WRI INDONESIA

WORKING PAPER

LOOKING PAST THE HORIZON: THE CASE FOR INDONESIA'S LONG-TERM STRATEGY FOR CLIMATE ACTION

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EXECUTIVE SUMMARY

- The world is not on track to limit the catastrophic impact of climate change. The United Nations Framework Convention on Climate Change (UNFCCC) calls on signatory countries to develop more ambitious long-term plans for climate actions by 2020.
- Indonesia's self-interest would be served by a long-term strategy (LTS) for climate action that looks beyond the next 5–10 years; such a strategy could secure needed growth while considering conditions and risks beyond 2030.
- This working paper offers a preliminary overview of the benefits and urgency of producing an LTS for climate action in Indonesia and highlights current opportunities to develop an effective strategy. The assessment is derived from a review of the literature and interviews with experts and government officials.
- Some current initiatives can serve as a basis for Indonesia's LTS, such as the low-carbon development initiative of the Ministry of National Development Planning (Badan Perencanaan Pembangunan Nasional; BAPPENAS), which includes long-term modeling exercises until the year 2045.
- An effective long-term climate strategy for Indonesia should have a durable, enforceable, and adaptable legal framework; high-level political commitment; cross-ministerial planning and collaboration; broad-based participation of various stakeholders; strong subnational ownership and capacity; and innovative and sustainable funding.

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Context

Under the Paris Agreement, countries are invited to formulate and then submit their long-term low greenhouse gas (GHG) emissions development strategies to the UNFCCC by 2020. So far, 12 countries have communicated their long-term strategies to the UNFCCC. Those strategies will play a central part in meeting the long-term temperature goals of the Paris Agreement (limiting the global temperature increase to less than 1.5°–2°C) and in setting the long-term visions with which countries should align their short- and medium-term actions.

Indonesia has committed to reducing its GHG emissions by 29 percent by 2030. This can be compared with the business-as-usual (BAU) scenario under Indonesia's first nationally determined contribution (NDC). Indonesia will strengthen the reduction to 41 percent with international support for financing, technology transfer and development, and capacity building.

Currently, Indonesia does not have a long-term decarbonization plan in place. Indonesia's emissions are projected by modeling efforts to increase to around 2.9 gigatons of carbon dioxide equivalent ($GtCO_2e$) in 2030 under the BAU scenario in its NDC, and to around 4.3–6.2 $GtCO_2e$ in 2050. It is crucial that Indonesia start the process of developing its LTS in order to decarbonize its economy and bend the emissions curve from baseline.

Long-Term Challenges for Indonesia's Growth

Indonesia is growing rapidly. Currently, Indonesia enjoys growth of around 5 percent in the gross domestic product (GDP) annually. Indonesia's population also keeps increasing; many observers predict that by 2045, Indonesia will emerge as a developed country with demographic "bonuses" of high increases in the potential labor force emerging in 2020–2035. A PricewaterhouseCoopers (2017) study predicted that with such demographic gains, Indonesia will be a big emerging market economy and the strongest economy in Southeast Asia in 2050.

However, Indonesia's growth faces some risks that are often unforeseen with a short-term planning approach. For example, Indonesia is highly vulnerable to the effects of climate change. The failure to limit global warming would intensify extreme weather events, such as torrential rains or storm surges, and sea-level rise and drought. These consequences of climate change are already resulting in agricultural loss, health impacts, and property losses in many areas of Indonesia, and they are expected to increase in frequency and intensity in the future. Indonesia's current growth also allows the exploitation of Indonesia's resources, which will be at risk of damage and scarcity in the long run. Indonesia needs to identify these risks ahead of time and plan to build a resilient economy and society.

How Indonesia secures long-term growth is crucial. The implications of today's policies will affect future growth. Many policy decisions and policy changes to respond to growth and its challenges should be planned now. Unfortunately, many current Indonesian policies are still narrowly focused on present-day concerns, such as prices, demand, and resources. For example, Indonesia's

Box 1 | **Key Findings from the Working Paper**

This working paper is a preliminary assessment that contains important considerations as Indonesian policymakers formulate a long-term, mid-century vision for the country. It identifies the benefits from producing a long-term climate strategy as well as the potential risks from failing to do so for Indonesia. This paper discusses the current progress of Indonesia's efforts as well as current modalities toward producing a long-term climate strategy. It identifies gaps in the process and highlights some factors that enable Indonesia to move forward with an effective LTS for the country—stressing how Indonesia could pursue its development trajectory while phasing out emissions over time. This working paper is among the first to address the long-term climate strategy in Indonesia as well as make suggestions on how the strategy could be incorporated into the ongoing process. The paper strives to answer the following questions:

- How urgent is it that Indonesia have a long-term climate strategy?
- Where is Indonesia in the process of developing a long-term climate strategy?
- What lessons can be drawn from existing long-term modeling of Indonesia's emissions?
- What does the institutional landscape look like for an effective LTS?
- What are some enabling factors for an effective LTS?

The qualitative analysis combines a review of relevant studies and interviews with government officials and experts. The report does not develop a new set of long-term modeling projections; rather, it emphasizes existing modeling efforts and the current process and key practical insights for decision-makers. The report also covers climate mitigation more thoroughly than adaptation because it focuses on Indonesia's opportunity to decarbonize its economy.

current climate change policy does not consider the projected growth of energy emissions and the massive potential of cheap renewable energy production in the future. The current governance and institutional framework also have too limited a timeframe to support the magnitude of long-term challenges that Indonesia must resolve in the next decades. Indonesia requires the ability to meet long-term challenges with a strategy that is not only beneficial at the present time but also sustains the need of the population over the long term.

Key Findings

- There is an urgency for Indonesia to develop an LTS for climate action. It makes economic sense: it could protect Indonesia from long-term costs, it gives Indonesia a chance to direct its land-use and energy systems more efficiently, it gives certainty to long-term investments, it safeguards Indonesia's growth from risks associated with climate change, and it could potentially bring Indonesia toward becoming a sustainability global leader.
- The priority for Indonesia's LTS is to evaluate and improve Indonesia's energy system and land use. For the energy system, thinking long-term could inform a power plant expansion strategy to reflect global trends and technology, avoid locking in high-cost infrastructure, and minimize potential stranded assets. As for land use, an LTS could help improve the country's land use management approach and inform the extent to which Indonesia could continue to exploit lands. Consideration should be given to more ambitious protection of Indonesia's pristine forests and peatlands, which protect Indonesia from future economic losses associated with fires, build resilience to tomorrow's climate, and act as a low-cost and less technology-reliant climate change mitigation solution.
- BAPPENAS has launched a low-carbon development initiative (LCDI) comprising efforts to mainstream low-carbon policies into development planning (Rencana Pembangunan Jangka Menengah Nasional; RPJMN). With modeling projections and scenarios until 2045 and with its link to the national policy planning process, the LCDI could be a basis for Indonesia's LTS. Efforts should be made to ensure that the initiative closely involves other sectoral ministries and local governments.
- Lessons from existing long-term modeling studies show that Indonesia's emissions will keep increasing, with major emissions to come from land use and the energy system. For land use, major drivers come from deforestation, peatland degradation, and forest fires. Drivers in the energy system mostly come from electricity.
- Understanding of the sources, causes, and trends related to climate change is closely related to the use of science and knowledge production for policy formulation. Co-creation and co-production of the LTS model with wider representation of nonstate actors is key to ensuring that the model captures the voices, substantive concerns, and assumptions of different groups.

Recommendations

- An effective LTS should be designed to ensure its own durability, adaptability, and enforceability. Although having a legal framework is important, past experience shows that for effective implementation, an LTS requires endorsement from high-level political leaders, ministries, diverse stakeholders, and subnational actors.
- This paper recommends building Indonesia's LTS as a part of an existing mechanism in Indonesia rather than as a new document or arrangement. The LCDI approach initiated by BAPPENAS for the next RPJMN is now the nearest approach to a basis for Indonesia's LTS. However, it is crucial to increase a strong buy-in from other ministries and, more important, from the Indonesian president's office, the Ministry of Finance, and the Ministry of Home Affairs.
- Strong political support is important, especially high-level leadership and commitment from the president or vice president. As has been done in the past, a presidential task force could be instituted to monitor the accelerated implementation of the LTS.
- This paper recommends engaging different sectors and actors and ensuring wide stakeholder participation in formulating Indonesia's LTS so that the long-term results would benefit all. In particular, proactive engagement should be tailored to those that are likely to be affected by the transition.
- On the subnational level, it is important to invest in capacity building and to introduce the integrated approach of the LTS into existing mechanisms, such as the provincial development plans (Rencana Pembangunan Jangka Menengah Daerah; RPJMD). Previous experience shows that the proliferation of stand-alone guidelines can overwhelm local policy planners.

- It is imperative that Indonesia identify innovative and sustainable funding instruments to support the LTS and to fund climate mitigation and adaptation efforts sustainably, from both domestic and international sources. Blended finance has the potential to unlock new investment and financial disbursement for "green" projects because it addresses market barriers that prevent private sector development in areas of strategic importance and high development impact.

Box 2 | **Abbreviations**

AFOLU	Agriculture, Forestry and Other Land Use
APERC	Asia Pacific Energy Research Center
B2G	Brown to Green
BAPPENAS	Badan Perencanaan Pembangunan Nasional (Ministry of National Development Planning)
BAU	Business-as-Usual
BNEF	Bloomberg New Energy Finance
BPK	Badan Pemeriksa Keuangan (Financial Regulatory Body)
BPP	Biaya Pokok Produksi (Electricity Production Cost)
BPPT	Badan Pengkajian dan Penerapan Teknologi (Agency for the Assessment and Application of Technology)
BPPT-H	Badan Pengkajian dan Penerapan Teknologi–High
BPPT-L	Badan Pengkajian dan Penerapan Teknologi–Low
BUR	Biennial Update Report
Cal 2050	Calculator 2050
CAT	Climate Action Tracker
DDPP	Deep Decarbonization Pathways Platform
EPS	Energy Policy Simulator
EUM	Energy Use Model
FREL	Forest Reference Emission Level
GCF	Green Climate Fund
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GtCO$_2$e	Gigatons of Carbon Dioxide Equivalent
IDDRI	Institute for Sustainable Development and International Relations
IDR	Indonesian Rupiah
IEA	International Energy Agency
IEEFA	Institute for Energy Economics and Financial Analysis
IELH	Instrumen Ekonomi Lingkungan Hidup (environmental economic instruments)
IESR	Institute for Essential Services Reform
IFC	International Finance Corporation
IIASA	International Institute for Applied Systems Analysis
IISD	International Institute for Sustainable Development
IMF	International Monetary Fund
INDC	Intended Nationally Determined Contribution
IPCC	Intergovernmental Panel on Climate Change
IPP	Independent Power Producers
IPPU	Industrial Processes and Product Use
IRENA	International Renewable Energy Agency
ITB	Institut Teknologi Bandung (Bandung Institute of Technology)
KemenPANRB	Kementerian Pendayagunaan Aparatur Negara dan Reformasi Birokrasi (Ministry of Administrative and Bureaucratic Reform)
KEN	Kebijakan Energi Nasional (National Energy Policy)
KLHK	Kementerian Lingkungan Hidup Kehutanan (Ministry of Environment and Forestry)
KLHS	Kajian Lingkungan Hidup Strategis (Strategic Environmental Assessment)
kWh	Kilowatt Hour
LCDI	Low-Carbon Development Initiative
LCSST2050	Low Carbon Society Scenario Toward 2050
LTS	Long-Term Strategy
LULUCF	Land Use, Land-Use Change and Forestry
MEMR	Ministry of Energy and Mineral Resources
MoEF	Ministry of Environment and Forestry
MtCO$_2$e	Million Metric Tons of Carbon Dioxide Equivalent

NDC	Nationally Determined Contribution
OCN	Open Climate Network
OJK	Otoritas Jasa Keuangan (Financial Services Authority)
PBL	Netherlands Environmental Assessment Agency
PLN	Perusahaan Listrik Negara (state-owned utility)
PPA	Power Purchase Agreement
PRIMAP	Potsdam Real-time Integrated Model for Probabilistic Assessment of Emissions Paths
RAN-GRK	Rencana Aksi Nasional Penurunan Emisi Gas Rumah Kaca (National Emissions Reduction Action Plan)
RAD-GRK	Rencana Aksi Daerah Penurunan Emisi Gas Rumah Kaca (Local Emissions Reduction Action Plan)
REDD	Reducing Emissions from Deforestation and Forest Degradation
REDD+	Reducing Emissions from Deforestation and Forest Degradation in Developing Countries, and the Role of Conservation, Sustainable Management of Forests, and Enhancement of Forest Carbon Stocks in Developing Countries
RKP	Rencana Kerja Pemerintah (Annual Workplan)
RPJMD	Rencana Pembangunan Jangka Menengah Daerah (Provincial Medium-Term Development Plan)
RPJMN	Rencana Pembangunan Jangka Menengah Nasional (National Medium-Term Development Plan)
RPJPN	Rencana Pembangunan Jangka Panjang Nasional (National Long-Term Development Plan)
RUEN	Rencana Umum Energi Nasional (National Energy General Plan)
RUPTL	Rencana Usaha Penyediaan Tenaga Listrik (Electricity Supply Business Plan)
SDSN	Sustainable Development Solutions Network
SNC	Indonesia's Second National Communication to the United Nations Framework Convention on Climate Change
TNC	Indonesia's Third National Communication to the United Nations Framework Convention on Climate Change
TNP2K	Tim Nasional Percepatan Penanggulangan Kemiskinan (National Team for Accelerating Poverty Reduction)
tupoksi	tugas pokok dan fungsi (core tasks and functions)
UKP-PPP	Unit Kerja Presiden Pengawasan dan Pengendalian Pembangunan (Presidential Work Unit on Monitoring and Controlling Development)
UNFCCC	United Nations Framework Convention on Climate Change
UNGC	United Nations Global Compact
WRI	World Resources Institute

CHAPTER 1: INTRODUCTION

For centuries, humanity has struggled with intertemporal choices—for example, whether to enjoy immediate gratification or postpone gratification to reap larger rewards. Humans often opt for what is easy over what is necessary. Climate change poses an intertemporal choice of towering proportions. What humans are choosing to do today will result in unintended consequences for the world's climate; protecting the climate will require difficult behavioral changes. In 2015, 196 countries adopted the Paris Agreement in a coordinated effort to limit global warming to well below 2°C above preindustrial levels and to pursue efforts to limit the temperature increase to 1.5°C above preindustrial levels (UNFCCC 2018a). Currently, more than 168 countries, including Indonesia, have submitted their post–2020 climate commitments. These nationally determined contributions (NDCs) describe how countries plan to reduce their greenhouse gas (GHG) emissions by 2025 or 2030 (UNFCCC 2018b).

Accomplishing the goals of the Paris Agreement requires transformations at scale and an ambitious strategy that will endure beyond the next 5–10 years. The Intergovernmental Panel on Climate Change (IPCC) report published in October 2018 warns of catastrophic impacts associated with a global temperature increase beyond 1.5°C; these are long-lasting and irreversible impacts that accrue to ecosystems with every increment of warming (IPCC 2018). The report also calls for rapid and far-reaching global transitions in land use, energy, industry, buildings, transport, and cities. The Brown to Green report on the Group of Twenty (G-20) countries' transition to low-carbon economies measured the G-20 countries' progress toward the Paris Agreement goals and found that none are on a pathway to limiting emissions enough to meet the 2°C or 1.5°C goal (Climate Transparency 2018). The UNFCCC invited countries to communicate by 2020 their mid-century, long-term, low GHG emission development strategies in accordance with the Paris Agreement (UNFCCC 2018a). To date, 12 countries (including France, Benin, Germany, Canada, Mexico, and the United States) have submitted to the UNFCCC a long-term strategy (LTS) that lays out their plans toward 2050. (For a full list of long-term strategies submitted to the UNFCCC, see https://unfccc.int/process/the-paris-agreement/long-term-strategies.)

Similarly, Indonesia could establish a mid-century climate target as part of an LTS. Indonesia is a member of the G-20 group and one of the world's largest GHG emitters, especially from the land-use sector (Republic of Indonesia 2016). As such, Indonesia, alongside a handful of countries, can "make or break" the Paris Agreement's temperature stabilization goal. Given Indonesia's growing economy and population, emissions from the energy sector are also projected to grow and will soon dominate Indonesia's emissions. In 2015, Indonesia committed to reduce GHG emissions by between 29 percent and 41 percent below a 2030 business-as-usual (BAU) scenario, depending on the international support received (UNFCCC 2018a). This commitment, however, is valid only until 2030. Moreover, Indonesia still has not considered any plans to reach peak emissions—that is, to decarbonize its economy and make the transition to net annual decreases in emissions. According to an analysis by the global change assessment model, at the current decarbonization rate, which continues to be Indonesia's NDC target beyond 2030, Indonesia is not projected to reach peak emissions until around 2080 (Joint Global Change Research Institute n.d.). With a revised NDC commitment and a more ambitious decarbonization rate of at least 5 percent annually, Indonesia could potentially reach peak emissions 50 years earlier, by 2030 (Figure 1.1).

Indonesia's LTS for climate action could provide a meaningful opportunity for Indonesia to assess the

Figure 1.1. **Indonesia's Emissions Trajectory under Current and More Ambitious Decarbonization Rates**

Source: World Resources Institute 2018d.

potential of accelerating the country's decarbonization rate and increase its current NDC ambitions. In 2020, Indonesia is invited to revise its NDC; the country could use this momentum to submit an LTS and position itself as a leading country for ambitious climate actions. Domestically, Indonesia's Ministry of National Development Planning has started developed a low-carbon development modeling exercise with a long-term projection as part of the Strategic Environmental Assessment (Kajian Lingkungan Hidup Strategis; KLHS) and Medium-Term National Development Plan (Rencana Pembangunan Jangka Menengah Nasional; RPJMN). This process has the potential to form the basis for the development of an LTS. That said, a policy gap remains in ensuring that there is further mobilization of resources toward this effort, including cultivating strong ownership from line ministries to increase the chances of effective implementation of low-carbon policies. This paper explores the benefits and urgency of developing and communicating Indonesia's LTS for climate actions. It also highlights the opportunities, challenges, and enabling environment within the country's national process.

Approach and Methodology

In looking ahead to mid-century, this paper seeks to assist the Indonesian government in answering the following questions:

- How urgent is it that Indonesia have a long-term climate strategy?
- Where is Indonesia in the process of developing a long-term climate strategy?
- What lessons can be drawn from existing long-term modeling of Indonesia's emissions?
- What does the institutional landscape look like for an effective LTS?
- What are some enabling factors for an effective LTS?

The qualitative analysis presented here combines a review of relevant studies and interviews with government officials and experts from universities and organizations that have a broad experience in the Indonesia's climate issues (see Appendix A). The focus is on practical insights that can guide implementation by key decision-makers.

This paper first identifies the potential benefits of a long-term climate strategy for Indonesia and discusses existing processes that could serve as building blocks in developing a long-term climate strategy. The main drivers for Indonesia's emissions in the medium- and long-term, as described by baseline scenarios from different modeling exercises, are described. These scenarios both provide key insights on these drivers and give a first idea of what type of policy interventions would be needed to reduce or abate emissions. The paper then identifies elements in the institutional landscape that appear to be critical to an effective LTS.

This paper draws on existing long-term modeling exercises and processes and highlights their potential to serve as a basis for Indonesia's LTS. There has been scant analysis of the environment that is needed to implement long-term climate pathway modeling. This publication is among the first to address a long-term climate strategy in Indonesia and make suggestions on how such a strategy could be incorporated into the current policy process.

The analysis provided here could provide a preliminary review as the Indonesian government begins planning for an LTS process in Indonesia. This paper puts heavy emphasis on climate mitigation efforts, specifically from the land-use and energy sectors, which together account for the country's major emitters. However, there are also opportunities to achieve climate risk resilience and adaptation benefits in conjunction with climate mitigation efforts. The paper also predicts the need to translate an LTS into an official document published by the Indonesian government to guard the implementation of the long-term targets and strategy for Indonesia.

The term "long-term climate strategy" includes not only the document expected to be submitted to the UNFCCC but also other national documents that provide long-term guidance in implementing Indonesia's climate targets, increasing its long-term climate ambitions, and outlining its approach to phasing out net emissions over time (Fransen et al. 2017).

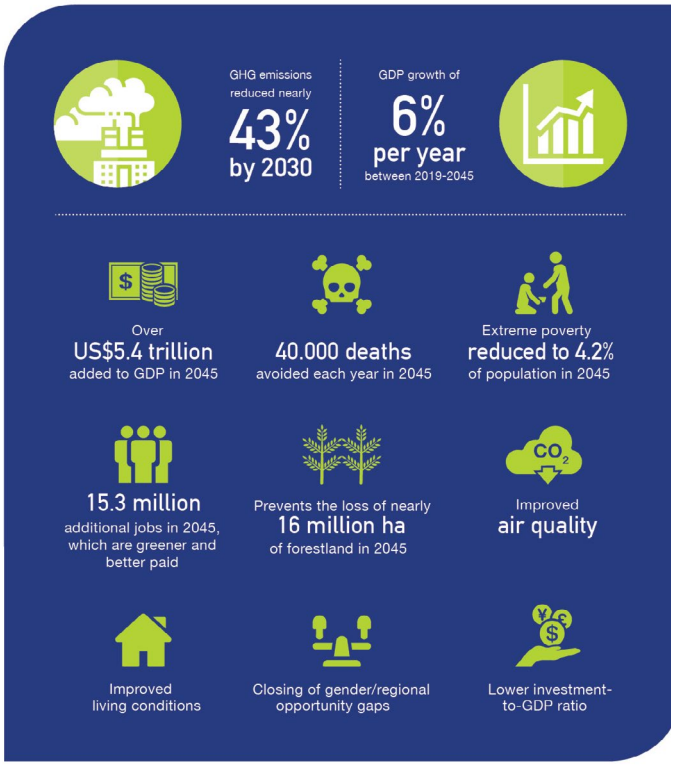
CHAPTER 2: THE URGENT NEED FOR, AND BENEFITS OF, INDONESIA'S LONG-TERM CLIMATE STRATEGY

By 2035, Indonesia's population of roughly 260 million today will rise by 67 million or more (Jones 2014). Along with this substantial growth in population will come the need for more food, water, energy, and land. At the same time, the 2030's is the decade in which Indonesia is predicted to enjoy a significant demographic bonus: the number of people of working age will be higher than the number of people of non-working age, such as children and senior citizens (Hayes and Setyonaluri 2015).

However, the time window is narrow: by roughly 2045, Indonesia will have an aging population. Therefore, 2030–2045 is the critical period in which Indonesia will seek an accelerated economic growth that can push the country into upper-middle-income status.

How can Indonesia address its needs and secure economic growth in light of climate change challenges? Preparing an LTS that considers the country's circumstances beyond 2030 is in Indonesia's self-interest if it is to provide the growth needed for its people. For example, the strategy could look at how Indonesia could manage its human and natural resources to benefit the economy, the people, and the environment. This type of long-term planning must answer diverse questions: What are some of the structural reforms and policies that have to be introduced? How much public and private investment would be required to achieve the plan's goals? Having a long-term vision and plan can affect both the near- and long-term development trajectory of Indonesia in a way that will make Indonesia's next plan and NDC more strategic and coherent. Developing a long-term climate change strategy will benefit Indonesia; there are also risks to inaction.

Figure 2.1 | **Benefits of Indonesia's New Low-Carbon Path**



Note: Low Carbon Development Initiative High Scenario compared with base case.
Source: Kementerian PPN/BAPPENAS 2019

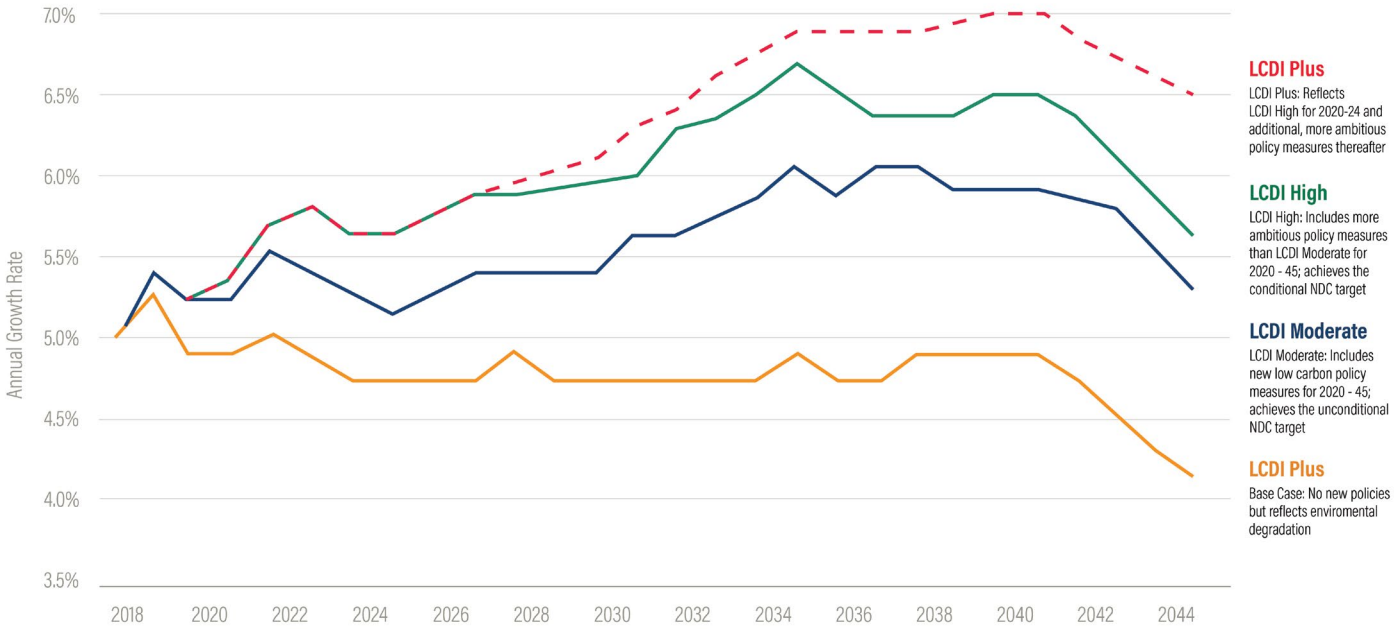
2.1. Economic and Social Development of the Energy and Land Sectors

Indonesia has grown and made significant progress for its citizens over the past two decades. During this period, Indonesia enjoyed an average GDP growth rate of 5.6 percent per year between 2000 and 2018 and per capita income has doubled (Badan Pusat Statistik 2018). In that time, Indonesia also halved extreme poverty; today, less than 10 percent of Indonesians live in extreme poverty. However, Indonesia's growth has been slowing down. The unsustainable exploitation of natural resources and investment in high-carbon, inefficient energy sources, are already depleting the well-being of the environment and public health. Continuing down this path would further destroy natural resources and limit productivity, which then limit growth, job creation, and poverty eradication.

Further, by the time Indonesia celebrates its 100th year of independence in 2045, Indonesia aspires to reach a level of GDP per capita comparable with that enjoyed today by countries such as Germany and The Netherlands. There are opportunities for Indonesia to reach this growth by embarking on a new sustainable pathway. According to the low-carbon development initiative (LCDI) assessment (Kementerian PPN/BAPPENAS 2019), which will be integrated into Indonesia's five-year development plan for 2020–2024 (RPJMN), a sustainable, inclusive, long-term growth path can deliver an average GDP growth rate of 6 percent a year until 2045. This is higher than the current BAU pathway (Figure 2.1). This pathway could reduce GHG emissions by almost 43 percent in 2030, surpassing Indonesia's current conditional national climate action plan. It could also reduce those in extreme poverty to 4.2 percent of the population and avoid 40,000 deaths each year in 2045 (Kementerian PPN/BAPPENAS 2019). In sum, the LCDI report finds that a low-carbon development pathway can unlock an array of economic, social, and environmental benefits (Figure 2.2).

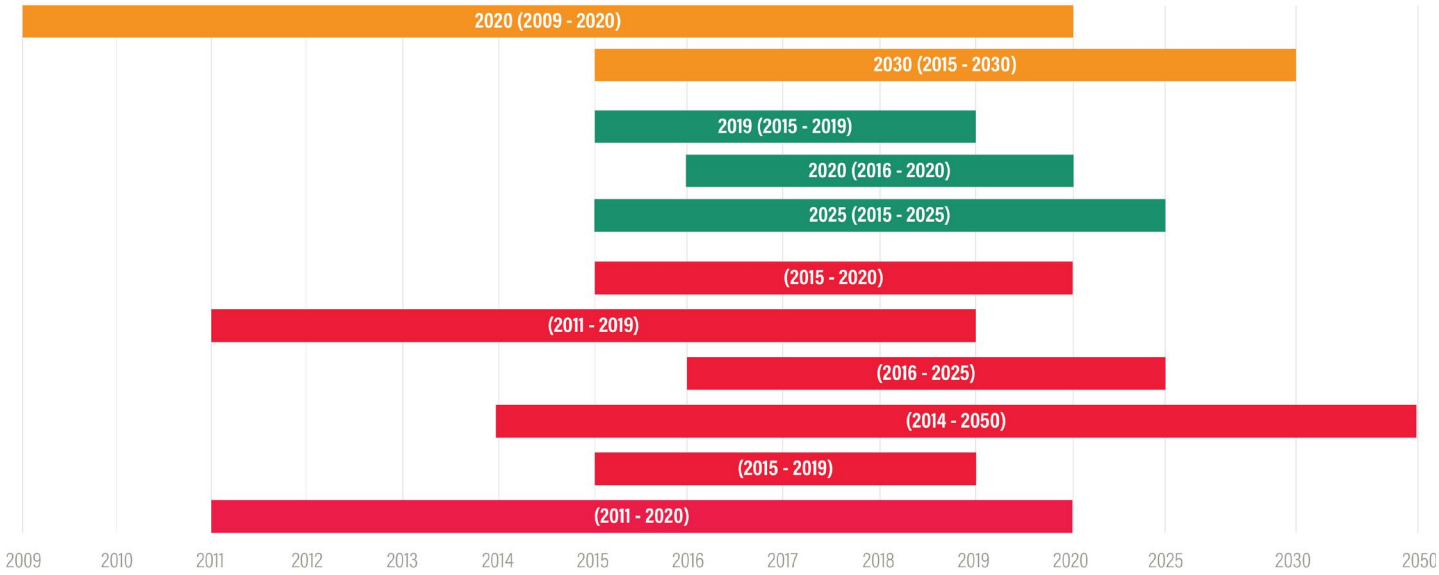
Indonesia does not have to wait to reap these benefits. However, the country does need to change its course of action, including implementing a set of actionable policies. A long-term climate strategy can provide a clear vision of sustainability and establish a pathway to guide near- and medium-term actions and planning for Indonesia. This will be necessary particularly in the energy and forestry sectors, which together account for 91 percent of Indonesia's total emissions (Republic of Indonesia 2015). This is of utmost relevance because most of Indonesia's existing international and national pledges guiding climate action in the land and energy

Figure 2.2 | Benefits of Indonesia's New Low-Carbon Path



Source: BAPPENAS Enviroment Directorate, based on result from Indonesia Vision 2045 Model - IV2045.

Figure 2.3 | Indonesia's International and National Pledges, Targets, and Plans to 2030



International Pledges

By 2020 (2009-2020)
- Unconditional 26% emissions reduction from BAU
- Conditional 41% emissions reduction from BAU

By 2030 (2015-2030)
- Unconditional 29% emissions reduction from BAU
- Conditional 41% emissions reduction from BAU

National Policies/Plans

By 2019 (2015-2019) Land and Forest Restoration Target: Restore 5.5 Mha of degraded land by 2019

By 2020 (2016-2020) Land and Forest Restoration Target:
- Peat Restoration Target: Restore 2 Mha of peatlands in priority provinces
- Social Foresty Target: Goverment - regulated forest area of about 12.7 Mha to be managed by local communities

By 2025 (2015-2025)
- Renewable Energy Target: 23% share of Renewable energy within national energy mix
- Energy Conservation Target: National target of energy intensity 1% decrease per year until 2025, and 21% energy conserved by 2030 from 7% in 2015

Domestic Targets

(2015-2020)
- Presidential Regulation No. 1 Year 2016 on Peat Restoration Agency

(2011-2019)
- Presidential Instruction No. 6 Year 2017 on Extension of ForestMoratorium Policy

(2016-2025)
- The Electricity Dupply Business Plan (RUPTL)

(2016-2025)
- Goverment Regulation No. 79 Year 2014 on National Energy Policy

(2016-2025)
- Medium Term National Development Plan (RPJMN)

(2016-2025)
- Presidential Regulation of the Republic of Indonesia No. 61 Year 2011 on The National Action Plan for Greenhouse Gas Emissions Reductions (RAN-GRK)

Source: Wijaya et al. 2017.

sectors will expire by 2030 (Figure 2.3). Although Indonesia has made a commendable commitment to curb its contributions to global warming, there is a risk of implementing climate policies with shorter time horizons and neglecting the country's long-term interests and needs (World Resources Institute 2018e). For example, Indonesia's moratorium on the issuance of new oil palm licenses is valid only until 2021. There is a risk of losing the forests after the moratorium policy expires. This moratorium policy should instead be a window of opportunity to undertake critical forest governance and agricultural and land-use reforms to improve land-use decisions in the country. Moreover, currently many environmental regulations in Indonesia overlap and conflict across different levels and sectors in the government.

Energy Sector

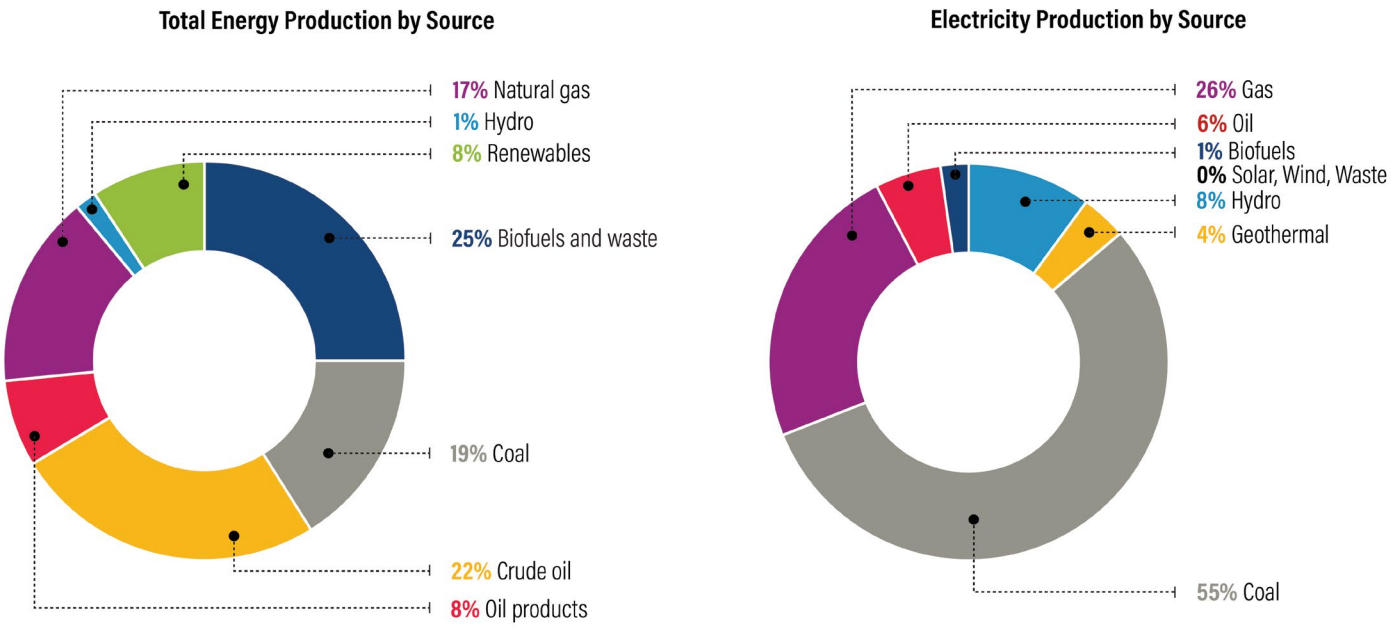
By 2030, Indonesia will be home to at least 290 million (Survei Penduduk Antar Sensus 2018) and up to 345 million people (Sulistyawati and Sasongko 2015). Along with the increase in population, Indonesia will experience an increased demand for energy and electricity. Between 2015 and 2030, Indonesia's total energy demand is projected to increase by 80 percent, while electricity demand could triple (International Renewable Energy Agency [IRENA] 2017). At the moment, although electricity access is widespread in the main islands of Sumatra, Java, Bali, Kalimantan, Sulawesi, and Papua, electricity reliability is limited. Indonesian end-users have reported frequent power outages and interruptions (Kunaifi and Reinders 2018).

Beyond adding more generation capacity, improvements should also prioritize designing the system to meet the need for affordable and reliable energy (Hamdi 2018). The availability and reliability of energy is vital in improving Indonesia's economic productivity and overall competitiveness.

According to the International Energy Agency (IEA), fossil fuels dominate Indonesia's energy mix: 66 percent of total primary energy supply and 87 percent of national energy production are provided by coal, oil, and gas (Figure 2.4) (IEA 2018a). Indonesia is the world's fourth-largest producer of coal and a top coal exporter, Southeast Asia's biggest gas supplier, and the tenth-largest gas producer (IEA 2018a). Despite these facts, Indonesia's imports of oil and oil products have been rapidly increasing in recent years. Studies such as the BPPT Energy Outlook 2017 (Badan Pengkajian dan Penerapan Teknologi 2017) predict that oil-based fuel will continue to dominate the country's energy mix until 2050 because of existing oil-dependent technology, particularly in the transportation sector, where demand is growing by 4.7 percent annually (Figure 2.5). Although arguably at a slower rate than that of the historical scenario, Indonesia is currently on a course to continue to use fossil fuel energy in the next 30 years.

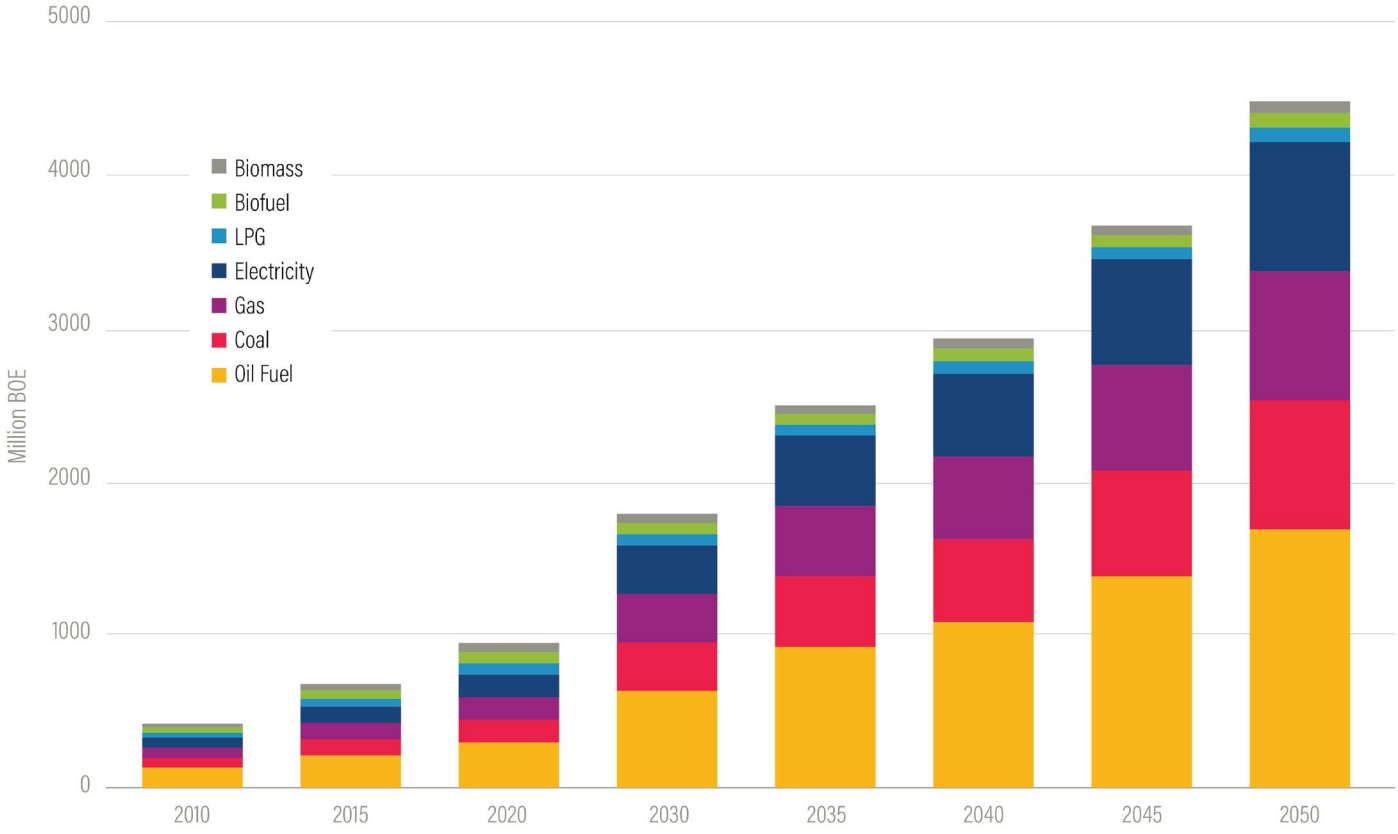
Beyond coal, subsidies for fossil fuel that distort energy prices must also be addressed, despite a recent cut in 2015 onwards. According to the IEA, Indonesia allocated approximately 64 trillion Indonesian rupiah (IDR) (US$5 billion) for fuel subsidies in its

Figure 2.4 | **Indonesia's Total Energy Production and Electricity Production by Source**



Source: Wijaya et al. 2017.

Figure 2.5 | **Final Energy Demand by Type in Indonesia Electricity Production by Source**



Note: BOE = barrel of oil equivalent.
Source: BPPT 2017.

2016 budget, compared with IDR 240 trillion ($19.3 billion) in 2014 (IEA 2016a). Indonesia's fuel subsidies mainly covered transportation fuels. According to the IEA estimates, only 5 percent of the poorest third of Indonesian households benefit from this budget or consume subsidized fuel; by contrast, 70 percent of the wealthiest top third of households consume subsidized fuels. Energy subsidies do not only hurt productivity, they also damage the environment through enabling higher levels of consumption; given Indonesia's net-importer status, they also widen the current account deficit. As Indonesia goes through the economic transition toward industrialization, energy subsidy removal may be able to nudge companies toward opting for more efficient machineries and assets that improve manufacturing productivity (World Bank 2018).

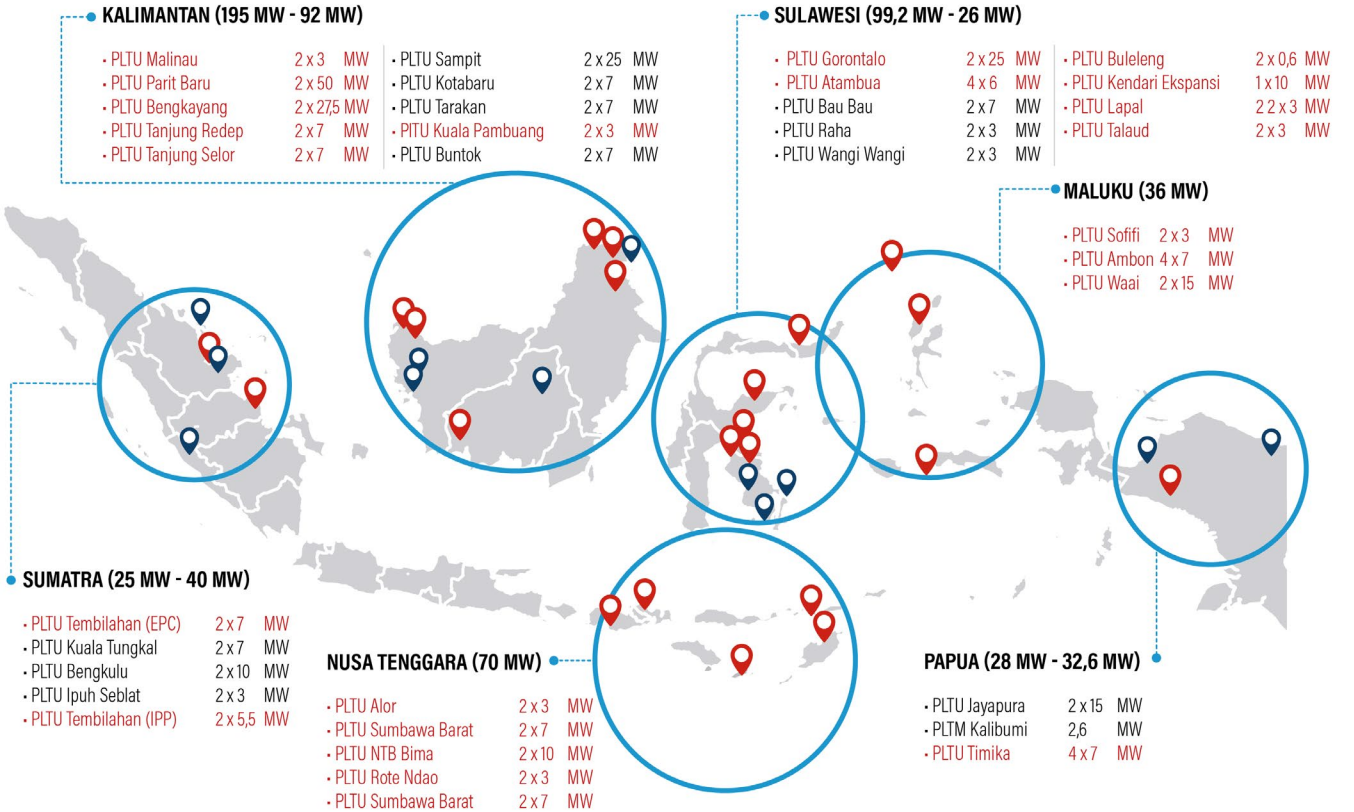
A recent study by the World Resources Institute projects that the energy sector could dominate Indonesia's GHG emissions by 2026–2027, largely because of continued reliance on fossil-fuel-based energy (Wijaya et al. 2017). Therefore, in the long term, promoting renewable energy sources and energy conservation offers significant emissions abatement potential for Indonesia. In its NDC, as well as in the 2014 National Energy Plan, the country pledged to achieve an energy mix of 23 percent new and renewable energy by 2025 and at least 31 percent by 2050 (Republic of Indonesia 2016). Combining this target with energy conservation policy would allow Indonesia to reduce projected BAU emissions in 2030 by 544 metric tons of carbon dioxide equivalent ($MtCO_2e$) or equal to 18 percent emission reduction (Wijaya et al. 2017). A view of global trends and a look toward the long-term Paris Agreement goals (and the vision of sustainable growth in Indonesia) suggest that there are some important elements to consider.

First, as both developed and developing countries continue to move toward new and renewable energy sources, Indonesia will have to decommission, replace, or abandon some or all of its "brown-energy"-based infrastructure. Global trends indicate decreasing demand for fossil-fuel-based energy. For example, in the past two years, there has been a declining trend in coal imports by two large coal importing countries, India and China (Timms 2016). Many experts believe that the loss of share by thermal coal imports is permanent and will be terminal by 2020 (IEEFA 2016), especially in light of recent falls in global renewable energy prices. There is a clear and immediate risk that Indonesian exports of coal will decline and coal mines will become stranded

financial assets, especially with exports accounting for 80 percent of total coal mined in the country (Timms 2016). There is also a growing demand for renewable energy power plants from the private sector. For example, the RE100 movement is an initiative in which more than 100 influential global companies have agreed to source 100 percent of their global electricity consumption from renewable sources by a specified year (RE100 2019). With many of these companies influencing business operations around the world, there will be a massive increase in demand for and delivery of renewable energy everywhere, including in Indonesia. Considering these developments, Indonesia will need to follow suit and decide on a domestic shift to renewable energy. Sooner or later, Indonesia's full implementation of existing and potentially new domestic renewable energy policies could turn Indonesia's coal-dependent infrastructure into stranded assets. Because it takes a relatively long time for a power plant, a building, or a vehicle fleet to reach the end of its economic lifespan, early termination of Indonesia's brown-energy-based infrastructure will result in stranded assets and long-term costs. The fact that no near-term action is being taken to avoid locking in more carbon suggests the shift may be expensive and highly inefficient.

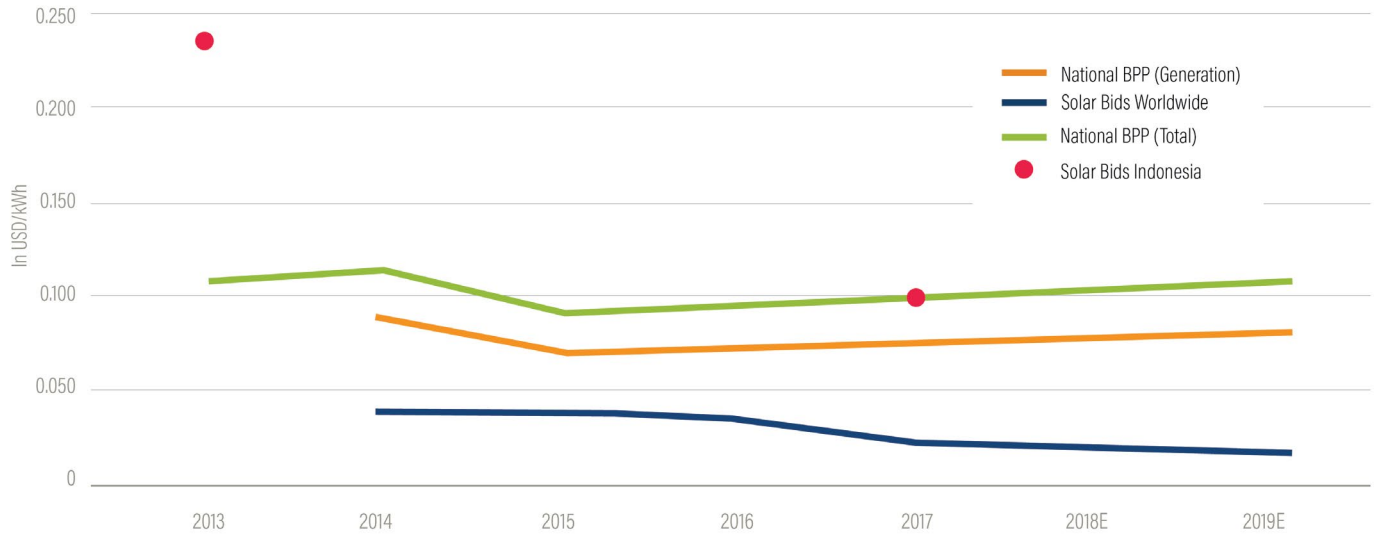
An LTS becomes essential because it could inform development plans—including power plant expansion strategy—in ways that a short-term plan could not. Indonesia's state-owned utility (Perusahaan Listrik Negara; PLN) is responsible for developing the Electricity Supply Business Plan (RUPTL) document, a medium-term plan for electricity development in Indonesia. The most recent RUPTL, for 2018–2027, was launched in 2019 and remains anchored in old technology and is overly reliant on fossil fuels to meet predicted needs (Brown and Hamdi 2019). PLN's forecast has been closely tracking the electricity demand with expected GDP growth. However, evidence suggests that the more advanced an economy becomes, the more the energy intensity of said economy will decline as energy usage decouples from growth and productivity per unit of energy increases (Hamdi 2018). Thus, PLN's power plant expansion strategy has continuously failed to forecast Indonesia's increased efficiency and, in turn, the shift in overall demand. Recently, the financial regulatory body (Badan Pemeriksa Keuangan; BPK) identified 34 abandoned coal power plants in Indonesia (Figure 2.6) because of the depreciation of the rupiah and weakening demand (Syahni 2016). For such development, the government already spent IDR 4.94 billion ($350,000) (Difa 2016). Although some

Figure 2.6 | **Distribution of Abandoned Coal Power Plants in Indonesia Production by Source**



Note: Continued plants (red); terminated plants (black).
Source: Syahni 2016.

Figure 2.7 | **Comparison of PLN Electricity Production Cost (BPP) and Historical Solar Bids Worldwide and in Indonesia**



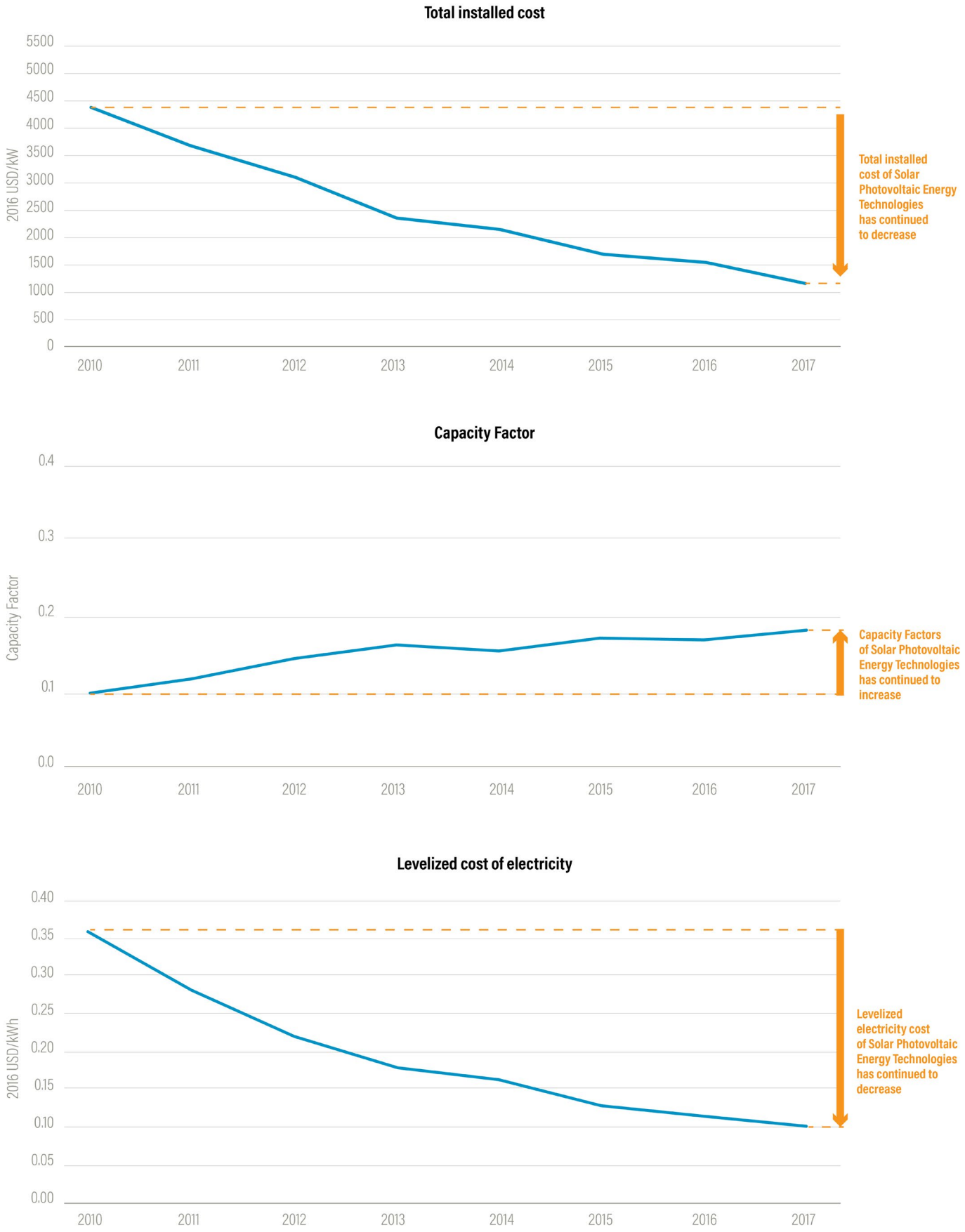
Source: Hamdi 2018.

of these assets may still be developed in the upcoming years, the termination of some of the abandoned power plants (totaling around 190 megawatts) will cost the country an additional IDR 2.3 billion ($161,000) (Difa 2016). The abandonment of these power plants shows the limits of how power generation is planned in the first place (Hamdi 2018). Such costly scenarios are likely to continue without adequate, foresighted planning in the development of new power plants. With long-term considerations including the trend toward renewable energy, a phase-out of coal in Indonesia's development of power plants has to be considered and calculated. Development of an LTS could help Indonesia avoid building costly structures that would last only for a short time.

Second, in determining its 2030 and 2050 energy mix goals, Indonesia may be misled by today's (or yesterday's) cost information for renewable energy development. Lack of transparency is one of the foremost challenges across the Indonesian electricity sector. Verifiable data on the real cost of electricity production are difficult to find. PLN's cost of generating electricity (biaya pokok produksi; BPP) has been used as a basis for many things, such as tariffs on independent power producers (IPPs), electricity pricing for consumers, and subsidy calculations, but the data used in calculation are hidden (Hamdi 2018). This lack of transparency has been an advantage for the nation's coal industry in advancing more coal-fired power generation. Despite outside studies showing how high the real costs of coal-fired generation are, government officials and the PLN have continued to back coal as the cheapest source of electricity and have insisted on building more coal-fired generation (Hamdi 2018). Those government and PLN assertions are outdated (Figure 2.7).
Figure 2.7 shows how PLN's coal-dependent electric generation costs have been well above the price of solar bids worldwide for the past five years (Hamdi 2018). At the same time, the cost for renewable technologies such as solar energy continued to decline (Figure 2.8), coming well into the cost range of fossil fuels. Many studies, such as the ones published by IRENA (2018), and Bloomberg New Energy Finance (BNEF) (2018), support the idea that the economic case for building new coal and gas capacity is crumbling, especially as batteries start to encroach on the flexibility and peaking revenues enjoyed by fossil fuel plants.

Indonesia's almost 700 gigawatt total of renewable energy capacity is ready to be harvested with the right investment and technology (Table 2.1) (IRENA 2018). Considering the rapidly declining cost of renewable energy, the average coal unit in Indonesia is projected to retire at just 15 years old, a far shorter lifespan than the assumed lifespan of standard coal plants, around 40 years (Benjamin 2018). In these circumstances, common economic sense should already be driving Indonesia to shift power generation investment toward domestic, clean, renewable energy solutions while recognizing that capacity building may be necessary to accompany the change with grid flexibility investments. As the technology becomes more affordable and renewable energy prices worldwide decrease, there is a call to review Indonesia's cost of generating electricity to reflect such changes. Indonesia should also review whether the targets of 23 percent renewable energy by 2030 and 31 percent by 2050 are ambitious enough to

Figure 2.8 | **Global Weighted Average Total Investment Costs of Solar Photovoltaic Energy Technologies, Capacity Factors, and Levelized Cost of Electricity Since 2010**



Source: IRENA 2018.

Table 2.1 | **Total Potential of Renewable Power Capacity**

GW	REFERENCE CASE 2030		THEORETICAL POTENTIAL FOR RENEWABLE POWER CAPACITY	THEORETICAL POTENTIAL BY RENEWABLE ENERGY POWER TECHNOLOGY						
	ON-GRID POWER CAPACITY	ON-GRID RENEWABLE POWER CAPACITY		SOLAR PV	LARGE HYDRO-POWER	SMALL HYDRO-POWER	BIOEN-ERGY	GEO-THERMAL	MARINE ENERGY (TIDAL)	WIND (ONSHORE)
Sumatra	39.2	17.6	196.2	137.1	15.6	5.7	15.6	12.9	8.3	1.0
Jawa-Bali	119.8	19.1	71.5	38.7	4.3	2.9	9.2	10.1	2.4	3.9
Kalimantan	10.3	5.4	184.2	149.0	21.6	8.1	5.1	0.2	-	0.3
Sulawesi & Nusa Tenggara	20.3	11.6	97.6	66.8	10.8	1.8	2.6	4.8	6.9	3.9
Maluku & Papua	3.9	2.1	166.8	140.9	22.8	0.8	0.2	1.5	0.4	0.3
Total Indonesia	**193.5**	**55.8**	**715.4**	**532.6**	**75.0**	**19.4**	**32.7**	**29.5**	**18.0**	**9.3**

Source: Kementerian PPN/BAPPENAS 2019.

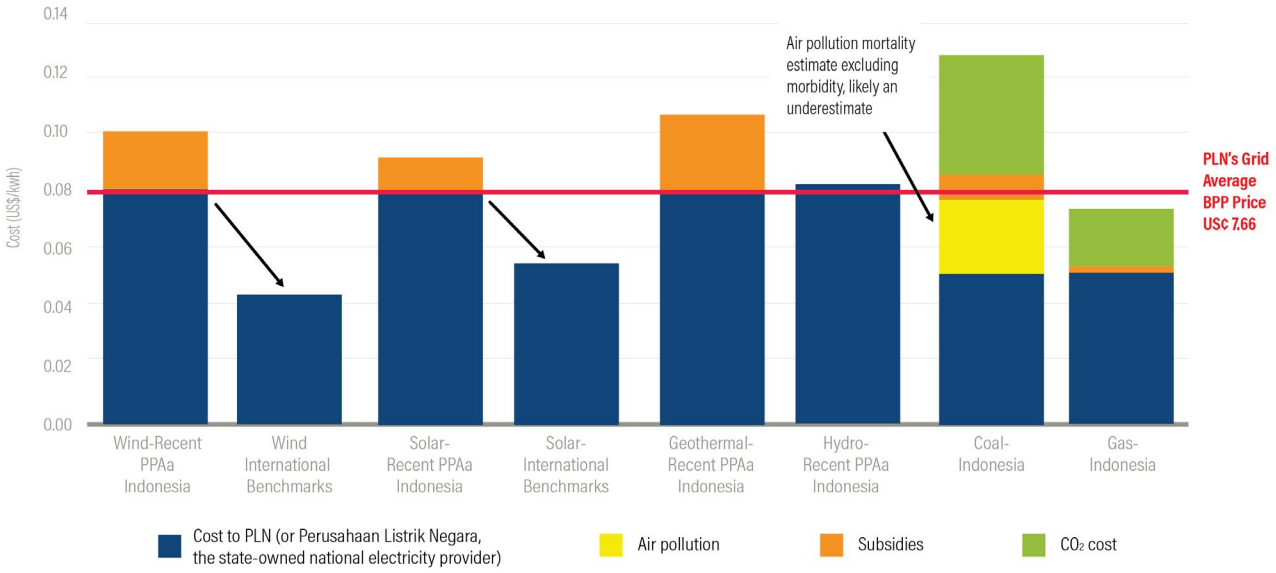
achieve the global Paris Agreement goals and to exploit Indonesia's full renewable energy potential. Beyond achieving emissions reduction goals, renewable energy development could help the Indonesian government provide better service delivery and achieve its electrification target for some of the most remote areas in the country (Kirari et al. 2018).

An LTS is necessary to include the true costs of fossil-fuel-based and renewable-energy-based power plants—costs that are invisible in the short run. Although a continued focus on coal could help close Indonesia's energy demand gap, it carries serious immediate costs and risks to society. Coal-fired plants are responsible for hundreds of pollution-related deaths each year and for environmental and public health consequences (International Institute for Sustainable Development 2017). A Greenpeace study estimates that each large (1,000 megawatt) coal plant is expected to result in the deaths of 600 Indonesians per year (Greenpeace 2015). Despite these negative impacts, Indonesia's coal industry and electricity sector still receive subsidies that lock in coal use and coal development over the next decades. In contrast, renewable energy is often portrayed as too expensive to build on a large scale. However, when a full cost analysis of coal-based and renewable-energy-based generation considers negative externalities, such as air pollution and GHG emissions, the picture changes. When these effects are monetized, the total cost of coal is estimated to be around $.13 per kilowatt hour (kWh), more than double the cost of competing renewable-energy-based generation in recent global renewable auction results (Attwood et al. 2017) (Figure 2.9).

Higher renewable energy uptake would reduce the total costs of the energy system and strengthen Indonesia's energy security (IRENA 2017). IRENA's study (2017) assessed Indonesia's additional renewable energy power in different regions, including Java-Bali, Kalimantan, Maluku and Papua, Sulawesi and Nusa Tenggara, and Sumatra. According to these regional potentials, the study found that Indonesia could increase its share of renewable energy to 23 percent in total final energy consumption (or 31 percent in total primary energy supply) by 2030. This is two decades sooner than Indonesia's current 2050 energy mix target. By increasing the share of renewable energy and replacing conventional fuels, the savings to the energy system in 2030 is estimated at $1.7 billion per year. This would also reduce demand for fossil fuels by 10 percent relative to BAU. The impact is the largest for coal (around minus 17 percent), and for oil (minus 9 percent), and thus would also contribute to reducing petroleum imports. Further, scaling up renewable energy sources can save Indonesia between $15.6 billion and $51.8 billion per year when externalities such as air pollution and climate change are included (IRENA 2017).

As Indonesia is projected to grow and invest in a more digital future, one where demand is expected to grow more rapidly than in the past, PLN must revisit its plans to rely on inflexible coal generators (Hamdi 2018).

Figure 2.9 | **Cost Comparison of Electricity Production Sources in Indonesia, 2018**



Source: Kementerian PPN/BAPPENAS 2019.

Modernizing the transmission and distribution sector is imperative to account for changing demands on the system. Overall, policymakers and investors need to direct their actions to minimize stranded assets and avoid high-cost energy source lock-in. An LTS document could be a vehicle for discussion of these short-term and long-term cost considerations and an appropriate renewable energy target for Indonesia. Change is sweeping global electricity-generation markets and it is not too late for Indonesia to take part.

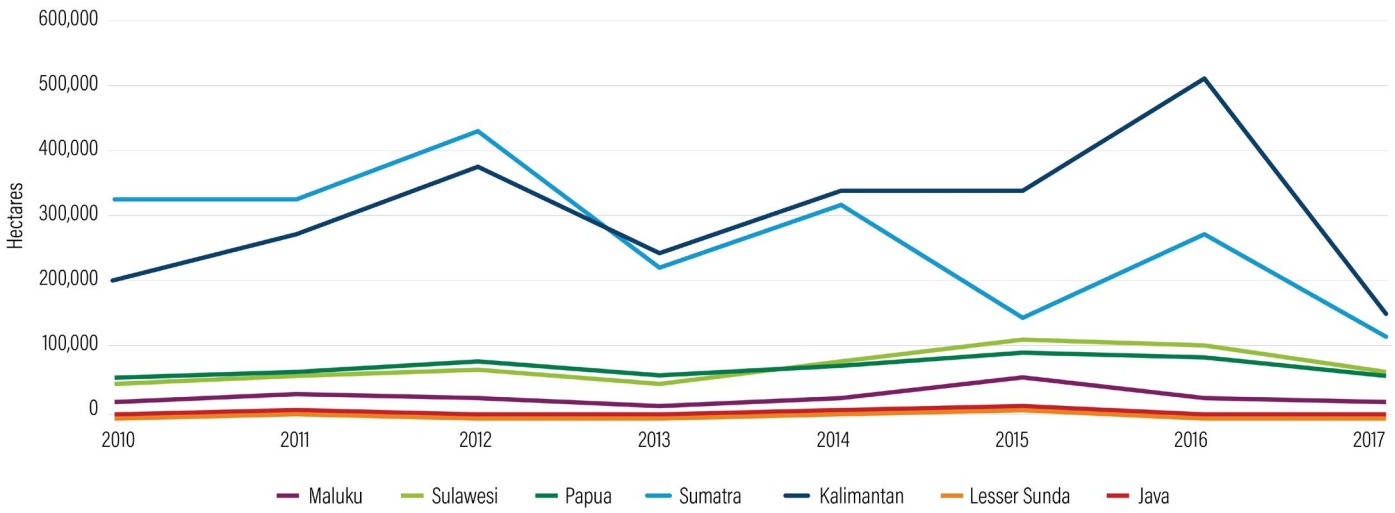
Land Sector

Like the energy sector, Indonesia's demographic trend will be a critical factor in deciding the country's management of the land-use sector as it is related to food security, agricultural production, and the livelihoods of millions of Indonesians. Currently, Indonesia's productivity in the agricultural sector is still low, including in the oil palm industry. Furthermore, deforestation of Indonesia's formerly pristine forests continues, although it has been declining in the past year (Hamzah et al. 2018). As a result, Indonesia still has much work to do to achieve sustainable land-use management. Challenges such as smallholders' limited access to resources and skills persist for this transition. Meanwhile, the risk of losing ecosystem services, biodiversity, and livelihoods for more than 50 million people living in and around the forest—including indigenous people and vulnerable communities—continues to loom.

Currently, the agriculture, forestry, and land-use sectors (AFOLU) contribute more than half of Indonesia's GHG emissions (Wijaya et al. 2017). As demand for food and water increases along with population growth and export targets, achieving the Paris Agreement's goals will require long-term planning in relation to land management. With Indonesia hosting one of the world's largest tropical forests and peatland and mangrove areas, any mismanagement in the land-use sector would cause a disturbance in the portion of the nation's economy that is largely dependent on the forest and agriculture resources. Unclear land tenure and overlapping licenses for land sector businesses, such as timber, oil palm, and mining concessions, are the most prominent issues to be resolved by the government. It is imperative to make sure that the competition among sectors and stakeholders for utilization of land in Indonesia can be better guided under a long-term framework.

First, setting a long-term framework in Indonesia's land-use management and governance would protect Indonesia's economy and society from future losses. In 2015, Indonesia faced an estimated $16.1 billion (IDR 221 trillion) loss caused by forest fires that burned 2.6 million hectares of land (World Bank 2016). This economic loss is equivalent to 1.9 percent of Indonesia's 2015 GDP, which is more than twice the cost of reconstruction after the 2009 tsunami in Aceh. Haze from the fire has contributed to the deaths of 19 people and more than 500,000 cases of acute respiratory infections. These forest fires were man-made fires, largely driven by the draining and conversion of peatland for palm oil production and timber plantations. Fire has long been a tool to open land for agriculture in Indonesia. Although agricultural gains could be significant in the short run, these benefits are felt by

Figure 2.10 | **Indonesia's Primary Forest Loss by Island (hectares)**



Source: Hamzah et al. 2018.

only a few; economic losses and damages associated with fire are borne by the whole nation.
Indonesia should reconsider the implications of continued growth of agricultural land expansion. For example, Indonesia is still focused on palm oil exports and the new and increasing biodiesel mandates for domestic use, which caused the area covered by oil palm plantations to expand by 7.67 percent annually from 2004 through 2014 (Kementerian Pertanian Direktorat Jenderal Perkebunan 2014). According to the Ministry of Agriculture, Indonesia is using more than 10.9 million hectares of its fertile lands to produce crude palm oil. Although this growth might be perceived as economically beneficial and necessary in the short run, the government must begin developing a response to the local ecological impacts of oil palm expansion, such as hotter, drier weather, increased risk of fires, and subsidence in peatland areas. A long-term climate strategy could help build awareness around the extent to which Indonesia could continue to exploit its lands. Moving forward, these considerations become critical in determining spatial plans and issuance of land-use permits.

Second, by maintaining and restoring land-use ecosystems right now, Indonesia could build resilience to tomorrow's climate (Seymour 2018). Indonesia should consider building the protection of forests, peatlands, and other natural ecosystems into long-term strategies for resilience in sectors such as water, energy, and public health and safety. Land sector emission reductions are associated with many co-benefits that advance the sustainable development goals of the United Nations, such as clean water, clean energy, and prevention of natural disasters. For example, forested watersheds provide reliable supplies of clean water for municipal water and sanitation, as well as irrigation water for agriculture. Intact natural ecosystems, especially forests, are also key in disaster prevention: forested watersheds also attenuate floods and landslides, mangrove forests buffer life and property from coastal storms, and inland forests mitigate temperature and rainfall extremes and their impacts on agriculture and health (Seymour and Busch 2016).

Third, by investing in low-cost, land-based emission reductions now, Indonesia could avoid higher-cost, more technology-intensive mitigation options in the future (Seymour 2018). Indonesia's forests are a natural infrastructure for a global carbon sink. Maintaining these existing carbon-dense ecosystems should be Indonesia's highest priority, as they are not dependent on the deployment of new technology, as are some other climate mitigation solutions. According to one estimate, reducing emissions from deforestation alone constitutes more than 60 percent of the low-cost emission reductions in developing countries (Busch and Engelmann 2017). Indonesia should see its forests as key assets in offsetting its own residual emissions and, further, in providing economic benefits for the country. By protecting and restoring its forests, Indonesia could participate in international financing opportunities and be rewarded for its forest management, just as it has done under the global effort in reducing emissions from deforestation and forest degradation, plus the sustainable management of forests, and the conservation and enhancement of forest carbon stocks (REDD+) (Seymour 2018). REDD+ is a framework negotiated under the UNFCCC as a way for industrialized countries to reward developing countries for reducing forest-based emissions and enhancing removals.

The centerpiece of Indonesia's NDC in the land sector is the two-year moratorium on the licensing of primary forests and peatlands which has just recently been made permanent. Presidential Instruction No. 6/2017 instructs ministries and government agencies to stop issuing land-use permits within primary forests and peatlands and applies to an area equivalent to three times the size of Great Britain (World Resources Institute 2019). This policy has been commended for its potential to achieve the largest source of emissions reduction of approximately 188 $MtCO_2$ by 2030 (equivalent to a 6.5 percent emission reduction against the BAU scenario) (Wijaya et al. 2017). In 2017 alone, Indonesia experienced a reduction of 60 percent in loss of primary forest cover compared with 2016 (Figure 2.10) (Hamzah et al. 2018). Indonesia received financial compensation from Norway as part of its REDD+ agreement for successfully reducing 4.8 million tons of carbon dioxide emissions from deforestation (Jong 2019).

Other than deforestation, Indonesia's biggest challenge in the land sector is curbing peatland and forest fires, which contribute significantly to Indonesia's overall emissions profile. The peatland and forest fires of 2015 produced more daily GHG emissions than the entire U.S. economy (Harris et al. 2015). They also provided evidence of the land's finite ability to recover. This prompted Indonesia to issue Presidential Regulation No. 2016, which includes a commitment to restore 2 million hectares of peatlands by 2020. By 2018, Indonesia had restored 1 million hectares, according to the Peatland Restoration Agency (Pantau Gambut 2018).

That said, more actions have to be taken to sustain this momentum. Although a permanent ban on converting primary natural forest and peatlands has been initiated, and this certainly will be significant in achieving GHG emission-reduction targets, more ambitious targets, such as including secondary degraded forest in the moratorium, could be beneficial for the climate. In developing an LTS, Indonesia could consider incorporating solutions that protect the country's remaining forests while pursuing the 2030 and later emissions reductions goals. Consideration of long-term trends also become critical in ensuring the success of other land-based emissions mitigation initiatives, such as restoration of ecosystem functions and community-based forest management.

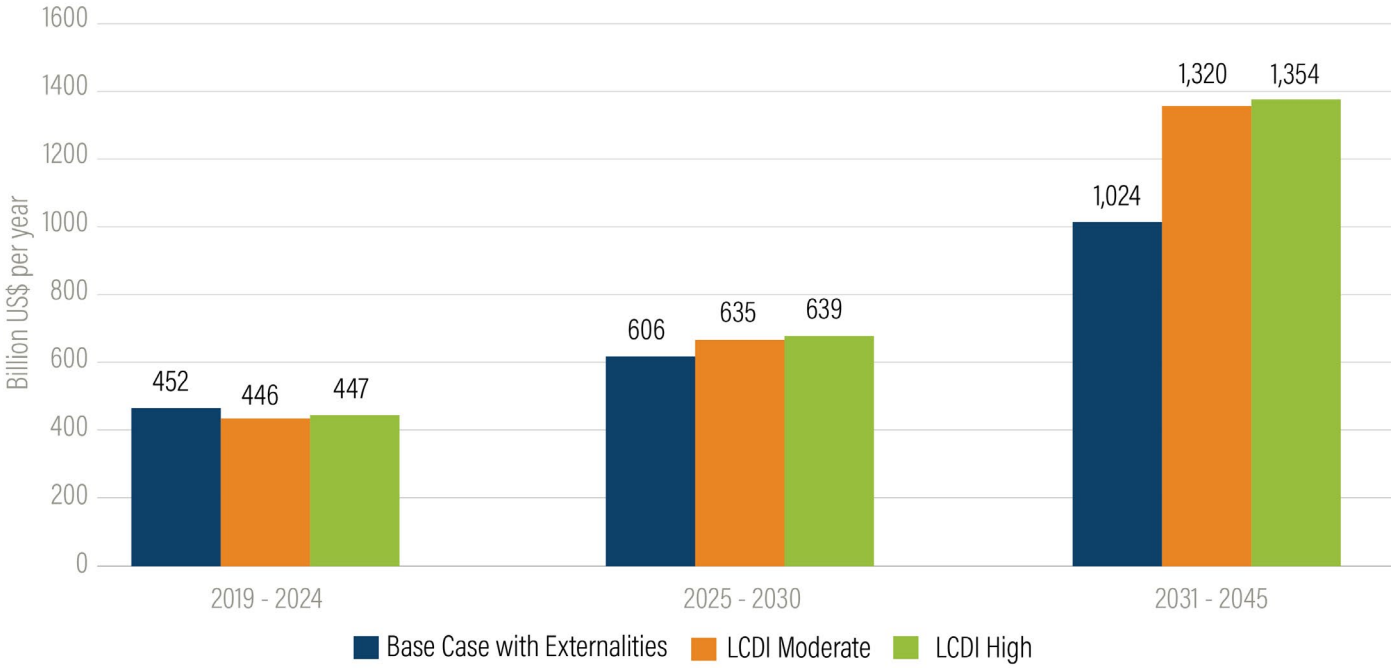
The economics of short-term and long-term planning at the national level could draw some examples from the household budgeting process. Looking only at one month's income and needs will lead to very different decisions from a process that factors in, for example, future college tuition needs (World Resources Institute 2018f). The latter would prompt the householder to set up automatic transfers to a savings account instead of spending all monthly income on expensive food or clothing. In the land sector, the state budget cost for fire suppression could instead be allocated for long-term sustainable land management that could prevent forest and peat fires in the first place. Addressing the issue of fires in Indonesia must start upstream, before the fires occur, which means shifting the focus from fire suppression to fire prevention efforts. Similarly, considering long-term trends and net-zero emissions aspirations may help Indonesia avoid some other expensive decisions in the short term.

2.2. Increasing Certainty for Private Sector Investment

In general, the availability of funds for reducing GHG emissions in Indonesia is insufficient when compared with funding needs. A 2012 study by Indonesia's Ministry of Finance showed that approximately $70.5 billion is needed to achieve the 2020 emissions reduction target; the public funds available in the state budget would only be able to achieve around 15 percent of this amount (Ministry of Finance 2012). As reported by BAPPENAS and quoted in the NDC, from 2007 to 2014 Indonesia spent around $17.5 billion for climate change adaptation and mitigation activities. Furthermore, the NDC states that Indonesia will continue to finance climate change plans and actions, including allocating $55 billion for the 2015–2019 period (Republic of Indonesia 2016). The low-carbon development initiative assessment by BAPPENAS also identifies the financing resources (Figure 2.11) required to reach Indonesia's unconditional (LCDI Moderate) target of 29 percent emission reductions in 2030 and conditional national climate targets of 41 percent emission reductions in 2030 (LCDI High).

Consequently, private financing will be key to low-carbon, climate-resilient investment. The climate finance discourse has focused largely on public finance sources (state budget) and on scaled-up grants from international development partners (Kementerian Keuangan and Climate Policy Initiative 2014). It is also necessary to be attentive to the strength and longevity of funding to maximize impact on the ground. This implies the need to tap into new and diverse funding sources, including commercial private sources (such as commercial banks, impact investors, philanthropists, and others). Indonesia could mobilize a rising ecosystem of institutional investors, particularly from emerging economies such as those in Asia. Currently, there is

Figure 2.11 | **Total Investments Needed for Indonesia's Unconditional (LCDI Moderate) and Conditional (LCDI High) NDC Targets**



Source: Kementerian PPN/BAPPENAS 2019.

an increase in demand from institutional investors for green investment opportunities or for investments that reduce risks arising from climate change, encourage social progress, and support sustainable development. The International Finance Corporation estimates a climate-smart investment potential of $23 trillion in 21 emerging market countries between now and 2030 (International Finance Corporation 2016). How can Indonesia unlock these investments?

Indonesia's LTS could help direct investment to where it is needed. The current policy context encourages investment in long-lived infrastructure and assets that may not be viable in the long term. An LTS could help steer domestic investment into areas that have long-term benefits, avoid loss of market value for financial institutions, and avoid the economic consequences of over-investment in technologies, industries, and infrastructure that are likely to become stranded as the world decarbonizes. Public policy could provide incentives for private sector investments in a way that is compatible with Indonesia's long-term growth. Long-term decarbonization strategies will need investments from both the public and private sectors. Increasing commercial demand for climate change solutions, setting bold climate and clean-energy targets, and increasing investment in climate change solutions from businesses send strong signals to government in support of stronger climate policy. Strong policies, bold targets, and clear timelines from governments will send the first signal and create clear market opportunities for clean solutions from business and enable them to go further. This is the "ambition loop"—a positive feedback loop between the private sector and government that accelerates progress toward the objectives of the Paris Agreement and sustainable development goals (United Nations Global Compact et al. 2018). Companies will move only if corporate governance leaders seriously integrate climate-related risks into their investment plans. Public policy and resources remain the source of clarity and of signals for the movement of investment. That also means communicating the nation's future direction clearly and eliminating counterproductive policies.

Given the importance of domestic private investment, an LTS as a guide to domestic public policy and support frameworks could create an "enabling environment" that supports domestic investment in low-carbon and climate-resilient projects. Stable and supportive policy frameworks can close the gaps in risks and returns between BAU investments and climate-compatible ones. Strategies can consider targeted supportive policies, such as removing subsidies from carbon-intensive sectors and providing feed-in tariffs, guarantees, tax incentives, and concessional loans. Analysis has shown that Indonesia can improve its fiscal policy frameworks to meet tax revenue and emission-reduction targets, as well as incentivize higher productivity (Mafira et al. 2015).

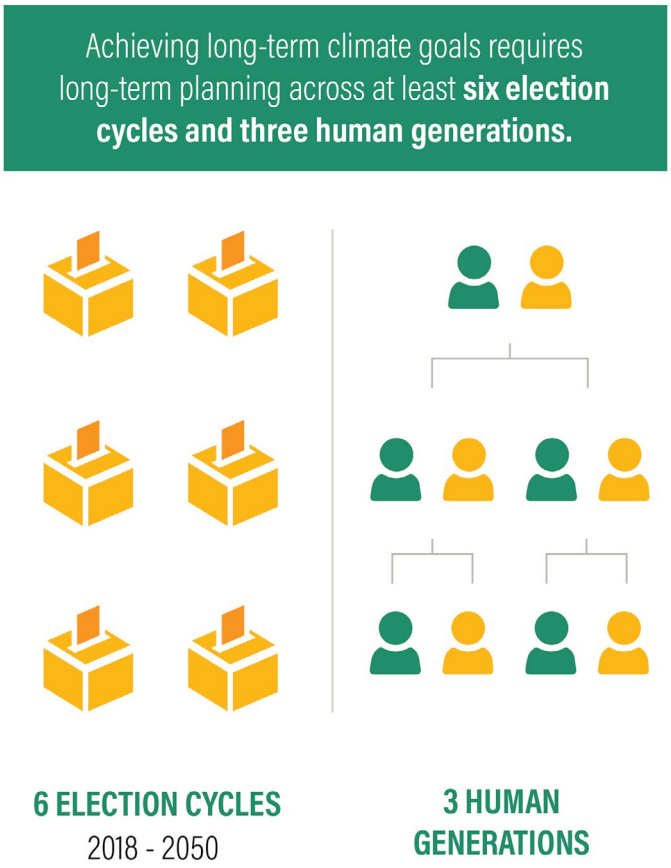
In Indonesia alone, various incentives have also been issued to encourage the implementation of environmental restoration and financing. Government Regulation Number 46 of 2017 concerning environmental economic instruments (Instrumen Ekonomi Lingkungan Hidup; IELH) provides a legal basis for regulating various market-based innovative opportunities in the form of green banking, green fiscal policies, green capital markets, and green insurance. The Financial Services Authority (OJK) has issued green bond regulations for the issuance of domestic bonds, namely green sukuk, the first sovereign green sukuk debt instrument in the world. In 2017, green sukuk experienced an oversubscription of 3.6 times (Climate Bonds Initiative et al. 2018). The success of the government's green sukuk issuance in March 2018, followed by the issuance of PT Sarana Multi Infrastruktur's green sukuk and bond, which was a real milestone, suggests that innovative funding initiatives are no longer just a proposal. Although green bonds are still in the early stages of development in Indonesia, these developments indicate that there is an important financial channel option for stakeholders to help the country's transition to a low-carbon economy.

The heightened awareness of the Paris Agreement's implications for future investment in carbon-intensive sectors offers more opportunity to incorporate climate risks in investment decisions. Future investment decisions will have to consider two risks associated with the trends: risks from investing in carbon-intensive sectors that may become stranded assets as policies, prices, and preferences change; and risks associated with the impacts of climate change, such as increased exposure to extreme weather events, such as the vulnerability of coastal infrastructure to storm damage or vulnerability of crops to extreme temperatures and droughts. These risks and information related to finance from both developing and developed countries will be crucial to drive ambition in formulating long-term strategies.

2.3. Managing the Transition Process and Avoiding Disruption

As a developing country, Indonesia faces development issues of a magnitude that cannot be resolved in a matter of months or even years—from reducing poverty and inequality to improving education and public health. Indonesia's development has been guided by five-year development plans (Rencana Pembangunan Jangka Menengah Nasional; RPJMN). These are strategic documents outlining the national development agenda, incorporating important macro trends and indicators to be considered within the sitting president's

Figure 2.12 | **Achieving Long-Term Climate Goals Is an Intergenerational Challenge**

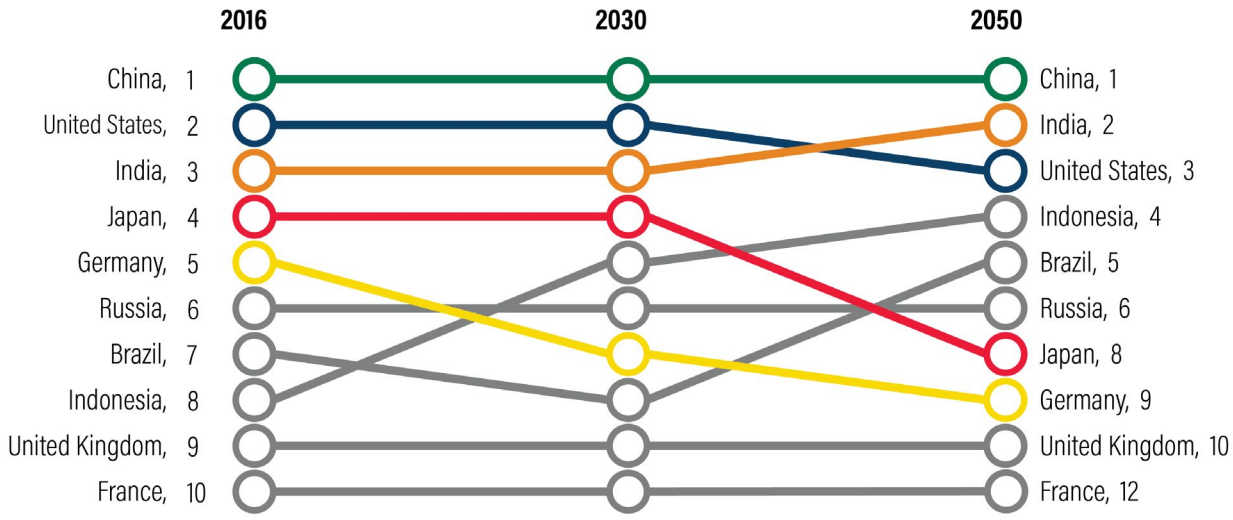


Source: WRI.

term of office before the next general election. In recent years, efforts have been made and committed by BAPPENAS to gradually incorporate climate change and a sustainable development agenda into national development plans, such as through the national GHG emission-reduction strategy documents (Rencana Aksi Nasional Penurunan Gas Rumah Kaca; RAN-GRK) and, more recently, the LCDI. However, there are still some persistent inconsistencies in the domestic policies developed by other ministries, such as the construction of new coal-fired plants and continued deforestation. Although there are some limitations, the five-year development plan and practice have allowed past presidents to communicate their development priorities as early as possible and accumulate the political support required to ensure successful implementation.

Besides the five-year plan, the Indonesian government also issues 20-year development plans, Rencana Pembangunan Jangka Panjang (RPJPN). The most recent plan covers the country's development vision from 2005 to 2025 under Law No. 17 Year 2007. The Vision and Directive for Indonesia's Long-Term Development 2005–2025 document is concerned with both the nation's ability to utilize natural resources to

Figure 2.13 | **Projected Changes in National Economic Rankings, 2016–2050**



Note: Rankings made on the basis of purchasing power parity.
Source: PricewaterhouseCoopers (2017, 7).

maximize the people's welfare and the protection of environmental functions according to the principles of sustainability, fairness, and equity.

That said, the Paris Agreement framework and global climate change impose a new challenge that requires Indonesia to plan beyond 5- and 20-year horizons. As shown in Figure 2.12, an LTS—one that spans 2018 to 2050—could cover at least six election cycles and three human generations. Curbing global warming necessitates a strategy that will endure through presidential election cycles and generational change.

Although Indonesia's 1945 constitution grants the executive the right to readjust development priorities for good reasons, it also leaves a huge risk that Indonesia's climate commitment could be abandoned in the event of political changes. Under President Joko Widodo's administration, some climate-friendly policies were issued. Some examples include Indonesia's pledge to restore 2 million hectares of peatlands by 2020, with 1.18 million hectares having been restored (Pantau Gambut 2018); the two-year extension of the moratorium on issuance of permits on primary forests and peatlands; and the establishment of the Clean Energy Center of Excellence to promote renewable energy. However, these policies all face the risk of policy reversal through political change and new executive decisions.

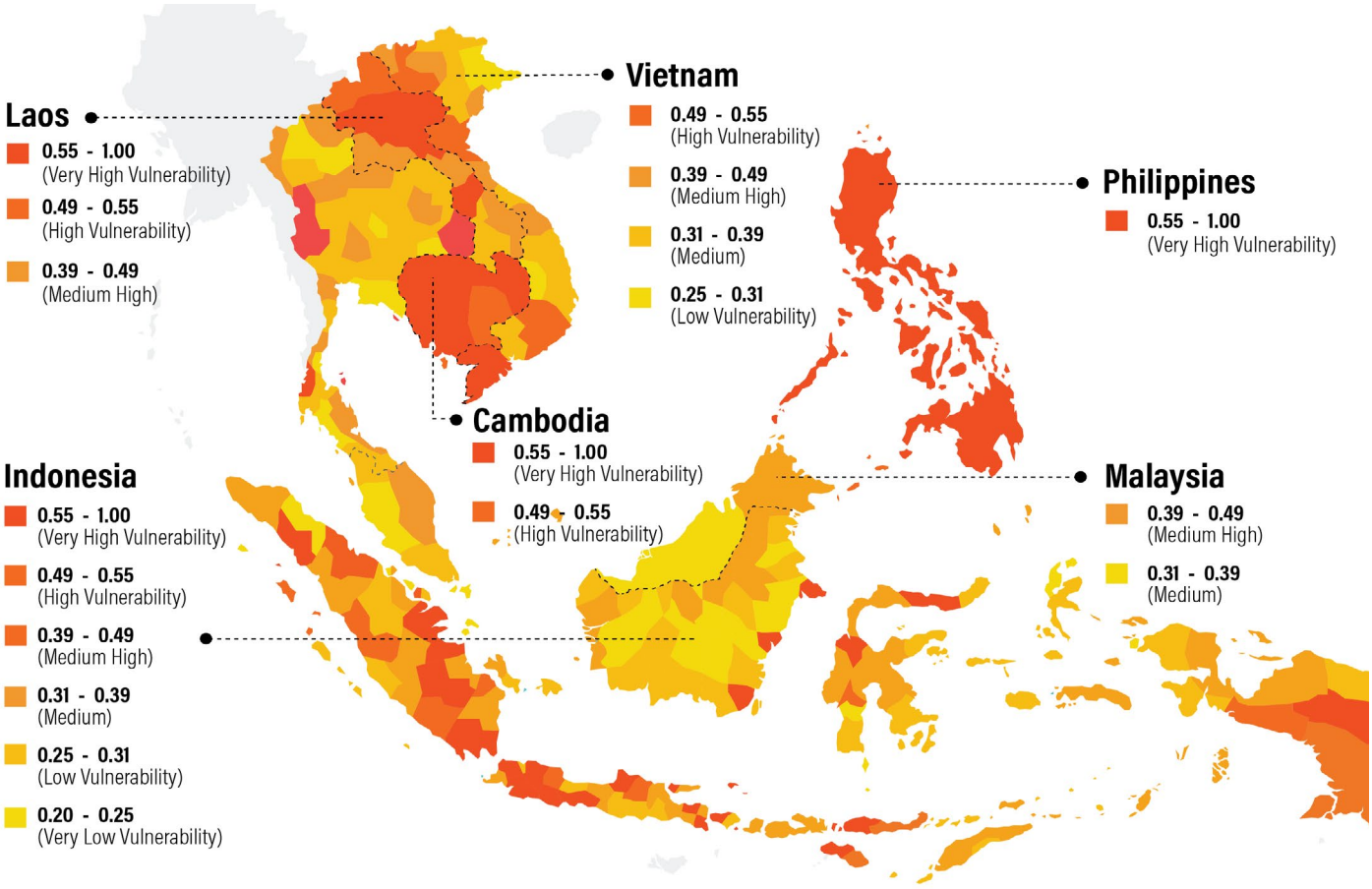
A robust LTS can help diminish some of the risks associated with political change while providing the flexibility to modify the strategy as technology and the sociopolitical landscape develop. The best example would be Indonesia's vision for better forest management under the REDD+ framework. Despite President Widodo's move to dissolve the REDD+ agency and streamline environmental and forestry work under one Ministry of Environment and Forestry, the REDD+ programs still remain.

President Widodo will eventually have to pass the baton of the presidency. There is no guarantee that the next president will share the same level of political commitment to climate action. He or she may easily reopen the market's access to Indonesia's protected forests or revise the energy mix target in favor of fossil fuels. An LTS hosted under a legally binding framework will prove that the current administration is serious about addressing climate change.

2.4. Safeguarding Long-Term Development Goals from Climate Risks

Indonesia is currently enjoying a positive economic outlook, with growth projected at 5.1 percent to 5.2 percent in 2018 even as global economic growth slows down (World Bank 2018). By 2050, the size of Indonesia's economy is projected to rise from the world's eighth largest in 2016 to the fourth largest (based on GDP at purchasing power parity), as shown in Figure 2.13 (PricewaterhouseCoopers 2017, 7). As one of the "Emerging 7" market economies, Indonesia will be one of the primary drivers of global economic growth, along with Brazil, China, India, Mexico, Russia, and Turkey.

Figure 2.14 | Climate Change Vulnerability in Different Regions in Indonesia and Neighboring Countries



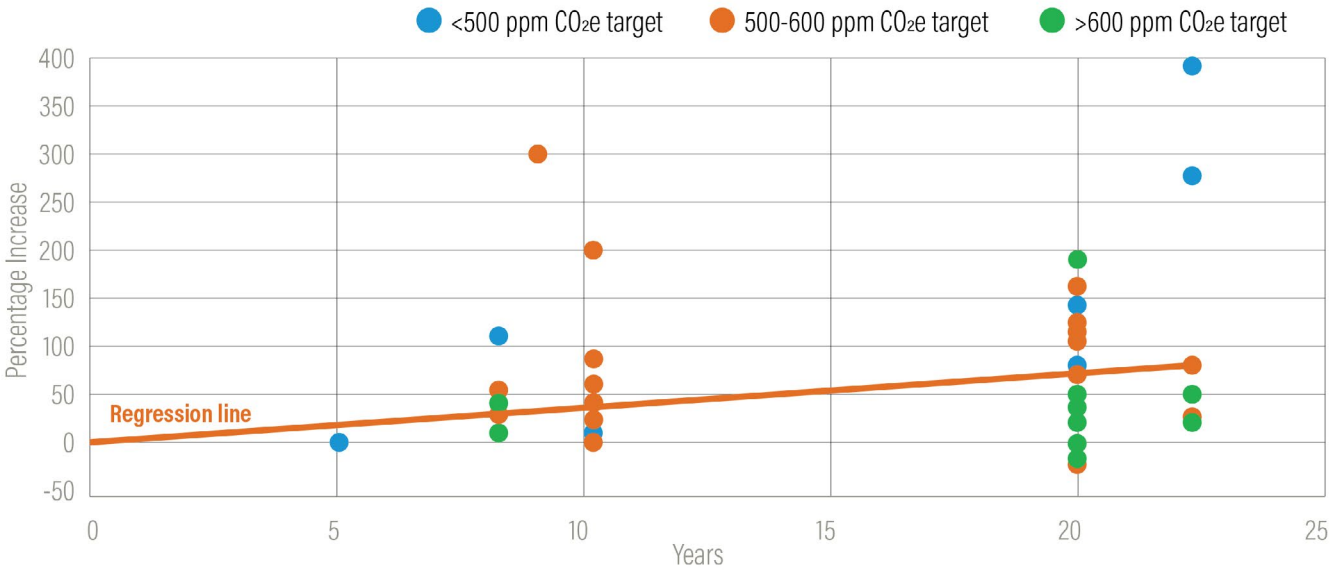
Notes: Darker red indicates greater vulnerability. The climate vulnerability of the region is assessed on the basis of climate variability and projections, as well as regional indicators including population density, ecological sensitivity, and adaptive capacity, which is a function of socioeconomic, technology, and infrastructure capacity.
For the legend, the scale used is 0-1 indicating the lowest vulnerability level (0) to the highest vulnerability level (1).
Source: Kementerian PPN/BAPPENAS 2014.

To get there, however, Indonesia will need to maintain stable economic growth protected from climate risks that already affect the country's productivity. The failure to limit global warming to well below 2°C would result in intensified extreme weather events such as torrential rains and storm surges along with slow-onset sea-level rise and chronic drought (Kementerian PPN/BAPPENAS 2014). In the past decade, the frequency and ferocity of flooding in Indonesia have already increased because of climate change (Siswanto 2014), affecting communities in the country's coastal cities, delta regions, and small islands.

An analysis by the U.S. Agency for International Development estimated that the projected costs of climate change in Indonesia in 2050 will reach more than IDR 132 trillion or $14.8 billion (Hect 2016). More than half of this will be due to agricultural losses, while the rest will come from health costs, as well as commercial and residential property loss caused by sea-level rise. The Institute for Development of Economics and Finance estimated that flooding events in Jakarta in 2015 cost almost IDR 3 trillion, from material destruction and the opportunity costs of a paralyzed economy (Friana 2018). As an archipelago with one of the longest coastlines in the world, Indonesia is very vulnerable to climate change. As shown in Figure 2.14, many regions in Indonesia, especially Java, southern Sumatra, and Papua, are highly vulnerable to the impacts of climate change.

An LTS could identify these risks ahead of time. More than a plan to reduce GHG emissions, such a document could also outline how the country plans to build its resilience and adapt to climate change. Among other tactics, Indonesia could focus on disaster prevention and management for the urban and rural areas as well as the technology required to maintain agricultural productivity. Indonesia's current climate adaptation plan, Rencana Aksi Nasional Adaptasi Perubahan Iklim, has established the foundations that could be further strengthened in an LTS.

Figure 2.15 | **Additional Costs of Mitigation Based on Length of Delay**



Notes: Data points are percentage of increase in mitigation costs delay and the associated length of delay in a given paired simulation. The scatterplot presents a total of 58 paired delay simulations. The solid line is the regression fitted to these dates, restricted to pass through the origin.
Source: White House Council of Economic Advisers 2014.

2.5. Inspiring Timely Climate Action

The signing of the Paris Agreement in December 2015 created a new global momentum toward a sustainable future. Hundreds of leaders in the public and private sectors, as well as in civil society, have joined the effort. New investments for clean energy have been mobilized, along with bilateral and international support for various climate actions. Maintaining this momentum is critical not only to sustaining effort but also to ensuring greater availability of, and opportunities for, Indonesia to access green funding.

It is important for Indonesia to engage its low-carbon transition early so as to minimize the risk of stranded assets and to prepare for the necessary adjustments in regional and socioeconomic development. Postponing climate action means accumulating GHG emissions in the atmosphere, which creates an additional burden for climate policy in the future to achieve the same level of emissions reduction. Economic modeling confirms the notion that making up for currently unabated emissions at some later date could prove costly, regardless of discounting. Simply put, the longer the delay, the more expensive and difficult to achieve the low-carbon economy targets (Figure 2.15). The contribution of the LTS should be to guide near-term actions in coherence with a country's long-term effort to ensure minimal cost and socioeconomic disruption.

A meta-analysis assessing 16 studies found that globally, on average, it costs 41 percent more for the same climate action when delayed by 10 years or more (White House Council of Economic Advisers 2015). Should Indonesia fail to achieve its current emissions reduction target of 29 percent to 41 percent relative to BAU by 2030, achieving the same level of emissions in 2040 would cost more than it would cost today. The real number will be further adjusted according to the specific level of ambition of Indonesia as well as the assumptions in the model.

Furthermore, delaying climate action would lead to failure in achieving the 2°C global warming target, which allows GHG to pass a level that will cause irreversible environmental damage. In Indonesia's case, there is already a considerable amount of drainage and conversion of Indonesia's peatland, which in turn causes permanent damage to the peatland's ability to store carbon and to regulate the water balance in the ecosystem. Once the peat carbon is lost, the losses are virtually irreversible and impossible to restore to its natural properties. Prevention of further degradation of peatlands should be a priority and an example of many mitigation actions that should not be delayed.

An LTS would help Indonesia maintain its momentum while sending a signal to the international community that the country is ready to take more leadership in the global effort of phasing out emissions. As a member of the G-20 and the fourth largest GHG emitter in the world, what Indonesia does matters not only to the country but also to the whole world. In the medium run, it is not impossible that this will bring more confidence for green investment and other opportunities for sustainable projects in Indonesia.

CHAPTER 3: PROCESS AND MODELING EFFORTS TO INFORM THE DEVELOPMENT OF INDONESIA'S LONG-TERM CLIMATE STRATEGY

In the previous chapter, key benefits were identified for Indonesia if the country were to develop a long-term climate strategy. There are some existing process and modeling pathways that could inform the initiation of Indonesia's long-term strategy document. This chapter will describe key institutions and planning processes at the national level that could clarify the opportunities and challenges related to the effort to establish a long-term climate strategy for Indonesia. This chapter will also compare some existing long-term modeling projects to identify future emissions drivers that would contribute to Indonesia's long-term planning.

3.1 Indonesia's Current Medium- and Long-Term Planning Efforts: Opportunities and Challenges

Opportunities

At the national level, BAPPENAS has launched the LCDI initiative, an approach to integrate climate change and environmental constraints into national development planning. Through this initiative, BAPPENAS is committed to deliver Indonesia's first low-carbon development planning for the Medium-Term National Development Plan (RPJMN) for 2020–2024. In the definition used by BAPPENAS, the low-carbon RPJMN 2020–2024 is a new development platform that aims to sustain economic and social growth through low GHG emission activities and minimal natural resources exploitation (Kementerian PPN/BAPPENAS 2018). To integrate the low-carbon planning into the RPJMN, BAPPENAS has also committed to applying a holistic, integrated, thematic, and spatial approach.

As the basis for the low-carbon RPJMN, BAPPENAS is conducting a strategic environmental assessment, which incorporates natural resources and environmental carrying capacity and climate change indicators into the proposed policies, plans, and programs of other sectoral directorates. The Strategic Environmental Assessment (KLHS), guided by Government Regulation No. 46 Year 2016, is a series of systematic, comprehensive, and participatory analyses to ensure that the principles of sustainability become the basis of and are integrated into the development of policies, plans, and programs. BAPPENAS is responsible for developing the strategic environmental assessment for Indonesia's development planning. To deliver the assessment, BAPPENAS applies system dynamics modeling that looks at the interactions between economic, social, and environmental dimensions as an integrated system. Development activities and policy interventions will be assessed on the basis of the impacts created (in the form of trade-offs and synergies) on the environmental and natural resources carrying capacity, as well as on the level of economic growth and poverty.

The LCDI report was published in March 2019 to summarize the key findings of the modeling efforts. There are four scenarios projected in this report: Base Case, LCDI Moderate, LCDI High, and LCDI Plus (Kementerian PPN/BAPPENAS 2019). The LCDI Moderate scenario includes low-carbon policies to achieve Indonesia's unconditional emission-reduction target in 2030; the LCDI High scenario includes more ambitious policies to achieve Indonesia's conditional emission-reduction target in 2030. The fourth scenario, LCDI Plus, is an even more ambitious scenario incorporating a set of measures that are not currently under consideration in the RPJMN, including carbon pricing, higher reforestation targets, and higher levels of improvement of energy efficiency and waste management. The LCDI Plus scenario is one that requires major transformation in Indonesia's structure. On the basis of the LCDI High scenario, the report concludes that a low-carbon growth path can deliver an average GDP growth rate of 6 percent annually until 2045; that would unlock an array of economic, social, and environmental benefits.

Indonesia's low-carbon RPJMN is potentially a good basis for a guide to a long-term vision for Indonesia. First, although BAPPENAS's current assessment is intended for RPJMN 2020–2024, it also provides long-term projections of main development indicators until the year 2045—a year inspired by the 100-year celebration of Indonesia's independence. Many observers predict that by 2045, Indonesia will have emerged as a developed country with a significant increase in its working-age population being felt in 2020–2035. BAPPENAS uses its system dynamics model to include these potential demographic dynamics in parallel with climate change impacts and natural resources constraints. Hence, the modeling projections will be inclusive of the economic, social, and environmental indicators and will consider long-term low-carbon and climate-resilient strategies in the country's broader context. The aim is not just to reduce emissions but also to guide Indonesia's sustainable development vision.

Additionally, BAPPENAS's low-carbon long-term assessment could be a good basis on which to initiate an LTS document, as it is already linked to Indonesia's

ongoing planning process (RPJMN 2020–2024) and potentially to the Long-Term National Development Plan (RPJPN) to 2045. BAPPENAS is responsible for developing and enhancing RPJMN every five years and RPJPN for a 20-year period. The RPJMN is then translated into a government work plan (rencana kerja pemerintah; RKP) each year and is referenced by subnational development plans. Consequently, BAPPENAS has a responsibility to ensure that the low-carbon plans within RPJMN will be reflected in sectoral line ministries' planning as well as by subnational ministries.

Third, the BAPPENAS long-term model is supplemented with an investment model to estimate the amount of money that must be mobilized from public and private sectors to realize the transition to a low-carbon economy in Indonesia. With these current modalities, the model could be an intersectoral integration platform, providing planning tools for policymakers to understand the interrelationships between programs, opportunities, actions, and strategies for an integrated sustainable development planning process.

Challenges

Although BAPPENAS has the potential to synergize planning in different sectors, the current effort to be incorporated as Indonesia's long-term strategy faces potential challenges. The main challenge lies in the lack of shared ownership by other directorates and line ministries. Currently, the preparation of low-carbon RPJMN should be within a group ownership model, so that the model is not owned only by BAPPENAS but also by other directorates and line ministries. All relevant ministries within a government need to be aware of and involved in the long-term strategy process to ensure coherence between various government policies. For example, in particular, the model building needs to involve closely the Directorate General of Climate Change under the Ministry of Environment and Forestry, which is responsible for the country's environmental and forestry policy, likely to be important elements of the strategy, and in charge of Indonesia's climate-change-related submissions to the UNFCCC.

With this challenge, there is a strong push for the BAPPENAS process to be made transparent. The inclusion of others in the process of developing this model will empower various actors to adopt the model in their own institutions. By promoting greater transparency in the model about the targets, intended actions, and assumptions about the future that underlie targets, Indonesia's planning process will minimize conflicting sectoral targets. Finally, the research and scenarios in the BAPPENAS model should be translated and communicated to the subnational level so that the provinces could build their own modeling for the mid-term provincial development plan (RPJMD).

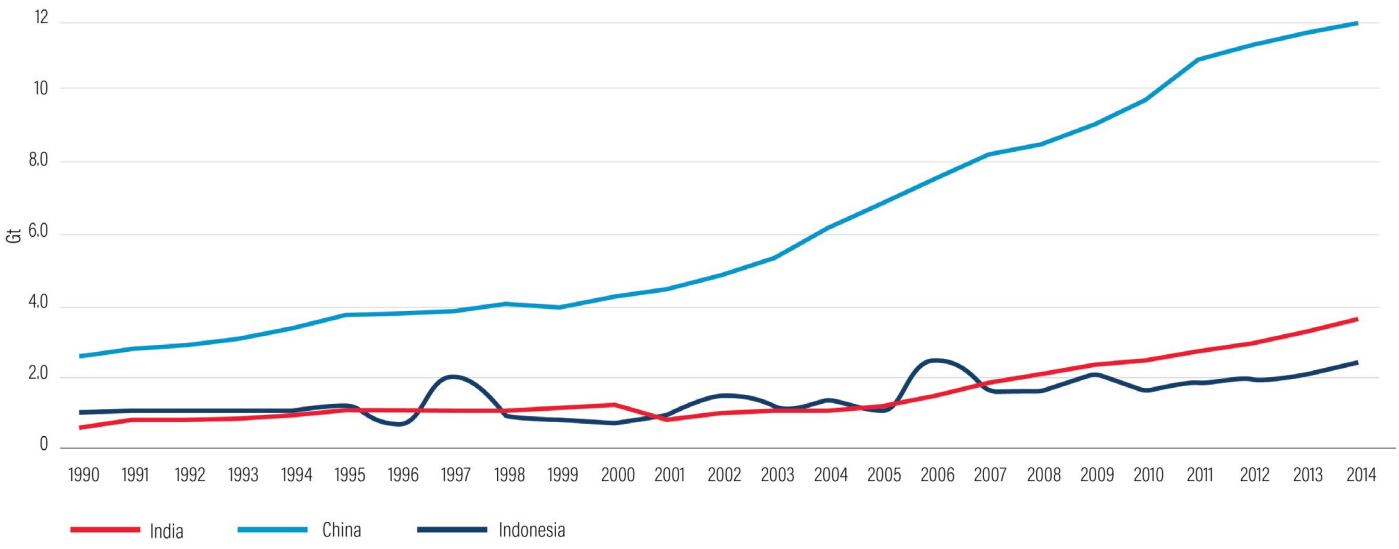
3.2 Comparing Existing Long-Term Modeling Projections

When considering Indonesia's long-term strategy, information on Indonesia's historical and future emissions projections could be helpful in determining the emission drivers. Knowing the emission drivers would help in identifying the type of intervention to be considered in the long-term strategy planning.

In 2014, Indonesia emitted 5.1 percent of total global GHG emissions (World Resources Institute 2018b). Unlike its developing country counterparts, such as China and India, whose emissions follow a linear trend, Indonesia's historical emissions demonstrate more unpredictable spikes and plunges (Figure 3.1). This is caused by the fact that most of Indonesia's emissions come not from energy generation and use, but rather agriculture, forestry, and land use—including slash-and-burn practices that can cause wildfires when forests have been damaged by logging and peatlands have been drained, exaggerated by the occurrence of El Niño. The peaks in 1997 and 2006 correspond to the catastrophic fire years. Another key limitation is the fluctuation of historical emissions data, which makes future emissions hard to predict. In addition to that, demographic transitions and policy changes will also affect Indonesia's emission scenario.

Indonesia's emissions come mainly from two sectors: land and energy. It is important to understand what the main drivers are in these sectors to plan for the transformative actions needed to transition to a low-carbon economy. Modeling exercises can shed light on these drivers. This section seeks to explain the differences between 16 existing models of Indonesia's emissions by comparing their underlying assumptions. Some lessons and general ideas from a literature review and assessment will be drawn that may help provide additional clarity regarding Indonesia's future emissions. Since the submission of Indonesia's First National Communication in 1999 as a party to the UNFCCC, various actors have developed scenarios projecting Indonesia's BAU emissions into the future. Of the analyses produced between 2008 and 2019, this paper will focus on 16 models (six multisector models, seven energy sector models, and three land sector models) published by a wide range of stakeholders, including Indonesian ministries and agencies, academics, and nonprofit organizations. A brief methodology is shown in Box 3.1.

Figure 3.1 | **Historical Emissions Trends in Indonesia, China, and India**



Source: WRI 2018b.

Although model-based scenarios may provide some insights into Indonesia's long-term emissions, their differing assumptions often cause variation in the projections. Baseline scenarios provide useful information for assessing why policies are needed and what the potential cost of policy intervention will be. Key inputs to these baseline scenarios are projections of driving forces such as population, economic activity, and assumptions on technology change, which can differ significantly across models. As a result, key model outputs from baseline scenarios, including projections of energy use and emissions over time in the absence of climate policy, can differ significantly as well. The broad range of emission projections in these core baseline scenarios does bring up an important issue: how useful are these core baseline scenarios as references for determining future mitigation commitments? Translating any percentage emission reduction below the baseline in 2020 or 2050 to an absolute emission number comes with a considerable uncertainty range, depending on which baseline scenario is chosen as reference. Hence, baseline-based policies are an inherently uncertain and an unverifiable (or counterfactual) way of formulating long-term policy commitments. This can be improved by being extremely specific about which assumptions have been made for the baseline scenario on which the policy commitment was based, and by using such baseline-based commitments only for short-term policy goals to avoid interference of unforeseen trends, such as higher or lower economic growth or changes in demographic trends.

Box 3.1 | **Comparison Study Methodology**

This section compares currently available baseline modeling projections published by the Indonesian government, nongovernmental organizations, and academia at the national level. The focus is on baseline scenarios, because these can provide key insights on the driving forces of Indonesia's emissions in the future and the type of policy interventions that would be needed to reduce them in the long term. Sixteen models that represent state-of-the-art of baseline projections in Indonesia were chosen and categorized into three sectors:

- Multisector: six models (publication: 2010–2019)
- Energy sector: seven models (publication: 2010–2017)
- Land-use sector: three models (publication: 2015–2016)

This study contains a literature review of research documents in English as well as available Indonesian research documents on Indonesia's long-term strategy, as well as Indonesia's official documents published by the Ministry of Environment and Forestry, the Ministry of National Development Planning, the Ministry of Energy and Mineral Resources, and the Agency for the Assessment and Application of Technology. Currently, there are limited literature resources on Indonesia's plan for a long-term climate strategy. Hence, the study also considered lessons and insights from international publications. To complement the literature review, the study also drew insights from interviews of climate change experts and government officials.

Recent studies from other high-emitting countries (e.g., Mexico and China) show that a baseline comparison does not prescribe ways to transition to a low-carbon future; instead, it can provide a reference on the needed scale of transformation and the trade-offs that policymakers and society as a whole may face (see Veysey et al., 2016; van Ruijven et. al, 2016; and Li et al., 2017). A summary of the 16 models discussed here is shown in Appendix A.

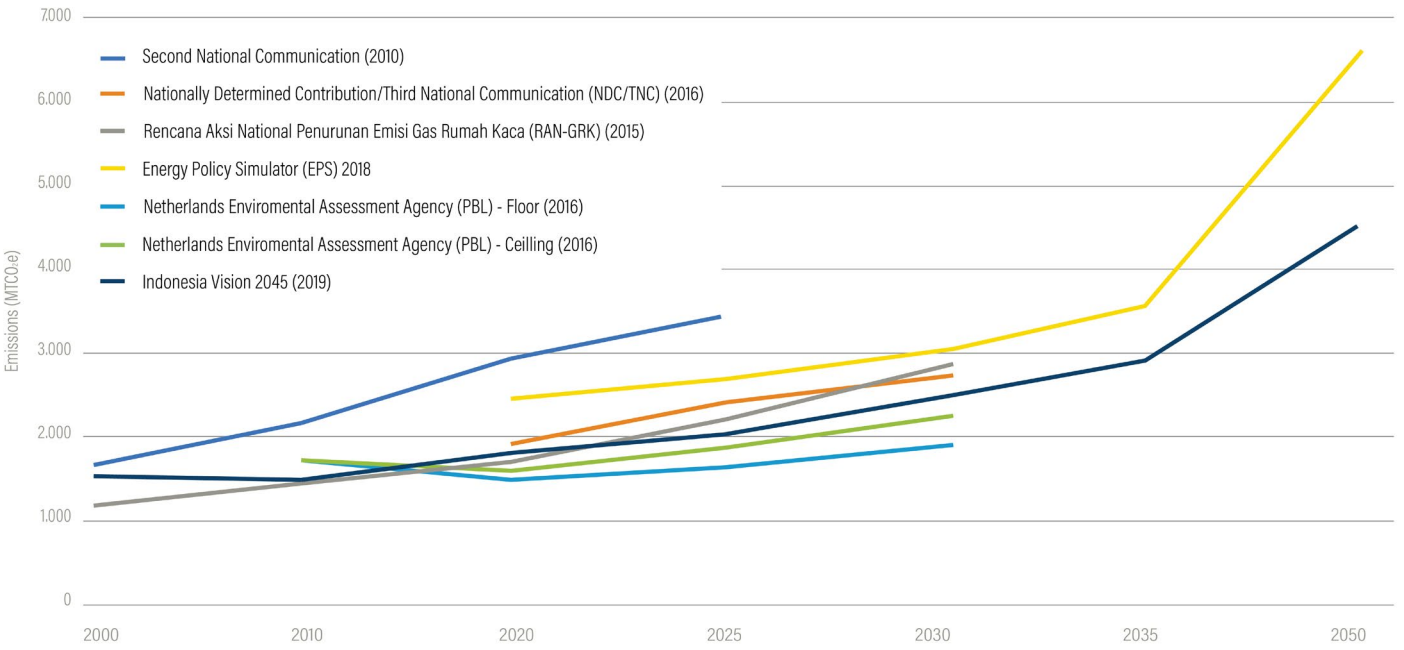
Multisector Models

Most of the multisector model scenarios available for Indonesia were developed by the national ministries for the purpose of official submission to the UNFCCC. This paper looks at six BAU emissions projections. Four were published by the government of Indonesia (Second National Communication, Nationally Determined Contribution/Third National Communication, RAN-GRK, and Indonesia Vision 2045) and the other two were conducted by independent research institutes (Energy Policy Simulator and Netherlands Environmental Assessment Agency/PBL). Among them, only two models (Energy Policy Simulator [EPS] and Indonesia Vision 2045) have a 2050 BAU projection.

Some key findings can be identified across the six studies:

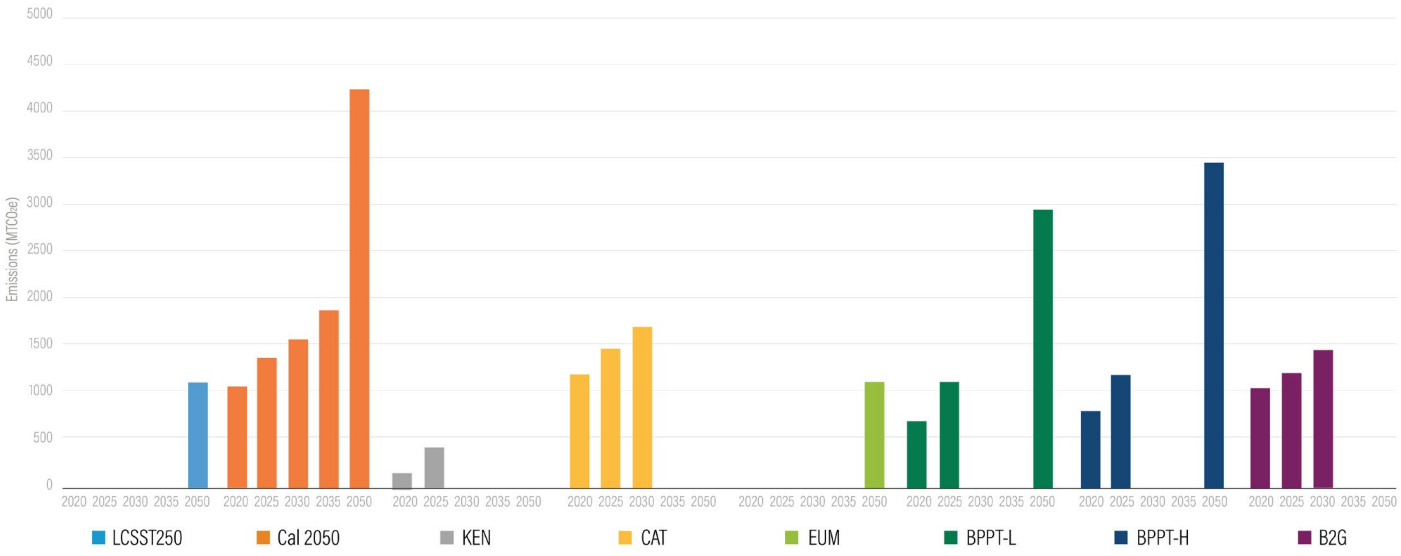
- All six multisector models project that Indonesia's emissions will continue to increase in the future. The Energy Policy Simulator model (Energy Innovation LLC et al. 2018) shows a significant increase of emissions in 2050 compared with the Indonesia Vision 2045 model.
- The national GHG emission-reduction strategy (Rencana Aksi Nasional Penurunan Gas Rumah Kaca; RAN-GRK) review projected that the energy sector would be the largest-emitting sector by 2020, accounting for 50 percent of national emissions (Kementerian PPN/BAPPENAS 2015). The NDC document and the Third National Communication (TNC) documents, as official documents submitted by the Ministry of Environment and Forestry to the UNFCCC, also predict that Indonesia's energy sector emissions will continue to increase and by 2030 are expected to reach around 1.67 $GtCO_2e$ (Republic of Indonesia 2016a). Similar findings appear in other studies, such as one that predicts the energy sector will overtake the land-use sector by 2028 (Wijaya et al. 2017).
- Both the Netherlands Environmental Assessment Agency (PBL) (Kuramochi et al. 2016) and EPS adapted international models to the Indonesian context, including translating international proxies to Indonesian proxies. For this reason, there are some differences in the numbers projected by PBL and EPS compared with Indonesia's official documents, such as NDC/TNC and RAN-GRK.
- Each model uses different types of historical data, methodologies, and assumptions, which are then reflected in the numbers of the projected emissions. Most models assume the continuation of current development activities and associated emissions until 2050. Another assumption made by the models is that Indonesia will maintain steady economic growth. Different assumptions are made regarding the uncertainty of emissions from peatland fires, which also vary significantly between years.

Figure 3.2 | **Comparison of Six Modeling Scenarios on Indonesia's Historical and 2020, 2025, and 2030 Business-as-Usual Emissions**



Sources: Kementerian PPN/BAPPENAS 2019; Republic of Indonesia 2010; Republic of Indonesia 2016a; Kementerian PPN/BAPPENAS 2015; Energy Innovation LLC et al. 2018, Kuramochi et al. 2016.

Figure 3.3 | **Comparison between Seven Modeling Scenarios on Indonesia's 2020, 2025, and 2030 Business-as-Usual Emissions in the Energy Sector**



Notes: LCSST2050: Low Carbon Society Scenario towards 2050—Energy Sector (Dewi et al. 2010); Cal 2050: Indonesia 2050 Pathway Calculator (MEMR 2014a); KEN: Kebijakan Energi Nasional (MEMR 2014b); CAT: Climate Action Tracker (2014); EUM: Energy Use Model (Dewi et al. 2015); and BPPT: Indonesia Energy Outlook 2016 (Badan Pengkajian dan Penerapan Teknologi 2016) (BPPT-L indicates "low" scenario and BPPT-H indicates "high" scenario); B2G: Brown to Green report (Climate Transparency 2018).
Sources: Dewi et al. 2010; MEMR 2014a; MEMR 2014b; Climate Action Tracker 2014; Dewi et al. 2015; Badan Pengkajian dan Penerapan Teknologi 2016; Climate Transparency 2017.

Energy Sector Models

In the energy sector, this paper focuses on seven studies, most of them commissioned by the Ministry of Energy and Mineral Resources. Comparing them requires caution because each model adopts a different base year and timeline for the projection (Figure 3.3). (The missing bars in Figure 3.3 indicate that information is unavailable for that year.) See Appendix B for summaries of the studies.

Like the multisectoral models, the models in the energy sector generally show an increase in emissions in the future. The BAU scenarios in the energy sector mostly assume that no additional mitigation action is taken beyond currently implemented climate policies. BAPPENAS projected the emissions from power plants as the fastest-growing energy subsector, increasing by 7.3 percent per year from 2015 to 2030. Industry and transport are also substantial sources of energy-related emissions in Indonesia. NDC/TNC predicted that by 2030, emission sources will be dominated by power generation subsectors (48.6 percent) and manufacturing industries (31.4 percent), followed by transportation (14.5 percent), household (3.12 percent), and commercial (0.8 percent). The BPPT model shows that by 2050, Indonesia's GHG emissions will be contributed by power plants (47.9 percent), followed by industry (21.1 percent), and transportation (20.9 percent). Generally, there is very limited variation in short-term projections. Meanwhile, there is a much higher variability in projected emissions for 2050 compared with earlier years. For example, in 2025, the range of BAU emissions projection is 1,138 to 1,426 $MtCO_2e$. By 2050, the range increases to 1,183 to 4,666 $MtCO_2e$. Furthermore, estimates from Indonesia Calculator 2050 (MEMR 2014a—orange bars) and Country Current Policy Projections from Climate Action Tracker (2014) (CAT—yellow bars) have higher estimates compared with those of BPPT (both low and high GDP—green and dark blue bars, respectively) and the Brown to Green report from 2017 (purple bars). This seems sensible given the higher uncertainty associated with a longer timeframe.

Land-Use Sector Models

Compared with the energy sector, the number of modeling scenarios in the forestry sector is limited. Indeed, emissions from agriculture, forestry, and land use are more difficult to predict than emissions from the energy sector This paper focuses on three model scenarios, namely the Deep Decarbonization Pathways Project (DDPP) (Siagian et al. 2015), the Forest Reference Emission Level for Deforestation and Forest Degradation (FREL) (Republic of Indonesia 2016b), and the RAN-GRK Review by BAPPENAS (Kementerian PPN/BAPPENAS 2015), which later became the basis for Indonesia's TNC and NDC BAU reference (Figure 3.4). See Appendix B for summaries of the three studies. In the land-use sector models, there are two

primary approaches: an assumed constant annual deforestation rate (for Indonesia, this is 800,000 to 1.1 million hectares per year), or an assumed projected deforestation rate. In making these assumptions, some studies utilize satellite images and others verify their data using field visits. The BAU scenario from the DDPP model shows that the emissions from land use will increase until 2020 and then decrease slightly. Compared with other models, DDPP has different assumptions that include steady economic growth, development of sufficient infrastructure to enable access to electricity for almost all households, and a reduced poverty rate. After 2030, the DDPP model also assumes that there will be no more unplanned deforestation and includes only planned deforestation.

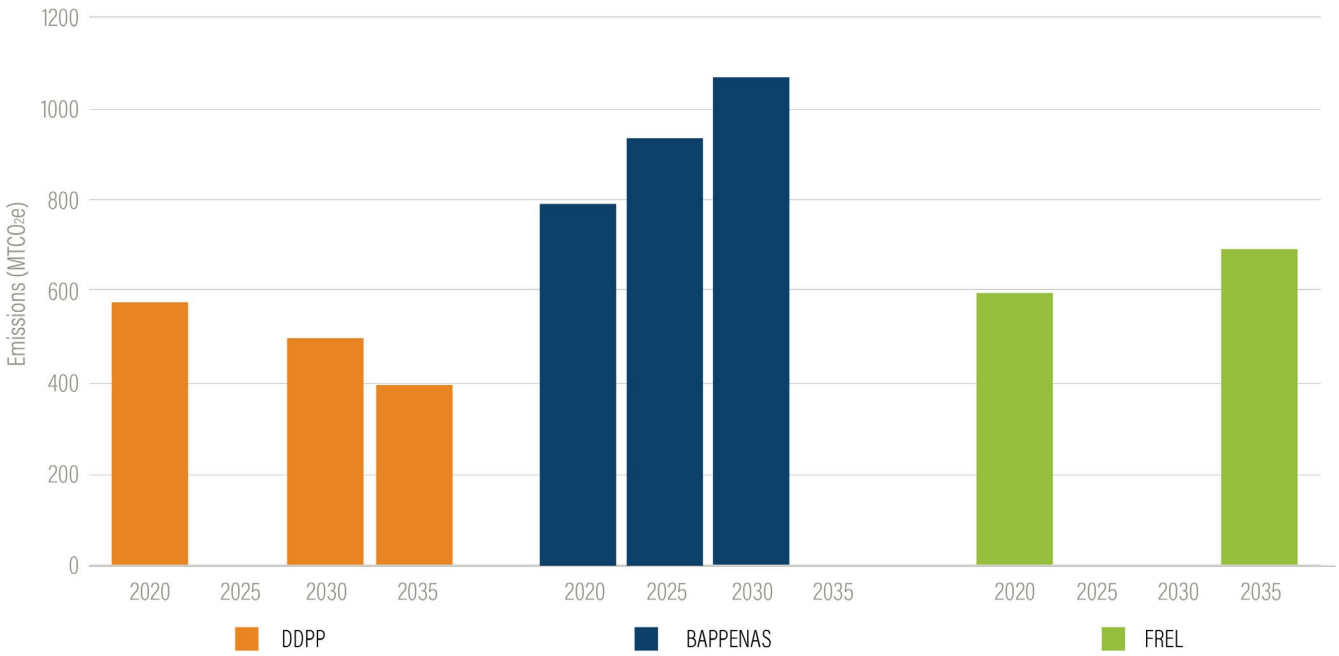
The BAPPENAS projection shows the predominance of peatland emissions in total emissions from the land-based sector, and also shows the peak-and-trough profile caused by the cyclical nature of peatland fires. DDPP finds that emissions from peat decomposition will continue to be the main source of emissions from this sector, mostly originating from peatland clearance for agricultural activities, agricultural plantations, and timber plantations. PBL also mentions that illegal logging is the highest source of GHG emissions in Indonesia.

3.3 Linking Scientific Models with Policy

Understanding the sources, causes, and trends related to climate change is closely related to the use of science and knowledge production. On the basis of the scientific models analyzed in this paper, Indonesia's emissions are projected to increase in the future, with major emissions come from land use and the energy system. Emission from peatland is the main driver in the land-use sector; power generation and industry are the drivers in the energy sector. Beyond scientific exercises, what is important is how the process of scientific modeling informs the actual and measurable action plan, which would then be institutionalized into public policy that is based on science. Understanding how such knowledge is generated and how it gets adopted into public policy requires understanding of the relationship between science and the policymaking process.

To create an effective model, Mumbunan suggested an innovation in public policy called "co-creation and co-production of the model," to link the process for knowledge production and its implication for policy (Mumbunan 2016, 55–56). This approach demands a new relation between state and nonstate actors, one that is totally different from the current situation. "Co-creation" refers to the involvement of nonstate

Figure 3.4 | **Comparisons between Three Modeling Scenarios on Indonesia's 2020, 2025, and 2030 Business-as-Usual Emissions in the Land-Use Sector**



Notes: DDPP: Deep Decarbonization Pathways Project (Siagian et al. 2015); BAPPENAS: Ministry of National Development Planning; FREL: National Forest Reference Emission Level for Deforestation and Forest Degradation (Republic of Indonesia 2016b).
Sources: Siagian el al., 2015; Republic of Indonesia, 2016b; Kementerian PPN/BAPPENAS, 2015.

parties, including entrepreneurs, civil society, regional governments, research communities, and so on, in designing policies and solutions to public issues. "Co-production" refers to efforts to leverage wider public engagement, which becomes important in the context of climate issues because the achievement of climate goals and targets requires the sharing of burdens and benefits with various parties other than state actors. Both co-creation and co-production demand a more in-depth public participation. Although this process requires more time and resources, in the long run, the deliberative process is likely to have a higher potential for effectiveness, efficiency, and sustainability. In developing a long-term strategy, the coherence of the plan is likely to increase through such processes.

The formulation and assessment of an LTS should not be consigned only to modelers and experts; there is a need to involve stakeholders with a wider range of representation. Science that is used to inform public policy in such realms should be democratized. Mumbunan (2016) also warns of the risk of the politicization of science, or the manipulation of science for political gain. Who is present in the construction of the model also becomes important because it represents the voices that are to be included in policy formulation. It also has implications in defining the substance and assumptions that are loaded into the modeling process. For example, on the basis of past experience of modeling intended nationally determined contributions (INDCs), the government defined fair and ambitious climate target scenarios. The assumptions behind what was "fair" and "ambitious" in this case were chosen based on the considerations of the few who were present in the modeling process. What is meant by fair or ambitious? Who (and what interests) are behind national interests? The answers differ depending on who is participating. The answers to such questions might be full of opposing interests or show considerable differences in imagination about Indonesia. In the INDC, the definition of a fair or ambitious level is determined by an expert judgment to which the ministry or institution then agrees. What is considered fair or ambitious for Indonesia goes only as far as the imagination and preferences of those whose interests are selected or included as experts or representatives of ministries or agencies in the process.

The purpose and benefits of an LTS can only be achieved by access to the model and data used and ensuring that the knowledge that is born can be truly understood by the public. That knowledge will depend on how it is produced and on the form of the policy formulation process.

CHAPTER 4: CREATING THE ENABLING ENVIRONMENT FOR AN EFFECTIVE LONG-TERM CLIMATE STRATEGY

Having established the merits of a long-term climate strategy and of existing studies, this paper will take a closer look at the required institutional landscape and governance for an effective long-term climate strategy. This paper identifies six elements that should be considered in ensuring an effective long-term climate strategy:

- A durable, adaptable, and enforceable legal framework
- High-level political commitment and leadership
- Cross-ministerial planning and collaboration
- Broad-based participation for diverse stakeholder contributions
- Translating high-level commitment into subnational ownership and capacity
- Innovative and sustainable funding

The framework was adapted from Levin et al. (2018) to correspond with specific challenges in Indonesia. The authority, acceptance, and ability framework in Andrews et al. (2017) was adopted. The list of elements identified is not exhaustive and should be considered to be preliminary considerations as Indonesia approaches the LTS exercise. These elements are not mutually exclusive; they are synergetic and when combined could lead to greater impact.

4.1. A Durable, Adaptable, and Enforceable Legal Framework

There are many approaches to establishing a long-term climate strategy and aligning it with national planning processes. The Indonesian government could choose, for example, to build an economy-wide stand-alone climate strategy (similar to the 2011 National Emissions Reduction Action Plan, RAN-GRK), to mainstream carbon reduction targets into existing national development plans (such as through the low-carbon RPJMN and RPJPN efforts of BAPPENAS), or to strengthen existing sectoral plans and strategies, such as the National Energy General Plan (Rencana Umum Energi Nasional; RUEN). However, each option has political and practical repercussions.

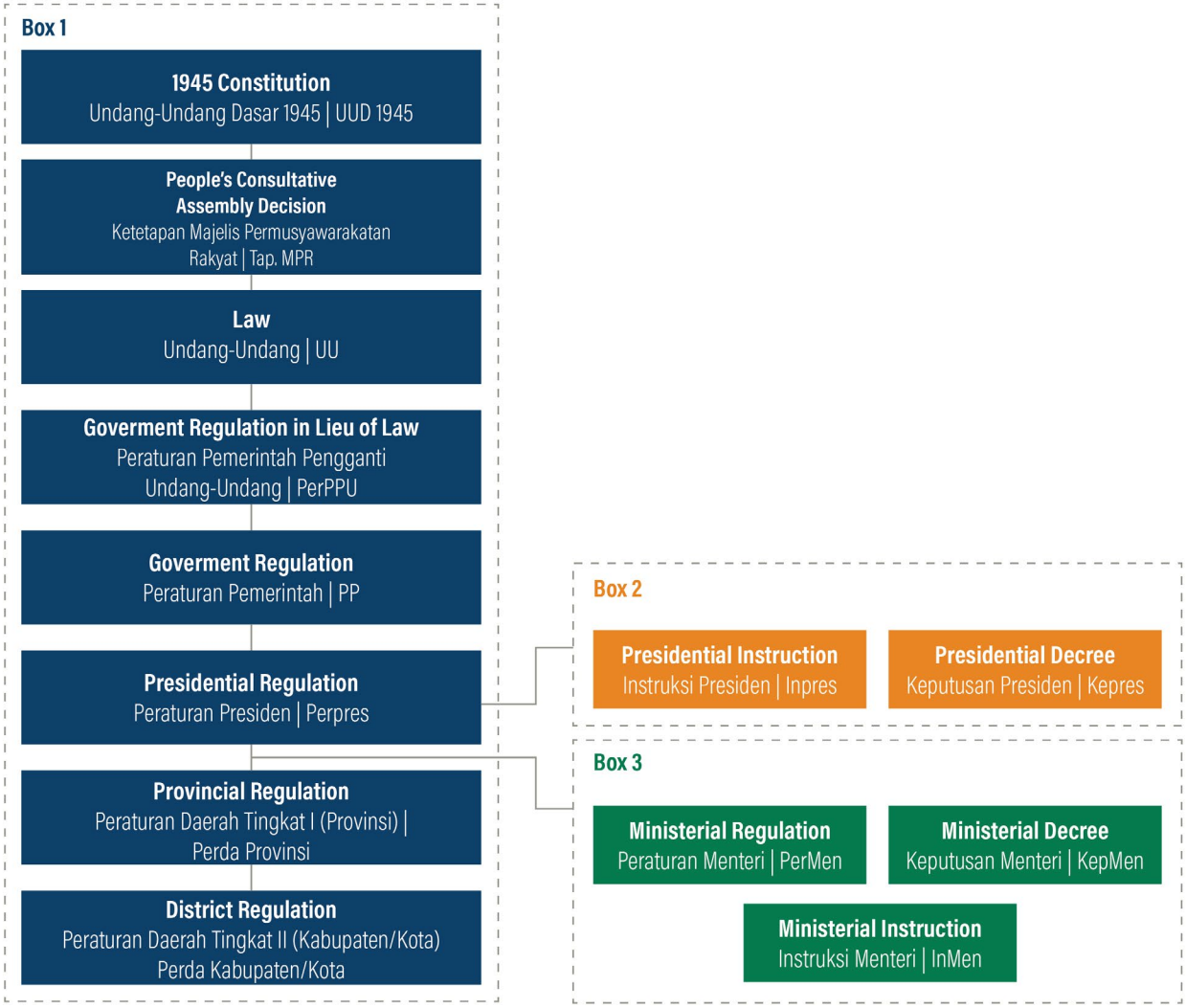
Figure 4.1 illustrates Indonesia's legal hierarchy, in which both the legislative and executive branches of the government have the authority to issue laws or regulations. The appropriate legal umbrella to introduce a

long-term climate strategy should ensure nonpartisan, national ownership; increase its chances of enduring through political cycles; and strike a balance between allowing adaptability for innovation through various political and technological changes and providing enough specificity and enforceability to mobilize action on the ground. In practice, all these attributes are closely intertwined.

First, nonpartisan, national ownership of the long-term climate strategy can be influenced by whichever branch of the government issues the strategy. The president, as the Indonesian head of state and head of government, could usually provide a national endorsement and strong directions for each ministry. Depending on the political dynamics, however, regulations issued by a president's executive decision could be perceived as a political gesture, decreasing the likelihood that the next president would take up the same direction regardless of his or her alignment with the issue. The next president usually aspires to set his or her own vision that is opposed, to the extent possible, to that of the previous administration. In the past, President Yudhoyono introduced Presidential Regulation No. 61/2011, which contains Indonesia's 2011–2020 National Emission Reduction Action Plan (RAN-GRK). This plan unconditionally committed Indonesia to reduce GHG emissions by 26 percent against a BAU scenario in 2020 (Republic of Indonesia 2011b). When President Widodo took office in 2014, his administration revised the commitment to reduce GHG emissions by 29 percent in 2030 (Republic of Indonesia 2016).

Although the revision does not necessarily suggest a contradictory climate change commitment between these two administrations, it confirms the reluctance

Figure 4.1 | **The Legal Hierarchy in Indonesia**



Source: Republic of Indonesia 2011a.

of the new administration to conform to the previous administration's direction. On the one hand, this tendency may pose a risk that a previous climate change commitment will be annulled by a new administration. On the other hand, presidential and administrative change could also be an opportunity to sway the new president to commit to more ambitious climate change actions, including setting up a long-term climate strategy. As a new president prepares new programs, he or she should be influenced to believe that enhanced climate actions and a long-term climate strategy are better programs than the previous administration's. At the same time, the departing administration could also be pressured to revise and enhance its actions on climate to leave a legacy for the country. That said, presidential decisions, although they can act as strong endorsements, still need other legal safeguards so that they perdure through political cycles.

Second, given the timeframe required to achieve the long-term plan (until 2050 or 2100), the strategy must be hosted under a legal framework that can persist through changing domestic political and social dynamics. With such uncertainty and dynamics in presidential executive decisions, a higher legislative decision—either through a People's Consultative Assembly Decision or Law—needs to be put in place to guard the commitment to long-term emissions reduction. Generally, the higher a legal product's position on the hierarchy, the more permanent it is, because amending it would require a significant political effort. For example, Indonesia's Law No. 32 Year 2009 on the Protection and Management of the Environment, and its derivative Government Regulation No. 46 Year 2016 on Strategic Environmental Assessment, now provide a relatively permanent corridor used by BAPPENAS to incorporate environmental considerations into Indonesia's next medium-term development plans. In 2016, Indonesia issued Law No. 16 Year 2016 as an instrument to ratify the Paris Agreement and state Indonesia's NDC commitment. Indonesia's long-term climate strategy could be attached as a revision to this law.

Finally, the appropriate level of legal framework should allow the long-term climate strategy to be both adaptable and enforceable. This task can be particularly tricky to accomplish under Indonesia's bureaucratic culture, which relies on strict regulations defining core tasks and functions for each ministry (also known as tugas pokok dan fungsi or tupoksi). While enforceability requires the strategy to be detailed and specific—including, for example, an incentive mechanism that would ensure action—adaptability requires enough room for adjustments aligned to political and economic dynamics as well as technological improvements. Both are equally important in ensuring the strategy's effectiveness.
One of the most important elements of a national long-term climate strategy is ensuring that such commitment is translated into programs and implemented by each relevant actor. Introducing a long-term climate strategy in a new regulation and a stand-alone document carries a risk that it will not be translated and integrated into other programs by ministries or by local governments. Further, the process of issuing a new regulation is often cumbersome, taking a relatively long time, and becomes costly the higher a legal product is in the hierarchy. Hence, building an LTS on existing development or other relevant plans and policies can offer numerous benefits, including optimizing resources, ensuring policy coherence, and building buy-in by key institutions (Levin et al. 2018).

That said, in Indonesia's case, long-term climate commitment may best be embedded as a part of an already ongoing process to ensure an integrated and coordinated national approach and avoid contradictory policies. Indonesia's long-term climate strategy could be initiated under Indonesia's existing national long-term development planning process and streamlined into the planning document (RPJPN) that gives the country's priorities of implementation for a 20-year period. The current RPJPN is valid for the period of 2005–2025; the next RPJPN will cover the period of 2025–2045. Each RPJPN is divided into four stages of medium-term development plans (RPJMN). Each RPJMN has a lifespan of five years and runs parallel with the taking of office of a new administration or president. The RPJMNs are issued under Presidential Regulations (Peraturan Presiden), which gives strong endorsement to and increases national ownership for the directions in the document. The plan also provides instructions at the implementation level and allows it to be revisited and adapted every five years. This allows the plan to reflect changing technology and market conditions.

As discussed, the government of Indonesia has started the LCDI, which is to be mainstreamed into the 2020–2024 medium-term development plans (RPJMN). The long-term low-carbon vision should be included in Indonesia's next long-term planning in RPJPN 2025–2045. Ensuring further enforceability of long-term climate strategy, the plans should be translated into the nation's annual work plan (RKP) and the budget of each ministry. As the Ministry of National Development Planning, BAPPENAS should work together with the Ministry of Finance to ensure that the budget approved by the Ministry of Finance reflects the long-term climate strategy outlined in the development plans. BAPPENAS and the Ministry of Finance could oversee and review

programs by line ministries; this in turn would push line ministries to propose programs that are in accordance with the RPJPN and RPJMN. In this way, the low-carbon long-term vision would be truly reflected in the work of other line ministries and government agencies.

4.2. High-Level Political Commitment and Leadership

Long-term climate change planning raises unique governance challenges that require, among other things, a strong political commitment and leadership (Levin et al. 2018). Strong political support is important to the start of the preparation of the LTS process as well as throughout the strategy's design and implementation. The process could be initiated by the president, who would provide a mandate for its development, or by the leadership of a ministry or department, and then raised with the head of state to secure his or her support (Levin et al. 2018). High-level political leadership can help drive the strategy, foster coordination between ministries, send the right signals to the private sector, and enable linking with other ongoing political processes. All in all, high-level political commitment and leadership shows that climate change is a high priority for the country's development direction.

The Indonesian president, directly elected by the people since 2004, holds considerable authority. The five-year plan (RPJMD) coincides with the five-year term of the president, with the plan in essence serving to highlight the president's priorities (Blondal et al. 2009). Although the president requires the approval of an independent and active parliament to issue a budget or pass laws, he or she can effectively block the progress of legislation by refusing to designate a representative to discuss bills—thus issuing a preemptive veto. Further, considerable policy work, although falling within the scope of legislation, does not require parliamentary approval, leaving significant discretion to the president. The use of discretion was illustrated shortly after the previous president, Susilo Bambang Yudhoyono, was re-elected in 2009 (Datta et al. 2011). Upon retaking office, he outlined 15 priorities for his first 100 days, including both food security (a key public concern) and climate change. Soon after, a Presidential Instruction on "securing national rice production in the face of extreme climate condition" was issued, giving instructions to 13 government institutions to take measures to increase rice production (Presidential Instruction No. 5 Year 2011).

A strong vision and leadership from the president can accelerate policy reforms and send directives to the cabinet. Ministers and heads of agencies are under considerable pressure to show effective performance to the president in order to retain their positions in the administration. In the past, presidents have formed an array of special task forces or commissions to review the progress and performance of ministers and to enforce cross-coordination on certain issues (Datta et al. 2011). These task forces are usually led by the Office of the President or the Office of the Vice President and managed by a prominent leader or "champion." These are often set up in response to the realization that, on some issues, particularly those that require cross-ministry coordination, normal government structures have failed to make progress (Datta et al. 2011). Such vehicles also serve to increase the visibility of the president on key issues, provide him with more control over the response, and enable him to claim credit for any subsequent progress. The Presidential Work Unit on Monitoring and Controlling Development (Unit Kerja Presiden Pengawasan dan Pengendalian Pembangunan; UKP-PPP), was one such commission, officially established and mandated by President Yudhoyono in 2009 to monitor priority development programs and "debottleneck" where necessary (Hartawan 2009).

The president used such task forces to push through quick priority reforms, such as the development of a moratorium on new permits to clear primary forests, in which President Yudhoyono delegated the task of developing a presidential regulation to the UKP-PPP (Datta et al. 2011). Another commission—the National Team for Accelerating Poverty Reduction (Tim Nasional Percepatan Penanggulangan Kemiskinan, or TNP2K)—led by Vice President Jusuf Kalla, was formed in 2010 to accelerate poverty reduction. Another commission and special task force that reports directly to the president includes the Corruption Eradication Commission (Komisi Pemberantasan Korupsi).

On issues where the president or vice president has not shown leadership, particularly those requiring cross-ministry coordination, progress seems to have stalled. The authority of the president and the vice president carries considerable weight in policymaking; policy actors are often compelled to respond to directives whether they come from the president directly or through a highly placed supervisor with a presidential mandate (Datta et al. 2011). This illustrates the importance of the involvement of the two most powerful elective offices in Indonesia's long-term climate strategy process. The president or vice president could perhaps institute a special task force to monitor accelerated progress on long-term climate actions. The special task force would not be responsible for creating the LTS document; rather it would act as a monitoring and coordinating body of the president or vice president, and work together with the ministry—for example, the Ministry of

National Development Planning—that prepared the LTS document. Such an arrangement could also ensure the president's and vice president's strong buy-in in the LTS process as they will constantly be updated and informed by the special task force.

4.3. Cross-Ministerial Planning and Collaboration

Unleashing Indonesia's full potential in transitioning to a low-carbon economy requires cross-ministerial planning and collaboration at the national level. For example, addressing the issues of peatland fires and a sustainable palm oil industry will require the Ministry of Environment and Forestry (MoEF) to work with the Ministry of Agrarian Affairs and Spatial Planning as well as the Ministry of Agriculture. Similarly, the Ministry of Energy and Mineral Resources could better promote its energy efficiency policies through collaboration with the Ministry of Industry or the Ministry of Public Works and Public Housing. Given the cross-cutting nature of climate change challenges, it is important that long-term climate strategy be integrated into the planning processes of all ministries and departments (Abeysinghe 2018).

Currently, Indonesia's 2030 climate goals under the NDC are formally hosted by the MoEF's Directorate General of Climate Change. Indonesia's TNC, submitted to the UNFCCC in 2017, specifies the institutional arrangements for the country's climate action implementation (Figure 4.2). BAPPENAS takes the role as the UNFCCC focal point and will coordinate activities conducted by line ministries, including the development of baseline scenarios and a mitigation action plan, as well as monitoring and reporting. Line ministries, however, are still responsible for implementing their own mitigation action plans from their respective sectors.

In reality, the MoEF (KLHK) often finds challenges to acting as the sponsoring ministry for climate change and in securing cooperation from other ministries. The ministry's lack of legal mandate (tupoksi) as a coordinating ministry for any line ministries has created some overlapping jurisdictions and ambiguities that may affect the effectiveness of implementation. For example, any effort to integrate mitigation actions into the national development planning—including leveraging the national development plan consultations process (musyawarah perencanaan pembangunan or musrenbang) at various administrative units, from the smallest unit of villages to the national level—fall under the jurisdiction of BAPPENAS, a separate ministry over which the MoEF has no jurisdiction. Authority to give direction and the monitoring of programs to local governments is held by the Ministry of Home Affairs. The MoEF's relations with other sectoral ministries, such as the Ministry of Energy and Mineral Resources, are also strictly horizontal.

The MoEF's difficulties in securing cooperation among ministries are exacerbated by past climate change institutional governance. Historically, Presidential Regulation No. 61/2011 designated a National Secretariat for the National Emissions Reduction Action Plan under BAPPENAS, which was also the body responsible for developing national strategies for reducing GHG emissions (RAN-GRK) as well as for monitoring 34 provincial strategies for climate action (RAD-GRK). The MoEF also used to be two separate ministries whose primary tasks were environmental protection (Ministry of Environment) and forestry management (Ministry of Forestry). In 2016, through Presidential Regulation No. 16/2015, President Joko Widodo decided to merge the two ministries, along with dissolving two ad hoc committees—namely the REDD+

Figure 4.2 | **Institutional Arrangements for Implementation of Climate Change Mitigation in Indonesia**

Notes: KLHK = Kementerian Lingkungan Hidup Kehutanan (Ministry of Environment and Forestry).
Source: Republic of Indonesia 2017.

Task Force and the National Council for Climate Change. Within this new directive, the president also ordered that climate change functions fall under the Directorate General of Climate Change under the MoEF. The new directive has since resulted in tensions between the MoEF and BAPPENAS over the change of authority.

Experience from early-mover countries demonstrates that getting the best value from a "road map" such as a long-term climate strategy requires embedding the guide in the country's structural reform process (World Resources Institute 2018c). The fact that climate change issues are handled by only one of the line ministries at the directorate general level turns climate change into a sectoral rather than a national and structural issue. It could lead to a low sense of ownership and responsibility across ministries and would not provide impetus enough to work across silos and encourage inter-ministerial collaborations required to turn an LTS into implementation.

If long-term climate strategy is to receive a strong buy-in for implementation in Indonesia, the Ministry of Finance and the Ministry of Home Affairs must not only be involved in the process but also build strong collaborations with BAPPENAS. The Ministry of Finance stands out as the most powerful ministry (Datta et al. 2011), with its role of managing the economy and controlling the budget, and therefore should be involved and well-informed about long-term climate strategy. The Ministry of Finance is responsible for assessing competing claims from ministries and agencies for resources (Law No. 39/2008). Although BAPPENAS is responsible for long-term, medium-term, and annual planning, the Ministry of Finance has the authority to establish the ceiling on resources available for programs, and the Ministry of Home Affairs has the authority to review and approve local government plans (Law No. 39/2008). Implementation of long-term development plans relies on close collaboration between these three ministries.

The previous section mentions the prospect of utilizing a presidential task force or commission to organize coordination efforts by ministries. Having a presidential commission on climate change that reports directly to the president could potentially secure cooperation by ministries and avoid competition of authority between ministries. The new commission does not necessarily have to enact its own policymaking process or create a new policy strategy; it could focus on acting on behalf of the president to ensure appropriate division of roles for each ministry and agency and ensure their willingness to cooperate. With that, the commission could accelerate the integration of climate actions into the long-term development plan (RPJMN) and ensure that the musrenbang process led by BAPPENAS reflects long-term climate strategy. The commission could also monitor budgetary approvals by the Ministry of Finance and provincial planning review by the Ministry of Home Affairs to align with the long-term climate strategy. The commission could also ensure that each line ministry develops appropriate sectoral plans and reports their climate actions to MoEF's reporting system.

When it comes to building an LTS, there needs to be a pathway that resolves the paradox of sectoral autonomy vis-à-vis the inevitable need for strong coordination. The culture of overreliance on legal mandates that yielded a siloed equilibrium must be transformed into a new culture where sectoral planning could go hand-in-hand with a more collaborative approach. The LTS should incorporate innovations in governance where public institutions reward government officials that take the risk to innovate and collaborate beyond their tupoksi. Currently, there is a plan for the Ministry of Administrative and Bureaucratic Reform (Kementerian Pendayagunaan Aparatur Negara dan Reformasi Birokrasi; KemenPANRB) to review overlapping jurisdictions among ministries in the cabinet in order to introduce a new, more efficient structure. This process could be leveraged to identify the resources and capacity of each ministry, as well as promote governance innovations that enable cross-ministerial collaboration for climate action—particularly across the MoEF, BAPPENAS, and Ministry of Energy and Mineral Resources. This would fundamentally address the competitive nature rooted in Indonesia's bureaucratic culture and slowly transform it into a leaner, more collaborative one.

4.4. Broad-Based Participation for Diverse Stakeholder Contributions

In addition to a robust legal framework, an inclusive, participatory framework in developing the long-term climate strategy is a prerequisite for a sustained, nationwide ownership. Beyond the final outcome, the process of engaging the public also strengthens awareness around the issue of climate change. The early-mover countries that have already submitted their long-term climate strategies to the UNFCCC (Benin, Canada, France, Germany, Mexico, and the United States, among others) acknowledge stakeholder consultation processes as important.

A participatory framework should be embedded not just as an output in the long-term climate strategy, but also as an inseparable element in its development process. While engaging stakeholders can be costly and

time-consuming, past experience has demonstrated that investing in an inclusive process provides benefits at multiple levels (World Resources Institute 2018a):

- **Awareness**—A public consultation process could help build a sustained momentum and wide awareness around pre-existing resources and opportunities for Indonesia to phase out its net emissions, which could be incorporated into the country's LTS.

- **Ownership**—Experience has demonstrated that a participatory process helps ensure the lasting ownership that is important in the implementation process. Indonesia must continue past best practices; for example, when BAPPENAS provided several consultation workshops prior to the country's submission of its INDC in 2015.

- **Empowerment**— The public engagement process could be conducted in a fashion that enables information to flow in both directions. That way, the process does not only inform government of public aspirations, but also equips community members with important information that helps them monitor the implementation of the long-term climate strategy.

- **Efficiency**—A participatory process could provide the opportunity for different actors and sectors to identify where their resources and goals overlap in order to maximize synergies and therefore efficiency. For example, companies with sustainability pledges can share their long-term vision and work with the government to identify opportunities for collaboration (e.g. public procurement, innovation policy, etc.)

A participatory process is critical both before the development of the strategy and during its implementation. A well-designed LTS should include a framework that allows the democratization of climate action, which may lead to deeper and wider stakeholder engagement and contributions. The stakeholder engagement process must proactively engage those that are likely to be highly affected by the transition. These people should be provided with all necessary information, such as the types of measures being considered, impacts on jobs, skill requirements, health, quality of life, housing, and so on. Government should give people opportunities to express their opinion, make recommendations, and be part of decision-making (Abeysinghe 2018). Ensuring that these voices are heard and their concerns are considered is critical for the LTS process and could allow the opportunity to find common ground with these groups.

Additionally, to ensure its effectiveness, a stakeholder engagement process requires messaging and incentive systems to strategically reach out to different sectors and levels of stakeholders. More, the timing of engagement becomes critical as different actors should be engaged at different points during the process in order to maximize their contribution. Basically, the process of the long-term climate strategy should adopt principles of inclusiveness and transparency and ensure that the views and contributions of members of diverse social, economic, and cultural groups are heard and considered in important decision-making processes. This will in turn contribute to the long-term climate strategy benefits being equitably enjoyed by all (Abeysinghe 2018). In practice, the government can utilize existing mechanisms incorporating a bottom-up process, such as the musrenbang—from the smallest unit of villages to the national level.

4.5. Translating High-Level Commitment into Subnational Ownership and Capacity

High-level political commitment provides the initial impetus to begin the process of LTS development. Historically, regardless of Presidents Yudhoyono's and Joko Widodo's widely celebrated commitment to climate action (such as the 2020 RAN-GRK or the commitment to restore 2 million hectares of peatlands), they often lacked the ability to enforce and implement these plans (McLellan 2015). Other than challenges from various dynamics at the national level, subnational ownership and capacity play an equally critical role in ensuring a plan's effectiveness.

The issue of vertical coordination between the national and subnational governments is not exclusive to climate policy. Past experience suggests that high-level commitments are usually significantly delayed before they are adopted at the subnational level. Partly, this is because most commitments are decided at the national level and introduced as a top-down instruction instead of a bottom-up process where aspirations and local possibilities are identified.

It is a common practice for provincial or district agencies to wait for detailed technical and implementation guidelines from the national government instead of developing their own organic action plan. Presidential Regulation No. 61/2011 on the National Emissions Reduction Action Plan attempted to promote a bottom-up approach by instructing provincial governments to submit their respective local emissions reduction

action plans (RAD-GRKs). Although some high-quality plans have emerged from the 34 provinces in Indonesia, ownership remains low, shown by the immediate abandonment of some of these plans following changes in political leadership. Previous experience shows that proliferation of stand-alone guidelines, such as for RAD-GRKs, can overwhelm local policy planners with limited capacities.

Therefore, beyond developing stand-alone subnational plans, it is even more important to design and invest in sustainable engagement and capacity-building processes that would promote awareness of climate change among subnational government agencies and the integration of climate change measures into agencies' development plans (Rencana Pembangunan Jangka Menengah Daerah; RPJMD). One approach is for the national government to introduce an incentive system based on each province's development priorities. For example, the government could ensure that its long-term climate strategy could identify new economic opportunities and protect vulnerable communities from climate change impacts in disadvantaged regions. Provinces that have included climate mitigation and adaptation action plans clearly into their regional plans (both the five-year and annual plans) in a robust and complete manner can be given access to resources to build the resilience of its region. This could involve ensuring support, capacity building, and financial allocation for affected subnational governments.

The national government could also leverage existing mechanisms in the top-down development planning process. For example, RPJPN informs RPJMN, which later informs RPJMD. As noted, BAPPENAS has already conducted a Strategic Environmental Assessment to inform the country's National Medium-Term Development Plan for 2020–2024. It is important to ensure that the provincial medium-term development plans also identify carrying and supporting capacity in sustaining economic growth.

4.6. Innovative and Sustainable Funding

In its NDC, Indonesia committed to increasing its emissions reduction contribution up to 41 percent (from the unconditional 29 percent target) relative to the BAU scenario by 2030. The commitment is subject to the availability of international support for finance, technology transfer, and capacity building. Given the difference between the two targets of up to 344.29 $MtCO_2e$ (Republic of Indonesia 2016), the international community could play a significant role in further advancing Indonesia's emissions reduction effort.

Similarly, the availability of innovative and sustainable funding instruments is critical for supporting Indonesia's long-term climate strategy beyond 2030.

One of the most significant current funding agreements for climate action is that between Indonesia and the Government of Norway, which committed $1 billion to strengthen Indonesia's efforts to protect its forests. As a result, Indonesia issued the moratorium on new permits to clear primary forest and peatland (through Presidential Instruction No. 10/2011) and the REDD+ Task Force (Presidential Decree No. 25/2011) (REDD Desk 2018). Although the task force is now disbanded, the implementation of REDD+ is continuing under the provision of the Directorate General of Climate Change under the MoEF. In February 2019, Norway announced that it will provide the first results-based payment from the $1 billion deal to Indonesia as part of a REDD+ agreement the two nations established in 2010 (Jong 2019).

At the global level, the 194 countries who are Parties to the UNFCCC created the Green Climate Fund (GCF) in 2010 as part of the financial mechanism that supports developing countries' efforts in responding to the challenge of climate change. As the Paris Agreement was signed in 2015, the GCF now serves the goal of keeping climate change well below 2°C. Since launching its initial resource mobilization in 2014, the GCF has gathered pledges worth $10.3 billion, mainly from developed countries (Green Climate Fund 2018). This financial support is accessible for developing countries, including Indonesia, to fund green projects and programs. Such projects can be designed and submitted to the GCF through both domestic and international accredited entities—if such projects are in line with the country's strategy and legislation. The main communication channel between the GCF and Indonesia is the nationally appointed National Designated Authority, which is hosted by the Fiscal Policy Agency of the Ministry of Finance in Indonesia (Fiscal Policy Agency et al. 2018). However, to date, there are only two approved projects to be funded by GCF in Indonesia (Green Climate Fund n.d.).

Moving forward, it is imperative that Indonesia identify other innovative ways to fund climate mitigation and adaptation efforts sustainably, from both domestic and international sources. Initiatives such as the proposed ecological fiscal transfer are examples of innovation in climate financing, where ecological services are integrated into the fiscal allocation formula to reward investments in conservation and to incentivize the expansion of protected areas. Other initiatives should also be developed in order to establish the baseline that

helps identify available resources for climate action in Indonesia in a way that could inform future plans. The ecological fiscal transfer also provides a new framework that breaks the silos between different ministries. It transforms the "money follows function" approach, where transfers are made by the Ministry of Finance on the basis of assigned allocations to each ministry, to a "money follows programs" approach, where climate action is integrated through different activities across ministries. This approach provides greater incentives for innovation and increases overall efficiency to maximize effects.

At the international level, bilateral and multilateral aid organizations must consider long-term frameworks in granting their support to the Indonesian government. Linking the emissions reduction effort with other major international undertakings, such as the sustainable development goals, could allow Indonesia to tap into more resources.

Indonesia's issuance of the world's first sovereign green sukuk ("green" bonds) is also a promising step in the direction of sustainable development. In early 2018, up to $1.25 billion green sovereign sukuk was successfully issued by the government of Indonesia to finance low-carbon and climate-resilient projects across ministries (Climate Bonds Initiative et al. 2018). Right now, there is strong demand from Organisation for Economic Co-operation and Development countries and also from Chinese investors who are responding to President Xi Jinping's exhortation to green their investments (Chiu 2017). The popularity of green bonds is set to continue, with 68 percent of investors intending to increase their low-carbon-related investments. The greatest interest is coming from Europe (97 percent), the Americas (85 percent), and Asia (68 percent) (HSBC 2017). Indonesia could tap into this pool of investors to help finance its climate implementations by setting a clear mechanism and regulatory framework within the country.

To encourage private investment in Indonesia, the perceived risks investors might encounter in financing green infrastructure, especially when large amounts of capital are involved, must be addressed. Public support can make the risk-return profiles of green investments more attractive through "blended finance" mechanisms (Morgado and Sedemund 2018). Blended finance is a financing package provided by development partners and private sector actors where the risks are not solely carried by the private sector. This mechanism explores the possibility of implementing high-impact projects while redistributing the risks between the public and private sectors. The government of Indonesia is currently developing a regulatory framework to accommodate blended financing. This regulation will apply to financing for sustainable development goals–themed projects, in line with OJK's new paradigm of sustainable development for economic growth (OJK 2014). Blended finance has the potential to unlock new investments and financial disbursements for green projects because it addresses market barriers that prevent private sector development in areas of strategic importance and high development impact.

With strong political support, a facilitative, transparent policy framework, and improving macroeconomic conditions, the opportunities to fund climate change mitigation efforts in Indonesia can only increase.

APPENDIX A. METHODOLOGY

This study contains a literature review of information from English and Indonesian databases on Indonesia's long-term strategy (LTS) and climate change governance, as well as Indonesia's official documents published by the Ministry of Environment and Forestry (MoEF), the Ministry of National Development Planning (BAPPENAS), the Ministry of Energy and Mineral Resources, and the Agency for the Assessment and Application of Technology. Literature resources on Indonesia's plans for a long-term climate strategy are limited; hence, the study considers lessons and insights from international publications and other countries' submission documents on their long-term strategies. To complement the literature review, the study also draws insights from interviews of climate change experts and government officials.

The people interviewed included:

1. Dr. Medrilzam, Director of Environment, BAPPENAS
2. Senior official, Directorate General of Climate Change, MoEF
3. Moira Moeliono, senior associate, Center for International Forestry Research
4. Fabby Tumiwa, executive director, Institute for Essential Services Reform
5. Wahjudi Wardojo, senior advisor, the Nature Conservancy
6. Rizaldi Boer, director of the Centre for Climate Risk and Opportunity Management in Southeast Asia and Pacific, Bogor Agricultural University

The following questions were asked in the interview:

- How familiar are you with long-term climate strategy? Can you describe your involvement with LTS in the past?
- How do you think having a long-term climate strategy will affect Indonesia (economically, in terms of development, or in other ways)? Why do you think it would be helpful or not helpful for Indonesia (capacity issue, political, or otherwise)?
- Other than you, how many people in your institution are aware of long-term climate strategy? Who are these people (technical people or echelon people)? What do they think of it? Similarly, why do they think it would be helpful or not helpful for Indonesia?

- Has there been activities in your institution that are related to or can contribute to the achievement of a long-term climate strategy for Indonesia? If yes: Who is taking the leadership in this process? Who is taking supporting roles for the technical deliverables in the process? If no: If you are going to develop an LTS, is there adequate in-house capacity to develop such a strategy?

- What kind of additional capacity would be needed for your institution to deliver or contribute to the development of a long-term climate strategy?

- If Indonesia is going to have an LTS, which ministries other than your ministry do you think have the authority or capacity to develop this kind of strategy? What is your institution's relationship with those ministry?

- Are there legal documents or regulations into which the LTS could be embedded? What prevents this from happening already?

APPENDIX B. DESCRIPTION OF MODEL ANALYSIS

Table B1 | **Descriptions of Models**

Organization & Study	Abbreviation	Year	Projection Timeline	Sector(s)	Projection Methodology	Emissions ($MtCO_2e$)				
						2020	2025	2030	2035	2050
MULTISECTOR										
BAPPENAS; Low Carbon Development Indonesia	Indonesia Vision 2045	2015	2000–2050	All	System dynamics model, which reflects a continuation of historical trends for the economy, society, climate, and the environment. No new policies are introduced under this scenario. The baseline does reflect the impacts that environmental degradation, including pollution and increased scarcity of environmental goods and services, has on people and the economy.	1,901	2,048	2,376	2,904	4,316
Energy Innovation LLC, WRI, Open Climate Network, Institute for Essential Services Reform: Indonesia Energy Policy Simulator	EPS	2017	2016–2050	Forests & Energy	System dynamics model, where the economy is viewed as an open, ever-changing, nonequilibrium system. It includes both "stocks" and "flow" values.	2,441	2,691	2,988	3,461	6,199
Ministry of Environment Forestry; Indonesia Second National Communication	SNC	2010	2005–2025	All	Base year: 2005. AFOLU projected emissions figure uses historical data, assuming a constant deforestation rate of 1.1 million ha/year. Electricity demand projection based on RUPTL 2009–2018. Solid waste disposal site emissions methodology adopted the mass balance approach (based on revised 1996 IPCC).	2,950	3,400	X	X	X
Ministry of Environment and Forestry; Indonesia Third National Communication & nationally determined contribution	TNC/NDC	2017	2010–2030	All	Base year: 2010. AFOLU projected emissions use FREL projected rates for REDD+ for 2011–2020, and 0.82 million hectare/year for 2021–2030. Electricity demand projection relies on RUPTL 2016–2025. Solid waste disposal site emissions methodology adopted first order decay approach (based on 2006 IPCC).	X	X	2,869	X	X

Table B1 | **Descriptions of Models (Cont'd)**

Organization & Study	Abbreviation	Year	Projection Timeline	Sector(s)	Projection Methodology	Emissions ($MtCO_2e$)				
						2020	2025	2030	2035	2050
BAPPENAS; RAN-GRK Review/Indonesia INDC Support Document	RAN-GRK	2015	2020–2030	All	Integrated model (intra- and inter-sectoral) with system dynamics approach, taking into account various consequences from any policy categorized into four sectors: energy, AFOLU, industrial processes and product use (IPPU), and waste.	1,791	2,284	2,881	X	X
Energy Only										
Ministry of Energy and Mineral Resources: Indonesia Calculator 2050	Cal 2050	2014	2014–2050	Energy	The scenario considers historical trends of renewable energy utilization and captures every element in the supply chain of provision and utilization of energy in Indonesia from upstream to downstream. The supply side is categorized into power plants and non-power plants, while the demand side is categorized into household, commercial, industrial, transportation, agriculture, mining, and construction sectors.	1,059	1,302	1,581	1,945	4,666
Ministry of Energy and Mineral Resources: National Energy Policy	KEN	2014	2014–2025	Energy	The scenarios consider four basic parameters: GDP growth, population growth, size of household, and distribution of population with environmental linkages to economic sector (industry, household, commercial, and other), and the energy sector (oil, coal, natural gases, electricity, and new and renewables).	280	406.15	X	X	X
Climate Action Tracker; Country Current Policy Projections	CAT	2014	2014–2030	All	Current policy scenario based on APERC (2016) page 105 "assumes current policies and trends continue" and the RUPTL 2018–2027 (MEMR 2018). Historical data used include Indonesia's 1st Biennial Update Report for 2000–2012, TNC for 2014, and data reported to the UNFCCC for the period before 2000. No attempt was made to harmonize data sources despite a small discrepancy of about 50 $MtCO_2e$. Using emission factors from the IEA's Current Policy Scenario for non-OECD Asia (IEA 2018b), multiplied by the time series of coal, oil, and gas in the total primary energy supply according to this BAU, gives an upper bound of emissions in the current policy scenario for the energy sector, representing continued use of coal. Energy emissions by 2030: 1,573–1,751 $MtCO_2e$.	1,173	1,426	1,751	X	X

Table B1 | **Descriptions of Models (Cont'd)**

Organization & Study	Abbreviation	Year	Projection Timeline	Sector(s)	Projection Methodology	Emissions ($MtCO_2e$)				
						2020	2025	2030	2035	2050
Climate Transparency: Brown to Green—G-20	CCPI	2017	2015–2030	Energy	Combined projections from Potsdam real-time integrated model for probabilistic assessment of emissions paths (PRIMAP) (2017) and CAT (2017).	1,100	1,240	1,410	X	X
Institut Teknologi Bandung: End-Use Model-ILCD	EUM	2016	2005–2050	Energy	The scenario identifies a deep decarbonization pathway. In order to create a low-carbon development scenario, a method based on the idea of back casting has been developed. Back casting sets a desirable goal first and then seeks the way to achieve it. The method starts with setting a framework (base year and target year, environmental target, target area, and number of scenarios), followed by the description and quantification of socioeconomic assumptions, collection and setting of low-carbon measures, estimating GHG emissions in the target year, and confirming measures and policy recommendations.	X	X	X	X	1,183.82
ESMAP: LCSS 2050—Energy	LCSST2050	2010	2005–2050	Energy	BAU assumes that the existing society orientation will continue until 2050.	X	X	X	X	1,190
PBL GHG Mitigation	PBL	2016	1990–2030	Energy	The International Institute for Applied Systems Analysis (IIASA) projection of the net land use, land-use change and forestry (LULUCF) emissions for Indonesia under the INDC is based on the scenarios presented in BAPPENAS (2015) and described in Admiraal et al. (2015). The projection includes emissions related to peat fires and peat oxidation from deforestation, and has for this work been harmonized with historical estimates of 2010 net emissions using the 2010 GHG inventory data for the same year.	1,065–1,335	1,600–2,000	1,700 – 2,050	X	X

Table B1 | **Descriptions of Models (Cont'd)**

Organization & Study	Abbreviation	Year	Projection Timeline	Sector(s)	Projection Methodology	Emissions ($MtCO_2e$)				
						2020	2025	2030	2035	2050
BPPT (low GDP)	BPPT-L	2016	2014–2050	Energy		842	1,138	X	X	2,900
BPPT (high GDP)	BPPT-H	2016	2014–2050	Energy		864	1,222	X	X	3,829
Land Use Only										
Sustainable Development Solutions Network (SDSN); Institute for Sustainable Development and International Relations (IDDRI) & ITB: DDPP	DDPP	2015	2010–2050	Land use	The scenario is a deep decarbonization pathway. The energy and GHG emission scenarios of DDPP were calculated using the calculator tool developed by the DDPP Secretariat (www.deepdecarbonization.org). The elaboration of the Indonesian DDPP scenarios has been conducted through an iterative process involving extensive consultation with domestic stakeholders in the areas of energy and climate change mitigation.	590	X	520	X	410
National Forest Reference Emission Level for Deforestation and Forest Degradation	FREL	2016	2020	Land use	The principal guideline for establishing FREL shall refer to the annex of FCCC/CP/2013/10/Add.1 (Guidelines and procedures for the technical assessment of submissions from Parties on proposed forest reference emission levels and/or forest reference levels) (UNFCCC, 2014). The general reference for measuring emissions is the IPCC Guideline (IPCC 2006).	593	X	X	X	X
RAN-GRK Review	BAPPENAS	2015			The land-based sector modeled for the RAN-GRK review corresponds to the AFOLU (Agriculture, Forestry, and Other Land Use) sector in the IPCC's 2006 GHG inventory guidelines (IPCC 2006).	766	885	1073		

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ABOUT WRI

World Resources Institute is a global research organization that turns big ideas into action at the nexus of environment, economic opportunity, and human well-being.

Our Challenge
Natural resources are at the foundation of economic opportunity and human well-being. But today, we are depleting Earth's resources at rates that are not sustainable, endangering economies and people's lives. People depend on clean water, fertile land, healthy forests, and a stable climate. Livable cities and clean energy are essential for a sustainable planet. We must address these urgent, global challenges this decade.

Our Vision
We envision an equitable and prosperous planet driven by the wise management of natural resources. We aspire to create a world where the actions of government, business, and communities combine to eliminate poverty and sustain the natural environment for all people.

Our Approach
COUNT IT
We start with data. We conduct independent research and draw on the latest technology to develop new insights and recommendations. Our rigorous analysis identifies risks, unveils opportunities, and informs smart strategies. We focus our efforts on influential and emerging economies where the future of sustainability will be determined.

CHANGE IT
We use our research to influence government policies, business strategies, and civil society action. We test projects with communities, companies, and government agencies to build a strong evidence base. Then, we work with partners to deliver change on the ground that alleviates poverty and strengthens society. We hold ourselves accountable to ensure our outcomes will be bold and enduring.

SCALE IT
We don't think small. Once tested, we work with partners to adopt and expand our efforts regionally and globally. We engage with decision-makers to carry out our ideas and elevate our impact. We measure success through government and business actions that improve people's lives and sustain a healthy environment.

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