A decade of national climate action: Stocktake and the Road Ahead

INDONESIA
LESSONS LEARNT AND CHALLENGES FOR IMPLEMENTATION OF THE PARIS AGREEMENT

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INTRODUCTION

The Paris Agreement, adopted at COP21 in 2015, established a global framework to limit temperature rise to well below 2°C, with efforts to pursue 1.5°C, primarily through nationally determined contributions (NDCs) and long-term strategies. Indonesia ratified the Agreement in 2016 via Law No. 16/2016, committing to significant emission reduction targets and integrating climate action into its national development agenda (BPK-RI, 2016). Indonesia's NDCs have been periodically updated, with the Enhanced NDC (ENDC) raising targets to 31.89% unconditionally and 43.20% with international support by 2030 (GoI, 2022).

Indonesia's long-term strategy, including the LTS-LCCR 2050, outlines a pathway toward a low-carbon, climate-resilient economy, targeting net zero emissions by 2060 or earlier. Central to this strategy are the FOLU Net Sink 2030, energy transition, and sustainable land-use reforms, aiming to peak emissions around 2030 (GoI, 2021). These measures reflect Indonesia's efforts to balance economic growth with environmental sustainability, while leveraging international partnerships for finance, technology, and capacity support.

Over the past decade, Indonesia has made notable progress in policy development, regulatory frameworks, and the establishment of financial mechanisms, such as sustainable finance initiatives and carbon trading platforms (Made et al., 2024; Nusantara & Rahadi, 2024). The implementation of Carbon Economic Value (NEK) policies and the introduction of a carbon tax are key steps toward incentivizing emission reductions and supporting sustainable development (Made et al., 2024; Fajarianti & Novitasari, 2025). However, challenges persist, including heavy reliance on fossil fuels, infrastructure gaps, weak regulatory enforcement, and the tension between development needs and climate ambition (Yonathan et al., 2024; Syabriyana, 2024; Suroso et al., 2022). This report aims to provide an assessment of Indonesia's progress in implementing its Paris Agreement commitments. It will analyze the effectiveness of existing policies, highlight lessons learned, and identify key obstacles hindering the full realization of climate goals. Furthermore, the report will offer recommendations and outline next steps to enhance Indonesia's capacity to meet its commitments and contribute meaningfully to global climate efforts.

INDONESIA'S EMISSION TRENDS SINCE 2005

In 2005, Indonesia's total national emissions reached 1,307,115 kt CO_2e, with the largest share coming from LULUCF (54%), followed by energy (29%), agriculture (8%), waste (5%), and IPPU (3%). By 2022, total emissions had increased slightly—by around 0.19% compared to 2005—yet the energy sector had overtaken LULUCF as the largest contributor (**Table 1**). The emission trajectory from 2005 to 2022 shows significant growth in the energy, IPPU, and waste sectors, driven by economic and population growth, as well as changes in lifestyle and consumption patterns (e.g., food, energy use, and transport demand; **Figure 1**). Emissions in these sectors grew annually by 3.39%, 4.03%, and 4.01%, respectively.

Indonesia's emission trajectory from roughly 2005 until now shown there are significant growth in GHG emissions in energy sector, which is as the consequence of economic and population growth, change of lifestyle and behavior on consumption patterns (energy demand, transport demand, etc.). The significant increase of emissions in the energy sector is also caused by a shift of energy type, i.e. natural gas to coal in power and energy intensive industries due to the shortage of natural gas supply while massive shift to renewable energy is still constraint by the high capital cost. The type of energy technology in industry is usually bound by processing technology so that it is not easy to shift the energy to low carbon one. In addition, economic growth drives higher demand for transport, in which public transport is still limited and used fossil fuels.

Emissions from the agriculture sector grew at a much lower rate compared to energy, IPPU, and waste. In contrast, LULUCF emissions showed

Table 1. The sectoral greenhouse gases emission and growth

	Emission		Average Annual Emission (2005-2022)	Annual Growth (2005-2022)
	2005	2022	$ktCO_2e$	%
Energy	377,183	738,753	529,142	3.39%
IPPU	39,017	57,362	44,419	4.03%
Agriculture	110,132	135,566	118,798	1.25%
LULUCF	709,681	312,312	755,345	-2.97%
Waste	71,103	138,862	100,820	4.01%
Total	1,307,115	1,382,855	1,548,525	0.19%

Source: GoI (2024)

a significant overall decline, though with high interannual variability largely driven by forest and peat fires (**Figure 1**). Substantial emission spikes occurred during drought years associated with El Niño—particularly in 2006, 2009, 2015, and 2019. However, the increase in 2019 was considerably lower than in earlier El Niño years, reflecting the effectiveness of fire management measures and law enforcement. Additional efforts, including social forestry, ecosystem restoration and forest moratorium policies, have also contributed to curbing emissions in this sector.

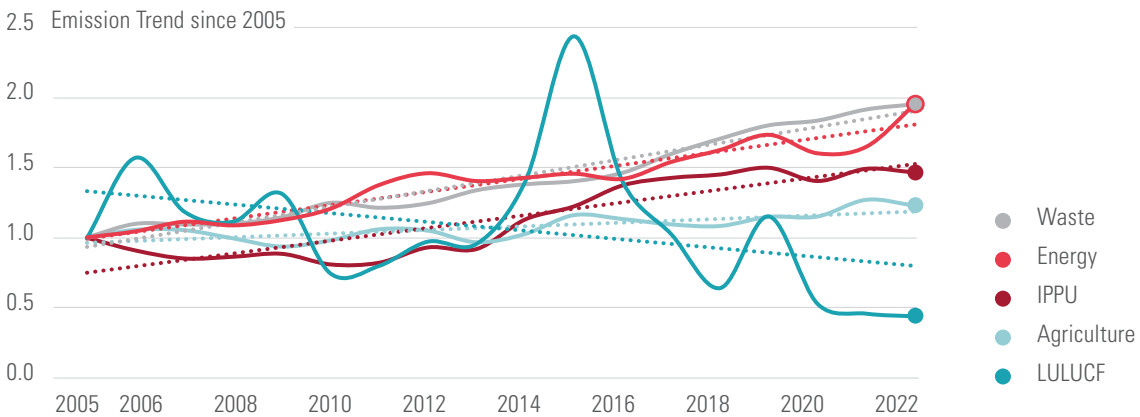
In the energy sector, intermediate indicators have not shown the reduction of emissions instead the emissions still increased due to low contribution of RE in the energy supply mix and increase in fossil fuels, particularly coal use in power plants and industries. The projection of emissions indicates that the emissions level will keep increase because the current planning in energy development, particularly power and industry sectors, still cannot significantly push the share of renewable in energy supply mix. However, the energy policy aims to provide directive to increase the share of low and zero carbon emitting energy and technology. The expected effects of the policy will appear after 2035, the GHG emissions peak is in 2035 and decline after this year because significant investments in renewable energy begins to increase.

INDONESIA'S LONG TERM PERSPECTIVE ON CLIMATE

Indonesia's Long-Term Strategy for Low Carbon and Climate Resilience 2050 (LTS-LCCR 2050) is a cornerstone policy document articulating the nation's vision for a low-carbon, climate-resilient future, in line with its Paris Agreement commitments and the pursuit of net-zero emissions by 2060 or earlier. The strategy is designed to ensure coherence between long-term climate goals and national development priorities, integrating the Nationally Determined Contribution (NDC), National Medium-Term Development Plan (RPJMN), and Long-Term Development Plan (RPJPN) (GoI, 2021; Maharani et al., 2024; Ershov, 2024).

The LTS-LCCR operationalizes Indonesia's climate ambitions by aligning sectoral policies and NDC roadmaps with broader development plans. This integration is essential for translating high-level targets into actionable programs, facilitating coordinated implementation and resource mobilization across national and sub-national levels (Maharani et al., 2024). The strategy anticipates ongoing policy adjustments to maintain alignment between immediate actions and long-term objectives, ensuring that early investments and reforms are consistent with the overarching vision. The LTS-LCCR uses detailed modeling and scenario development to ensure sector targets

Figure 1. Sectoral emission trend from 2005-2022



Source: GoI, 2024

are consistent with overarching climate goals, economic growth, and sustainability considerations [GoI, 2021). Cross-sectoral coordination mechanisms are established to resolve competing land uses, avoid negative side effects (e.g., food security impacts from biofuel use), and optimize co-benefits (Maharani et al., 2024; Sambodo et al., 2022; Tarigan, 2025). The LTS promotes continuous monitoring, capacity building, and policy evaluation to adapt pathways while maintaining alignment with the Paris Agreement and Indonesia's development aspirations

Key pillars of the LTS-LCCR include the Forestry and Other Land Use (FOLU) net sink target and a comprehensive energy transition. The FOLU sector is expected to deliver significant emissions reductions. In the energy sector, the strategy emphasizes a shift from fossil fuels to renewables, particularly solar PV. However, the continued reliance on coal and the need for technological, financial, and regulatory reforms present persistent challenges (Ershov, 2024; Maharani et al., 2024; Sambodo et al., 2022; Zahari & Mclellan, 2024).

The FOLU net sink target and the energy transition are both recognized and modeled within Indonesia's long-term climate strategy (LTS-LCCR 2050), contributing to emissions pathways aimed at achieving net zero emissions by 2060 or sooner (GoI, 2021). Despite robust modeling and participatory planning, the translation of the LTS-LCCR into consistent sectoral policies faces barriers such as financial constraints, regulatory uncertainty, and governance fragmentation. Effective implementation requires strong policy frameworks, innovative financing, and enhanced collaboration between central and local governments (Rakatama et al., 2023; Sambodo et al., 2022). Governance and technological barriers are particularly significant, underscoring the need for capacity building, stakeholder engagement, and adaptive policy evaluation (Sambodo et al., 2022).

Overall, the long-term strategy acts as a guiding framework integrating medium-/short-term policies, ensuring sectoral commitments in FOLU and energy transition contribute coherently to Indonesia's climate and development objectives through 2050.

CLIMATE GOVERNANCE IN INDONESIA

The Ministry of Environment and Forestry (MoEF)[1] plays a central role in Indonesia's climate governance as the National Focal Point for climate change and leads the formulation and implementation of national climate policies. MoEF coordinates the development of the Nationally Determined Contributions (NDCs) and the Long-Term Strategy for Low Carbon and Climate Resilience (LTS-LCCR), while also managing platforms for knowledge sharing and adaptation planning. Its leadership is complemented by strong inter-ministerial coordination to ensure that climate actions are embedded across development priorities and sectoral strategies.

Bappenas (National Development Planning Agency) has a pivotal role in mainstreaming climate change into national development planning frameworks. It ensures that climate policies are fully integrated into the National Medium-Term Development Plan (RPJMN) and cascaded into Regional Medium-Term Development Plans (RPJMD). Bappenas also steers the integration of mitigation and adaptation policies with economic, social, and infrastructure planning, thereby aligning Indonesia's climate commitments with long-term development objectives. This role makes Bappenas a key bridge between MoEF's climate policy leadership and broader economic and sectoral planning.

Sectoral ministries—including those responsible for agriculture, forestry, finance, industry, trade, energy, transport, public works and housing, and home affairs—are tasked with operationalizing climate policies within their respective domains. Their responsibilities include: Designing and implementing sector-specific emission reduction and adaptation programs; Ensuring consistency between sectoral strategies and Indonesia's overall NDC and LTS commitments; Coordinating infrastructure development, energy demand management, and land-use

1 In the new government the MoEF has been separated to Ministry of Environment (MoE) and Ministry of Forestry (MoFor), whereas the MoE acts as the National Focal Point for Climate Change.

planning to avoid trade-offs and maladaptation; Working with local governments to cascade national targets into provincial and district-level climate action plans.

Cross-sectoral coordination is facilitated through inter-ministerial mechanisms and national coordination forums (e.g. Change Steering Committee under MoEF, Bappenas-led Forums on Low Carbon and Climate Resilience, National FOLU Net Sink 2030 Task Force, National Energy Council (DEN), National Action Plan for GHG Reduction & National Action Plan for Climate Change Adaptation, Inter-Ministerial Committees on Climate Finance and Carbon Market Mechanisms), which seek to harmonize sectoral initiatives, promote knowledge management, and align investment priorities. These platforms emphasize the need to avoid maladaptation, ensuring that progress in one sector does not inadvertently undermine resilience or emission goals in another. Policy frameworks such as the Strategic Environmental Assessment (KLHS), the Regional Environmental Protection and Management Plan (RPPLH), and regional climate change action plans provide both vertical (national–regional–local) and horizontal (cross-sector) coherence. These frameworks support the iterative updating of the NDCs and the LTS, allowing climate policy to adapt to new scientific knowledge and stakeholder feedback. Stakeholder engagement is institutionalized through consultations with civil society, academia, the private sector, and local communities. While these mechanisms enhance transparency and inclusiveness, challenges remain—particularly the underrepresentation of vulnerable groups and limited influence of civil society in decision-making. Powerful vested interests, and the absence of a formal just transition framework highlights gaps in inclusive and equitable climate governance.

Science and modeling play a critical role in underpinning Indonesia's climate strategies. Advanced analyses provide emission projections, land-use and energy scenarios, and risk assessments that inform evidence-based policymaking. These tools are essential for identifying cost-effective pathways toward low-carbon and climate-resilient development. However, their influence on actual target-setting and political decision-making has been partial, with evidence sometimes subordinated to economic or political interests. Strengthening the use of science in decision-making is crucial for aligning Indonesia's policies with the Paris Agreement.

INDONESIA'S INTEGRATED CLIMATE CHANGE MITIGATION POLICIES: PROGRESS, STRATEGIES, AND INSTITUTIONAL INNOVATIONS

Indonesia adopts a comprehensive approach to climate change mitigation, integrating policies across land use, energy transition, carbon pricing, and sustainable finance. These measures are designed to reduce emissions while supporting sustainable development, underscoring the country's commitment to a low-carbon and climate-resilient future (Muhammad et al., 2025; Brata & Toparakkasi, 2023; Djalante et al., 2021; Yamin et al., 2024).

A cornerstone of this approach is the FOLU Net Sink 2030 strategy, which prioritizes reforestation, peatland restoration, and mangrove conservation (MoEF, 2022). By curbing deforestation, restoring degraded peatlands, and protecting mangrove ecosystems, Indonesia leverages the critical role of these landscapes as carbon sinks. Safeguarding peatlands and mangroves not only reduce emissions but also enhances biodiversity and strengthens ecosystem resilience (Basuki et al., 2022). Indonesia has made notable progress in reducing deforestation and peatland degradation efforts. Despite some fluctuations due to economic and development pressures, overall trends show a decline in deforestation rates attributed to strengthened policies, community engagement, and restoration initiatives, including peatland and mangrove ecosystem conservation (MoEF, 2024; Wongkar, 2021). These efforts support Indonesia's goal to enhance natural carbon

sinks and sustain its emission reduction targets. Lately, after LTS LCCR has been submitted to UNFCCC in 2021 there are many positive climate change mitigations endeavor that lead to many important decisions in energy plans and policies. The energy sector, Indonesia's largest source of emissions, is undergoing significant reform. Through updated the National Energy Policy (KEN) and Power Generation Plan (RUKN) in 2024, the government has set ambitious renewable energy targets, aiming to expand solar, wind, hydro, and geothermal utilization as part of Indonesia's Energy Transition. In both KEN and RUKN, instead of planning for early retirement of coal power plant the GoI aims to increase the share of renewable energy, which eventually reduces the use of coal and other fossils. Complementary policies that address challenges such as intermittency (via battery storage systems or BESS), high investment costs, and stranded fossil fuel assets are needed.

The complimentary policies include encouragement of investment in battery industries, which are integrated with critical minerals processing to supply raw materials. These policies align with the government macro policy on the development of downstream industries to increase value added to these mineral resources for achieving high economic growth in the short term. Currently, to deal with high investment costs, the development of renewable energy can use domestic capital sources available from Sovereign Wealth Fund (DANANTARA) and international funds or partners. DANANTARA is established by the GoI to finance high capital investment, including investment for energy infrastructure. Concerning the stranded fossil fuel assets issues, complementary policies include significant increase of renewables that eventually will avoid the need to do coal early retirement.

Super grid development is needed to enable access to dispersedly located renewable resources and enhance system reliability, while micro grid is also needed for rural and remote areas. To attract investment, GoI has introduced feed-in tariffs (FiTs), power purchase agreements or PPAs (Yudha & Tjahjono, 2019 and Erdiwansyah et al., 2020), fiscal incentives (Yoo & Ha, 2024), simplification of renewable development permits, and gradual fossil fuel subsidy reforms. Additional measures include biomass co-firing in power generation plants and industry—while ensuring feedstock comes from agricultural and plantation waste rather than deforestation (Muhammad et al., 2025; Yamin et al., 2024), and continued development of biofuels for transport.Efforts to enhance energy efficiency are advancing across industry, buildings, and transport, through an integrated mix of regulations, fiscal incentives, and technological innovation. Green Industry standards and Green Building Codes promote low-carbon manufacturing, construction, and urban development. While the transport sector combines disincentives for private vehicle use such as congestion charging (Shiddiqi et al., 2024; Wicaksono et al., 2025), higher parking fees (Shiddiqi et al., 2024; Arifianto et al., 2024), fuel and vehicle taxes (Shiddiqi et al., 2024; Barus, 2022), and traffic management measures such as Odd-Even License Plate Policy (Arifianto et al., 2024) with major investments in mass transit systems and commuter rail, supported by integrated ticketing to promote sustainability mobility (Pujiati et al., 2022; Ardi et al., 2024; Syafruddin, 2025). These efforts are complemented by the growing role of domestic and international Energy Service Companies (ESCOs) in financing and delivering efficiency projects (Brata & Toparakkasi, 2023; Djalante et al., 2021), alongside policies to accelerate decarbonization technologies such as electric vehicles and hydrogen, with incentives like preferential EV parking and a strong emphasis on expanding renewable-based electricity to ensure genuine emissions reductions. To accelerate market-based solutions, Presidential Regulation No. 98/2021 established a legal framework for carbon pricing, covering both emissions trading and offsets. This was followed by OJK Regulation No.14/2023, which set operational guidelines and confirmed OJK's

supervisory role[2]. Building on this foundation, the Indonesia Carbon Exchange (IDXCarbon) was launched in September 2023 as the official platform for carbon transactions. In its first year, IDXCarbon recorded more than 1.6 million tons of CO_2-equivalent traded, valued at IDR 78.4 billion, involving 129 entities across eight projects—a promising start for Indonesia's carbon market (Muhammad et al., 2025; Djalante et al., 2021).

Strengthening climate finance systems is also a priority. Climate budget tagging helps track expenditures and align them with national priorities, while fiscal policies—such as taxes, incentives, and subsidies—support renewable energy, energy efficiency, and reforestation. The Indonesian Environmental Fund Agency (BPDLH) manages dedicated funds for climate projects and encourages sustainable investment. Blended finance approaches mobilize both public and private capital to scale up green infrastructure. International collaborations, including the Just Energy Transition Partnership (JETP), Green Climate Fund (GCF), and bilateral agreements, provide additional financing and technical support.

Key institutional mechanisms reinforce transparency and accountability. The National Registry System (SRN), GHG emission reduction certificates (SPE-GRK), MRV protocols, and corresponding adjustment frameworks underpin both domestic and international carbon trading. Complementary digital systems such as SRN-PPI and SIGN SMART enable monitoring of emission reductions and data-driven policy adjustments. In parallel, the Sustainable Finance Taxonomy (TKBI) supports environmentally sound investments, laying the foundation for a robust green finance market.

PERSISTENT CHALLENGES HINDERING INDONESIA'S CLIMATE COMMITMENTS

Despite notable progress, Indonesia still faces critical challenges that hinder the full realization of its climate commitments. These challenges span mitigation efforts, financial mobilization, institutional capacity, governance, and socio-economic dimensions. Addressing them is essential to ensure effective and equitable climate actions.

A key mitigation hurdle lies in balancing emission reductions with the risk of reinforcing fossil fuel lock-in. The FOLU Net Sink 2030 strategy, while ambitious, is complicated by fluctuating forest cover and land-use practices, making it difficult to secure sustained carbon sequestration. Reliance on carbon offsets from forestry and land use requires strong enforcement, yet persistent gaps in land governance and tenure issues weaken implementation (Meehan et al., 2019; Novita et al., 2022; Wongkar, 2021). At the same time, the continued operation and expansion of coal-fired power plants—especially proposed captive coal projects—pose serious risks to Indonesia's climate ambitions. Existing infrastructure and new fossil-based investments deepen the threat of long-term lock-in, while the limited deployment of renewable energy further compounds the challenge. The expansion of bioenergy, such as wood pellets and palm biodiesel, introduces additional risks tied to sustainability, land-use change, and potential harm to forest conservation, requiring careful oversight (Novita et al., 2022; Mardiatmoko, 2021). Renewable energy penetration remains relatively low, far from the 23% target for 2025. High costs, policy uncertainty, perceived risks, and infrastructural barriers continue to constrain large-scale deployment (Sembiring, 2025; Resosudarmo et al., 2023; Grigoryan, 2024).

Indonesia faces a substantial climate finance gap, estimated to be around two-third of the required investment for aligning with its climate goals. Although Indonesia has mobilized funds through innovative mechanisms like green sukuks and international climate finance

2 OJK is Indonesia's independent financial services authority mandated by Law No. 21/2011 to regulate and supervise banking, capital markets, insurance, pension funds, and other financial sectors through an integrated approach that ensures the security, stability, and integrity of the financial system by monitoring risks, enforcing compliance, investigating violations, imposing sanctions, and coordinating with Bank Indonesia and the Deposit Insurance Corporation to maintain systemic stability.

partnerships, domestic sources remain insufficient to meet the ambitious investment needs. The reliance on international supports is vital but also indicates a dependence that could undermine long-term sustainable financing. Indonesia's efforts to develop domestic financial instruments and leverage private sector investment are ongoing but face challenges related to risk perception, market maturity, and capacity constraints (Rakatama et al., 2023; Idris et al., 2024; Suroso et al., 2022; Setiawan et al., 2021; Resosudarmo et al., 2023).

Policy coherence across sectors remains a concern, with existing policies sometimes conflicting or lacking integration—particularly between forest, land use, and energy policies—reducing overall effectiveness (Ritonga et al., 2025; Mardiatmoko, 2021; World Bank Group 2023). Enforcement gaps are evident in forest governance, where illegal logging and land clearing continue, undermining reforestation and land management efforts (Alisjahbana & Busch, 2017; Meehan et al., 2019; Sinaga, 2020).

The MRV systems require further strengthening to accurately track emissions reductions and ensure transparency. Limited capacity and technical expertise hamper the development of a comprehensive and reliable data regime necessary for credible climate accountability (Wongkar, 2021; World Bank Group 2023).

A critical socio-economic obstacle is ensuring a just transitions that balances climate ambition with social equity. Concerns over job-loss in fossil fuel sectors, energy affordability, and regional disparities threaten public support for climate policies. Transitioning workers from coal and other carbon-intensive industries must be managed carefully to prevent social discontent and economic dislocation (Sembiring, 2025; Resosudarmo et al., 2023; World Bank Group 2023).

Regional disparities between urban and rural areas, and among islands—also pose challenges to equitable policy implementation. Ensuring inclusive participation, especially for vulnerable communities and indigenous peoples, remains a priority but requires targeted strategies and social safeguards.

The Indonesian government's commitment to climate change and the Net Zero Emissions (NZE) target by 2060 requires an inclusive and sustainable green economic transformation. One of the key elements in this transformation is the creation of green job opportunities, namely jobs that support environmental sustainability, reduce carbon emissions, and manage natural resources sustainably. The potential for green jobs is enormous, especially in the context of a green economy transition and a Just Energy Transition (Resosudarmo et al., 2023; World Bank Group 2023). According to the Green Economy Index publication, the green economy could create 1.8 million new jobs by 2030 (Bappenas, 2021).

Indonesia's forthcoming energy transition is poised to significantly impact industries integral to the electricity supply ecosystem—such as mining, quarrying, electricity generation (including the expansion of renewables), and construction. Notably, there is also considerable emphasis on sectors aimed at driving up electricity demand, particularly clean transport and electronics manufacturing (PAGE, 2023). Consequently, shifts within the energy sector will likely precipitate comprehensive changes across Indonesia's broader economy.

The effects on employment in the electricity supply sector are likely to vary widely depending on region and the phase of transition. For instance, coal-dependent areas such as East Kalimantan, West Kalimantan, and South Sumatra are expected to face job losses within coal mining and quarrying industries. Conversely, regions like West Papua, Central Sulawesi, and Maluku are poised to see job growth, largely due to increased demand for their copper and nickel resources. In essence, regional outcomes will differ as the energy landscape changes over time (PAGE, 2023).

As Indonesia embarks on its energy transition toward a greener, low-carbon future, the reskilling and upskilling of its workforce has become essential to ensure a just and inclusive transformation. The move from fossil fuels to renewable energy sources such as solar, wind, and geothermal demands new technical competencies and

green job readiness across various sectors. By investing in training programs and educational initiatives, Indonesia can equip workers—particularly those in traditional energy industries—with the necessary skills to thrive in emerging green roles. This reskilling effort not only helps mitigate potential job displacement but also fosters inclusive economic growth by creating employment opportunities aligned with the country's climate goals. A well-prepared workforce is essential to ensuring a just and smooth transition to sustainable energy systems across the archipelago.

Nonetheless, structural challenges persist: underinvestment in the green sector, lack of targeted training, rural–urban disparities in education access, and limited public awareness of green job opportunities. To address these gaps, Bappenas (Mariska, 2024) recommends an integrated regulatory framework and roadmap for green workforce development. This includes vocational training, certification standards, and cross-sectoral collaboration. Coordinated efforts—linking reskilling programs with investment-driven job creation and systemic policy integration—are critical to equipping Indonesia's workforce for a green economy, while supporting both climate goals and sustainable employment.

KEY LESSONS FROM INDONESIA'S CLIMATE ACTIONS

Indonesia's climate action journey has generated valuable insights into effective strategies, persistent challenges, and enabling factors that are critical for advancing its climate agenda. Reflecting on these experiences offers important lessons that can guide future policy and implementation.

The execution of flagship sectoral programs—most notably the FOLU Net Sink 2030 initiative and the energy transition agenda—has been central to translating commitments into action. The FOLU Net Sink program targets emissions and carbon sequestration in forestry and land use, which account for a significant share of Indonesia's greenhouse gas inventory. Its time-bound roadmap to achieve a net sink in Forestry and Other Land Use (FOLU) by 2030 underscores the essential role of forest conservation and peatland management in the national climate strategy. Targeted interventions have helped prioritize actions, mobilize resources, and engage stakeholders more effectively. Multi-year declines in deforestation rates suggest progress in governance and conservation, though these gains remain fragile due to ongoing land-use pressures and enforcement challenges (Meehan et al., 2019; Tacconi et al., 2019; Ruysschaert & Hufty, 2020; Novita et al., 2022).

In parallel, the energy transition agenda—focused on scaling up renewable energy and gradual reduction of fossil fuels utilization—has been a critical driver of power sector decarbonization. Together, these flagship programs provide concrete frameworks around which policies, investments, and institutional efforts can be aligned, fostering clarity of purpose and enabling coordinated action (Wurarah, 2024; Alisjahbana & Busch, 2017). The Ministry of Finance (MoF) has implemented legislation that provides financial benefits to power providers, thereby promoting their shift towards more environmentally friendly energy sources. The Regulation of MoF No. 103 of 2023 provides fiscal support for the acceleration of energy transition in the electricity sector and was implemented on 13 October 2023 (Askandar & Putro, 2025).

High investment costs of RE development and other climate actions can be financed through domestic and international funds. International funds generally have requirements that difficult to fulfill as sometime do not align with government policy in maximizing the utlization of domestic energy resources to achieve self suffient energy. As one of the international partners, the Just Energy Transition Partnership (JETP) offers Indonesia a major opportunity to accelerate its energy transition by mobilizing $20 billion in international finance to support early coal retirement, renewable energy expansion, and a more equitable shift toward low-carbon development. It provides a structured framework for coal phase-out, enhances energy security, and

promotes job creation and community support, positioning Indonesia as a potential model for other countries. However, JETP also faces significant challenges, including political and social resistance rooted in concerns about foreign influence and debt-driven financing (Jazuli et al., 2024; Wardhana et al., 2024; Banerjee, 2024), as well as regulatory complexity, limited implementation capacity, and risks of policy misalignment with national priorities (Wardhana et al., 2024; Maskun et al., 2023). Questions remain over the clarity of its "just" dimension, with insufficient involvement of local stakeholders (Maskun et al., 2023; Banerjee, 2024) and risks of inequitable compensation for coal investors (Boute, 2025), raising concerns that without stronger domestic ownership, JETP could be perceived as externally imposed and fail to deliver a truly inclusive transition. To accelerate RE development as one of climate mitigation actions in Indonesia's energy transition, the RE investment can use DANANTARA (Indonesia's Sovereign Wealth Fund). For example, development of Geothermal Power Plant has been financed using DANANTARA fund.

A robust measurement, reporting, and verification (MRV) system is fundamental for transparency and accountability. Indonesia's development of MRV frameworks has strengthened the credibility of emission reduction claims and improved progress tracking. Yet, challenges remain in ensuring data consistency, interoperability across institutions, and strict adherence to standardized methodologies. Sustained capacity building and clear regulatory guidance are needed to safeguard MRV reliability and maintain stakeholder trust, both domestically and internationally (Wiati et al., 2022; Meehan et al., 2019; Dirgantara, 2022; Novita et al., 2022).

International cooperation has also played a pivotal role, providing financial resources, technical expertise, and knowledge transfer. Partnerships with multilateral funds, development agencies, and bilateral contributors have accelerated climate action through grants, concessional loans, and capacity-building initiatives. These collaborations have supported policy learning, adoption of best practices, and mobilization of climate finance, particularly in light of Indonesia's domestic finance gap (Wiati et al., 2022; Wurarah, 2024). Continued engagement with the global community remains critical to bridge capability constraints and sustain momentum.

Results-Based Payment (RBP) schemes under REDD+ have provided crucial funding and incentives for reducing emissions from deforestation and forest degradation, but their lasting effectiveness depends on overcoming persistent challenges. Key lessons emphasize the complexity of safeguard implementation and verification, the critical need for transparent and equitable benefit-sharing mechanisms (Morita & Matsumoto, 2023), the importance of strong national ownership and policy integration, and the ongoing requirement to strengthen MRV capacity and improve forest governance (Kim et al., 2021). Looking ahead, streamlining safeguard requirements, reinforcing national systems and legal frameworks, ensuring inclusive and fair benefit-sharing, fostering private sector participation (Morita & Matsumoto, 2023), and aligning REDD+ outcomes with NDCs and net-zero strategies (Kim et al., 2021) will be vital to enhance the accessibility, credibility, and sustainability of RBP finance while delivering stronger climate and social benefits.

Indonesia has also made progress in developing a carbon market to incentivize emission reductions and monetize climate actions. Foundational regulatory frameworks and registries have been established, laying the groundwork for market-based mechanisms. However, challenges persist, including limited market liquidity, a small pool of licensed verifiers, insufficient tradable credit volumes, and concerns about transparency. Addressing these issues by strengthening verification capacity and improving market oversight will be key to building trust and encouraging broader participation (Dirgantara, 2022).

Coherent and integrated policy frameworks are equally important. The development of the Taxonomy for Sustainable Finance (TKBI), aligned with ASEAN standards, provides clear guidance for channeling investments toward environmen-

tally sustainable activities and advancing green economic growth. When corporate transition plans align with national targets and taxonomy criteria, they reduce investor uncertainty and foster consistency. Clear regulatory signals and long-term planning also help financial institutions and businesses allocate capital effectively, supporting sustainable investment flows. Anchoring domestic regulations in international best practices further enhances credibility and attracts global capital (Putri & Bakhtiar, 2023; Wurarah, 2024).

Long-term engagement, coalition-building, and social learning—such as those seen in REDD+ projects and NGO-led forest governance initiatives—are crucial for policy innovation and effective implementation. Flexibility in project design and openness to local learning agendas can yield more meaningful and sustainable outcomes (Sanders et al., 2020; Ruysschaert & Hufty, 2020; Resosudarmo et al., 2019). Beyond these, sustainable REDD+ and forest governance outcomes also rely on complementary factors: secure land tenure and recognition of local rights as the basis for equitable participation and benefit-sharing; conditional incentives supported by transparent, context-specific mechanisms to foster legitimacy and sustained engagement (Wunder et al., 2020; Shah & Race, 2024); and strong national ownership with integration into broader policy frameworks to maximize effectiveness. Meaningful community participation—grounded in free, prior, and informed consent (FPIC; Shah & Race, 2024; Lawlor et al., 2013; Awung & Marchant, 2020) strengthens local well-being and support for forest protection, while investments in technical and institutional capacity, adaptive project design, and rigorous monitoring and transparency of both carbon and non-carbon outcomes reinforce accountability and long-term sustainability (Nantongo et al., 2024). Together, these elements form a comprehensive foundation for REDD+ initiatives that are effective, equitable, and resilient.

Taken together, these lessons highlight Indonesia's evolving institutional, regulatory, and financial frameworks underpinning its climate agenda. They also reinforce the importance of integrated approaches, transparency, and sustained political commitment as Indonesia advances toward its climate objectives.

STRATEGIC PRIORITIES FOR INDONESIA CLIMATE ACTIONS 2025-2030

As Indonesia strengthens its climate commitments for 2025–2030, a series of strategic actions will be essential to consolidate progress and accelerate the transition to a low-carbon, climate-resilient pathway. Building on past experiences and existing frameworks, the following priorities will guide Indonesia's efforts during this critical phase:

Lock in FOLU Net Sink gains through stronger enforcement and real-time monitoring

Securing the achievements of the FOLU Net Sink 2030 program requires robust governance, improved law enforcement, and the adoption of real-time monitoring technologies. Illegal logging and land-use conflicts remain major threats to carbon stock preservation. Deploying advanced satellite-based monitoring and transparent data systems can provide timely information on deforestation and peatland degradation, enabling rapid response to violations. Community engagement through social forestry programs is also vital for sustaining carbon sequestration gains and safeguarding critical ecosystems (Novita et al., 2022; Basuki et al., 2022; Resosudarmo et al., 2019; Tacconi et al., 2019)

Update the RUPTL to accelerate renewable energy and limit captive coal

Indonesia's electricity supply plan (RUPTL) must be urgently updated to reflect ambitious renewable energy targets and climate goals. The revised plan should prioritize renewables in line with Presidential Regulation No. 112/2022, set clear targets and timelines for scaling up low-carbon energy sources, and introduce stricter controls on captive coal power plants. A clear coal decom-

missioning timetable, integrated into the electricity planning framework, will provide certainty for investors and stakeholders (Siagian et al., 2017; Sarjiya et al., 2023; Rahman et al., 2021; Firmansyah et al., 2023).

Scale up the carbon market with compliance demand and Article 6 readiness

Expanding the domestic carbon market is critical for creating compliance demand and incentivizing emission reductions across sectors. A clear roadmap for mandatory participation, aligned with emerging international rules under Article 6 of the Paris Agreement, will help integrate Indonesia into global carbon markets. Efforts should focus on improving market liquidity, strengthening verification systems, and ensuring transparency and integrity (Fajarianti & Novitasari, 2025; Alisjahbana & Busch, 2017).

Accelerate deployment of low-carbon technologies

Rapid scaling of low-carbon technologies—including solar, wind, biogas, energy storage, and smart grid management—is vital for achieving mid-century climate targets. Investment in research and development, capacity building, and supportive regulatory frameworks will drive adoption. Integrating digital solutions for energy management and resource efficiency can further optimize Indonesia's transition pathways (Siagian et al., 2017; Sarjiya et al., 2023; Ramadhan et al., 2024; Firmansyah et al., 2023).

Mobilize climate finance

Bridging Indonesia's climate finance gap requires scaling up blended finance mechanisms that combine public, private, and international capital for mitigation and adaptation projects. Expanding sovereign financial instruments—such as green bonds and climate risk insurance—will strengthen fiscal capacity and risk management. At the same time, improving access to international climate funds, including the Green Climate Fund (GCF), is crucial (Suroso et al., 2022; Rahman et al., 2021). Streamlining project pipelines, enhancing proposal quality, and meeting fund requirements will help secure greater financing for transformative initiatives.

Strengthen institutional coherence

Policy coherence across sectors is essential for harmonized climate action. Institutional mechanisms should enable integrated planning and coordination among key ministries. Establishing inter-ministerial commissions or task forces can facilitate alignment of policies, regulations, and financial instruments, improving resource allocation and supporting integrated implementation of climate and development goals (Ershov, 2024).

Build confidence through transparency and early wins

Sustaining stakeholder confidence requires transparent tracking of progress and outcomes. Institutionalizing regular, publicly accessible reporting and strengthening MRV systems will enhance accountability and trust. Proactive engagement with government, private sector, civil society, and local communities will enrich dialogue and foster collective ownership of climate goals. Demonstrating early wins—particularly in coal retirement and forest protection—will showcase tangible progress and reinforce public confidence in Indonesia's climate leadership (Novita et al., 2022; Alisjahbana & Busch, 2017; Resosudarmo et al., 2019).

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