Chapter 3

Nationally Determined Contributions of EAS

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Chapter 3

Nationally Determined Contributions of EAS Countries

This chapter reviews the Nationally Intended Contributions (NDC) of countries to the Conference of Parties (COP 21). It shows how countries lay out targets or programmes aimed at reducing carbon dioxide (CO_2) emissions. Some countries have clear policies and targets while some have none. Thus, it is very important for countries to lay out their road maps on how to concretely contribute to COP 21 through clear actions and programmes with timeframe.

Finally, this chapter serves as an exercise for the working group to improve its national data by practising intellectual scenarios of keeping CO_2 emissions at the 2013 level until 2040 and reviewing their countries' NDC commitments. This will improve the capacity of national experts on the energy outlook.

3A. Review of Nationally Determined Contributions of Australia

Australia submitted its Intended Nationally Determined Contributions (INDC) in August 2015, which later became Australia's first Nationally Determined Contributions (NDC). Australia's NDC includes a target of reducing greenhouse gas (GHG) emissions by 26%–28% against the 2005 level by 2030. It represents a progression beyond the 2020 target of reducing emissions by 5% below 2000 levels, or a reduction of 13% below 2005 levels. Australia's NDC target is nearly double the rate of emissions reduction target in 2020. Compared to the amount of emissions in 2005, this NDC target is equivalent to 50%–52% of emissions reduction per capita and to 64%–65% per unit of gross domestic product (GDP) by 2030. This ambitious target would mean significant emissions reduction per capita and per GDP unit. Having this background in mind, Australia's NDC clearly demonstrates an ambitious commitment to mitigate future emissions. The mitigation target set out in NDC incorporates national circumstances, such as economic and population growth, current energy infrastructure, high abatement costs, and the country's position as global resource provider (UNFCCC, 2015). Table 3A.1 presents the scope and coverage of Australia's NDC.

Table 3A.1. Scope and Coverage of Australia's NDC

Target	Emissions reduction of 26%–28% by 2030 against the 2005 level
Target type	Absolute economy-wide emissions reduction
Gases covered	Carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF_6), nitrogen trifluoride (NF_3)
Sectors covered	Energy; industrial processes and product use; agriculture; land-use, land-use change, and forestry; waste
Base year emissions covered	100% of GHG emissions and removals in the national GHG inventory

GHG = greenhouse gas, NDC = Nationally Determined Contributions.
Source: United Nations Framework Convention on Climate Change (2015).

Prior to Australia's submission of its NDC in 2015, attempts to mitigate GHG emissions have been pursued since 1992 when Australia signed the Rio Declaration on Environment and Development (Agenda 21). In 1997, the government signed the Kyoto Protocol even if its ratification is not in country's national economic interest, particularly for investment and industrial development. Despite this, Australia ratified the Kyoto Protocol in 2007, demonstrating its commitment to tackling climate change. In the first commitment period (2008–2012), the target was to limit emissions increase (excluding land use, land-use change, and forestry [LULUCF]) to 8% above the 1990 levels. In the second commitment period (2013–2020), Australia has committed to 5% reduction of GHG emissions below 2000 levels. Under the Copenhagen Accord (2010), Australia's pledge includes a reduction of 25% below 2000 levels depending on the commitments of other countries. However, since the Copenhagen Accord lacks compliance provisions, this pledge is not legally binding. Finally, Australia

ratified, in November 2016, the Paris Agreement formalizing its commitment to climate change mitigation efforts.

Australia's total GHG emissions (including LULUCF) were estimated to be 565 metric tonnes of carbon dioxide equivalent ($MtCO_2e$) in 1990 and remained lower than 600 $MtCO_2e$ until 2004. In 2006, the country's emissions started to increase and peaked at 613 $MtCO_2e$. This amount was a 9% increase against the 1990 level. However, total emissions have steadily declined thereafter as a result of government policies and energy efficiency measures. The country's emissions were lowest during the implementation of carbon pricing scheme introduced in 2011 and came into effect the following year (Wijesekere and Syed, 2017).

Despite its small contribution to the global GHG emissions (about 1.5%), Australia's per capita emissions rank the highest among OECD countries as well as globally. Such high amount is largely due to high emissions intensity for energy use as a result of the country's reliance on coal for electricity. Emissions from the transport sector in Australia are similar to those of other developed countries (Garnaut, 2008). In addition to that, export income in Australia is mainly derived from energy-intensive products (Wijesekere and Syed, 2016).

Recognising the urgent need to systematically address the climate change challenges, the Australian government formulated a set of policies to create an enabling environment while at the same time supplementing the ongoing actions at national or state levels. The central policy for emissions reduction in Australia is the direct action plan whereby Emissions Reduction Fund become the central component. The fund implements a long-term framework that provides incentives to adopt technologies to further improve productivity or energy efficiency. This programme has three elements: crediting emissions reductions, purchasing emissions reductions, and safeguarding emissions reductions (Commonwealth of Australia, 2014). A safeguard mechanism is currently being finalised to guarantee that emissions reductions bought under this scheme are not offset by increased emissions elsewhere in the economy. Furthermore, this programme is expected to reduce the country's GHG emissions by 5% by 2020 (against the 2000 level). The first auction (April 2015) successfully bought over 47 million tonnes of abatement at an average rate of AU$13.95 (UNFCCC, 2015). The first three auctions generated AU$194 million for land sector income as reported by the Australian Farm Institute in 2016. Revenue from projects is being reinvested to improve farms and help indigenous communities secure their land (Commonwealth of Australia, 2014).

The key component of future energy policy in Australia is the Energy White Paper 2015. The document lays out the priority for energy market reforms to encourage reliable supply and competitive energy prices for households and businesses. The paper provides policies that encourage investments in new energy sources and technologies through the right market settings. It is expected that the policy directions and future decision-making would give certainty for industry and consumers. Australia has also introduced the Renewable Energy Target (RET) as an additional policy measure. The desire to promote deployment of renewable energy as substitute for fossil fuels is one reason for having this scheme. Aligned with the Energy White Paper 2015, the RET scheme includes actions to encourage investments in renewable energy, provide certainty to industry, and improve the market condition. Under RET, the government sets to have over 23% (33,000 gigawatts [GW]) of electricity sourced from renewables by 2020. RET is operated in two different scales: the small-scale renewable energy scheme (SRES) and the large-scale renewable energy target (LRET). The former provides financial incentives to install small-scale renewable energy system in households, small businesses, or communities. The

large-scale renewable target, on the other hand, provides financial incentives to establish or expand renewable energy power stations such as solar farms and wind or hydroelectric power stations (Commonwealth of Australia, 2015).

To complement policy measures, the Australian government is developing post-2020 mitigation commitments that target improved energy productivity around 40% between 2015 and 2030. In addition, the government will start the formulation of post-2020 emissions reduction policies that are appropriately calibrated towards achieving the 2030 target (UNFCCC, 2015).

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3B.Review of Nationally Determined Contributions of Brunei Darussalam

In November 2015, Brunei Darussalam submitted its Intended Nationally Determined Contributions (INDC) to the United Nations Framework Convention on Climate Change, reaffirming its commitment to combat future climate change and limit global warming to 2°C above the pre-industrial levels. Brunei Darussalam's INDC concerns are primarily on the energy sector, the largest sector contributing to the country's economic growth and greenhouse gas (GHG) emissions. Although much emphasis is given to the energy sector, Brunei Darussalam's INDC considers emissions reduction from other sectors as equally important. The INDC pledge is focused on GHG mitigation from transportation, forestry, and other sectors that are anticipated to generate significant mitigation impacts in the near future. Under the INDC framework, Brunei Darussalam targets to reduce its total energy consumption by 63% by 2035 against the Business as Usual (BAU) scenario. Furthermore, the country aims to achieve a 10% total share of renewable energy in the power generation by 2035. With regards to the transport sector, the target is to reduce carbon dioxide (CO_2) emissions from morning peak-hour vehicle use by 40% by 2035 compared to the BAU scenario. Another target in the INDC is to enhance the stocks of carbon sinks by increasing the total forest reserves from the present 41%–55% of the country's total area.

The estimated total emissions in Brunei Darussalam represent a small fraction relative to the global emissions, which accounts for only 0.016% of the global emissions in 2010. According to the Initial National Communication draft, Brunei Darussalam's GHG emissions in 2010 were estimated to be 10.02 metric tonnes of carbon dioxide equivalent ($MtCO_2e$) with the net GHG of 7.40 $MtCO_2e$. At the same time, land-use change and forestry contributed 2.63 $MtCO_2e$ of emissions.

Brunei Darussalam's GHG profile is long dominated by emissions from the energy sector, where electricity generation is the largest source of emissions. At present, natural gas represents 99% of Brunei Darussalam's electricity mix, largely generated from open cycle power plants. By 2020, it is estimated that emissions generated from these plants will be around 4.18 $MtCO_2e$. Another considerable source of emissions is the production of oil and gas for both domestic and international markets. As presented in Table 3B.1, emissions from oil and gas production reached 3.31 $MtCO_2e$ in 2010. Apart from that, Brunei Darussalam's emissions also come from direct combustion of fossil fuels in end-use sectors such as transport, industry, and residential sectors. Other emissions sources are considered small compared to the emissions from the energy sector.

Table 3B.1. Estimated Emissions in Brunei Darussalam, 2010

Emissions source	Emissions ($MtCO_2e$)
- Energy production (including oil and gas production for domestic and export markets)	3.31
- Fuel consumption in transport	1.17
- Industrial energy consumption	0.45
- Combustion from residential and other sectors	Below 0.39
- Waste management, agriculture, and industrial processes	Below 0.53

$MtCO_2e$ = metric tonne of carbon dioxide equivalent.
Source: United Nations Framework Convention on Climate Change (2015).

The energy sector is a central element of Brunei Darussalam's economy as it holds a significant share to its gross domestic product (over 60%). The energy sector generates benefits through revenues from oil and gas extraction, refining, and export. Being highly reliant on the oil and gas sector, the government has recognised the need to promote sustainability within the current economy, particularly in the energy sector. The overarching goals include achieving energy security, supply diversification, and energy efficiency and conservation. To this end, the government has introduced the Energy White Paper in 2014. The paper sets out policy framework which will deliver concerted efforts to diversify the energy mix by promoting the use of renewable and alternative energy sources for power generation.

In its INDC pledge, Brunei Darussalam intends to reduce its total energy consumption by 63% by 2035 relative to the BAU scenario. As of 2013, the country was able to reduce energy consumption by 13.9%. To achieve greater reduction in energy consumption, the government has formulated policies and actions in several areas as outlined in Table 3B.2. Apart from actions on the energy sector, the government has developed guidelines requiring all buildings, including industrial, commercial, and housing, and government buildings, to maintain at least 10% of the land for green area.

The government acknowledges the critical importance of promoting the growth of other sectors, in addition to the energy sector, to balance the economy. With this aspiration, the government is working with the hydrocarbon industry to limit its direct impacts and maximise its environmental benefits. The hydrocarbon industry is perceived as one of the major sources of GHG emissions. Under this mechanism, the industry provides funding for forestry projects such as forestry protection initiatives, increasing tree plantations for carbon sequestration, and campaign for raising awareness. At the same time, the government also actively promotes integrated approaches with other departments. For example, it provides top-down approaches in many facets of the economy that are further bolstered by bottom-up support for activities at the community level like raising awareness about climate change.

Table 3B.2. Policies and Actions in the Energy Sector, Brunei Darussalam

Mitigation Measures	Implementation Strategies
Energy intensity reduction across all sectors Target: reduction in energy intensity by 45% against 2005 level	- Energy efficiency and conservation (until 2035): 1. Electricity tariff reform 2. Energy efficiency and conservation building guidelines for non-residential sector 3. Standards and energy labelling for products and appliances 4. Energy management policy 5. Fuel economy regulation 6. Financial incentives 7. Awareness rising - Project-based energy efficiency measures: 1. Increase the use of energy-efficient streetlights 2. Replace existing high-pressure sodium vapour street lighting to increase the standards nationwide
Increase the share of renewable energy in power generation Target: 10% of total power is from renewable energy by 2035	- Increase the use of solar power - Utilise the 10–15 MW potential of waste to energy resource
Emissions reduction from land transport Target: 40% reduction in the morning peak hour CO_2 emissions against BAU in 2035	

BAU = Business as Usual, CO_2 = carbon dioxide, MW = megawatt.
Source: United Nations Framework Convention on Climate Change (2015).

The Brunei Vision 2035, known as 'Wawasan Brunei 2035', highlights the importance of the environment to support future development. The document lists strategies aimed to minimise environmental pollution, mitigate the deterioration of natural ecosystem, and maintain biodiversity.

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3C.Review of Nationally Determined Contributions of Cambodia

Introduction

Cambodia respects the principles of the United Nations Framework Convention on Climate Change, particularly that of 'common but differentiated responsibilities and respective capabilities' along with the right to the sustainable development of developing countries.

Cambodia presented its Intended Nationally Determined Contributions (INDC) to the convention in December 2015, ahead of the Conference of Parties or COP 21 in Paris. The INDC is subject to revisions to meet national circumstances as the country continues along its development pathway.

As Cambodia is a low emitter of greenhouse gases (GHG) and highly vulnerable to the negative effects of climate change, its contributions are therefore necessarily aligned with its development priorities. The country's INDC includes both adaptation and mitigation actions based on national circumstances. It is composed of five sections:

- National context, presenting national circumstances relevant to INDC;
- Adaptation, covering Cambodia's vulnerability to climate change and prioritised adaptation actions;
- Mitigation, including Cambodia's intended contributions to reduce GHG emissions, with information to ensure clarity, transparency, and understanding, and consideration of fairness and ambition;
- Planning and implementation processes, with indications of the institutions, policies, strategies, and plans that will support the implementation of INDC; and
- Means of implementation, with information on the support needed for the implementation of INDC.

Adaptation

Adapting to current and future effects of climate change is a priority for Cambodia. The country firmly believes that climate change adaptation actions require an integrated, multi-sectoral approach to be effective and to be able to support national development objectives. Cambodia has therefore selected the following priority actions, giving prominence to ones with climate change impact mitigation co-benefits:

- Promoting and improving the adaptive capacity of communities, especially through community-based adaptation actions, and restoring the natural ecology system to respond to climate change;
- Promoting climate resilience through improved food, water, and energy security;

- Promoting low-carbon planning and technologies to support sustainable development;
- Improving capacities, knowledge, and awareness for climate change responses;
- Strengthening institutions and coordination frameworks for national climate change responses; and
- Strengthening collaboration and active participation in regional and global climate change processes.

Mitigation

Cambodia proposes a GHG-mitigation contribution for the period 2020–2030, conditional upon the availability of support from the international community, particularly in accordance with Article 4.3 of the United Nations Framework Convention on Climate Change. Significantly, despite Cambodia's status as a least developed country, it is implementing actions in accordance with its sustainable development needs that also address climate change as shown in Table 3C.1.

(i) **Energy industries, manufacturing industries, transport, and other sectors**: Cambodia intends to undertake actions as listed in Table 1, the impact of which is expected to be a maximum reduction of 3,100 gigatonnes of carbon dioxide equivalent ($GgCO^2eq$) compared to the baseline emissions of 11,600 Gg CO_2eq by 2030.

Table 3C.1. Mitigation Actions in Key Sectors – Aggregate Reductions by 2030

Sector	Priority Actions	Reduction as Gg CO_2e and % in 2030 compared to the baseline.
Energy Industry	National grid-connected renewable energy generation (solar energy, hydropower, biomass, and biogas) and connecting decentralised renewable generation to the grid. Off-grid electricity such as solar home systems, hydropower (pico, mini, and micro). Promoting energy efficiency by end users.	1,800 (16%)
Manufacturing Industry	Promoting use of renewable energy and adopting energy efficiency for garment factories, rice mills, and brick kilns.	727 (7%)
Transport	Promoting mass public transport. Improving operation and maintenance of vehicles through motor vehicle inspection and eco-driving, and increased use of hybrid cars, electric vehicles, and bicycles.	390 (3%)

Others	Promoting energy efficiency for buildings and more efficient cooking stoves. Reducing emissions from waste through use of biodigesters and water filters. Use of renewable energy for irrigation and solar lamps.	155 (1%)
Total		**3,100 (27%)**

(ii) **Land Use, Land Use Change, and Forestry (LULUCF)**: Cambodia intends to undertake voluntary and conditional actions to achieve the target of increasing forest cover to 60 percent of national land area by 2030. In the absence of any actions, the net sequestration from land use, land use change, and forestry is expected to reduce to 7,897 $GgCO_2$ in 2030 compared to projected sequestration of 18,492 $GgCO_2$ in 2010.

Cambodia requires support in the form of financing, capacity building, and technology transfer to implement the actions set out in its INDC. Based on the assessment of financial needs for priority activities up to 2018 as included in the sectoral climate change action plans, Cambodia would require US$1.27 billion to support the implementation of these activities. The assessment also took into account the climate finance absorption capacity of Cambodia to ensure that the proposed investments are effective.

3D.Review of Nationally Determined Contributions of India[1]

Introduction

Global climate change due to rising levels of greenhouse gases (GHGs) in the atmosphere is one of the most serious environmental challenges at present. In its fifth assessment report, the Intergovernmental Panel on Climate Change states that 'warming of the climate is unequivocal and, since the 1950s, many of the observed changes are unprecedented over decades to millennia'. The atmospheric concentrations of carbon dioxide, methane, and nitrous oxide have increased to unprecedented levels and 'carbon dioxide concentrations have increased by 40% since pre-industrial times, primarily due to fossil fuel emissions'. This necessitates 'substantial and sustained' efforts to reduce GHG emissions to limit climate change.

Glaring inequities exist in the distribution of the causes of climate change and the distribution of its impacts among the nations and peoples of the world. While the developed countries are predominantly responsible for climate change due to their historic contribution to the build-up of GHG concentration in the atmosphere, the effect of global warming is perceived to be more adverse on the developing countries as their resources and capacity to adapt to impact of climate change are very limited.

India is in a particularly difficult position vis-à-vis the climate change problem. It accounts for 2.4% of the world surface area but supports around 17.5% of the world population. It houses the largest proportion of global poor (30%), around 24% of the global population without access to electricity, about 30% of the global population relying on solid biomass for cooking, and about 90 million without access to safe drinking water. The adverse impacts of climate change on the developmental prospects of the country are amplified enormously by dependence of a large proportion of the population on climate-sensitive sectors for livelihood. India has an enormous task in hand to secure their futures through economic development. Hence, adaptation is inevitable and an imperative for the development process. Although India is at present the third largest emitter of GHGs globally, its per capita emissions are a mere 1.6 tonnes of CO_2 equivalent (tCO_2e).

India's Response to Climate Change

India's broad policy framework on environment and climate change is laid down by its National Environment Policy 2006 which promotes sustainable development along with respect for ecological constraints and the imperatives of social justice. The National Action Plan on Climate Change (NAPCC) was launched in 2008 and a concerted effort was put in place to draw strategies that would help India align its development with low-carbon actions. NAPCC is implemented through eight national missions, outlining

[1] Full version is available at http://www4.unfccc.int/submissions/INDC/Published%20Documents/India/1/INDIA%20INDC%20TO%20UNFCCC.pdf

priorities for mitigation and adaptation to combat climate change. Carrying the vision of NAPCC forward, all states and union territories are in the process of formulating State Action Plans on Climate Change. The action plans are aligned with the eight national missions. In 2009, under the Copenhagen Accord, India made a voluntary pledge to reduce by 2020 the GHG emissions intensity of its gross domestic product by 20%–25% over the 2005 level.

Adaptation strategies

Five of the eight missions of NAPCC concentrate on adaptation measures in sectors such as water, agriculture, Himalayan ecosystem, capacity building, and knowledge management. The policy framework catering to adaptation in some crucial areas is briefly described below.

To target the various threats that the agriculture sector is facing, the government of India has implemented several policies and missions. For instance, the National Mission on Sustainable Agriculture aims at food security; protecting resources such as land, water, and genetics; early warning systems and weather forecasting systems; and newer and more environment-friendly technologies and practices. Among other programmes are the National Initiative on Climate Resilient Agriculture for National Resources and the National Agroforestry Policy. Another government scheme involves the provision of 'soil health cards' to farmers, along with the facility of mobile soil testing laboratories.

As water is the most critical component of the life support system, various adaptation strategies that focus on enhancing efficient use of water, securing its access, and combating adverse climate change impacts are implemented. India has launched the National Water Mission with the key objectives of conservation, enhancing efficient usage, and equitable distribution of water through integrated water resources development and management. Further, in its adaptation strategies, the government has prioritised groundwater management and replenishment through rainwater harvesting and watershed development programme to give additional impetus to watershed development in the country. Additionally, the government has taken up initiatives such as the National Mission for Clean Ganga and the setting up of the National River Conservation Directorate for conservation of rivers and other water bodies as well as improving their water quality.

Climate change can adversely impact human health. Keeping in mind the various health consequences, India is formulating a health mission under the ambit of NAPCC which would present strategies on mitigation, containment, and management of adverse health impacts of climate change. The objectives of the mission are the analysis of epidemiological data; identification of vulnerable population; and increasing expertise, awareness, and community participation. In addition to the general efforts of the government in public health infrastructure are several specific programmes such as the Integrated Disease Surveillance Programme and the National Vector Borne Disease Control Programme.

Considering the accentuated vulnerability to rising sea levels faced by India's 7,517-km long coastline, its island territories, India has implemented several programmes to tackle these adverse effects. It has identified and demarcated vulnerable areas as the coastal regulation zone, restricting development of industries and operations in such areas. Further, through programmes such as the Integrated Coastal Zone Management and the Island Protection Zone, the government has attempted to conserve habitat,

biodiversity, provide livelihood security to the locals, as well as reduce disaster risks. Another effort, in collaboration with the International Union for Conservation of Nature, to protect coastal livelihood is the Mangroves for the Future initiative.

With over 85% of its geographical area vulnerable to one or multiple hazards, the Indian subcontinent is one of the world's areas most prone to disasters. Through strategies such as early warning systems, development and maintenance of multipurpose cyclone shelters, improved access and evacuation, and strengthened response capability of vulnerable local communities, the government has tried to fortify disaster risk mitigation and adaptation capacity at central, state, and local levels. Further, the Sendai Framework for disaster risk management has drawn up roadmaps for adequate response to calamities. India has put in place the National Disaster Relief Fund which is financed through the levy of a cess to create a fund pool to help achieve disaster management and risk-reduction goals.

To protect its strong biodiversity, the country has developed a biogeographic classification for conservation planning and has mapped biodiversity-rich areas. Recognising the grave importance of the Himalayan ecosystem and its extreme vulnerability to climate change, India launched the National Mission for Sustaining the Himalayan Ecosystem and the complementary National Mission on Himalayan Studies. These programmes seek to address threats and issues faced by Himalayan Glaciers, their associated hydrological consequences, protect biodiversity and local livelihoods, along with building a strong traditional and scientific knowledge base that demonstrate replicable solutions to relevant problems.

Mitigation strategies

India has demonstrated its commitment to fast track GHGs-mitigation measures that align well with its development priorities. Many national strategies and policies supplement this. The Energy Conservation Act encourages efficient use of energy and its conservation. The National Electricity Policy underscores the focus on universalising access to electricity and promoting renewable sources of energy, as does the Integrated Energy Policy.

India has adopted several measures for clean and renewable energy, energy efficiency in various sectors of industries, lower emission intensity in the automobile and transport sector, non-fossil-based electricity generation, and building sector based on energy conservation. Thrust on renewable energy, promotion of clean energy, enhancing energy efficiency, developing climate resilient urban centres, and sustainable green transportation network are some of the measures for achieving this goal.

With the National Solar Mission as a major initiative of the government, contributing solar energy to the country's energy mix is expected to grow significantly. Main schemes, under varying levels of development, include establishment of 25 solar parks, ultra-mega solar power projects, canal top solar projects, and 100,000 solar pumps for farmers. To accelerate development and deployment of renewable energy in the country, the government has scaled targets for renewable-based power generation to 175 gigawatts (GW) by 2021–2022 out of which 100 GW will be from solar energy.

The energy efficiency of thermal power plants will be improved systematically and mandatory over the time. The Performance Achieve and Trade mechanism will be broadened as a market-based energy

efficiency trading mechanism which at present involves 478 large energy consumers in the industrial sector. Additionally, more than 1 million medium and small-scale enterprises will be involved in the Zero Defect, Zero Effect scheme to improve their quality and energy efficiency, enhance resource efficiency, control pollution, manages wastes, and use renewable energy.

Every day, the Indian railways handle 3 million tonnes of freight and 23 million passengers. Although over the time, the volume of freight and passengers carried by rail in India has increased significantly, there has been a decline of share of traffic by railways compared to traffic by roads which is more energy intensive. Efforts are being made to check this declining trend of railways.

India's urban transport policy envisages encouraging moving people rather than vehicles with a major focus on Mass Rapid Transit Systems. India already has to 236 km of metro rail in place and about 1150 km metro projects are being planned for other cities.

India is one of the few countries where forests and tree covers have increased in recent years, transforming the country's forests into net sinks. Per the latest assessment, forests and tree covers have increased from 23.4% of the geographical area in 2005 to 24% in 2013. The government's long-term goal is to bring 33% of the country's geographical area under forest cover.

India's Intended Nationally Determined Contribution

Although ambitious, India's Intended Nationally Determined Contributions (INDC), submitted to the United Nations Framework Convention on Climate Change on 2 October 2015, clearly embarks upon the fact that the country has come a long way towards developing low-carbon solutions and strategies. India's INDC has eight elements:.

1. **Promote sustainable lifestyles.** To put forward and further propagate a healthy and sustainable way of living based on traditions and values of conservation and moderation.
2. **Achieve cleaner economic development.** To adopt a climate-friendly and a cleaner path than the one followed hitherto by others at corresponding levels of economic development.
3. **Reduce emissions intensity of GDP.** To reduce the emissions intensity of its GDP by 33%–35% by 2030 from the 2005 level.
4. **Increase share of electricity generated from non-fossil fuel sources.** To achieve about 40% cumulative electric power installed capacity from non-fossil fuel-based energy resources by 2030 with the help of transfer of technology and low-cost international finance including from the Green Climate Fund.
5. **Create additional carbon sinks through afforestation.** To create an additional carbon sinks of 2.5 to 3 billion tonnes of CO_2 equivalent through additional forests and tree covers by 2030.
6. **Improve adaptation measures.** To better adapt to climate change by enhancing investments in development programmes in sectors vulnerable to climate change, particularly agriculture, water resources, Himalayan region, coastal regions, health, and disaster management.

7. **Mobilize finance.** To mobilise domestic and new and additional funds from developed countries to implement the above mitigation and adaptation actions in view of the resources required and the resource gap.
8. **Build capacity, develop and transfer technology.** To build capacities, create domestic framework and international architecture for quick diffusion of cutting edge climate technology in India, and for joint collaborative research and development for such future technologies.

Means of Implementation of India's Intended Nationally Determined Contributions

Implementing the NDCs will require India to develop innovative policies, institutional frameworks, mobilize the required resources and find solutions to promote newer, cleaner technologies. India is working on developing a roadmap for implementation of its NDC and has constituted a committee and six thematic sub-committees involving key ministries and departments. The six thematic sub-committees include: Mitigation; Adaptation; Finance; Forestry; Technology and Capacity Building; Transparency Compliance and Legal aspects.

Climate change finance

Finance is a key enabler of climate change action. A wide range of studies providing different estimates of the financial requirement to combat the adverse effects of climate change all tend to demonstrate the enormity of funds that would be needed for this task.

Estimates for India's finance requirements to combat climate change

Preliminary estimates peg India's financial requirements for adaptation actions in agriculture, forestry, infrastructure, water, and ecosystems in the order of US$ 206 billion (at 2014–2015 prices). Further investments would be required to strengthen resilience and disaster management. Additionally, NITI Aayog of Government of India estimates expenditure on mitigation activities for moderate low-carbon development for India to be around US$834 billion till 2030 (at 2011 prices).

Sources of climate change finance for India

India's actions tackling climate change have primarily been funded from domestic sources in the form of budgetary allocations under various schemes that have adaptation and mitigation components built into them. Apart from this, India sources the required funds from a careful mix of market mechanisms, fiscal instruments, and regulatory interventions to mobilise finance for climate change. To augment the availability of assured targeted resources, the government has set up two dedicated funds at the national level for mobilising finance for mitigation and adaptation actions, respectively. These are the cess on coal production and the National Adaptation Fund. India imposes a cess of INR 200 per tonne of coal

production[2], which is equivalent to a carbon tax. The cess on coal primarily drives the National Clean Energy Fund which is used to finance clean energy and related projects. The National Clean Energy Fund, of its total funds of INR 170.84 billion till 2014–2015, is being used to finance 46 energy projects worth INR 165.11 billion.

Other fiscal instruments and incentives employed by the government to achieve a low- carbon economy and a sustainable growth trajectory include a reduction in subsidies and an increase in taxes on fossil fuels such as petrol and diesel. Among other strategies, the government is issuing Tax Free Infrastructure Bonds of INR 50 billion for funding renewable energy projects during 2015–2016, and following up on the 14th Finance Commission recommendation of setting up an incentive for creation of carbon sinks through forestry. Per the Finance Commission's recommendation, the devolution of funds to states from the federal pool would be based on a formula that would attach 7.5% weight to areas under forests, thus conditioning about US$6.9 billion of transfers to states based on their forest covers.

Technology transfer, knowledge sharing, and international cooperation

Finally, the pursuit of a low-carbon growth path cannot be achieved through domestic means alone. A significant reason behind the reduction of carbon intensity in India's economy is the adoption of new and innovative international technologies that address climate mitigation and adaptation. Thus, in order to pursue its path to low-carbon sustainable development, India vitally depends upon international collaborations both in terms of financial aid, technology transfer, knowledge sharing, and capacity building efforts.

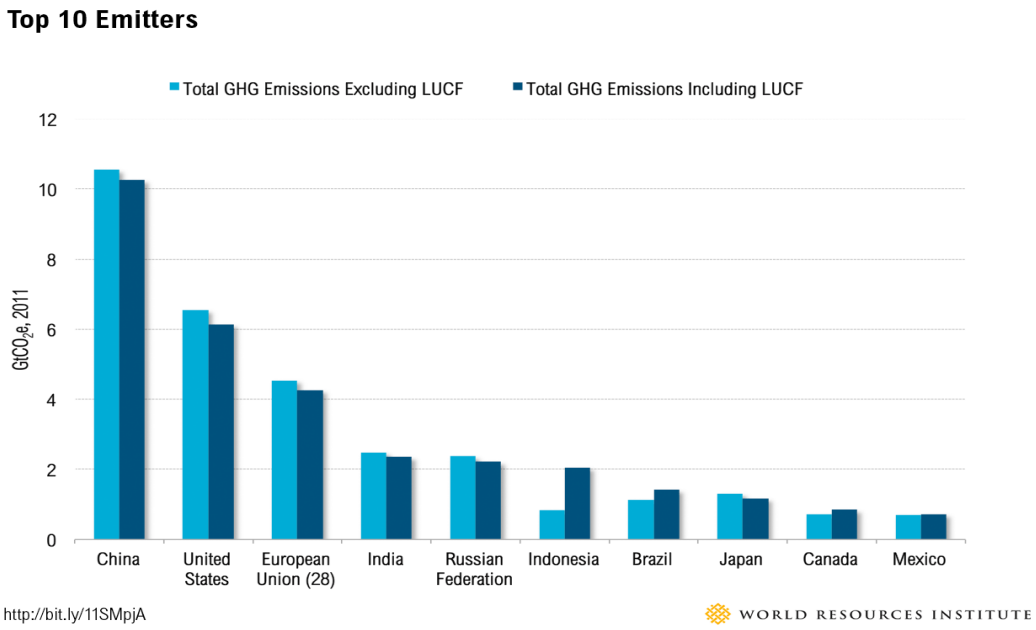
[2] With effect from 1April 2016 cess on coal production increased to INR400 per tonne

3E.Review of Nationally Determined Contributions of Indonesia

Indonesia's GHG Emissions

According to the World Resource Institute (2014), 10 countries produce around 70% of global greenhouse gas (GHG) emissions (Figure 3E.1). Indonesia's total GHG emissions rank the sixth largest if land use change and forestry are included.

Figure 3E.1. World's Top 10 GHG Emitters



GHG = greenhouse gas, GtoCO$_2$e = gigatonne of carbon dioxide equivalent, LUCF = land use change and forestry.
Source: Mengpin Ge, Johannes Friedrich, and Thomas Damassa (2014**)**.

A later analysis by the World Research Institute (2015) indicated that Indonesia's fires crisis in 2015 released more GHG emissions, reaching a total of 1.62 billion metric tonnes of carbon dioxide (MtCO$_2$). This surpassed Russia's total annual emissions and marked Indonesia as the world's fourth-largest emitter of GHGs. Excluding land use change, Indonesia's current total emissions are nearly 760 MtCO$_2$. Considering its impact to the global emissions, Indonesia's climate commitment is an important piece of the global response to climate change.

Indonesia's emissions reduction

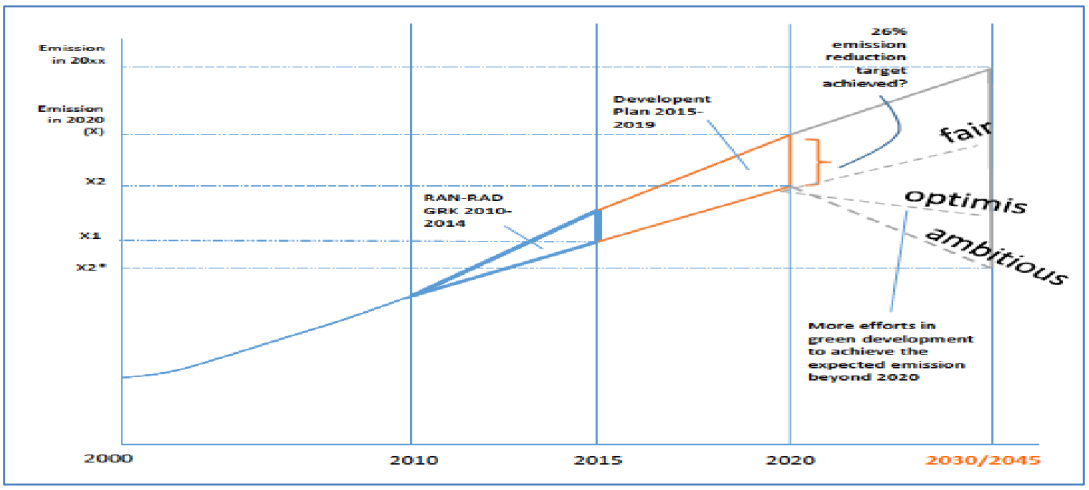
According to Indonesia's Second National Communication of 2010, national GHG emissions were estimated at 1.8 gigatonnes of carbon dioxide equivalent (Gt CO_2e) in 2005. Most emissions (63%) were the result of land use change, peat and forest fires, with combustion of fossil fuels contributing approximately 19% of total emissions.

In 2009, Indonesia voluntarily committed to reduce emissions by 26% by 2020 with its own effort and 41% with international support against the Business as Usual (BAU) scenario. This target is nationally implemented through the Presidential Regulation of the Republic of Indonesia No. 61 Year 2011, otherwise known as the National Action Plan for Greenhouse Gas Emissions Reduction.

The commitment to mitigation and adaptation has been included in the national mid-term development plan 2015–2019, thus mainstreaming the climate change commitment into the development plan as well as other global commitments such as Not Allowing Clearing Primary Forest and Prohibiting Open Peatland Areas.

As a continuing commitment, Indonesia has set in its Intended Nationally Determined Contributions (INDC) the 29% target of emissions reduction relative to the BAU scenario in 2030. Three mitigation scenarios were modelled for the National Action Plan for Greenhouse Gas Emissions Reduction review and INDC. The 'fair' scenario corresponds to the 29% unconditional reduction and the 'ambitious' scenario corresponds to the 41% reduction conditional on international support. The 'optimis' scenario is in between where more efforts have been pursued in green development to achieve the expected emissions beyond 2020 (Figure 3E.2).

Figure 3E.2. Reduction Scenarios

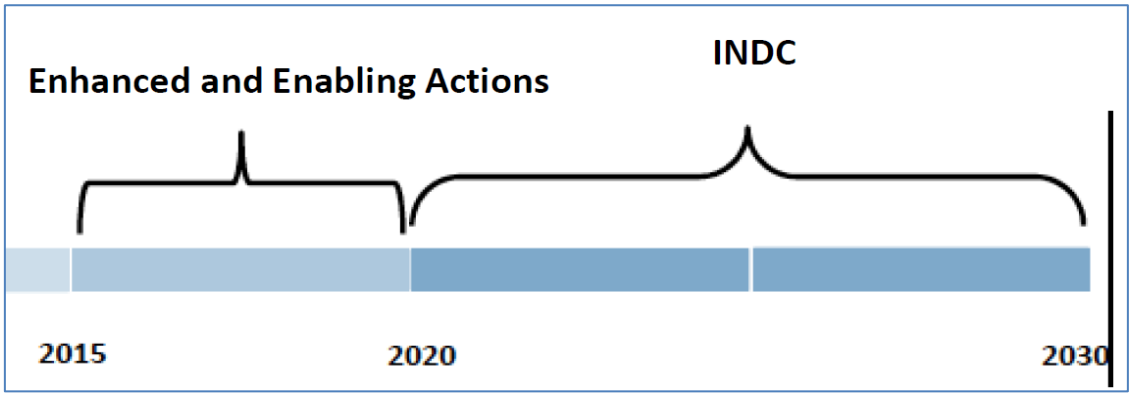


Source: Presentation at the Session 5: Synergies on land-use/REDD+ in countries' INDCs submitted to the United Nations Framework Convention on Climate Change and national strategy documents and REDD+ programmes; Joint FCPF/UN-REDD Programme Knowledge Exchange San Jose, Costa Rica, 8 November 2015.

Indonesia's INDC

Indonesia's INDC sets the path of the country's transition towards a low-carbon future by outlining enhanced actions and putting in place the necessary enabling environments for 2015–2019 that will lay the foundation for more ambitious goals beyond 2020 (see Figure 3E.3).

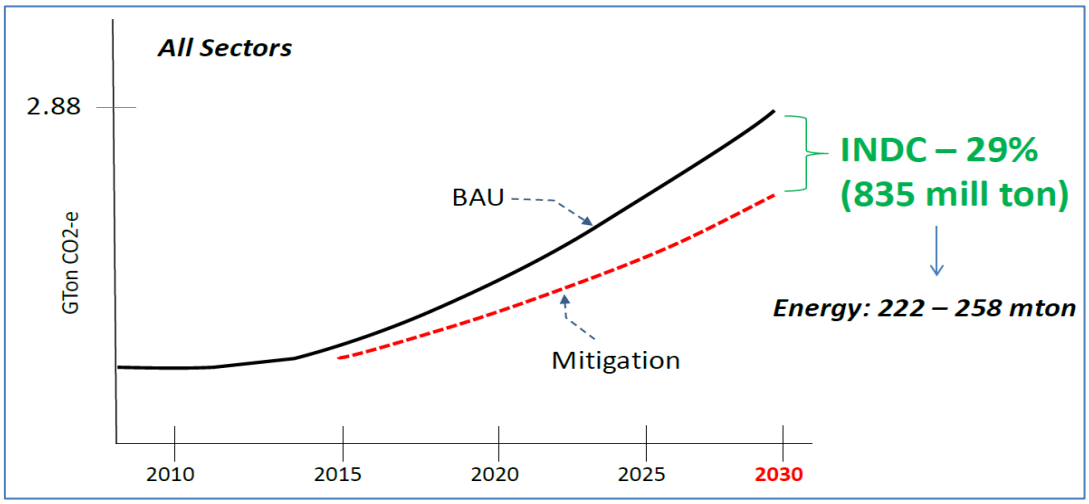
Figure 3E.3. INDC Transitional Strategy



Source: Presentation at the Session 5: Synergies on land-use/REDD+ in countries' INDCs submitted to the United Nations Framework Convention on Climate Change and national strategy documents and REDD+ programmes; Joint FCPF/UN-REDD Programme Knowledge Exchange San Jose, Costa Rica, 8 November 2015.

Indonesia's INDC is a continuing commitment to reduce the country's GHG emissions. Indonesia submitted its INDC in September 2015 to the United Nations Framework Convention on Climate Change. The BAU scenario projection puts Indonesia's GHG emission at 2,881 $GtCO_2eq$ in 2030. The reduction of up to 29% relative to the BAU scenario in 2030 will be equivalent to a reduction of around 835 metric tonnes of CO_2 equivalent ($MtCO_2e$) (Figure 3E.4). Around 222–258 $MtCO_2e$ will be the reduction from the energy sector. With international support, this target can be extended up to 41%, equivalent to a reduction versus BAU of 1,192 $MtCO_2e$ in 2030.

Figure 3E.4. Indonesia's INDC



BAU = Business as Usual, GTCO2e = gigatonne of carbon dioxide equivalent, INDC = intended nationally determined contributions.
Source: Siagian, et al. (2015)

Reduction level

Indonesia's INDC states conditional and unconditional mitigation targets. It would reduce 29% of the emissions against the BAU scenario by 2030 as unconditional scenario. If there is additional international support, Indonesia intends to reduce additional 12% of the emissions. The intended contributions cover five sectors: energy (including transportation), industrial processes and product use, agriculture, land use, land-use change and forestry, and waste sector, with three greenhouse gases: carbon dioxide, methane, and nitrous oxide. The amount of emissions under the 29% and 41% reduction targets would be 0.848 $GtCO_2eq$ and 1.119 $GtCO_2eq$, respectively.

Unconditional reduction level

The commitment to reduce GHG emissions unconditionally by 26% against BAU by 2020, and by 29% by 2030 will be implemented through:

- Effective land use and spatial planning;
- Sustainable forest management including social forestry programmes;
- Restoring functions of degraded ecosystem;
- Improved agriculture and fisheries productivity;
- Energy conservation and the promotion of clean and renewable energy sources (the 23% EBT share in the energy mix in 2025, as stated in the Ministerial Decree No 79/2014, will encourage plantations for energy); and
- Improved waste management.

This is a fair reduction target scenario based on the 2010 National Action Plan on GHG Reduction which was estimated at 2.881 GtCO2e at BAU scenario in 2030.

Conditional reduction

Support from international cooperation is expected to help increase Indonesia's contribution up to 41% emissions reduction by 2030. The additional 12% is subject to provisions in the global agreement through bilateral cooperation: technology development and transfer, capacity building, payment for performance mechanisms, technical cooperation, and access to financial resources to support mitigation and adaptation efforts.

Content of the INDC document

The INDC document consists of six parts: the national context (including the mitigation and adaptation situation), planning process, strategic approach, information to facilitate clarity, transparency and understanding, key assumptions, and review and adjustment.

An annex to elaborate salient items particularly on adaptation has been included.

Coordination and mainstreaming of Indonesia's INDC

Indonesia's NDC has been well mainstreamed into the National Development Plan. The National Coordination Team (through the Secretariat of the National Action Plan for Greenhouse Gas Emissions Reduction) has been established since 2010 and it will continue to implement actions and provide data and information on GHG emissions reduction results. Involvement of non-governmental organisations and the private sector has been accommodated in the NDC measures.

Supports required

- Improving quality of monitoring, evaluation, and reporting;
- Improving capacity of regional and local governments; and
- Enhancing government and private sectors capacity to access Climate Change (CC) Funds

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3F.Review of Nationally Determined Contributions of Japan

Having faced a drastic change in its energy circumstances as a result of the Great East Japan earthquake and the accident at the Tokyo Electric Power Company's Fukushima Dai-ichi Nuclear Power Station, Japan decided to use the new Strategic Energy Plan in 2015 as starting point for reviewing and rebuilding from scratch its energy strategy.

Japan's intended nationally determined contribution towards post-2020 greenhouse gas (GHG) emissions reduction is at 26.0% by fiscal year (FY) 2030 compared to FY2013 (25.4% reduction compared to FY2005, approximately 1.042 billion tonnes of carbon dioxide equivalent as 2030 emissions). This is consistent with Japan's energy mix, set as a feasible reduction target by bottom-up calculation with concrete policies, measures, and individual technologies, and taking into adequate consideration, inter alia, technological and cost constraints, and set based on the amount of domestic emissions reductions and removals assumed to be obtained.

GHG Emissions Reductions

Energy-originated carbon dioxide (CO_2)

Approximately 90% of GHG emissions in Japan is covered by energy-originated CO_2. Emissions of energy-originated CO_2 will be reduced by 25% by FY2030 compared to FY2013 level (24% reduction compared to FY2005 level or approximately 927 $MtCO_2$). The estimated emissions in FY2030 in each sector are shown in Table 3F.1.

Table 3F.1. Estimated Emissions of Energy-originated CO_2 in Each Sector

	Estimated Emissions of Each Sector in 2030	2013 (2005)
Energy-originated CO_2	927	1,235 (1,219)
Industry	401	429 (457)
Commercial and other	168	279 (239)
Residential	122	201 (180)
Transport	163	225 (240)
Energy conversion	73	101 (104)

[Value: $MtCO_2$]

CO_2 = carbon dioxide, $MtCO_2$ = metric tonne of carbon dioxide.
Source: Author's calculation.

Non-energy originated CO_2

The target reduction is 6.7% compared to FY2013 level (17.0% reduction compared to FY2005 level or approximately 70.8 $MtCO_2$). See Table 3F.2.

Methane

The target reduction is 12.3% compared to FY2013 level (18.8% reduction compared to FY2005 level or approximately 31.6 metric tonnes of carbon dioxide equivalent ($MtCO_2e$). See Table 3F.2.

Nitrous oxide

The target reduction is 6.1% compared to FY2013 level (17.4% reduction compared to FY2005 level or approximately 21.1 $MtCO_2e$). See Table 3F.2.

Table 3F.2. Estimated Emissions of Non-energy-originated CO_2, Methane, and Nitrous Oxide

	Estimated Emissions of Each Gas in 2030	2013 (2005)
Non-energy originated carbon dioxide (CO_2)	70.8	75.9 (85.4)
Methane (CH_4)	31.6	36.0 (39.0)
Nitrous oxide (N_2O)	21.1	22.5 (25.5)

[Value: $MtCO_2e$]

Source: Author's calculation.

Fluorinated gases (hydrofluorocarbon, PEC_S, sulphur hexafluoride, and nitrogen trifluoride)

The target reduction is 25.1% compared to Calendar Year (CY) 2013 level (4.5% increase compared to CY 2005 level or approximately 28.9 $MtCO_2e$). See Table 3F.3.

Table 3F.3. Estimated Emissions of Fluorinated Gases

	Estimated emissions in CY 2030	FCY2013 (CY2005)
Fluorinated gases	28.9	38.6 (27.7)
Hydrofluorocarbons (HFC_S)	21.6	31.8 (12.7)
PFC_S	4.2	3.3 (8.6)
Sulphur hexafluoride (SF_6)	2.7	2.2 (5.1)
Nitrogen trifluoride (NF_3)	0.5	1.4 (1.2)

[Value: $MtCO_2e$]

Source: Author's calculation.

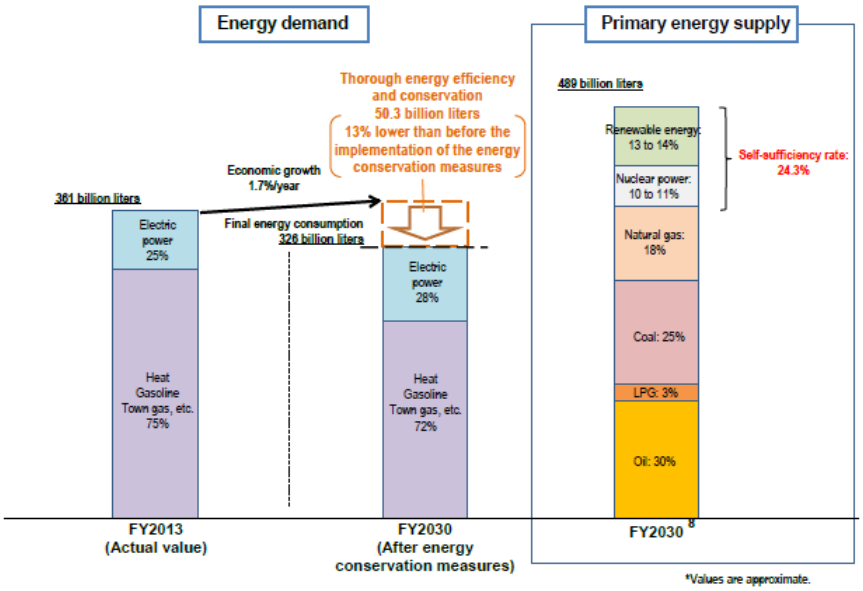
Energy Mix Used for the Emission Reduction Target

Energy demand and primary energy supply structure

The average annual economic growth is assumed at 1.7%, and estimated real gross domestic product (GDP) in 2030 will be ¥711 trillion. The population projection is assumed by the National Institute of Population and Social Security Research (Medium-Mortality Assumption) to be 117 million in 2030.

Energy saving of approximately 50.3 billion litres (crude oil equivalent) is set to be achieved in terms of final energy consumption, resulting in the final energy consumption of 326 billion litres in FY2030. See details in Figure 3F.1.

Figure 3F.1. Energy Supply and Demand

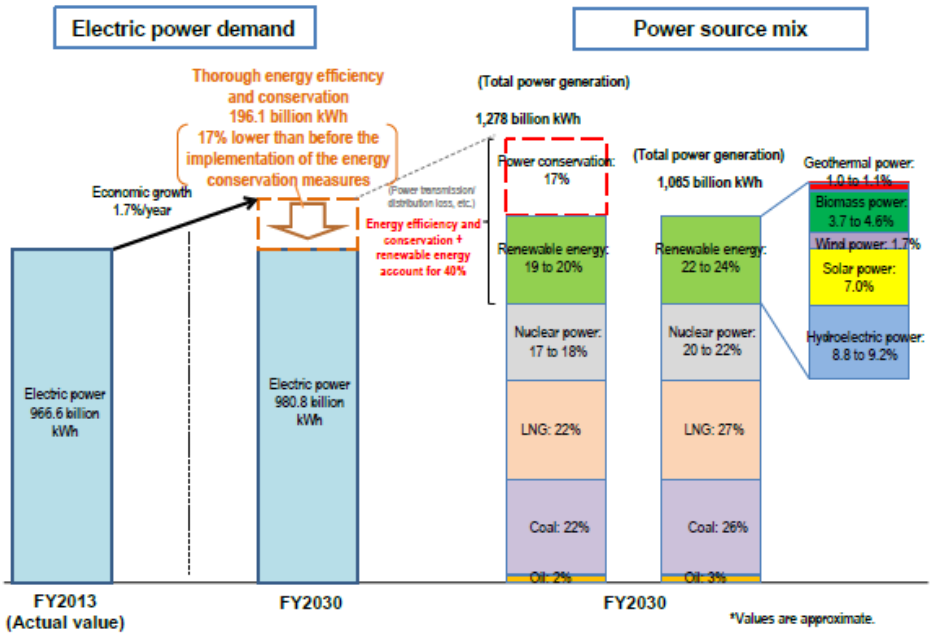


Source: METI.

Power Generation

The electric power supply-demand structure in 2030 will greatly reduce the dependence on the nuclear power plants, which was approximately 30% before the Great East Japan earthquake, to approximately 20%–22%. Also, renewable energy is expected to be introduced to the maximum extent possible, which will be 22%– 24%. See details in Figure 3F.2.

Figure 3F.2. Power Generation



Source: Ministry of Economy, Trade and Industry.

Trend of GHG emissions per GDP and GHG emissions per capita

Japan's GHG emissions per GDP are 0.29 kgCO_2e/US$ in 2013 and per capita are 11 t-CO_2e/person in 2013, all of which are already at the leading levels among developed countries.

The indicators noted above are projected to improve by around 20%–40% by 2030 with further measures to reduce emissions.

3G.Review of Nationally Determined Contributions of the Lao PDR

National Context

With around 70% of the Lao population relying on subsistence agriculture for livelihood, effects of climate change, such as unpredictable rains and extended dry seasons, will have a significant impact on their lives across the country.

The Lao People's Democratic Republic (Lao PDR) is not a major contributor to climate change but is likely to be disproportionably affected by it. The country is concerned about the serious consequences of climate change to its economic development, human capacity, poverty reduction, and environmental sustainability.

The government of the Lao PDR ratified the United Nations Framework Convention on Climate Change in 1995 and the Kyoto Protocol in 2003. This strategy builds on the country's commitment to its climate change adaptation efforts.

To date, only limited assessment, analysis, or projections have been made on the potential climate change impacts to the physical and social environment in the Lao PDR due to the lack of long-term climate data to support projections of climate trends.

The Lao PDR has a long-term goal for national development as set out in its 8th Five-Year National Socio-economic Plan (2016–2020), with a vision for 2030. The goal is for the Lao PDR to make the transition of its status from a least developed country to a middle-income country by 2030 and supported by inclusive, stable, and sustainable economic growth while alleviating poverty. The country recognizes the strong link between economic development, sustainability, and the need to mainstream environmental considerations, including action on climate change, into its development plans.

The Lao PDR hasdeveloped the Climate Change and Disaster Law and the overarching legal framework for climate change and disaster management was provided in the law.

The National Strategy on Climate Change (NSCC) of Lao PDR was approved in early 2010 and states a vision '[to] secure a future where Lao PDR is capable of mitigating and adapting to changing climatic conditions in a way that promotes sustainable economic development, reduces poverty, protects public health and safety, enhances the quality of Lao PDR's natural environment, and advances the quality of life for all Lao People.'

In addition to the overarching strategy set out in NCCS, the climate-change action plans for 2013–2020 define mitigation and adaptation actions in the sectors of agriculture, forestry, land use change, water resources, energy, transportation, industry, and public health. The Lao PDR is a highly climate-vulnerable country and its greenhouse gas (GHG) emissions were only 51,000 giga cubic grams in 2000, which was negligible compared to total global emissions. Despite this, the Lao PDR has ambitious plans to reduce its GHG emissions while at the same time increasing its resilience to the negative impacts of climate change. Examples of such plans include the following:

- An ambitious target set out in the National Forestry Strategy to the Year 2020 to increase forest cover to a total of 70% of land area by 2020, and maintain it at that level going forward. This will reduce the risk of floods and prevent land degradation. At the same time, the GHG mitigation potential of such a target is substantial and long lasting.
- In terms of the country's large-scale electricity generation, its electricity grid draws on renewable resources for almost 100% of output. The Lao PDR also aims at utilizing unexploited hydropower resources to export clean electricity to its neighbours. By supplying neighbouring countries such as Cambodia, Viet Nam, Thailand, and Singapore with hydroelectricity, the Lao PDR is enabling other countries in Southeast Asia to develop and industrialize in a sustainable manner.
- The government has also laid the foundations for implementing a renewable energy strategy that aims to increase the share of small-scale renewable energy to 30% of total energy consumption by 2030.

Climate change is already causing economic loss and affecting the livelihoods, food security, water supply, and health of much of the country's population. As the frequency and intensity of climate-related hazards such as droughts and floods are expected to increase, the Lao PDR must urgently take steps to build resilience by enhancing its adaptation efforts across all sectors. A more detailed summary of the country's vulnerabilities to climate change and the adaptation actions proposed to address them are discussed further in Section 3 of its Intended Nationally Determined Contributions (INDC).

The Lao PDR is committed to implement its NCCS and sectoral climate change action plans for the national, regional, and global benefit. However, technical and financial support are required to deliver its mitigation and adaptation actions. With such support, the NCCS will be most efficiently implemented, the potential GHG reductions will be optimized, and the country can most effectively adapt to the negative and immediate effects of climate change.

Mitigation

Mitigation contribution

The Lao PDR has identified several actions which it intends to undertake to reduce its future GHG emissions, subject to the provision of international support. These are outlined in Table 3G.1 together with preliminary estimates of the projected emissions reductions.

These estimates have been drawn from various sources and need to be reviewed and updated to address consistency and accuracy in analytical methods once more reliable data and information are available.

Table 3G.1. Intended Mitigation Activities to be Implemented by the Lao PDR in 2015–2030

No.	Name of Activity	Objective of the Activity	Estimated CO_2e Reduction
1	Implementation of the 'Forestry Strategy to the Year 2020' of the Lao PDR	To increase forest cover to 70% of land area (i.e. to 16.58 million hectares) by 2020. Once the target is achieved, emissions reductions will carry on beyond 2020	60,000–69,000 $ktCO_2e$ (once the target has been met by 2020 onwards)
2	Implementation of the Renewable Energy Development Strategy	To increase the share of renewable energy to 30% of energy consumption by 2025	1,468,000 $ktCO_2e$ (by 2025)
3	Implementation of the Rural Electrification Programme	To make electricity available to 90% of households in rural area by 2020. This will offset the combustion of fossil fuels to produce power where there is no access to the electricity grid.	63 $ktCO_2$/per annum (pa) (once the target is met in 2020)
4	Implementation of transport-focused Nationally	In one NAMA feasibility study, road network development is identified as a first objective which will reduce the number of kilometres travelled by all	Road network development is 33 $ktCO_2$/pa, and 158 $ktCO_2$/pa for public transport

	Appropriate Mitigation Actions (NAMAs)	vehicles. The second objective is to increase the use of public transport compared to the business as usual (BAU) scenario.	development
5	Expansion of the use of large-scale hydroelectricity	The objective of this activity is to build large-scale (>15 MW) hydropower plants to provide clean electricity to neighbouring countries	16,284 $ktCO_2$ per annum (2020–2030)
6	Implementation of climate change action plans	To build capacity to monitor and evaluate policy implementation success, with a view to producing new policy, guidance, and data. The objective is to develop and implement effective, efficient, and economically viable climate change mitigation and adaptation measures	To be estimated as part of the implementation plan

CO_2 = carbon dioxide, $ktCO_2e$ = kilotonne of carbon dioxide equivalent, MW = megawatt.
Source: UNFCCC.

Ambitious and fair

The Lao PDR's GHG emissions are very low in the global context and the country's historic contribution to climate change has been minimal. Despite this and its status as a least developed country, the government of the Lao PDR intends to implement policies that support the long-term goal of limiting global GHG emissions in line with the objectives of the United Nations Framework Convention on Climate Change and the findings of the Intergovernmental Panel of Climate Change's 5th Assessment Report. These represent the first time that the Lao PDR has made an international undertaking to act on mitigation and therefore fulfil the requirements of the Lima Call for Climate Action to go beyond existing efforts.

To maximize the ambition of its mitigation contribution while considering the need for economic development, the Lao PDR has prioritized mitigation actions that both address the main causes of future increases in emissions and have significant development co-benefits. This is a fair approach to the nation's first INDC. Forestry-based actions will not only increase the amount of GHG sinks in the Lao PDR but will also provide adaptation co-benefits contributing to prevention of flooding, soil erosion, and landslides, and protection of biodiversity and ecosystem services. Improving public transport will not only lessen GHG emissions as a result of travel but will also improve air quality and support more sustainable economic growth. The rural electrification programme will reduce

GHG emissions, promote rural development, and reduce poverty. Finally, exporting hydropower to other countries in the region will allow their economies to grow in a more sustainable manner by replacing consumption of fossil fuels.

The Lao PDR's INDC includes a mix of plans by the government, including those supported by overseas development assistance. The Lao PDR is also implementing other national and local plans such as the allocation of approximately US$12 million annually for disaster emergency response plans. This demonstrates that the Lao PDR is not content to wait for international support to take action on climate change. Reforestation and maintenance of forests, for example, is a major challenge for the country, so achieving success with international programmes and assistance such as REDD+ and FLEGT is strongly desired.

Overall, to achieve maximum mitigation potential, further international support is required by the Lao PDR. The main support needs are set out in Section 4 and Annex 1 of the Lao PDR's INDC.

Adaptation

As set out in the vision for NSCC referred to earlier, the Lao PDR intends to balance its need for development without compromising its environment. For climate change adaptation, this translates into the following goals as articulated in the NSCC:

- Increase resilience of key economic sectors and natural resources to climate change and its impacts.
- Enhance cooperation, strong alliances, and partnerships with national stakeholders and international partners to achieve national development goals.
- Improve public awareness and understanding of various stakeholders about climate change, vulnerabilities, and impacts to increase willingness of stakeholders to take actions.

The Lao PDR's economy is already experiencing the impacts of climate change and most of the population remains highly vulnerable to climate hazards, particularly floods and droughts. This is because the Lao PDR's economy and over 70% of population depend on natural resources for livelihoods and ensuring food security. The agriculture sector is responsible for 29.9% of GDP and approximately 70% of the population are dependent on the sector for

livelihoods. Increasing climate resilience with respect to agriculture, especially food security, is therefore a high priority. Another high priority is the provision and management of water resources as this contributes to social well-being, economic productivity, and water supply for agriculture, industrial processes, and energy production.

Flooding is a major climate risk in the country, threatening livelihoods almost every year. Fourteen out of 17 provinces as well as Vientiane, the country's capital, have experienced floods since 1995. The country's annual rainfall is expected to increase its variability which, accompanied with increase in temperature, could have significant impact on water resources, ecosystems, and agricultural production. In addition, floods have an adverse impact on housing, health, education, industrial

activities, and infrastructure (transportation, water, and sanitation). As an example, the flooding in 2005 caused widespread disruption with estimated economic costs of US$29 million.

The Lao PDR is also experiencing increasingly frequent episodes of drought. Severe droughts occurred in 1996, 1998, and 2003. About 6 out of 17 provinces are already at high risk of droughts. Droughts adversely affect water resources, hydro-electric generation, and agricultural production resulting in widespread economic losses.

The National Adaptation Programme of Action (2009) maps out a country-driven programme to address immediate and projected climate change adaptation requirements in the agriculture, forestry, water resources, and public health sectors. The adaptation programme, intended for implementation by 2020, was further developed in NSCC to cover the main sectors of the economy, which are identified as agriculture and food security, forestry and land use change, water, energy and transport, urban development, industry, and public health sectors.

One guiding principle of the NSCC is to develop and implement integrated adaptation and mitigation solutions, i.e. provide low-cost measures, improve energy efficiency, promote cleaner production, and provide adaptation/mitigation synergies as well as economic, environmental, and socio-economic benefits. Hydroelectricity has great potential in the Lao PDR in providing clean energy, an opportunity to reduce GHG emissions and meet other objectives such as flood, irrigation, and water supply management. The forestry sector, for example, contributes to both national economy and livelihoods of many Laotians. Sustainable forest management therefore improves the resilience of communities and ecosystems and at the same time reduces GHG emissions by absorbing carbon dioxide.

To work towards achieving NSCC's vision and goals and effectively implement the climate change action plans for all sectors, development of a monitoring and evaluation system is an immediate need for the Lao PDR. Table 3G.2 reflects the nation's adaptation priorities given the current understanding of expected climate impacts. These actions will be continuously assessed and improved when monitoring and evaluation data and new information about climate change and impacts become available.

Table 3G.2. Focus of Adaptation Projects in Key Sectors

No.	Sector	Focus of Projects and Programmes
1	Agriculture	- Promoting climate resilience in farming systems and agriculture infrastructure - Promoting appropriate technologies for climate change adaptation
2	Forestry and land use change	- Promoting climate resilience in forestry production and forest ecosystems - Promoting technical capacity in the forestry sector for managing forest for climate change adaptation
3	Water resources	- Strengthening water resource information systems for climate change adaption - Managing watersheds and wetlands for climate change resilience - Increasing water resource infrastructure resilience to climate change - Promoting climate change capacity in the water resource sector
4	Transport and urban development	- Increasing the resilience of urban development and infrastructure to climate change
5	Public health	- Increasing the resilience of public health infrastructure and water supply system to climate change - Improving public health services for climate change adaptation and coping with climate-change-induced impacts.

INDC Development Process and Implementation Plan

The Lao PDR's INDC has been prepared through an inclusive stakeholder consultation process involving line ministries, research institutions, civil organisations, provincial governments, private sector, and international development partners. The main sources of information in preparing this document were the 7th and 8th five-year National Socio-Economic Development Plan 2011–2015 and 2016–2020, with a Vision to 2030 (2011 and 2015); National Climate Change Strategy (2010); Forestry Strategy to the Year 2020 of the Lao PDR (2005); Renewable Energy Development Strategy (2011); Sustainable Transport Development Strategy (2010); Climate Change Action Plan of Lao PDR for 2013–2020 (2013); National Adaptation Programme of Action (2009); Second National Communication to the UNFCCC (2013); and Investment and Financial Flows to Address Climate Change in Energy, Agriculture and Water Sector (2015).

The cross-ministerial National Disaster Management Committee will oversee the overall implementation of INDC. Using the committee's existing structure, the Ministry of Natural Resources and Environment will act as the Secretariat. This will involve coordination with relevant ministries and cooperation with international stakeholders to access finance and capacity building

for the implementation of INDC, including the establishment and implementation of a monitoring, reporting, and verification (MRV) system.

The Ministry of Natural Resources and Environment will disseminate INDC and, later, the results of the COP 21 to relevant ministries in the central and line agencies at the local levels. INDC will also be incorporated in the 8th National Socio-Economic Development Plan to ensure the continued mainstreaming of climate-related policy in overall national plans.

INDC will be implemented in a coordinated manner with NCCS, climate change action plans, and sectoral plans. The current climate change action plans run until 2020 and the Lao PDR will start devising the next set of action plans to continue to implement NCCS before the end of 2020. Details of implementation of the mitigation and adaptation actions identified in Sections 2 and 3 of this INDC are set out in Annexes 1 and 2, respectively.

To facilitate implementation of INDC and ensure that climate change action plans are executed in the most effective, efficient, and economic manner, the Ministry of Natural Resources and Environment will carry out four elements as follows:

1. **Overall strategy, coordination of INDC implementation, and regulatory framework.** This will be established by the ministry. Effective arrangements for liaison with line ministries responsible for aspects of INDC, international stakeholders, and development partners at national and local levels to facilitate implementation of INDC will be put in place. This will also include strengthening the policy and regulatory framework specially to continue development and promulgation of the Climate Change and Disaster Law, which is expected to be in effect in 2017. This law will be a continuum of earlier achievements on climate change policies and plans such as the Environmental Protection Law, the Revised Urban Planning Law, the Strategic Plan on Disaster Management 2020 (2003), and the National Strategy on Climate Change (2010).
2. **Capacity building**. One of the biggest requirements is to instigate the development of technical capacity not just across sectors but at all levels of engagement from central government decision-makers through to local levels and technical staff. In mitigation, capacity building is needed, for example, in feasibility studies, mitigation analysis, and policy development. Regarding adaptation, capacity building is needed in understanding the climate change impacts, adaptation measures (including technical requirements such as drought- and flood-resistant varieties of crops, research into new crops and climate-resilient technologies), and how the adaptation measures will impact on communities and environments.
3. **Finance.** In summary, broadly eight main steps need to be followed to ensure that domestic and international finance is successfully acquired, utilized, and accounted for:
    a. Assess needs, define priorities, and identify barriers to investment
    b. Identify policy mix and sources of financing
    c. Identify access routes to multilateral finance

d. Blend and combine resources

e. Formulate projects, programmes, and sector-wide approaches to access finance

f. Implement and execute planned action

g. Implement and manage project coordination systems

h. Monitor, report, and verify / monitor and evaluate climate finance

With respect to domestic resources for climate action, the Lao PDR has apportioned US$12.5 million for climate change, which represents approximately 0.14% of GDP in 2012. To implement the mitigation actions and address adaptation needs, international support in the form of financial, technology transfer, and capacity building is needed. An initial estimate of the financial needs for implementing identified mitigation and adaptation policies and actions is US$1.4 billion and US$0.97 billion, respectively. Details are provided in Annex 1 (mitigation) and Annex 2 (adaptation).

4. **Monitoring, reporting, and verification (MRV).** An MRV system is the cornerstone of effective national implementation as it allows progress against implementation plans to be demonstrated and provides data for learning for future project development. The Lao PDR recognizes that its capacity with respect to MRV requires development if the climate change goals set out in its INDC are to be realized. Specifically, a GHG inventory system, nationally appropriate mitigation actions,MRV framework, adaptation evaluation indicators, and tracking systems for climate finance need to be developed. In the immediate term, to develop an MRV system, the Lao PDR intends to carry out the following:

    - Readiness assessments. These will identify the current state and barriers on data, organizational arrangements, personnel capacity, national policies, and any existing domestic MRV systems.

    - Capacity building. Once the readiness assessment is complete, a capacity development plan will be produced and implemented, and tools will be provided to carry out MRV inclusively.

References

UNFCCC (2015) Lao PDR report on Intended Nationally Determined Contribution, 30 September 2015.

3H.Review of Nationally Determined Contributions of Malaysia

Introduction

In 2013, parties to the United Nations Framework Convention on Climate Change (UNFCCC) were invited to initiate domestic preparations for and submit their intended Nationally Determined Contributions (INDC) by 2015. The INDC submission aimed to facilitate the UNFCCC negotiations for adopting relevant instrument under the convention applicable to all parties towards achieving the objective of the convention as set out in its Article 2. Countries were expected to outline in their INDCs the post-2020 climate actions they intend to take under an international agreement. During the 21st Conference of the Parties (COP21) of UNFCCC in Paris in December 2015, the parties adopted the Paris Agreement, a historic international climate agreement aimed to hold increase of global average temperature to well below 2°C, to pursue efforts to limit the increase to 1.5°C, and to achieve net zero emissions in the second half of this century.

Malaysia submitted its INDC to UNFCCC in November 2015. It stipulates that Malaysia intends to reduce its greenhouse gas (GHG) emissions intensity of gross domestic product (GDP) by 45% by 2030 relative to the emissions intensity of GDP in 2005. This consist of 35% on an unconditional basis and a further 10% conditional upon receipt of climate finance, technology transfer, and capacity building from developed countries. Malaysia's INDC was developed by a participatory process through an inter-ministerial/agencies working group. Stakeholder consultations were conducted in 2015 to obtain inputs on possible measures to reduce GHG emissions.

Major GHG-Emitting Sources

In 2005, Malaysia emitted about 288 metric tonnes of carbon dioxide equivalent ($MtCO_2e$), including emissions from the land-use change and forestry sector. With the country's GDP in 2005 of RM543.578 billion (US$ 143.534 billion), the emissions intensity of GDP in the base year was 0.531 tonnes CO_2 eq per thousand RM. The GHGs to be covered were carbon dioxide, methane, and nitrous dioxide. The sectors to be addressed were the energy, industrial processes, waste, agriculture and land use, and land-use change and forestry.

Table 3H.1. Level of Emissions in the Energy Sector, 2005 and 2011

Source of Emissions	Historical Emissions ($ktCO_2e$)	
	2005	2011
Energy industries	91,308.04	113,885.95
Transport	45,608.51	44,310.00
Industry	35,636.30	23,094.82
Oil and gas	27,106.17	29,535.66

CO_2 = carbon dioxide, $ktCO_2e$ = kilotonne of carbon dioxide equivalent.
Source: Malaysia's First Biennial Update Report submitted to the United Nations Framework Convention on Climate Change in December 2015 (MNRE, 2016).

In the context of the Intergovernmental Panel on Climate Change's categorization of GHG inventory, the energy sector consists of six sub-sectors. Four of these sub-sectors alone – energy industries, transport, manufacturing, and oil and gas – emitted about three-quarters of total national emissions in 2005 and 2011. Table 3H.1 summarizes the level of emissions from these four energy sub-sectors.

Mitigation Actions

Power sector

Feed-in tariff mechanism

A feed-in tariff (FiT) mechanism has been implemented in Peninsular Malaysia and Sabah since 2011 to increase proportion of renewable energy in the fuel mix for grid electricity generation. The aim is to enhance national electricity supply security and sustainable socio-economic development. Indigenous renewable energy sources targeted for generation of power for supply to the grid network include biogas (e.g. agro-industrial waste and landfill gas), biomass (e.g. agro-waste and municipal solid waste), small hydropower, and solar photovoltaic. The mechanism obliges distribution licensees to buy from feed-in approval holders the electricity produced from renewable energy sources and supplied to the electricity grid for a specific duration. By guaranteeing access to the grid and setting a favourable price, it ensures that renewable energy becomes a viable and sound long-term investment for company's industries and for individuals. Renewable energy generation is based on statements of claims on sales by all approval holders submitted by distribution licensees for recovery from the Renewable Energy Fund.

Net energy metering scheme

The net energy metering scheme was initiated as one of the two programmes to continue effort of the feed-in tariff mechanism – which would end by 2017 – in developing renewable energy projects in Peninsular Malaysia and Sabah. The scheme was agreed by the Implementation Committee for Electricity Supply and Tariff in 2015 with a total capacity of 500 megawatts (MW) from 2016 to 2020. As announced in the 2016 budget, the Sustainable Energy Development Authority will offer a quota of 100 MW per year to encourage the use of solar photovoltaic (PV) system. It is an instrument implemented under the Eleventh Malaysia Plan to enable consumers to use their own generating facilities to offset their consumption of electricity over a billing period. Its implementation will provide savings on electricity bills to consumers by allowing renewable energy generators to use the electricity first and feed surplus electricity to the grid.

Solar PV is the only technology applicable under the net energy metering scheme, mainly because of its feasibility for the public at large to address climate change by generating clean energy. Furthermore, based on feed-in tariff experience, solar PV is a technology that requires minimal construction and with high take-up rate compared to other renewable energy technologies, mostly due to the declining cost of solar PV systems in recent years.

The concept of net energy metering is that the energy produced from the solar PV system installed will be consumed first and any excess will be exported and sold to the distribution licensees (such as the Tenaga Nasional Berhad [TNB] and the Sabah Electricity Sdn Bhd [SESB]) at the prevailing displaced cost prescribed by the Energy Commission. This scheme is applicable to all domestic, commercial, and industrial sectors if they are customers of TNB (Peninsular Malaysia) or SESB (Sabah and FT Labuan).

Large-scale solar photovoltaic plants

Together with the net energy metering scheme, the large-scale solar photovoltaic plants programme has been initiated by the government to encourage and increase the contribution of renewable resources in the fuel mix for national electricity generation after the feed-in tariff mechanism is ended by 2017. The large-scale solar photovoltaic plants programme (LSS) aims for large-scale solar projects with minimum 1 MW and maximum 50 MW of power generation. The electricity generated from LSS will be connected to either the transmission network or distribution network in Peninsular Malaysia, Sabah, or Labuan.

In accordance to the decision by the Planning and Implementation Committee of Electricity Supply and Tariff in August 2015, LSS will be implemented by the Energy Commission from 2017 to 2020 with a total 1,000-MW generation from Peninsular Malaysia and Sabah. For each year of the 4-year implementation, 200 MW will be installed in Peninsular Malaysia and 50 MW in Sabah. Besides the 1,000 MW through a competitive bidding framework, additional LSS projects will also be directly awarded in 2017, which include 150 MW in Peninsular Malaysia and 50 MW in Sabah.

Public and private licensees (non-feed-in tariff) for renewable energy generation

The Electricity Supply Act 1990 (amended in 2001) requires that any activity related to the supply of electricity be licensed. In accordance to the Electricity Regulations 1994 (amended in 2003), public and private licences may be granted. ST grants licences for the operation of such facilities in Peninsular Malaysia and Sabah.

Public licence is for the licensee to operate a public installation to supply energy to others; private licence is for the licensee to operate a private installation to generate electricity for its own use or at its property. In terms of renewable energy, the licences allow public licensees to sell electricity generated from renewable energy sources to utilities. The private licensee can manage electricity generation for own use using efficient technologies such as co-generation or power generation using renewable energy sources.

During operation, the licensee is required to monitor and submit information on monthly performance to ST. The electricity generation and installed capacity of renewable energy by public and private licensees are published by ST in its annual National Energy Balance. This mitigation effort excludes renewable energy generated from feed-in tariff mechanism.

Transport sector

Development of energy-efficient vehicles

The development of energy-efficient vehicles (EEVs) is one main objective of the National Automotive Policy 2014, including making Malaysia the regional hub for EEVs in ASEAN. By 2020, it was projected that some 85% of vehicles produced in the country will be EEVs. The key agencies for driving EEV development include the Ministry of International Trade and Industry and the Malaysian Automotive Institute.

EEVs are vehicles that meet a set of defined specifications in terms of carbon emissions level (gCO_2e/km) and fuel consumption (L/100 km). EEVs include fuel-efficient internal combustion engine vehicles, hybrid and electric vehicles, and alternative-fuelled vehicles.

The government has implemented several programmes to drive the EEV development forward, including several roadmaps to support the implementation of the National Automotive Policy 2014. Fiscal incentives of 100% tax exemption for both import duty and excise duty for hybrid electric vehicles were provided in 2011–2013. Tax exemption was also extended for models assembled in Malaysia for hybrids and EVs until 2015 and 2017, respectively. Beyond these dates, the exemptions will be determined based on the strategic value of these completely knocked-down assembly investments.

Use of compressed natural gas in motor vehicles

In Malaysia, the utilization of natural gas is diversified, including natural gas for vehicles. Natural gas is more environmentally attractive than other fossil fuels because it is composed chiefly of

methane that releases carbon dioxide and water vapour when burned completely. In comparison, oil and coal compounds have much more complicated molecular structures that do not burn as cleanly. As such, the use of compressed natural gas (CNG) as an alternative fuel in automobiles has been promoted to enhance environmental quality and reduce carbon emissions.

CNG is mostly used in public transport vehicles which run on both natural gas and gasoline. The use of CNG was originally introduced for taxis during the late-1990s. New taxis were launched with NGV engines while operators were encouraged to install CNG tanks in existing taxis to minimize operational costs. To date, the use of CNG still predominantly occurs in the main cities, including Klang Valley and Penang. As fuel subsidies have been gradually removed in Malaysia since 2008, the subsequent price hike on petrol and diesel has led to a significant increase in the number of new CNG tanks installed. To date, no incentives have been offered to users of CNG engines other than taxi owners, while government subsidies on petrol and diesel have made conventional road vehicles cheaper to use in the eyes of the consumers.

Urban rail-based public transport

The Land Public Transport Master Plan underpins the development and operation of rail-based transportation in the country, especially in the urban areas. The rail network continues to be the backbone of Malaysia's existing and future public transport system. The government is injecting substantial investments to improve the rail network across major cities in the country. Rail usage is the fastest-growing among all modes of urban public transportation per ridership data from rail operators.

Public investment in rail-based urban mass transit infrastructure in the Klang Valley is taking place in the form of the light rail transit, the mass rapid transit, and the monorail networks. It aims to upgrade and integrate the urban public transport system and to promote reduced use of private transport and demand on-road infrastructure through increasing public transport modal share. The initiatives include construction of new rail-based mass rapid transit networks to integrate with the existing networks, and extension of existing networks to increase coverage and enhance efficiency.

Palm oil-based biodiesel in blended petroleum diesel for the transport sector

Palm oil biodiesel is an alternative fuel derived from palm oil and can be used as fuel in diesel engines without any engine modifications. It can also be blended in any proportion with petroleum diesel. The biodiesel-blended petroleum diesel can increase the use of palm oil-based biodiesel as a renewable clean-burning petroleum diesel replacement to contribute towards reducing Malaysia's dependence on fossil fuels and enhancing sustainable socio-economic development.

The B5 biodiesel is a blend of 5% palm oil or palm methyl ester and diesel, the use of which has been implemented in phases in the country since 2011. Depots nationwide with in-line blending facilities have been set up by the government together with participating petroleum companies. Since 2015, the programme has increased to 7% palm biodiesel blended with 93% petroleum diesel under the B7 programme.

Industry sector

Energy efficiency measures by large and medium-size industries

An energy audit maps the energy consumption of a facility. It aims to identify areas where energy efficiency can be implemented including, for example, energy wastage from equipment that is left on but not being used, or improvements in the processes that lead to energy savings. The outcome of an energy audit is recommendations on energy efficiency measures to be implemented and an evaluation of their costs and benefits. Energy audits are typically done by external consultants with expertise in energy auditing methods and the facility.

ST is implementing an energy audit and management programme that offers free energy audits to large and medium-size industries. In return, the owners are required to invest in energy-savings measures with an amount equal to the cost of the audit. The energy savings that can be expected from energy audits are at least 5% per year for 3 years of the total energy consumption of the installations concerned. Most of these savings are derived from eliminating energy wastage and accelerated change of inefficient equipment which are beyond their economic and technical lifetime. Larger energy efficiency projects are not considered in the savings calculations but will most likely also take place in many of the facilities which will significantly increase the savings.

Energy management is the day-to-day monitoring and management of the energy consumption in a facility. Programmes are initiated to mandate facilities to implement energy management by appointing an energy manager and preparing energy management reports. The Efficient Management of Electrical Energy Regulations 2008 already prescribes that large facilities need to implement energy management and this will be expanded to cover medium-size facilities. Furthermore, the energy management system requirements will be improved to ensure that energy efficiency measures and practices are being continuously implemented and tracked.

The campaign will run in the period 2016–2025 and target large and medium-size industrial facilities. The former consume a monthly electricity exceeding 500,000 kWh. It is estimated that there are approximately 1,500 and 3,000 large and medium-size industries, respectively.

Promotion of cogeneration in industries

Cogeneration increases thermal conversion efficiencies by generating both electricity and thermal power. However, its implementation, especially in the industries, is hindered by high top-up and standby rates and the inadequacies in the natural gas supply for co-generation.

These barriers will be addressed in ST's effort in promoting cogeneration in industries with high demand of heating or cooling. Several key strategic measures will be implemented including:

- Design of standby, top-up and load-connected charges that are cogeneration friendly by lowering the amount of charges and offering non-firm standby charges (daily or monthly as used charges).
- Open bidding for special package of cogeneration plants with special gas tariff pricing.
- Promoting the existing incentives such as low-cost financing by the Malaysia Green Technology Corporation and others.
- Capacity building for local manufacturers.
- Regulatory framework for grid-connected cogeneration and sales of excess power.
- Awareness enhancement on the benefits of cogeneration.

The market is facilities with high demand for heating or cooling. The preliminary market is only considered to be the supported projects in this programme. By the end of the plan period, it is targeted to have 100 operating cogeneration plants.

Use of high-efficient motors in industries

Motors are widely used in industrial processes and machinery and can either be purchased as stand-alone motors or integrated in equipment. Malaysia's Energy Commission or Suruhanjaya Tenaga (ST) has adopted the international standard by the European Committee of Manufacturers of Electrical Machines and Power Electronics and the International Electronical Commission for energy rating of motors, which classifies motors per the level of energy efficiency. ST is implementing a mandatory minimum energy performance standard for motors, planned to be effective in 2020, that defines the minimum performance for motors. In the period until 2019, awareness and promotion campaigns will be carried out to inform the industries about the benefits of energy-efficient motors and phasing out of low-efficient types. The campaign will also target importers and manufacturers of motors and equipment with integrated motors.

Oil and gas sector

Flaring and venting reduction in oil and gas operations in Malaysia

Fugitive emissions occur in oil and gas systems that comprise all infrastructure required to produce, collect, process or refine, and deliver natural gas and petroleum products to the market. The system begins at the wellhead or oil and gas source and ends at the final sales point to the consumer. The sources of fugitive emissions on oil and gas systems include, but are not

limited to, equipment leaks, evaporation and flashing losses, venting, flaring, incineration, and accidental releases (e.g. pipeline dig-ins, well blow-outs, and spills).

Petronas, an oil and gas company owned by the government of Malaysia, recognizes its corporate responsibility to balance climate change risks while sustainably producing affordable and reliable energy. Within its Climate Change Framework, Petronas' carbon commitments drive the efforts to reduce carbon footprint and improve operational efficiency, including reducing flaring and venting in upstream.

In 2015, the oil and gas company's reduction in flaring and venting at several oil fields in domestic operations led to a 17-% decline of its overall annual emissions compared to 2014. The reduction was mainly attributable to the elimination of continuous flaring and venting for new projects, vent-to-flare conversion projects in existing undertakings and assets, better good management, and improved export compressor reliability.

Petronas has been gathering information of relevant activities since 2005 that result in emissions reductions from flaring and venting operations. This information is subject to third-party verification. Subsequently, upon internal approval, it may be disclosed in sustainability report and/or provided to relevant government ministries. The verified information is expected to be available in the first half of 2017. The estimated emissions reduction of 5–8 $MtCO_2e$ is the amount of reductions targeted to be achieved annually by 2030.

Commercial and residential sector

Energy efficiency measures in large and medium-size commercial buildings

ST is implementing an energy audit and management programme that offers free energy audits to large and medium-size commercial buildings. In return, the owners are required to invest in energy-saving measures an amount equal to the cost of the audit. The energy savings that can be expected from energy audits are at least 5% per year for 3 years of the total energy consumption of the installations concerned. Most of these savings are derived from eliminating energy wastage and accelerated change of inefficient equipment which are beyond their economic and technical lifetime. Larger energy-efficiency projects are not considered in the savings calculations but will most likely also take place in many of the facilities which will significantly increase the savings.

Energy management is the day-to-day monitoring and management of energy consumption in a facility. Programmes will be initiated to mandate facilities to implement energy management by appointing an energy manager and preparing energy management reports. The Efficient Management of Electrical Energy Regulations 2008 already prescribes that large facilities need to implement energy management and this will be expanded to cover medium-size facilities. Furthermore, the energy management system requirements will be improved to ensure that energy-efficiency measures and practices are being continuously implemented and tracked.

The campaign will run in 2016–2025. Energy management in large commercial facilities will be conducted during the whole plan period. Training courses and materials will be prepared to create awareness about energy-saving options and reporting will be required from the facilities. It will be marketed as an additional brand value for the facility.

The programme targets large and medium-size commercial buildings. The former consume a monthly electricity exceeding 500,000 kWh. It is estimated that there are approximately 600 and 1,400 large and medium-size commercial buildings, respectively.

Energy-efficiency measures in large government facilities

ST is implementing an energy audit and management programme that offers free energy audits to large government buildings. In return, the owners are required to invest in energy-saving measures an amount equal to the cost of the audit. The energy savings that can be expected from energy audits are at least 5% per year for 3 years of the total energy consumption of the buildings concerned. Most of these savings are derived from eliminating energy wastages and accelerated change of inefficient equipment that are beyond their economic and technical lifetime. Larger energy-efficiency projects are not considered in the savings calculations but will most likely also take place in many of the facilities which will significantly increase the savings.

Energy management is the day-to-day monitoring and management of energy consumption in a building. Programmes will be initiated to mandate facilities to implement energy management by appointing an energy manager and preparing energy management reports. The Efficient Management of Electrical Energy Regulations 2008 already prescribes that large building need to implement energy management. Furthermore, the energy management system requirements will be improved to ensure that energy-efficiency measures and practices are being continuously implemented and tracked.

The campaign will run in 2016–2025. For large government facilities, energy management will be compulsory by circular. This will allow the government to show leadership in energy efficiency as well as in implementing cost-reduction measures. A part of the energy management will be procurement procedures, ensuring that the government facilities are purchasing 5-star rated equipment.

The programme targets large government buildings that consume a monthly electricity exceeding 500,000 kWh. It is estimated that there are approximately 108 large government buildings.

Building energy efficiency through Green Building Index

The Green Building Index is a private-sector regulated green building rating tool initiated in 2013. In line with the demand for good corporate social responsibility, it aims to promote sustainability in the built environment through the application of green rating tools for buildings and

townships by stakeholders in the building sector. The tool also encourages property developers and owners to plan, design, construct, and sustainably manage buildings and sites to optimize energy and water efficiency, enhance indoor environment quality, and to use materials and resources sustainably. During its implementation, the index compiles electricity consumption of all completed, assessed, and verified buildings based on the findings of completion and verification assessments conducted for computing energy savings in the certified buildings.

Promotion of 5-star rated refrigerators

The Programme for Promoting 5-Star Rated Refrigerators aims to transform the market of new refrigerators into more efficient models. It builds on the existing 5-star rating and labelling for refrigerators, which was introduced on a voluntary basis in 2005. Over the years, the rating and labelling initiative stimulated the 5-star rated refrigerators in the market, but its share is still low compared to conventional refrigerators that are 3-star rated. The 5-star rated refrigerators are more than 25% energy-efficient than the average 3-star refrigerators. As nearly all households in Malaysia own a refrigerator, which is often one of the most electricity-consuming appliances, increasing the market share of more energy-efficient refrigerators will result in high potential for energy savings. Total market is determined based on all residential consumers having one refrigerator each and this will increase annually with the increase in the number of registered consumers.

The programme will be implemented through several measures, including enforcement of minimum energy performance standards (MEPS) and labelling, review of the current MEPS value, awareness raising for promoting purchase of 5-star refrigerators, and the benefits of smart meter.

Promotion of 5-star rated air-conditioners

The programme aims to promote 5-star rated air-conditioners to residential and commercial users for saving energy use. The sale of air-conditioners is expected to increase with the growth of economy and population. For modern homes, it is not unusual that three to four air-conditioners are installed. Therefore, it is important to ensure that the consumers are choosing energy-efficient models.

The Energy Commission is implementing a mandatory star-rating scheme and energy labelling for air-conditioners. Air-conditioners with 5-star rating are at least 25% more efficient than conventional models. The programme will be implemented through several measures, including enforcement of mandatory MEPS and labelling of all air-conditioners in the market, improving the standards (wider range of capacity) and MEPS value, and raising awareness for promoting purchase of 5-star air-conditioners and the benefits of smart meter.

Promotion of energy-efficient lighting

Lighting is a basic electrical energy-consuming appliance to residential and commercial users. For the latter, lighting accounts for about 15%–20% of total electricity consumption. As such, improving lighting energy efficiency can result in substantial energy savings. The Programme for Promoting Energy-Efficient Lighting aims to achieve such objective. Measures to be implemented by ST include enforcement of MEPS and labelling as well as awareness-enhancement programmes including the benefit of using smart meters.

Conclusions

The progress of INDC implementation needs to be monitored to determine if the intensity-reduction targets are achieved. Such tracking will provide early alert if additional mitigation efforts are required when necessary.

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Petroliam National Berhad (PETRONAS), (2016), *Building Strength through Adversities: Sustainability Report 2016I,* Kuala Lumpur: Petronas.

3I.Review of Nationally Determined Contributions of Myanmar

National Circumstances

Myanmar's Intended Nationally Determined Contributions (INDC) is an opportunity to confirm its commitment to climate change mitigation by pursuing the correct balance between socio-economic development and environmental sustainability. To this end, Myanmar has identified mitigation actions and policies in the primary areas of forestry and energy, complemented by supporting policies in other sectors.

However, as one of the world's least developed countries, Myanmar's existing technological, financial, and capacity gaps limit its ability to achieve its vision for sustainable development while balancing socio-economic development with environmental sustainability. For this reason, Myanmar requires significant support from the international community for capacity building, technology development and transfer, and financial resources to implement the actions proposed in its INDC.

Mitigation Contribution

Myanmar would undertake mitigation actions in line with its sustainable development needs, conditional on availability of international support, as its contribution to global action to reduce future emissions of greenhouse gases (GHG).

Mitigation actions

The actions presented below will result in significant reductions in GHG emissions. The implementation of these actions will be contingent to several factors, including support for capacity-building, technology development and transfer, and financial resources from the international community, as well as the active participation of the national and international private sector.

- By 2030, Myanmar's permanent forest estate target is to increase national land area as forest land.
- Actions are taken on both the supply side and the demand side of energy.
- The government of Myanmar is currently developing policies with the Long-Term Energy Master Plan and the National Electrification Master Plan, developed alongside the Energy Master Plan to increase the share of hydroelectric generation within limits of technical hydroelectric potential.
- To increase access to clean sources of electricity amongst communities and households currently without access to an electric power grid system.
- For energy efficiency in industrial processes:

(a) To mitigate GHG emissions in the rapidly developing industrial production sector by improving energy efficiency within the Myanmar industry.

(b) To focus on the implementation of energy management systems compatible with the international standard ISO50001.

(c) To realise a 20% electricity saving potential by 2030 of the total forecast electricity consumption.

- To increase the number of energy-efficient cooking stoves disseminated to reduce the amount of fuel wood used for cooking under the National Forestry Master Plan and National Energy Policy.

Institutional arrangements and planning for implementation

Climate change and environment

- The National Climate Change Policy, Strategy and Action Plan is being developed by the Myanmar Climate Change Alliance Programme and the Ministry of Environment, Conservation and Forestry and is designed to increase awareness of climate change in Myanmar, strengthen institutional capacity to develop policies to address it, and develop ecosystem-based adaptation practices.
- The Green Economy Strategic Framework is under development and will be ready in 2016.
- The National Environmental Policy, Framework and Master Plan (2030) is also currently being developed with the United Nations Development Programme and will update the National Environmental Policy (1994).
- The Environmental Conservation Law (2012) is being implemented and includes provisions to address climate change and make provisions for environmental impact assessments for development projects.
- The State of Environment Report 2015 was published.

Forest management

- The National Forestry Master Plan was first implemented in 2001 and will expire in 2030, upon which the next strategy will be designed and implemented.
- In 2011, the National Biodiversity Strategy and Action-Plan was published as a complementary strategy to the Master Plan.
- The National Strategy Action plan (2015) was published.
- Myanmar joined the United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries

in November 2011, submitted its REDD+ Readiness Roadmap document in 2013, and developing country programme and taking actions in line with the REDD+ roadmap.

Energy management

- The National Energy Policy (2014) is the overarching national policy that provides the framework for energy development and planning in Myanmar.
- The Long-Term Energy Master Plan was published.
- The National Energy Efficiency and Conservation Policy, Strategy and Roadmap for Myanmar draft was finalized.
- The National Electricity Master Plan draft has been finalized. It aims to harmonize the medium- and long-term decisions on primary energy source selection and transmission system planning.

Other key sector

- The National Transport Master Plan and the National Implementation Plan on Environmental Improvement in the Transport Sector are being developed.
- To promote sustainable urbanisation, the government of Myanmar is drafting the National Urban and Regional Development Planning Law, a national housing policy, and a national urban policy.
- The National Waste Management Strategy and Action Plans was completed in 2017.
- The Ministry of Agriculture and Irrigation is involved in the following research works: alternative wet and dry paddy production techniques, implementing effective mitigation actions such as energy from crop residues, promoting the use of organic fertilisers, and methods to shorten the time of composting agricultural by-products. The bio-char programme is also being planned and will reduce GHG emissions as a result of less anaerobic decomposition in the production process. At the same time, this will increase crop production.

Adaptation

A National Adaptation Plan will be developed to plan, fund, and guide actions to meet adaptation objectives and priorities. Its implementation will be continued as planned in the document submitted to the INDC.

Implementation of INDC

There are five main aspects for successful implementation of INDC:

- Development of a clear strategy and coordination plan;
- Separate needs assessments for mitigation and adaptation activities;
- Identification of capacity-building requirements for mitigation and adaptation activities;
- Mobilising resources for policy development, identification, and purchase of suitable technologies for planned actions; and
- A monitoring system

Means of Implementation

To implement its INDC, Myanmar, as a least developed country, requires further capacity building along with access to technological and financial support from the international community.

Technology development and transfer

Understanding technology development and transfer needs in Myanmar is still developing and an additional technology need assessment should be completed with international support to better understand these requirements. Clearly needed is the transfer of environmentally sound technologies such as renewable energy and energy efficiency technologies for mitigation and flood control technology and early warning technologies for adaptation.

Capacity building

Mitigating climate change and adapting to its impacts will require significant capacity building in all aspects of Myanmar's plans to implement actions identified in its INDC. Human resources, scientific research, and technical and institutional capacities all require development, and international assistance is an important requirement to achieve these. For the various stages of the monitoring, reporting, and verification process, Myanmar will require international support at each step.

Financial support

The financial support required for the technology needs assessment for mitigation and adaptation activities, financial need assessment for estimation of implementation and operational and maintenance cost, identification of need assessment for capacity building for implementation, and monitoring of mitigation and adaptation activities. It is envisaged that financial support will be utilised by Myanmar in a variety of ways including but not limited to implementing identified actions in the forestry sector and energy sector; addressing financial needs of the other key sectors; development and implementation of other sectoral and eventually national monitoring, reporting, verification systems; producing GHG emissions

inventories; quantifying development benefits; accounting for funds received; and reduction in vulnerability.

Mitigation Actions and Policies in the Energy Sector

1. Energy: 30% renewable in rural electrification (mini hydropower; biomass; solar, wind, and solar minigrid technologies)
2. Clean cooking and heating: Distribute approximately 260,000 energy-efficient cooking stoves between 2016 and 2031.
3. Renewable energy (hydropower): 9.4 GW hydro-electric generation by 2030.
4. Energy efficiency: 20% electricity-saving potential by 2030 of the total forecast electricity consumption.

Way Forwards

1. To finalize and submit NDC.
2. To revise INDC.
3. To update and add to NDC ahead of finalization, including corrections and clarifications.
4. Means of implementation, including progress on climate finance framework.
5. Implementation plans, including any outputs from the stakeholders' workshop.
6. To draw the NDC implementation roadmap.
7. To define the specific targets for each sector.

Reference

Myanmar's Intended Nationally Determined Contribution (2015), Ministry of Environment Conservation and Forestry.

3J.Review of Nationally Determined Contributions of New Zealand

An important feature of the Paris Agreement is the emissions target each country pledges under the framework of Intended Nationally Determined Contributions (INDC), which further progressed into Nationally Determined Contributions (NDC) once countries ratified the agreement. New Zealand's first NDC sets a clear commitment to reduce emissions by 30% below 2005 levels by 2030 that equals to 11% of emissions reduction against the 1990 levels. This demonstrates a progression beyond the current target, particularly with regards to cost and emissions impact. Compared to the Business as Usual (BAU) emissions, New Zealand's NDC target represents a significant reduction that also reflects continuous improvement in emissions efficiency across the economic activities in the country. New Zealand's INDC target is economy-wide absolute emissions reduction covering five sectors of the economy (UNFCCC, 2016). The scope and coverage of New Zealand's NDC is presented in Table 3J.1.

Table 3J.1. Scope and Coverage of New Zealand's NDC

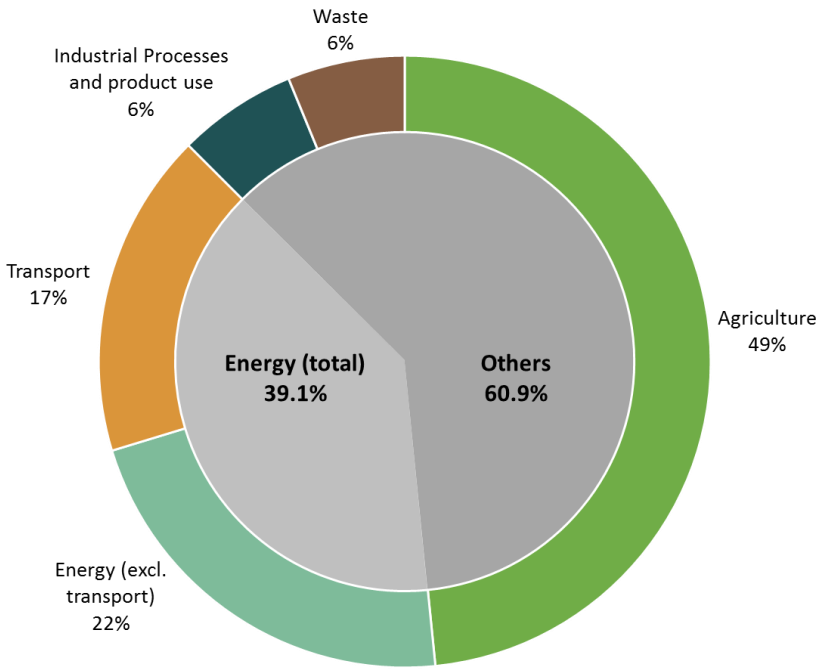
Target	Emissions reduction to 30% below 2005 levels by 2030
Target type	Absolute reduction target, managed using a carbon budget
Gases covered	Carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF_6), nitrogen trifluoride (NF_3)
Sectors covered	Energy, industrial processes and product use, agriculture, forestry and other land use, and waste.
Baseline scenario	2005

NDC = Nationally Determined Contributions.
Source: UNFCCC (2016).

New Zealand is endowed with abundant and diverse energy sources, including renewable sources. Among OECD countries, New Zealand already has the highest share of renewable sources in electricity generation. Around 80% of its electricity has come from renewable sources in recent years and New Zealand aspires to progress towards achieving 90% of electricity generation from renewable sources by 2025 (UNFCCC, 2015).

Since 1990, emissions intensity in the New Zealand economy has decreased by 33%. On a gross emissions basis, New Zealand generated around 400 tonnes of carbon dioxide (CO_2) per unit of GDP in 2013. Chart 3J.1 presents GHG emissions per sector in New Zealand (2013) as reported in its national inventory report in 2015 (UNFCCC, 2015).

Chart 3J.1. New Zealand Greenhouse Gas Emissions by Sector in 2013



Source: Prepared by author with data sourced from UNFCCC (2015).

New Zealand emissions are relatively small compared to the total global emissions. In 2012, New Zealand only contributed 0.15% of global emissions. Despite having small share of emissions globally, New Zealand is committed to play its part in the global efforts to combat climate change. The country's first INDC communication mentions that the cost to attaining the 2030 target would be greater than that borne by other countries in meeting their climate target (in terms of GDP). The reasons for high abatement cost are the inclusion of already high level of renewable electricity generation and nearly half of the country's emissions generated from the agriculture sector (UNFCCC, 2015).

While New Zealand is committed to decarbonising its economy, significant challenges lie ahead. The country acknowledges that capturing the atmospheric stocks of CO_2 is perceived as the most pressing challenge. Given the limited potential for domestic abatement, New Zealand will employ market mechanism to meet the pledged target. An example is through carbon markets that allows the trading and the use of wide variety of mitigation outcomes that meet the standard and guidelines. The New Zealand government wants to ensure the environmental integrity of emissions reductions generated or purchased, avoid double counting, and ensure transparency in accounting and governance (UNFCCC, 2016).

Another challenge to decarbonization is the significant share of emissions from the agricultural sector, particularly biological methane that brings manifold challenges to the transformation into low-emissions economy (UNFCCC, 2015). Significant proportion of emissions coming from the agriculture sector seems to be unusual for a developed country. Reducing emissions from

the agriculture sector would be burdensome for New Zealand considering that it needs more food to accommodate the growing population. At the same time, the agriculture industry historically provides critical contribution to the country's economic growth. In addition to that, historical forest planting and harvest cycle are significantly contributing to New Zealand emissions and are projected to continue in the future. In 2013, removals by forest land reached 33% of gross emissions. Nevertheless, New Zealand operates a highly efficient food production system and thus reducing total emissions from agriculture will be determined by technological innovation and adoption on the farm (MET, 2015). Moreover, New Zealand is gazette a target to reduce emissions to 50% (against 1990 levels) by 2050 (UNFCCC, 2015).

New Zealand's electricity generation is rather different from most countries. It has 80% of electricity generated from renewable sources, which means that New Zealand does not have much room to reduce emissions from power generation. The challenge for New Zealand is reducing the amount of carbon generated from the transport sector. Although emissions from this sector has been slowed recently, the amount accounts for the largest share of total energy emissions. Nonetheless, New Zealand is well placed to take advantage of its high share of renewable sources in electricity generation. The target to increase renewable uptake to 90% will further support the decarbonization in the transport sector (UNFCCC, 2015).

Decarbonizing the transport and agriculture sectors will take longer than the INDC commitment period (2021–2030). However, the government has anticipated the accelerated emissions reduction post-2030 if the agricultural mitigation technology and low-emission transport technology achieved their widespread deployment and uptake. Despite the manifold challenges of emissions reduction from the agriculture and transport sectors, the government is taking serious actions on each sector. For example, New Zealand has committed NZ$45 million to the Global Research Alliance on Agricultural Greenhouse Gases. The government further allocated NZ$48.5 million through New Zealand Agricultural Greenhouse Gas Research Centre for research on agricultural mitigation technology. Support for research will become priority for the New Zealand government (UNFCCC, 2015).

In response to the climate change challenges, New Zealand has formulated policies and actions that incorporate the national circumstances, level of the climate target, and recognition that climate change is a global issue that relies largely on domestic actions. New Zealand has formulated the Climate Change Response Act 2002 (the Act) that contains legal framework to enable the country to achieve its international climate pledge. Some amendments were made in 2008, including the introduction of the New Zealand Emissions Trading Scheme, the primary mechanism for reducing national emissions and achieving the international climate commitments (UNFCCC, 2015).

Apart from that, New Zealand is expanding its efforts to reduce emissions well beyond its own footprint by, for example, providing leadership in research, technological advancement, and innovation to reduce emissions from the agriculture sector. The government has also established the New Zealand Agricultural Greenhouse Gas Research Centre that aims to deliver knowledge, technologies, and practices to allow the country to enhance its agricultural productivity with low emissions. New Zealand is one of the members of the Global Research

Alliance on Agricultural Greenhouse Gases whose objective is to increase international cooperation and investment in agricultural research to explore solutions for increasing food production in a sustainable way (UNFCCC, 2015).

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3K.Review of Nationally Determined Contributions of the Philippines

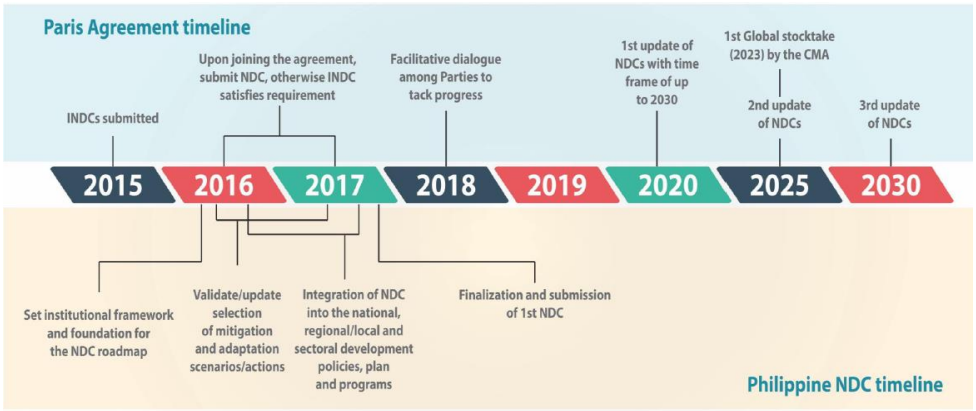
Introduction

The Republic of the Philippines officially submitted its Intended Nationally Determined Contributions (INDC) to the United Nations Framework Convention on Climate Change on 1 October 2015. It was premised on pursuing climate change mitigation as a function of adaptation since the country is highly vulnerable to climate and disaster risks. The Philippines recognizes its responsibility to contribute its fair share in global climate action, particularly in the effort to realize the ultimate aim of the convention to avoid dangerous anthropogenic interference with the climate system. Its adaptation actions that require additional support from international sources will enhance the country's capacity towards climate resiliency and its capacity to implement the mitigation options.

However, the Nationally Determined Contributions (NDC) efforts of the Philippines encompass a transition period from the previous government administration to the current one where, even if the level of commitment to the Paris Agreement i maintained, some differences in terms of perspectives on assumptions, methodologies, and other considerations on the NDC planning process are anticipated.

Content of INDC and NDC Roadmap Under the Previous Administration (2015)

Figure 3K.1. NDC Roadmap (Under the Previous Administration)



CMA = Conference of the Parties serving as the meeting of the Parties to the Paris Agreement, INDC = Intended Nationally Determined Contributions, NDC = Nationally Determined Contributions.
Source: Climate Change Commission, Office of the President of the Philippines.

The country's commitment to the Paris Agreement is described in Figure 3K.1. In 2015, INDC was

officially submitted, while from 2016 to 2017, the first NDC (which was supposed to be based on INDC) was finalized and submitted. The NDC is expected to be updated from 2020 until a third one in 2030.

Regarding its INDC commitment on mitigation options, the Philippines will target greenhouse gas (GHG) emissions reduction of 70% by 2030 relative to its Business as Usual (BAU) scenario of 2000–2030. The mitigation contribution is conditioned on the extent of financial resources – including technology development and transfer – and capacity building that will be made available to the Philippines. In the identification and selection of mitigation options, the country's climate vulnerabilities and capacity to implement are among the critical determinants.

For adaptation, the Philippines will strive to ensure that climate change adaptation and disaster-risk reduction are mainstreamed and integrated into the country's plans and programmes at all levels. The path towards a low-emission development will require climate resilience and improved adaptive capacity. Financial resources, technology transfer, and capacity-building support for adaptation will ensure that the country's committed mitigation INDC will be attained.

Current Position of the Philippines on NDC Effort

The Climate Change Commission of the Philippines announced on 24 March 2017, through its website, that the Instrument of Accession to the Paris Agreement of the Republic of the Philippines had been submitted to the United Nations. With this, the Philippines became a full-fledged party to the Paris Agreement on 22 April 2017.

With this development, the government makes the following declaration in relation to the Paris Agreement (Office of the President, 2017):

- That it is the understanding of the Government of the Philippines that its accession to and the implementation of the Paris Agreement shall in no way constitute a renunciation of rights under any local and international laws or treaties, including those concerning State responsibility for loss and damage associated with the adverse effects of climate change.
- That the accession to and implementation of the Paris Agreement by the government is for supporting the country's national development objectives and priorities such as sustainable industrial development, the eradication of poverty and provision of basic needs, and securing social and climate justice and energy security for all its citizens.
- Finally, the Government of the RP will submit its first Nationally Determined Contribution before 2020.

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Office of the President (2017), Text of Declaration to Accompany Instrument of Accession, Declaration of the Government of the Republic of the Philippines, 6 March 2017.

Climate Change Commission, Office of the President of the Philippines, Website Press release, 24 March 2017

3L. Review of Nationally Determined Contributions of Singapore

Singapore's National Circumstances

Singapore's national circumstances are recognized by the United Nations Framework Convention on Climate Change, where Articles 4.8 and 4.10 stand out as particularly relevant to the country's situation. Under Article 4.8, Singapore is classified as a small island country, with low-lying coastal areas and is very dependent on income coming from the processing and trade of fossil fuels and associated energy-intensive commodities. Difficulties in switching to alternative forms of cleaner energy could be attributed mainly to the land constraints Singapore faces, with only 719 km^2 of land area by which to accommodate around 5.6 million people (SINGSTAT, 2017). Hence, virtually no natural fuel resource could be found in Singapore and that it is challenging to accommodate infrastructure that could harness the potential of renewable energy sources such as wind and geothermal power.

However, Singapore is not deterred by this constraint and has intensified its carbon-reduction efforts to realise its climate change commitments which were endorsed during the Paris Agreements at the 21st session of the Conference of Parties to the United Nations Framework Convention on Climate Change on 12 December 2015, and further ratified in September 2016. Led by the Inter-Ministerial Committee on Climate Change and coordinated by the National Climate Change Secretariat, Singapore has put in place several mechanisms – mainly led by the public sector – by which to facilitate progress in reducing carbon and other associated greenhouse gas (GHG) emissions.

Singapore's Climate Commitments

Singapore pledged in 2009 to unconditionally reduce carbon emissions to 7% to 11% lower than its Business as Usual level by 2020 (UNFCCC, 2017). A further 16% reduction by 2020 is also committed after COP-21 in Paris on 12 December 2015 (Ho et al, 2016), where participating countries adopted a universal and legally-binding agreement on post-2020 climate action. In conjunction with this target, Singapore plans to further reduce emissions intensity by 36% in 2030 as compared to 2005 and stabilize its emissions at a peak by 2030. This means that at 2010 prices, Singapore's GHG emissions/S$ GDP should reduce from 0.176 kilogramme of carbon dioxide (CO_2) equivalent per Singapore dollar ($kgCO_2e$/S$) in 2005 to about 0.113 $kgCO_2e$/S$ in 2030.

Outline of Carbon Mitigation Efforts

Singapore's efforts mainly focus on policy measures that facilitate the investment of efficient technologies, fuel switching in power generation (from fuel oil to natural gas and solar power), as well as the measurement/reporting of energy use and associated emissions from both power-generation companies and firms listed in the Singapore Exchange Limited. There is emphasis on the integration of solar photovoltaic systems into the electricity grid, where harnessing power from the sun is currently the most viable renewable option for tropical Singapore. As such, 8% of Singapore's peak electricity demand could come from renewables in 2030. In addition, introducing carbon tax in 2019 is intended to ensure GHG emissions are further controlled (National Climate Change Secretariat, 2017). Singapore's mitigation efforts are supported by collaborative programmes with various organizations and research institutes worldwide (NEA, 2016), where it learns and shares experiences on carbon-mitigation strategies to further enhance its capabilities on climate actions.

Efforts so far have helped curb emissions in such a way that Singapore's share of global emissions (0.11%) is significantly smaller than its share of global trade (2.2%) (see Figure 3L.1).

Figure 3L.1. Efforts of Singapore to Curb Emission

As outlined in Singapore's Second Biennial Update Report 2016, it has achieved an estimated carbon abatement of more than 6 metric tonnes in 2014, which is already more than two-thirds of its quantitative goal in 2020. As such, it is well on track to realize its climate change commitments.

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3M.Review of Nationally Determined Contributions of Thailand

On 29 September 2015, Prime Minister H.E General Prayut Chan-o-cha (ret.) of the Kingdom of Thailand announced at the general debate of the 70th Session of the United Nations General Assembly that 'Thailand intends to reduce greenhouse gas emissions by 20% from the BAU [Business as Usual] level by 2030.' Thailand's level of contribution, the prime minister further said, could increase up to 25% subject to adequate and enhanced access to technology development and transfer, financial resources, and capacity-building support through a balanced and ambitious global agreement under the United Nations Framework Convention on Climate Change.

On 1 October 2015, Thailand's Office of Natural Resources and Environment Policy and Planning officially submitted the country's Intended Nationally Determined Contribution (INDC) in greenhouse gas to the United Nations Framework Convention on Climate Change (see Table 3M.1).

Table 3M.1. Accompanying Information to Annex Thailand INDC to UNFCCC

Baseline	Business as Usual projection from reference year 2005 in the absence of major climate change policies (BAU2030: approx. 555 $MtCO_2e$)
Time frame	2021–2030
Coverage	Economy-wide (inclusion of land use, land-use change, and forestry will be decided later)
Gases	Carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF6)
Assumptions and methodological approaches	– Global warming potential on a 100-year timescale in accordance with the Intergovernmental Panel on Climate Change Fourth Assessment Report – National statistics, including sector activity and socioeconomic forecasts
Planning processes	Thailand's INDC was developed through participatory process. Stakeholder consultations were conducted through the establishment of an inter-ministerial working group and steering committee comprising representatives from relevant sectoral agencies, the academe, and the private sector. In addition, three national consultations were held during the technical analysis phase. Thailand's INDC was formulated based on the following plans already approved or in the pipeline for approval by the Cabinet: – National Economic and Social Development Plans – Climate Change Master Plan B.E. 2558–2593 (2015–2050) – Power Development Plan B.E. 2558–2579 (2015–2036) – Thailand Smart Grid Development Master Plan B.E. 2558-2579 (2015–2036)

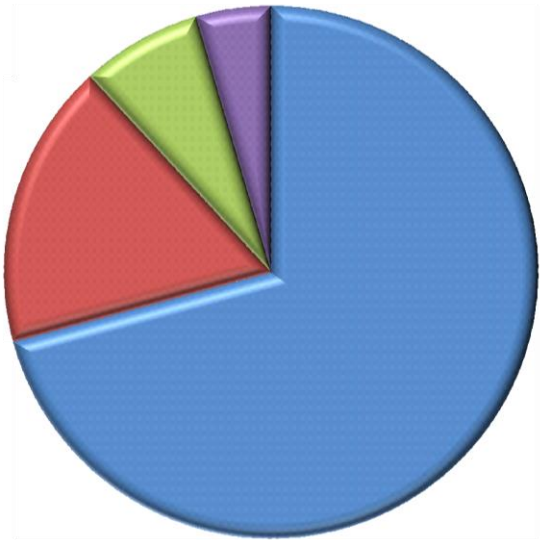
	– Energy Efficiency Plan B.E. 2558–2579 (2015–2036) - Alternative Energy Development Plan B.E. 2558–2579 (2015–2036) – Environmentally Sustainable Transport System Plan B.E. 2556–2573 (2013–2030) – National Industrial Development Master Plan B.E. 2555–2574 (2012–2031) – Waste Management Roadmap
International market mechanism	Thailand recognizes the important role of market-based mechanisms to enhance the cost effectiveness of mitigation actions, and, therefore, will continue to explore the potentials of bilateral, regional, and international market mechanisms as well as various approaches that can facilitate, expedite, and enhance technology development and transfer, capacity building, and access to financial resources that support Thailand's efforts towards achieving sustainable, low-carbon, and climate-resilient growth, as appropriate.
Review and adjustments	Thailand reserves the right to review and adjust its INDC as necessary upon finalizing the new global agreement under the UNFCCC.

INDC = intended nationally determined contributions, $MtCO_2e$ = million tonne of carbon dioxide equivalent, UNFCCC = United Nations Framework Convention on Climate Change.
Source: Office of Natural Resources and Environment Policy and Planning.

Greenhouse Gas Situation

According to the report of Thailand's contribution to COP21 in the UNFCCC, GHG emissions increased from 229.08 million tonnes of carbon dioxide equivalent ($MtCO_2e$) in 2000 to 305.52 $MtCO_2e$ in 2011, or an increase of 2.65% a year on the average. For GHG emissions by sector, on the average, the energy sector was highest emitter with a share of 70.79% and followed by agriculture, industrial process, and waste with 17.35%, 7.33% and 4.53%, respectively (see Figure 3M.1).

Figure 3M.1. Thailand's Emission of Gas by Source in 2011



Source: Office of Natural Resources and Environment Policy and Planning, 2015

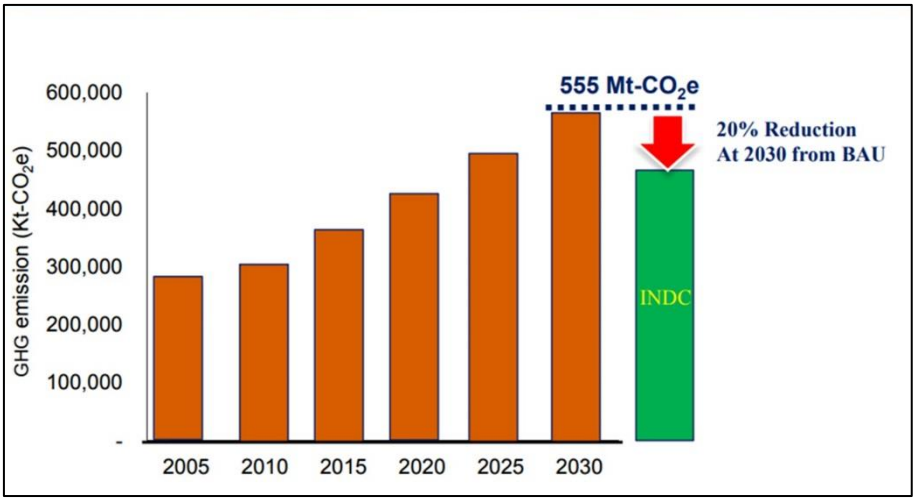
Greenhouse Gas Projection, BAU

According to the Office of Natural Resources and Environment Policy and Planning, GHG emissions in BAU case is expected to grow continuously from 279 $MtCO_2e$ in 2005 to 555 $MtCO_2e$ in 2030 or a 2.79 growth rate per year because of economic development, economic activities, rapid expansion of urban areas, and high consumption. The energy sector will continue to contribute the highest amount of GHG emissions among the big four sectors: the rest of them, agriculture, industrial process, and waste. GHG emissions from energy will increase from 195 $MtCO_2e$ in 2005 to 426 $MtCO_2e$ in 2030 or 76.76% of the total GHG emissions of all sectors. The rest of the three sectors taken together will take only 23.24% of the total GHG emissions. The second largest will be agriculture and is expected to emit much less than the energy sector, at around 77 $MtCO_2e$ in 2030, compared to 426 $MtCO_2e$ of the latter.

INDC and NDC of Greenhouse Gases in 2030

From BAU of GHG emissions in 2030, Thailand expects its GHG emissions to reach 555 $MtCO_2e$ by then, with 76.8% mainly from the energy and transport sectors alone. According to Thailand's INDC, the country will intend to reduce GHG emissions by 20% of the BAU emissions in 2030. It means that the amount of GHG emissions reduction of Thailand's intention should be 111 $MtCO_2e$.

Figure 3M.2. Thailand's INDC/NDC by 2030



Source: Office of Natural Resources and Environment Policy and Planning, 2017