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World Bank Group

COUNTRY CLIMATE AND DEVELOPMENT REPORT

April, 2023

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APRIL, 2023

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ABBREVIATIONS AND ACRONYMS

ADS	Accelerated Decarbonization Scenario
AMDAL	*Analisis Mengenai Dampak Lingkungan* (Environmental Impact Assessment)
ASI	Avoid-Shift-Improve
ASP	Adaptive Social Protection
BAU	Business-as-usual
BMKG	*Badan Meteorologi, Klimatologi, dan Geofisika* (Meteorology, Climatology, and Geophysics Agency)
BNPB	*Badan Nasional Penanggulangan Bencana* (National Disaster Management Authority)
BPDLH	*Badan Pengelola Dana Lingkungan Hidup* (Environment Fund Management Agency)
BPS	*Badan Pusat Statistik* (Statistics Indonesia)
BRGM	*Badan Restorasi Gambut dan Mangrove* (Peat and Mangrove Restoration Agency)
BSP	Benefit-sharing Plan
CBAM	Carbon Border Adjustment Mechanism
CCDR	Country Climate and Development Report
CDP	Carbon Disclosure Project
CGE	Computable General Equilibrium
CNG	Compressed Natural Gas
CSA	Climate Smart Agriculture
DMO	Domestic Market Obligation
DRIP	Disaster Resilience Improvement Program
DTKS	*Data Terpadu Kesejahteraan Sosial* (Integrated Social Welfare Database)
E&S	Environmental and Social
EGA	Environmental Goods Agreement
EIP	Eco-Industrial Park
EM-DAT	Emergency Events Database
EPC	Engineering, Procurement, and Construction
ESG	Environmental, Social, and Governance
ETS	Emissions Trading Scheme
EU	European Union
EV	Electric Vehicle
FAO	Food and Agriculture Organization
FCPF	Forest Carbon Partnership Facility
FDI	Foreign Direct Investment
FOLU	Forestry and Other Land Uses
GDP	Gross Domestic Product
GGP	Green Growth Plan
GHG	Greenhouse Gas
HCV	High Conservation Value
IDM	*Indeks Desa Membangun* (Developing Village Index)
IDS	Intermediate Decarbonization Scenario
IEA	International Energy Agency
IFC	International Finance Corporation
ILO	International Labour Organization
IPP	Independent Power Producer
JKN	*Jaminan Kesehatan Nasional* (National Health Insurance)
KUR	*Kredit Usaha Rakyat* (A Business Credit Scheme for Micro, Small, and Medium Enterprises)
LCDI	Low Carbon Development Initiative
LCR	Local Content Requirement
LGST	Luxury Goods and Services Tax
LTS-LCCR	Long-Term Strategy for Low Carbon and Climate Resilience
LTV	Loan-to-valuation
LUCF	Land Use Change and Forestry
MoA	Ministry of Agriculture
MoEF	Ministry of Environment and Forestry
MoEMR	Ministry of Energy and Mineral Resources
MoF	Ministry of Finance
MoH	Ministry of Health
MoI	Ministry of Industry
MRV	Monitoring, Reporting, and Verification
MSoE	Ministry of State-owned Enterprises
ND-GAIN	Notre Dame-Global Adaptation Index
NDC	Nationally Determined Contribution
NPL	Non-performing Loan
NTM	Non-tariff Measure
NUMP	National Urban Mobility Policy
OJK	*Otoritas Jasa Keuangan* (Financial Services Authority)
PFB	*Pooling Fund Bencana* (Pooling Fund for Disasters)
PKH	*Program Keluarga Harapan* (Family Hope Program)
PLN	*Perusahaan Listrik Negara* (State-owned electricity company)
PPA	Power Purchase Agreement
PPP	Public Private Partnership
PROKLIM	*Program Kampung Iklim* (Climate Village Program)
PSO	Public Service Obligation
PV	Present Value
RIL	Reduced Impact Logging
RKP	*Rencana Kerja Pemerintah* (Government Work Plan)
RPJMN	*Rencana Pembangunan Jangka Menengah Nasional* (National Medium-Term Development Plan)
RPJPN	*Rencana Pembangunan Jangka Panjang Nasional* (National Long-Term Development Plan)
RTRW	*Rencana Tata Ruang Wilayah* (District Spatial Plan)
RUEN	*Rencana Umum Energi Nasional* (National Energy Plan)
RUPTL	*Rencana Usaha Penyediaan Tenaga Listrik* (Business Plan for Electricity Provision)
SEZ	Special Economic Zone
SNI	*Standar Nasional Indonesia* (Indonesia National Standard)
SoE	State-owned Enterprise
SSE	Sustainable Stock Exchange
TORA	*Tanah Obyek Reforma Agraria* (National Land Reform Program)
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change

1

CLIMATE & DEVELOPMENT IN INDONESIA

PAGE
1–20

BOROBUDUR
• YOGYAKARTA

Climate challenges in Indonesia are intertwined with the country's growth and development trajectories. Chapter 1 of Indonesia's Country Climate and Development Report (CCDR) takes a historical look at climate and development challenges in Indonesia to: (i) present a baseline for the future low-carbon and climate-resilient journey; and (ii) develop a framework to illustrate climate-growth dynamics. The framework is centered around Indonesia's abundant supply of carbon-intensive natural resources–land and energy–matched by high demand for those resources in parts of the economy that drive growth–agriculture, urban expansion, industry, transportation, and trade. The resulting emissions have direct and indirect costs. They erode climate resilience and increase costs from climate shocks. Rising carbon content in the economy also imposes sunk costs for the low-carbon transition. Although these challenges are known, and efforts are being made to tackle them, the framework aims to link these economy-wide issues to the ongoing and future reforms that are discussed later in the CCDR.

Indonesia has made important commitments to meet its climate and development targets. Ongoing efforts are starting to pay dividends in slowing greenhouse gas (GHG) emissions, maintaining growth, and strengthening economic and social resilience. The transition involves trade-offs between climate actions and near-term development priorities–especially as Indonesia's strong track record of growth and poverty reduction was thanks in part to its natural resource endowments–including coal, oil, forests, and peatlands. Indonesia has set out a new path in its Long-Term Strategy for Low Carbon and Climate Resilience (LTS-LCCR) 2050 to sustain and potentially accelerate its economic transformation from a middle- to high-income country. As stated in the Low Carbon Development Initiative (LCDI), Indonesia is looking for ways to "maintain economic and social growth through development activities with low GHG emissions and minimizing the exploitation of natural resources" (Bappenas 2021).

The CCDR does not take a position on Indonesia's climate commitments. Indonesia has been clear in its Enhanced Nationally Determined Contribution (NDC) (Republic of Indonesia 2022) and its LTS-LCCR (Republic of Indonesia 2021) on the emissions reductions it intends to achieve with and without international support.[1] Similarly, Indonesia has set out clear development goals, as per its national medium-term and long-term development plans (*Rencana Pembangunan Jangka Menengah Nasional*: RPJMN and *Rencana Pembangunan Jangka Panjang Nasional*: RPJPN), toward achieving high-income status by 2045. New medium- and long-term plans are now under development–with the mainstreaming of climate measures a priority. In line with this policy focus, the intent of the CCDR is to assess how Indonesia can achieve its climate goals while maximizing its development outcomes.

1 As discussed in Chapter 2, Indonesia has committed in its Enhanced NDC to a 31.9 percent reduction (below business-as-usual or BAU emissions) by 2030, and up to 43.2 percent with international financial support. The Enhanced NDC was released in September 2022.

> "Indonesia has made important commitments to meet its climate and development targets"

1.1 DEVELOPMENT TRANSITIONS & CARBON EMISSIONS

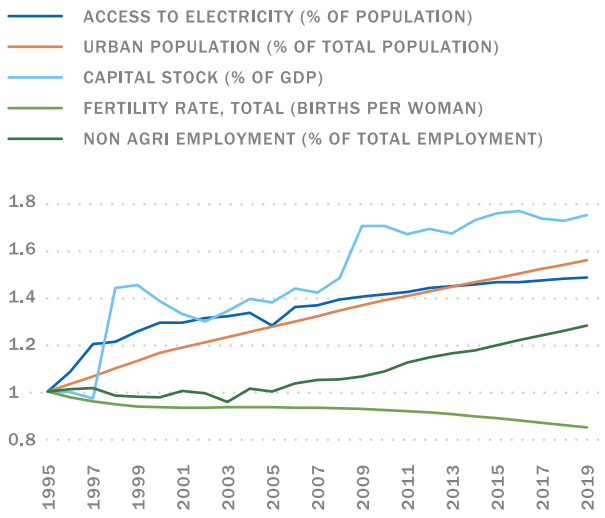
Indonesia has experienced important development transitions in the 25 years to 2022 that have involved rapid and positive change in a short period of time. Since 1997, Indonesia has seen rapid change (Figure 1) in its physical capital stock; access to electricity (67 percent of the population in 1995 to 99 percent in 2020); urbanization (36 percent of the population in 1995 to 56 percent in 2020); non-agricultural employment (57 percent of employment in 2006 to 71 percent in 2020); and fertility rates (declining to slightly above the population replacement rate in 2020). There are many other examples, including internet and mobile phone access, and the major political and governance changes of *reformasi* and decentralization. Economic growth over this period averaged five percent per year–contributing to income convergence that accelerated rapidly relative to peer countries[2] since 2009 (Figure 2). The poverty rate concurrently fell from 19 percent in 2000 to 9.4 percent by 2019. Indonesia's transition to a low-carbon and climate-resilient economy is a transformation that could define the next phase of economic growth and poverty reduction.

2 This report uses a standard basket of peers where data allows. Peers are Nigeria, China, India, Ukraine, Thailand, the Philippines, Mexico, the Arab Republic of Egypt, the Russian Federation, and Brazil, selected based on their statistical similarity in terms of population, GDP per capita, and total GDP. An additional set of aspirational peers is also used when relevant: Republic of Korea, Chile, Poland, and the Czech Republic. In some instances, developed countries are also used as comparisons when discussing emissions levels and targets.

FIGURE 1

Important Development Transitions

Indicators of development transitions (Index 1995=1)

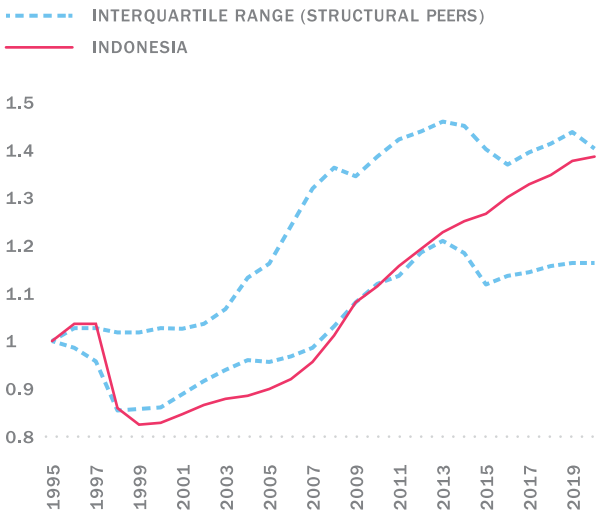


Source: World Development Indicators (World Bank databank), figures compiled by World Bank Group (WBG) staff.

FIGURE 2

Acceleration in Income Convergence

Indonesia and structural peers vs. US (GDP per capita, PPP 2017)



Note: Figure 2 shows rate of income convergence of Indonesia versus rate of income convergence of structural peers (relative to the US). See Footnote 2.

Historically, those economic transitions meant rising carbon emissions, in line with Indonesia's stage of development. Indonesia accounts for about 3.5 percent of global GHG emissions.[3] Indonesia has the 4th largest population, the 16th largest economy, and accounts for 1.25 percent of the world's Gross Domestic Product (GDP). Indonesia's emissions–1,495 million tonnes of carbon dioxide (CO_2) equivalent ($MtCO_2eq$) annual average in 2018-2020–are high compared to structural peers in absolute terms (Figure 3) but encouragingly show signs of slowing–including in per capita terms (Figure 4). Per capita emissions in Indonesia in recent years have been in line with those of other large developing economies, and lower than those of large developed economies (Figure 5). The high emissions base has meant that GHG emissions overall increased only moderately between 1990 and 2018 (by 35 percent). China and India, which had higher base emissions in 1990, saw much larger overall increases in GHG emissions (above 400 percent and 300 percent respectively) but also have larger populations and economies, and experienced faster growth.

The challenge for Indonesia and other large developing economies is how to decouple growth and GHG emissions. No country has transitioned to high-income status while also reducing emissions, yet this is the challenge implicit in the low-carbon transition. GHG emissions in Indonesia have translated to high but declining GHGs emitted per unit of GDP (Figure 6); GHG emissions from energy per unit of GDP has not increased as dramatically as in peer countries despite the increased dependence on coal. Indonesia has seen some decoupling between growth in per capita GDP and growth in GHG emissions (Figure 7),[4] but the extent of decoupling narrows when adjusted for the carbon content in Indonesia's traded goods. Higher growth countries like China and India show stronger relative decoupling but also higher emissions. Only 14 countries (mostly developed ones) have achieved absolute decoupling from both production and consumption-based emissions.[5]

3 Climate Watch. "Data Explorer." Emissions for 2018 include forestry and land use, and all major greenhouse gases (link).

4 Relative decoupling is when emissions growth is positive but less than GDP per capita growth; absolute decoupling is when emissions are stable or decreasing while the GDP per capita is growing.

5 Production-based emissions are from domestic output; demand-based emissions adjust for carbon content in trade. See Hubacek et al. 2021.

FIGURE 3

Absolute GHG Emissions

Annual GHG emissions (All GHG, 3-year moving average)

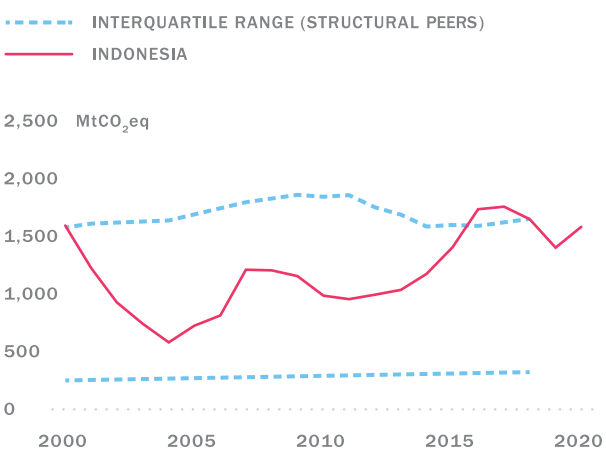
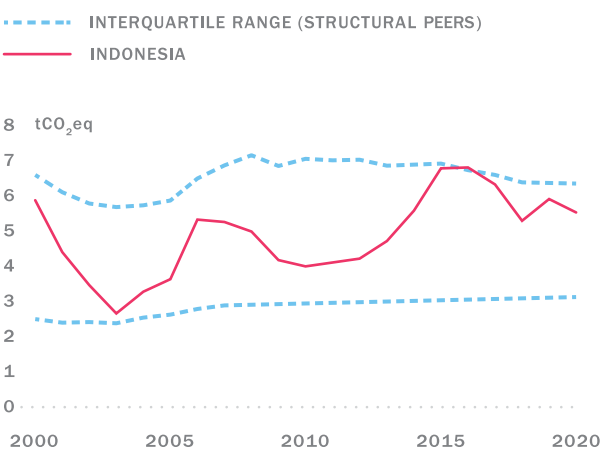


FIGURE 4

Per Capita GHG Emissions Starting to Decline

Annual GHG emissions per capita (All GHG, 3-year moving average)



"The challenge for Indonesia and other large developing economies is how to decouple growth and GHG emissions."

FIGURE 5

Per Capita Emissions Remain Below Those of Major Developed Economies and in Line With Developing Country Peers

Per capita GDP (PPP constant 2017) vs. Per capita emissions (1990-2019)

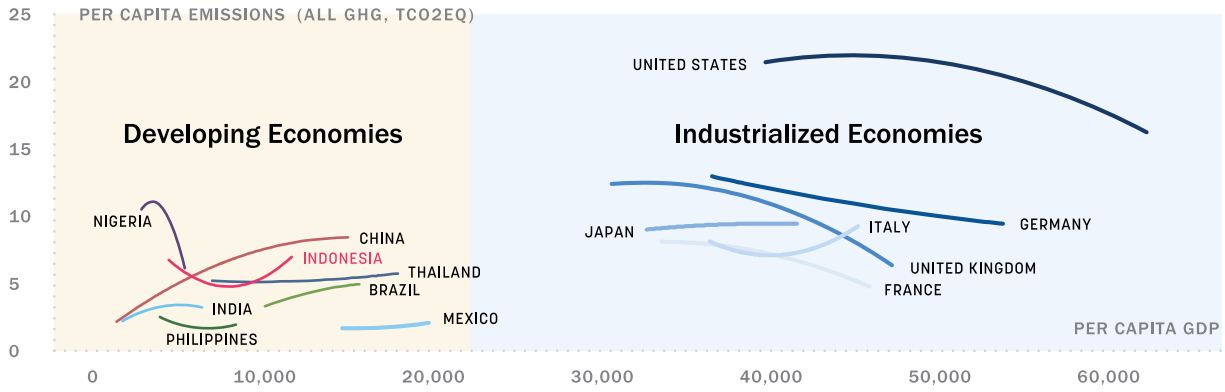
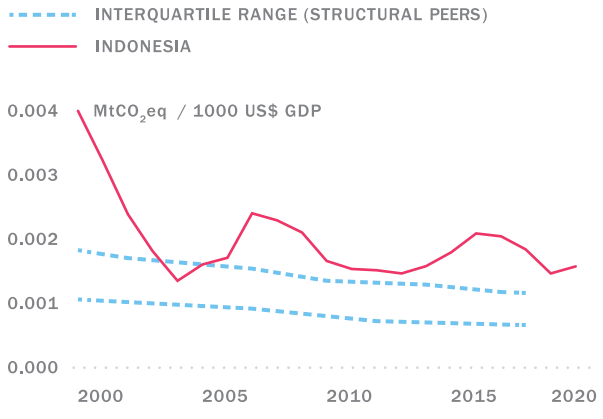


FIGURE 6

Growth Becoming Less Carbon Intensive

Carbon intensity of growth (All GHG, 3-year moving average)



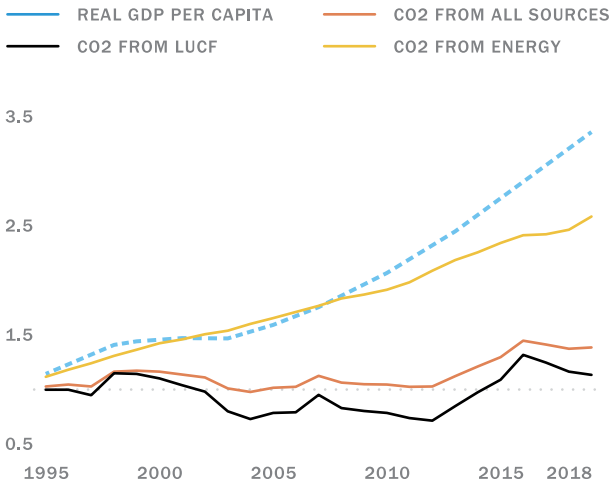
Note: Interquartile range refers to performance of structural peers (see Footnote 2).

Sources: World Development Indicators (World Bank databank); Climate Watch Data Explorer; Ministry of Environment and Forestry (MoEF) data; figures compiled by WBG staff.

FIGURE 7

Some Signs of Relative Decoupling

Decoupling GHG emissions and GDP per capita (Index 1990=1, 5-year moving average, data up until 2019)



Notes: Lines show polynomial trends for 1990-2019 in per capita emissions. LUCF = land use change and forestry.

1.2 SOURCES OF CARBON EMISSIONS

The carbon content of growth in Indonesia derives from a combined high supply of, and demand for, resources with a high carbon concentration. The abundant *supply* of land (from carbon-rich forests and peatlands) and energy resources (from fossil fuels, particularly coal), have driven Indonesia's emissions profile. On the *demand* side, large parts of the economy have made use of these resources to drive development (for electricity, industry, transportation, urban expansion, agriculture, and forestry). These trends are reinforced by the underpricing of carbon in land and energy resources (explored in Chapter 2).

On the supply side, much of Indonesia's GHG emissions come from land-based sources. Deforestation and fires have historically accounted for about 42 percent of Indonesia's GHG emissions (Figure 8).[6] Agriculture and forestry activities were the primary drivers of land cover change, notably export-oriented timber extraction, and pulp and paper plantations which expanded rapidly from the 1980s-90s, and oil palm, which followed in the 1990s-2000s (Tsujino, et al. 2016). These activities impacted carbon-rich ecosystems such as peatlands–partially flooded lowland areas of Kalimantan, Sumatra, and Papua with carbon-rich soils.[7] Mangrove conversion for agriculture and aquaculture in coastal areas similarly contributed to high emissions (Goldberg et al. 2020).[8]

6 Total of forest, land use, and peat fire emissions between 2000-20 as a proportion of total emissions (MoEF 2021 data).

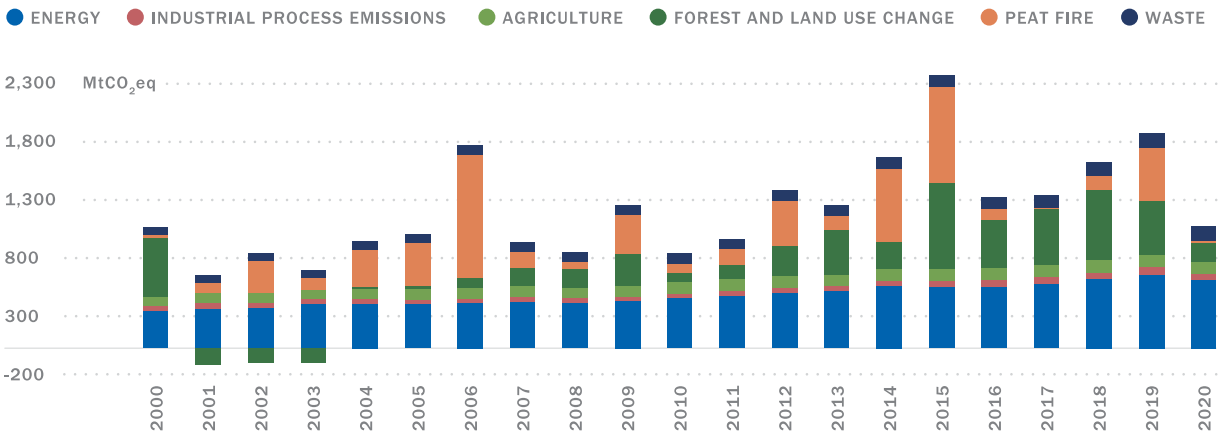
7 Carbon stored in Indonesia's peatlands is estimated at 13.6 to 40.5 billion tonnes of carbon, one of the largest biological carbon stores on Earth.

8 At 3.31 million hectares, Indonesia has the largest global stock of mangroves (about 20 percent). Loss rates have been high in past years but have slowed more recently.

FIGURE 8

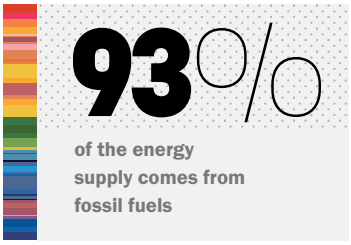
Sources of Indonesia's Emissions over Time

Indonesia GHG emissions by sector, 2000-2020 ($MtCO_2eq$)



Source: MoEF 2021 emissions data.

Note: FOLU = Forestry and Other Land Uses; IPPU = Industrial processes and product use.



93%

of the energy supply comes from fossil fuels

80%

of Indonesia's coal is exported, accounting for about 10 percent of merchandize exports

Considering these trends, the authorities significantly tightened forest and peat protection which has contributed to a slowdown in land-related emissions. About 8.49 million hectares of forest cover was lost between 2000 and 2020 (MoEF 2021), but the loss rate has slowed considerably in recent years (Figure 9). Deforestation slowed from an average of 1.08 million hectares (ha) per year between 2000-07, to 0.61 million ha per year between 2007-14 and to an average of 0.48 million ha per year between 2014-21.[9] Deforestation in 2019-21 was less than 0.12 million ha (MoEF 2021) per year, the lowest rates since 1990 (explored in Chapter 2). Fires also contributing to land-based emissions–some of which arise due to burning for clearing purposes (World Bank 2021). These also have decreased due to reduced clearing, zero-fire policies (that ban the use of fires for clearing), peat rewetting, and fire suppression efforts in recent years.[10]

Primary energy supply is heavily dominated by fossil fuels and it is the second largest source of carbon emissions. Energy accounts for approximately 39 percent of GHG emissions in Indonesia between 2000 and 2020. About 93 percent of the energy supply comes from fossil fuels, namely coal (43 percent), oil (31 percent), and gas (19 percent). Abundantly available domestically, the share of coal in Indonesia's energy mix increased over the two decades to 2019 (Figure 10). The coal industry's share of the economy is less than 2 percent and it employs 0.2 percent of the workforce, but Indonesia is now the world's second largest coal exporter. About 80 percent of Indonesia's coal is exported, accounting for about 10 percent of merchandize exports. The use of coal is most intensive in the power sector; 90 percent of what is not exported fuels more than 50 percent of electricity generation. The share of renewables was low (10-15 percent) over most of the past two decades but has been increasing slightly in the past six years (Figure 10).

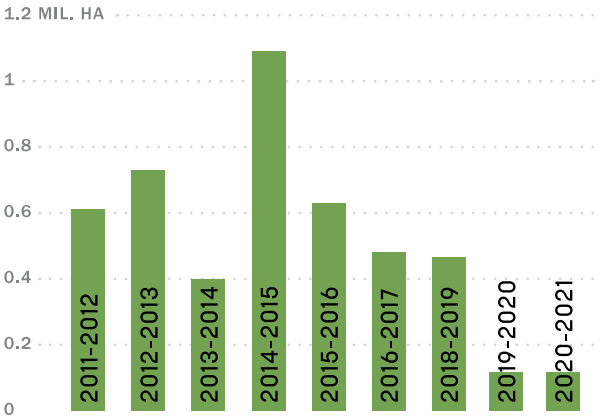
9 Measured from mid-year, in line with MoEF data.

10 Fire incidence was much lower in 2020 and 2021 than in 2018 and 2019 (MoEF data, Forest and Land Fire Early Warning and Detection System). Longer timeseries (MODIS Burned Area satellite data product) also shows a declining trend in fire extent (2001-2021).

FIGURE 9

The Rate of Deforestation Has Fallen in Recent Years

Deforestation extent per year (mil. ha)

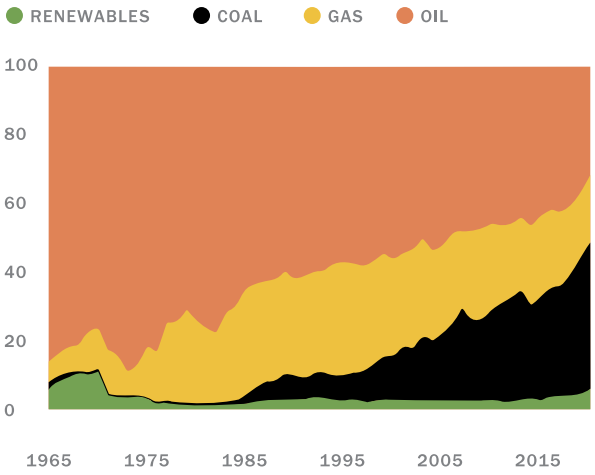


Source: MoEF 2022 data, figure compiled by WBG staff, based on years for which annual data is available.

FIGURE 10

Coal in the Energy Mix has Increased

Indonesia primary energy consumption by source (% of total)



Source: BP Statistical Review of World Energy; figure compiled by WBG staff.

On the demand side, there is potential to further slow emissions through efficiency gains in land use. The most economically important commodity, oil palm,[11] extends over 14.7 million hectares. While estimates vary, an expected 20-30 percent of land-use conversion in the past two decades is thought to be due to plantation establishment. Conversion for oil palm peaked in 2009 and has declined since. Oil palm smallholder production in particular has considerable scope for increasing yields within the existing production area (Sari et al. 2021).[12] Urban land use, while on a much smaller scale, also has scope for efficiency gains. Population growth has rapidly expanded the footprint of Indonesian cities, with spatial patterns of growth hampering connectivity of residents to services and jobs in some locations. Urbanization in Indonesia's peer countries was associated with slightly higher growth outcomes. For example, between 1996 and 2016, every percentage point increase in the share of Indonesia's population living in urban areas was associated with a 1.4 percent increase in GDP per capita–this compares to an average of 2.7 percent in other low- and middle-income East Asian countries, and 3 percent in China (World Bank 2016).

11 Oil palm is the plant. Palm oil is the refined product.

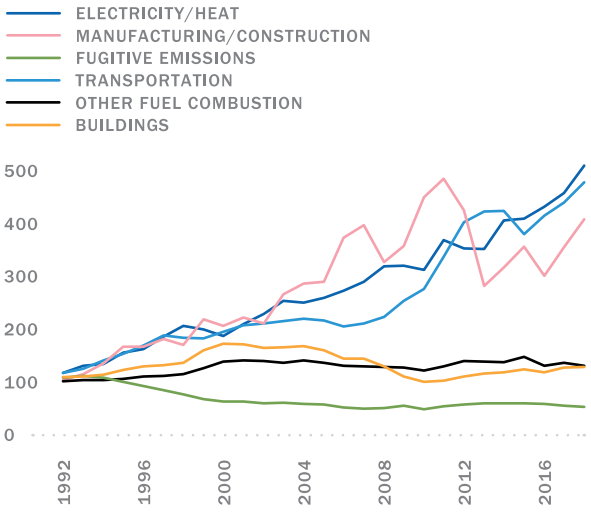
12 Recent estimates suggest the potential for 50 percent land sparing with optimal technical efficiency (among smallholders, representing 34 percent of production). Due to the rebound effect, about one-half of this gain would be offset. Demand and supply-side measures for land management are, therefore, important complements. See Dalheimer et al. 2021.

The demand for primary energy has been driven by the electricity sector (representing final energy)[13] which has been the largest contributor to emissions from energy use (Figure 11). Those emissions are linked to the rising dominance of domestic coal in electricity generation (Figure 12). Of 70 GW of installed generation capacity in 2020, 52 percent was made up of coal-fired power plants, with approximately 16 GW of the 20 GW of capacity that was added in 2011-20 coming from coal. The grid connected capacity of 70 GW compares to a peak demand of approximately 40 GW; given current rates of demand growth, this represents several years of overcapacity, constraining the development of lower-carbon technologies. Expansion of the grid has supported electrification and the development of Indonesia's manufacturing sector which accounts for about 40 percent of Indonesia's total energy demand (Setyawan 2020). Growth in manufacturing and the grid's increasing emissions factor contributed to increase the sector's emissions. However, there are also clear trends toward greater energy efficiency in manufacturing which helped mitigate larger potential increases in emissions (Figure 13).

FIGURE 11

Energy Supply Driven by Electricity

Growth of GHG emissions from energy use (1990=100)

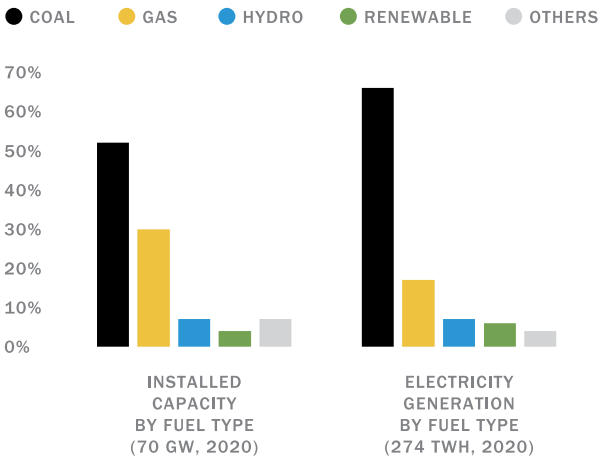


Source: Climate Watch Data; figure compiled by WBG staff.

FIGURE 12

Coal Dominates Power Generation

Installed capacity (GW) and electricity generation by fuel type (share of total)

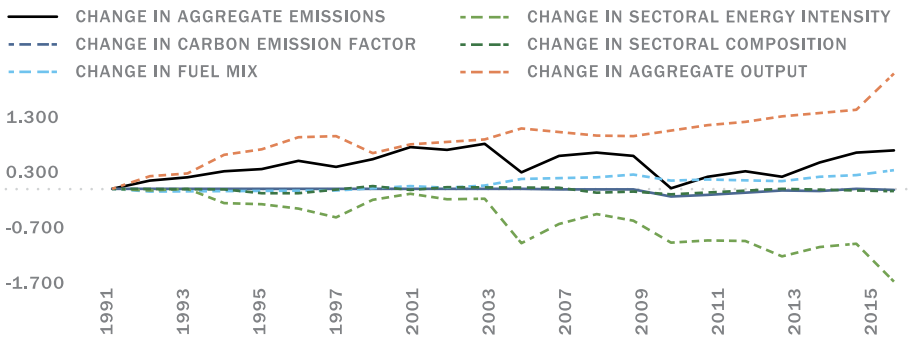


Source: Ministry of Energy and Mineral Resources data (MEMR, 2020); figure compiled by WBG staff.

FIGURE 13

Manufacturing Emissions Increased along with Efficiency[14]

Decomposition analysis of emissions growth 1991-2017



Source: WBG staff decomposition analysis using BPS data.

13 Primary energy refers to unprocessed energy sources, whereas final energy (such as electricity or refined transportation fuels) is processed for end users.

14 Aggregate emissions are driven by the mixed impact from an increase in industrial output and reduced emission intensity within sectors. Figure 13 presents the trends in aggregate emissions (log scale) and the contribution from changing output level (scale effect), technical effect (changing emission intensity within 2-digit sectors), and composition effect (changing sectoral composition). It shows that output has grown steadily but decreasing emission intensity within 2-digit sectors has limited the increase in total emissions to a significantly lower rate. The contribution of changing sectoral composition to aggregate emissions has been negligible.

Efficiency gains in transport systems and urbanization patterns could help to reduce energy demand. Improved spatial growth patterns of Indonesia's cities, along with additional investment, could accelerate the development of low-carbon mobility options such as public transit, walking, and cycling. Public transit mode shares range between 2-15 percent in most Indonesian cities compared to 50 percent or more in other Asian cities.[15] Road transport is responsible for over 85 and 90 percent of passenger and freight movement respectively (Leung 2016), and a similar proportion of overall fuel consumption (Sukarno et al. 2016). The vehicle fleet has grown at over 10 percent per year over the two decades to 2021, a trend likely to continue given motorization rates are still comparatively low. The transport sector, which is responsible for about 25 percent of Indonesia's energy emissions and approximately 10 percent of total emissions, is an important element of Indonesia's decarbonization efforts (see, for example, MoEF 2021a and Bappenas 2021). Recent investments and policies are promoting this shift, including Jakarta's Mass Rapid Transit system, and investment in busways and feeder systems.

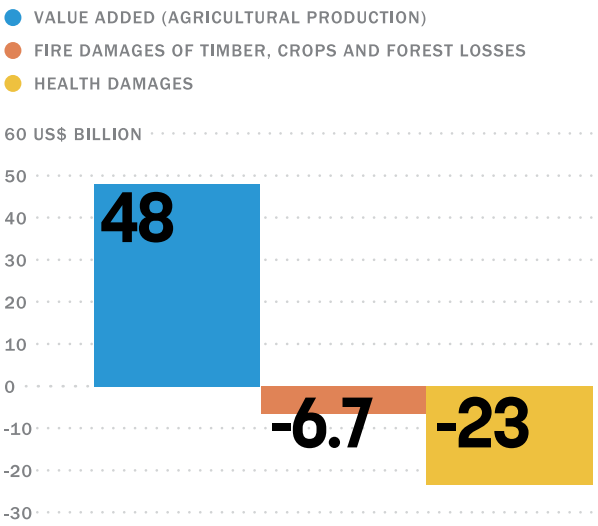
Efficiency gains in natural resource use could further improve outcomes for Indonesia's natural asset base and human capital. Historical patterns of agricultural development in peatlands, for example, drove economic growth but also caused costs. The value of total agricultural production in these areas was estimated by the World Bank at US$48 billion between 2008 and 2017 (5.7 percent of GDP), but with forest clearing contributing to health damages from smoke (estimated to cost US$23.5 billion over the same period), and fire damages to timber and crops (US$6.7 billion) (Figure 14). The fires that occurred in 2019 were estimated to have cost Indonesia US$5.2 billion (0.5 percent of GDP) through their impact on agriculture, forestry, tourism, transportation, health, and school closures (World Bank 2019). Indonesia's program of large-scale peatland rewetting and restoration (discussed in Chapter 2) has, however, reduced such fires and their costs in recent years (Kiely et al. 2021).

15 WBG staff analysis using 2019 Sakernas data. Jakarta and Bandung achieve a public transport modal share of about 10 percent, with other major Indonesian cities at 2-5 percent. By contrast, large and rapidly growing cities in China generally attract 20-30 percent public transport modal share while cities with well-developed networks, such as Seoul; Singapore; Tokyo; Hong Kong SAR, China; Mumbai; and Kolkata achieve more than 50 percent.

FIGURE 14

Peatland Agriculture: Costs and Benefits

Socio-economic benefits and costs of peatlands agriculture (US$ billion) 2008-17

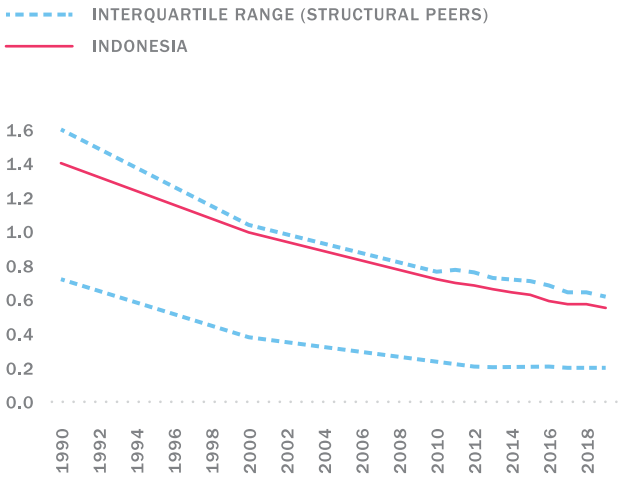


Source: WBG staff using a computable general equlibrium (CGE) model of Indonesia's agriculture and forestry sector.

FIGURE 15

Income Loss from Premature Deaths

Labor income due to premature deaths attributable to air pollution, % of GDP equivalent



Source: Changing Wealth of Nations database, figure compiled by WBG staff.

Existing evidence points to the potential for significant human capital gains from reduced emissions. Air pollution levels in Indonesia are estimated to lower life expectancy by 1.2 years on average, with losses of over 4 years in some pollution hotspots (at sustained 2016 levels of pollution) (Greenstone and Fan 2019). The associated loss of labor income is estimated at 0.6 percent of GDP equivalent (2019) (Figure 15). Efficiency gains in transport and urbanization noted above could also contribute to significant gains. Congestion leads to significantly higher average commuting time in Indonesian cities and disproportionately affects the poor who tend to live far from the city center. Wasted time due to congestion is estimated to cost about US$5.1 billion nationally per year (equivalent to 0.5 percent of national GDP).[16]

1.3 VULNERABILITIES TO CLIMATE SHOCKS

Emissions are only one-half of the story: continuing to adapt to climate shocks will be central to avoiding large drops in economic output and household welfare. Between 1990-2021, Indonesia experienced more than 300 natural disasters–including 200 flooding events affecting more than 11 million people. The frequency of these disasters is increasing (Figure 16)–with climate-related disasters accounting for approximately 70 percent of the total. These trends are expected to continue. Rising sea surface temperature is associated with greater severity of tropical cyclones, while heavier rainfall will exacerbate floods and landslides. More frequent El Niño events are likely to increase drought and fire risks for Indonesia's agriculture and forestry sectors. Warmer temperatures also impact labor productivity. The International Labour Organization (ILO) estimates that Indonesia will lose 2.97 percent of its total worker hours (or approximately 4.0 million full-time equivalent positions) by 2030 due to heat stress. It is estimated that the total cost of these and other climate-related impacts will reach 1.24 percent of GDP by 2030, increasing to 6.97 percent in the 2060s under 3°C warming (Kompas et al. 2018).

16 World Bank staff estimates based on analysis of weekday traffic data in 28 metropolitan areas in Indonesia. In addition to time costs, congestion contributed to excess fuel consumption is approximately US$500 million.

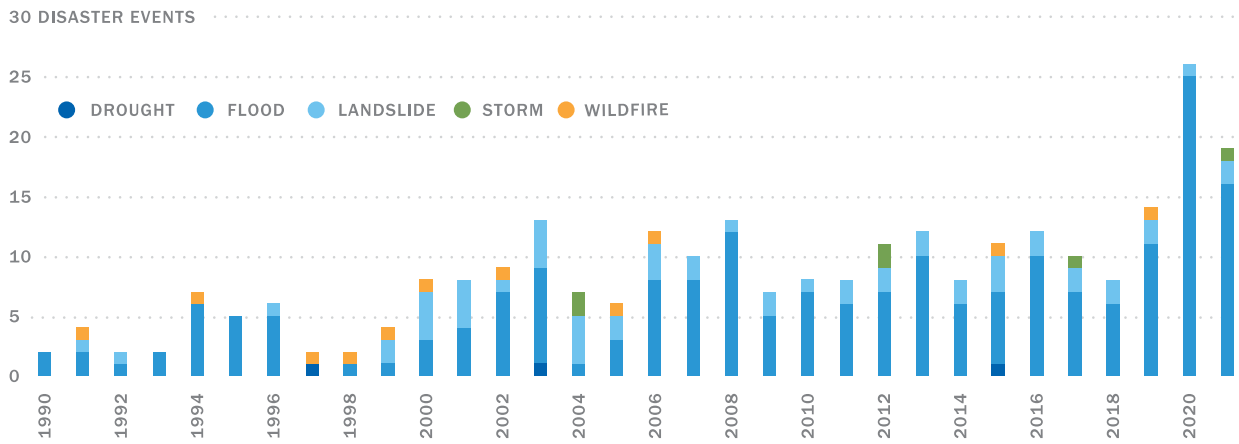
17 By the end of the 21st century (2080-99) relative to a benchmark period of 1986-2005. See World Bank Group and Asian Development Bank. 2021.

18 ILO estimates based on a RCP2.6 pathway. See International Labour Organization. 2021.

FIGURE 16

Rising Incidence of Climate-related Disasters

Meteorological, hydrological and climatological disaster incidence in Indonesia, 1990-2020.



Source: Data from the international Emergency Events Database (EM-DAT), figure compiled by WBG staff.

300

Weather-related disasters happened in Indonesia between 1990-2021

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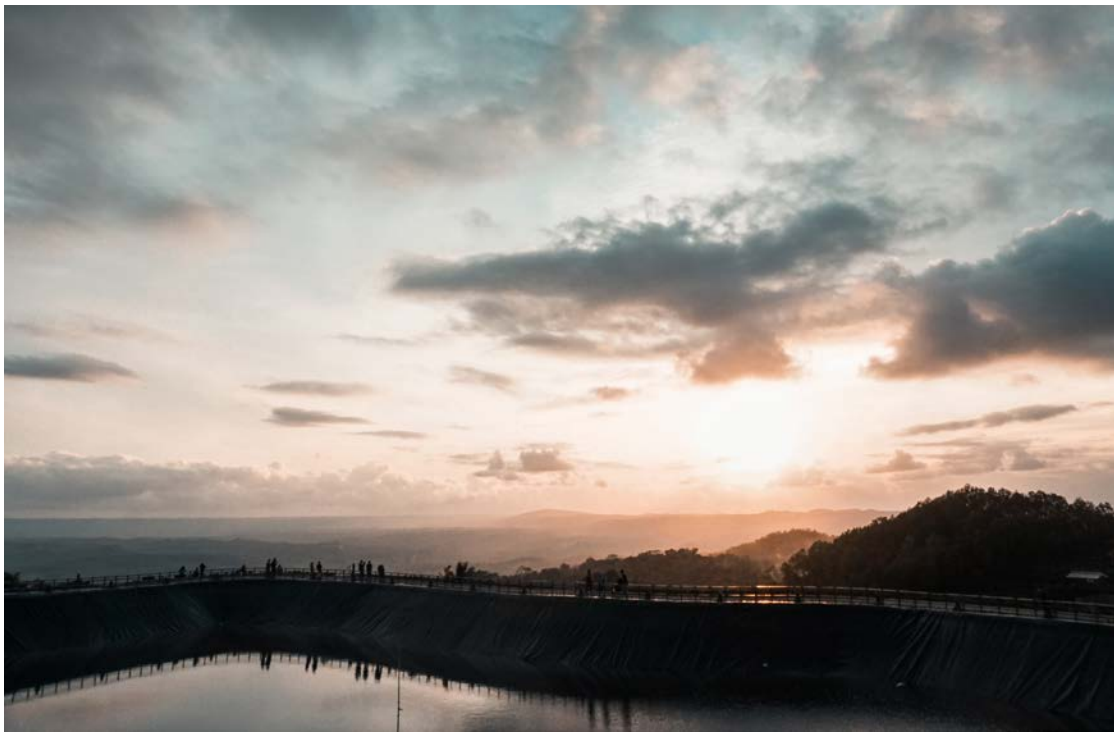
Continuing efforts to adapt could accelerate poverty reduction as climate shocks are disproportionately felt by the poor and vulnerable. Areas of Java are better positioned in terms of both disaster incidence and development, while Kalimantan, Sulawesi, East Nusa Tenggara, and West Nusa Tenggara face greater disaster incidence and lagging development. Although climate change affects the whole population, the poor and vulnerable–one-third of the population–are likely to carry a disproportionate burden. Their livelihoods are more often reliant on agriculture and they often live in areas prone to natural hazards–but without the necessary resilience to cope with shocks and the ability to protect their assets. Impacts are also differentiated by gender–with women and girls at greater risk due to relatively poorer access to assets, services, and financial resources.[19] Previous disasters in Indonesia (including the 2004 tsunami) led to a disproprtionate number of deaths among women (Frankenberg et al. 2011).

Key impacts include water scarcity–which could be partially alleviated through higher water productivity and plugging of infrastructure gaps. Intensification of both rainfall and drought are expected–with parts of Sumatra and Kalimantan 10-30 percent wetter by 2080 from December to February, and islands below the equator anticipating a 15 percent decline in precipitation.[20] In a context of increasing water demand[21] the net effect will be one of scarcity: by 2050, 31 percent of Indonesia's districts will no longer record months of surplus water,[22] more than double the number in 2010. More erratic rainfall patterns are compounded by a lagging national water storage capacity, a level of water productivity (US$3.20 per cubic meter) that is one of the lowest in Asia, and high dependence on already strained resources. Approximately one-half of Indonesia's GDP is currently produced in river basins experiencing "severe" or "high" stress in the dry season. Overall, a lack of water availability is projected to result in 2.5 percent lower GDP by 2045 in the absence of adaptation measures (World Bank 2021a).



19 Women are more likely to live in poverty than men, have less ability to move freely and own land, and may face violence and harassment that escalates during periods of financial or household instability caused by natural disasters. These inequalities may be worsened by climate-related hazards, resulting in heavier workloads, occupational hazards, and psychological or physical harm. Disaster-response planning is often male dominated. These disparities are not unique to Indonesia. See Thurston, et al. 2021.

20 World Bank Climate Change Knowledge Portal: Mean Climate Projections (link).

21 Water demand is projected to increase by 31 percent between 2015 and 2045. See World Bank 2021a.

22 Months of surplus water is a key indicator of water scarcity and refers to excess water available in a system. See WBG and ADB 2021.

Agriculture is vulnerable to climate change impacts, with implications for food and nutrient security. At the national level, rising temperatures and shifting rainfall are projected to reduce yields of several production systems key to poverty reduction and food security–including rice (-0.72 percent by 2030), maize (-7.1 percent) and palm oil (-1.21 percent) (Figure 17). Yield-enhancing measures and investments in climate-resilient agriculture could more than offset these declines (discussed further in Chapter 2). Pest and disease outbreaks–often induced by higher temperatures–are expected to intensify along with the impact of floods, droughts, and saltwater intrusion. These factors contribute to a higher risk of crop failure, loss of income for farmers, and price volatility for consumers. Indonesian consumers already pay among the highest prices in the region for staples and nutritious food with price volatility likely to further affect nutrition outcomes. While stunting levels have fallen considerably in recent years, 24.4 percent of Indonesia's children under five years of age suffered from stunting in 2021 (Ministry of Health: MoH 2021).[23]

Adaptation efforts aside, Indonesia's efforts to decarbonize could also help build resilience as acknowledged in the authorities' climate strategies. While underlying climate changes–as a function of global emissions–are largely beyond Indonesia's control, resilience is a function of Indonesia's infrastructure,

23 The rate of stunting is down from 30.8 percent in 2018.

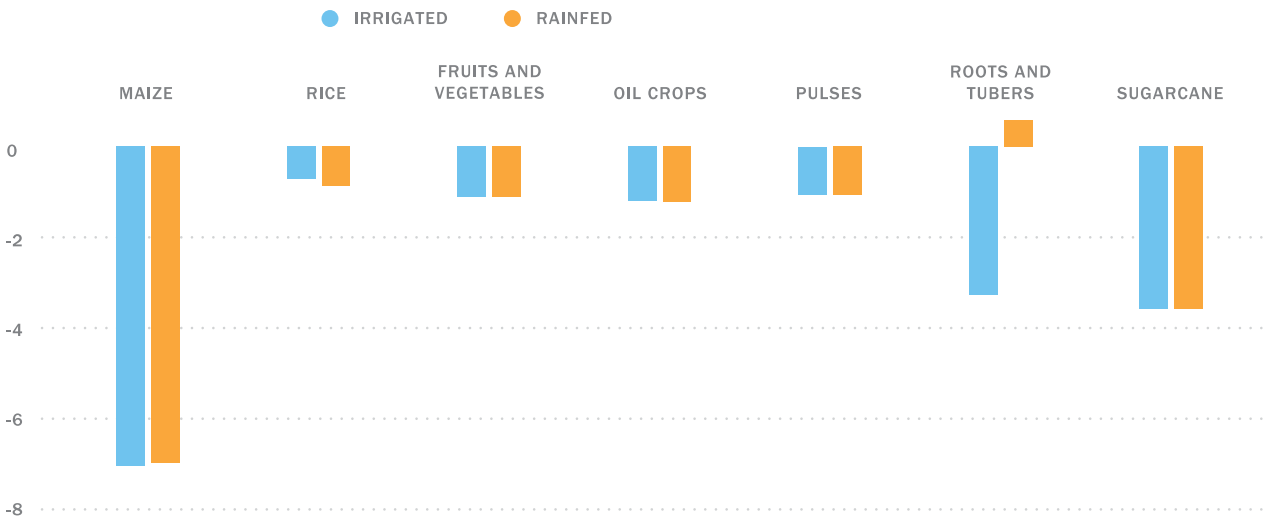
human capital, and natural assets. For example, the vulnerability of Indonesia's cities could decrease through improved patterns of land use and reduced groundwater extraction. Between 2000 and 2014, Indonesian cities expanded by 6,904 km^2 (3.9 percent). Nearly three-quarters of this expansion was on cultivated land or natural ecosystems (Coalition for Urban Transitions 2021) (in DKI Jakarta, for example, the vegetated area decreased from 60 to 29 percent between 1990 and 2018), increasing runoff rates and vulnerability to floods.[24] At the same time, urbanization trends were driving groundwater extraction and consequent land subsidence–thereby compounding the flood risks by lowering the height of land in critical areas. Jakarta, for example, continues to subside at 1-15 cm per year (amounting to about 3.5 meters subsidence since the 1980s in the most affected northern coastal areas). The vulnerability of Indonesia's urban population to heat stress has similarly been driven by urban development patterns (Figure 18). The conflation of land use, water use, and rising sea levels has created some of the most climate-vulnerable urban centers in the world.

24 Projected peak runoff rates have been estimated to increase by 20 percent from 2007 levels under 2030 projected land cover changes in the Ciliwung River Basin, Jakarta. See Emam et al. 2016.

FIGURE 17

Climate Change will Reduce Agricultural Yields Without Adaptive Measures

Projected Impact of Climate Change on Crop Yield in Indonesia (%) 2030



Source: WBG staff compilation of IMPACT model results (see IFPRI, Bappenas, and ADB 2019). Results are in the absence of yield-enhancing research and development which can be expected to counteract some losses.

FIGURE 18

Elevated Temperatures in Cities and Share of Vegetated Land Cover

Population exposed to specified average surface temperatures in ten cities (%), and vegetated land cover (%) (2021)

Temp. (°C) ►	20 – 21	22 – 23	24 – 25	26 – 27	28 – 29	30 – 31	32 – 33	% of vegetated area
Balikpapan	19	41	30	7				73.5
Sorong	24	36	31	9	1			62.9
Medan	1	16	34	43	8	1		44.2
Manado	1	25	38	31	5			36.7
Palembang	1	26	42	31	1			32.4
Semarang		1	17	34	46	3		30.8
Banajarmasin		10	28	55	8			27.2
Denpasar		2	18	70	11			26.4
Makassar			11	36	38	16	1	9.0
Bandung	1	3	8	31	50	8	1	6.3

Source: WBG staff analysis.

Note: Darker colors indicate a larger share of population exposed.

Changes to land and water management planned or underway will improve resilience in rural areas. Restoration and rewetting of drainage-based agricultural cultivation in low-lying areas of Sumatra and Kalimantan, which cause emissions and land subsidence, will help reduce flood risks that are further compounded by sea-level rise. Halting mangrove loss for aquaculture development (concentrated in Kalimantan and Sulawesi) and for oil palm (concentrated in Sumatra) will strengthen the protective benefits that intact mangroves provide for communities and infrastructure along coastlines. The protective benefit of mangroves is recognized by the government in its recent commitment to restore 600,000 hectares of mangroves by 2024–the largest such effort in the world.

1.4 TRANSITION RISKS

While the low-carbon and climate-resilient transition can bring benefits, there are also substantial transition costs. Tightening global monetary policy impacts the cost of financing the low-carbon energy transition while subsidies increased due to soaring energy prices and below-cost pricing domestically. The supply of cheap land, and the expansive agricultural model that depends on it, will be constrained by land-emissions mitigation policies. Shifts within these supply chains will have spillover effects on workers and the financial sector, while global capital and trade preferences for greener goods will introduce further pressures. There is the challenge of dealing with stranded assets resulting from decarbonization efforts, with spillover effects to the real sector and the financial system.

Renewed global turbulence since the start of Russia's invasion of Ukraine has added new dynamics to the transition out of coal. Indonesia was the world's largest thermal coal exporter in 2020. Coal prices have increased sharply and are projected to remain higher than historical averages over the next 5-10 years.[25] This is driven in part by rising demand, including from Europe due to cuts to gas supplies from Russia, that could slow the planned exit from coal. At the same time, the rising cost of coal and other fossil fuels should encourage a shift toward renewables, however, there are countervailing forces. First, progress on eliminating energy subsidies (and replacing them with targeted transfers to the poor) has become more difficult in the very near-term. Second, the increased cost of financing and higher investment costs due to tightening of global supply chains creates financial challenges for new investment in renewables. Third, high energy prices make it difficult to implement carbon pricing to shift incentives toward renewables. In addition, coal makes a large economic contribution in geographically concentrated areas with few economic alternatives–making those areas vulnerable to severe and multiplicative impacts from mine closures.[26]

> "Tightening global monetary policy impacts the cost of financing the low-carbon energy transition while subsidies increased due to soaring energy prices and below-cost pricing domestically."

25 Consensus Economics Inc., Energy and Metals Forecasts (September 2022).

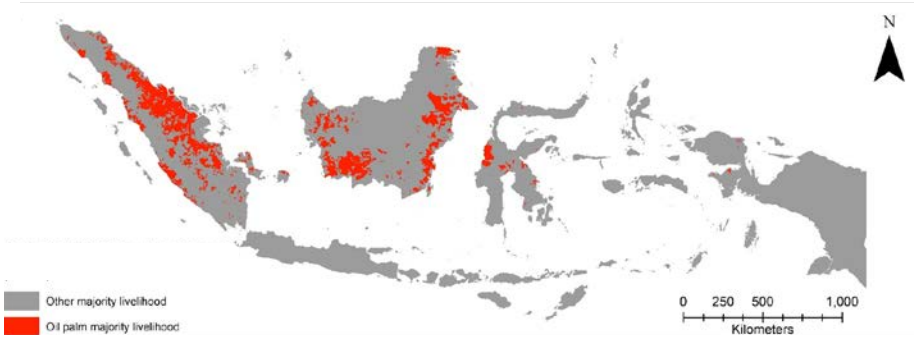
26 East, South, and North Kalimantan, and South Sumatra, with the East and South Kalimantan local economies being relatively more dependent. In East Kalimantan, for instance, coal contributed 35 percent of provincial GDP in 2017.

Indonesia's other major resource export–palm oil–faces its own risks. In 2019, Indonesia produced 52 million tons of palm oil product–mainly from plantations in the lowlands of Kalimantan and Sumatra (Figure 19)–contributing 72 percent of global supply and 4.5 percent of Indonesia's GDP (BPS 2020). Palm oil faces growing global demand, but the low-carbon transition implies restrictions on the supply of new land and rising costs of fuel and fertilizer. Land availability may decrease as forested areas are more strongly protected (Orbitas 2021). Several such protections have been implemented in recent years, including protection of high conservation value (HCV) forests within concessions (described in Chapter 2). Producers will need to use existing land, fuel, and fertilizer more efficiently. Smallholder operations (representing 60 percent of total production) have yields up to 40 percent below those of the larger producers; closing this gap presents a productivity opportunity but will require finance and technical support to replace older plantations with new high-yielding varieties.

FIGURE 19

Oil Palm Livelihoods are Concentrated in Kalimantan and Sumatra Lowlands

Villages in which oil palm provides the primary income source for a majority.



Source: WBG staff analysis based on PODES (2018) data.

Climate actions by the international community could also impact Indonesia's economy and international trade. These actions include individual countries' actions under their NDCs and the European Union's (EU) Carbon Border Adjustment Mechanism (CBAM). World Bank modelling results indicate that when both NDCs and the EU CBAM are implemented, Indonesia faces a real income decrease of 0.5 percent in 2030, relative to a 2030 counterfactual. The decrease of real income for Indonesia is a consequence of a fall in output of 1.1 percent, including due to a decrease in coal output of 20.3 percent or US$47 billion.[27] The effect of the EU CBAM is negligible; the reduction is mainly due to NDC implementation by countries globally. The impact on Indonesia is lower compared to the rest of East Asia and Pacific (0.6 percent), but higher than for high-income countries in Asia (0.4 percent).

These transition risks in the real economy could affect Indonesia's financial sector. Almost three-quarters of the Indonesian banking system's lending portfolio comprises sectors that are potentially exposed to climate transition risks (Figure 20).[28] The processing industry comprises 24 percent of Indonesian banks' loan portfolio, while agriculture (including palm oil) comprises 11 percent, followed by construction (10 percent), transportation (8 percent), and real estate (7 percent). Shocks to these sectors and thus to the financial

27 All figures are in 2014 US dollars.

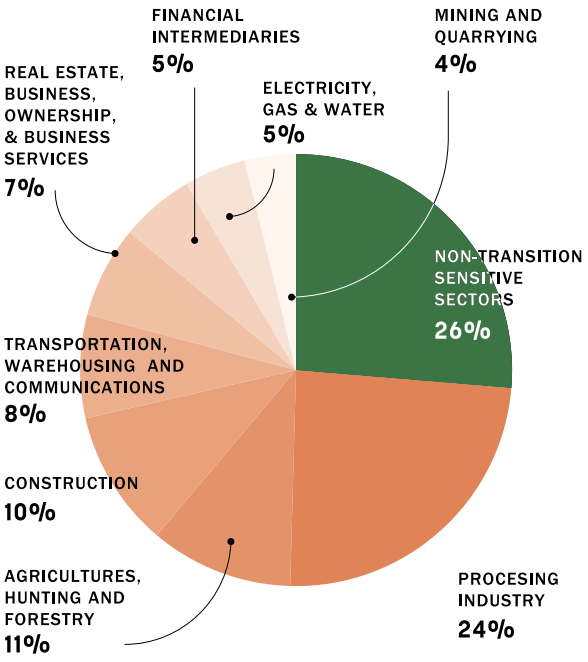
28 Measured as the carbon footprint adjusted loans to total loans for deposits.

sector, could result from rapid and unanticipated decarbonization coupled with lack of industry preparedness. Stock markets in Indonesia are also exposed to climate transition risk with 75 percent of stocks belonging to transition-sensitive sectors (Figure 21).

FIGURE 20

Lending Exposure of Indonesian Banks to Transition-sensitive Sectors is High

Distribution of non-transition and transition sensitive loans



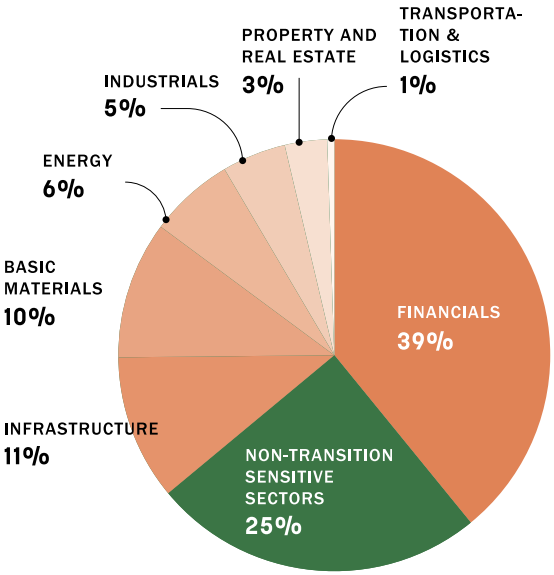
Source: IMF Climate Change Dashboard (2021).

Notes: Some sectors may be incorrectly classified due to aggregation. Indirect impacts such as supply chains are not captured.

FIGURE 21

Indonesia's Stock Markets are Weighed Toward Emissions-exposed Sectors

Distribution of transition sensitive equities



Source: IMF Climate Change Dashboard (2021).

Notes: Transition-sensitive sectors are those with either high absolute emissions, high emission intensities, high exposure to emission-intensive sectors, or are expected to be directly affected by climate policies.

1.5 A VIRTUOUS CYCLE OF DECARBONIZATION, RESILIENCE, & GROWTH

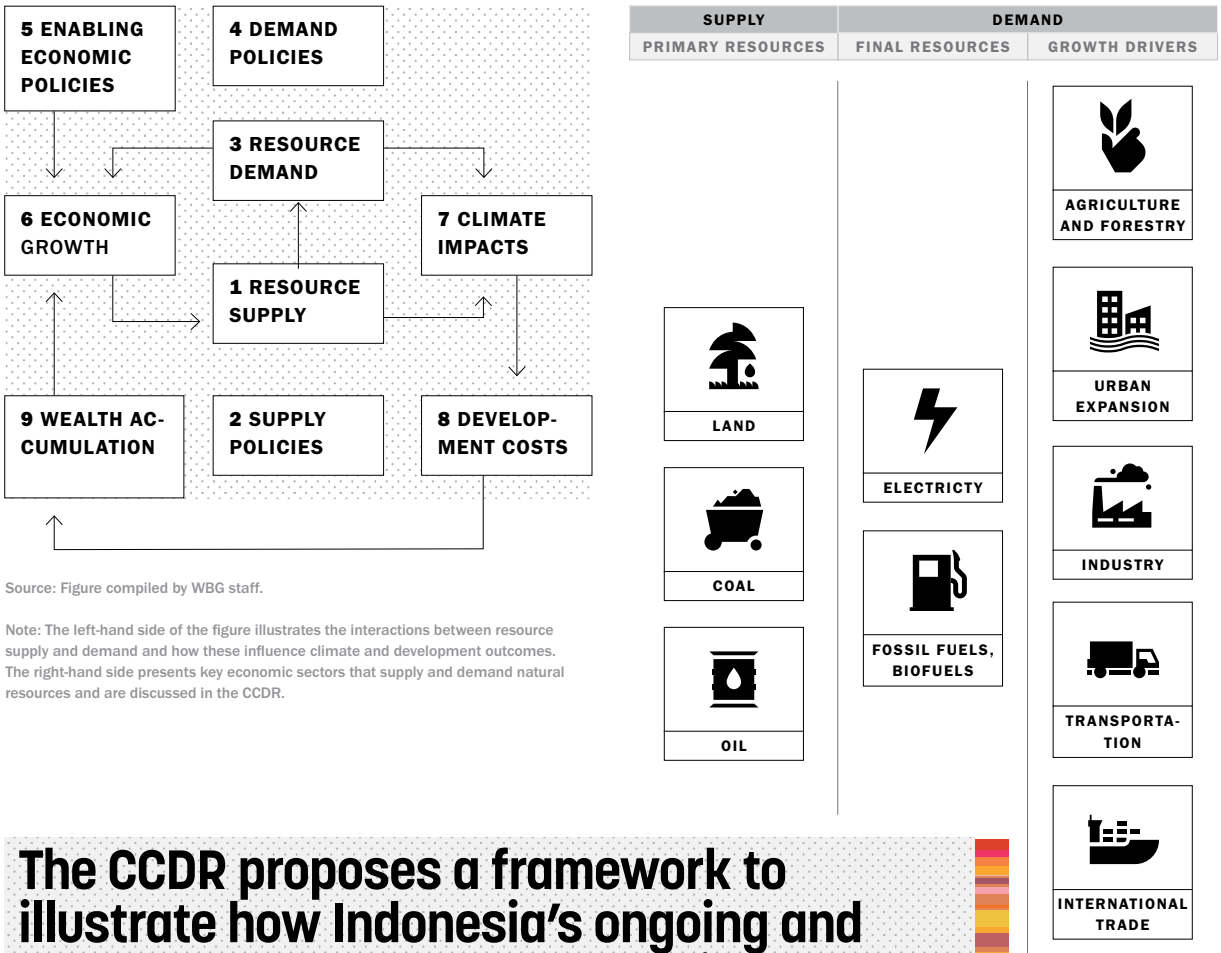
The CCDR proposes a framework to illustrate how Indonesia's ongoing and future reforms could support a just and affordable transition through positive climate and development dynamics (Figure 22). A reduction in the supply of carbon-intensive resources (land and non-renewable energy) (1) can be supported through policy and institutional reforms, some of which are already in place or underway (2). This will, however, also require a reduction in demand for those resources (for electricity, agriculture, urban expansion, transport, industry, and trade) (3) that require reforms to incentivize more efficient use of resources (for example, through carbon price, spatial planning) or alternative resources (for example, renewable energy) (4). Complementing these measures with enabling economic policies can help allocate resources to greener and more productive parts of the economy (5). A combination of these measures could help decouple growth

from carbon emissions (6) which could strengthen the economy's resilience to a rising incidence of climate impacts (that is, higher temperatures, sea level rises, and flooding) (7). This could help reduce the development costs of climate-related shocks (for example, physical damage, human capital loss) (8).

This cycle could help accelerate growth in Indonesia's national asset base (9). Indonesia's total wealth increased between 1995 and 2018. Indonesia has diversified its stock of wealth through a buildup of human and physical capital. There is, however, scope to accelerate overall wealth accumulation and wealth convergence relative to structural peers (Figure 23). The natural capital stock has increased over this time but has involved a reduction in the stock of renewable resources on the one hand (like forests) and increased dependence on non-renewable resources on the other (like coal). The accumulation of human capital stock also has scope to accelerate (Figure 24). Given the role of wealth accumulation as the basis for future growth, this trajectory could support Indonesia's effort to transition from a middle- to high-income country.

FIGURE 22

Reducing Supply of, and Demand for, Carbon-intensive Resources Through Sector and Enabling Policy and Institutional Reforms



Source: Figure compiled by WBG staff.

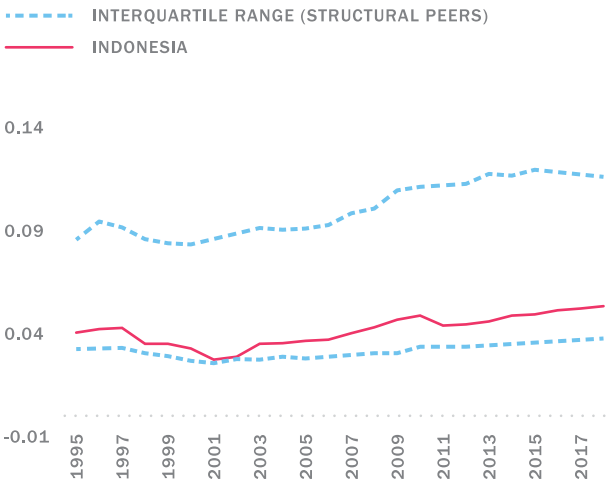
Note: The left-hand side of the figure illustrates the interactions between resource supply and demand and how these influence climate and development outcomes. The right-hand side presents key economic sectors that supply and demand natural resources and are discussed in the CCDR.

> "The CCDR proposes a framework to illustrate how Indonesia's ongoing and future reforms could support a just and affordable transition through positive climate and development dynamics"

FIGURE 23

Potential to Accelerate Convergence in Per Capita Wealth

Per Capita Wealth ex.nonrenewable source, convergence to US, Indonesia and interquartile range

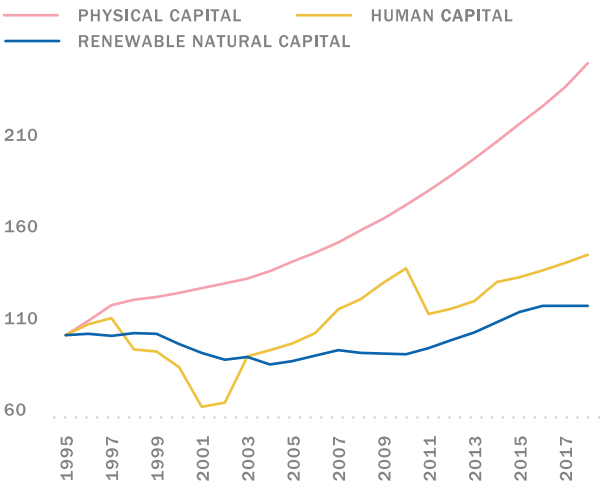


Note: The figure above presents the rate of per capita wealth convergence of Indonesia against the per capital wealth convergence of structural peers, relative to the US. See footnote 2 on structural peers.

FIGURE 24

Including Through Faster Growth in Human Capital Stock

Indonesia change in national wealth (Index 1995=100)



Source: Changing Wealth of Nations Database, figure compiled by WBG staff.

2

COMMITMENTS & CAPACITIES

PAGE
21—37

TEGALLALANG • BALI

Indonesia has embarked on a path of policy and institutional reforms to address the climate and development dynamics discussed in Chapter 1. Low-carbon and resilient development policies are a national priority under the RPJMN 2020–24, the NDCs, and the LTS-LCCR. Chapter 2 of the CCDR considers the policies, tools, and resources that Indonesia is using to deliver on these ambitions, and opportunities for further strengthening. This chapter covers three issues: (i) climate mitigation through supply-side emission cuts (that is, land and energy); (ii) climate mitigation through demand-side emission cuts (that is, electricity, industry, transportation, urban expansion, and agriculture); and (iii) climate adaptation, including the management of disaster-related contingent liabilities. It focuses on sector-specific policies, rather than cross-cutting economic policies that impact those sectors (for example, fiscal, financial sector, investment, and trade policies) as these are discussed in Chapter 3.

2.1 POLICIES & INSTITUTIONS FOR THE SUPPLY-SIDE

Indonesia has committed to cutting emissions as part of its NDCs under the 2015 Paris Agreement. Indonesia's Enhanced NDC, released in September 2022, sets out an unconditional 31.9 percent reduction in emissions against BAU projections by 2030, and up to a 43.2 percent reduction conditional on international support.[29] It proposes actions across the economy, including for energy, agriculture, industrial, waste, and FOLU sectors.[30] Estimated per capita emissions under the Enhanced NDC's unconditional target are projected to be 6.5 tCO_2eq per year in 2030, lower than most other large economies including Brazil, China, Japan, and the United States (Figure 25 and 26). Total emissions in 2030, of an expected 1,953 Mt-CO_2eq, will be on par with those of the EU and Russia, and below those of the US, China, and India (Figure 27). This CCDR does not take a position on what Indonesia's NDC targets should be. It acknowledges the principle of common but differentiated responsibility[31] and assesses options for Indonesia to meet its commitments while also achieving its development goals.

Indonesia has also mapped out longer-term emissions trajectories toward a net-zero target by 2060 or earlier. The LTS-LCCR[32] is a detailed roadmap that demonstrates the technical feasibility of a low-carbon trajectory, reaching 1.61 tCO_2eq per capita emissions by 2050 under its low-carbon strategy scenario (aligned with the Paris Agreement). While the NDC is a quantitative commitment, the LTS is a longer-term vision that demonstrates possibilities and pathways (Figure 28). The net-zero vision–and pathways toward it–are further mapped out by the government's LCDI (Bappenas 2021a). Recently, Indonesia signaled a more ambitious target of peaking power sector emissions by 2030 and achieving net-zero emissions in the power sector by 2050 in the context of the Joint Statement by the Government of Indonesia and the International Partners Group (IPG) under the Just Energy Transition Partnership (JETP). The JETP is expected to mobilize US$20 billion over the next three to five years of which, of which $10 billion are expected to be mobilized by IPG members and the remaining will consist of private financing mobilized by the Glasgow Financial Alliance for Net Zero (GFANZ) Working Group.[33]

29 The Ministry of Finance (MoF) estimates the required international support at about US$114 billion. See Ministry of Finance (MoF) 2021.

30 While the CCDR covers a wide range of sectors in line with its demand and supply-side framework (see Chapter 1), relatively more attention is devoted in Chapter 2 to FOLU and Energy, given their relatively larger fraction of emissions. Chapter 3 includes discussion of industry in the context of the private sector and the overall enabling environment.

31 The common but differentiated responsibilities principle is formalized within the United Nations Framework Convention on Climate Change (UNFCCC). It recognizes that all countries have a shared obligation to address climate change but that responsibility for addressing the issue differs between countries, given different capabilities and historical contributions.

32 LTS-LCCR extends the unconditional 2030 commitment through three scenarios: (i) current policies, where emissions will continue to increase after 2030; (ii) transition, where emissions will decrease but are insufficient to reach the 2050 target; and (iii) low-carbon, where emissions will decrease rapidly after 2030. See Republic of Indonesia 2021.

33 Joint Statement by the Government of Indonesia, and the Governments of Japan, the United States of America, Canada, Denmark, the European Union, Germany, France, Norway, Italy, and the United Kingdom (together the "International Partners Group" or IPG) (link). The GFANZ is a group of financial institutions including Bank of America, Citi, Deutsche Bank, HSBC, Macquarie, MUFG, and Standard Chartered.

FIGURE 25

Per Capita Emissions of Major Economies under Stated Targets

Projected per capita emissions (tCO_2eq per year) in line with stated commitments

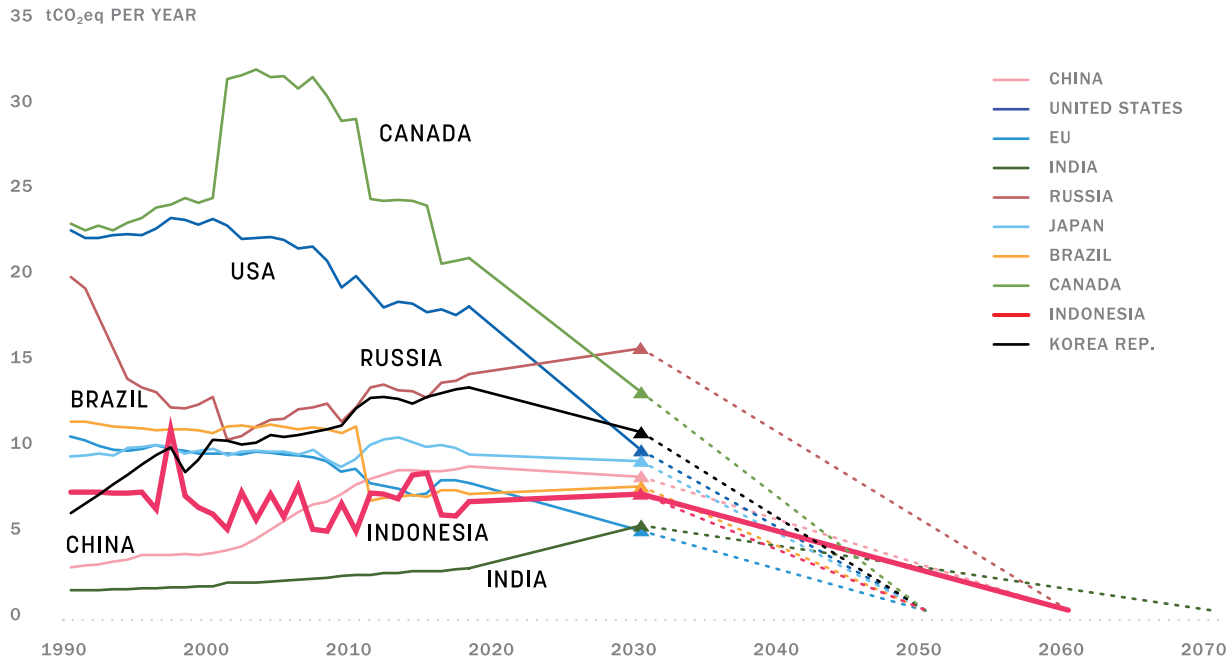
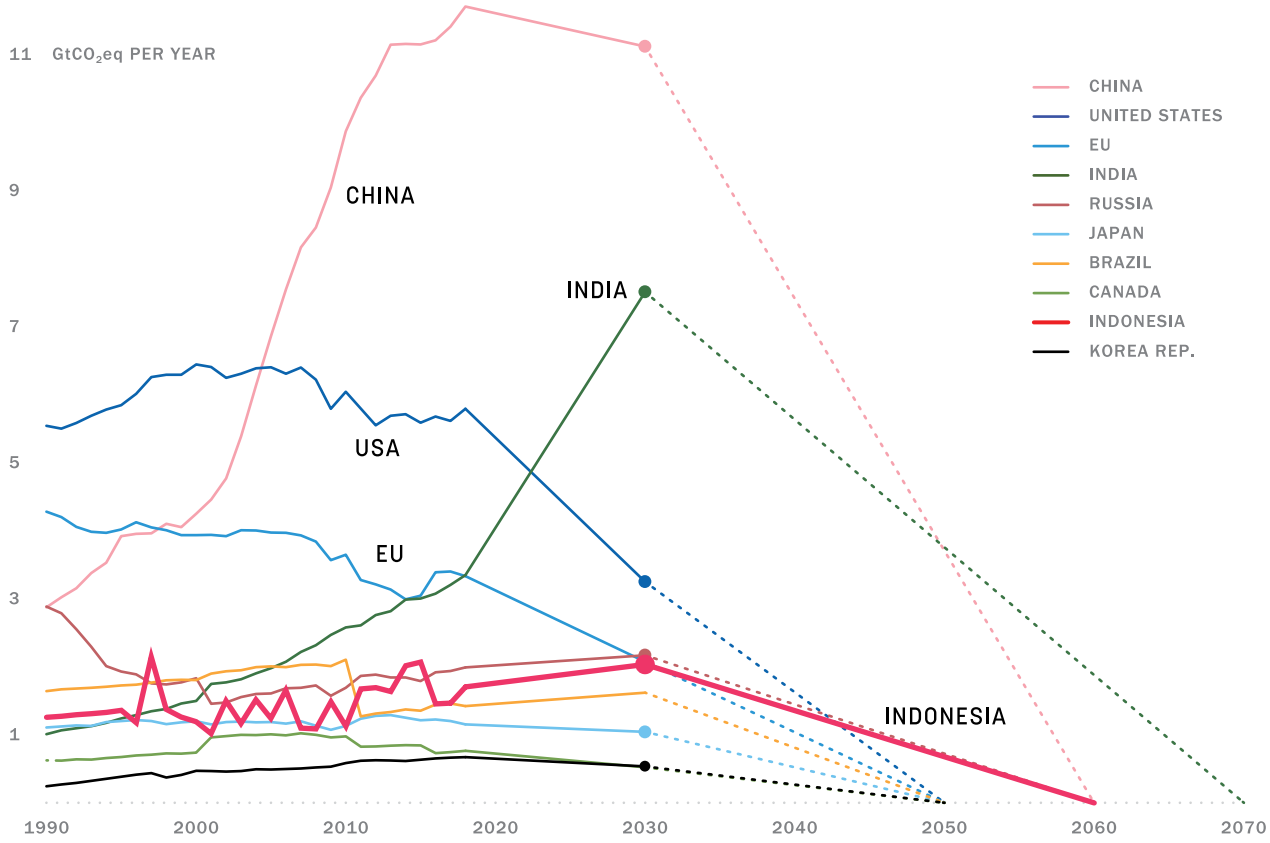


FIGURE 26

Absolute Emissions of Major Economies under Stated Targets

Projected absolute emissions ($GtCO_2eq$ per year) in line with stated commitments

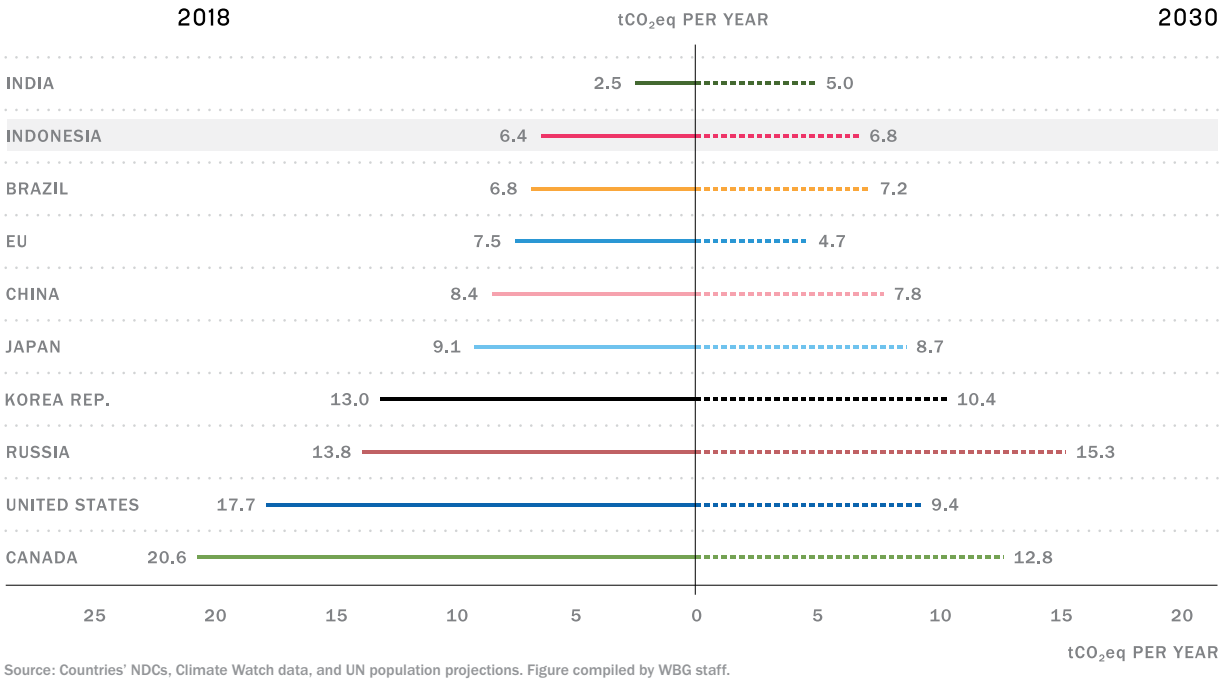


Source: Countries' NDCs, Climate Watch data, and UN population projections. Figures compiled by WBG staff.

FIGURE 27

2030 Commitments Per Capita: Top-10 Emitters

2018 and projected 2030 per capita emissions (tCO_2eq per year) based on NDC commitments

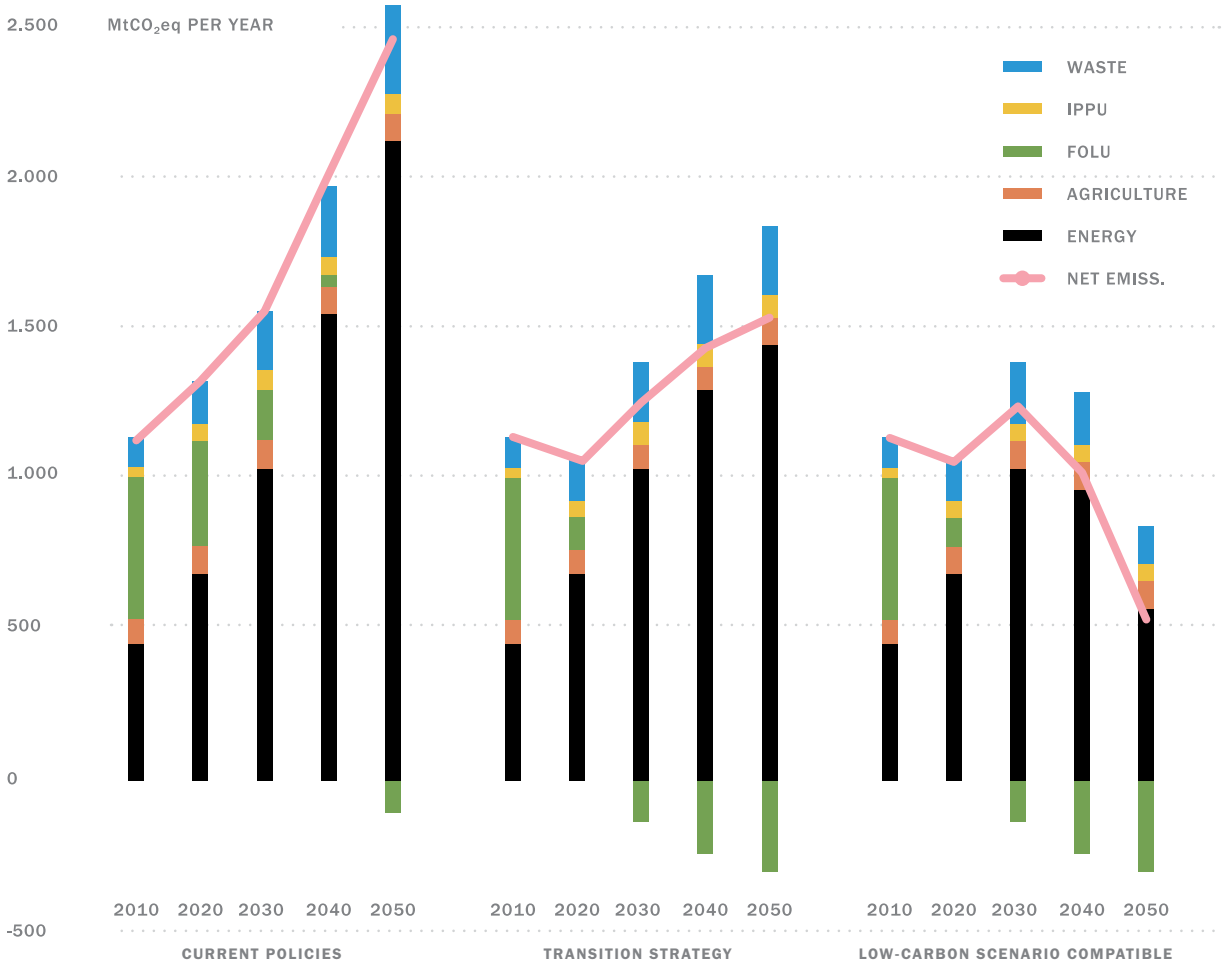


Source: Countries' NDCs, Climate Watch data, and UN population projections. Figure compiled by WBG staff.

FIGURE 28

Possible Post-2030 Pathways for Indonesia

Emissions trends modelled in Indonesia's Long-Term Strategy (2021)



Source: Republic of Indonesia (2021).

Note: FOLU = Forestry and Other Land Uses; IPPU = Industrial processes and product use.

The low carbon and resilient transitions are also reflected in Indonesia's development plans. "Strengthening the environment and improving resilience against natural disasters and climate change" is one of six major development themes under the RPJMN 2020-24 which guides the government's annual plans (*Rencana Kerja Pemerintah*: RKP). In the most recent annual plan, 26 out of 39 priority projects make a direct or indirect contribution toward NDC mitigation and adaptation targets. New medium- and long-term plans are now under development–with the mainstreaming of climate measures a key priority. This is being supported by the inclusion of climate change indicators in the formulation of development targets.

More than 60 percent of the emission reduction target in Indonesia's Enhanced NDC is intended to be met through actions in the FOLU sector. FOLU emissions are projected to fall from a BAU projection of 714 $MtCO_2eq$ to 214 $MtCO_2eq$ in 2030 under the NDC's unconditional target (Figure 29 and 30). While already ambitious, the government further aims to make FOLU a carbon sink by 2030 (that is, negative net emissions) under its FOLU Net Sink 2030 plan.[34] Stipulated actions to achieve these goals include restoring 2.7 million hectares of peatlands, rehabilitating 5.3 million hectares of degraded forestlands, and continuing recent progress in reducing deforestation and forest degradation rates (Table 1). Reforestation, peatland restoration, and mangrove restoration targets are also included in the RPJMN 2020-24. FOLU Net Sink 2030 activities are also expected to have important co-benefits for biodiversity and soil and water management[35]

34 Ministerial Decree No. 168/Menlhk/PKTL/PLA.1/2/2022, the Operational Plan for Indonesia's FOLU Net Sink 2030.

35 Indonesia is home to 10 percent of the world's flowering species and is a major center for agrobiodiversity of plant cultivars and livestock. About 12 percent of the world's mammal species live in Indonesia, ranking second (after Brazil), 17 percent of bird species (ranking fifth) and 16 percent of reptiles (fourth).

FIGURE 29

Conditional and Unconditional 2030 NDC Targets

Emissions ($MtCO_2eq$) by major emitting sector, 2019, and 2030 (NDC targets)

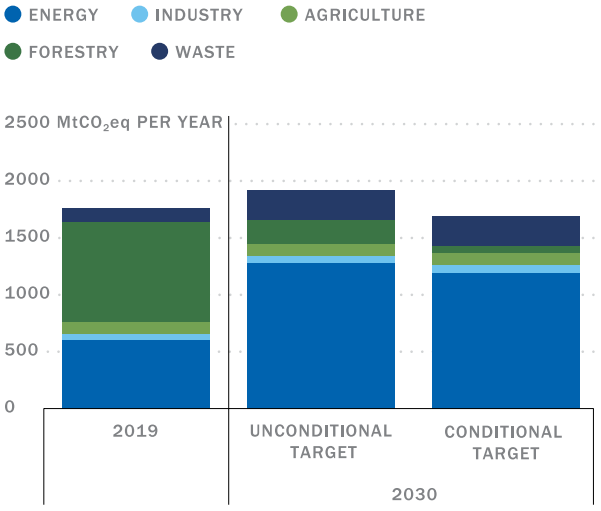
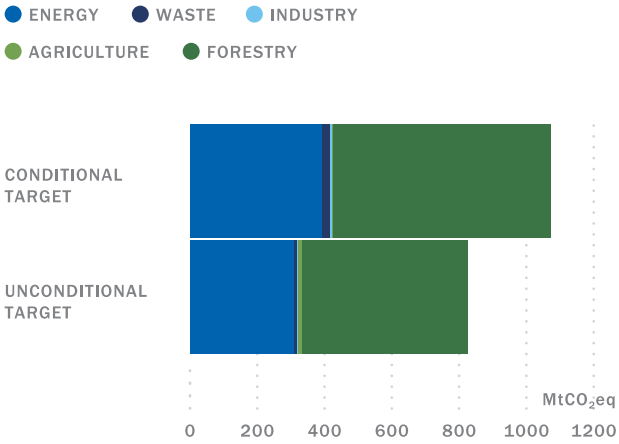


FIGURE 30

Planned Sectoral Contributions to 2030 NDC Targets

Emissions reduction ($MtCO_2eq$) from projected BAU under NDC targets



Source: Indonesia Enhanced NDC and MoEF data (2022). Figures compiled by WBG staff.

60%

More than 60 percent of the emission reduction target in Indonesia's Enhanced NDC is intended to be met through actions in the FOLU sector

TABLE 1 Actions (and Targets) to Reach Negative FOLU Emissions by 2030

	ACTION	TARGET
1	Reduce deforestation on mineral soils	Average rate of deforestation not to exceed 241,000 hectares/year
2	Reduce deforestation on peat soils	
3	Reduce forest degradation on mineral soils	Average rate of degradation not to exceed 131,000 hectares/year
4	Reduce forest degradation on peat soils	
5	Develop industrial timber plantations	12.8 million hectares by 2050
6	Sustainable Forest Management and Reduced Impact Logging (RIL)	1.7 million hectares of forest concessions practice RIL by 2030 and 8.8 million by 2050; all concessions gov. certified by 2050
7	Forest rehabilitation using non-native species	5.3 million hectares rehabilitated by 2030, and 10.6 million hectares by 2050
8	Forest rehabilitation using native species	
9	Peatland restoration	2.7 million hectares by 2030
10	Improved peatland water management	950,000 hectares by 2030

Source: MoEF 2021. Note: An eleventh action calls for conserving biodiversity (a non-quantified target).

Commitments are built on a foundation of strengthened policies and institutions. In 2011 the government placed a moratorium on new licenses for forest conversion in primary forests and peat (a measure made permanent in 2019) and in 2016 strengthened the moratorium for areas of deep peat. These moratoriums protect a combined 66 million hectares. In 2015, the government merged the Ministry of Environment and Ministry of Forestry and mandated the new body to lead the country's climate commitment. Two further agencies were established: (i) the Peat Restoration Agency in 2016 responsible for delivering peatland restoration targets (later expanded to include mangrove in 2021 as the Peat and Mangrove Restoration Agency (*Badan Restorasi Gambut dan Mangrove*: BRGM); and (ii) the Indonesian Environment Fund Management Agency (*Badan Pengelola Dana Lingkungan Hidup*: BPDLH) in 2019, a unit under MoF that is responsible for channeling financing for climate and environmental projects (in FOLU activities, energy investments, and beyond). More recently, Presidential Regulation No. 98/2021 on the Economic Valuation of Carbon was introduced to support result-based payments and other market-based instruments that incentivize climate mitigation activities.

These and other actions are showing progress–MoEF data indicates that deforestation slowed from an average of 1.13 million hectares (ha) per year between 2000-06, to 0.12 million ha and 0.11 million ha in 2019-20 and 2020-21 respectively (see Figure 9 in Chapter 1). This represents a downward trend that stands in contrast to other major tropical forest countries. Further

> "deforestation slowed from an average of 1.13 million hectares (ha) per year between 2000-06, to 0.12 million ha and 0.11 million ha in 2019-20 and 2020-21 respectively"

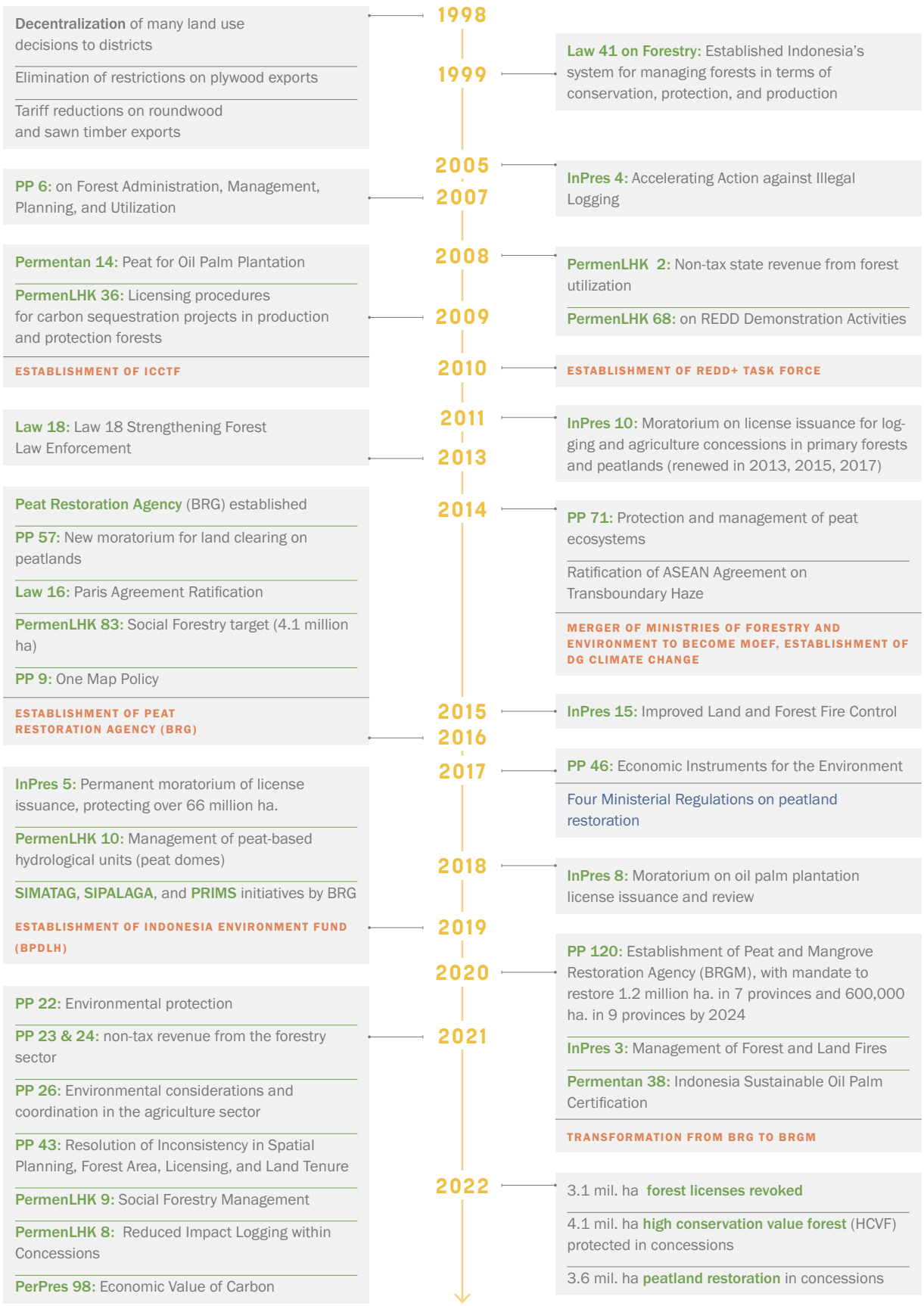
measures are expected to support this trajectory going forward (Figure 34). MoEF revoked 3.1 million ha of forest concession licenses in 2022 and required concessionaires to protect HCV forest areas. Restoration of 1.3 million hectares of peatlands has been undertaken by BRGM to date, with a further 3.6 million ha restored by the private sector within concessions under the government's peatland management regulations (MoEF 2022). In contrast to earlier years (2001-15), the rise in oil palm prices since 2016 does not appear to have led to an upswing in forest clearing (Kiely et al. 2022). This may suggest a decoupling of commodity market prices and deforestation. Many policy measures have long lead times to impact, with further results expected in future years.

The government's commitment to land rights reform is another important step toward reducing land-based emissions. Many smallholder activities within forest areas are informal, encouraging land conversion and preventing access to social support and markets. Indonesia has embarked on major land tenure reforms, including a commitment to award 12.7 million hectares of social forestry licenses. These are a form of land use right held at the community level that aim to reverse incentives for forest clearing and encourage investment in lower-impact land uses such as tourism, selective logging, and agroforestry. Approximately 4.1 million hectares of social forestry access had been granted by May 2020. Similarly, the National Land Reform Program (*Tanah Obyek Reforma Agraria*: TORA) aims to formalize land ownership of an additional 9 million hectares outside the forest estate. These are some of the largest land reform programs in the world (MoEF 2021). Over time, these programs could be further targeted toward high deforestation-risk areas to maximize impact and combined with livelihood programs to improve communities' access to capital and technical resources for low-impact livelihoods (Resosudarmo et al. 2019; Kraus et al. 2021).

After FOLU, the energy sector would need to deliver the largest tranche of emission cuts. About 39 percent of the emission reduction target in Indonesia's Enhanced NDC would be met through actions in the energy sector. Absolute emissions from the energy sector are projected to increase from approximately 600 $MtCO_2eq$ in 2020 to 1,311 $MtCO_2eq$ under the unconditional target in the Enhanced NDC (Figure 32)–an increase in absolute terms but a 21 percent reduction relative to the estimated 1,669 $MtCO_2eq$ of energy sector emissions by 2030 under a BAU scenario (Figure 33). By 2030, the energy sector would have overtaken land as the biggest source of carbon emissions in Indonesia.

FIGURE 34

The Land Use Policy Framework: A Chronology



Source: Figure compiled by WBG staff.

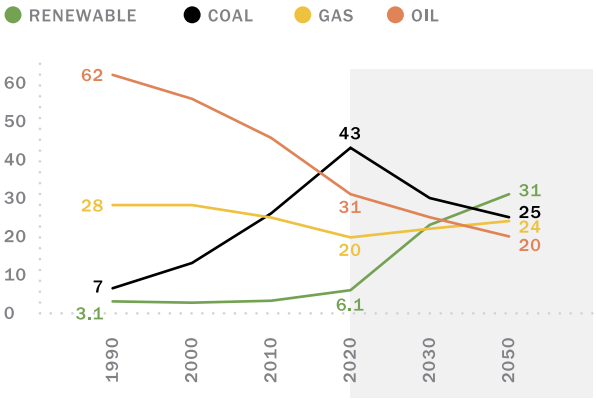
Notes: PP = Peraturan Pemerintah (Government Regulation); PerPres = Peraturan Presiden (Presidential Decree); InPres = Instruksi Presiden (Presidential Instruction); UU = Undang Undang (law), Permen LMK = Ministerial Regulation (MoEF); BRG = Badan Restorasi Gambut (Peat Restoration Agency); ICCTF = Indonesia Climate Change Trust Fund.

To implement cuts in energy emissions, Indonesia aims to change its primary energy mix. Given Indonesia's intensive use of fossil fuels as covered in chapter 1 above, the scale of the effort required is substantial. This includes targeted cuts to the share of coal (43 to 30 percent between 2020 and 2030) and oil (31 to 25 percent) and targeted increases in the share of renewables (6.1 to 25 percent)[36] (Figure 31). There has been some increase in renewable energy consumption to date, driven mainly by biofuels (Figure 32). Biofuels have increased since 2016 on the back of subsidies and mandates, with a government rule requiring diesel fuels to have 30 percent biodiesel content by 2020 (and 40 percent by 2025). However, the use of other renewable energy resources has not progressed substantially, and not at the scale needed to implement the NDC's energy commitments. Most sources of primary energy (including coal but excluding oil) will continue to increase in absolute terms until 2050.

FIGURE 31

Commitments to Changes in the Energy Mix

Primary energy mix (% shares)

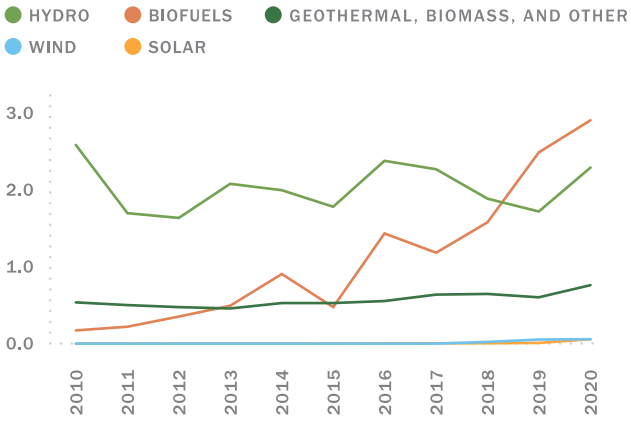


Source: Our World in Data, Indonesia NDC 2022 (p.7), figure compiled by WBG staff.

FIGURE 32

Renewables as a Share of Total Energy Consumption

Indonesia renewable energy consumption (% share of total energy consumption)



Source: Our World in Data, figure compiled by WBG staff.

Against this backdrop, an important initial step in enabling increased renewable energy penetration in the energy mix was the recent decision to establish a more favorable pricing scheme for these technologies. Presidential Regulation No. 112/2022 overrides the existing regulation which caps such purchase prices at or below the average cost of grid electricity generation (which is mostly determined by coal-based generation). Instead, the regulation sets out new ceiling prices differentiated by renewable energy technologies, size, and location which, overall, are higher than the previous caps. It also established competitive principles for procurement of renewable energy technologies such as Solar PV and provides for direct fiscal support for the state-owned electricity company PLN (PT. Perusahaan Listrik Negara) to be compensated if the development of new renewable capacity increases its average generation cost. Facilitated by these regulatory reforms, the implementation of large-scale competitive selection processes will be needed going forward to achieve the deployment of renewable energy at the scale required for the transition.

36 Under the Just Energy Transition Partnership, the target share of renewables in 2030 is now 34 percent of the power mix (that is, not primary energy mix).

Two other fundamental reforms will be needed to incentivize the move away from coal. As noted above, recent global developments create headwinds for the coal exit, including rising coal prices and higher costs of financing for the energy transition. Reforms that can help reduce the relative cost of renewables will be even more important in the current environment. Priority changes in this regard would remove:

1 **The Domestic Market Obligation (DMO) for coal**

Indonesian coal producers are obliged to sell a minimum amount of their output to PLN for electricity generation–at a rate capped at US$70/tonne, a rate well below recent market prices. This creates incentives for reliance on coal for electricity generation, and artificially reduces the cost of electricity, leading to less efficient use of final energy by end users on the demand side.

2 **Local content requirements (LCRs)**

Existing regulations set a minimum threshold for local content both for materials and services used in renewable energy generation, including solar power, with the ambition of supporting development of domestic manufacturing capability.[37] Local solar panel manufacturers have not yet reached sufficient scale and competitiveness, however, resulting in panels that are more expensive and of lower quality than those on the international market. Local content requirements therefore increase the cost of renewable energy, making it less competitive vis-à-vis fossil fuel generation.

2.2 POLICIES & INSTITUTIONS FOR THE DEMAND SIDE

At COP26 in 2021, Indonesia committed to the 'Global Coal to Clean Power Transition Statement' ensuring transition away from coal.[37] Following this announcement, PLN removed in its 2021-2030 10-year investment plan 20 GW of new coal plants compared to the previous 10-year plan (2019-2028). Some 13.8 GW of planned grid-connected coal capacity is, however, already under development and expected to come online before 2030.[39] Indonesia is considering options to reduce these increases. Of the planned 13.8 GW of coal plants, 9 to 10 GW are at advanced stages of construction. These are expected to be commissioned in the next two years. As mentioned in Chapter 1 above, additional coal generation will result in stranded assets which will become a constraint for the transition.

In an important recent step forward, Indonesia set out for the first time a legally binding restriction on building coal-fired power plants connected to the country's electricity grid in Presidential Regulation No. 112/2022. The regulation also provides, however, for significant exemptions to this coal plant moratorium. These exemptions include coal plants that were already approved and those integrated with industries aimed at the transformation of raw natural resources or that support projects deemed of national strategic importance.

37 Ministry of Industry (MoI) Regulation No. 54/2012 (updated through MoI Regulation No. 5/2017, and further detailed in MoI Regulation No. 4/2017).

38 Like some other countries, Indonesia excluded the third point of the statement, which requires no further issuance of new permits for the construction of unabated coal-fired power plants. Over 40 countries supported the statement in whole or in part. Indonesia has stated a willingness to consider accelerating the coal phase-out into the 2040s, conditional on additional international financial and technical assistance.

39 These are part of the government's plan that was approved in 2015 for an additional 35 GW of capacity.

Indonesia has banned the export of nickel and bauxite, and the government has plans to gradually stop exporting other raw materials too. Energy demand for the processing of minerals has the potential to increase substantially over the next few years. The exemption in the regulation poses a significant risk to Indonesia's coal phase-down if new coal-fired plants materialize and could further lock industrial processes into a high-carbon content development path.

To enable the phase out of coal, Indonesia is establishing an Energy Transition Mechanism Country Platform. This Platform creates the institutional set-up to organize, achieve scale, and coordinate funding and financing for the energy transition. The Country Platform, to be managed by PT. *Sarana Multi Infrastruktur* (PT. SMI), will channel state budget, donor funding, and proceeds from carbon trading for energy transition projects. Financial solutions have the potential to reduce the costs of the energy transition by harnessing multilateral, donor, and philanthropic funding and financing to blend it with state budget and private sector capital to maximize resources. Investments and activities expected to benefit from these mechanisms include, among others, renewable energy projects and early retirement of coal-fired power plants.

The contribution of solar and wind to the energy mix will need to accelerate rapidly but is challenged by over-capacity in coal. From 2010 to 2019, the share of renewable electricity output increased from approximately 14.1 percent to 15.3 percent overall,[40] leaving a considerable gap to the 2025 National Energy Plan (*Rencana Umum Energi Nasional*: RUEN) target of 23 percent, and the 2030 targets above. The over-supply of capacity in the system, mainly from coal, has reduced the 'space' for adding renewable energy without creating stranded coal power assets, most notably in the Java-Bali grid.

Reforming PLN's current revenue model and retargeting of end-user subsidies is needed to put the electricity sector in a solid financial footing to implement the transition. Scaling and integrating variable renewable energy (solar and wind) will require both PLN and the private sector to invest in grid and transmission capacity, energy storage such as pumped hydro and battery storage, digitizing the grid, and improving system dispatch, among others. Since 2017, however, tariff adjustments that would allow costs to be passed on to consumers have been restricted, limiting PLN's ability to make necessary investments, and resulting in losses that are covered by the state budget. This requisite payment (or top-up) from the budget to PLN is typically delayed–sometimes by up to two years–resulting in cash flow challenges. PLN also sets tariffs below cost recovery to provide low-cost electricity to poor and vulnerable customers but, as they are based on weak targeting, they further exacerbate inefficient subsidies. PLN's current revenue structure, set as a cost-plus seven percent margin, is not sufficient to cover operating costs and debt service. The incremental cost of the transition will be substantial as discussed in chapter 3 below and therefore, improving PLN's financial sustainability will be key to enable its implementation.

Addressing PLN's debt burden will also be important to enable it to invest in the energy transition. The rapid growth in outstanding debt has fed through into increasing challenges in meeting debt service commitments. This dependence on subsidies has posed several challenges. It has heavily

40 The proportion of renewables in the generation mix moves considerably from year to year given fluctuations in local conditions (for example, hydropower dam storage). The average of the three years up to 2010 and 2019 is reported to account for these fluctuations (International Energy Agency: IEA data).

politicized the process of setting tariffs and led to an emphasis on short-term cost minimization at the expense of investing now to reduce costs and risks in the longer-term.

Commitments to reduce the carbon intensity of the electricity system are being complemented by the government's electric mobility targets. The National Electric Vehicle (EV) Program for Road Transportation,[41] initiated in 2019, establishes a target for domestic EV production to represent 20 percent of total domestic sales by 2025 (Maghfiroh and Pandyaswargo 2021). By 2030, the Ministry of Energy and Mineral Resources (MoEMR) aims for 0.6 million electric cars, and 2.45 million electric two-wheelers on Indonesia's roads. These targets aim to reduce fossil fuel use, improve air quality, and develop the country's nickel reserves (the largest in the world) for lithium-ion batteries. Ambitious targets for the electrification of public transit fleets (90 percent by 2030) are also in place. Market uptake has been limited to date, owing to higher up-front EV costs (which are exacerbated by LCRs). Higher uptake, provided it occurs in concert with grid decarbonization, will help lower emissions (Box 1).

41 Presidential Decree No. 55/2019 on the Promotion of Battery Electric Vehicles (EVs) for Ground Transportation.

"Commitments to reduce the carbon intensity of the electricity system are being complemented by the government's electric mobility targets."

BOX 1

Modelling urban transport GHG emissions reductions

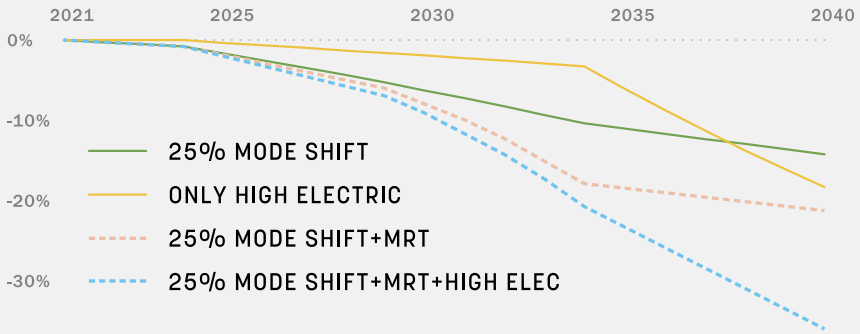
World Bank modelling assessed potential emissions reductions from the deployment of mode shift strategies (public transport and walking and cycling, demand management) along with electrification. Estimates are based on data for urban cores of 29 large urban agglomerations in Indonesia, combined with typical trip rates and mode splits between public and private transport. These were projected year-by-year for 20 years, considering potential changes in vehicle ownership, vehicle electrification and electricity carbon emissions. Mode shares of 25 percent public transit by 2034 would lead to reductions of 14 percent in urban transport GHG emissions by 2040 (Figure B.1.1). Reductions could be scaled up to 21 percent by implementing more sophisticated and high-performance mass rapid transit systems in densely trafficked corridors. These strategies further contribute to reduced congestion and the livability of Indonesia's cities.

A strategy for vehicle fleet electrification in isolation shows limited results by 2035 owing to the proportion of coal in the energy mix. Combining an electric mobility strategy with the urban mobility strategy leads to bigger climate impacts and reduced congestion. A high electrification scenario alone results in lower emission reductions of 2 percent by 2030 and 19 percent by 2040 (as the grid begins to decarbonize). Combining with improved public transport mode share (25 percent) and implementation of mass rapid transit systems leads to emission reductions of 31 percent and 38 percent respectively.

FIGURE B.1.1.

Commitments to Changes in the Energy Mix

Reduction in urban transport GHG emissions through sustainable transport strategies



Notes and source: High vehicle electrification of 25 percent car, 50 percent motorcycle, and 100 percent bus electrification by 2034. Estimates assume BAU electricity emission factors as described in the energy model. WBG staff estimates.

Building on recent investments in urban transport infrastructure, there are opportunities to include broader transport strategies in national plans and commitments. "Avoid-Shift-Improve" (ASI) strategies for decarbonizing the transportation sector would complement existing NDC plans for the transport sector. "Avoid strategies for decarbonizing urban mobility reduce the number and length of trips via integrated land use and transport planning. They require several decades to show results. 'Shift' strategies promote a move toward less GHG-intensive modes of transit via investment in reliable and integrated public transit, improvements to the pedestrian and cycling environment, and demand management tools (parking policies, personal vehicle taxes, and gradual removal of fuel subsidies). 'Improve' strategies include adoption of cleaner fuel technologies–such as from diesel to compressed natural gas (CNG) or electric, improved fuel, or efficiency standards. Including ASI strategies can guide efforts to reduce transport-related emissions while supporting competitiveness and urban livability.

There are also further opportunities to harness city planning and construction processes to reduce urban emissions. Urban footprints, and associated emissions from land use and service provision will expand dramatically over the next decade in Indonesia (Figures 33 and 34). Indonesia has mandated efficiency standards (green certification) for high-rises. Including landed houses under certification standards (*Sertifikasi Bangunan Gedung Hijau*) would help further energy efficiency gains. Regional Low-Carbon Development Plans (*Rencana Pembangunan Rendah Karbon Daerah*) are under development. The first such plan approved was for Jakarta in 2021, which targets GHG emissions reductions of 50 percent by 2030. Expansion of this process to other locations will strengthen the alignment of national climate goals with actions at the subnational level.

FIGURE 33

Emissions from Land Cover Changes in Rapidly Developing Cities

Expected emissions due to land use change ($MtCO_2$)

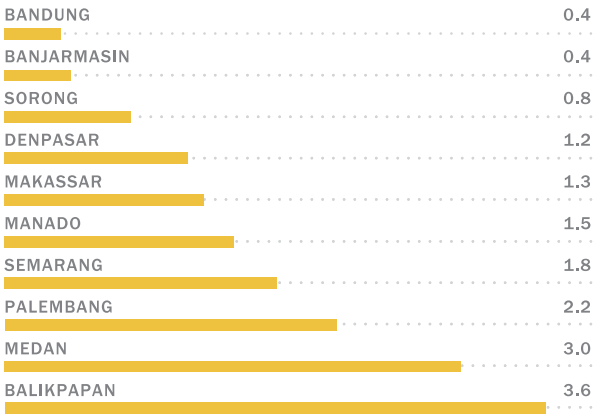
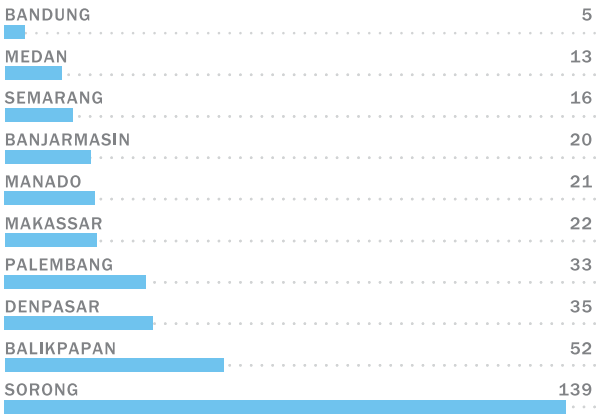


FIGURE 34

Emissions from Provision of Urban Services

Expected increase in emissions due to urban services after urban expansion (%)



Source: World Bank modelling of expected urban development for ten metropolitan areas between 2015 and 2030.

2.2

COPING WITH CLIMATE CHANGE

Policies and institutions that are key to adaptation have improved in recent years. Indonesia's high-level adaptation commitment is to minimize GDP loss to 2.87 percent by 2050.[42] The LTS and NDC provide frameworks for adaptation actions that are intended to guide the RPJMN and budget allocations; regulations guide their incorporation into regional and sectoral development plans along with vulnerability and climate risk assessments.[43] Major adaptation and resilience initiatives include Indonesia's Disaster Resilience Improvement Program (DRIP) which invests in resilient infrastructure and disaster preparedness and the recently established Pooling Fund for Disasters (*Pooling Fund Bencana*: PFB)–a central mechanism for managing disaster-related contingent liabilities in a cost-effective manner. An Adaptive Social Protection (ASP) Roadmap has been developed to provide a guide for leveraging social protection to address risks to climate-related hazards and other shocks. These and other initiatives have contributed to improvements in Indonesia's overall climate "readiness".

Empowered decision-making at a local level–in collaboration with the private sector, academia, and civil society–is also contributing to improved resilience. The success of Indonesia in achieving adaptation goals under the NDC will be strongly influenced by the actions of non-party stakeholders, and communities' awareness and empowerment. The Climate Village Program (*Program Kampung Iklim*: PROKLIM) is a key contribution toward such participation. Launched in 2012 and expanded in 2016, the program helps communities understand climate risks, determine their adaptation needs and mitigation potential, and implement and monitor progress, while bringing local authorities together with civil society actors, the private sector, and academia. As of 2021, 3,270 villages had established PROKLIM activities, toward a targeted 20,000 villages by 2024 under the RPJMN 2020-24. Communities are also receiving support through related sector-specific programs, including Fire Care Communities, the Disaster-Resilient Villages Program under the National Disaster Management Authority (*Badan Nasional Penanggulangan Bencana*: BNPB), and the Climate-Healthy Villages Program under the MoH. Climate information at local level is being provided by the Vulnerability Index Data Information System (*Sistem Informasi Data Indeks Kerentanan*)–a national data platform for tracking village vulnerability.

42 Government modelled losses in the absence of adaptation. See MoEF 2021a.

43 Notably, MoEF Regulations No. 33/2016 and No. 7/2018.

Recent expansions to social systems–social protection and health programs–will underpin climate resilience and the human capital accumulation needed for growth. A key social protection commitment under the RPJMN 2020-24 is to facilitate access to social protection for 98 percent of the population. Social protection programs have seen a significant expansion of coverage over the decade to 2021–complemented by a suite of non-contributory transfer programs for emergency situations. A unified social welfare registry list (*Data Terpadu Kesejahteraan Sosial*: DTKS) of nearly 29 million poor and vulnerable households has been developed to identify potential beneficiaries for a range of programs. Health insurance coverage (*Jaminan Kesehatan Nasional*: JKN) has increased from 130 million people to over 220 million in the five years to 2021, with an RPJMN 2020-24 commitment to increase coverage to 98 percent of the population. In addition to financial protection against impoverishing health episodes, JKN helps promote climate resilience of health facilities and improve care for climate-sensitive health conditions. In 2021, social assistance spending was 1.5 percent of GDP–close to the global average (1.54 percent), however, as is the case in countries globally, these systems will be stretched further by climate change.

Disaster risk management (DRM) has improved significantly. The government's 30-year disaster management master plan aims to reduce the number of cities with high disaster risk from 75 percent to 40-45 percent by 2045. Important steps toward this goal include the laws on Disaster Management and Spatial Planning passed in 2007 which clarified responsibilities for disaster preparedness and response and ensured identification and protection of evacuation areas and high-risk areas. The BNPB which was established in 2008, improved coordination across government. A new regulatory framework has further incorporated disaster risk into spatial plans–an important step with the potential to change the trajectory of community and infrastructure vulnerability long term.[44] As a result, Indonesia has internationally recognized good practices in emergency response and community-based post-disaster recovery, however, financing for contingent liabilities remains below needs; the CCDR returns to this difficult issue in Chapter 3. Complementing these DRM reforms, there are opportunities for further detailed consideration of disaster risks in development spatial planning, and in infrastructure standards (see Chapter 5).

Some structures–notably tariffs in the water sector–contribute to increased vulnerability (World Bank Forthcoming). Just as PLN's revenue model constrains its ability to expand renewable energy capacity, the revenue model for some water utilities may indirectly contribute to urban flooding. The rapid sinking of Jakarta and north coastal areas of Java is partially due to groundwater extraction which is itself a response by residential and commercial water users to the cities' low coverage of piped networks. In Greater Jakarta, it is estimated that about 43 percent of piped water needs are currently covered. Water utilities face technical and financial constraints to expanding these networks as the water tariff does not fully cover the operation and maintenance of existing systems, let alone the expansion of services. Mayors or heads of districts have authority to approve tariff increases, however, they often ask for approval from the city/district council and rate increases are politically challenging. While groundwater pumping is not the only cause of subsidence

44 Flood modelling for Indonesian cities shows that rigorously enforced spatial planning can reduce flood exposure by 50 to 84 percent and is particularly effective in cities with rapid urban expansion. See Muis et al. 2015.

and flooding, aligning incentives in the tariff structure could help to alleviate investment constraints and to improve water use efficiency. These measures would be well-complemented by disincentives to pumping groundwater directly, including increased charges for groundwater use and stronger limits on new or extended permit issuances.

The agriculture sector has adopted reforms to adapt to climate change and build resilience. In February 2022, the Ministry of Agriculture (MoA) released the draft *Grand Design on Climate-Resilient and Low-Carbon Agriculture* which outlines the ministry's overarching strategy to improve the adaptive capacity of the country's agricultural sector to climate change while simultaneously achieving its NDC commitments. The framework, together with the establishment of the MoA Climate Change Working Group, provides an opportunity to improve the linkages and coherence of Climate Smart Agriculture (CSA)-related initiatives that currently reside under different technical units within the ministry. The MoA is in the process of developing roadmaps and action plans to operationalize the *Grand Design*. A further useful step could be to establish monitoring, reporting, and verification (MRV) systems to track and evaluate progress, along with coordination mechanisms with other line ministries, such as the Ministry of Public Works and Public Housing, MoEF, and the Meteorology, Climatology, and Geophysics Agency (*Badan Meteorologi, Klimatologi, dan Geofisika*: BMKG), to support MoA in achieving its climate objectives.

Climate resilience in the agriculture sector would benefit from further site-specific services to build adaptive capacity.[45] Many countries face challenges in scaling CSA practices.[46] Such challenges include fragmented land holdings (close to 90 percent of Indonesia's farmers own less than 2 hectares of land) (BPS 2018), and gender barriers to farmer groups that limits women's access to extension services and new technologies (Food and Agriculture Organization 2019). Fragmentation of programs across government departments is also common, and farmer demographics tend to be older and less educated. These challenges are not easy to overcome. Gradually redirecting resources from input subsidies to more targeted forms of climate-sensitive support–including extension services for new technologies and expansion of agriculture credit (such as *Kredit Usaha Rakyat*: KUR)–could help.[47] Improved smallholder access to formal credit and insurance enables farmers to finance climate-smart investments and better manage risks (Saveli et al. 2021).

45 CSA packages would typically comprise a mix of advisory services (for example, agronomic, climatic, and business development advisory services), improved inputs (for example, higher yielding and/or drought-/flood-tolerant varieties), climate-resilient infrastructure and technologies (for example, water-saving irrigation, improved post-harvest infrastructure to minimize losses, digital technologies), and other supporting services (for example, financial services). Adaptation measures in agriculture typically also have mitigation co-benefits.

46 For example, the promotion of the System of Rice Intensification, integrated crop calendars, climate field schools, rice and livestock insurance schemes, and the development of flood- and/or drought-tolerant rice varieties.

47 In 2020, Indonesia spent approximately 20 times more on fertilizer subsidies (US$16.4 billion) than on its agricultural knowledge and innovation systems (US$81.6 million; comprising US$ 23.6 million for agricultural research and development and US$ 58.0 million for extension services).

"Recent expansions to social systems–social protection and health programs–will underpin climate resilience and the human capital accumulation needed for growth"

3

ENABLING ECONOMIC POLICIES & INSTITUTIONS

PAGE
38—58

SCBD • JAKARTA

3.1

BUILDING THE FOUNDATIONS FOR A LOW-CARBON & CLIMATE-RESILIENT FUTURE

The sector-specific policies and institutions for mitigation and adaptation discussed in Chapter 2 are critical, but not the only building blocks toward Indonesia's stated commitments. For a transition that also delivers on Indonesia's development ambitions, a broad set of policy and institutional enablers can be used to complement the sector-specific measures. These enablers aim to raise and allocate financial, physical, and human resources for climate action. They are also important foundations for capital accumulation and efficient resource allocation that will underpin long-term economic growth:

1

The fiscal framework can be used to address market failures in mitigation and adaptation, raise revenues, and provide buffers during the low-carbon and climate-resilient transitions.

2

The financial system can be used to raise and channel savings to mitigation and adaptation activities, provided that structural constraints and exposure to climate and stranded-assets risks can be alleviated.

3

Investment climate and regulations can be used to engage private sector participation in mitigation and adaptation.

4

Trade policies can be used to facilitate green exports and imports, move Indonesia toward the green technology frontier, and modify incentives for carbon-intensive commodity production.

These enabling policies and institutions are interrelated and mutually reinforcing. The fiscal framework helps set price signals and protect investments. In doing so it affects the cost and availability of financial capital for green investments. Green investments are further influenced by the investment climate and business regulations. Meanwhile, trade policies support firms' access to green inputs and markets–further facilitating green investments. These interactions further determine the incentives and opportunities for firms and workers to participate in the green economy. Chapter 3 first considers these enabling conditions, before turning to Indonesia's private sector directly to ask: to what extent is it ready and willing to step up to make the investments and operational changes that will move the transition forward?

3.2 FISCAL POLICY FOR THE CLIMATE AND DEVELOPMENT CHALLENGE

45%

of the PSO is used to subsidize households that do not fall within the database for poor and vulnerable households

Indonesia's fiscal framework has historically incentivized carbon consumption, although ongoing reforms are trying to redress this. Incentives are driven by low taxation of, and subsidies for, fossil fuels. Support for fossil fuels as a share of tax revenue in Indonesia has declined, with a sharp drop in 2015 (Figure 35). This drop was driven by ambitious transport fuel subsidy reform in 2014-15. Transport fuels receive around one-half of total fossil fuel support. This has declined over the 20 years to 2020 (Figure 36). Cuts in total support (from 3.9 percent of GDP in 2000 to 1.8 percent in 2020)[47] created space for higher spending on health, infrastructure, and social assistance. Social assistance increased from 0.3 percent of GDP in 2004 to 1.5 percent of GDP in 2021. Total fuel subsidy expenditure rose because of the energy crisis in 2022, although the government has increased administered prices to contain these pressures.

There are opportunities for further reduction in fossil fuel support that could enhance economic efficiencies and welfare. Most fossil fuel support is targeted to consumers rather than producers (Figure 37). This results in low petrol end-user prices (Figure 38) designed to assist households; however, benefits accrue more to the better-off households as they are larger consumers of fuel than the poor. In the power sector, as discussed in Chapter 2, electricity tariffs are set below cost recovery under a PSO arrangement (Figure 39). Although efforts have been made (especially between 2015 and 2017) to reassign consumers to non- or less-subsidized tariff classes through means testing, many relatively better-off households still receive the benefit of the PSO tariff. Approximately 45 percent of the PSO is used to subsidize households that do not fall within the database for poor and vulnerable households.

48 As per the 2020 national budget. This includes reported direct subsidy spending and estimated implicit subsidies accruing as payment obligations to Pertamina, the state-owned oil and gas enterprise.

FIGURE 35

High but Decreasing Fossil Fuel Support

Total fossil fuel support

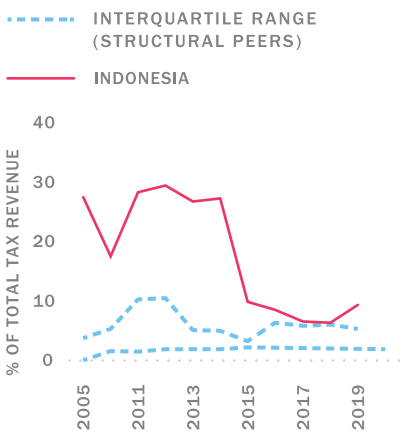


FIGURE 36

Most Support Goes Toward Petroleum

Petroleum support

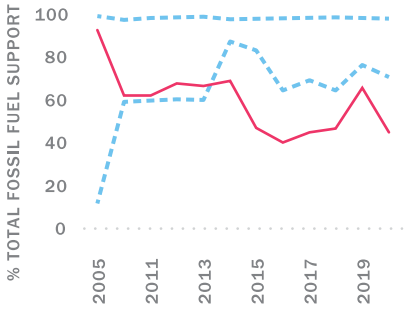


FIGURE 37

Most Support is Geared to Consumers

Fossil fuel consumer support

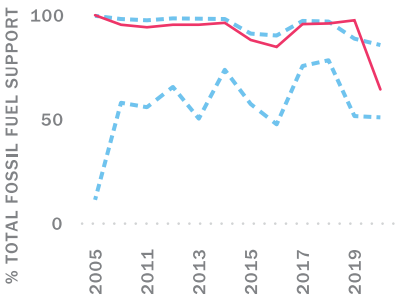


FIGURE 38

Resulting in Low Petrol End-user Prices

Petrol end-user price

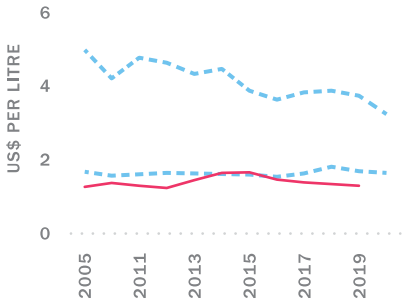
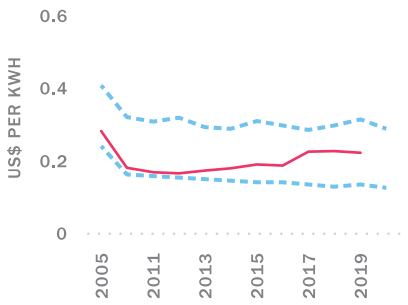


FIGURE 39

And Low Residential Electricity Prices

Residential electricity price



Sources: OECD Green Growth Data, figures compiled by WBG staff.

Note: Interquartile range refers to equivalent data for the 25th and 75th percentile of structural peers (see Footnote 2).

The current economic environment does create challenges for the reduction of fossil fuel subsidies although there are steps that can be taken to help gradually move the process forward. Some governments choose fuel price subsidies over targeted transfers at times when energy prices are high because for example: (i) many poor households do not receive social transfers to compensate for higher fuel prices; (ii) price controls can shield producers from higher input costs; and (iii) price controls help keep inflation expectations in check. Reducing and redirecting fossil fuel subsidies will require sustained efforts to strengthen the delivery infrastructure for social protection and devising transfers that are consistent with political imperatives–such as timebound transfers to affected households.

Fiscal instruments could be used to disincentivize emissions in other emissions-intensive sectors. Several fuels and sectors currently lack direct fiscal incentives to increase efficiency, including oil and gas, industrial processes and product use, and residential electricity. Although the forestry sector and plantation agriculture are subject to licenses and export levies–forms of fiscal instruments–these are not differentiated between production on land associated with high emissions and that in more suitable areas.[49]

49 The emissions footprint of one tonne of crude palm oil varies spatially by a factor of 35 (0.7-26.0 tCo_2eq^{-1}). See Lam et al. 2019.

There are opportunities to promote greater consistency across fiscal instruments for stronger overall incentives to decarbonize. In some instances, fiscal instruments within the same sector that have countervailing effects could be addressed over time:

1 Coal SECTOR

Royalties and the upcoming carbon tax on coal-fired power plants combine to discourage the use of coal. This is partially offset by a zero-royalty policy on coal used for domestic value-added activities, including coal used for coal-fired power plants.

2 Agricultural SECTOR

Fertilizers account for over 10 percent of agriculture-related emissions, implicitly encouraged through fertilizer subsidies. A crude palm oil export levy aimed at boosting domestic supply implicitly discourages emissions from the palm oil sector (the second largest consumer of fertilizers in agriculture), yet expenditure of the levy's proceeds on subsidizing biofuels may be increasing production and, therefore, emissions.[50]

3 Residential SECTOR

Emissions are encouraged by electricity subsidies provided by below-cost retail prices and a commitment to compensate PLN for losses. At the same time, the carbon tax will raise PLN's cost for supplying electricity, but not the administered retail prices–thereby creating a need for larger government subsidies.

4 Transport SECTOR

Provincial government taxes on transport fuels discourage emissions but are counteracted by central government subsidies on diesel and a popular brand of low-quality, high-emission gasoline. The net effect of fiscal policy is to promote transport emissions (representing approximately 25 percent of energy-related emissions).

"Fiscal instruments could be used to disincentivize emissions in other emissions-intensive sectors"

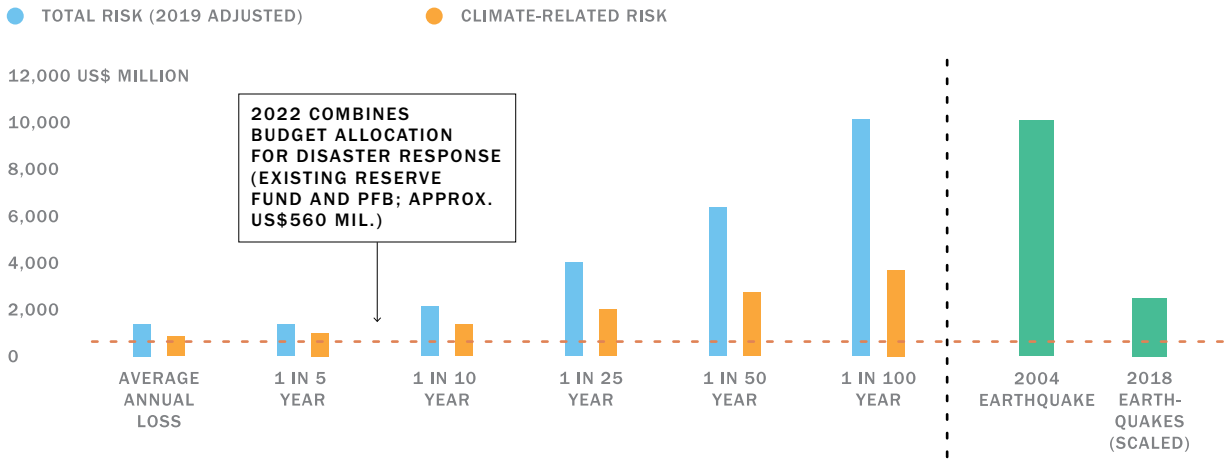
50 There is a risk that incentives for biofuels production could promote land-associated emissions in the absence of forest protection measures and sustainable palm oil production standards. While biodiesel produced by oil palm is less emissions intensive than conventional diesel at point of use, it can be more emissions intensive if land conversion is required.

Beyond emissions mitigation, fiscal policy is equally critical for climate resilience. Indonesia has made important advances in DRM institutions, including the new PFB. As fiscal space permits, increased contributions will be needed to match climate shock risks. Post-disaster spending was 0.11-0.38 percent of total government expenditure from 2014-18.[51] World Bank analysis finds that, under current rates of disaster incidence, Indonesia can expect to face average direct disaster losses of US$1.3 billion per year (excluding post-disaster economic support). Greater costs are possible in more severe years, with a 2 percent probability of US$6.4 billion in losses in a given year.[52] Climate-related risk represents 63 percent of these average direct disaster losses and can be expected to rise. The government's new PFB is an important step toward covering these costs, adding to the allocations made to the existing disaster reserve fund (a total of US$560 million in 2022) (Figure 40).

FIGURE 40

Expected Contingent Liabilities from Natural Disasters

Expected liabilities from disaster events, with comparison to 2004 and 2018 earthquakes (for scale), based on past (20-year) records



Source: WBG staff analysis based on the EM-DAT database.

Note: Loss estimates are calculated based on past disaster incidence, not projected risks. Climate change is expected to increase some risks. 2004 and 2018 earthquakes refer to all earthquakes in those years, although the majority of damage occurred in the North Sumatra and Central Sulawesi events in those years respectively. Expected liabilities are estimated disaster damages at various percentiles of the distribution of damages fitted to historical data (all those recorded in EM-DAT).

The CCDR recognizes that reforms to fiscal policy and energy subsidies are politically challenging, particularly at a time of rising global food and fuel prices. It is unlikely that the remaining fossil fuel subsidies can be addressed on short timelines and the same applies to the introduction of carbon pricing. Nevertheless, in the context of Indonesia's low tax revenue (8-10 percent of GDP), these distortions become increasingly expensive as prices rise, and the revenue they absorb is needed for Indonesia's expanding and improving social infrastructure (see Chapter 2). Resilience investments and contingent liabilities will also require further financing, consistent with trends globally. Despite the challenges, targeted, incremental reforms are currently being pursued by Indonesia, such as those underway on electricity tariffs and fuel prices.[53] These will gradually reshape incentives for emissions and help create fiscal space. As outlined in Chapter 5 of the CCDR, further such adjustments, timed for when circumstances allow, will be important for development of an efficient, incentive-compatible fiscal system for the medium and long term.

51 This underestimates spending on reconstruction which is often integrated in future capital investment projects or reallocated from budget items such as maintenance. Based on a World Bank review of disaster-related public expenditures from 2016-20.

52 World Bank staff analysis based on the EM-DAT database. These figures estimate the total damages from a disaster, which does not necessarily represent the government's contingent liability arising from a disaster. Governments also face costs from longer-term support needs.

53 The government increased electricity prices for selected households in July 2022 and raised the administered price of gasoline and diesel by 30 percent in September 2022.

3.3 PUTTING A PRICE ON CARBON

Notwithstanding the near-term challenges of high energy prices, the eventual expansion of carbon-pricing when the economic conditions allow will help complement the above fiscal reforms. In October 2021, the government enacted legislation that provides a legal basis to introduce carbon-pricing instruments–including an emissions trading system (ETS)[54] and a carbon tax.[55] Carbon-pricing instruments shift the costs associated with GHG emissions from society to emitters and help incentivize investments in low-carbon options. Carbon pricing also benefits countries with a large informal sector–such as Indonesia (carbon prices may be imposed upstream where fuel enters the economy or downstream where commodities are exported or processed, indirectly incentivizing, and raising revenue from, informal actors). Once implemented, Indonesia will join about 40 countries and more than 20 cities, states, and provinces that use carbon pricing mechanisms (covering about 20 percent of annual GHG emissions globally).

The authorities plan to introduce an ETS in the power sector. Building on the experience of a voluntary cap-and-trade system introduced in 2020 (covering 84 coal-fired power plants), the MoEMR is preparing the launch of a mandatory emissions trading system to be fully implemented by 2024. An MoEMR regulation will introduce an 'emissions cap' for coal-fired power plants, tiered by their capacity at the unit level. At the end of the reporting year, units with emissions exceeding the cap will need to either purchase allowances from other units or through carbon offset credits (from energy efficiency or renewable energy projects), although the former will be prioritized. Given high energy prices globally, the previous plan to complement the above mechanisms with a carbon tax (planned at approximately US$2.10 per tonne) has been delayed.

Indonesia has a mechanism to ensure alignment across carbon-pricing instruments which could be strengthened with coordination with the broader emissions reductions policies–as both are critical to avoid "waterbed effects." In October 2022, MoEF issued an implementing regulation which mandates NDC-relevant sectoral ministries to issue a carbon-trading roadmap based on emissions considerations prior to introducing an ETS. This will be harmonized with the carbon-tax roadmap to be issued by the MoF. This is important to ensure that each sector will be covered by one carbon-pricing instrument.[56] This will help avoid waterbed effects, which occur when emissions cuts in one sector are offset by higher emissions in another. For example, if policies to promote energy efficiency lower coal-fired power plants' demand for emissions allowances, the price of those allowances in the market will drop. This benefits other industries within the ETS that can purchase cheaper allowances resulting in higher emissions (in the absence of adjustments to the overall cap). Similarly, carbon tax implementation will interact with the cap-and-trade mechanism.

Further analysis on market design could support development of the system's operational plans and implementation. Regulations that formalize the technical design and underlying infrastructure of carbon pricing will determine

54 Presidential Regulation No. 98/2021 on Economic Valuation of Carbon.

55 Law No. 7/2021 on Tax Harmonization.

56 The most recent draft of the roadmap spells out that the power sector will be covered by the ETS, transportation by carbon tax, buildings will use a carbon offset mechanism, and carbon trading for the industry sector.

the efficiency and impact of the system. These design elements include the level of pricing over time, revenue collection points (upstream or downstream), GHG and sectoral coverage, MRV mechanisms, and the carbon exchange market setup. Analytical work to better understand the impact of the carbon price at different levels, instrument design options, and interactions with other policies, can also help guide these operational plans. This could build on existing studies such as the LCDI which found revenue-generating potential of 2.6 percent of GDP by 2031 under moderate carbon tax and subsidy reforms[57] (Bappenas 2021). The CCDR also considers a subset of these issues in Chapter 4, where it presents GDP, price, and poverty outcomes for carbon prices in combination with sectoral policies.

Indonesia is harnessing other forms of carbon pricing, including results-based payments and carbon credits trading. There are options for international payments for emission reductions that do not require corresponding adjustments to Indonesia's NDC. For example, Indonesia is harnessing international emissions reduction payments to incentivize jurisdiction-wide actions in Jambi and East Kalimantan Provinces (Box 2). This could be scaled to other provinces. There are also emerging opportunities to utilize other international payment mechanisms to incentivize private sector actions without transfer of mitigation outcomes (corresponding adjustments)–thereby ensuring that Indonesia's NDC progress is not compromised.

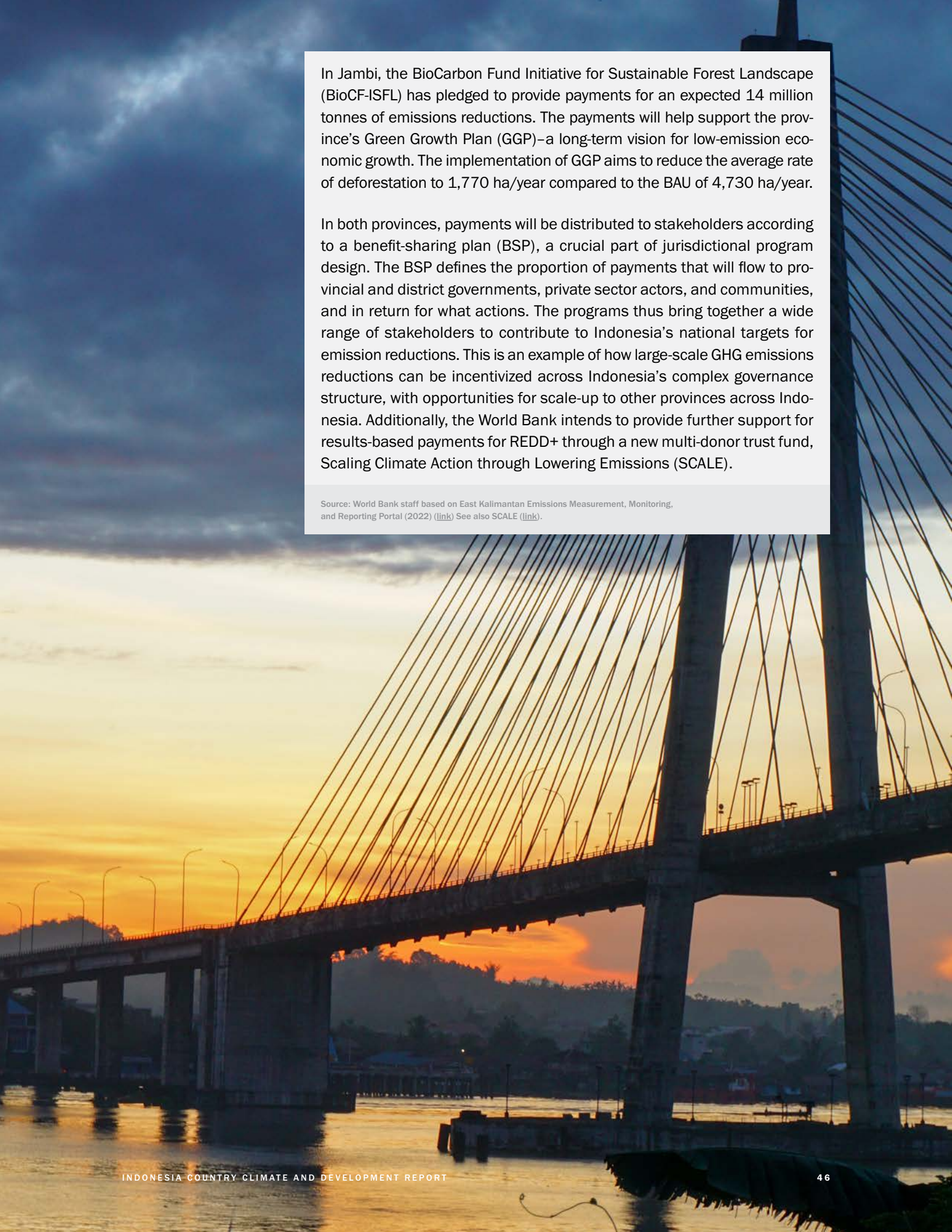
BOX 2

Realizing the Economic Value of Reduced Emissions

Through the MoEF and provincial governments, Indonesia is implementing ambitious jurisdictional-level programs to reduce emissions from deforestation and forest degradation (REDD+). Jurisdictional programs provide payments for verified emissions reductions from a defined region overall–helping to avoid the problem of leakage that can arise from project-level payments. The payments help cover the investment costs needed for emissions reduction and provide a financial incentive to the jurisdiction for success. Unlike carbon credits, where prices are determined by market forces, negotiation between donors and recipient jurisdictions sets the payment rates.

Indonesia has jurisdictional programs under formal development in East Kalimantan and Jambi. In East Kalimantan, The Forest Carbon Partnership Facility (FCPF), a global partnership to achieve REDD+, pledged to provide up to US$110 million in payments for reduced emissions within the province between 2020 and 2025, verified by external third parties. Actions to reduce emissions included the protection of HCV forest located within oil palm concessions and tighter regulations on mining. To date, the East Kalimantan REDD+ program has achieved significant results. While still under verification, it is expected that the province reached about 30 million Emissions Reductions (equivalent to tons of CO_2eq) from 2019 to 2020, a rate three years ahead of schedule. A first payment of US$20.9 million was made in November 2022.

57 Under a carbon tax that starts at less than US$5.00 per tonne in 2022 and rises to US$40.00–60.00 by 2040. See Bappenas (2021).



In Jambi, the BioCarbon Fund Initiative for Sustainable Forest Landscape (BioCF-ISFL) has pledged to provide payments for an expected 14 million tonnes of emissions reductions. The payments will help support the province's Green Growth Plan (GGP)–a long-term vision for low-emission economic growth. The implementation of GGP aims to reduce the average rate of deforestation to 1,770 ha/year compared to the BAU of 4,730 ha/year.

In both provinces, payments will be distributed to stakeholders according to a benefit-sharing plan (BSP), a crucial part of jurisdictional program design. The BSP defines the proportion of payments that will flow to provincial and district governments, private sector actors, and communities, and in return for what actions. The programs thus bring together a wide range of stakeholders to contribute to Indonesia's national targets for emission reductions. This is an example of how large-scale GHG emissions reductions can be incentivized across Indonesia's complex governance structure, with opportunities for scale-up to other provinces across Indonesia. Additionally, the World Bank intends to provide further support for results-based payments for REDD+ through a new multi-donor trust fund, Scaling Climate Action through Lowering Emissions (SCALE).

Source: World Bank staff based on East Kalimantan Emissions Measurement, Monitoring, and Reporting Portal (2022) (link) See also SCALE (link).

3.4

DEEPENING THE FINANCIAL SYSTEM FOR CLIMATE & DEVELOPMENT ACTION

All countries' financial systems must respond to two important climate-related challenges: (i) the management of climate and environmental risks to the financial sector; and (ii) mobilization of financial capital for mitigation and adaptation investments. The two are interrelated. Climate-related risks, if not well-managed, can cause shocks to the financial system that reduce the appetite for investments, whether green or not. Fiscal policy, as discussed above, is constrained in its ability to protect against such shocks. On the positive side, measures to expand green finance also address factors that may otherwise impede the depth, efficiency, and reach of the financial sector more generally. These measures are crucial for long-term efficient capital allocation.

The financial sector is exposed to climate-related risks.[58] Those risks are grouped in two main categories. The first are physical risks from climate shocks (for example, business disruption and property damage) that reduce borrowers' ability to service their debt, thereby causing financial instability. The second are transition risks from financial sector exposure to high-emissions sectors that will shrink because of low-carbon policies at home and abroad. Indonesia has the fourth highest carbon intensity of its loan portfolio of any country.[59] These challenges are magnified by the relatively small size of Indonesia's financial sector in terms of its total assets and private credit relative to GDP (World Bank 2022).

As is the case in many countries, the financial sector's capacity to monitor and manage climate-related risks is nascent, however, there has been recent progress. Indonesia participates in international and national networks on managing climate risks to the financial sector.[60] The Financial Services Authority (*Otoritas Jasa Keuangan*: OJK) released a Sustainable Finance Umbrella Policy in 2017, including regulations requiring banks to develop procedures for monitoring and managing Environmental, Social, and Governance (ESG) risks. OJK has also launched two roadmaps on sustainable finance.[61] These outline priorities including: (i) a green taxonomy; (ii) sustainability disclosure requirements; (iii) a climate financial risk management framework and risk-based supervision; (iv) innovative green financing instruments; and (v) a National Taskforce on Sustainable Finance. Over time, detailed guidance to financial institutions will help them assess, manage, and price climate risks. This could be complemented by capacity-building to conduct detailed climate-risk assessments, including on data and modelling.

Climate-risk management challenges aside, the government is working to catalyze a broader greening of the financial system. An important step forward was the issuance of the OJK Regulation on the Implementation of Sustainable Finance in 2017, requiring financial institutions to incorporate

58 For example, private credit to GDP accounts for only 38 percent, compared to a middle-income-country average of over 120 percent of GDP.

59 Measured as the carbon footprint adjusted loans to total loans for deposits. Data from IMF Climate Dashboard (2021).

60 For example: (i) OJK is a member of the International Finance Corporation's Sustainable Banking and Finance Network; (ii) Bank Indonesia is a member of the Network for Greening the Financial System; (iii) Indonesia is a member of the Coalition of Finance Ministers for Climate Action; (iv) the Indonesia Sustainable Finance Initiative was established as a market-led platform; and (v) OJK implemented a pilot project on "first movers on sustainable banking".

61 Indonesia Sustainable Finance Roadmap Phase I (2015-19) and II (2021–2025).

US$ 6.4 bil.

has been raised by Indonesia through green bonds and syndicated loans since their first issuance in 2018

sustainable practices in their business operations. OJK's Sustainable Finance Roadmaps and the Green Finance Taxonomy are promoting the development of financial instruments such as green bonds or Sukuk (Islamic bonds), along with the technology and information infrastructure to ensure the integrity of the green bond market and build capacity for industry's participation. OJK has mandated financial institutions to publish sustainability action plans to raise awareness of ESG issues among investors and issuers, and the Indonesian Stock Exchange joined the Sustainable Stock Exchanges (SSE) initiative in 2019 to strengthen its commitment to ESG issues.

Indonesia's green financial markets can contribute to the country's climate ambitions if sufficiently scaled. Approximately US$6.4 billion, or about 0.6 percent of GDP, has been raised by Indonesia through green bonds and syndicated loans since their first issuance in 2018. The country ranked 42nd in terms of amount raised (as a share of GDP) over the 2017-21 period and compares favorably to structural peers (Figure 41). Bonds accounted for 92 percent of the amount raised. Issuances by the government and government-backed entities accounted for a significant fraction (almost 70 percent)–a contrast to structural peers where corporations were the dominant issuers (Figure 42).[62] Indonesia has issued Sovereign and Retail Green *Sukuk* (Islamic finance) amounting to approximately US$3.9 billion between 2018 to 2021 (the largest issuance of any country). Nevertheless, private sector involvement is limited, and total corporate green bond issuance remains low at US$1.7 billion.[63] The characteristics of green debt in Indonesia (tenor and currency of denomination) reflect the dominance of government-backed entities in the market. Green issuances were mostly in foreign currency, with 93 percent of the amount raised in US dollars,[64] and have some of the longest maturities among peer countries (over 11 years on average) (Figure 43).

Energy dominates the use of green bond proceeds (Figure 44). About 98 percent of all green issuances from Indonesia stated that proceeds would be allocated (either totally or partly) to projects in the energy sector. Only two non-financial corporations issued bonds for other purposes, namely projects related to green buildings and sustainable land use. While energy uses also dominate other green finance markets, funding use in peer countries is more diverse (for example, at least 30 percent of the proceeds of green issuances in Thailand flowed to the transport sector).

Indonesia's green finance system has both demand (that is, borrower) and supply-side (that is, investor) challenges. On the demand side there is a need to: (i) increase market awareness and local knowledge of green and sustainable projects and the applicable financing instruments; (ii) reduce the high cost of issuing green bonds–issuances of less than US$100 million have costs above those of a comparable-sized loan from conventional sources (Climate Bonds Initiative 2019); and (iii) increase the availability of longer-term credits. Challenges on the supply side include a lack of assets and projects to invest in, and reputational risks (Orbitas 2021).,[65] Greater transparency will be required within the financial sector and within sectors targeted for green investment to increase the size of the pipeline.

62 Corporations issued 80 percent or more of green bonds in Brazil, Mexico, Philippines, Thailand, and Ukraine, and about 70 percent in China and India. Indonesia has one of the lowest numbers of corporate issuers among peer countries.

63 Asian Development Bank Asia Bonds online database (link).

64 About one-half of the green issuances from Brazil and Russia, about two-thirds of the issuances from China, and almost all issuances from Thailand and Nigeria were in local currency.

65 Some 66 percent of 125 global companies surveyed by the Carbon Disclosure Project (CDP) cited reputational and market-related risks as the greatest challenges within the palm oil supply chain. By contrast, 16 percent of companies nominated regulatory risks. See Carbon Disclosure Project (CDP) 2020.

FIGURE 41

Green Debt Market Size

Green debt markets (amount raised as a share of GDP, 2017-2021)

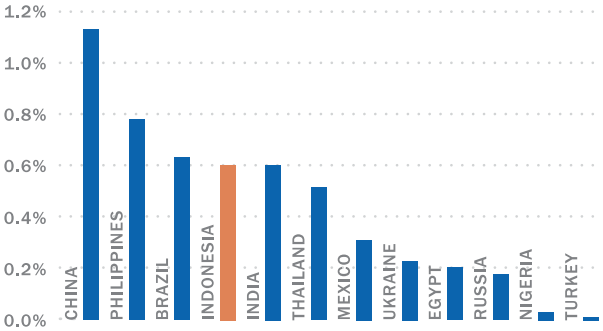


FIGURE 42

Types of Green Debt

Issuances by Corporates vs. Government Backed Entities (Share of total raised)

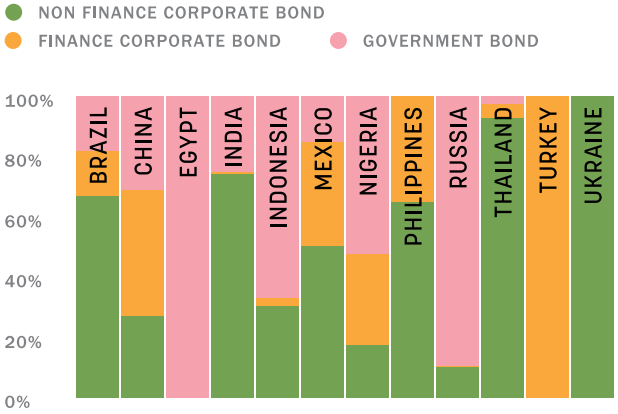


FIGURE 43

Maturity of Green Debt

Green debt maturity at issuance (share of amount raised, 2017-2021)

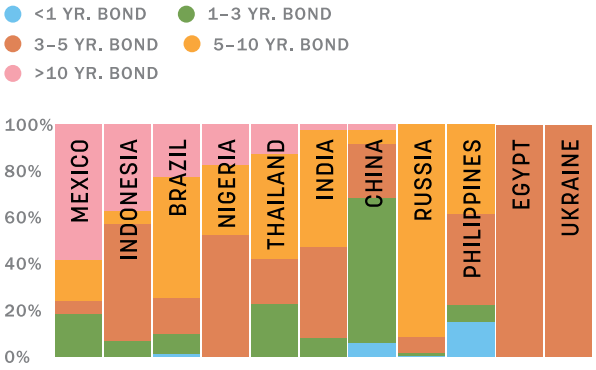
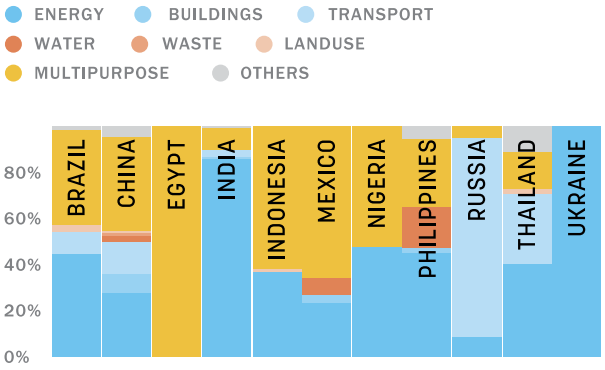


FIGURE 44

Use of Green Debt Proceeds

Sector allocation of green debt issuances (use of proceeds, 2017-2021)



Source: WBG staff analysis using Climate Bonds Initiative data.

> **Three-quarters of respondents considered laws and regulations requiring financial institutions to review ESG risks to be the most important drivers of sustainable investing."**

The CCDR's survey of Indonesian financial institutions affirms the need for standards, information transparency, and capacity-building. Three-quarters of respondents considered laws and regulations requiring financial institutions to review ESG risks to be the most important drivers of sustainable investing. For about one-half of the respondents, integration of ESG principles is driven by: (i) the perception that they are good for profits; (ii) mandates from the board or top management; and (iii) the potential for reputational gains from sustainable investing. Nevertheless, only 35 percent of the respondents believed that ESG investments would drive effective change in recipient firms. Moving from ESG motivators to climate investment opportunities more broadly, asset managers and banks reported the range of opportunities to be limited (although insurance companies were more optimistic). Lack of information and insufficient expertise were considered the most binding constraints for sustainable investing. This highlights the need for clear, consistent, and globally accepted definitions, reporting and disclosure standards, and analytics, to reduce uncertainty and the risk of greenwashing.

3.5 CLEARING THE WAY FOR THE PRIVATE SECTOR TO STEP UP

Further progress on investment climate and regulatory reforms in Indonesia could enable greater private sector participation in climate action. Sustained macroeconomic stability has been an essential ingredient in promoting private sector competitiveness. Indonesia's key reform opportunities now lie at the micro level, including competition, infrastructure, human capital, and financing (Chang et al. 2019). Addressing financing gaps, as discussed above, is necessary to promote private green investments. Boosting human capital, including green skills, as discussed below, will also be important. Even more critical, however, will be competitiveness measures to encourage private firms' market entry and expansion. These will support Indonesian firms' ability to expand green investments while boosting private sector productivity more generally. Competitiveness measures can also help address Indonesia's declining share of manufacturing in output, exports, and inward foreign direct investment (FDI). Some competition constraints were alleviated recently through the removal of sector-based and other restrictions on private domestic and foreign investment. Addressing remaining issues, including trade restrictions as discussed below, will help improve private investment in climate mitigation and adaptation.

Private sector investment could be encouraged by allowing more private participation in, for example, infrastructure projects currently dominated by State-Owned Enterprises (SoEs). The government has relied heavily on SoEs for infrastructure investment–often accompanied by state equity injections, subsidies, guarantees, and preferential access to finance. This allows SoEs to accept risk allocations and rates of return that private investors cannot–giving SoEs a competitive advantage when bidding on publicly tendered projects. Private investment in infrastructure has concurrently declined, while SoE leverage has increased (World Bank 2022a), part of which is also due to the pandemic.

Private green investments could be supported by further strengthening the framework for Public Private Partnerships (PPP). The government has developed PPP institutions, instruments, and processes overseen by the Ministry of

National Development Planning (Bappenas) and MoF (International Finance Corporation 2018). Various government support instruments (for example, viability gap funding, availability payments, and guarantees) are available to support PPP. Some PPP project structures and documentation do not meet international standards, however, thereby limiting their appeal to private investors. Among other areas, these constraints hold back progress on the deployment of renewable energy. Improvements to the PPP framework could help support SoEs in partnering with independent power producers (IPPs), unlocking private investments and access to the latest renewable energy technology.

Measures to strengthen the legal framework for cooperation projects could also facilitate private investment. At present, different regulations govern different aspects of the project preparation and procurement life cycle, thereby causing uncertainties. For example, IPPs are required to obtain a business viability letter, a form of government guarantee, even though IPPs fall under Presidential Regulation No. 38/2015 on PPPs. To take another example, the 2017 Construction Law requires a project company to select and appoint its engineering, procurement, and construction (EPC) contractor using an independent tender process. This effectively means that project sponsors cannot bid on tenders in consortium with an EPC contractor, in contrast to international practices as well as the principles set out in the regulation on cooperation projects. In some cases, complexity has been compounded by legal and regulatory regime changes. Given that cooperation projects tend to be based on long-term (often 20 to 40-year) contracts, stability will help ensure private investor confidence.[66]

Environmental and social (E&S) standards within the infrastructure sector are improving. E&S standards are essential to attract foreign and private sector financing–helping to mitigate risks for investors in large-scale infrastructure and other investments. Awareness and implementation of E&S standards for sustainable infrastructure would further benefit from guidance regarding the methodologies and rules governing the environmental impact assessments that are required under the legal framework on cooperation projects (World Bank 2018). Recent progress includes OJK's draft policy on sustainable financing and the deployment of an E&S that is broadly compliant with international standards by the government-backed financier PT. SMI.

Improving the investment climate in addition to addressing the sector-specific constraints discussed earlier (that is, energy, land, transport) could help unlock green investment potential. Preliminary due diligence suggests private sector interest and opportunities for mitigation investment in: (i) energy, including renewables (wind, solar, geothermal, distributed solar rooftop generation) and biofuel (sustainable palm-based biodiesel); (ii) transportation, including EVs and their supporting infrastructure; (iii) urban development, including green buildings, green retrofitting, waste-to-energy projects, and waste management; and (iv) manufacturing, including cement sector emissions reduction and battery cell production. Carbon pricing will improve the attractiveness of mitigation investments and efficiency measures, which will be further facilitated by expanded green financing instruments. While the bulk of adaptation investments tend to come from the public sector, there are also opportunities for private investment in water storage, climate-smart irrigation, and others.

66 The energy sector, for example, was subject to multiple changes affecting Power Purchase Agreements (PPAs) and IPPs in 2016 and 2017, with multiple new regulations within a year of issuance. See World Bank 2018.

3.5 TRADING IN GREEN

Trade policies can also contribute to Indonesia's decarbonization objectives. Despite low average tariffs on imports of green goods and technologies, non-tariff measures (NTMs) continue to pose costs to green goods in Indonesia. At an average of 1.1 percent, Indonesia's tariffs on green goods are lower than aggregate average tariffs on all imports (Figure 45). CCDR estimates, however, find that NTMs on green goods have been growing in number (Figure 46) and impose costs equivalent to an average 20 percent tariff, higher than those on "non-green" goods (Figure 47). Among NTMs, import approvals, compliance with Indonesian national standards (*Standar Nasional Indonesia*: SNI), and pre-shipment inspections (PSIs), have impacts on products critical to climate-change adaptation (Figure 48). Their impact in Indonesia exceeds that seen in regional peers.

While LCRs may provide incentives for local manufacturing, they impact short-term uptake of renewable energy technologies. LCR regulations set the level of domestic components for solar modules at a minimum of 40 percent. Domestically produced solar panels are still more expensive and their efficiency is lower than those available in foreign markets (Institute for Essential Services Reform 2021). These incremental costs also negatively weigh on the competitiveness of renewable energy generation vis-à-vis fossil fuels. LCRs may also act as barriers to international public procurement–thereby reducing the attractiveness of major renewable energy sector public procurement projects.

FIGURE 45

Tariffs on Green Goods are Low

Indonesia's average tariffs on green goods imports (%)

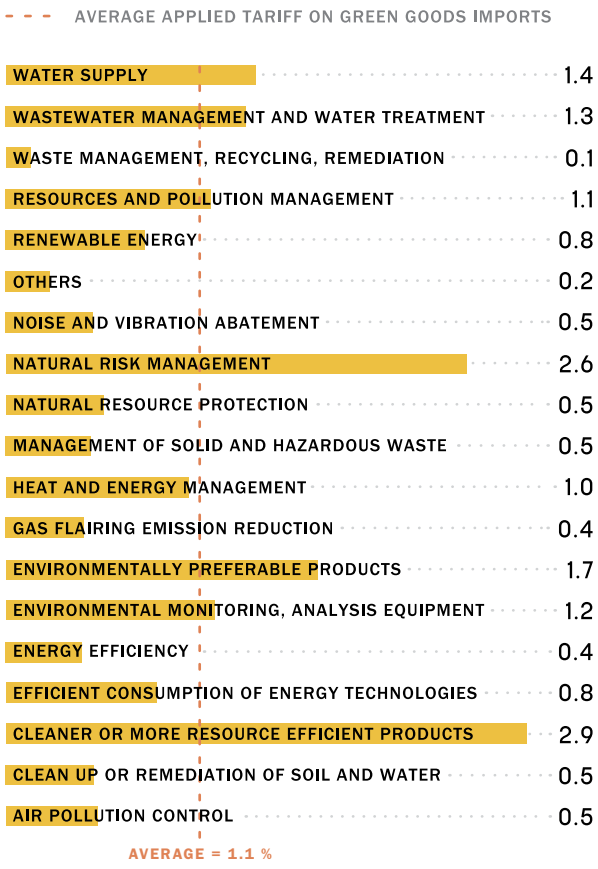


FIGURE 46

But NTMs can be Burdensome

Indonesia's NTMs on green goods (number)

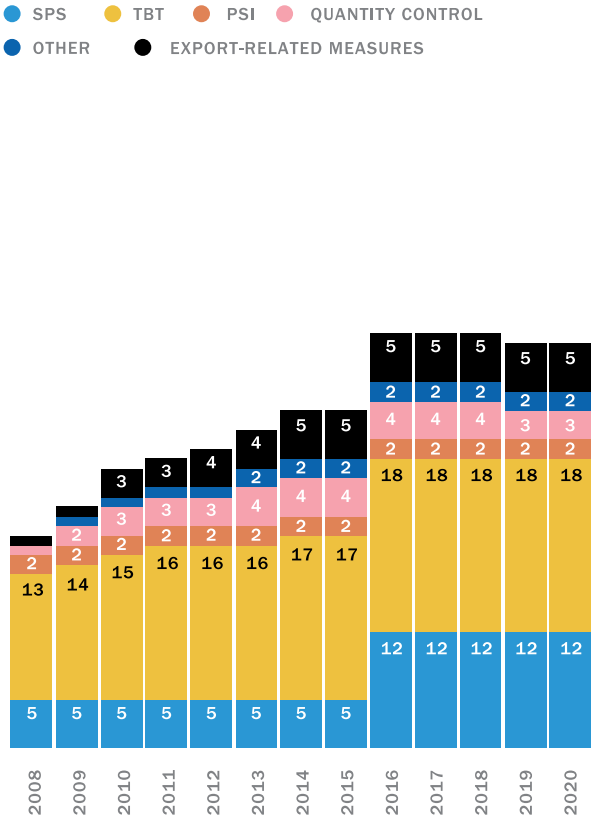
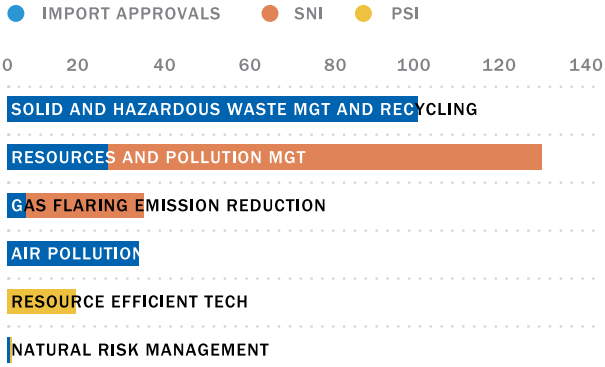


FIGURE 47

Contributing to Higher Import Costs

Tariff equivalents of selected NTMs (%)



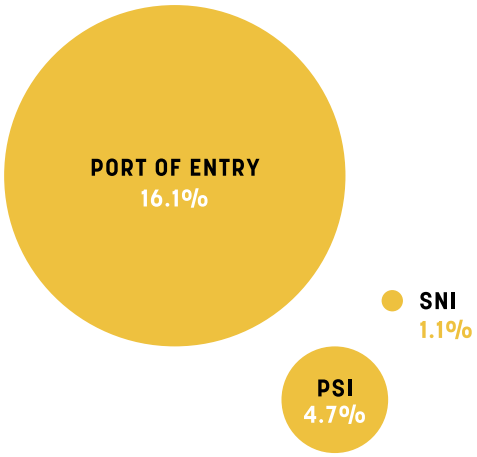
Source: WBG staff calculations based on the World Bank Jakarta NTM database and Green Transition Navigator list of green goods.

Note: SPS: Sanitary or phytosanitary; TBT: Technical barriers to trade; EAP: East Asia and the Pacific; SNI: Standar Nasional Indonesia; PSI: pre-shipment inspections

FIGURE 48

And Loss of Competitiveness

Tariff equivalent of Most Problematic NTMs on Green Goods relative to EAP (average difference) (%)



Indonesia could consider making further use of environmental provisions in trade agreements. At the global level, close to 90 percent of trade agreements currently in force include some form of commitments concerning the environment. Of Indonesia's 11 trade agreements in force, four (the ASEAN-Republic of Korea, ASEAN-Japan, Indonesia-Chile, and Indonesia-Japan agreements) include environmental provisions. Of these, the Indonesia-Chile and ASEAN-Japan agreements include environmental provisions that could be legally enforced. The inclusion of such provisions in trade agreements has been shown to mitigate potential adverse environmental effects. Indonesia ratified a trade agreement with countries of the European Free Trade Association (a small market) in May 2021 which strengthens certification and MRV systems for the trade of sustainable palm oil.

Indonesia could also consider helping to shape the Environmental Goods Agreement (EGA) at the World Trade Organization in ways that support its economy. Indonesia is not currently engaged in negotiations to eliminate tariffs on green goods under the EGA. CCDR analysis finds that the implementation of the EGA without Indonesia's participation would slightly reduce exports (0.3 percent) and imports (0.8 percent) due to trade diversion, while participating would boost green goods exports by 1.1 percent (US$99 million) and imports by 1.2 percent (US$214 million)–valuable in direct terms and in unquantified benefits from technology transfer over time. Indonesia could also consider joining and influencing recently launched multilateral initiatives aimed at tackling climate trade issues: (i) the Trade and Environmental Sustainability Structured Discussions; (ii) the Informal Dialogue on Plastics Pollution and Sustainable Plastics Trade; and (iii) the Fossil Fuel Subsidy Reform.

3.5 ARE BUSINESSES & WORKERS READY TO GO GREEN?

Fiscal, financial, investment, and trade reforms could incentivize firms and workers to participate in the green economy–but are they ready? Indonesia's competitiveness has improved over time although there is scope for further progress including through higher FDI and greater firm-level connections with the global market. This can help accelerate investment in new technologies including those required for the climate transition. The transition will be disruptive for some firms–particularly those in carbon-intensive sectors–requiring a transformation in what and how they produce. Fiscal, financial, investment, and trade enablers may help them in this transformation, but they are not sufficient. Knowledge, access to technology, access to finance, and skills at the firm level are needed to grasp new opportunities and adjust to a new normal of carbon prices and lower demand for carbon-intensive production. The CCDR assesses *firm level readiness* using a survey of manufacturing firms,[67] and assesses *labor market readiness* using job-vacancy and employment data that indicates green skill needs across different occupations.

67 The CCDR survey of 750 firms gathered evidence on firm-level emissions, environmental management practices, and drivers of, and constraints to, green practices. The sampled firms cover large and medium manufacturing firms based in Java (which accounts for more than 75 percent of all manufacturing firms in Indonesia). The survey was carried out for firms in six industries that have a high share of electricity and fuel in both output and the energy mix. These are the firms that will be most disrupted by the low-carbon transition and where environmental management practices will, therefore, be most relevant. The survey follows a similar structure to the green module in the most recent World Bank Enterprise Surveys in the Europe and Central Asia Region.

An encouraging sign on firm readiness in Indonesia is the prevalence of green practices in manufacturing industries[68] that have high carbon emissions (Figure 49). Indonesian firms perform relatively well compared to firms surveyed in Eastern Europe and Central Asia (where the World Bank has recently deployed an equivalent survey instrument, see footnote 67) (Figure 50). Approximately 40 percent of Indonesian firms reported having *a green strategy*, 58 percent of firms reported having *dedicated energy teams or personnel*, and, while about 37 percent of surveyed firms indicated that they monitor emissions from energy use, only 15 percent set energy and emissions targets. Foreign-owned, and large firms tend to have higher green practice scores (Figure 51).

68 Included firms are those that manufacture chemicals and chemical products, other non-metallic mineral products, rubber and plastic products, paper and paper products, textiles, and other manufactures.

FIGURE 49

Good Signs on the Prevalence of Some Green Practices in Indonesia

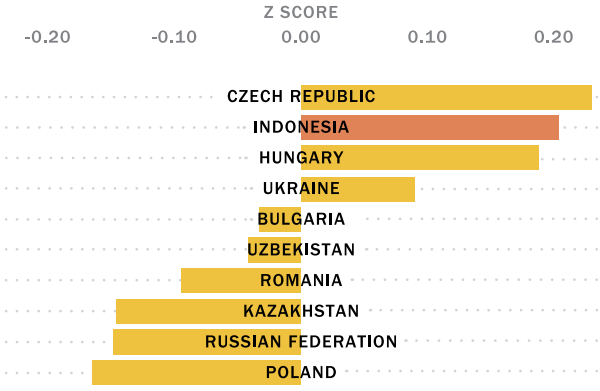
Tariff equivalents of selected NTMs (%)

	Presence of Green Strategy	Presence of Energy Team/Personnel	Presence of Emission Monitoring	Presence of Emission Target
Bulgaria	36%	19%	7%	13%
Czech Republic	39%	38%	17%	7%
Hungary	43%	30%	13%	10%
Indonesia	39%	58%	37%	15%
Kazakhstan	22%	17%	11%	7%
Poland	25%	21%	8%	7%
Romania	24%	21%	12%	9%
Russian Federation	23%	13%	6%	4%

FIGURE 50

Indonesian Firms Perform Well Relative to Firms in Selected ECA Countries

Green Practice (z score)



ECA: Eastern Europe and Central Asia

FIGURE 51

Foreign and Large Firms have Higher Green Practice Scores in Indonesia

Relation between firm characteristics and z-score green practice

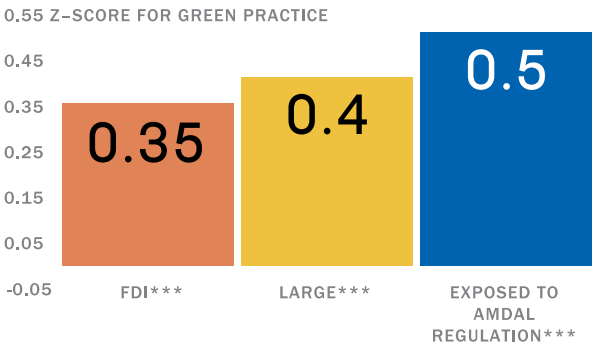
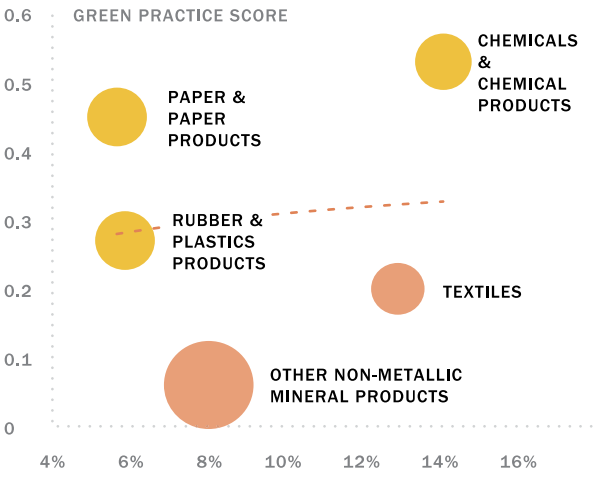


FIGURE 52

Electricity and Energy Use are Weakly Associated with Green Practices

Electricity and energy use vs. green practice



Sources: CCDR firm survey and ECA Enterprise Survey, WBG staff estimates.

Some industries that make up important shares of energy and electricity use in manufacturing have potential to improve green practices. Chemicals and chemical products firms, which account for a large share of manufacturing electricity and energy use, score well on green practices (Figure 52). Non-metallic mineral products and textiles perform less well. Unsurprisingly, government regulations drive adoption of many green practices. Approximately 60 percent of surveyed firms are required to comply with Environmental Impact Assessment (*Analisis Mengenai Dampak Lingkungan*: AMDAL) environmental regulations. Controlling for industry and location, firms covered by AMDAL regulatory requirements have higher environmental practice scores.

About one-half of the respondents reported investing in energy efficiency measures–those that did not invest did not consider it a priority or were constrained by lack of information or financing. Approximately one-half of those that did invest reported increased use of energy-efficient manufacturing equipment and lighting and one-quarter reported investment in energy-efficient equipment. At the same time, however, about 58 percent of firms reported that energy efficiency is not their priority (Figure 53). Other important reasons for not adopting energy-efficiency practices include lack of information on energy-efficient technologies and lack of access to finance. The access to finance challenge is consistent with the above discussion on finance as an enabler of the green transition–it is not just the availability of finance, but also its cost and its tenor. The estimated payback period for energy investments is three years for medium firms and five years for large firms, but most credit options available in the market have shorter maturity (Figure 54).

> "Some industries that make up important shares of energy and electricity use in manufacturing have potential to improve green practices"

50%

of respondents reported investments in energy efficiency measures

FIGURE 53

Reasons for Firms (Lack of) Adoption of Energy Efficiency Measures

Reasons for not adopting energy efficiency measures (share of respondents)

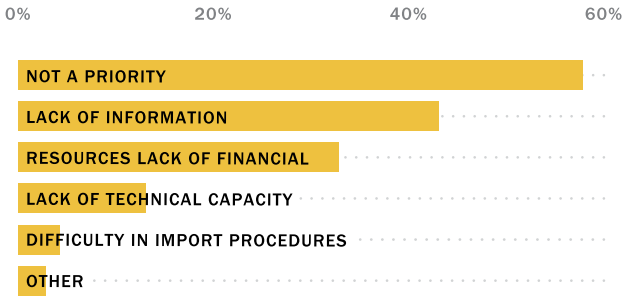
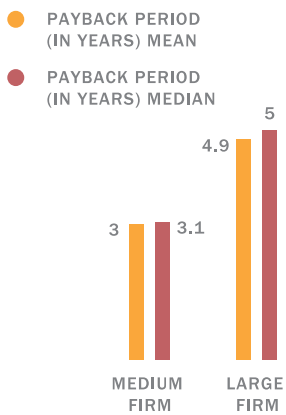


FIGURE 54

Payback Periods for Energy Efficiency Measures

Payback period (in years)



Sources: CCDR firm survey and ECA Enterprise Survey, WBG staff estimates.

Industrial estates and Special Economic Zones (SEZ) remain carbon intensive, however, Eco-Industrial Parks (EIPs) may improve the climate footprint of manufacturing firms. SEZs are geared to export firms, whereas industrial estates include domestic firms. Both are equipped with supporting facilities and infrastructure to encourage benefits from agglomeration. The number of industrial parks in Indonesia increased from 45 to 122 between 1999 and 2021. Industrial estates and SEZs are, however, carbon-intensive–accounting for approximately 20 percent of Indonesia's GHG emissions. Indonesia is developing EIPs (GEIPP 2022) to improve the climate footprint of firms. Such zones focus on shared infrastructure and knowledge for low-carbon and resource-efficient production.[69] These approaches could be further supported through development of an EIP strategy with environmental performance indicators and targets, and a shift away from SoE utilities and operators with insufficient capital for investments in low-carbon energy supplies.

The supply and demand for green skills[70] is small but likely to grow. Indonesia's economy has a small share–six percent–of firms producing green outputs. Five percent of online job advertisements surveyed for the CCDR required at least one green skill.[71] Of those, the skills most in-demand are those related to clean energy (9 percent), natural resource conservation (8 percent), GHG reductions and pollution reduction (6 percent), and recycling and reuse of waste materials (4 percent). Not all green-related jobs in Indonesia have high skill requirements, (Figure 55), yet trends in high-income countries suggest that the demand for advanced green skills will grow–requiring a commensurate shift in training and education.[72] Overall, Indonesia can expect to see both changes in the number of new green jobs and changes to the nature of existing jobs.

As demand grows, benefits will accrue to those who can access green jobs. Jobs with high green task intensity pay 18 percent more than jobs without any green tasks. The difference gradually shrinks for jobs that are relatively less green, but even jobs with low levels of greenness in Indonesia still pay about three percent more than jobs with no green tasks.[73] Access to green jobs is not yet equal as women are less likely to hold a green job (Figure 60), potentially because green jobs tend to demand science, technology, engineering, and mathematics qualifications that women are less likely to pursue. This compounds existing inequalities in Indonesia's labor force which has a 28-percentage point difference between labor force participation rates for men and women (a gap close to the global average of 25 percentage points) (ILO 2022).

69 For example: solar photovoltaic plant, waste heat recovery at the on-site power plant, solid waste management including segregation and recycling, smart water metering and distribution, and GHG emission accounting systems.

70 The CCDR considers green jobs and skills to be those that reduce a firm's impact or contribute to environmentally friendly outputs.

71 World Bank analysis of 140,000 Indonesian job advertisements retrieved in 2020 from more than 200 online sources.

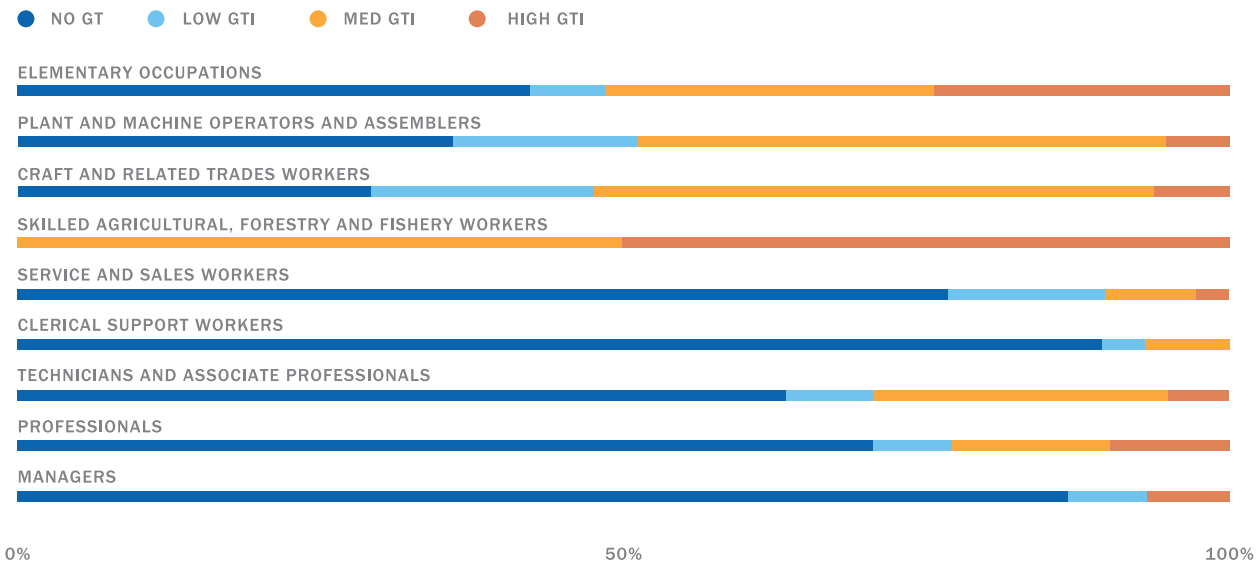
72 In the U.S. 60 percent of total green employment belonged to highly skilled occupations in 2006-14.

73 World Bank staff analysis using a wage regression controlling for gender, education level, broad occupational groups) (Indonesian Standard Classification of Position (Klasifikasi Baku Jabatan Indonesia)), and province of residence.

FIGURE 55

Green Tasks by Occupation Category

Intensity of green tasks (contributing to defined green outputs) by occupation category

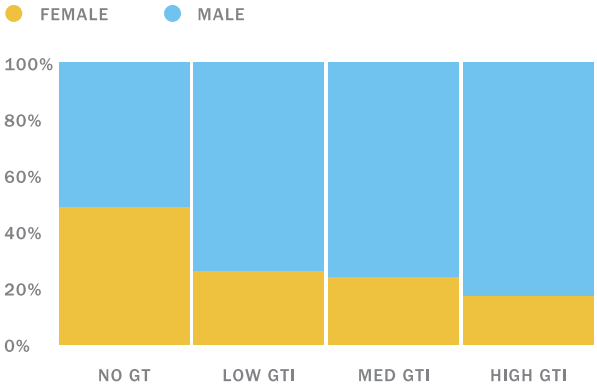


Note: GTI = Green Task Index.

FIGURE 56

Women are Under-represented in Green Jobs

Share of women in non-agricultural green and non-green jobs



Source: WBG staff analysis using Labor Force Survey (Sakernas) 2017 data.

Note: High, medium, low, and "no" categories are defined as the 1st, 2nd, 3rd, and 4th quartiles respectively for the proportion of green tasks (that is, activities producing defined green outputs such as ensuring compliance with environmental regulations, fire prevention), and green skills. GTI = Green Task Index.

"Access to green jobs is not yet equal as women are less likely to hold a green job"

4

ECONOMIC IMPACTS OF CLIMATE ACTIONS

PAGE
59—74

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4.1 THE IMPACTS & SIDE-EFFECTS OF CLIMATE ACTIONS

The CCDR explores the possible economic and social impacts of climate actions. It looks at how energy, land, and fiscal policies discussed in Chapter 2 and 3 could impact emissions and the economy. The impacts of policy reforms are difficult to predict because they partially depend on factors like technological change and global circumstances. The modeling results below do not, therefore, prioritize a particular outcome above all other possibilities. The intention is to help think through possible interactions between policies and economic outcomes. It focuses on the implications of mitigation given its challenge relative to adaptation. The estimated costs of climate change are discussed in Box 3 at the end of Chapter 4. Potential adaptation costs for the budget are analyzed in the discussion on contingent liabilities. To analyze broader costs to the economy will require development of damage functions that can be brought into the CGE modeling below; this could be done separately as a follow-up to the CCDR.

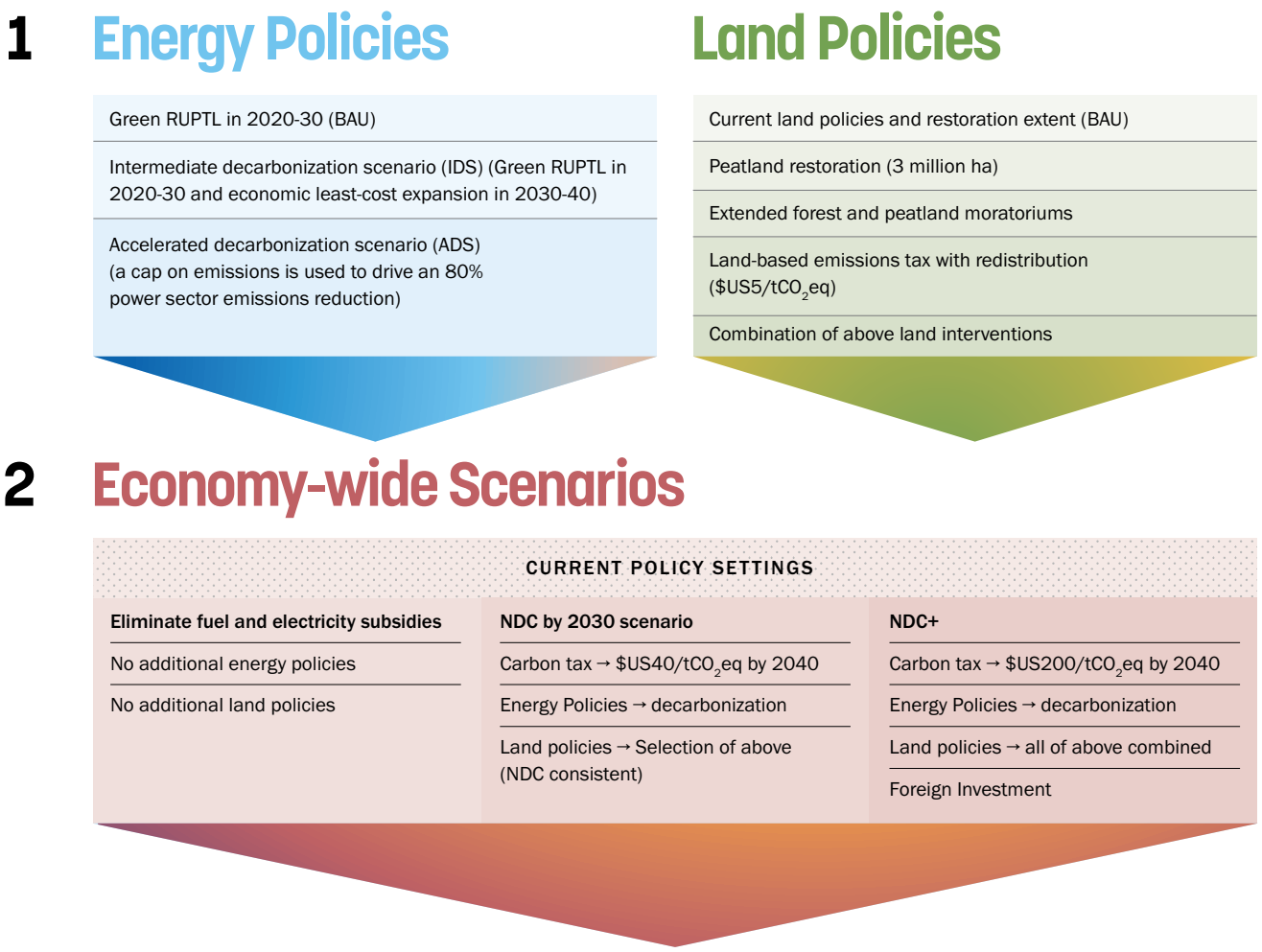
The economic and social impacts of climate actions are modelled in an integrated three-stage modelling exercise (Figure 57). *In stage one*, separate land and energy models are used to assess the impacts of sector-specific policies. *In stage two*, the land and energy modelling results are brought into a CGE model and complemented with fiscal policies (elimination of fossil fuel subsidies, carbon taxes) to estimate economy-wide impacts. *In stage three*, the outputs of the integrated CGE model are further assessed using microeconomic and trade simulation models to assess household and trade impacts of climate actions.

The modelling scenarios are based on incremental climate actions; they start with actions that enable Indonesia to internalize benefits through to more ambitious ones that could benefit other countries. Clarifying how much Indonesia can internalize the benefits of its climate actions is important to understanding what the country should do on its own and what it might do if international support is forthcoming. The macro-CGE modelling exercise, therefore, looks at three levels of climate actions for Indonesia: (i) actions to remedy domestic policy distortions that create deadweight loss (for example, untargeted fossil fuel subsidies) and, thereby, work against the national economic interest; (ii) actions that reduce emissions to address local (within Indonesia) externalities (for example, reduced pollution from fires associated with deforestation), which go against Indonesia's national welfare; and (iii) actions that reduce emissions to remedy global externalities and would, therefore, require external financial and technological support.[74]

In summary, the proposed climate actions could help reduce emissions while also generating growth and poverty reduction gains. The economic impact, however, depends on whether savings are channeled to transfers (resulting in slower growth but lower poverty than business as usual, BAU) or to investments (higher growth but weaker welfare outcomes); the latter is illustrative, as Indonesia is required by law to provide subsidies to protect the poor from

74 For example, mitigating the negative impacts of air pollution would improve health outcomes locally, so it is in Indonesia's best interest to act on this, regardless of external support. Conversely, increasing (the scope and the speed of) emission cuts yield benefits not only for Indonesia but also for the rest of the world, so external support in this area may be warranted.

FIGURE 57 Overview of Modelled Scenarios



Note: RUPTL: Rencana Usaha Penyediaan Tenaga Listrik (Business Plan for Electricity Provision).

rising energy prices. Actions that only remedy inefficient energy subsidies do not significantly reduce GHG emissions. Combining subsidy reforms with land and energy reforms, together with a carbon tax, phased in gradually (US$40 per tonne of CO_2eq by 2040), could help achieve the NDC targets and add an average of 0.7 percentage points to GDP over the long term. A more ambitious carbon tax (US$200 per ton of CO_2eq by 2040, also phased in gradually) would over the long term see a reduction in growth below the baseline unless there is external financing–which could add 0.8 percentage points to GDP on average over the long term. These carbon tax scenarios are illustrative–they are not recommendations. Incremental investment costs could range from 0.4 percent to 1.6 percent of GDP per year. Poverty is expected to decline in the modelled scenarios.

The modeling analysis is based on specific assumptions–which suggests caution in interpreting the results. The analysis in the power sector focuses on generation connected to the electricity grid managed by PLN. In 2020,

this represented 64 GW of a total installed capacity of 70 GW. As a result, the modelling does not cover, for example, coal-generation in captive power plants or in off-grid systems. Secondly, the CGE model assumes that markets work efficiently[75] and that the economy always operates at full capacity. In reality, there are many frictions that prevent markets from clearing. Thirdly, the model assumes that agents know of all technological options and that there is an instant adjustment, however, it takes time to adopt new technologies, so outcomes may take longer than predicted. Fourthly, the model assumes fixed money supply, so additional investment in low-carbon equipment will either crowd out other investment or require higher savings and reduced consumption. Fifthly, the carbon tax assumptions are only used to illustrate the range of possible economic outcomes, they are not recommendations for the carbon tax rate in Indonesia. Finally, there are political economy factors that may impede progress on reforms. These are not possible to model.

4.2 MITIGATION PATHWAYS FOR FOREST- & LAND-BASED EMISSIONS

1.3 MIL

hectares of peatland restoration has already been undertaken

Reductions in forest- and land-based emissions are key to achieving Indonesia's NDC. Policy levers that are or could be pursued by government include: (i) strengthened limits on forest conversion; (ii) restoration of peatlands and forests; and (iii) a carbon tax applied to land-based emissions. The first two levers are extensions of existing policies and are aligned with the government's approach, notably the FOLU Net Sink 2030 plan (MoEF 2022a). The restoration scenario assumes restoration of 3 million hectares of degraded peatlands–slightly higher than the government's target of 2.7 million hectares (by 2030). Restoration of 1.3 million hectares of peatlands has already been undertaken. Second, a strengthened peat and mangrove forest moratorium scenario assumes increased protections on 1.4 million hectares of at-risk peatlands and 0.5 million hectares of at-risk mangroves inside the existing moratorium area and geographic extension of the moratorium to 1.0 million hectares of at-risk peatlands outside the moratorium area. In the third scenario, a land-based emissions tax is modelled, although it is important to note that Indonesia has not implemented such a tax and the CCDR does not take a position on such an instrument. This hypothetical scenario would entail a US$5 per tonne charge on high-emissions agricultural activity (including forest conversion) to provide a disincentive on the development of the most carbon-rich forest or plantation concessions.[76] While not based on an existing policy, it is included to explore potential complementarities between fiscal- and moratorium-based options.

Land-based measures drive substantial emissions reductions and have relatively small impacts on GDP. By 2030, emissions reductions of 521, 453, and 69 $MtCO_2eq$ per year are expected to be realized from restoration, strengthened moratoriums, and the land-based emissions tax respectively. The combined

75 Although the CGE does assume labor market frictions.

76 Such an instrument would be relatively novel. One approach would be to apply a downstream tax on select commodities produced on designated high-carbon landscapes via adjustments to the existing fiscal instruments used in the agricultural sector (such as the palm oil levy). While some implementation challenges remain, Indonesia's agricultural traceability systems can increasingly distinguish commodity units by production location or method. More broadly, fiscal policies on land use could include payments for ecosystems services (an incentive rather than a disincentive) and results-based payments at the landholder level.

scenario (all three policies) is estimated to reduce emissions by 987 $MtCO_2eq$ by 2030[77] which is sufficient to meet the government's FOLU Net Sink 2030 objective and exceed its NDC commitments regarding land-based emissions.

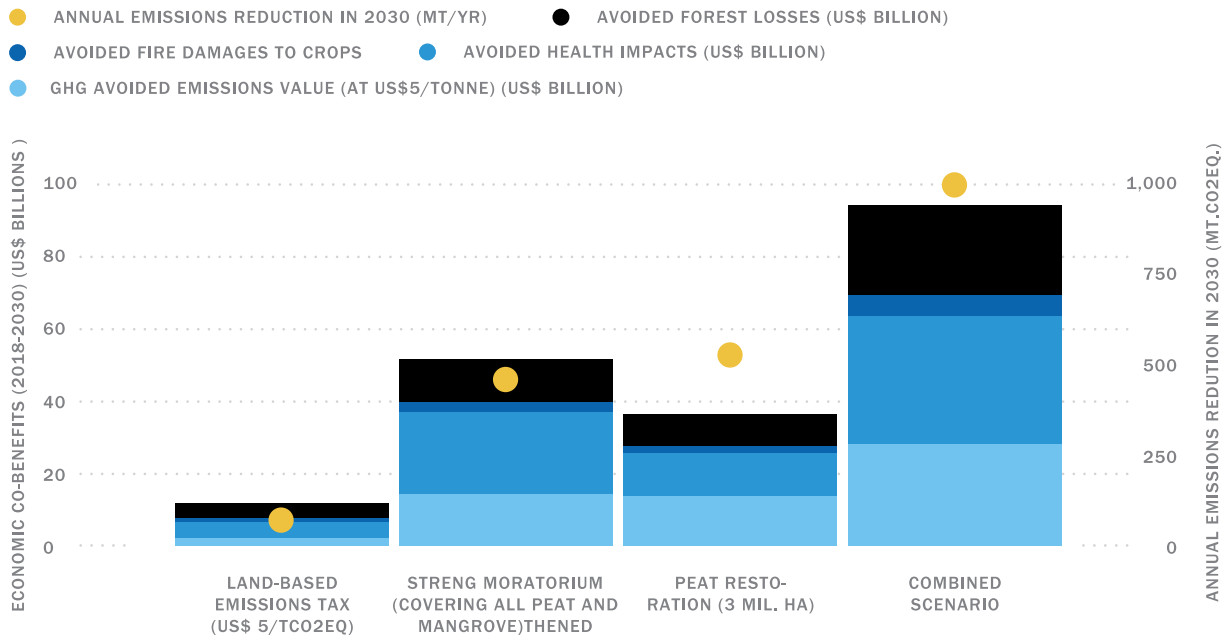
In aggregate, this package of complementary forestry and land use policies is positive in terms of GDP. Between 2018-30, GDP is projected to increase under the restoration scenario because of the investment required.[78] GDP is reduced under the strengthened moratoriums and under the hypothetical land emissions tax. This results in a net gain of US$16.19 billion over the 12-year period. The distributional impact of the package of activities is projected to favor low-income households (the bottom quintile)–with an income rise of 4.6 percent (relative to BAU), due to assumed redistribution of the land emissions tax proceeds and positive economic impacts of restoration activities. Strengthened moratoriums alone are projected to have limited impacts on household incomes of this group (0 to -0.8 percent).

Forestry and Land Use-based measures have considerable additional benefits in terms of reduced health impacts and losses due to fires. Fires started during clearing processes risk causing damage to crops and timber, while harmful particulate matter emissions from fires reduce labor productivity and cause illness and fatalities. Avoided losses from these impacts is estimated at US$65.04 billion between 2018-30 for the combined policy scenario, including US$34.90 billion in avoided health impacts and US$5.47 billion in avoided fire damages to crops and timber. The strengthened moratoriums alone reduce health impacts by US$22.38 billion, along with a further US$3.02 billion in avoided physical fire damages over 12 years. These contribute to significant net benefits from land interventions independent of carbon emissions reductions (Figure 58).

77 Model outcomes are not purely cumulative due to general equilibrium effects within the model. Changes to factor prices and quantities from one policy influence the effects of other policies.

78 All cumulative values are calculated at a five percent discount rate. Estimates are based on World Bank staff analysis using an integrated economic and biophysical CGE model (see Figure 58 notes).

FIGURE 58 Policies to Reduce Land-based Emissions have Significant Economic Co-benefits



Source: World Bank staff analysis using an integrated economic and biophysical CGE model.

Notes: Economic values are cumulative (2018-30), discounted at 5 percent. Costs of health impacts (premature mortality, lost working days) arise from estimated particulate matter emissions. Forest losses are the present value (post 2030) of losses in timber. GHG emissions include peat oxidation, peat fires, and emissions from mineral soils. Impacts on biodiversity and watershed protection are not modelled. A US$5.00/tonne carbon price is a conservative assumption; international carbon markets may offer higher prices in future.

4.3 MITIGATION PATHWAYS FOR THE ENERGY SECTOR

Transition pathways for Indonesia's coal-dominated electricity grid will be crucial for decarbonization. To inform the discussion on clean energy transition pathways, an exploratory decarbonization analysis was performed for the CCDR. As mentioned above, the analysis focused on PLN's system which covers 64GW out of an installed generation capacity of 70 GW in 2020. The analysis reviewed the costs of different decarbonization scenarios in economic terms.[77] Three scenarios are considered (Figure 59 and 60). First, a BAU scenario that: (i) follows the capacity expansion plan in the Green RUPTL in the 2020-30 period; and (ii) maintains the level of peak coal reached in 2030 in the 2030-40 period while allowing renewable energy and gas to meet the increase in demand. Second, an intermediate decarbonization scenario (IDS) that: (i) follows the capacity expansion plan in the Green RUPTL in the 2020-30 period; and (ii) adopts an economic least-cost expansion plan in the 2030-40 period. Third, an advanced decarbonization scenario (ADS) that adopts an expansion plan to achieve a nearly 80 percent emission reduction compared to the BAU scenario by 2040. The ADS is consistent with Indonesia's ambitions to achieve net zero emissions before 2060, with coal generation and capacity falling well before 2030 and renewable generation capacity increasing strongly in the following decade (Figure 61 and Figure 62).[80]

79 The analysis does not consider financial costs to PLN and MoF from early retirement of coal plants.

80 The modeling did not include carbon capture and other emission-removal technologies that would be expected to have a role in achieving net zero emissions in the power sector. In its place, a generic backstop technology was modelled by considering a value of US$300.00/ton$CO_2$eq.

FIGURE 59

Accelerated Decarbonization is Consistent with Net Zero Emissions Before 2060

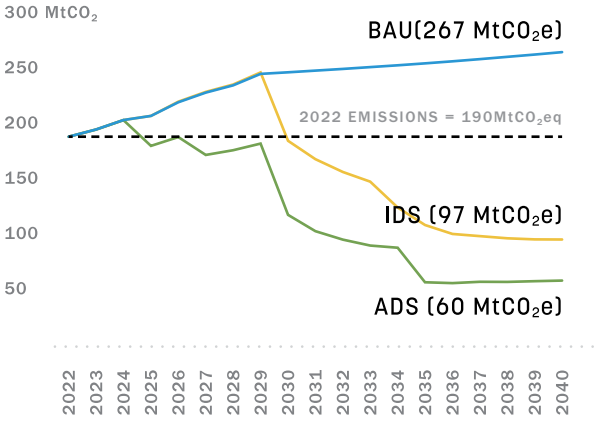
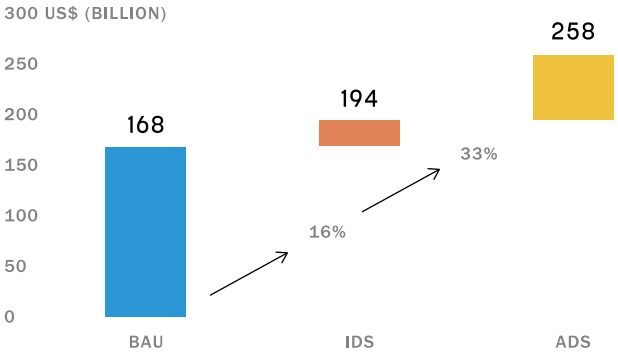


FIGURE 60

This Would Require 50 percent Higher Investment Compared to BAU



Note: BAU: Business as usual; IDS: Intermediate decarbonization scenario; ADS: advanced decarbonization scenario

FIGURE 61

Renewable Generation Capacity Increases Strongly after 2030

Historical and Forecast Electricity Generation Capacity (GW) 1990 -2040 (ADS Scenario)

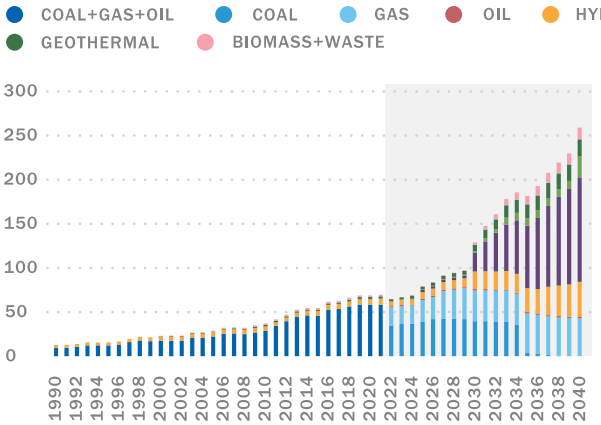
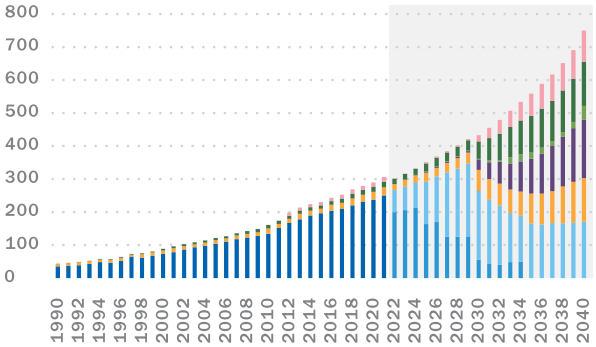


FIGURE 62

Fossil Fuels Remain in the Generation Mix but at Greatly Reduced Levels through 2040

Historical and Forecast Electricity Generation (TwH) 1990 -2040 (ADS Scenario)



Source: WBG staff analysis based on power sector modeling. Historical electricity generation and capacity data based on EIA Statistics.

TABLE 2

Present Value (PV) of Total System Costs under Different Scenarios (2022-40)

ITEM	BUSINESS AS USUAL (BAU)	INTERMEDIATE DECARBONIZATION (IDS)	ADVANCED DECARBONIZATION (ADS)
Capital costs (generation) (US$ bil.)	80	91	121
Fuel costs (US$ bil.)	120	107	106
Variable Operating and Maintenance (O&M) costs (US$ bil.)	16	10	9
Fixed O&M costs (US$ bil.)	36	32	39
Capital costs (network) (US$ bil.)	24	27	36
Total system costs (US$ bil.)	**276**	**267**	**311**
Levelized cost of electricity (average 2022-40) (US$/MWh)	5.7	5.6	6.3
Cumulative GHG emissions (millions of tonnes)	4,559	3,037	2,351
Local environment damage costs (US$ bil.)	41	29	20
Global environment (GHG) damage costs (US$ bil.)	124	90	71

Source: WBG staff analysis based on power sector modeling.

Notes: Present values calculated at 6 percent discount rate. Values in columns are totals, not incremental above BAU. Global and local environmental costs calculated using World Bank standard values for GHG emissions (lower bound) and local pollutants (SOx, NOx and PM2.5).

The modelling analysis suggests that it will be economically advantageous for Indonesia to exit from 4 GW out of 13.8 GW of pipeline coal plants that have not started construction or are at early stages of development. Given the excess capacity in the system, these plants will not be needed to meet electricity demand. Their PPAs will be financially onerous on PLN and deter the development of renewable energy. In addition, it will also be important for Indonesia to pursue its plans for early retirement of coal plants to benefit from low-cost renewable energy generation.

Accelerating the decarbonization of the power sector is likely to require significant investment for Indonesia. The investment requirements of the power sector are expected to be at least 50 percent higher under ADS (US$157 billion in discounted terms) than BAU (US$104 billion in discounted terms) (Figure 60). At the same time, the levelized cost of electricity in ADS will be 11 percent higher than under BAU (Table 2).

The domestic and international private sector can play a leading role in investments. An estimated two-thirds of capital investments, about US$200-220 billion (undiscounted terms) between 2022 and 2040, can be mobilized from the private sector, driven substantially by renewable energy projects (214 GW by 2040 under ADS). This estimate is based on the mix of energy types predicted by the model. Additional opportunities exist for the private sector to participate in the clean energy transition in the medium term, including: (i) green bonds issued by sector utilities (SoEs); (ii) equitization and recycling of existing sector assets; (iii) selected transmission and distribution investments (for instance, lines connecting private power plants to the grid network); and (iv) the energy-efficiency market. Indonesia can also develop its expertise in the clean energy supply chain (solar panels, wind turbines, batteries) to enhance prospects for exporting such equipment and services.

US$
200
BIL.

between 2022 and 2040, can be mobilized from the private sector, driven substantially by renewable energy projects

Public sector support can create an enabling environment to leverage private investments in low-carbon power infrastructure. Continued public investment support, estimated to be about US$100-120 billion (undiscounted terms) between 2022 and 2040, can de-risk power sector projects (for example, by alleviating grid bottlenecks and building inter-island connections, enhancing system flexibility), support early retirement of coal plants, help manage the poverty and social impacts of the energy transition and provide market-based guarantees to unlock green finance. A significant share of these public resources will have to be on concessional terms to support the early retirement of coal plants, improve the financial viability of PLN, and ensure affordability of electricity for consumers.

4.4 ECONOMY-WIDE IMPLICATIONS OF MITIGATION PATHWAYS

The combined effects of land, energy, and fiscal policies are analyzed in three scenarios with incremental levels of ambition to assess costs and benefits of decarbonization over time. This is done using a CGE model that provides an economy-wide analysis of long-term emissions and economic growth. The baseline projection is a BAU case in which current climate policies are maintained with no new additional policies; the impacts of the three scenarios are presented as percentage points of GDP difference compared to BAU (at the equivalent point in time). The three scenarios are:

1 Redirection of electricity & fuel subsidies

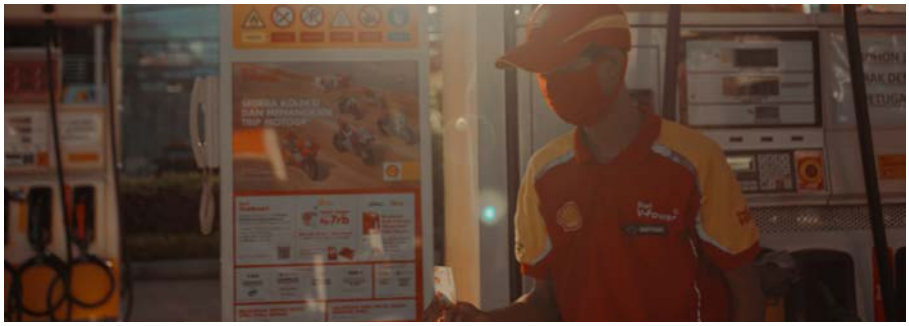
As discussed in Chapter 2 and 3, the retargeting of remaining scenarios is expected to be a net gain for Indonesia. No additional land or energy policies are assumed in this scenario. Two sensitivity analyses are conducted on use of savings from the elimination of subsidies: first, transfers to compensate the bottom 40 percent of the population; and, second, no transfers but investment instead. The latter is only illustrative as Indonesia is required by law to provide subsidies to protect the poor from rising energy prices.

2 Nationally Determined Contribution (NDC)

This includes redirection of subsidies, new land and energy policies (as per above sector-based modelling), and a carbon tax that reaches US$40.00/$tCO_2$eq by 2040. The carbon tax is applied to all sectors and greenhouse gas emissions except for agriculture. The reduction of emissions under this scenario should enable Indonesia to internalize benefits by lowering fire and flood hazards that impose economic costs. Revenues from the carbon tax are used for investment–including in low-carbon equipment. It is assumed that replacing stranded fossil fuel assets accounts for 25 percent of the new investment.

3 Nationally Determined Contribution Plus (NDC+)

This includes all the actions from the NDC scenario, but also includes a much higher carbon tax rate, reaching US$200/$tCO_2$ by 2040. This could reduce emissions twice as quickly as in the NDC scenario. This is a more ambitious scenario that would involve higher net costs for Indonesia while also reducing global externalities. To help compensate for the costs and positive externalities, a sensitivity analysis is added to this scenario with an increase in foreign investment that is equivalent to 1 percent of GDP in Indonesia throughout the projection period.[81]



81 The LCCR target is to reach 540 $MtCO_2$eq total emissions by 2050 (LTS-LCCR 2050). The CCDR's NDC+ scenario is less ambitious. Under the NDC+ scenario trends, Indonesia could reach 540 $MtCO_2$eq by 2060. This is, however, just an illustrative scenario, not a prediction. Much will depend on technological progress, reforms, and investments.

The modeling results show that the impact of climate actions on GHG emissions reduction will be driven in large part by land-related policies. SCENARIO 1 (redirection of energy subsidies) is expected to reduce emissions by 3-4 percent, but the effects are limited once redirection is completed (Figure 63). The land use policies and carbon prices are projected to have a more substantial impact, with continued emissions reduction as the carbon prices are increased. By 2030, GHG emissions under **SCENARIO 2** (NDC) could be lower by 27 percent compared to BAU; this reduction would help meet Indonesia's conditional NDC target. Under **SCENARIO 3** (NDC+), GHG emissions are 47 percent below BAU by 2030 and 63 percent below BAU by 2040. Beyond land, the power sector, which has the technologies available to reduce emissions to near-zero levels, shows the biggest reductions in all scenarios. There are also substantial emission reductions from manufacturing and transport.

The net impact of climate actions on long-term GDP depends, in part, on how increased carbon tax receipts and reduced subsidies are recycled. In all scenarios, if savings from lower subsidies are recycled through transfers, then GDP could be slightly lower than in the BAU during initial years. On the other hand, if they are channeled to investment, there could be a small initial reduction followed by an increase in GDP that is sustained throughout the projection period. In **SCENARIO 1** (redirection of energy subsidies), the difference in output compared to BAU is projected to be positive (Figure 64). This reflects the removal of the distortionary effects of the subsidies, and possibly additional indirect air quality effects. **SCENARIO 2** (NDC) has a stronger positive impact on GDP (assuming carbon tax receipts are channeled to investment rather than transfers), peaking at 1.5 percentage points of GDP above BAU in the early 2030s. This result is driven by the removal of economic distortions from energy subsidies, higher investments financed out of carbon tax receipts, an increase in agricultural productivity, and enhanced labor productivity through improved air quality. The air quality effect grows in line with the phase-out of coal.

In the more ambitious Scenario 3 (NDC+), the availability of external financing could play an important role in determining the long-term economic growth path. **SCENARIO 3** is projected to have a positive impact on GDP up to 2035 which is higher than the NDC benefits in the mid-2020s. Beyond 2035, the distortionary effects of the carbon tax, which is much larger than in **SCENARIO 2**, outweighs these positive effects. A higher carbon tax could reduce the use of fossil fuels more quickly (thereby reducing growth) than the economy can offset through adoption of new technologies (which would otherwise accelerate growth). It could also disincentivize investment due to higher cost from carbon tax on the one hand and domestic financing constraints on the other. These constraints could be alleviated through external financing. An additional 1 percent of GDP financing could lead to a positive impact on GDP (Figure 65).

The primary energy sector will be negatively impacted by domestic decarbonization and global reduction in demand over the long term, despite short-term windfalls due to Russia's invasion of Ukraine. Model results show a reduction in output for fossil fuel producers across all scenarios. Overall output would decline as would employment (by potentially up to 115,000 workers by 2040 out of 240,000 currently employed). Global demand and coal prices

are projected to decline sharply. Although coal production and prices have received a short-term boost from the effects of the war, it has also triggered energy security concerns and commitments to accelerate the transition to renewable energy. The long-term (post 2030) outlook is for significant losses of coal export market opportunities, combined with depressed prices.

There will be gains and losses across sectors. Sectors that are likely to be most directly affected by carbon pricing and other emissions reduction measures (e.g., energy, power, transport, waste) are likely to experience the sharpest drops in output (Figure 66). The coal sector accounts for significant export earnings that have financed important developments in the real sector. Other sectors, which make up large shares of GDP (e.g., construction, financial services, hospitality, wholesale and retail trade) and where the impact of transition policies is not as direct, are projected to expand and offset losses in the long term.

Any transition will be disruptive in the short term–even if beneficial over the long term; strong political support for a comprehensive decarbonization strategy will be essential to promote a smooth transition. All three scenarios, however, are within Indonesia's reach. Although the redirection of fossil fuel subsidies is challenged by current energy prices, it is consistent with the longer-term trend in Indonesia, will generate fiscal savings for development, and incentivize more efficient resource use. The NDC scenario is already consistent with the authorities' land and energy sector commitments.

The estimated investment above BAU that is assumed across the above scenarios range from an average of 0.4 to 1.6 percent of GDP per year. The model assumes a fixed money supply which means that additional investment in low-carbon equipment must be financed either by displacing ('crowding out') other investment or through increased savings and reduced consumption. There is, therefore, no possibility for the financial sector to play a positive role in the transition under this assumption. Conversely, potential issues relating to a lack of access to finance are also not covered by the model. In all three scenarios (removal of energy subsidies, NDC, and NDC+), therefore, it is assumed that investments will be financed out of domestic sources, whether through crowding out or increased savings. Only in SCENARIO 3, where sensitivity analysis assumes external financing, do additional investments peak at just below 2 percent of GDP in the late 2020s. Table 3 presents a summary of all macroeconomic results.

FIGURE 63

Achieving Decarbonization Objectives

Total GHG Emissions, difference from BAU ($MtCO_2eq$)

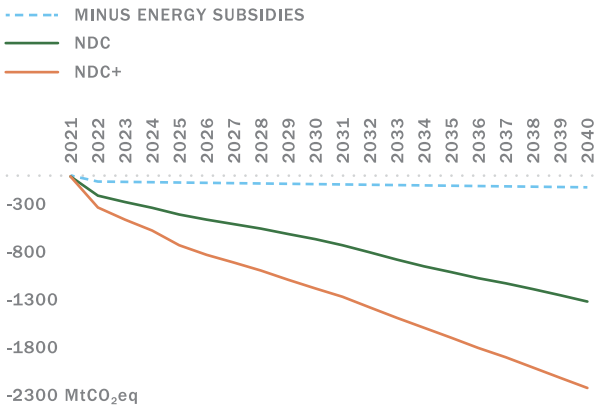


FIGURE 64

With Potential Positive Growth Payoffs

GDP percentage difference from BAU

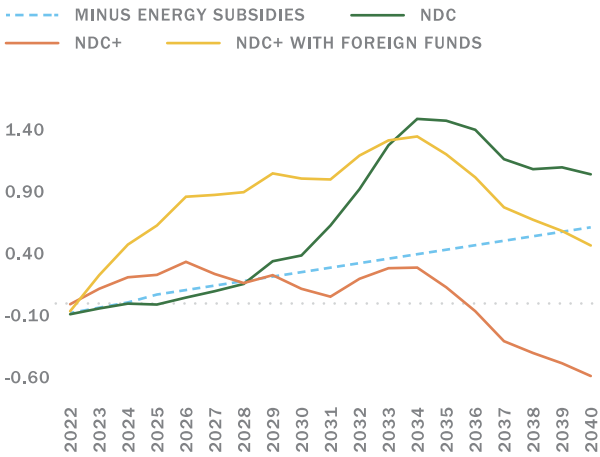
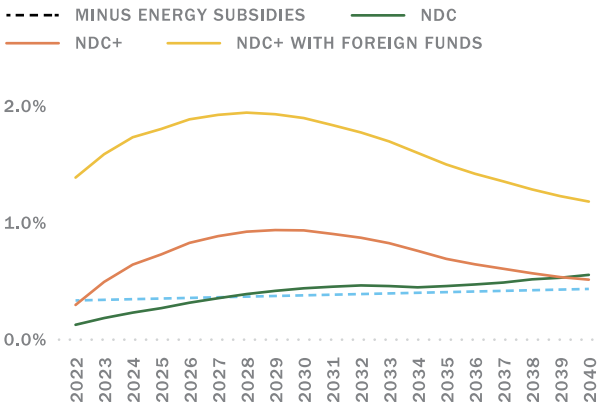


FIGURE 65

Foreign Investments can Alleviate Trade-offs in More Ambitious Scenarios

Investments (difference from BAU, % of GDP)

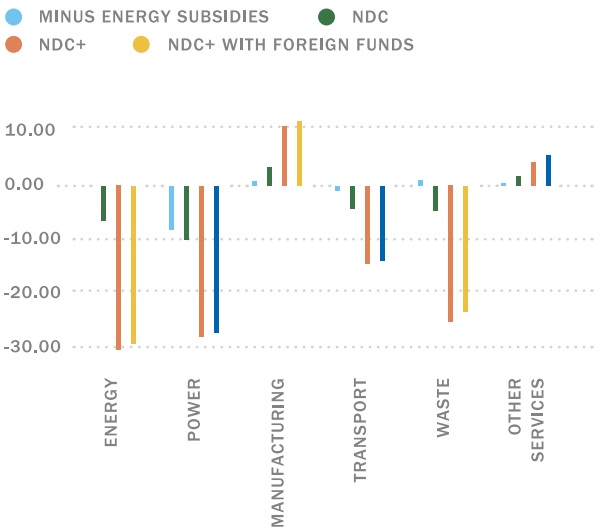


Source: WBG staff analysis using the MANAGE CGE model.

FIGURE 66

There Will Be Gains and Losses Across Sectors

Sector Output % difference from BAU in 2040



4.5 IMPACT OF CLIMATE ACTIONS ON HOUSEHOLDS

The economy-wide impacts of climate mitigation will affect households through employment and wages.[82] By redirecting energy subsidies, the first scenario has only minuscule impacts on employment growth, while the second and third scenarios (NDC and NDC+) lead to marginal impacts–not exceeding 0.7 percentage points annually over the 2020 to 2040 period. Most negative impacts are felt in energy-intensive sectors (Figure 67) given the increase of costs due to the carbon tax, but overall employment in these sectors is relatively low (below 10 percent of total employment). Wage growth in most sectors is not substantially affected by the scenarios, except for large increases in electricity, gas, and water supply sectors, by about 25 percent in the NDC and 215 percent in the NDC+ scenarios relative to the BAU scenario (by 2040). Labor demand for renewables and gas increase, leading to higher wages given labor frictions (that is, a function of the skill transferability of workers).

The implementation of land policies together with the introduction of a carbon tax (NDC and NDC+) progressively affect household expenditures–driven by recycling of revenues into social assistance. While the effective tax on energy increases energy prices across scenarios, improved agricultural productivity due to land policies in the NDC and NDC+ scenarios more than mitigates the aggregate price impact through lower food and non-food prices (which are much larger components of the overall consumption basket than energy) (Figure 68). Household expenditures increase progressively in absolute terms for the NDC and NDC+ scenarios (Figure 69). The progressive growth of household expenditures is mostly driven by increased social assistance which is generated by revenue from the carbon tax. Except in the SCENARIO 1, household expenditures in rural areas increase more than in urban areas given the higher agricultural productivity of land due to the land policies and an increase of investment in the agriculture sector due to its lower energy intensity (Figure 71).

While revenue recycling can mitigate adverse impacts on poverty, specific groups might still require targeting with tailored support. The poverty rate is hardly affected in the subsidy removal scenario. Poverty is set to decline in the NDC and NDC+ scenarios (Figure 72)–driven by social assistance. Although poverty is not worsening in any geographic area, specific groups can lose from the reforms and will need targeted asistance. In the short term, however, poverty might be more strongly affected by price volatility undermining households' purchasing power. A food price shock of 30 percent can increase poverty by seven percentage points while a similar energy price shock increases poverty by only 1.4 percentage points.

82 Distributional impacts are assessed using micro-economic simulations of the results from the CGE macro model. An occupational choice model re-allocates workers based on the outputs of the CGE model. Income is transformed into expenditure based on the marginal propensity to consume. Consumption shares are kept constant assuming that households do not adapt their behavior in response to changes in prices. population parameters are adjusted based on UN population growth projections, with education levels adjusted based on the aging of the youngest cohorts.

FIGURE 67

Impacts on Employment

Employment Relative to BAU by 2040 (percentage points)

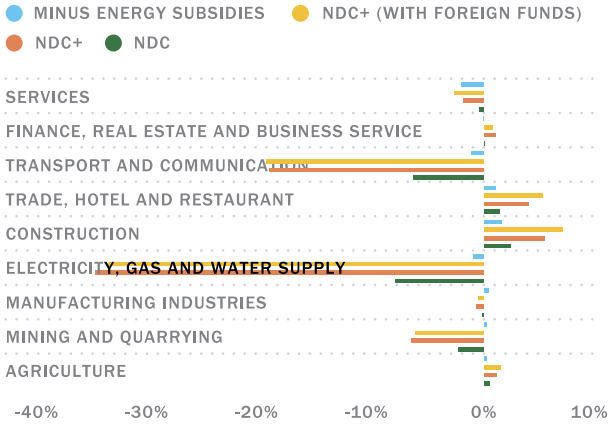


FIGURE 68

Impact on Prices

Price Change vs. BaU by 2040 (percentage points)

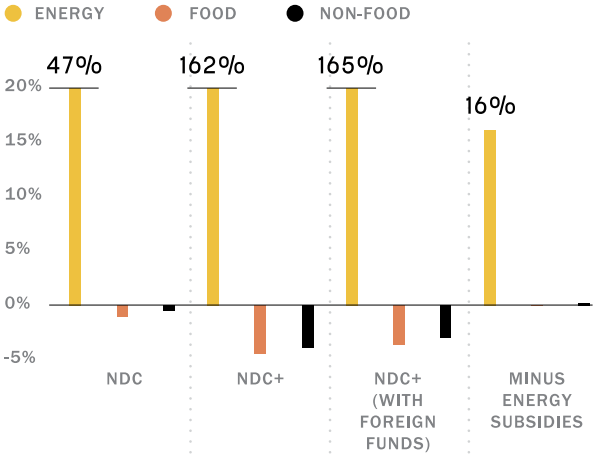


FIGURE 69

Impact on Household Expenditure

Percent Change in Expenditure vs BaU by 2040

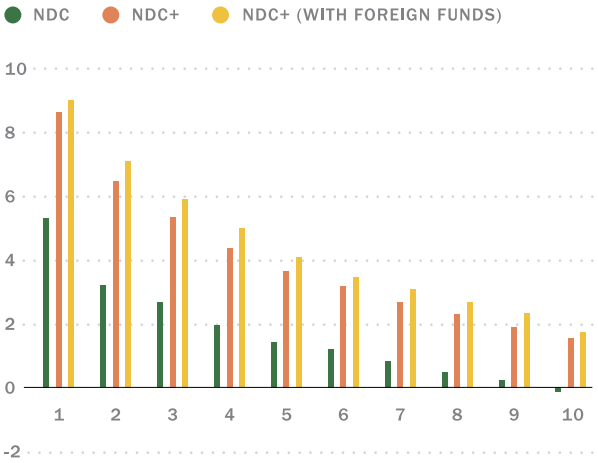


FIGURE 70

Impact on Expenditure by Worker Type

Percent Change in Expenditure vs. BaU by 2040

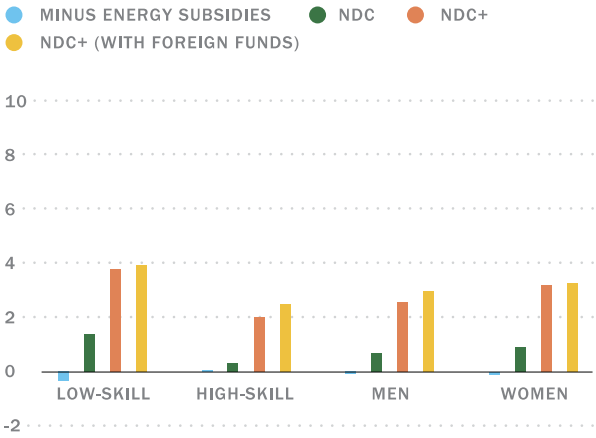


FIGURE 71

Drivers of Expenditure Change

Contributions to Expenditure Growth, by urban/rural

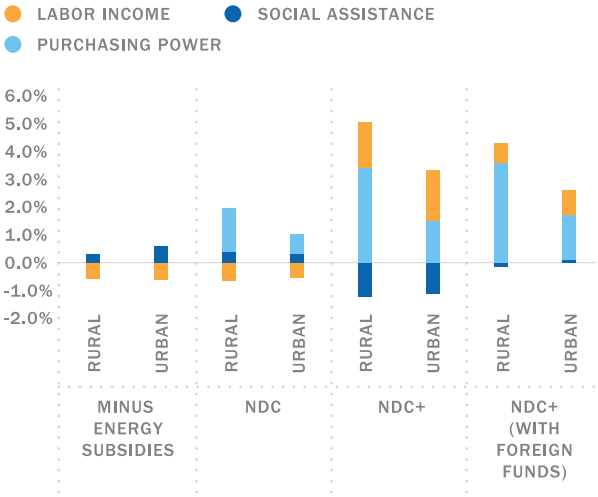
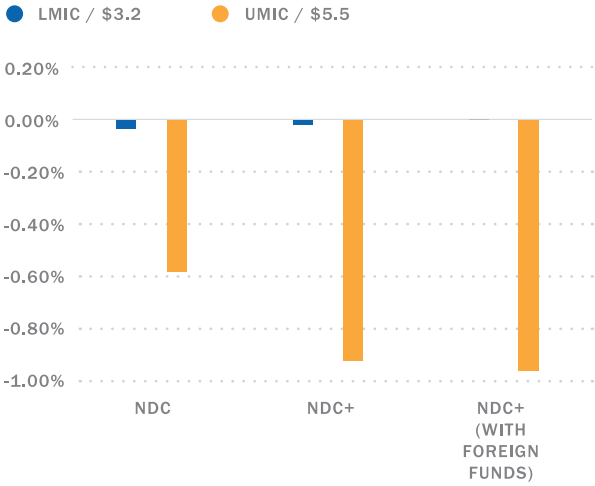


FIGURE 72

Impact on Poverty

Change in Poverty Rates vs. BaU by 2040 (percentage points)



Source: World Bank staff estimates based on a Microsimulation Model. Model is based on SUSENAS 2019 data projected forward to 2020 (to avoid perturbations by COVID-19 impacts). Macroeconomic projections are derived from CGE results above.

TABLE 3

Summary of Macroeconomic Modelling Results

	2022	2030	2040	2022	2030	2040	2022	2030	2040	2022	2030	2040	2022	2030	2040
			BAU	Minus Energy Subsidies			NDC			NDC+			NDC+ with Foreign Funds		
				Deviation from BAU (Percent)*			Deviation from BAU (Percent)*			Deviation from BAU (Percent)*			Deviation from BAU (Percent)*		
Average Growth, %															
Real GDP	5.21	5.02	4.66	-0.08	0.03	0.03	0.13	0.05	-0.06	0.22	-0.12	-0.11	0.16	-0.04	-0.12
Real GDP per capita	4.13	4.19	4.06	-0.08	0.03	0.03	0.13	0.05	-0.06	0.22	-0.12	-0.11	0.16	-0.04	-0.12
Per Capita Income and Consumption															
Real GDP Per Capita (Constant 2020 US$)	639	893	1,329	-0.08	0.26	0.62	-0.09	0.39	1.04	-0.01	0.12	-0.58	-0.06	1.01	0.47
Real Household Consumption Per Capita (Constant 2020 US$)	345	511	810	-0.63	-0.20	0.21	-0.41	-0.34	0.04	-0.58	-1.56	-2.58	-0.58	-0.17	-0.74
Real Expenditure Shares in Real GDP															
Private Consumption (% of GDP)	54.02	57.18	60.91	-0.30	-0.26	-0.25	-0.17	-0.41	-0.61	-0.31	-0.96	-1.22	-0.28	-0.67	-0.73
Government Consumption (% of GDP)	8.75	8.75	8.75	0.00	-0.07	-0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Private Investment (% of GDP)	27.96	25.95	23.06	0.30	0.35	0.43	0.11	0.28	0.42	0.20	0.56	0.59	1.16	1.31	1.15
Government Investment (% of GDP)	1.09	1.02	0.95	0.00	0.00	-0.01	0.00	0.00	-0.01	0.00	0.00	0.01	0.00	-0.01	0.00
Net exports (% of GDP)	4.96	4.96	4.98	0.00	-0.01	-0.03	0.06	0.14	0.21	0.11	0.40	0.61	-0.88	-0.61	-0.41
Sectoral Shares in GDP															
Agriculture	6.49	5.97	5.23	0.02	0.00	-0.02	0.02	0.07	0.10	0.03	0.17	0.34	0.02	0.13	0.28
Industry	54.11	54.67	57.52	-0.04	-0.03	0.11	-0.10	-0.27	-0.38	-0.12	-0.76	-2.05	-0.01	-0.65	-1.90
Services	39.40	39.37	37.24	0.02	0.03	-0.09	0.08	0.20	0.28	0.09	0.59	1.71	-0.01	0.52	1.61
External Balance															
Current Account Balance (% of GDP)	-5.11	-4.77	-4.46	0.00	0.01	0.03	0.00	0.02	0.05	0.00	0.01	-0.03	1.00	1.04	1.02
Fiscal Aggregates															
Fiscal revenue (% of GDP)	8.77	9.14	9.95	0.75	0.74	0.82	0.59	1.60	2.52	1.14	4.04	5.89	1.21	4.16	6.05
Fiscal expenditure (% of GDP)	13.27	15.62	19.30	0.01	-0.04	-0.12	0.23	0.65	1.05	0.45	1.49	1.83	0.58	1.80	2.26
Budget deficit (% of GDP)	-5.59	-7.52	-10.39	0.74	0.78	0.94	0.36	0.94	1.48	0.68	2.53	4.05	0.62	2.35	3.80
Public debt (% of GDP)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Emissions															
Emissions (millions of tons C02)	1,895	2,487	3,538	-3.27	-3.67	-3.47	-12.87	-30.90	-44.63	-25.40	-65.50	-68.86	-25.28	-64.98	-68.28
Emissions per unit of output (tons C02)	1608.0	1410.2	1260.2	-3.20	-3.92	-4.06	-12.79	-31.16	-45.20	-25.40	-65.54	-68.68	-25.24	-65.33	-68.43

4.6 IMPACT OF CLIMATE ACTIONS ON TRADE

The redirection of distortive electricity and fuel subsidies will result in efficiency gains for Indonesia and benefit not only the domestic economy but also international trade. Exports and imports are found to expand by 1.2 percent and 1.1 percent by 2040, respectively (Figure 73). Gains materialize over the long run (that is, after 2033),

following muted initial adjustment losses in earlier years. Export gains are mostly explained by the expansion of sectoral exports such as manufacturing and extractives, while on the imports side the increase in imports of manufactures and services is outweighed by the decline in imports of mining and energy products.

NDCs are found to have a muted but negative impact on Indonesia's trade flows–with an estimated decline of 1 percent and 1.4 percent by 2040 in exports and imports, respectively. The contraction of exports is driven by the decline of extractives exports, while other sectors are found to expand (Figure 74). Results show that, over time, the negative impact on trade is outweighed by benefits for the economy as a whole–with a slight U-shaped recovery of trade flows over the longer term. When worldwide climate action is considered, the impact on Indonesia's economy and trade is marginal, and exports mainly decline in carbon-intensive sectors while other sectors benefit.

Achieving a much more ambitious net zero emissions goal is found to have a more pronounced impact on trade–with a decline of 15.5 percent in exports and 13.9 percent in imports by 2040, respectively (Figure 73). In this scenario, exports of energy and extractives decline significantly and are also associated with a decline of manufacturing exports. As the adjustment of the economy to the net zero goal continues to 2050, the decline of trade over the years is cumulative and more pronounced. With the right policies, however, Indonesia may mitigate some of this negative impact–for example, through policies that would enable access to green technologies from the global market–including through addressing specific NTMs and multilateral agreements on green goods with other countries (through the World Trade Organization).

FIGURE 73

Trade Impacts of NDCs are Slightly Negative

Trade impacts relative to BAU in 2040 (%)

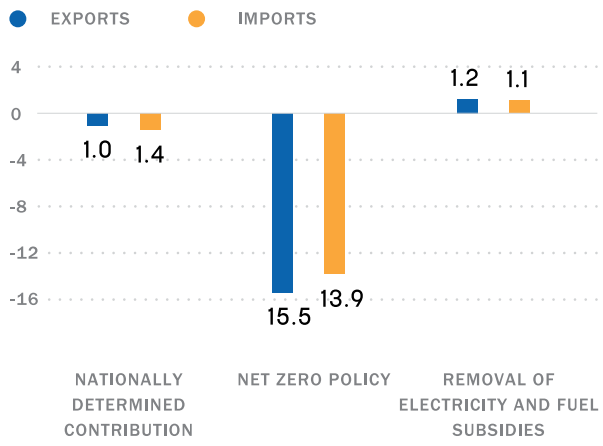
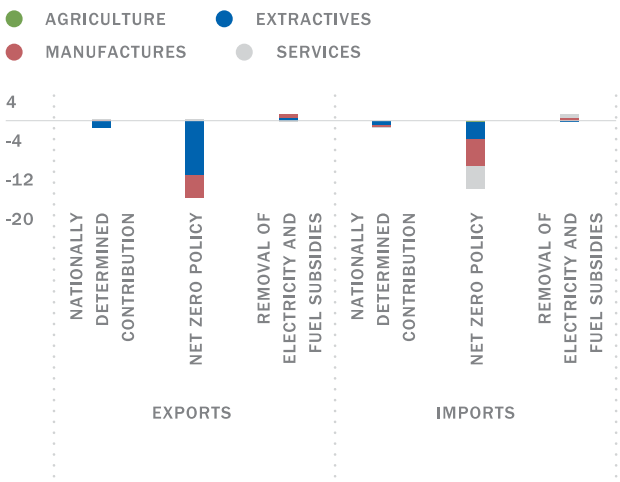


FIGURE 74

Partly Driven by Declining Manufacturing Exports

Sectoral drivers of trade growth relative to BAU in 2040 (%)



Source: WBG staff estimates using the World Bank's Environmental Impact and Sustainability Applied General Equilibrium (ENVISAGE) CGE model.

BOX 3

Potential Impacts of Climate Change & Adaptation Capabilities

Indonesia is ranked in the top-third of countries in terms of climate risk, with high exposure to flooding and extreme heat. Without effective adaptation, population exposed to these hazards will rise. For example, modelling suggests that the population exposed to an extreme river flood can be expected to grow by 1.4 million by 2035–2044 in the absence of adaptation measures and under moderate climate change. Indonesia is also vulnerable to sea-level rise, with the country ranked fifth highest in the world terms of the size of the population inhabiting lower elevation coastal zones. Without adaptation, the total population likely to be exposed to permanent flooding by the period 2070–2100 could reach over 4.2 million people (WB and ADB 2021).

The impacts of climate-related shocks can be highly disruptive to the economy through their effects on firms and households. For example, World Bank modelling suggests that the costs to firms in Indonesia from various infrastructure disruptions in 2019 could have been in the order of 2.4 percent of GDP (Hallegatte, et al. 2019). Most of those costs are estimated to have been driven by loss of sales followed by reduced utilization rates (that is, output capacity that goes unused due to transport and services interruptions) (Figure B.3.1). Projecting forward, the approximate loss in GDP under midrange climate assumptions is expected be around 1.4 percent of GDP by 2030 relative to a scenario with no climate change (Figure B.3.2). Concurrently, the income of the bottom 40 could fall by 2.2 percent by 2030 relative to a scenario with no climate change (Figure B.3.3).

FIGURE B.3.1

Climate shocks pose risks through infrastructure disruptions

Cost of climate shocks on infrastructure disruptions (% of GDP, 2019)

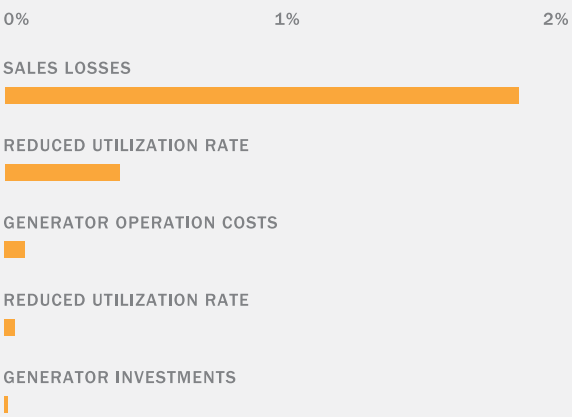


FIGURE B.3.2

Which contribute to long-term loss in income

Change in GDP with climate change relative to a scenario with no climate change

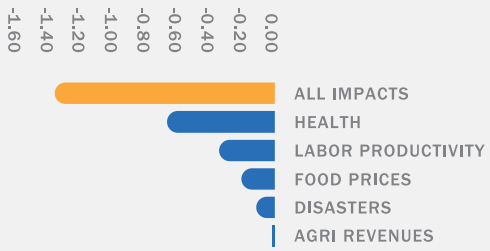
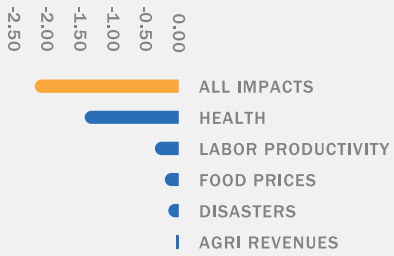


FIGURE B.3.3

Including through impacts on the income of the bottom 40

Change in income by 2030 of the bottom 40% with climate change (%)

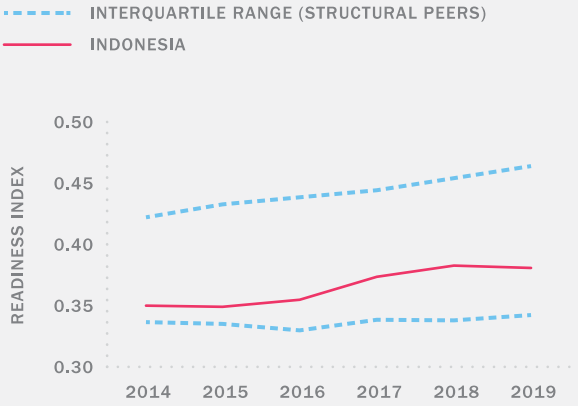


Sources: Figures B.3.1-B.3.3 are WBG estimates (Hallegatte, et al. 2016; 2019)

FIGURE B.3.4

Gradual improvement in readiness to deal with climate shocks

Readiness versus peer countries



Sources: Data from Notre Dame Global Adaptation Initiative (2022). Structural peers are Nigeria, China, India, Ukraine, Thailand, Philippines, Mexico, Egypt, Russia, Brazil with benchmarking choices based on population, GDP per capita, and total GDP.

Indonesia's capacity to adapt to these climate shocks has gradually strengthened as discussed in part B, and further measures will help better absorb the above costs. According to the Notre Dame-Global Adaptation Index (ND-GAIN), Indonesia is the 87th least ready country to the impacts of climate change (i.e., around the global median). Readiness (i.e., country's ability to leverage investments and convert them to adaptation actions) is assessed by considering indices of economic performance, governance, and social systems. Indonesia's performance on readiness is improving, including gradual catch up with the performance of peers (Figure B.3.4).

An example of where Indonesia is improving readiness is in the capacity of the Social Protection (SP) system. The CCDR undertook a 'Stress Test' (Sen et al, 2022) to assess the capacity of Indonesia's SP System to respond to climate shocks and found the country to be operating at a midrange Level. Indonesia scored 3.26 on a scale of 1 (Nascent) to 5 (Advanced) in four areas, including the effectiveness of its Programs and Delivery Systems (score: 3.47); Data and Information (score: 3.08); Financing (score: 3.25); and Institutions and Partnerships (score: 3.25). These scores are in line with countries of comparable income. While opportunities remain for further improvement, recent progress has included expansion of conditional cash transfers and establishment of a social registry of the poorest 40 percent (see Chapter 2). Other areas of adaptation have also improved, such as early warning systems (EWS) for natural hazards.

Source: Hallegatte, et al. 2016; 2019; Notre Dame Global Adaptation Initiative (2022); WB and ADB 2021, "Indonesia Climate Risk Profile"

5

CLIMATE & DEVELOPMENT POLICY FRAMEWORK

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KERENG BANGKIRAI •
CENTRAL KALIMANTAN

5.1 THE CLIMATE & DEVELOPMENT TO–DO LIST

What are the implications of all the above for priorities going forward? To recap, Indonesia has drawn on its abundant supply of natural resources while achieving impressive development transitions in income, social services, infrastructure, economic growth, and poverty reduction–particularly over the quarter-century to 2022. Yet climate change poses physical and economic risks for Indonesia, and some aspects of the earlier growth model have imposed costs on development. In response, Indonesia has embarked on a transition toward low-carbon and climate-resilient growth that "balances between emission reductions and economic development" (Republic of Indonesia 2021). Addressing mitigation and resilience needs will entail not just sector policies but also enablers that are important for long-term growth. Reforms for a climate transition will, therefore, involve four types of measures: (i) supply-side; (ii) demand-side; (iii) adaptation; and (iv) enabling policies and institutions. All four work together, with the transition expected to be more efficient when simultaneous progress is made in each area.

The CCDR draws on the government's strategic documents as well as its own analysis to propose a policy framework that balances climate and development (Figure 75). Policies aim to balance changes in the supply of carbon-intensive inputs with adjustments to demand for those inputs. They further aim to create the enabling conditions that will facilitate a reallocation of resources from carbon-intensive to greener parts of the economy, and from low-productivity to high-productivity areas of the economy, while raising new financing. Policies also aim to provide certainty and insurance for Indonesia's economy and people via adaptation measures that protect against shocks, reduce risks, and ensure inclusion.

While many actions could contribute to these needs, not all are urgent and not all contribute to both climate and development goals to the same extent. The CCDR policy framework is built around considerations of *urgency* and *synergy*. While many measures are important, some are relatively more urgent because inaction will lock in carbon-intensive development patterns or vulnerabilities that increase subsequent costs and financial risks. Other measures can be delayed in recognition of short-term financing limits or potential benefits from the expected decline in the cost of green technologies. The CCDR indicates urgency by suggesting each action as either a short-term priority (by 2025), a medium-term priority (by 2030), or a long-term priority (beyond 2030). Regarding *synergy*, some measures are expected to contribute to both climate and development goals by improving the business environment, helping to balance the budget, or by reducing development costs such as local air pollution. The CCDR indicates those measures with high potential toward both goals (Figure 76). Urgency and synergy inform selection of the measures and their relative prioritization presented later in this Chapter.

FIGURE 75

Building Blocks for the Transition

FIGURE 76

Prioritization Approach for Recommendations

URGENCY When to act		SYNERGY Expected climate and development outcomes		
		CLIMATE	DEVELOPMENT	
SHORT TERM PRIORITY	S	3	3	VERY HIGH
MEDIUM TERM PRIORITY	M	2	2	HIGH
LONG TERM PRIORITY	L	1	1	LOW-MODERATE

Source: WBG staff.

Note: Extent of synergy is indicated by a qualitative (1-3) scoring of expected climate and development benefits: measures with high potential (that is, higher scores) toward both goals are considered more synergistic. Urgency is defined by short (by 2025) medium (by 2030), and long-term (after 2030) categories.

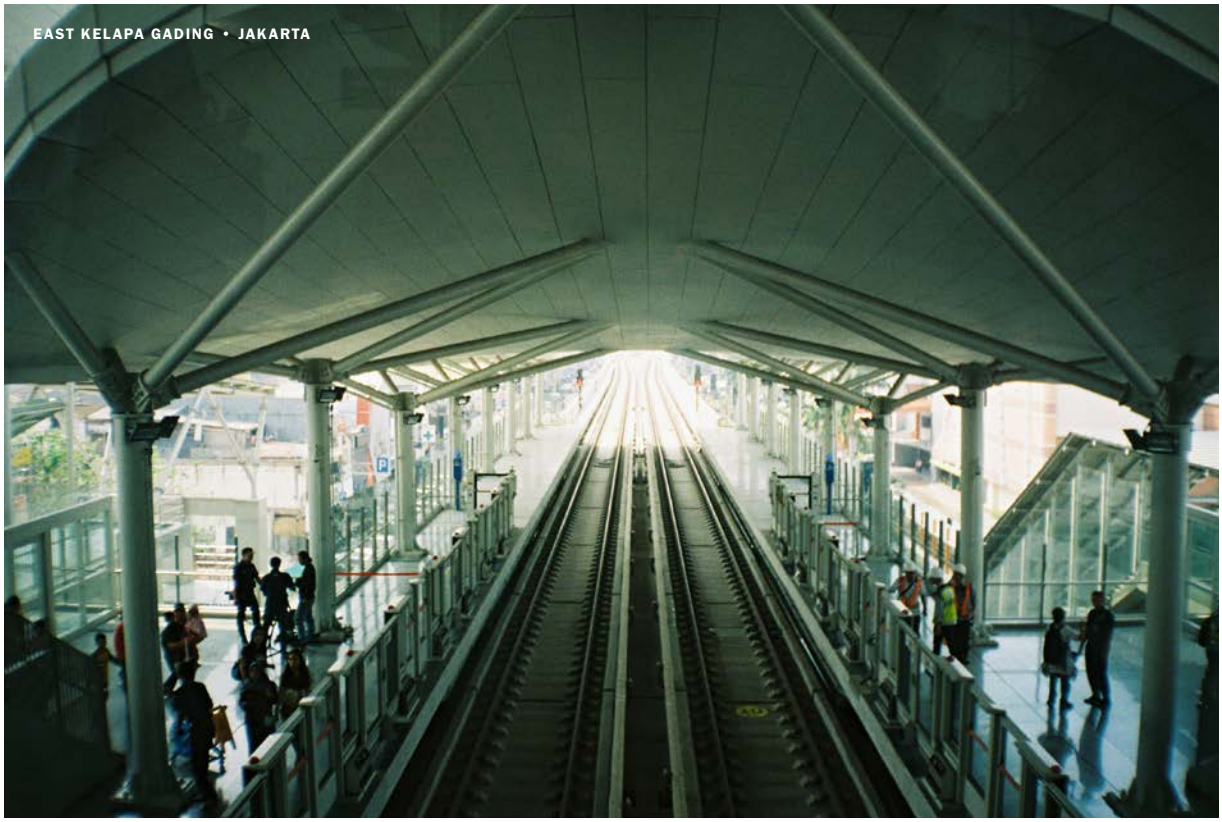
> "The CCDR policy framework is built around considerations of urgency and synergy"

The CCDR recognizes that the feasibility and ultimate success of reforms do not depend only on their technical merits but also on political support for those reforms. Political support will depend on, among other things: (i) the distributional impacts of reforms; (ii) the tradeoffs between the short-term costs of reforms and their long-term gains; and (iii) institutional capacities to implement reforms. The CCDR does not claim that these reforms are straightforward, nor that they can be all be achieved within the timeframes presented. It is likely that political considerations will necessitate tradeoffs and choices between competing priorities. Nevertheless, the CCDR presents a policy framework and timeline from a technical perspective, informed by Indonesia's stated ambition, while recognizing that it is for Indonesia to decide collectively how, when, and what reforms to move forward.

Before presenting the full policy framework (below), the CCDR offers a selection of short-term priorities (by 2025) based on urgency and synergy considerations. These are short-term priorities that aim to place Indonesia on a smooth transition trajectory. They are starting points–with longer-term reforms and investment options to follow the planning and initial steps they establish. In some cases, these short-term priority areas refer to actions that the CCDR designates as medium- and long-term actions. This is because longer-term implementation does not mean delayed action: planning, piloting, institutional strengthening, and initial steps toward longer-term outcomes may need to start now for realization of future results.

CHALLENGES ADDRESSED		SELECTED SHORT-TERM PRIORITIES (BY 2025)
1	Some remaining gaps in forest and land use policies and finance	**Continue to strengthen the policy framework for net zero emissions from forests and land use and develop a financing roadmap for the FOLU Net Sink 2030 plan.** Build on recent regulatory reforms to further expand forest protections over areas of peat not already covered. Integrate mangrove protection into subnational (provincial and district) spatial plans (focused on nonforest areas) and help ensure AMDAL assessors correctly designate mangroves as HCV ecosystems. Finalize OneMap and continue to clarify tenurial status of different land functions as a stronger basis for enforcement. Use fiscal incentives plus increased enforcement to ensure district governments complete their spatial plans to direct new agriculture away from high-carbon and sensitive ecosystems. Develop a financing roadmap to support restoration investments and other planned FOLU Net Sink 2030 activities. Support (longer-term) expansion of farmer extension and financing to improve agricultural yields, focused on smallholders.
2	Structural barriers impede the energy transition	**Implement an energy transition strategy founded on five pillars:** (i) adopt a comprehensive approach to decarbonization planning and energy transition; (ii) accelerate carbon pricing and subsidy reform when circumstances allow (including removal of the DMO and the price cap for coal)–to increase the incentives for investment in renewable energy and energy efficiency; (iii) improve the investment climate for renewable energy through institutional and regulatory reforms; (iv) strengthen the capacity and flexibility of electricity networks to absorb additional renewable energy; and (v) manage the poverty and social impacts of the energy transition.
3	Inefficiencies in energy use in transportation and buildings	**Further catalyze investments in low-carbon transport through the development of a national urban mobility policy (NUMP) framework and increase energy efficiency of commercial and residential buildings through green certification.** Unplanned urbanization risks locking in suboptimal energy use patterns in the building sector and in transportation networks. A NUMP will set goals for achievement of green mode share targets, and develop planning, institutional, and funding frameworks for prioritizing investments in efficient modes (public transport, walking, and cycling) and efficiency improvements (electrification of vehicles) in the longer term. Meanwhile, cost-effective green standards already exist but are not yet applied to all building types. These could be considered for extension.

CHALLENGES ADDRESSED		SELECTED SHORT-TERM PRIORITIES (BY 2025)
4	City planning undermines climate and development efforts	**Improve flood resilience through spatial planning and early-warning systems.** Re-map flood-prone zones with climate-sensitive hydrological predictions and update spatial plans. Prioritize enforcement of mandated groundwater abstraction limits or prohibitions at subsidence hot spots to reduce coastal flooding risks. Continue investing in an integrated and people-oriented multi-hazard early warning system based on a user needs study for improving weather warning services and develop a roadmap for shifting from weather-prediction to "impact-prediction" services.
5	Fiscal policy distorts price signals for decarbonization	**Continue to shift fiscal policy to disincentivize emissions.** Develop a roadmap for subsidy reform covering: (i) resumption of transport fuel subsidy reductions building on recent progress; (ii) replacement of the electricity price subsidy (PLN's PSO) with targeted cash transfers; and (iii) consistent with the subsidy reform plan, develop a medium-term plan for carbon pricing. This could include fossil fuel excises and extension of the existing pilot ETS and carbon tax across additional sectors.
6	Underinvestment in green projects by financial and private sectors	**Strengthen the financial and private sector enabling environment for green investments:** (i) develop a comprehensive strategy for financial sector climate-risk assessment with detailed guidance for banks; (ii) develop further specific national climate finance strategies to diagnose Indonesia's climate finance gap; (iii) incentivize the use of green bonds; (iv) reform SoEs to create new opportunities for private investment in green infrastructure; and (v) reform PPP project selection, preparation, agreement, and concession procedures.



EAST KELAPA GADING • JAKARTA

SUPPLY

Supply-Side Policies & Institutions

A | PRIMARY ENERGY SUPPLY

Achieving Indonesia's target of rebalancing the primary energy mix from coal to renewables requires short-term regulatory reforms and a just transition for the coal sector. There are opportunities to make the regulatory framework more supportive of Indonesia's energy mix objectives, including reforms to PLN (discussed in the next section) which could help reduce demand for carbon-intensive energy sources. Specific measures include:

S.1. Fragmented approach to decarbonization planning and energy transition

URGENCY
CLIMATE
DEVELOPMENT

Adopt a comprehensive approach to decarbonization planning and the energy transition. This includes: (i) incorporation of government climate commitments and targets in sectoral plans such as the RUPTL and corporate plans of SoEs such as PLN; (ii) further assessment of cost-effective decarbonization pathways, building on the LTS-LCCR and LCDI; (iii) development of a decommissioning timetable for coal-fired power plants, a financing plan, and least-cost replacement of coal generation with renewable energy sources consistent with Presidential Regulation No. 112/2022 on Renewable Energy issued in September 2022; and (iv) a stakeholder consultation and dissemination plan. A coordinating inter-ministerial commission with the participation of MoEMR, the Ministry of State-owned Enterprises (MSoE), and MoF could be established to ensure alignment of sector, climate, and financial targets.

S.2. Coal pricing disincentivizes renewables

URGENCY
CLIMATE
DEVELOPMENT

Continue energy pricing and subsidy reform by phasing out coal DMO subsidies and phasing in carbon pricing. This includes: (i) progressively removing the DMO for coal to help level the playing field for renewables; and (ii) preparing a roadmap for carbon pricing (extension across sectors and a price trajectory through time). See also recommendation E.1 - E.5.

S.3. Distorted investment climate for renewables

URGENCY
CLIMATE
DEVELOPMENT

Lower regulatory barriers to renewable energy development by the private sector. LCRs which set a minimum threshold for local content both for materials and services used in solar power generation raise costs for solar IPP developers and reduce PLN's willingness to enter new PPAs with them. Local solar panel manufacturers have been unable to produce at scale, resulting in solar PV panels which are more expensive and often of a lesser quality than what the developers could procure on the international markets. To address this, the government could issue a waiver on these protections for several years. This will give time for the domestic solar generation sector to develop, thereby creating a base for demand for equipment. The government could keep the waiver under review, returning to the domestic production protections when that no longer undermines demand.

S.4. Lack of capacity and flexibility of electricity networks

URGENCY
CLIMATE
DEVELOPMENT

Further invest in the capacity and flexibility of transmission and distribution networks, including interconnections between island systems. These investments would be supported by pricing mechanisms and associated regulations for energy storage systems and ancillary services that support renewable energy integration. Planning by MoEMR is underway toward island interconnections–with major islands intended to be connected by 2024 and smaller islands subsequently.

S.5. The coal phaseout will have negative economic impacts

URGENCY
CLIMATE
DEVELOPMENT

Pursue a "Just Transition for All" for the coal phaseout. A just transition can be underpinned by: (i) continuous dialogue and consultation with a wide variety of stakeholders to determine scope, scale, and timing of coal facilities' closures; (ii) upfront planning, sustained through dialogue and participatory monitoring during the stages of closure and transition; (iii) provision of temporary income support to coal workers and their families that is complementary to other existing social protection programs; and (iv) deployment of active labor market policies that offer services, programs, and incentives to encourage and enable re-employment among laid-off workers.

B | SUPPLY OF LAND RESOURCES

Indonesia has a clear pathway toward negative emissions from the land sector by 2030. The most cost-effective first step is further strengthening conservation of primary forests and peatlands, building on recent regulatory tightening that is protecting HCV forests and peat. Land management in Indonesia will require an integrated landscapes approach with coordination across sectors and levels of government. Specific measures include:

S.6. Gaps in forest conservation measures

URGENCY
CLIMATE
DEVELOPMENT

Continue strengthening regulations on forest clearing. Indonesia has imposed regulations that have been effective in slowing deforestation (see Chapter 1). Continued strengthening of measures to protect high-value, carbon-dense peatland and primary forest will support the Net Sink 2030 objective. For mangroves, this could be supported by integrating mangrove protection into subnational (provincial and district) spatial plans (focused on non-forest areas) and by helping to ensure that AMDAL assessors correctly designate mangroves as HCV ecosystems. For forests outside of the Forest Estate, technical support and fiscal incentives could be provided to districts willing to designate high-value forests as Essential Ecosystem Areas (conservation zoning).

S.7. Fragmentation in management of key natural resources

URGENCY
CLIMATE
DEVELOPMENT

Expand the integrated landscape management approach. BRGM has successfully demonstrated how an agency with the mandate to achieve specific ecosystem outcomes can operate effectively in a complex administrative environment. This *landscapes approach* could be broadened for the management of critical ecosystems such as primary forests and mangroves, in addition to peatlands. This approach would entail the adoption of high-resolution maps for planning, cumulative impact assessment, and common performance metrics across ministries and subnational governments.

S.8. Misalignment between local land incentives and national land incentives

URGENCY
CLIMATE
DEVELOPMENT

Increase fiscal incentives for sustainable land use practices at the local level. Indonesia's decentralized system of governance requires vertical fiscal transfers that incentivize local actions aligned with national priorities. Add payment metrics to the Regional Incentive Fund (*Dana Insentif Daerah*) for the completion and enforcement of district spatial plans (*Rencana Tata Ruang Wilayah*: RTRW), and/or incentivize with international results-based-payments channeled through BPDLH, potentially through a streamlined BPDLH funding window that aggregates donor contributions and provides ongoing and simplified results-based support to provinces. Increase the knowledge and capacity of the most vulnerable villages regarding climate resilience and mitigation activities with livelihood co-benefits, and provide implementation support (for example, technical training and multi-year budgeting flexibility). Provide top-up funds rather than diverting already stretched revenues under the Village Fund (*Dana Desa*) and Village Fund Budget (*Alokasi Dana Desa*). Village-level services could be established to provide subsidized land preparation services as an alternative to burning, although priorities should be determined at the local level in line with village funding principles.

DEMAND

Demand-Side Policies & Institutions

A | THE DEMAND FOR ENERGY

Efforts to rebalance the supply of primary energy will be most effective if complemented with reforms that support a reduction in the demand for coal in the electricity sector. PLN's impaired balance sheet further prevents a move away from coal. This is driven by PLN's current revenue structure that is not sufficient to cover operating costs and service its debt. It is also driven by tariffs set well below cost-recovery. In addition, high external leverage of PLN creates debt overhang which is aggravated by low viability of renewable energy created by regulatory pricing distortions. These make it difficult for PLN to scale up the investment and attract the private investment needed for renewable energy. Specific issues and measures include:

D.1. PLN's tariff arrangements and untargeted subsidies weigh on balance sheet

URGENCY
CLIMATE
DEVELOPMENT

Increase the share of revenue received from electricity tariffs. PLN's tariff adjustment arrangements weigh on the balance sheet. Reforms could include: (i) improving the automatic adjustment formula to account for future investments, including renewables; (ii) revising the tariff structure to make it more transparent and provide greater pricing signals to customers, shifting demand from peak periods and greater energy efficiency, and potential progressive tariffs for certain categories of customers. These measures would be well complemented by electricity subsidy reform (see recommendation E.2.). Some tariff reforms are underway, along with subsidy targeting efforts.

D.2. Traditional financing is insufficient for PLN to expand renewable energy

URGENCY
CLIMATE
DEVELOPMENT

Review alternative financing options for PLN to use to finance expansion of renewable energy. Traditional financing is unlikely to be sufficient for PLN's expansion plans for renewable energy. Alternative financing could include: (i) further developing the use of asset-based securities and asset recycling and monetization models; (ii) expanding the use of green bonds and green financing through full implementation of the ESG and sustainable financing framework; and (iii) introducing independent transmission providers.

Further downstream in the energy value chain are opportunities to improve efficiency in use. Regulations for efficiency have been applied in some types of buildings and could be extended to others. Transportation has scope for reductions through further spatially informed infrastructure planning and compact urban design, shifting to low-emissions transport modes, and improving efficiencies and electrification of existing technologies. Substantial efforts are also needed to encourage the development of clean energy supplies for industrial processes such as those transforming raw minerals. Energy efficiency and electrification measures would be well complemented by measures to reduce the carbon-intensification of the electricity grid. Specific measures include:

D.3. Lack of green design standards in construction leads to energy inefficient houses

URGENCY
CLIMATE
DEVELOPMENT

Increase energy efficiency in commercial and residential buildings through green certification. Investing in green buildings will significantly reduce GHG emissions and result in lower housing costs for households and developers. Integrate cost-effective climate-smart components and green standards into government programs such as One Million Homes and Credit for Home Ownership (*Kredit Pemilikan Rumah*: *KPR Subsidi*). In the short term, conduct a study on green building feasibility for the *Bantuan Stimulan Perumahan Swadaya* (Stimulus Assistance for Private Housing) retrofit program, and consider expanding green standards (*Sertifikasi Bangunan Gedung Hijau*) for a wider range of building types.

D.4. High dependence on energy-inefficient private transport modes in urban areas

URGENCY
CLIMATE
DEVELOPMENT

Develop a NUMP to catalyze investments into public transport, walking, and cycling. This would include: (i) national goal setting for green mode shares; (ii) sustainable urban mobility strategies and action plans for urban areas above a certain size that prioritize transit, walking, and cycling, demand management and integrated spatial planning; and (iii) integrated institutions to plan, fund, and manage urban transport across metropolitan areas and across modes (for example, Metropolitan Transit Authorities with statutory authority). These could be supported by dedicated sources of funding (for example, transport tax revenues) and a national assistance scheme for mass transit that would reinforce the NUMP framework. This would be the primary decarbonization strategy for transport which yields robust impacts irrespective of energy source–with electrification as a complement (see recommendation D.5).

D.5. Low uptake of electrified mobility options

URGENCY
CLIMATE
DEVELOPMENT

Accelerate the adoption of electrified mobility (e-mobility) in concert with decarbonization of the electricity grid. This could involve: (i) mandates for the procurement of electrified public fleets on a timed schedule that provides a signal to EV manufacturers; (ii) direct monetary incentives for EVs, as is being pursued through the Low-Carbon Emission Vehicle Program that increases vehicle taxes proportionally to vehicle CO_2 emissions; and (iii) revised business models for public bus services to: (a) address the short contract duration (of up to three years) that currently makes it difficult to recoup large e-bus capital expenses; and (b) explore possibilities for fleet aggregation and leasing, and charging-as-a-service models, which provides flexibility for private sector innovation.

D.6. National climate targets are not yet fully translated into city-level policy making

URGENCY
CLIMATE
DEVELOPMENT

Integrate cities into medium- and long-term climate change strategies at the national level with dedicated city-level targets. Engaging cities in the low-carbon transition could have a substantial impact on the distribution of mitigation efforts and their costs. Dedicated climate targets at the city level will incentivize local authorities to mainstream climate change into planning, develop implementation strategies, and prioritize low-carbon investments. This is underway in some cities (for example, Jakarta) with opportunities to expand further.

B | THE DEMAND FOR LAND

Mitigation actions based on influencing the supply of land would be best complemented by measures that simultaneously improve efficiency of land use. Supply-side restrictions on land conversion, for example, restrict plantation expansion. These impacts can be offset by increased intensification of existing plantations. Better use of land could also be achieved through fiscal incentives aligned with climate objectives, some of which are underway. Specific measures include:

D.7. Inefficiencies remain in plantation agriculture, particularly among smallholders

URGENCY
CLIMATE
DEVELOPMENT

Bridge yield gaps through sustainable intensification. Smallholder operations in palm oil have yields on average 25 percent lower than large plantations. Improved access to technologies and inputs (for example, high-yielding varieties, balanced mix of fertilizer, digital and precision farming technologies); technical advisory and supporting services (for example, veterinary, climate advisory, equipment rental and maintenance services); and finance could help improve yields. The private sector will play an important role in incentivizing the adoption of climate-smart practices and in co-financing necessary investments. Further enhancements to traceability systems could be used to enable the rewarding of sustainable practices at farm level–for instance, through concession license renewals and price premiums for sustainably produced goods.

D.8. Public expenditure for agriculture is misaligned with climate goals

URGENCY
CLIMATE
DEVELOPMENT

Repurpose public spending in agriculture to incentivize resilient and low-carbon agriculture. Public support to agriculture in Indonesia is among the highest in emerging and OECD economies–but has been largely directed toward fertilizer subsidies and irrigation that is predominantly focused on rice–without commensurate gains in growth and productivity. There are opportunities to gradually re-orient agricultural spending to support increased productivity and farmer incomes and achieve climate objectives. This requires: (i) shifting input subsidies toward direct payments that are conditional on environmentally sustainable practices; (ii) promoting diversification to high-value, locally suitable, less emissions-intensive crops; (iii) incentivizing adoption of climate-smart practices (for example, use of improved crop varieties and livestock breeds); (iv) conservation agriculture; (v) water-use efficiency; and (vi) integrated pest management. These would need to be enabled by business development training for small-scale producers, the development of producer groups, and financing mechanisms.

D.9. Lack of clarity on land tenure and spatial planning leads to under-investment and deforestation

URGENCY
CLIMATE
DEVELOPMENT

Clarify peat and forest land designations and tenure rights, within and beyond the forest estate, with a focus on high-risk areas. Land rights issues are being addressed through major land rights reform programs underway (TORA and social forestry) that are helping to incentivize improved local land management. These programs could be spatially targeted based on 'prioritization maps' (combining environmental value, socioeconomic disadvantage, and high deforestation risk). A 'high-priority' area target for tenure reform could be used alongside existing targets to incentivize and measure progress in areas where land rights issues are most pressing. Land administration would be further strengthened by publication of timber and plantation concession maps under the One Map Policy, and through completion of high-resolution maps of peatlands and lowlands. Increased technical guidance and funding could help district governments to complete their RTRWs and incorporate climate considerations (risks and land-based emissions).

Similar land use dynamics play out in the urban space. Spatial planning that protects natural land–including forests at the urban periphery and high-risk flood zones–would be well complemented by efficient urban design measures and transportation systems that make higher density livable. The measure proposed below aims to improve synergies between measures influencing the demand and supply of land in urban areas:

D.10. Inefficient spatial growth patterns in cities

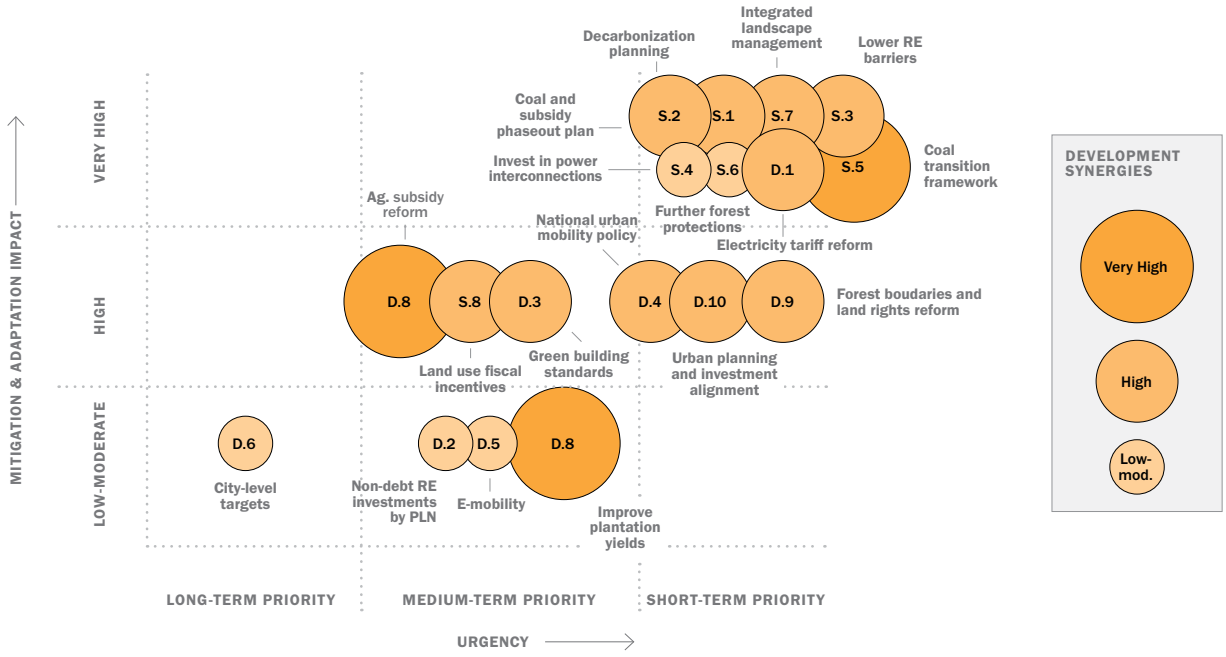
URGENCY
CLIMATE
DEVELOPMENT

Integrate spatial planning with capital investment planning and prioritization–especially in new, secondary, and small cities. Promoting a compact urban form will be crucial in Indonesia's secondary and smaller cities (with populations under 1 million), where most of the infrastructure needs to be built and carbon-intensive spatial patterns are yet to be locked in. Integrating spatial and capital investment planning may help reduce emissions arising from urban expansion and tree cover loss, and improve livability, while creating conditions for low-carbon transport modes.

Mitigation measures can be prioritized based on urgency and development synergies (Figure 77). Recommendations assessed as being relatively more urgent are those needed to avoid locked-in carbon-intensive development (such as avoiding loss of peatland and primary forest), start or strengthen crucial planning processes (for example, the coal transition framework), and put in place settings needed for longer-term investments (for example, renewable energy regulatory reforms). Short- and medium-term actions with the greatest expected mitigation impacts, combined with large, expected development co-benefits, include reform of energy subsidies, reform of agricultural subsidies, and the coal transition framework.

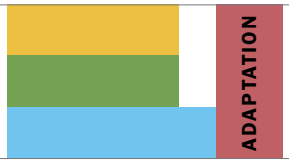
FIGURE 77

Timeframe and Expected Impact of Supply- (S) and Demand-side (D) Mitigation Measures



Source: WBG staff assessment.

Note: Actions assessed as being more urgent, with the greatest climate impacts, are to the top right; those with greatest development co-benefits are represented by larger/darker circles. Short-term priorities are those envisaged prior to 2025, medium term prior to 2030, and long term after 2030.



Adaptation & Resilience

Indonesia's physical and human capital stock underpin long-term growth prospects but are threatened by climate change. Reforms in social protection and DRM are already underway, building on important institutional and policy foundations such as the DTKS, the BNPB, and the 2007 laws on Disaster Management and Spatial Planning. Complementary recommendations are made below with the aim of strengthening synergies between disaster response and ex ante risk reduction, ensuring comprehensiveness of social protection systems, and strengthening spatial planning. Specific measures include:

A.1. Damage to infrastructure from climate-related disasters

URGENCY
CLIMATE
DEVELOPMENT

Continue to improve standards and practices for more resilient infrastructure. Intensify post-disaster investigation to better understand climate-related disaster impacts on infrastructure, revise technical guidelines, strengthen construction supervision practices, and enhance Balai level budget planning and funding flexibility for disaster needs (for example, high-priority maintenance and monitoring). Include climate resilience considerations in public infrastructure implementation processes via: (i) specific guidelines for conducting climate and environmental assessments; (ii) explicit inclusion in contracts of climate risks (and contingent liabilities); and (iii) inclusion of climate risks in State Asset Condition reports.

A.2. Flood management remains challenged by limits to data, planning, and enforcement

URGENCY
CLIMATE
DEVELOPMENT

Improve flood resilience through spatial planning and groundwater pumping control. Map flood-prone zones and delineate in spatial plans. Ensure development is controlled accordingly via zoning. Link spatial plans to investment plans and annual budgets at city levels (see also D.9. on spatial planning for efficient urban spaces). A Water Information Management System could be used for improved data sharing on flood risks. Further enforce mandated groundwater abstraction limits at high subsidence areas to reduce coastal flooding risks. Consider opportunities to adjust tariffs for cost-recovery and long-term investment in piped water infrastructure (to offset groundwater abstraction).

A.3. Gaps in social assistance programming

URGENCY
CLIMATE
DEVELOPMENT

Complete the ongoing reforms to strengthen the social protection system's adaptability to climate risk, including finalizing links to the PFB and completion of the ASP roadmap. Continue to close remaining social protection coverage gaps to poor and at-risk populations and improve ex ante quantification of post-shock social protection financing needs to facilitate improved pre-positioning of resources. Improve the use of social registry systems for faster provision of post-shock support by increasing coverage and updates to the DTKS with links to early warning systems, necessary data for post-shock delivery, and providing improved registry access to humanitarian agencies during shocks.

A.4. Social assistance programs are not yet fully harnessed to build resilience

URGENCY
CLIMATE
DEVELOPMENT

Build resilience among households through social programs. Existing social programs provide support but do less to improve preparedness for climate shocks and adaptive capacity of households. This can be addressed by: (i) providing education and information about climate-related disaster preparedness; (ii) ensuring programs have climate-informed designs (for example, disaster-resilient and energy-efficient housing social assistance); and (iii) improving cross-sectoral cross-links to other social programs that build complementary aspects of resilience (for example, livelihood diversification programs and green jobs; support for climate-smart agriculture; and climate-resilient housing for social protection beneficiaries).

A.5. Disaster response is not yet fully sensitized to gender and inclusion of vulnerable groups

URGENCY
CLIMATE
DEVELOPMENT

Improve DRM processes to address the needs of diverse and vulnerable groups. Develop targeted mitigation and preparedness initiatives for people of all ages, abilities, and genders; and ensure inclusive response and recovery programs. This could be achieved by: (i) improving information sharing on affected households with vulnerable categories; (ii) direct targeting of DRM programs to women and people with disability; (iii) ensuring that temporary shelters and reconstructed infrastructure and buildings include universal accessibility and safety measures to prevent gender-based violence; (iv) increasing the representation of women, people with disability, and other vulnerable groups to make decisions on DRM programs; and (v) increasing gender-specific research (including sex-disaggregated data collection) in sectors prone to climate change.

A.6. Cities are increasingly vulnerable to water- and heat-related threats

URGENCY
CLIMATE
DEVELOPMENT

Invest in city-level infrastructure for urban flood resilience and livability. Integrated green infrastructure and water-sensitive urban designs can reduce flood risks and produce co-benefits for urban livability. Investments could include integrated water storage infrastructure for rainwater capture and flood control at strategic locations and 'blue-green' urban infrastructure such as street trees, parks, and urban water bodies to reduce heat stress. Some steps to implement this vision include: (i) establish the foundations for the proposed National Urban Flood Resilience Program with a set of pilot cities; (ii) generate a knowledge exchange platform for capacity building on urban flood resilience for cities; and (iii) identify risk-financing mechanisms for local government for implementing multi-year flood-resilient city plans.

A.7. Early warning services are fragmented and need a coordinated and impact-based approach

URGENCY
CLIMATE
DEVELOPMENT

Further invest in an integrated and people-oriented multi-hazard early warning system. Indonesia's early warning services remain fragmented with multiple agencies responsible for upstream hazard monitoring and downstream warning dissemination to stakeholders. Further coordinated investments in integrating early warning monitoring and dissemination platforms; instrumentation, equipment, and decision support systems; and capacity building for impact-based warnings (that provide clear advice on early actions) is needed. Short-term actions toward this goal include: (i) conducting a user needs study to inform weather warning services improvements; and (ii) developing a roadmap for impact-based hydrometeorological warning services.

A.8. Climate impacts on agriculture vary greatly by location

URGENCY

CLIMATE

DEVELOPMENT

Deliver site-specific CSA intervention packages based on local vulnerabilities. Climate impacts on agriculture vary greatly by location. Tailored packages could comprise: (i) advisory services (for example, expanded coverage of KATAM Integrated Crop Calendar, climate information and early-warning services developed by BMKG, closer linkages between agriculture extension and Climate Field Schools run by BMKG); (ii) advice on improved use of inputs (for example, site-specific nutrient management, balanced fertilization, and use of locally adapted drought-/flood-tolerant crop varieties); (iii) climate-resilient infrastructure (for example, investments in dams to complement water-saving tertiary irrigation, post-harvest infrastructure to minimize food losses); and (iv) enabling environment measures (for example, strengthened capacities of subnational governments and agricultural extension workers to formulate local CSA intervention packages, and expanded use of KUR to finance smallholder investments). Measures can leverage the private sector in developing and disseminating CSA technologies, training farmers and extension workers, and co-financing CSA infrastructure).

A.9. Climate challenges will necessitate strengthening of the health system

URGENCY

CLIMATE

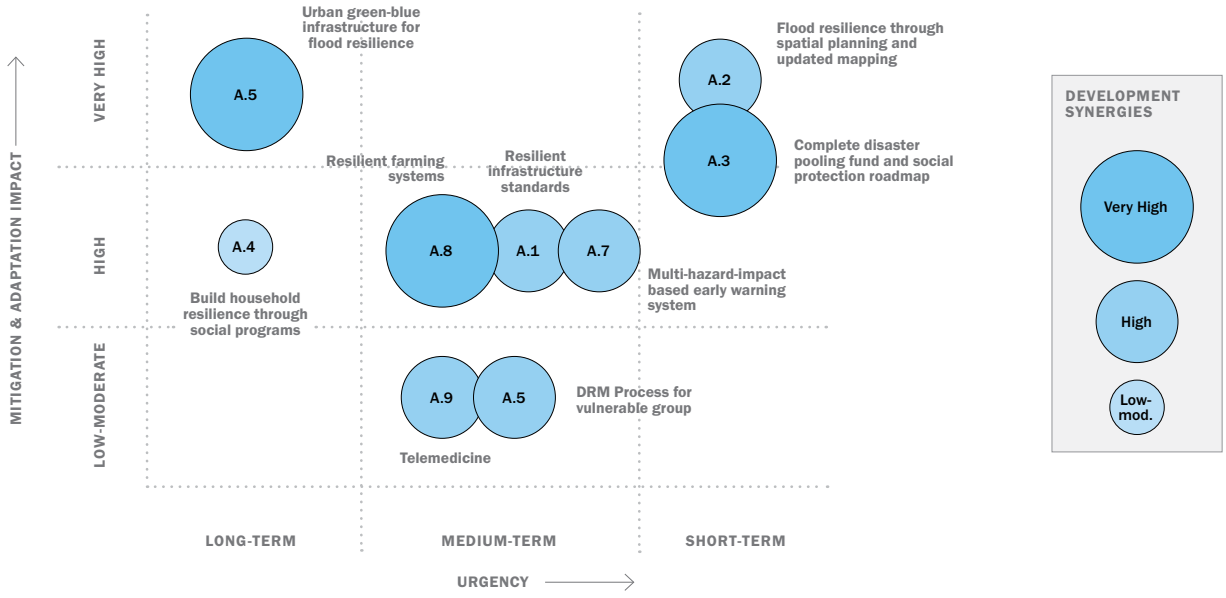
DEVELOPMENT

Leverage technology including telemedicine to strengthen the health system in the face of climate challenges. Better leveraging of technology including telemedicine can improve the availability, accessibility, and quality of health services and help people adapt to climate-sensitive diseases and shocks such as heat stroke, heat exhaustion, and typhoid or cholera (from increased flooding). It can also help maintain access to support in case of more extreme disasters and events disrupting the availability of physical health centers and in rural and remote areas that face personnel shortages. Several actions will enable increased use of telemedicine: (i) a standardized regulatory framework for the public and private sector; (ii) a focus on data privacy and clear flows of data; (iii) clear communication for improved public trust and knowledge; and (iv) continued efforts to increase households' internet penetration rate.

Adaptation measures could focus on completion of disaster financing and social protection measures as short-term priorities, while commencing planning for longer-term urban infrastructure investments (Figure 78). While steps toward resilience investments are needed in the short term, such as further investments in the disaster pooling fund and social protection systems, and strengthened spatial planning to avoid locking in vulnerabilities, a longer-term horizon is expected for physical urban investments given their capital requirements. Medium-term priorities could focus on supporting farmers with site-specific extension programs, financing, and technology for higher and more drought-resistant yields; development of improved warning systems (impact-based forecasting); while strengthening the built infrastructure that will be required to support growth over future decades.

FIGURE 78

Timeframe and Expected Impact of Adaptation Measures



Source: WBG staff assessment.

Note: Actions assessed as most urgent, with the greatest climate impacts, are to the top right; those with greatest development co-benefits are represented by larger/darker circles. Short-term priorities are those envisaged prior to 2025, medium term prior to 2030, and long term after 2030.

ENABLERS

Enabling Policies & Institutions

A | FISCAL MEASURES

Fiscal policy reforms can help create price signals that promote a low-carbon transition and raise revenues for mitigation and adaptation investments. Although subsidy spending on energy consumption has declined in recent decades, it continues to provide significant support for the use of fossil fuels in the economy. These inefficient and poorly targeted electricity and transport fuel subsidies are inconsistent with the low-carbon transition. In addition, the coverage of fossil fuel taxes is limited, while in some instances fiscal instruments within the same sector have countervailing effects on the incentives for emissions. Fossil fuel taxes can raise revenue for climate expenditures, which are below mitigation and adaptation needs, and not yet fully aligned with NDC objectives. Specific issues and measures include:

E.1. Fuel subsidies are regressive, distort carbon price signals, and weigh on the budget

URGENCY

CLIMATE

DEVELOPMENT

Develop a roadmap to complete transport fuel subsidy reforms. Fuel subsidies are regressive, distort carbon price signals, and weigh on the budget. Rising global oil prices make it politically difficult to eliminate fuel subsidies in the short-term, however, planning for reform could begin now in anticipation of more favorable medium-term conditions. Reform planning would include redistribution mechanisms to offset impacts on the poorest. World Bank analysis suggests that removing subsidies in isolation could increase the poverty rate by 0.4 percentage points, but fiscal savings (from reduced fuel and electricity subsidies) can be used to offset impacts on households with net fiscal savings of 0.3 percent of GDP.

E.2. Some households receiving electricity subsidies are not poor

URGENCY
CLIMATE
DEVELOPMENT

Convert the electricity price subsidy (PLN's PSO) into targeted cash transfers for eligible households. This would allow the charging of tariffs that cover generation costs while using cash transfers to compensate the poor and vulnerable for price rises. This may require updates to the DTKS (see recommendation A.3.), to ensure sufficient information for targeting, managing, and monitoring cash transfers.

E.3. Tax policy inadequately shaping incentives for GHG emissions

URGENCY
CLIMATE
DEVELOPMENT

Review the inventory of tax measures to better align fiscal policy with low-carbon objectives. The review could consider: (i) opportunities to introduce an excise on fossil fuels after eliminating existing subsidies and introducing compensatory measures for the poor; (ii) removing tax incentives for carbon-intensive sectors; and (iii) eliminating conflicting effects of tax policy on emissions within high-emission sectors. This would be aligned with Presidential Regulation No. 98/2021 on the economic value of carbon.

B | CARBON-PRICING REFORMS

Fiscal reforms could include extension of Indonesia's important carbon-pricing reforms that were adopted by the authorities in 2021.[83] *The authorities first introduced carbon pricing through a voluntary ETS in the power sector. This is slated for extension to other sectors from 2024. Any emissions above predetermined caps would be subject to the new carbon tax or will need to be offset through trading of allowances. This is an important step forward for Indonesia. As is common with the introduction of new tax instruments, implementation challenges are likely to arise, including from the interaction of different carbon-pricing instruments (tax, ETS, and offsets).*

E.4. Carbon-pricing instruments have complex interaction effects

URGENCY
CLIMATE
DEVELOPMENT

Develop an integrated roadmap for carbon pricing. Develop a roadmap for expanded carbon pricing based on a review of the impact, cost, and feasibility of alternative instruments for sectors beyond 2024. Ensure alignment across different carbon-pricing instruments (ETS, carbon tax, and potential offsetting schemes). Estimate baselines disaggregated by subsector and projected annual emissions. Explore options to trade carbon credits internationally.

C | THE FINANCIAL SYSTEM

The financial system is critical to Indonesia's climate transition; addressing two challenges will help it do so: (i) strengthening the management of climate- and environment-related financial risks; and (ii) mobilizing savings for climate mitigation and adaptation investments. Specific measures include:

83 Presidential Regulation No. 98/2021 provides the legal umbrella to introduce a price on carbon through carbon trading (cap-and-trade and carbon offsets mechanisms), performance-based payments and carbon tax/levies. The Tax Harmonization Law (2021) mandates the introduction of a carbon tax. The taxes' introduction was on hold at time of writing.

E.5. Financial system lacks comprehensive approach to climate risk management

URGENCY
CLIMATE
DEVELOPMENT

Develop a comprehensive strategy for climate-risk assessment. Building on the recent progress on regulations and roadmaps for sustainable finance, a climate risk assessment strategy could include how authorities (for example, Bank Indonesia and OJK) plan to: (i) integrate climate risks in their supervisory frameworks; (ii) address climate risks within their internal organization and governance structure (for example, dedicated units to manage climate risks); and (iii) allocate the needed resources and expertise to address climate risks, including through outreach and capacity-building to key financial institutions.

E.6. Banks do not have detailed policies and procedures for managing climate risks

URGENCY
CLIMATE
DEVELOPMENT

Develop further guidance on risk management approaches and disclosure requirements for banks. OJK could draw on the Basel Committee on Banking Supervision's principles for climate-risk management (Bank for International Settlements 2021). Guidance would include stress testing and scenario analysis methodologies, risk identification and management approaches, and procedures for disclosure of climate risks.

E.7. Lack of detailed assessment of climate financing gaps and options to fill them

URGENCY
CLIMATE
DEVELOPMENT

Develop a further climate finance strategy focused on Indonesia's climate finance needs and opportunities. This strategy would build on the Sustainable Finance Roadmap in that it would specifically: (i) estimate the current and projected financing gap to meet the country's climate mitigation and adaptation targets; (ii) determine the priority sectors requiring climate investments; and (iii) explore potential sources of finance for priority sectors, including regulatory reforms that would encourage private sector financing.

E.8. There are limited incentives to scale up the corporate green bond market

URGENCY
CLIMATE
DEVELOPMENT

Incentivize the use of green bonds through diverse channels. This could include: (i) aggregation and securitization so that green bonds can reach the size that investors are demanding. For example, OJK could develop standardized contract templates and procedures to create consistency and simplicity in the bond issuance process; and (ii) reduce listing requirements for labeled bonds and support new and existing issuers to bring these bonds to the market.

E.9. Lack of macroprudential incentives could be hampering growth of green loans market

URGENCY
CLIMATE
DEVELOPMENT

Develop further guidance and incentives to stimulate green loans. In 2019, Bank Indonesia issued a regulation on loan-to-valuation (LTV) for green mortgages to support green building development (Iswara 2019). This regulation enables a five percent increase in the maximum LTV for green development (to 90 percent), thereby lowering the down payment paid by borrowers. In addition to the incentive framework already introduced by Bank Indonesia, there are a range of other incentive mechanisms that authorities could consider for encouraging the uptake or de-risking of these loan products–such as guarantees, subsidies, data provision, and aggregation.

Financial system reform will help encourage private sector participation in climate investments; this would be well complemented by investment climate and regulatory reforms. Private sector participation in green infrastructure is partially crowded out by SoEs which are buffered by fiscal support. Nevertheless, SoEs cannot fully deliver on climate investments themselves because investment needs are too large and SoE balance sheets are too fragile to carry the load. Continued improvements in climate and regulatory reforms will help ensure private sector participation in the transition. Specific measures include:

E.10. Lack of level playing field created by SoE dominance

URGENCY
CLIMATE
DEVELOPMENT

Reform SoEs to create new opportunities for private investment in green infrastructure. This could include: (i) reform of SoE incentives and key performance indicators by MSoE to encourage SoEs to mobilize private capital and improve efficiency; (ii) joint venture agreements that include revenue-sharing arrangements and international standards regarding corporate governance; and (iii) competitive bidding on financially viable projects, both new and asset monetization projects.

E.11. Private sector participation in green infrastructure is limited

URGENCY
CLIMATE
DEVELOPMENT

Reform PPP project selection, preparation, agreement, and concession procedures. PPP reform could help enable SoEs to partner with private and foreign companies, unlocking private capital and expanding access to the latest renewable energy technology.

E.12. Inefficient use of state assets creates lost opportunities for accelerating green investments

URGENCY
CLIMATE
DEVELOPMENT

Develop an asset monetization strategy to promote private sector participation in SoE assets. This would build on SoE reforms underway that aim to help: (i) increase private sector involvement in improving SoE governance and performance; (ii) enhance operational autonomy from the government; and (iii) leverage the value of SoEs' operating assets to attract private investors through partial monetization of those assets.

E.13. Inadequate legal framework around Cooperation Projects deters private green infrastructure investment

URGENCY
CLIMATE
DEVELOPMENT

Consolidate the regulatory framework governing Cooperation Projects. Review sector-specific regulations on private sector participation and eliminate inconsistencies with regulations for Cooperation Projects where possible. To help streamline and avoid frequent changes, a consultation process could be followed for any amendments of regulations affecting Cooperation Projects, with private sector input.

E.14. Underdeveloped investment instruments prevent foreign participation

URGENCY
CLIMATE
DEVELOPMENT

Unbundle investment risks and connect markets by developing foreign currency and interest rate hedging instruments and introducing products where foreign and domestic investors can co-invest. At the same time, securities issuances in the global market, particularly by Indonesian infrastructure projects or entities, could be encouraged and facilitated to mobilize funds from foreign investors. MoF could further leverage the current momentum on Komodo bonds (including green and sustainable Komodo bonds) and further develop the market by extending the bond terms beyond five years, possibly with credit enhancements from reputable international entities.

E | TRADE POLICY

Adjustments to trade policies could be used to support Indonesia's decarbonization objectives. Indonesia has low average tariff rates on imports of green goods and technologies (below rates for non-green goods), however, NTMs add costs to green goods that exceed tariff costs. While many represent important standards that should be maintained, there may be opportunities for streamlining these barriers. There may also be scope for integrating environmental provisions in Indonesia's trade agreements and for Indonesia to more fully participate in policy initiatives on green trade.

E.15. Low average tariffs hide tariff peaks for green products

URGENCY
CLIMATE
DEVELOPMENT

Liberalize remaining tariffs on imports of green goods, including through multilateral participation. While average tariffs are encouragingly low, there are a few remaining tariff peaks for green goods. Reducing import tariffs will reduce key goods' prices and boost access to lower-cost and more energy-efficient technologies. This may be particularly important for industries that must comply with climate change mitigation policies.

E.16. NTMs add significant costs to imports

URGENCY
CLIMATE
DEVELOPMENT

Review and streamline NTMs on green goods. Some NTMs could be simplified such as import approvals and compliance with SNI. Some NTMs could be considered for removal entirely, such as PSIs and port of entry restrictions. Over time, some NTMs could be phased out as a robust national single window and integrated risk management system is developed.

E.17. Many national standards are not aligned with international product standards

URGENCY
CLIMATE
DEVELOPMENT

Harmonize existing local standards with international ones and develop new standards that are aligned with international standards and practices. Firms trading in green goods reported a lack of harmonization with international standards as a key challenge. Misalignment imposes costs on exporters and increases the time required to bring green goods to market. Working toward a harmonization of product standards across markets could encourage imports of green goods and boost Indonesian exports in new markets with comparable standards.

E.18. LCRs are prohibited under WTO law

URGENCY
CLIMATE
DEVELOPMENT

Reduce the stringency of LCRs until demand can sustain local economies of scale. High LCRs prior to establishment of market demand large enough to support domestic manufacturing economies of scale may prevent industry development, increase prices, and prevent international technology transfer. Allowing the market to first develop, such that domestic production can support the economies of scale required to keep prices affordable, may be more effective.

E.19. Lack of participation in green trade initiatives limits ability to shape policy

URGENCY
CLIMATE
DEVELOPMENT

Look for opportunities to include enforceable environmental provisions in trade agreements and participate in plurilateral and multilateral trade policy initiatives on green goods. Environmental provisions and commitments are likely to become more detailed in terms of scope and ambition. Direct participation in multilateral and plurilateral environment-related trade policy initiatives would allow Indonesian exporters to benefit from improved market access in destination markets, while also giving Indonesia a seat at the table to shape the content and course of discussions.

F | FIRM AND WORKER-LEVEL MEASURES

The private sector is affected by climate change and will be integral to the low-carbon and resilient transitions. Challenges include: (i) the need to align incentives for climate-sensitive private sector-led growth; and (ii) the need to support the entry of new sustainable firms and ensure competitive pressure on existing firms (including reducing SoEs' footprint in competitive sectors). The workforce is also integral to the low-carbon transition and long-term growth. It needs to be synchronized with changes triggered by firms. Key issues and measures include:

E.20. FDI in renewables is insufficient

URGENCY
CLIMATE
DEVELOPMENT

Facilitate entry of foreign investors in renewable energy through the upcoming Job Creation Law's (11/2021) Presidential Regulation on Green Investments. FDI in renewables will be important for Indonesia's low-carbon transition. This could be assisted by planning and prioritization with targeted performance-based incentives, lowering LCRs in renewables (see recommendation E.19.), developing domestic suppliers' capacity, and greening the energy mix.

E.21. Industrial Estates offer opportunities for improved efficiencies and resilience

URGENCY
CLIMATE
DEVELOPMENT

Develop an EIP roadmap and program through the Smart Eco-Industrial Park initiative, including a model EIP to serve as a benchmark. EIPs have the potential to help reduce emissions and improve the competitiveness and resilience of industry. An EIP roadmap could help by: (i) assessing the cost of green industrial infrastructure upgrades needed to lower carbon intensity and improve the resilience of firms in priority industrial estates; and (ii) strengthening industrial estates' preparedness and resilience by conducting vulnerability mapping and physical risks (floods) to green industrial infrastructure and firms and jobs.

E.22. Circular Economy (CE) solutions require support

URGENCY
CLIMATE
DEVELOPMENT

Implement circular business and low-carbon growth measures as per Bappenas' LCDI. Develop action plans to promote circular business and low-carbon growth models specifically in the government's five priority sectors: construction, food processing, electronics, textiles, and plastics. A strengthened policy framework to support a circular economy could include incentives for circular economy development; circular economy standards (end-of-waste criteria, green label products, and waste classification), and finance public good investments in shared infrastructure.

E.23. There is a need to align business support with climate objectives

URGENCY
CLIMATE
DEVELOPMENT

Finalize the efficiency and effectiveness review of business support programs. Approximately US$1.15 billion is spent annually across 146 business support programs. The review could consider options for targeting this support to assist firms vulnerable to higher carbon prices, and for those whose productivity is affected by climate change. The CCDR's firm survey highlighted three priority areas of support: (i) training and capacity building related to environmentally friendly technology (80 percent); (ii) access to green financing schemes (40 percent); and (iii) connections to green technology providers (32 percent).

E.24. There is emerging demand for green skills but low supply of green skills

URGENCY
CLIMATE
DEVELOPMENT

Continue modernizing the skills development system to respond to changes in labor demand. The skills development system requires frequently updated labor market information to support updates to curriculums. Changes would be served well by partnerships between technical and vocational training institutes and universities and the private sector. The Ministry of Manpower has started this reform and is committed to deepening it in the coming years. For the public sector, climate change subjects could be included in the civil service's DIKLATPIM (National Leadership Training) I, II, III, and IV to ensure that government leaders and managers understand strategic climate-transition issues.

E.25. Lack of education on adaptation and mitigation reduces climate change awareness

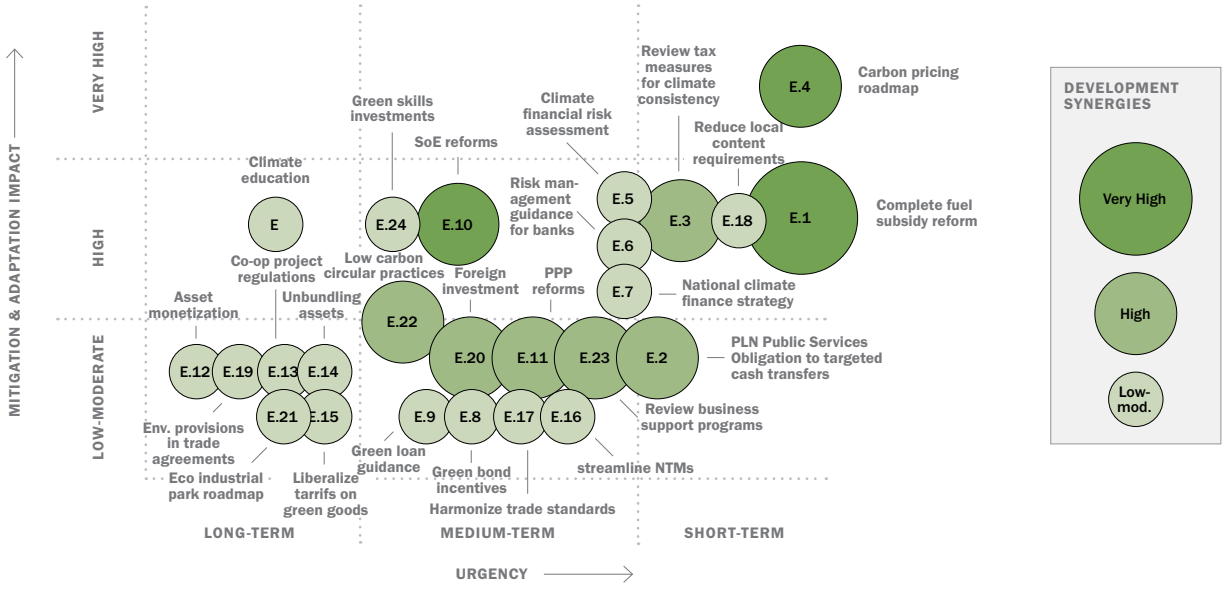
URGENCY
CLIMATE
DEVELOPMENT

Introduce climate change education in schools. While green jobs are likely to rely heavily on transversal skills (reading, writing, math, problem solving, management, social and digital) and technical skills, climate change education can help young Indonesians understand risk, uncertainty, and rapid change. Climate change education helps nurture students' behavior toward ecology consciousness and pro-environmental actions. It also helps to build citizens' capacity to adapt to natural disaster events, in addition to changing their behavior and beliefs needed to make informed decisions in a dynamic context.

Measures to improve enabling conditions could focus on fiscal and financial measures in the short term, including setting out a roadmap for carbon pricing (Figure 79). Short-term measures will help to align tax incentives with climate goals and improve economic efficiency (for example, through incremental subsidy reform). Planning for carbon pricing will help inform the private sector's medium- and long-term investment decisions. Medium-term actions that improve the business environment are expected to have important development benefits, including continued improvements to the skills development system, harmonization of trade standards for green goods, and electricity tariff reform.

FIGURE 79

Timeframe and Expected Impact of Enabling Condition Measures



Source: WBG staff assessment.

Note: Actions assessed as most urgent, with the greatest climate impacts, are to the top right; those with greatest development co-benefits are represented by larger/darker circles. Short-term priorities are those envisaged prior to 2025, medium-term prior to 2030, and long-term after 2030.

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