and human rights agendas, namely: human resources in the fields of science and technology, media and information, marine resources, as well as the socialization and dissemination of technology. The Habibie Center advances initiatives and strengthens efforts to democratize society based on the idea of democracy that goes beyond its conventional scope, by viewing it as a proactive and preventive mechanism rooted in the interpretation of democracy as a political vehicle. As a reflection of this conceptualization of democracy, The Habibie Center launched the Habibie Democracy Forum program at the end of 2023, with themes related to creating civic space as part of strengthening democracy.

The Habibie Center's involvement in energy issues began in 2015. Its initial programs on renewable energy focused on developing effective communication for fossil fuel subsidy reform, revising oil and gas laws and national energy security, as well as improving market access and investment. Meanwhile, the Just Energy Transition program began in 2022 as a marker of strengthening The Habibie Center's contribution to research and advocacy on Just Energy Transition issues in Indonesia. The program is expected to contribute to the national commitment to achieve net-zero emissions by 2060 or sooner.



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