



The role of energy transition in anticipating the impacts of climate change

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ABSTRACT

Background: Climate change has emerged as one of the most pressing global challenges in the 21st century, with Indonesia an archipelagic and tropical nation being particularly susceptible to its consequences. Despite its enormous renewable energy (RE) potential of over 3,600 GW, Indonesia remains heavily dependent on fossil fuels, especially coal, which contributes significantly to greenhouse gas emissions and environmental damage. This study aims to analyze Indonesia's energy transition strategy through the lens of climate justice, emphasizing the importance of an inclusive and equitable transformation. Previous research has underscored the critical role of distributive, procedural, and recognition justice in enabling fair energy transitions. **Methods:** This study applies a qualitative-descriptive approach using literature-based research. It draws on national policies, legal documents, academic journals, and global reports to evaluate Indonesia's energy transition framework. The analysis is grounded in the energy justice framework, which examines equity in energy distribution (distributive), inclusiveness in decision-making (procedural), and acknowledgment of vulnerable groups (recognition). **Findings:** The results show that Indonesia's energy transition efforts are evolving but face significant challenges, including regulatory uncertainty, limited investment, and institutional rigidity. Although policy measures like the Just Energy Transition Partnership (JETP) and Presidential Regulation No. 112/2022 represent a shift towards a cleaner model, actual renewable energy installed capacity remains under 1%. Structural barriers such as fossil fuel subsidies and bureaucratic delays hamper progress. Integrating justice principles can enhance effectiveness by ensuring fair access, local empowerment, and participatory policy design. **Conclusion:** Indonesia's energy transition is a vital strategy to mitigate climate change but must be rooted in justice to ensure inclusivity and sustainability. Strong policy coordination, stakeholder collaboration, and innovative financing mechanisms are necessary for success. **Novelty/Originality of this article:** This study offers a novel contribution by placing energy justice at the center of the analytical framework, unlike most existing literature on JETP or energy policy in Southeast Asia, which primarily focuses on financing mechanisms, technical pathways, or climate mitigation goals. By integrating environmental, socio-political, and governance dimensions, this research provides a comprehensive, justice-oriented evaluation of energy transitions, particularly relevant for developing countries where equity, participation, and local impact are often underexplored.

KEYWORDS: climate justice; energy transition; energy policy; energy justice; renewable energy.

1. Introduction

Climate change has become the most urgent global issue of the 21st century. The increasing concentration of greenhouse gases (GHGs) in the atmosphere, especially carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O) has led to a significant rise in the Earth's average temperature. According to the Intergovernmental Panel on Climate Change

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(IPCC), global temperatures have risen by more than 1.1°C since the pre-industrial era. Without meaningful intervention, the world is projected to surpass the 1.5°C threshold within the next two decades (Hansen et al., 2023). The consequences include rising sea levels, glacier melt, more frequent extreme weather events, and disruptions to global food production patterns. These changes directly affect human well-being, particularly in developing countries and tropical regions that depend heavily on nature, including Indonesia.

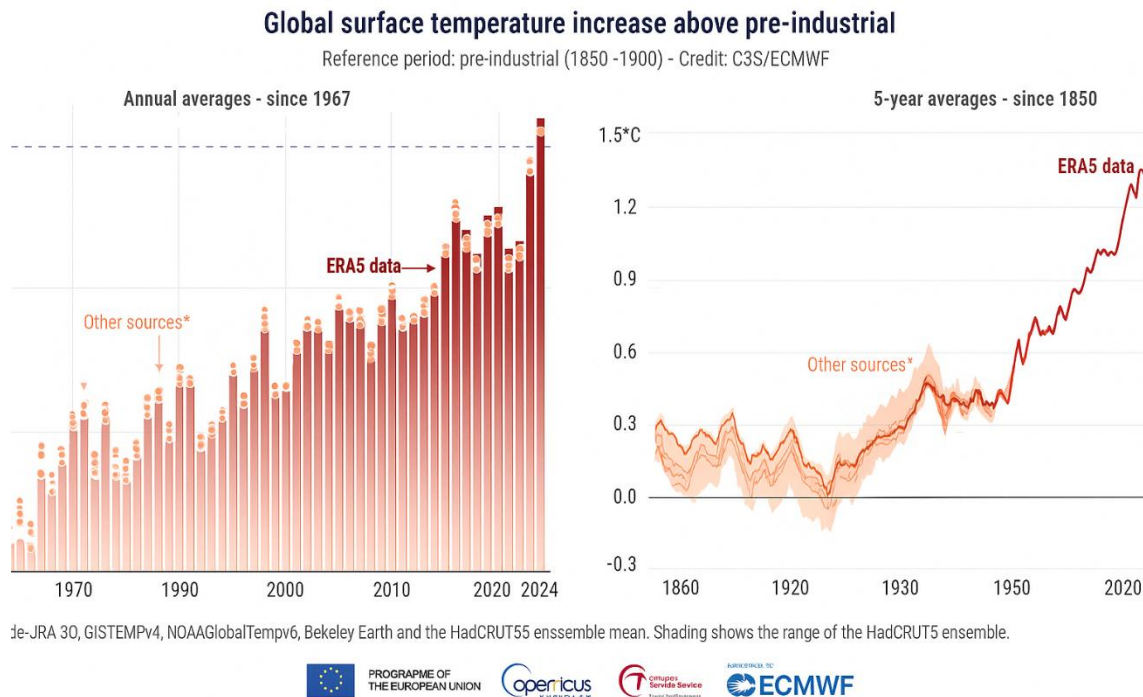


Fig. 1. Global surface temperatures increase 1860-2024
(Hansen et al., 2023)

As a tropical archipelago with over 17,000 islands and a coastline stretching more than 99,000 kilometers, Indonesia is highly vulnerable to the impacts of climate change (Priatna & Monk, 2023). Data from the National Disaster Management Agency (BNPB) indicate that hydrometeorological disasters such as floods, landslides, and droughts have increased significantly during the past decade. The majority of coastal areas are endangered by tidal flooding due to the increase in sea levels, whereas farmers and fishermen experience the effects of low productivity due to climatic uncertainty. It is estimated by the Ministry of Environment and Forestry (KLHK) that Indonesia loses hundreds of trillions of rupiah annually as the direct and indirect result of the impacts of climate change. As a response to this crisis, Indonesia has ratified the Paris Agreement and set GHG emissions reduction targets within its Nationally Determined Contribution (NDC). In its latest NDC, Indonesia aims to reduce emissions by 31.89% unconditionally and up to 43.2% conditionally with international support by 2030. This is backed by the government's pledge to achieve Net Zero Emissions (NZE) by 2060 or sooner. Achieving this ambitious target requires deep transformations in the largest emitting sectors, particularly the energy sector, which accounts for nearly 35% of national emissions.

Indonesia's energy sector remains dominated by fossil fuels, especially coal. As of 2023, over 60% of the national power generation relies on coal, while renewable energy accounts for only 12-14% of the primary energy mix (Massagony et al., 2025). This dependence not only exacerbates the climate emergency but also contributes to air pollution, environmental degradation, and economic dependence on high-carbon exports. Consumption of coal also threatens severe health effects among individuals in mining communities and near power

stations. Therefore, there is a need to transition away from fossil fuels towards cleaner and more sustainable forms of energy. Transition in energy is the shift from a fossil fuel-based energy system to one that is green, efficient, and sustainable. This transformation is not just about technological changes, such as the development of power plants based on renewable energy, but it is deeply intertwined with social, economic, institutional, and political factors. In the Indonesian case, energy transition forms part of the national low-carbon development strategy and the 2045 Golden Indonesia Vision that puts environmental sustainability as one of the primary pillars (Bräuchler, 2025).

Indonesia has abundant renewable energy potential. According to the Ministry of Energy and Mineral Resources (ESDM), the country's total renewable energy potential exceeds 3,600 gigawatts (GW), including solar, wind, hydro, biomass, geothermal, and ocean energy. However, the installed capacity of renewable energy remains around 15 GW, or less than 1% of its total potential (Pambudi et al., 2023). This creates a paradox despite its wealth of clean energy sources, Indonesia continues to exhibit a high reliance on fossil based energy sources, posing significant challenges to the country's low carbon transition efforts. This is due to various factors, including investment barriers, regulatory uncertainty, weak fiscal incentives, and the dominance of major players in the conventional energy sector.

To accelerate the energy transition, the Indonesian government has adopted several key policies. Presidential Regulation No. 112 of 2022 marks a significant step by banning the construction of new coal-fired power plants and mandating the early retirement of existing ones. Additionally, the National Energy Plan (RUEN) and the Electricity Supply Business Plan (RUPTL) of PT PLN for 2021–2030 have set targets for renewable energy shares at 23% by 2025 and 31% by 2050 (Fifianny & Setiabudy, 2025). Fiscal policies have also been introduced, including feed-in tariff incentives for solar and geothermal energy, as well as the establishment of a renewable energy fund. The government is also promoting international collaboration through the Just Energy Transition Partnership (JETP), which promises over USD 20 billion in funding to support a just energy transition (Ministry of Energy and Mineral Resources, 2021). Nevertheless, the implementation on the ground remains far from expectations. Renewable energy projects often face delays due to slow permitting processes, land acquisition difficulties, and low investor interest stemming from an uncompetitive energy market structure. PLN, as the sole off-taker, still applies a business model that is inflexible toward small-scale and decentralized renewable energy. Additionally, high fossil fuel subsidies that have not been reallocated to the renewable sector weaken the competitiveness of clean energy. Meanwhile, global trends show that the cost of solar and wind power generation continues to fall and is even cheaper than coal in many countries.

The energy transition also poses social risks if not designed inclusively. Many regions in Indonesia rely on coal mining and other fossil fuel industries for local economic activity. If not properly managed, the transition could lead to unemployment, regional disparities, and resistance from affected communities. Hence, the principle of justice in the energy transition, or "just energy transition," is crucial. This principle emphasizes the fair distribution of transition benefits and burdens, the recognition of the rights of vulnerable groups, and the active participation of communities in decision-making processes. The just energy transition approach aligns with global agendas such as the Sustainable Development Goals (SDGs), particularly Goal 7 (affordable and clean energy), Goal 13 (climate action), and Goal 10 (reduced inequalities) (Ministry of Energy and Mineral Resources, 2021). Implementing this principle in Indonesia requires cross-sectoral and multi-stakeholder synergy among central and local governments, financial institutions, private sectors, academia, and civil society. Programs such as green workforce training, integration of renewables into rural development, and community-based green financing schemes can serve as effective medium-term strategies.

In the geopolitical context, Indonesia holds a strategic opportunity to become a leader in Southeast Asia's energy transition. Its geographic advantage, abundant natural resources, and position as the region's largest economy give Indonesia a comparative edge in developing and exporting clean energy. The country possesses diverse renewable energy

reserves, including widespread solar resources, hydro and micro-hydro potential in mountainous regions, and geothermal energy among the largest in the world. These advantages make Indonesia a prime candidate to become the "clean energy hub" for ASEAN, provided these resources are optimally and sustainably managed.

A concrete opportunity lies in Indonesia's participation in the ASEAN Power Grid (APG) initiative, which aims to integrate electricity networks across Southeast Asia to enhance regional energy security and efficiency. Within this framework, Indonesia can serve not only as a consumer or importer but also as an exporter of renewable energy to neighboring countries such as Malaysia, Singapore, and Thailand (Mubarok & Kartini, 2023). By building cross-border electricity interconnections and strengthening domestic transmission networks, Indonesia can maximize its green energy surplus for regional needs. This will have positive implications for the national energy balance while opening new economic opportunities through carbon trading, green investment, and job creation. Beyond regional cooperation, Indonesia can tap into global partnerships, particularly through South-South Cooperation and international climate finance. South-South Cooperation enables Indonesia to forge strategic alliances with other developing countries to exchange technologies, experiences, and resources in energy transition efforts. Meanwhile, climate finance instruments such as the Green Climate Fund (GCF), Climate Investment Funds (CIF), and JETP can be leveraged to support renewable energy projects, green skills training, and inclusive energy governance (Ministry of Finance, 2022). Through smart energy diplomacy, Indonesia can position itself not only as a beneficiary but also as a key actor in shaping the global energy transition architecture.

With the climate crisis urgency, the abundance of renewable energy prospects, and robust national policy initiatives, Indonesia's energy transition is no longer an option but an imperative. Continued dependence on fossil fuels is a long-term risk not only to the environment but also to energy security. But to ensure that this change is beneficial in a way that is just and does not enhance existing disparities, it must be grounded on principles of justice, inclusiveness, and sustainability. Ignoring the social dimension of the transition may compound disparities, especially in fossil fuel-intensive areas like coalmining. Unless complemented by protection and empowerment packages, these communities risk losing employment, becoming marginalized, and impoverished. Therefore, energy transition policies can no longer be technocratic but must put the welfare of affected individuals first. This includes building local capacity, skills transfer, social protection, and inclusive community participation in energy project planning and implementation. Also, challenges such as limited finance, poor cross-sectoral coordination, and poor infrastructure must be addressed through innovative and collaborative means. Green financing instruments such as green bonds, blended finance, and carbon pricing mechanisms need to be mobilized at scale to accelerate the deployment of renewable energy in Indonesia, including rural and underpenetrated areas. Clear regulation frameworks and robust incentives for the private sector to actively participate in a just energy transition agenda also need to be implemented by the government.

In consideration of the complexities in such opportunities and challenges, this study aims to explore how Indonesia's energy transition is being planned and implemented under a climate justice framework. This is interested in analyzing whether social justice guidelines, equitable sharing of gains, and public engagement are part of existing policies. The study also provides policy recommendations for the enhancement of Indonesia's transition into a just, resilient, and sustainable energy system. By embracing an integrated and fair strategy, Indonesia has the potential to become a good example of energy transition in Indonesia and globally.

2. Methods

This study employs a qualitative descriptive approach based on literature review, focusing on the analysis of energy transition policies, regulations, and initiatives in Indonesia within the context of climate change. This method is chosen for its suitability in

exploring and interpreting the multidimensional aspects of energy transition from social, economic, and environmental justice perspectives. A qualitative approach allows the researcher to understand the dynamics, meanings, and narratives embedded in energy policies and their implications for different social groups. Primary data sources include recent academic studies, policy reports, indexed scientific journals, and official government regulations relevant to the topic, such as the Energy Law, National Energy Policy (KEN), the PLN Electricity Supply Business Plan (RUPTL), Presidential Regulation No.112/2022, and Indonesia's Nationally Determined Contribution (NDC). International literature, such as reports from the IEA, UNFCCC, and national institutions like IESR and Bappenas, are also referenced to provide a comparative and up-to-date global perspective. References were selected based on the relevance to the research theme, recency (within the last five years), and academic credibility. Policy documents were selected based on their legal relevance, recency, and thematic alignment with energy transition discourse, particularly those issued or endorsed by authoritative institutions. To ensure validity and mitigate bias, triangulation was conducted by cross-referencing national policies with academic literature, expert reports, and international regulatory frameworks.

The analysis process followed several steps is data reduction, thematic categorization, and narrative interpretation. A content analysis technique was applied to identify key themes, such as "just energy transition," "renewable energy potential," "energy policy," and "implementation barriers." Each theme was analyzed by considering temporal dimensions, policy actors, and socio-political context. Cross-validation was performed by comparing findings from multiple sources to ensure consistency and reliability. This research also adopts the theoretical framework of energy justice (Van Uffelen, 2022) as the main analytical tool. The three core dimensions of energy justice distributive justice, recognition justice, and procedural justice are used to evaluate the extent to which energy transition policies and practices in Indonesia reflect justice principles. As such, this framework not only helps in problem identification but also in formulating relevant policy recommendations. Methodologically, this study does not rely on primary data or quantitative techniques, as its emphasis lies in interpreting policy discourse and analyzing secondary narrative sources. Nonetheless, the strength of this study lies in its comprehensive integration of literature and solid theoretical foundation, thus providing significant scholarly contributions to the discourse on energy transition and climate change in the Indonesian context.

3. Results and Discussion

3.1 Just energy transition as a pillar of change

A just energy transition requires that the shift from fossil fuels to clean energy incorporates socio-economic considerations, ensuring equitable benefits for all affected parties. According to the Institute for Essential Services Reform (IESR), this principle is central to Indonesia's goal of achieving net zero emissions by 2060 or sooner (Brodjonegoro, 2024). Transition policies must therefore be inclusive and collaborative, reflecting the global commitment to "leave no one behind," which supports more ambitious climate action and Sustainable Development Goals (Regulation of the Minister of Energy and Mineral Resources of the Republic of Indonesia, 2024). This principle aligns with the global concept of "leaving no one behind" in the clean energy agenda, which, according to the United Nations, drives more ambitious climate action and the achievement of the Sustainable Development Goals (Lim et al., 2018).

In Indonesia, the urgency for a just energy transition is high due to the country's dependence on coal. For instance, about 86% of the national electricity supply still comes from fossil fuels, with coal accounting for up to 64% of the energy mix (Pribadi, 2023). This energy composition leads to both climate challenges and social disparities, especially in mining areas and coal-fired power plant zones that often suffer from greater health and environmental damages. Meanwhile, workers in the traditional energy sectors face the risk

of job loss (Vögele et al., 2023). The principle of justice demands that the shift to renewable energy should not place a burden on vulnerable groups. Initiatives like the Just Energy Transition Partnership (JETP) reflect a comprehensive approach to this issue. Through JETP, Indonesia has mobilized significant funding (over USD 800 million approved, and another USD 5 to 6 billion under negotiation) to support the transition to renewable energy (Brodjonegoro, 2024). These funds aim to ensure that the expansion of clean energy contributes to job creation and economic growth in affected regions, making the transition an opportunity rather than a burden.

Table 1. Case studies of up-skilling programs for energy transition in Indonesia

Program name	Implementation area	Target worker sector	Type of training	Organizing institutions	Key impact
Solar PV Training for Former Coal Workers	Muara Enim, South Sumatra	Coal mining workers	Solar panel installation and maintenance techniques	Ministry of Energy and Mineral Resources, Energy Polytechnic	200+ workers certified as solar technicians; 50% employed in the renewable sector
Green Job Training Initiative	East Kalimantan	Oil and gas sector workers	Energy auditing, renewable energy project management	BPJS Employment, USAID, Mulawarman University	500 trainees gained green job skills; 30% launched their own clean energy business
RE-Boot (Renewable Energy Bootcamp)	Yogyakarta & West Nusa Tenggara	Rural youth and factory workers	Basics of renewable energy & green entrepreneurship	IESR, GIZ, State Polytechnic	80% of participants initiated off-grid solar projects in their villages
Just Energy Transition Center (JETC)	Banten & West Java	Displaced factory workers and farmers	Training in micro-hydro and biogas energy systems	JETP, BRIN, local NGOs	12 community-based energy cooperatives were established
Solar Energy Training for Women	East Nusa Tenggara (NTT)	Housewives & informal sector workers	Solar lamp assembly and micro-enterprise management	UNDP, NTT Regional Government, Kopernik NGO	120 women generated additional income through solar-based home industries

(IESR et al., 2024)

Furthermore, current international commitments prioritize justice in the transition process. At COP-28, countries agreed to triple renewable energy capacity and double energy efficiency efforts by 2030. Achieving this target must be approached in a fair and inclusive manner, as IESR emphasized (Brodjonegoro, 2024). In brief, an equitable energy transition must balance emission reduction and community empowerment are actions and investment in the energy transition must create new green jobs, upskill displaced workers, and develop local infrastructure so that no community gets left behind in the process. An equitable energy transition is a policy that focuses on uniting greenhouse gas emission reduction with the socio-economic empowerment of communities. This change is not merely breaking away from fossil to renewable energy but also ensuring the process is

inclusive, just, and does not leave behind some groups particularly those who have traditionally depended on conventional energy sources such as coal and oil. In this case, energy transition policy and investment need to go beyond environmental and technological considerations to address social ones such as job creation, redistribution of economic benefits, and local capacity building.

The importance of synergy between emission reduction and community empowerment is now widely acknowledged in policy documents and international policies. One of the key leaders is the principles of the Just Transition advocated by the International Labour Organization (ILO) and which have become a model for many countries, including Indonesia, in creating national blueprints for energy transition. These standards affirm that all transition processes must involve the implementation of provisions to eliminate social impacts, such as reskilling workers in fossil energy, compensating small businesses affected, and ensuring appropriate social protection. Indonesia's path to a fair energy transition has begun, but there remain implementation challenges. One of the key areas is the creation of green jobs work that ensures environmental conservation with decent wages and good working conditions. Solar, wind, and biomass renewable energy sectors are extremely high on job-absorption potential, especially for rural and less-developed regions. But this is possible only with proper investment and focused worker training schemes.

Up-skilling and re-training are crucial so that workers in the coal or fossil-based industries do not lose their livelihood but are given a chance to adapt to new labor market needs established via the energy transition. The public administration, private sector, and education institutions need to collaborate and provide training curricula, skill certifications, and business mentorship to achieve economic continuity for the displaced workers.

Moreover, locally driven renewable energy infrastructure development needs to be specially designed to involve the people actively not only as beneficiaries, but as main stakeholders in the development process. The transition towards energy can also be employed as a broader socio-economic change tool, not merely a change in technology. It can reduce inequality, establish intergenerational justice, and enhance community resilience to climate and economic shocks. Strengthening the synergy between emission reduction and local empowerment is key so that the transition to clean energy can indeed yield fair and sustainable dividends for all Indonesians.

3.2 Renewable energy potential indonesia's hidden strength

Indonesia possesses an extraordinary wealth of New and Renewable Energy (NRE) resources. According to the Secretary General of the Ministry of Energy and Mineral Resources (ESDM), the country's total NRE potential reaches approximately 3,686 gigawatts (GW) (Pribadi, 2023). This potential spans nearly all natural sources, including solar, wind, hydro, biomass, geothermal, and even marine energy (from currents, waves, and tides) (PT PLN (Persero), 2017). The 3.7 terawatt (TW) potential is 45 times greater than the current installed capacity of around 81 GW in 2022, indicating that most renewable sources remain untapped (Pribadi, 2023). With Indonesia's current electricity capacity at only about 81 GW, one can imagine the transformative potential of 3,700 GW (Tureah, 2025). With such a vast resource base, renewable energy stands as a cornerstone for Indonesia's future energy landscape.

Harnessing this renewable energy potential is crucial to fill the energy gap created by the phasing out of coal-fired power plants (PLTU). Indonesia currently targets a 23% renewable energy share in its power mix by 2025, as outlined in the RUPTL and Presidential Regulation No. 22/2017. However, as shown in Table 2, by 2023 realization has only reached around 11–14% (Tureah, 2025; Pulungan et al., 2025). According to the *Chicago Policy Review* (February 2025), the national use of renewables only rose from 2% to 3% between 2020 and 2023 equivalent to 14.5% of total electricity generation in 2023 still far below the 23% target (Tureah, 2025). This gap reflects the so-called *renewable energy paradox* abundant potential (3,692 GW) but limited utilization (Fathoni & Setyowati, 2022).

Indonesia is currently also exploring other future energy sources, such as hydrogen and nuclear (Aditya et al., 2025).

Table 2. Renewable energy targets vs. realization and investment in Indonesia

Indicator	Target 2025	Realization 2023	Gap
Renewable energy share (%)	23%	11–14%	9–12%
Investment target (USD billion)	4	1.6	2.4

(Tureah, 2025;Pulungan et al., 2025;Fathoni & Setyowati, 2022)

Opportunities also arise from technological trends that are becoming more affordable and accessible. The potential of rooftop solar energy is enormous, especially for office buildings and households (Fifianny & Setiabudy, 2025). The government is actively promoting rooftop solar installations, including through Ministerial Regulation of ESDM No. 2/2024, which simplifies the net-metering scheme (Ministry of Energy and Mineral Resources of the Republic of Indonesia, 2024). Furthermore, Indonesia is also vast with plenty of opportunities for the utilization of a number of renewable energy sources, particularly rural regions that are currently beyond the country's national electricity grid. These include the development of micro hydro power plants (PLTMH), offshore wind farms, and biomass waste energy conversion. Micro-hydro power systems, for instance, are suitable for areas with small or medium-sized rivers, which are mostly found in mountainous and hilly regions of many provinces. These resources are relatively fixed and solid to suffice the electricity needs of surrounding communities without having a major impact on ecosystems. In contrast, wind potential in the southern and eastern coastlines of Indonesia is enormous for the development of medium to large scale wind farms. On the other hand, agriculture, plantation, and forest biomass waste such as straw, palm oil wastes, and wood chips can be used to produce energy either from biological or thermal conversion.

NRE expansion in rural communities is not only a technical solution to electrification issues but also a local economic development initiative. Village-scale solar power plants (PLTS) and micro-hydro power plants have managed to create employment both during construction and operation. Local employees can be hired to install solar panels, build water turbines and canals, and maintain systems, hence encouraging regional technical expertise and economic strength. The spillovers extend to improved welfare, access to education, and economic productivity, with a secure source of energy supplying energy to micro and small enterprises, foodstuffs processing, and basic services such as lighting and internet connectivity.

But realizing such huge potential is confronted with intricate challenges, primarily in the regions of poor investment and bureaucracy. Figures from the Ministry of Energy and Mineral Resources (ESDM) show that in 2022, Indonesia targeted USD 4 billion worth of investments in the renewable energy sector. But up to the close of the year, only USD 1.6 billion or approximately 40% of the target had been realized. This shortage is brought about by long-term structural limitations, including duplicative rules, protracted permitting, and lack of legal certainty for investors (Aditya et al., 2025). Classic obstacles such as complex licensing, limited financing, and policy misalignment continue to hinder progress. Nevertheless, opportunities remain if these barriers are addressed, the development of renewable energy could reduce greenhouse gas emissions, enhance energy security, and create tens of thousands of new jobs in regions that have long depended on coal or fossil fuels.

3.3 Energy justice in public policy

Energy justice consists of three core dimensions the fair distribution of energy benefits and burdens (*distributive justice*), the recognition of the rights of all stakeholders including vulnerable groups (*recognition justice*), and transparent and inclusive policy-making processes (*procedural justice*) (Van Uffelen, 2022). In the Indonesian context, this issue is clearly evident in the effort to expand electricity access and ensure that the energy

transition does not leave behind marginalized communities. Fathoni & Setyowati (2022) emphasize that "energy injustice and inequality in electricity distribution" must be addressed immediately to achieve energy access that is truly "fair and equitable". In response, a decentralized and community-empowering approach is needed so that all layers of society including remote areas can benefit from electricity (Hidayat et al., 2022). One example includes the "Electricity for Villages" (LisDes) program and the "One Price Fuel" initiative for frontier, outermost, and disadvantaged (3T) regions, both of which aim to reduce disparities in energy access (Azubuike et al., 2024). However, their implementation still faces geographical and capacity challenges, thus requiring additional policies that respond to local needs in a participatory manner.

To ensure fair pricing and energy subsidies, the government has adopted several policies. Law No. 30/2009 on Electricity provides a legal foundation for universal access, while promoting renewable energy investments and offering subsidies and financial assistance for low-income communities (Kartika et al., 2025). This implies that Indonesian law supports the realization of cheap energy for the poor and, at the same time, also supports green projects. Energy justice is shown by both monetary policy (subsidies) and incentives to develop renewable energy. At the national policy level, the notion of energy justice has silently become an integral part of Indonesia's energy development policy. This is also true in many strategic policies, particularly on equal access to energy by all stakeholders in society. A concrete example thereof is achieving 100% village electrification ratio by 2018, which is now almost completely realized. This is a sign of the state's will that groups in distant, interior, and island areas are not overlooked in availing themselves of good and affordable electricity. Rural electrification is not just about connecting homes onto the grid but also a fundamental issue of citizens' right to be provided with public services essential to modern life.

This equity program also goes beyond electrification. The government also places special attention on the creation of electricity programs in 3T regions. Programs such as the establishment of communal solar power plants (PLTS), micro-hydro power plants (PLTMH), and the expansion of PLN's electricity grid to previously inaccessible areas indicate that energy, besides being considered an economic commodity, is also considered a vehicle for empowerment and social development. Energy justice in this regard encompasses distribution (who ends up with access), participation (who end up with decision-making access), and recognition (whose needs are being met) (Bindi et al., 2025) (Horst et al., 2021). Even the concept of justice is starting to be incorporated into Indonesia's energy transition policies. One good example is Indonesia's membership in international cooperation schemes such as the Just Energy Transition Partnership (JETP). This plan, unveiled at the 2022 G20 Summit in Bali, would be aimed at supporting the energy transition in developing countries to be boosted, with equity being its key pillar (G20, 2022a, 2022b). In the JETP framework, the financing not only covers low-carbon energy infrastructure but also includes social components such as training for green jobs, building capacity in the local community, and support to lower-middle economic segments affected by the shift from fossil to renewable energy.

JETP-sponsored green job training is a key mechanism to ensure that the shift to a low-carbon economy does not result in new job loss, especially in coal and other conventional energy sectors. Displaced workers are given access to learn new skills in sectors such as solar panel installation, energy management, energy efficiency, and other new emerging sectors key to a clean energy economy. On the other hand, support from the local community strives to ensure the social sustainability of energy projects becomes feasible, allowing communities to become not only passive recipients, but active stakeholders in the transition process (Bappenas, 2025).

3.4 Evaluation of the energy regulatory framework

Indonesia's energy regulatory framework has been developed through a series of laws and regulations since the early 2000s (Loy et al., 2024; Erdiwansyah et al., 2022). Law No.

30/2007 on Energy establishes the general framework for national energy management, emphasizing energy security, sustainability, and the diversification of sources, including the development of renewable energy (Embassy, 2017). This was followed by Law No. 30/2009 on Electricity, which regulates the distribution and provision of electricity, promotes private sector involvement, and ensures universal electricity access. This law also mandates subsidies for low-income communities (Climate Transparency, 2020). At the national policy level, the cornerstone is the National Energy Policy (KEN), established under Government Regulation No. 79/2014. KEN outlines the national energy mix roadmap, including a target of 23% electricity from renewable sources by 2025, gradually increasing to 31% by 2050 (Kartika et al., 2025). These targets were further translated into the National Energy General Plan (RUEN) through Presidential Regulation No. 22/2017 and supported by the Electricity Supply Business Plan (RUPTL) 2021–2030 issued by PLN (PT PLN (Persero), 2017). RUPTL details medium term investment and power plant development plans, including energy mix scenarios aligned with national targets (PT PLN (Persero), 2017).

Recently, the National Energy Council proposed a revision of the renewable energy target to 17–19% by 2025 in the draft revision of KEN (Jati, 2024). This move received criticism for potentially weakening Indonesia's energy transition commitment (IEA, 2022). On the other hand, Presidential Regulation No. 112/2022 reinforces climate action by prohibiting the construction of new coal-fired power plants and mandating early retirement of existing ones (Kartika et al., 2025). This regulation sends a strong political signal that Indonesia is accelerating the decarbonization of its energy sector (Sisdwinugraha & Hapsari, 2025; Kartika et al., 2025). Technical regulations have also been strengthened through several Ministerial Regulations (Regulation of the Minister of Energy and Mineral Resources of the Republic of Indonesia, 2024) issued by the Ministry of Energy and Mineral Resources (ESDM). For instance, Regulation No. 12/2017 governs renewable electricity pricing mechanisms and the purchase of electricity from renewable energy power plants (REPP), including a feed-in tariff scheme to ensure project bankability. Regulation No. 53/2018 was introduced to accelerate renewable energy adoption through simplified permitting, fiscal incentives, and the development of pilot projects (Climate Transparency, 2020). More recently, Regulation No. 2/2024 simplifies rooftop solar panel installations by easing capacity limits and the import-export electricity mechanism, thus accelerating decentralized solar energy adoption (Van Uffelen, 2022). On the legislative side, the Job Creation Law (Omnibus Law) is implemented through Government Regulation No. 25/2021, which sets a 0% royalty rate for certain mineral industries and encourages geothermal exploration, thereby opening up opportunities for new clean energy investments (Fifianny & Setiabudy, 2025).

Indonesia's regulatory framework includes a long-term vision (KEN, RUEN, NDC 2060) and detailed technical rules (ESDM Ministerial Regulations, RUPTL, RUKN) (Regulation of the Minister of Energy and Mineral Resources of the Republic of Indonesia, 2024). While regulatory overlaps and frequent policy changes remain challenges, reform efforts continue to make energy regulations more adaptive to the needs of a just transition. Synchronization between national and regional regulations, as well as legal certainty for renewable energy investments, is essential to effectively and equitably achieve climate mitigation targets for all Indonesians.

4. Conclusions

Indonesia faces both a significant challenge and opportunity in its national energy transformation amid the urgent global climate crisis. As a tropical archipelagic nation highly vulnerable to climate change impacts, Indonesia holds a strategic and moral responsibility to reduce greenhouse gas emissions while safeguarding environmental sustainability. Transitioning from a fossil fuel dominated energy system particularly coal to clean and renewable energy is no longer optional but an urgent necessity. The country has laid a solid policy foundation for this shift through various regulations, including the Energy Law, the National Energy Policy (KEN), the National Energy Plan (RUEN), and Presidential

Regulation No. 112/2022, all aimed at increasing renewable energy's share in the energy mix. International commitments such as the Paris Agreement and Indonesia's pledge to reach net-zero emissions by 2060 further reinforce this direction. Yet, there remains a significant gap between policy ambitions and on-the-ground implementation, as the current share of renewable energy is still far below targets, and investment in clean energy has not reached its full potential. Indonesia's renewable energy potential estimated at around 3,600 gigawatts is a strategic asset that can enhance energy security and independence while fueling economic growth through a green economy. However, structural obstacles such as bureaucratic complexity, overlapping regulations, insufficient fiscal incentives, and the dominance of conventional business models hinder full realization of this potential.

This study highlights the critical need to embed energy justice principles at every stage of the transition process. A transition focused solely on technical fixes and emission reductions risks perpetuating or even exacerbating existing social and economic inequalities, especially in coal dependent regions. Therefore, distributive justice (ensuring equitable access to clean energy across all regions including remote and marginalized areas), recognition justice (attending specifically to vulnerable groups like coal workers and indigenous communities), and procedural justice (guaranteeing meaningful community participation in energy planning and decision-making) must form the core of Indonesia's energy transition framework. Indonesia's engagement in international initiatives such as the Just Energy Transition Partnership (JETP) exemplifies efforts to mainstream these justice principles by linking climate finance, green workforce training, and renewable infrastructure investments. Upskilling workers and involving local communities as active stakeholders are essential to building a socially inclusive green economy that generates new jobs and resilience. To overcome barriers, regulatory reforms to simplify licensing, fiscal incentives tailored to renewable energy, and fostering an innovation-friendly investment climate are imperative. Strengthening cross-sector collaboration among government, industry, academia, civil society, and local communities will be key to scaling renewable adoption nationally. Furthermore, Indonesia's geopolitical position offers strategic leverage to lead Southeast Asia's energy transition by participating in regional initiatives like the ASEAN Power Grid and leveraging smart energy diplomacy. Key policy recommendations include integrating justice principles into all energy policies, expanding inclusive green workforce programs, developing innovative financing mechanisms such as carbon pricing and green bonds, enhancing local community involvement in renewable projects, and building institutional capacities for effective governance. With strong political will, participatory policymaking, and multi-stakeholder cooperation, Indonesia has the potential to become a global leader in achieving a just, equitable, and sustainable energy future.

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Author Contribution

H.W. Nugroho was at the forefront of the entire research process and manuscript preparation. He conceptualized the study, formulated the research framework, and set the overall objectives aimed at Indonesia's energy transition in the context of climate and energy justice. Nugroho also wrote the initial draft very diligently, declaring the background, methodology, findings, and implications with clarity and in a systematic manner. The writing process also included strict review and editing conducted by Nugroho himself for the sake of clarity and consistency. Methodologically and in data analysis, he designed a qualitative-descriptive methodology and conducted a critical review of available policy documents and academic literature. With complete involvement at every stage, Nugroho gave a single vision and academic standard of this work, developing a

comprehensive analysis giving insightful information on the foundations of energy justice in the case study of Indonesia's energy transition.

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Conflicts of Interest

The author declares no conflict of interest.

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