KINGDOM OF CAMBODIA
NATION-RELIGION-KING

Implementation Plan for Long-Term Strategy for Carbon Neutrality

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ABBREVIATION

BUR	Biennial Update Report
CCCSP	Cambodia Climate Change Strategic Plan (2014 – 2023)
CCS	Carbon Capture and Storage
CNG	Compressed natural gas
DSM	Demand Side Management
EAC	Electricity Authority of Cambodia
EDC	Electricite Du Cambodge
FOLU	Forestry and other land use
GDA	General Directorate of Agriculture
GDAHP	General Directorate of Animal Health and Production
GHG	Greenhouse Gas
GWP	Global Warming Potential
IP	Implementation Plan
IPPU	Industrial Processes and Product Use
INDC	Intended Nationally Determined Contribution
LTS4CN	Long-Term Strategy for Carbon Neutrality
MAFF	Ministry of Agriculture, Forestry and Fisheries
MEF	Ministry of Economy and Finance
MoEYS	Ministry of Education, Youth and Sport
MISTI	Ministry of Industry, Science, Technology and Innovation
MLMUPC	Ministry of Land Management, Urban Planning & Construction
MME	Ministry of Mines and Energy
MOE	Ministry of Environment
MOT	Ministry of Tourism
MPWT	Ministry of Public Works and Transport
MRV	Measurement, Reporting and Verification
NCAP	National Cooling Action Plan
NCSD	National Council for Sustainable Development
NCDD	National Committee for Sub-National Democratic Development
NDC	Nationally Determined Contribution
NSDP	National Strategic Development Plan
REDD	Reducing Emissions from Deforestation and Forest Degradation
TNC	Third National Communication
UNDP	United Nations Development Program

EXECUTIVE SUMMARY

Cambodia submitted her Long-Term Strategy for Carbon Neutrality (LTS4CN) on 30th December 2021, which provides a vision for the country to achieve carbon neutrality in 2050 while ensuring the coherence of short-term climate action with long-term climate goals, and considering the balance between emission reduction, economic growth, social justice, and climate resilience. The strategy focusses on six sectors – agriculture, forestry, and other land use (FOLU), energy, transport, industrial processes, and product use (IPPU) and waste.

Now, the LTS4CN as a vision, needs to be implemented, integrating multiple stakeholders, national and international climate change, and allied processes, including alignment between the NDC and the LTS4CN. This implementation plan aims to further elaborate the long-term vision into clear policy pathways that guide Cambodia in meeting her commitment under her Updated NDC and towards net zero emissions by 2050.

The LTS4CN trajectory relies heavily on increasing carbon sinks in the FOLU sector, especially through execution of the REDD+ Investment Plan, which will drive reduced rates of deforestation as well as an expansion of afforestation and reforestation activities. In the energy sector, the strategy focusses on transitioning away from coal and increasing share of renewables, while using natural gas as a transition fuel, reducing demand through energy efficiency, and switching to cleaner forms of energy. In the transport sector, the emphasis is on increasing urban public transport, electrification of vehicles, and development of railways. In the agriculture sector, major emission reductions will be achieved by reducing methane-intensive rice and livestock production, and promoting composting and producing biogas in livestock management, organic fertilizer, and deep fertilizer technology. Key mitigation actions in the IPPU sector are clinker substitution and carbon capture and storage in cement production, recycling of aggregate concrete, and better management of direct emissions from the refrigeration and air-conditioning sector. In the waste sector, the focus is on improved solid waste management and domestic wastewater treatment, reducing open burning and mainstreaming of the 3R principle.

The implementation of the plan would need strengthening the country's position on strategic directions such as more sustainable management of forest resources, reducing dependence on coal, transferring subsidies from fossil fuels to renewables, and promoting public and non-motorised transport systems.

Across all sectors, the realisation of the LTS4CN targets would require investments in capacity building and innovation such as developing a cadre of certified energy efficiency and renewable energy professionals, expanding, and upgrading skills of scientists, engineers, and information technology professionals who can create appropriate technologies and processes suitable for Cambodian conditions and upgrading the skills of planning professionals (town planners, sectoral planners, etc). The education system and research institutions need to be upgraded to absorb these changes.

The implementation focusses more on addressing the drivers and root causes behind large scale emissions, which in many cases is driven by unsustainable consumption patterns and the absence of more sustainable and affordable alternatives. Hence, provision has been made for long term efforts to effect behavioural changes and to develop markets for cleaner and affordable alternatives, supported by technology transfer and indigenisation of technology.

The implementation of the LTS4CN in the energy, transport, IPPU, and waste sectors would require large investments in the infrastructure, such as power system modernisation and expansion, electric vehicle charging infrastructure, rail, and multimodal transport infrastructure, industrial, and building retrofits, etc. Across all sectors, steep increase in funding research and development is needed, for example, on improved methods to monitor forest and land cover, identifying low carbon agriculture practices and technologies or demonstrating viable carbon capture and storage systems. This would need large scale

private investments and public private partnerships, for which an enabling environment needs to be provided.

The long-term transition to carbon neutrality will be implemented adhering to the government's strong positions on poverty reduction, gender equality and leave no one behind. While the transition would produce net benefits, major changes in sectoral activities could disrupt viability of existing businesses and livelihoods, and loss of employment. Hence, transition finance and capacity building support are crucial to instil confidence and to support stakeholders successfully undertake the transition, especially micro, small, and medium enterprises (MSME), unskilled workers, farmers, and the most vulnerable. Impact assessments of the proposed policy pathways would help identify wider range of impacts and to devise safeguards.

1 INTRODUCTION

1.1 Background

Cambodia is focusing on poverty reduction and stable economic growth as part of her drive to become an upper-middle-income nation by 2030, as enshrined in the National Strategic Development Plan (NSDP). Cambodia is highly vulnerable to the effects of climate change, and at the same time her greenhouse gas (GHG) emissions are increasing rapidly. In response, Cambodia has made remarkable progress in climate change policy, especially in mainstreaming climate change into national and sub-national planning. The country has also developed and continues to implement the Cambodia Climate Change Strategic Plan 2014 – 2023 (CCCSP) (2013). Cambodia submitted her Nationally Determined Contribution (NDC) in 2015 and updated it in 2020. Cambodia's first Biennial Update Report (BUR) was completed in 2020, the Third National Communication (TNC) is recently finalized, and the National Framework for Monitoring and Evaluation of climate change response is also developed.

In addition, Cambodia submitted her Long-Term Strategy for Carbon Neutrality (LTS4CN) to the UNFCCC on 30th December 2021, which provides a vision for Cambodia to achieve carbon neutrality in 2050, while ensuring the coherence of short-term climate action with long-term climate goals, and considering the balance between emissions reduction, economic growth, social justice, and climate resilience. It focusses on six sectors – agriculture; forestry and other land use (FOLU); energy; transport; industrial processes and product use (IPPU); and waste.

The LTS4CN trajectory relies heavily on increasing carbon sinks in the FOLU sector, especially through execution of the REDD+ Investment Plan, which will drive reduced rates of deforestation as well as an expansion of afforestation and reforestation activities. In the energy sector, the strategy focusses on transitioning away from coal and increasing share of renewables, while using natural gas as a transition fuel, reducing demand through energy efficiency, and switching to cleaner forms of energy. In the transport sector, the emphasis is on increasing urban public transport, electrification of vehicles, and development of railways. In agriculture major emission reductions will be achieved by reducing methane-intensive rice and livestock production, and promoting composting and producing biogas in livestock management, organic fertilizer, and deep fertilizer technology. Key mitigation actions in the IPPU sector are clinker substitution and carbon capture and storage in cement production, recycling of aggregate concrete, and better management of direct emissions from the refrigeration and air-conditioning sector. In the waste sector, the focus is on improved solid waste management and domestic wastewater treatment, reducing open burning and mainstreaming of the 3R principle.

The LTS4CN is a vision, which needs to be implemented now. It is ambitious and varied in its scope, with multiple stakeholders taking the lead for different actions. There is also the need to ensure integration of these actions with existing structures and processes at the national and international level, and alignment between the targets of the updated NDC and the LTS4CN. Hence, there is the need for developing an implementation plan as the next step to further elaborate the long-term vision into clear policy pathways, that should guide Cambodia in meeting her commitment under her updated NDC and towards net zero emissions by 2050.

1.2 Emission reduction trends projected by the LTS4CN

Compared to the BAU scenario, where carbon emissions are expected to increase to up to 156 MtCO2e in 2050, the LTS4CN modelling (the figures 1 & 2) suggests that Cambodia could achieve carbon neutrality in 2050 with the FOLU sector providing a total carbon sink of 50 megatons of carbon dioxide equivalent (MtCO2e). The energy sector is expected to be the highest emitter in 2050 at 28 MtCO2e, followed by the agriculture sector at 19 MtCO2e. The waste and IPPU sectors are projected to emit 1.6 and 1.2 MtCO2e, respectively. The emissions are projected to decline gradually until 2040, and emission reductions slowing down between 2040 and 2050.

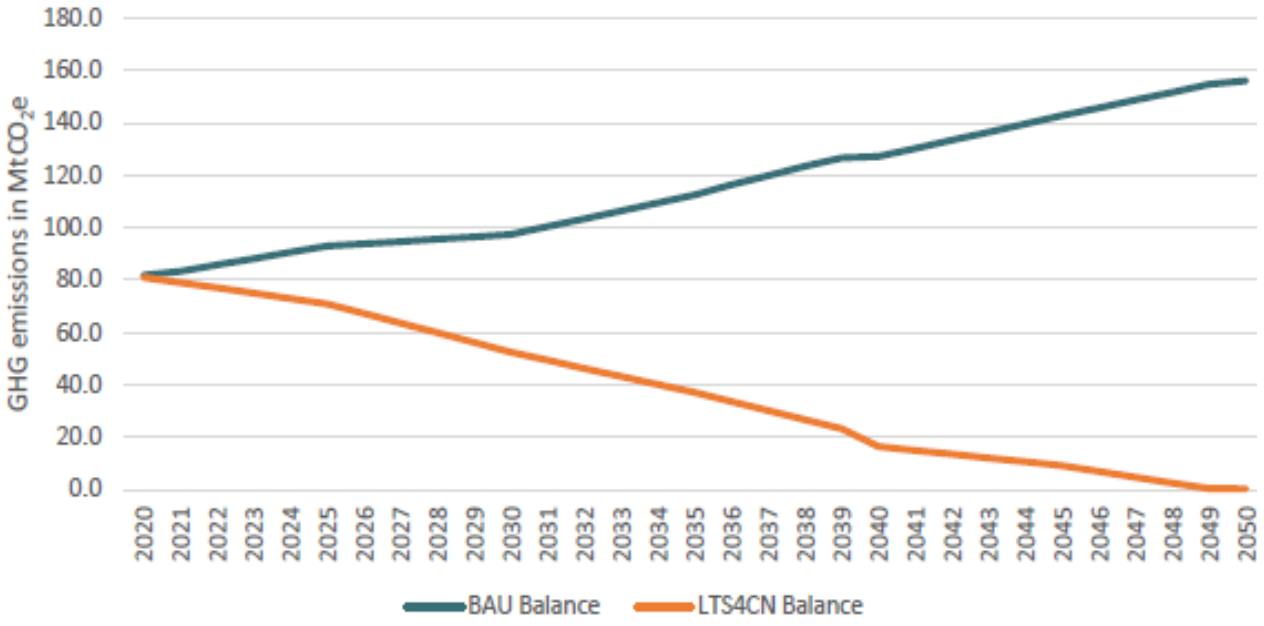

Figure 1: GHG emissions projections in the BAU and LTS4CN scenarios[1]

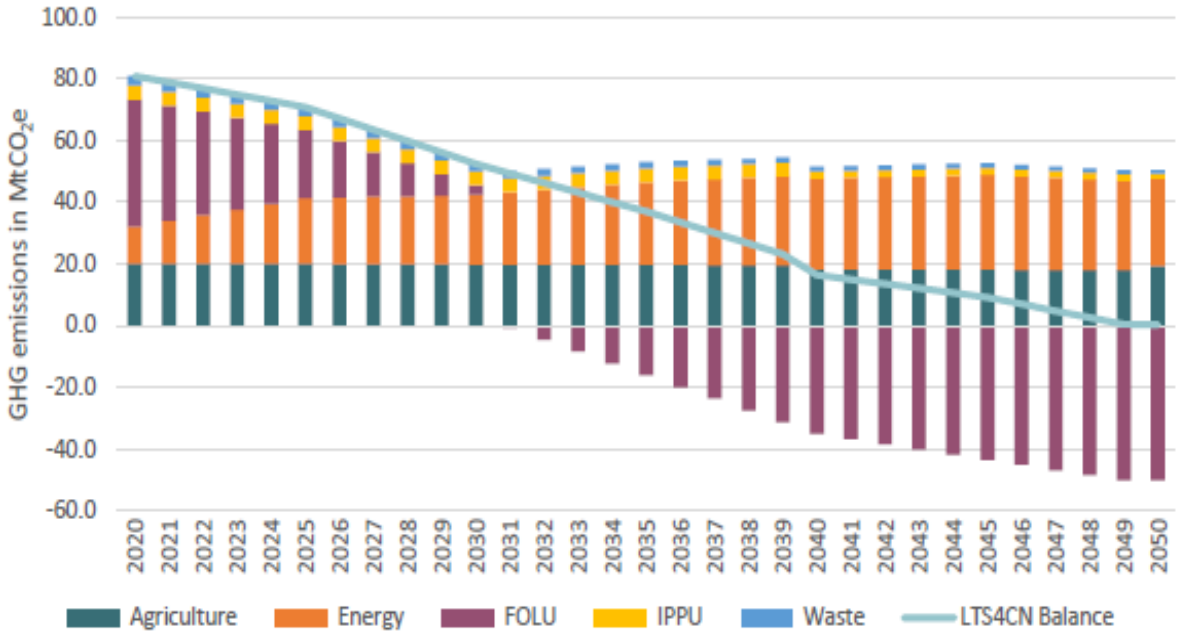

Figure 2: GHG emissions projections in the LTS4CN scenario with sectoral shares[2]

[1] NCSD, 2021. Long-Term Strategy for Carbon Neutrality,National Council for Sustainable Development,Ministry of Environment,Royal Government of Cambodia

[2] NCSD, 2021. Long-Term Strategy for Carbon Neutrality,National Council for Sustainable Development,Ministry of Environment,Royal Government of Cambodia

2 GAP ANALYSIS

Across all sectors, there is the need to strengthen research and knowledge management, to ensure that updated and reliable information is available. There is the need for improved planning and implementation, and better integration between sectoral and between regional and sectoral plans. While the policy and regulatory framework is being strengthened, ambitions could be raised to ensure policies and intentions are converted into reality. Capacity and awareness on climate change mitigation needs to be strengthened, as well as the capacity for measurement, reporting and verification (MRV) of GHG emissions. In general, there is inertia towards changing existing technologies and practices, and adopting new ones. All these contributes to increased risks and costs for financing, and hence, there is inadequate offerings and supply of attractive and innovative financing products for climate change mitigation. Due to higher risks and low availability of financing and insurance products, the appetite for private investments and for risk-taking and innovation in climate change mitigation is low. At this initial stage of the market development process for climate change mitigation technologies, Cambodia could leverage her significant public procurement system to develop the market for low carbon technologies. While gender equality is not yet a priority and there is not much information to conduct analysis, LTS4CN provides an opportunity to mainstream and implement it. The transitions being proposed by the LTS4CN could lead to major changes to sectoral activity, with new business and employment opportunities being created and some businesses dying out during the transition. While the net benefits could be positive, this could also lead to employment loss, especially of unskilled labour, and hence, it is important to conduct impact assessments (e.g., strategic environmental assessment) of the proposed policies to identify impacts and devise safeguards during the transition. In addition, there are sector specific challenges and opportunities.

2.1 Agriculture

Land use efficiency and agricultural productivity is low. There is greater risk in the agriculture sector, and climate change is adding to this pressure. There is also conflicting demand for land use and often agricultural land gets converted for more profitable ventures in real estate or industrial activity. It is challenging for farmers to continue farming or adopting new technologies and practices or contributing to new value chains unless incentives and transition financing is provided. While there is a concern that organic fertilizer might be less viable as a mitigation option, due to higher energy needed for its production and transport, there is no detailed research comparing life cycle impacts between organic fertilizer and inorganic fertilizer production and usage in Cambodia. Most of the inorganic fertilizers are currently being imported, and there is also the need for a study to understand future requirements of inorganic fertilizers and feasibility of increasing domestic production of key inorganic fertilizers[3].

2.2 Forestry and other land use (FOLU)

The general challenge to get reliable and updated information on forest and land cover and tracking of harvested products and limited capacity on MRV, makes it also difficult to implement policies like REDD+ (and other policies based on payment for ecosystem services principle) that has significant components of accounting and MRV. Deforestation rates and trends are high, partly because assets that are not easily accounted for are less likely to be experienced managed, and this also makes forest resources vulnerable to pressures from other sectors such as its use as a fuel for cooking and for certain industrial processes. While the LTS4CN expects the largest contribution to carbon neutrality from mitigation in the FOLU sector, based on past deforestation trends there is a need for strong leadership to achieve that target.

[3] An example is Urea, which can also utilize CO2 captured in the proposed carbon capture and storage systems proposed by the LTS4CN

2.3 Energy and transport

More capacity for integrated planning is needed for climate change mitigation in the energy and transport sectors. While Cambodia has made a lot of improvements in expanding the power infrastructure and interlinkages between grids, more needs to be done in expanding and modernising the power system and to have a single grid, to meet additional demand for quantity, quality, and reliability from mitigation measures such as electrification of transport[4]. The policy and regulatory framework need to be strengthened to give confidence to private investors. There is limited capacity in energy efficiency and renewable energy, especially in energy efficiency in buildings. In terms of energy and GHG accounting and targeting, there is a need to implement demand side management (DSM) or demand management programmes, which could be a lower cost option in the long term. While LTS4CN sees natural gas as a low carbon transition fuel, there is currently no natural gas infrastructure. There are large locked in investments and culturally set patterns in coal and petroleum product usage, and a move away from it would require strengthened efforts. The public transport system and intermodal linkages need to also be strengthened, especially the rail infrastructure. There is a rising trend of private vehicle ownership and a relative lack of appetite for non-motorised transport options. Large investments are needed for making transition to low carbon options, which is also a challenge.

2.4 Industrial processes and product use (IPPU)

The IPPU sector is relatively small in Cambodia, with the larger sub-sectors being garments, building materials and food and beverage. However, it is likely that the IPPU sector will grow with the growing economy and be a much more significant contributor to GHG emissions. Carbon capture and storage (CCS) proposed as a mitigation option by the LTS4CN is challenging for Cambodia, partly because it is still not well developed globally and partly because industrial activity is relatively small in Cambodia making the scale of such potential CCS systems smaller[5] and less economically viable. To make CCS more viable in Cambodia, more planning is needed. The LTS4CN also targets climate change mitigation through phasing out and management of fluorinated gases with high global warming potential (GWP), especially refrigerants. This activity is likely to progress well due to it being driven and co-financed by the Multilateral Fund for the implementation of the Montreal Protocol, in addition to potential climate finance. The LTS4CN also prioritises the implementation of the National Cooling Action Plan (NCAP). As reducing space cooling demand is the most prominent aspect of the NCAP, the implementation of the NCAP is closely linked to the implementation of the Kigali Amendment to the Montreal Protocol and that of proposed energy efficiency building code and green building rating systems, and hence, all these policy tools and their implementation plans need to be harmonised and cross-referenced.

2.5 Waste

As in most developing countries, the waste sector is in its very initial stages of development. The emphasis of current activities tends towards managing the waste that is generated and less on waste minimisation and prevention, which might be more cost effective in the long run. There is the need for stronger policy and regulatory frameworks, strengthened institutional coordination and capacities, investments in waste management infrastructure, strengthening data collection and research, improved human resource capacity, and increased public participation and awareness.

[4] A recent trend to electrify smaller boilers has also been reported

3 ACTION PLAN TO IMPLEMENT THE LTS4CN

The action plan lists milestones under each of the mitigation options[6] proposed in the LTSC4N for each of the six sectors, as well as cross-sectoral. These milestones could be considered as short term (up to 2030), medium term (up to 2040) and long-term (up to 2050). The short term and medium-term milestones include those proposed under the updated NDC.

[6] In the LTS4CN, these are indicated as "strategies". For the sake of clarity and to distinguish it from the LTS4CN itself as a strategy, the term "mitigation option" is used in this document

3.1 AGRICULTURE

MITIGATION OPTION	SUB-ACTIONS	TIMESCALE			LEAD ENTITY	COLLABORATING ENTITIES	PART OF Updated NDC TARGETS (YES/NO)
		2030	2040	2050			
Less Methane-Intensive Rice Cultivars	1. Produce better rice varieties (high yield, short duration, better grain quality, stress tolerant, etc.) in a large scale.			√	MAFF		No
	2. Use climate smart agriculture and good agriculture practices in rice production and rice value chains.			√	MAFF		No
	3. Promote Sustainable Rice Platform (SRP)		√		MAFF		No
	4. Significantly increase the share of organic rice production.			√	MAFF		No
Direct Seeding Practices	1. Distribute 100 million seedlings nationally, to public and local community.	√			MAFF		**Yes**
	2. Produce extensively direct-seeded rice.		√		MAFF		No
	3. Apply integrated management of weed widely to direct-seeded rice cultivation.		√		MAFF		No
	4. Extensively promote farm machinery custom-hiring service.		√		MAFF		No
	5. Practice modern mechanized agriculture to enable direct-seeded rice systems.		√		MAFF		No
	6. Legume cover crops widely available and integrated in rice-based cropping systems.		√		MAFF		No
	7. Modern mechanized agriculture widely practiced to enable no-till sowing of rainfed crops (maize, pulse and cassava).		√		MAFF		No
Alternate Wetting and Drying Practices	1. Use water saving technologies and practices for concrete canals, on farm irrigation and gravity irrigation.	√			MAFF		No
	2. Significantly increase water productivity.	√			MAFF		No
	3. Practice integrated micro-watershed management.	√			MAFF		No
	4. Practice laser land leveling.	√			MAFF		No

Promotion of Organic Fertilizer and Deep Fertilizer Technology	1. Increase effectiveness and sustainability of agricultural land management techniques (Conservation Agriculture) in Battambang, Preah Vihea and Kampong Cham Provinces.	√			MAFF		**Yes**
	2. Practice organic input agriculture and bio-slurry from biodigesters, and deep placement fertilizer technology, in 10 provinces.	√			MAFF		**Yes**
	3. Protect agricultural land.			√	MAFF		No
	4. Apply extensively Integrated Soil Nutrient Management (ISNM)/Site Specific Nutrient Management (SSNM).			√	MAFF		No
Feed Additives for Cattle	1. Update existing policy on feed additive for cattle that can reduce methane.	√			MAFF		No
	2. Develop technical procedure for feed additive for cattle that can reduce methane.	√			MAFF		No
	3. Strengthen capacity of the government officials for research, laboratory management and operations related to feed additive for cattle.	√			MAFF		No
	4. Promote extensively feed additive for cattle.	√	√		MAFF	Local authorities	No
	5. Build capacity of stakeholders for production of feed additive for cattle that can reduce methane.		√		MAFF		No
	6. Conduct public participation and awareness raising program for proper production of feed additive for cattle that can reduce methane.		√		MAFF	Local authorities	No
	7. Domestically produce -3- nitrooxypropanol (NOP) used as feed additive for cattle.			√	MAFF	Local authorities	No
	8. Ensure effective monitoring by national and sub-national officials of domestic production of feed additive for cattle that can reduce methane.			√	MAFF	Local authorities	No
	1. Develop technical procedures[7] for fodder establishment.	√			MAFF		No

[7] seedbed preparation, fertilizing and manure application, planting, and management after sowing

Improved Fodder Management	2. Promote fodder technology options[8] that fit the smallholder.	√			MAFF		No
	3. Use climate smart agriculture practices to improve fodder management including integration annual crops – livestock – perennial crops.		√		MAFF		No
	4. Use fodder production extensively to improve high nutrient rich and high-quality forage feed value agriculture by- products technology to support cattle production 1year/1ha/province.	√			MAFF		**Yes**
	5. Use fodder production systems extensively to improve environmental sustainability[9].			√	MAFF		No
	6. Modern mechanized agriculture widely practiced for rice straw management and fodder sources.			√	MAFF		N
Introduction of Composting Technology	1. Enhance existing regulatory regime governing manure composting.	√			MAFF		No
	2. Promote manure management through compost making process in 25 provinces and cities.	√	√	√	MAFF		**Yes**
	3. Scale up biodigester construction and use of bio-slurry for crop farming.		√		MAFF		No
	4. Scale up production of compost and use.		√		MAFF		No
	5. Improve traditional manure composting technique management.			√	MAFF		No
	6. Improve modern technology for aerobic composting.			√	MAFF		No

[8] Criteria for selecting technologies for the smallholder, backyard fodder crops and fodder banks and feeding and conservation of fodder crops

[9] including reducing nitrous oxide emissions, reducing methane emissions, grazing management, direct inputs of water, fertilizer, or organic matter, sowing of improved forage species and fire management.

3.2 FORESTRY AND OTHER LAND USE (FOLU)

MITIGATION OPTION	SUB-ACTIONS	TIMESCALE			LEAD ENTITY	COLLABORATING ENTITIES	PART OF Updated NDC TARGETS (YES/NO)
		2030	2040	2050			
Reducing the Deforestation Rate by 50 Percent in 2030 **Stopping Deforestation by 2045**	1. Implement REDD+ priorities for the NDC[10].	√			REDD+ Secretariat	MAFF, MoE	**Yes**
	2. Strengthen management of protected areas/ strengthened implementation of the National Protected Areas Strategic Management Plan.	√	√	√	REDD+ Secretariat	MAFF, MoE	**Yes** (for actions planned till 2030)
	3. Strengthen monitoring systems for forest cover for clear zoning and monitoring of forests.	√	√	√	REDD+ Secretariat	MAFF, MoE	
	4. Improve management of fuelwood[11].	√	√	√	REDD+ Secretariat	MAFF, MoE	**Yes** (for actions planned till 2030)
	5. Integrate REDD+ into subnational land-use planning.	√	√	√	REDD+ Secretariat	MAFF, MoE	**Yes** (for actions planned till 2030)
	6. Implement conservation concessions[12].	√	√	√	REDD+ Secretariat	MAFF, MoE	**Yes** (for actions planned till 2030)

[10] REDD+ priorities for the updated NDC of Cambodia include: Strengthen management of forest conservation areas; Promote forest land tenure security through forest land classification, zoning, demarcation, and registration; Strengthen law enforcement activities to address unauthorized logging, and encroachment; Monitor the status of Economic Land Concessions (ELCs) and Social Land Concessions (SLCs) for compliance with regulations and strengthen capacity for effective monitoring; Support harmonization of legal frameworks for effective management of forest resources; Strengthen regulatory framework and capacity for social and environmental impact assessment and compliance; Strengthen capacity for data management and establish decision support systems for forest and land use sector; Strengthen and scale up community-based forest management; Engage and encourage the private sector to implement alternative and sustainable supply chains from agro industrial plantations, and to reduce emissions; Expand afforestation, reforestation and restoration activities; Enhance timber supply and wood-based energy sourced from community-based forest management areas and private plantations to reduce pressure on forest areas; Promote effective, equitable, sustainable management and use of forests, forest lands and non-timber forest products; Identify and implement alternative and sustainable livelihood development programmes for local communities most dependent on forest resources; Support mechanisms to mainstream policies and measures that reduce deforestation in relevant government ministries and agencies; Strengthen national and subnational capacity for improved coordination mechanisms for national land use policy and planning; Strengthen capacity, knowledge and awareness of stakeholders to enhance their contribution to reducing deforestation and forest degradation; Encourage public engagement, participation and consultations in forestry and land use planning, and promote the involvement of multiple stakeholders; Strengthen capacity of academic and research institutions in training, research and technology development associated with forestry and land use; and establish partnerships with development partners in building knowledge and human resources related to forestry, land use and climate change

[11] Covers: forest law enforcement and improved governance; promote systems of certification of managed forests

[12] Set aside large tracts of forest for conservational purposes

	7. Improve agricultural productivity for smallholders to decouple population growth and deforestation.	√	√	√	MAFF		No
	8. Develop the market for electric cooking and highly efficient stoves, thereby reducing biomass use and deforestation.	refer to the implementation plan for the energy sector			MME		No
	9. Develop the market for low carbon, cleaner brick products, thereby reducing biomass use and deforestation.	refer to the implementation plan for the energy sector			MME		No
	10. Implement sustainable sourcing of fuel wood for the garment industry.	refer to the implementation plan for the energy sector			MISTI	MME	**Yes**
Afforestation, Improved Forest Management and Forest Restoration	1. Strengthened implementation of the National Forestry Programme[13].	√	√	√	REDD+ Secretariat	MAFF, MoE	**Yes** (for actions planned till 2030)
	2. Strengthened approaches for sustainable management of flooded forest and mangrove resources [14].	√	√	√	REDD+ Secretariat	MAFF, MoE	**Yes** (for actions planned till 2030)
	3. Access to funding and innovations to increase the resilience of the forestry sector against forest fires and natural disasters.	√	√	√	MAFF		No
Agroforestry and Commercial Tree Plantation	1. Increase investment in research, extension and capacity building on agroforestry and commercial tree plantations.	√	√	√	MAFF		No
	2. Increase farmers access to improved planting material.	√	√	√	MAFF		No
	3. Improve farmers access to institutional credit and insurance cover for agroforestry.	√	√	√	MAFF		No
	4. Facilitate increased participation of industries dealing with agroforestry produce.	√	√	√	MAFF	MISTI	No

[13] This involves forest law enforcement and governance; community forestry programmes; forest demarcation, classification, and registration; and forest resource management and conservation, including forest certification, production forest management, and reforestation/afforestation

[14] This involves community fisheries; fisheries conservation areas; and sustainable management of habitat in fishing lots

	5. Provide incentives to farmers engaged in agroforestry.	√	√	√	MAFF		No
Full Implementation of the REDD+ Investment Plan by 2050	1. Increase access to climate finance, especially to carbon markets.	√	√	√	MOE	MoE	No
	2. Strengthen commitment to the REDD+ investments and improve speed of implementation.	√	√	√	REDD+ Secretariat	MoE	No

3.3 ENERGY

MITIGATION OPTION	SUB-ACTIONS	TIMESCALE			LEAD ENTITY	COLLABORATING ENTITIES	PART OF Updated NDC TARGETS (YES/NO)
		2030	2040	2050			
No new coal generation capacity beyond already committed projects	1. Conduct a feasibility study for early retirement of inefficient and older coal-based power plants.	√			MME	MME, EAC	No
	2. Conduct a feasibility study for use of washed coal and clean coal technologies for remaining coal-based power plants that cannot be retired early.	√			MME	MME, EAC	No
	3. Support achieving thermal power plant efficiency (heat rate and operational efficiency) comparable with ASEAN benchmarks.		√		MME	MME, EAC	No
	4. Support updates to the policy and regulatory framework to reflect no additional coal-based power plants and where possible early retirement of old and inefficient coal-based power plants.	√	√		MME	EDC, EAC	No
	5. Support updates to the power tariff to reflect no additional coal-based power plants and where possible early retirement of old and inefficient coal-based power plants.	√	√		MME	MME, EDC	No
	6. Support updates to the Power Development Plan that reflects no additional coal-based power plants and where possible early retirement of old and inefficient coal-based power plants.	√	√	√	MME	MME, EAC	No
	7. Support updates to the EDC's corporate strategy, work plans, rules, and procedures to reflect no additional coal-based power plants and where possible early retirement of old and inefficient coal-based power plants.	√	√		MME		No

	8. Conduct 25 Public awareness campaigns on low carbon pathways.	√			MME		**Yes**
Use of Natural Gas as A Dispatchable transition fuel	1. Develop and adopt a roadmap for downstream natural gas (distribution network, sales, etc.) market development.	√			MME		No
	2. Support the development of an enabling environment[15] for downstream natural gas infrastructure market development.		√		MME		No
	3. Support achievement of the targets under the roadmap for market development of downstream natural gas infrastructure and market.		√	√	MME		No
	4. Conduct a feasibility study of introducing combined-cycle gas turbine power into the power system.		√		MME		No
	5. Support the commissioning of 3.1 GW of combined-cycle gas turbine power generation capacity.			√	MME	MME, EAC	No
Investments in LNG Import, Storage, and Infrastructure	1. Develop and adopt a roadmap for midstream natural gas (processing, LNG facilities, storage, pipelines, etc.) market development.	√			MME		No
	2. Support the development of an enabling environment for midstream natural gas infrastructure market development.	√	√		MME		No
	3. Support achievement of the targets under the roadmap for market development of midstream natural gas infrastructure and market.	√	√	√	MME		No
Increase in Solar, Hydro, Biomass and Other Renewables to	1. Develop and adopt a roadmap for market development of high impact renewable energy solutions such as behind-the-meter renewable power (solar PV, wind power),	√			MME	EDC, EAC, MISTI, MAFF, MoE	No

[15] Policy and regulatory framework developed, assessments and feasibility studies

35 Percent of the Generation Mix by 2050, Of Which 12 Percent is from Solar	biomass energy[16], waste to energy, refuse-derived fuels (municipal solid waste and industrial waste), battery energy storage system and solar hot water[17].						
	2. Support the development of an enabling environment[18] for market development of renewable energy solutions.	√	√	√	MME	EDC, EAC, MISTI, MAFF, MoE	No
	3. Support implementation of off-grid street lighting in 10 Sangkat of Senmonorom municipality, Kep municipality, and Preah municipality.	√			NCDD	MME, EDC	**Yes**
	4. Support production of refuse-derived fuels from either a) fresh MSW or b) old MSW mined from the Dangkor landfill.	√			MoE	MME	**Yes**
	5. Support achievement of refuse-derived fuels (MSW and Industrial waste) market development targets.	√	√	√	MoE	MME	No
	6. Support achievement of biomass residue-based fuel market development targets.		√	√	MME	MISTI, MAFF, MoE	No
	7. Support eco-payment based on changing behavior on firewood use of community in Angkor and Kulen Conservation Park[19]. Integration of climate change into financial management, institutional arrangement, and policy reform in 20 communes of Prasat Bakong district, Kulen District, Norkor Krav District, and Banteay Srey District, of Siem Reap Province.	√			NCDD	MAFF, MME	**Yes**

[16] especially biomass sourced from plantations and agricultural residues and biogas

[17] This will be linked with other relevant actions such as grid modernization, tariff revisions, fossil fuel subsidy removal, market development for clean cooking solutions/green buildings, sustainable cities, sustainable public procurement, mitigation in FOLU and agriculture sector etc

[18] Updated policy and regulatory frameworks; strengthened institutional arrangements and capacity; assessments and feasibility studies; resource mapping; updated technical guidelines; net metering; feed in tariffs; streamlined and faster process for getting statutory licenses and permits; standardized power purchase agreements; auction mechanisms; prospectus of potential sites; appropriate gate fees at waste processing and treatment facilities and landfills; land allocations and concessions for installation and operation of waste to energy facilities; long term waste supply agreements; enhanced dispatch and grid code; R&D on biomass drying, densification and torrefaction technologies; certification process for engineers/technicians; enhanced waste management system and infrastructure for handling wastes from solar PV, wind power and batteries; enabling renewable energy service companies (RESCOs) to operate etc.

[19] Reducing GHG emission though avoiding the extraction of the forest from Angkor conservation park and Kulen conservation park for housing, firewood consumption, and agriculture land.

	8. Support establishment of 6000 ha of timber plantations between 2021-2030. Support establishment of 1800 ha of firewood plantations between 2021-2030.	√			MISTI	MAFF, MME	**Yes**
	9. Support achievement of the targets under the roadmap for renewable energy market development.	√	√	√	MME	EDC, EAC, MISTI, MAFF, MoE	No
Investments in Grid Modernization, Flexibility and Storage	1. Develop and adopt a roadmap for power system modernization and expansion, compatible with LTS4CN targets[20].	√			MME	MME, EAC	No
	2. Support the development of an enabling environment for power system expansion and modernization, compatible with LTS4CN targets.	√			MME	EDC, EAC	No
	3. Support implementation of a demand response (DR) programme.		√		MME	MME, EAC	No
	4. Support connecting all 25 provinces by a single grid.		√		MME	MME, EAC	No
	5. Support development of a uniform power tariff throughout the country.		√		MME	MME, EDC	No
	6. Support full integration with the regional GMS grid.		√		MME	MME, EAC	No
	7. Support achievement of reliability and resilience parameters of the power system comparable with ASEAN benchmarks.			√	MME	MME, EAC	No
	8. Support achievement of reliability and resilience parameters of the power system comparable with regional/Asia Pacific benchmarks.			√	MME	MME, EAC	No

[20] This could include investments in grid modernization and expansion, creation of a single grid connecting all 25 provinces, full integration with the regional GMS grid, enhancement of grid code, improved reliability, and resilience.

Energy Efficiency Measures in Buildings and Industry	1. Support capacity building and institutionalizing it for energy efficiency in power sector and in industry[21].		√		MME		No
	2. Support the development of an enabling environment[22] for "behind the meter" distributed renewable power resources.						
	3. Support implementation of a utility led demand side management (DSM) programme.	√	√	√	MME	MME	No
	4. Conduct of mandatory energy audits and adoption of energy management system (e.g., ISO 50000) in all large[23] power plants, industries, commercial buildings/hotels. Voluntary measure for smaller organizations.	√			MME		**Yes**
	5. Report energy consumption and actions taken on energy efficiency and renewable energy, made mandatory for all large energy consumers in energy, industry, commercial sectors.	√			MME	MISTI	No
	6. Monitor air quality and carbon emissions estimated in 105 factories annually, provide permit letter for air quality for 90 factories.	√			MoE		**Yes**
	7. Support establishment of five regional service centers for providing advisory support for industries on climate change mitigation and adaptation, environmental management, and productivity improvements.	√			MISTI	MoE, MME	No
	8. Support the development of an enabling environment for energy servicing companies (ESCO).	√			MME		No

[21] including: capacity for conducting detailed energy audits, functional certification system for energy auditors and energy managers, capacity for the design and conduct of demand side management programmes, etc.

[22] Policy and regulatory framework; incentives for actors in the value chain; integration of distributed energy in urban planning, building codes and electricity distribution regulations.

[23] That consume more power than a predefined threshold

	Trading Of Carbon And Energy Savings Certificates						
	9. Develop and adopt a roadmap for implementing carbon trading and trading of energy saving certificates among larger industrial and power generation facilities.	√			MoE	MME, MISTI	No
	10. Support the development of an enabling environment for trading of carbon and energy saving certificates in larger industrial and power generation facilities.		√		MoE	MME, MISTI	No
	Market Development Of High Impact, Higher Efficiency Industrial Equipment						
	11. Develop and adopt a roadmap for market development of high impact, higher efficiency standardized industrial equipment like electric motors, boilers (especially biomass boilers and smaller electric boilers), variable speed drives water pumps, transformers, etc.	√			MME	MME, MISTI	No
	12. Support the development of an enabling environment for market development of high impact, higher efficiency industrial machinery and equipment[24].	√	√		MME	MISTI	**Yes** (only for boilers and motors)
	13. Support the introduction into the market of high impact, higher efficiency industrial machinery and equipment.		√	√	MME	MISTI	**Yes** (only for boilers- especially in F&B sub-sector, and motors)
	14. Support setting up a system for periodic survey of boilers.	√			MME	MISTI	No
	15. Support indigenization of high impact, higher efficiency standardized industrial machinery and equipment sold.			√	MME	MISTI	No
	Standards And Labeling (S&L) Programme For Products And Appliances						

[24] Among others, this will also include capacity development in the design, assessment and efficient operation and maintenance of relevant energy systems (e.g., steam systems in industry), instead of focusing on a particular equipment only (e.g., steam boiler)

	16. Develop and adopt a roadmap for market development of high impact, higher efficiency products and appliances like energy efficient lighting products, energy efficient ceiling fans, energy efficient air conditioners and refrigerators using low GWP refrigerant, etc., and phase out of inefficient/polluting appliances/products. This roadmap will also cover an enhanced standard and labeling programme for equipment using high GWP fluorinated gases.	√			MME	MISTI	**Yes** [25]
	17. Support the development of an enabling environment developed for market development of high impact, higher efficiency products and appliances, and retirement of inefficient appliances.	√			MME	MISTI	**Yes**
	18. Support implementation of the S&L programme for room air conditioners and residential refrigerators[26] .	√			MME	MISTI	**Yes**
	19. Support market penetration of higher energy efficiency ratings room air conditioners and residential refrigerators.		√	√	MME	MISTI	No
	20. Support implementation of S&L programme for other widely used products and appliances (e.g., LED lighting, ceiling fans, microwaves, etc.).		√		MME	MISTI	**Yes** (only the part that will be completed by 2030)
	21. Support market penetration of higher energy efficiency rating versions of widely used products and appliances (e.g., LED lighting, ceiling fans, microwaves, etc.).			√	MME	MISTI	No
	22. Support achievement of the S&L programme targets met.	√	√	√	MME	MISTI	**Yes** (only the part that will be completed by 2030)

[25] NDC talks of S&L programme for lighting, cooling, and equipment

[26] This will be linked and coordinated with the proposed utility led demand side management (DSM) programme where preference will be given to design an initiative involving mass distribution at discounted prices of higher energy efficiency room ACs and refrigerators

	23. Support an enhanced waste management system for handling older, inefficient products/appliances.		√		MoE	MISTI	No
	24. Support achievement of the targets for market development for the selected appliances, products.	√	√	√	MME	MISTI	**Yes** (only the part that will be completed by 2030)
	Market Development Of Green Buildings						
	25. Develop and adopt a roadmap for green buildings market development adopted[27].	√			MLMUPC	MISTI	No
	26. Support the development of an enabling environment[28] for market development of green buildings.		√		MLMUPC	MISTI	No
	27. 2 percent of the existing public and commercial buildings are retrofitted to meet green building standards.	√			MLMUPC	MME, MISTI	**Yes**
	28. Initial investment required for low carbon green buildings (of higher ratings) comparable with traditional constructions.		√		MLMUPC	MISTI	No
	29. Develop and promulgate the mandatory energy efficiency building code.	√			MME	MME	**Yes** [22]
	30. Support implementation of the National Cooling Action Plan.	√			MoE	MME	**Yes**
	31. Build capacity of building energy assessors.		√		MLMUPC	MISTI, MME	No
	32. Build capacity of building developers and contractors for the design and construction of low carbon, green buildings.			√	MLMUPC	MME	No
	33. Develop a mandate for new public buildings to be green buildings meeting a higher energy efficiency standard.		√		MLMUPC	MLMUPC(co-lead for passive cooling aspects)	No

[27] This will be closely linked with the proposed sustainable cities programme

[28] Policy and regulatory framework enhanced; mandatory energy efficiency building code deployed; voluntary green building rating system introduced; capacity building and certification of building energy assessors; technical guidelines developed for different building typologies for different climatic zones; benchmarking and awards for larger buildings; energy management systems and building information management systems for larger buildings.

	34. Support achievement of the targets for green buildings market development.	√	√	√	MLMUPC	MLMUPC	**Yes** (only for achievements till 2030)
	Sustainable Cities						
	35. Develop and adopt a roadmap for GHG emission reduction in all major cities and towns of Cambodia. This will be integrated with smart city, climate change adaptation and disaster risk management priorities.	√			NCDD		No
	36. Conduct an analysis of Phnom Penh and Siem Reap for mitigating urban heat island effect (UHIE) and support Implementation of projects.	√			MLMUPC	MME	**Yes**
	37. Develop three mitigation and urban planning solutions for three sub cities (2 completed by 2025, another one completed by 2030).	√			MLMUPC	MME	**Yes**
	38. Support integration of green city principles in 5 Sangkats of Battambang municipality.	√			NCDD	MME	**Yes**
	39. Support integration of climate change into financial management, institutional arrangement, and policy reform of 10 Sangkat of Senmonorom municipality, Kep municipality, and Preah Sihanouk municipality.	√			NCDD		**Yes**
	40. Support establishment of green belts along major roads for climate change mitigation.	√			MoE	MLMUPC	**Yes**
	41. Support installation of air quality monitoring equipment in all provinces and establishing air quality data monitoring center with mobile application for public information and access. Support establishment of air quality monitoring and broadcasting center.	√			MoE	MLMUPC	**Yes**
	42. Support improvements to air quality management in construction sites.	√			MoE		**Yes**
	43. Support enhancement of green spaces in the city.	√			MoE	NCDD	**Yes**

	44. Support achievement of GHG emissions reduction targets in focus cities, sub-cities, and towns	√	√	√	NCDD	MLMUPC	No
	Sustainable Tourism						
	45. Develop and adopt a roadmap for achieving sustainable tourism.	√			MoT		No
	46. Support achievement of sustainable tourism priorities for the NDC[29].	√			MoT		**Yes**
	47. Support achievement of sustainable tourism roadmap targets.	√	√	√	MoT	NCDD, MLMUPC	No
	Building Material Industry						
	48. Support the development of a master plan for the building material industry.[30]	√			MISTI	MLMUPC	No
	Brick Industry						
	49. Develop and adopt a roadmap for low carbon brick[31] products market development.[32]	√			MISTI		No
	50. Support the development of an enabling environment for production and use of low carbon brick products.	√			MISTI		No
	51. Support achievement of energy efficiency and carbon intensity of brick production comparable to ASEAN benchmarks.		√		MISTI		No
	52. Support achievement of energy efficiency and carbon intensity of brick production comparable to regional/Asia Pacific benchmarks.			√	MISTI		No

[29] This includes: promoting one tourist, one tree campaign (target: 25 locations covering all provinces/city); Practicing responsible travel in order to protect and conserve environment, biodiversity, culture and local livelihood improvement (target: 150 Hotels); practicing 3R in all tourists 'activities; reducing energy use,, increasing renewable energy, carbon offsetting, waste management and water conservation; operating sustainable destination management; promoting adventure and green tourism activities

[30] This will also look at socio-economic and environmental concerns, including demand reduction for carbon intensive and polluting materials, and market development of sustainable alternatives (e.g., bamboo)

[31] Depending on market assessments, this could include moving into higher efficiency and cleaner brick kiln technologies, improvements to process and product design, as well as the production and use of non-fired bricks and the phasing out of fired clay bricks.

[32] This will also address other social, economic, and environmental issues related to brick production such as topsoil usage and impact on agriculture, air pollution, labor conditions, links to deforestation etc. This will also link to the proposed overall master plan for the building material industry

	53. Support achievement of low carbon brick products market development targets met.	√	√	√	MISTI	MME	No
	Cement Industry						
	54. Support the development of an enabling environment for climate change mitigation in the cement industry.	√			MISTI	MME	**Yes**
	55. Support achievement of energy efficiency and carbon intensity of cement production comparable to ASEAN benchmarks.		√		MISTI	MME	**Yes** (only for actions taken till 2030)
	56. Support achievement of energy efficiency and carbon intensity of cement production comparable to regional/Asia Pacific benchmarks.			√	MISTI	MME	No
	57. Support achievement of cement to clinker ratio comparable to ASEAN benchmarks.		√		MISTI	MME	**Yes** (only for actions taken till 2030)
	58. Support achievement of cement to clinker ratio comparable to regional/Asia Pacific benchmarks.			√	MISTI	MME	
	59. Support achievement of the climate change mitigation targets for the cement industry.	√	√	√	MISTI	MME	**Yes** (only for actions taken till 2030)
	Garment Industry						
	60. Conduct detailed energy and environmental audits of all larger garment factories.	√			MISTI	MME	**Yes**
	61. Implement recommendations of the audits, including sustainable sourcing of fuel wood and including setting up an energy management system for larger factories.	√			MISTI	MME	**Yes**
	Food And Beverage Industry						
	62. Conduct detailed energy and environmental audits conducted of all larger food and beverage industries.	√			MISTI	MME	**Yes**
	63. Implement recommendations of the audits, including setting up an energy management system for larger factories.	√			MISTI	MME	**Yes**

	64. Replace LPG fired boiler consuming about 704,428 L/year with a biomass-residues fired boiler in a food import and export company.	√			MISTI	MME	**Yes**
	65. Replace a diesel-fired dynamo replaced with grid electricity at a milling factory.[33]	√			MISTI	MME	**Yes**
	66. Install system to collect and re-use waste steam and hot water from meat steamer, resulting in potential 524 m3/year of fuelwood saving.	√			MISTI	MME	**Yes**
	Latex And Rubber Wood Processing Factories						
	67. Conduct energy and environmental audit in all major latex and rubber wood processing factories.	√			MISTI	MME	**Yes**
	68. Implement recommendations of the audits in all major latex and rubber wood processing factories, including setting up energy management systems for larger factories.	√			MISTI	MME	**Yes**
Fuel Switching to Electricity for Cooking	1. Support market penetration of high efficiency stoves.		√		MME	MISTI	No
	2. Support market penetration of electric stoves.		√		MME	MISTI	No
	3. Develop and adopt a roadmap for cleaner and low-carbon cooking solutions market development, including electric cooking, higher efficiency stoves, solar energy-based stoves, and improved method for charcoal production.	√			MME	MISTI	No
	4. Support the development of an enabling environment for cleaner and low-carbon cooking solutions market development.	√			MME	MISTI	No
	5. Deployment of a standards and labeling system for cooking stoves.	√			MME	MISTI	No

[33] The diesel dynamo is consuming 12 liters/hour operating for 8 hours/day, 20 days/month

	6. Improve sustainability of charcoal production achieved through enforcement of regulations, 100,000 ton/year (2025), 200,000 ton/year (2030).	√			MME	MISTI	**Yes**
	7. Support achievement of cleaner and low-carbon cooking solutions market targets.			√	MME	MME, EAC	No
	8. Increase energy access to 85 percent of rural areas.	√			MME	MME, EAC	**Yes**
	9. Increase energy access to 90 percent of rural areas.	√			MME	MISTI	**Yes**
Substitution of Coal in The Industrial and Power Sector	1. Develop and adopt a roadmap for phasing out of coal-based boilers.[34]	√			MME	EDC	No
	2. Support provided for conversion of coal-based boilers to low carbon fuels.		√	√	MME	EDC	No
	3. Support achievement of coal-based boiler phase-out targets.	√	√		MME	EDC	No
	4. Achievement of target of 50 percent of fuel for clinker kilns in cement industry sourced from alternative fuels (especially replacing coal with refuse-derived fuel sourced from municipal solid waste and industrial waste, as well as by sustainable biomass).			√	MISTI	EDC	**Yes** (only for actions taken till 2030)
	5. Support provided for conversion of coal based industrial process equipment's and process technologies, to low carbon sources.	√	√	√	MISTI	MME	No

[34] Banning new boilers and replacing existing boilers

3.4 TRANSPORT

MITIGATION OPTION	SUB-ACTIONS	TIMESCALE			LEAD ENTITY	COLLABORATING ENTITIES	PART OF Updated NDC TARGETS (YES/NO)
		2030	2040	2050			
More Use of Public Transport – 30 percent Modal Share in Urban Areas by 2050	1. Develop and adopt a roadmap for increasing public transport.	√			MPWT		No
	2. Demonstrate Time of Use congestion charging in a major city.	√			MPWT		No
	3. Demonstrate the application of real time incentives in a major city, for demand shaping and peak shifting.		√		MPWT		No
	4. Demonstrate the application of public transport friendly urban and land use planning in a major city.		√		MPWT	MLMUPC	No
	5. Scale up the application of Time of Use congestion charging to all urban areas.		√		MPWT	MLMUPC	No
	6. Promote integrated public transport systems in main cities.	√			MPWT	MLMUPC	**Yes**
	7. Scale up the application of real time incentives for demand shaping and peak shifting to all urban areas.			√	MPWT	MLMUPC	No
	8. Demonstrate the application of Mobility as a service (MaaS) in a major city, combining wayfinding, ticketing on a single, open platform combining multiple modes.		√		MPWT	MLMUPC	No
	9. Scale up the application of Mobility as a service (MaaS) to all urban areas.			√	MPWT	MLMUPC	No
	10. Scale up the application of public transport friendly urban and land use planning, into all urban areas.			√	MPWT	MLMUPC	No
	11. Support the achievement of targets under the roadmap for increasing public transport.	√	√	√	MPWT	MLMUPC	No
Moderate Penetration of Electric Vehicles – 70 Percent for	1. Develop and adopt a roadmap for market development of electric vehicles across all market segments and for electric vehicles battery supply chain development and waste management system. This will incorporate the LTS4CN targets of 70	√			MPWT		No

Motorcycles and 40 Percent for Cars and Urban Buses by 2050	percent for motorcycles and 40 percent for cars and urban buses by 2050.						
	2. Support the implementation of a fast-charging station network for electric vehicles.		√	√	MPWT	MISTI, MoE	No
	3. Provide support to the government to ensure that all new purchases of cars and light vehicles by the government are electric vehicles.		√	√	MPWT	EDC,MME	No
	4. Support provided to ensure that a special EV tariff is made available.		√		MPWT	MEF	No
	5. Support the market development of EV so that it reaches purchase cost parity with petrol/diesel equivalent competition.			√	MPWT	MPWT, EDC	No
	6. Support the market development of EV so that it becomes cost effective in terms of total cost of ownership.		√		MPWT		No
	7. Support expansion of the charging infrastructure in workplaces, so that 50 percent of workplaces with car parking have charging infrastructure.		√		MPWT		No
	8. Support the adoption of EV in ride-hailing and taxi fleets, so that they are common in most urban areas.			√	MPWT	EDC	No
	9. Support work to introduce wireless charging.			√	MPWT	MLMUPC	No
	10. Support work to enable EV's to provide significant storage capacity for the grid.			√	MPWT		No
	11. Support work to introduce cyber-security standards for EV's, to address concerns of hacking.			√	MPWT	EDC	No
	12. Support attainment of market development targets for electric vehicles and the electric vehicles battery supply chain development and waste management system.	√	√	√	MPWT	EDC	No
Increased Fuel Efficiency for Internal Combustion Engine Vehicles	1. Develop and adopt a roadmap for increasing fuel efficiency of IC engine vehicles	√			MPWT		No
	2. Support the introduction of fuel-economy labelling scheme for light duty vehicles.	√			MPWT		No
	3. Support the introduction of one-time fuel economy-based vehicle registration tax fee-bate.	√			MPWT		No
	4. Support the introduction of annual fuel economy-based vehicle circulation tax.	√			MPWT		No

	5. Support the introduction/refining of fuel taxation, with lower taxation for alternative fuels such as CNG, LPG or low-carbon biofuels.	√			MPWT		No
	6. Support benchmarking of the fuel economy standards with ASEAN standards.		√		MPWT		No
	7. Support benchmarking of the fuel quality standards with ASEAN standards.		√		MPWT		No
	8. Support the implementation of the enhanced programme on eco-driving.	√			MPWT		No
	9. Support the development of the system and capacity building for enhanced technical vehicle controls.	√			MPWT		No
	10. Support the implementation of a programme for enhanced maintenance and inspection of vehicle (Piloting maintenance and emission inspections of vehicles) 30 vehicle inspection centers in operation.	√			MPWT		Yes
	11. Support the implementation of a programme for enhance maintenance and inspection of vehicle. 60 vehicle inspection centers in operation.			√	MPWT		No
	12. Support the implementation of intelligent transport systems to improve flow of traffic in all urban areas.			√	MPWT		No
	13. Support attainment of targets under the roadmap targets for increasing fuel efficiency of IC engine vehicles.	√	√	√	MPWT		No
Rail for Freight and Passengers	1. Develop and adopt a roadmap for expansion and modernization of rail network for passengers and freight, in alignment with the Railway Master Plan.	√			MPWT		**Yes**
	2. Develop a master plan for multimodal transport and logistics.	√			MPWT		**Yes**
	3. Strengthen and enhance the legal framework to govern railway infrastructure, operation, technical standards, and specifications.	√			MPWT		**Yes**
	4. Support securing private investment needed for rail infrastructure through developing stable long-term policy framework, including binding targets, and measures for investment security.	√	√	√	MPWT	MEF	**Yes** (only activities that are planned till 2030)
	5. Support the development of incentives for rail operators to invest in rolling stock, to increase traffic volume and enhancing safety.	√	√	√	MPWT		**Yes** (only activities that

							are planned till 2030)
	6. Support the full development of the northern line.		√		MPWT		**Yes** (only activities that are planned till 2030)
	7. Support the development of the railway link from Phnom Penh to the new Phnom Penh Autonomous Port (PPAP) container terminal.		√		MPWT		**Yes** (only activities that are planned till 2030)
	8. Support the development of the railway link from Phnom Penh to the Viet Nam border.		√		MPWT		**Yes** (only activities that are planned till 2030)
	9. Support the development of the multimodal logistics facility at Steung Bod, with passenger services till Poipet.	√			MPWT		**Yes** (only activities that are planned till 2030)
	10. Support the electrification of all railway lines.			√	MPWT	MME, EDC, EAC	No
	11. Support the achievement of all the targets under the roadmap.	√	√	√	MPWT		No
CNG Penetration of 80 Percent for Interregional Buses and 80 Percent for Trucks Until 2050	1. Develop and adopt a roadmap for CNG penetration for interregional buses and trucks.	√			MPWT	MME	No
	2. Conduct a study of hydrogen or other zero-carbon fuels as long-term alternatives to natural gas for buses and trucks.	√			MME	MPWT	No
	3. Support securing of private investment in natural gas infrastructure and market through developing stable long-term policy framework, including binding targets, and measures for investment security.		√	√	MME	MEF, MPWT	No
	4. Support the development of CNG refueling infrastructure within the country and linked to the CNG networks in the GMS region.		√	√	MME	MPWT	No

3.5 INDUSTRIAL PROCESSES AND PRODUCT USE (IPPU)

MITIGATION OPTION	SUB-ACTIONS	TIMESCALE			LEAD ENTITY	COLLABORATING ENTITIES	PART OF Updated NDC TARGETS (YES/NO)
		2030	2040	2050			
Clinker Substitution in Cement Production	1. Conduct feasibility studies to identify viable materials, especially waste from industry and construction, that can be used to substitute for clinker.	√			MISTI	MME	No
	2. Conduct demonstration projects and support manufacturers for making changes to products, raw materials, production process and process technology.	√			MISTI	MME	No
	3. Clinker substitution ratio comparable to ASEAN benchmarks.		√		MISTI	MME	No
	4. Clinker substitution ratio comparable to regional/Asia Pacific benchmarks.			√	MISTI	MME	No
Carbon Capture and Storage for Cement Kilns	1. Conduct feasibility study to identify viable technology options for carbon capture and storage (CCS) in cement kilns, and in thermal power and other industrial facilities.	√			MISTI	MoE	No
	2. Develop an enabling environment[35] to develop the market for CCS in Cambodia.		√		MISTI	MoE	No
	3. Support the demonstration of CCS in industrial and thermal power facilities, especially CO2 capture, refining and utilization in other industrial applications and/or long-term storage options.		√		MISTI	MoE	No
	4. Support the scaling up of CCS in industrial and thermal power facilities, especially cement kilns			√	MISTI	MoE	No
Use of Recycled Aggregate Concrete	1. Conduct feasibility study to identify viability of using recycled aggregate concrete for building construction, civil works, etc., in different parts of the country.	√			MISTI	MoE	No

[35] Among others, this will also include the development of standards, technical guidelines, capacity building, mapping of facilities and potential for long term carbon storage or large-scale utilization, incentives/penalties etc.

	2. Develop an enabling environment[36] to develop the market for recycled aggregate concrete in Cambodia.		√		MISTI	MoE	No
	3. Support the demonstration of production and use of recycled aggregate concrete for different kinds of construction works.		√		MISTI	MoE	No
	4. Enable scaling up the use of recycled aggregate concrete in construction works.			√	MISTI	MoE	No
Increasing Use of Refrigerants with Low Global Warming Potential	1. Develop a roadmap[37] for increasing the use of low GWP refrigerants, in alignment with Cambodia's plan for implementing the Kigali Amendment to the Montreal Protocol, the National Cooling Action Plan (NCAP)[38] and the proposed energy efficiency building code (EEBC)[39].	As per the timelines for implementation of the Kigali Amendment and relevant elements of the NCAP and the EEBC			National Ozone Unit (MoE)	MME	No
Regular Inspection of Refrigeration and Air-Conditioning Equipment and Recovery of Spent Refrigerants	1. All relevant activities and plans currently being undertaken by the National Ozone unit to implement the Montreal Protocol and its Kigali Amendment. This will also consider relevant elements and activities under the National Cooling Action Plan (NCAP)	As per the timelines for implementation of the Montreal Protocol and its Kigali Amendment and relevant elements of the NCAP			National Ozone Unit (MoE)		No

[36] Among others, this will also include the development of production and construction standards, integration with the building code, technical guidelines, capacity building, setting up of waste exchanges, incentives for various actors in the value chain, creating a business model where the value chain can function smoothly and all actors get fair returns, application of IT and other modern technology to facilitate business processes and information collection/sharing etc.

[37] To avoid duplication, this will follow the actions to be taken by already ongoing efforts to implement the Kigali amendment and the proposed NCAP, and energy efficiency in buildings (including the proposed energy efficiency building code)

[38] Currently being developed

[39] Propose in the LTS4CN implementation plan for the energy sector

3.6 WASTE

MITIGATION OPTION	SUB-ACTIONS	TIMESCALE			LEAD ENTITY	COLLABORATING ENTITIES	PART OF Updated NDC TARGETS (YES/NO)
		2030	2040	2050			
Reducing Open Burning by Expanding Waste Collection Coverage to 85 Percent in 2050	1. Update the policy and legal framework and guidelines for waste management.	√			MoE	Local authorities	No
	2. Strengthen the institutional arrangements and capacity for government entities and service providers involved in preventing waste generation and managing municipal solid waste, open back yard burning, land-clearings, forest fires.	√			MoE	Local authorities	No
	3. Develop an enabling environment[40] for public private partnerships in municipal solid waste management (for all types of waste).		√		MoE	Local authorities	No
	4. Provide adequate, safe, and affordable waste management services: 85 percent coverage in large cities, 80 percent nationwide.		√		MoE	Local authorities	No
	5. Reduce open waste burning by 50 percent (per capita) nationwide, compared to 2016.[41]	√			MoE	Local authorities	No
	6. Reduce open waste burning by 70 percent (per capita) nationwide, compared to 2016.		√		MoE	Local authorities	No
	7. Reduce open waste burning by 90 percent (per capita) nationwide, compared to 2016.			√	MoE	Local authorities	No
	8. Support local authorities and service providers in managing municipal solid waste, open back yard burning, land-clearings, forest fires, open biomass burning.	√			MoE	Local authorities	No

[40] This will include, establishing baseline data, capacity for monitoring/reporting/verification, feasibility studies, waste management friendly infrastructure, availability of waste management equipment/machinery, establishing viable business models that provide fair returns to all actors in the value chain, a platform for dialogue among key stakeholders, an advisory group to review and make recommendations for sector reforms, awareness raising etc.

[41] 2016 has been chosen as the base year, as it is the year for which the latest national GHG inventory was done

Implementing a reduce, reuse, and recycle strategy	1. Encourage community participation for waste separation at source to allow for composting and recycling.	√			MoE	Local authorities	No
	2. Develop capacity of commercial users and households on waste separation, collection, transport, and disposal.	√			MoE	Local authorities	**Yes**
	3. Implement the national 3R strategy in all cities and secondary towns, and in all areas prioritized for tourism.	√			MoE	MoT, local authorities	**Yes**
	4. Enable segregation at source 100 percent of the waste collection for commercial users.		√		MoE	Local authorities	No
	5. Reduce by 50 percent municipal solid waste (per capita), generated by commercial establishments, compared to 2016.		√		MoE	Local authorities	No
	6. Reduce by 30 percent municipal solid waste (per capita), generated by individual households, compared to 2016.			√	MoE	Local authorities	No
	7. Reduce by 50 percent industrial waste generated (per capita), compared to 2016.			√	MoE	Local authorities	No
	8. Enable segregation at source 70 percent of the waste collection for individual households.			√	MoE	Local authorities	No
	9. Phase out disposal in landfills of all waste which has alternative use.[42]		√		MoE	Local authorities	No
	10. Enable 50 percent reduction of food-waste (per capita) from larger restaurants, compared to 2016.			√	MoE	Local authorities	No
	11. Enable 50 percent reduction of post-harvest losses (per capita) for major agriculture produces, compared to 2016.			√	MAFF	MoE	No
	12. Implement collection fee based on the amount of waste generated.		√		MoE	Local authorities	No
	13. Create investment opportunities for the private sector in municipal solid waste management.			√	MoE	Local authorities	No
	14. Commission a centralized recycling facility for industrial waste from garment sector.	√			MISTI	MoE	**Yes**

[42] Organic, recyclable, energy-recoverable etc.

	15. Promote waste recycling in cities and secondary towns, 20 percent in-country recycling of dry waste in 2030.	√			MoE	Local authorities	No
	16. Promote waste recycling in cities and secondary towns, 40 percent in-country recycling of dry waste in 2040.		√		MoE	Local authorities	No
	17. Promote waste recycling nationwide, 70 percent in-country recycling of dry waste in 2050.			√	MoE	Local authorities	No
	18. Set up a fund to incentivize industrial symbiosis[43].		√		MoE	MISTI	No
	19. Promulgate Extended Producer Responsibility (EPR) for packaging and other products, for select products.		√		MoE	MISTI	No
	20. Phase out single use plastics and create markets for viable alternatives.		√		MoE	Local authorities	No
	21. Ensure that all plastic packaging placed on the market is recyclable, reusable, or compostable.		√		MoE	Local authorities	No
	22. Support a significant increase in public procurement of products produced from secondary resource materials.		√		MoE		No
	23. Support all large industries to apply cleaner production methods and technologies to reduce waste and for effective treatment and disposal of waste.		√		MoE	MISTI	No
	24. Support the market development of waste to energy opportunities, so that a wide range of them become commercially viable.		√		MoE	MISTI, Local authorities	No
	25. Develop national standards for resources recovered from major types of waste.		√		MoE		No
	26. Set up minimum requirements for eco-design to encourage resource-efficient and economically viable product design.		√		MoE		No
	27. Develop the market for reuse and recycling of products generating high municipal waste volumes.		√		MoE	Local authorities	No

[43] Waste of one industry becomes a resource for another industry

	28. Make mandatory proper waste management in all schools, including recycling.		√		MoE	MoEYS	No
	29. Support large industrial sub-sectors to sustainably manage chemicals they use and produce and address barriers to the reuse and recycling of these chemicals.			√	MoE	MoE	No
	30. Support the establishment of a viable market for at least one refuse derived fuel.			√	MoE	MISTI	No
	31. Provide adequate hazardous waste drop-off options in all urban areas.			√	MoE	MME	No
	32. Provide electronic waste disposal options in all urban areas.			√	MoE	Local authorities	No
	33. Provide residential yard collection service in all urban areas.			√	MoE	Local authorities	No
Landfill Gas Management	1. Formulate technical guidelines for sanitary landfill and landfill gas (LFG) management.	√			MoE	MPWT, Local authorities	No
	2. Construct and upgrade landfills, so that minimum 50 percent of landfills are sanitary landfills with LFG extraction.	√			MoE	MPWT, Local authorities	No
	3. Dispose around 50 percent of MSW at sanitary landfills with LFG extraction.		√		MoE	MPWT, Local authorities	**Yes**
	4. Install new sanitary landfills with LFG extraction and utilization at the Dangkor landfill and other landfills in the country.		√		MoE	MPWT, Local authorities	**Yes** (only for Dangkor landfill)
	5. Construct and upgrade landfills, so that minimum 75 percent of landfills are sanitary landfills with LFG extraction.		√		MoE	MPWT, Local authorities	No
	6. Engage investors in financing, constructing, and operating sanitary landfill and LFG systems.			√	MoE	MPWT, Local authorities	**Yes** (only for actions planned till 2030)
	7. Construct and upgrade landfills, so that 100 percent of landfills are sanitary landfills with LFG extraction.			√	MoE	MPWT, Local authorities	No
Organic Composting	1. Encourage composting of MSW with a target of 10 percent of MSW composted,	√			MoE	Local authorities	**Yes**

	supplemented with separation of organic waste (at source).						
	2. Develop an enabling environment for households and larger private investment for composting facilities.	√			MoE	Local authorities	No
	3. Encourage composting of MSW with a target of 30 percent of MSW composted, supplemented with separation of organic waste (at source).		√		MoE	Local authorities	No
	4. Encourage composting of MSW with a target of 50 percent of MSW composted, supplemented with separation of organic waste (at source).			√	MoE	Local authorities	No
Anaerobic Digestion and Wastewater Treatment	1. Undertake studies of existing centralized wastewater treatment systems to improve efficiency and effectiveness.[44]	√			MoE	MPWT	No
	2. Develop an enabling environment[45] for market development for biodigesters.	√			MoE	MOE	No
	3. Bio-digesters construction (85 percent reduction compared to 2000) (Small size (2-3-4m3) Medium size(6-8-10m3) Large size(>10m3). 1,500 bio-digester plant per year (include: small=1450; medium= 45; large=5).	√			MoE	MOE	**Yes**
	4. Develop an enabling environment[46] for expansion of wastewater treatment.	√			MoE	MPWT, Local authorities	No
	5. Develop master plan for wastewater management in all urban areas.	√			MoE	MPWT, Local authorities	No

[44] Looking at reducing wastewater loading linking with cleaner production initiatives in industry and reduction of agriculture run offs; reduction of storm water inflows and other infiltration into the system; reduction of leakages in the system; improvements in the wastewater treatment technology etc.

[45] Enhanced and updated policy and legal framework; updated technical guidelines; institutional arrangements and capacity developed for relevant entities; strengthened collaborations; capacity building; awareness raising.

[46] Establishment of legislation, policies, standards, specification, guidelines and drawings for wastewater and sewerage system; institutional capacity developed for relevant institutions; strengthened collaborations; capacity building; resource mobilization.

	6. Ensure effective treatment of 30 percent of urban wastewater.	√			MoE	MPWT, Local authorities	No
	7. Ensure treatment using decentralized systems of 5 percent of rural domestic wastewater and fecal sludge.		√		MoE	MPWT, Local authorities	No
	8. Ensure better management of wastewater treatment system in the food & beverage sector. Capture and use 5-10 percent of methane emissions. Install 40 percent of required Wastewater Treatment Plants. Implement 50 percent of improvements identified.	√			MoE	MPWT, Local authorities	**Yes**
	9. Develop market for biodigester digestate to partially replace inorganic fertilizer.		√		MoE	GDAHP/ MAFF	No
	10. Conduct feasibility study and demonstration projects for using bio-methane for transport.		√		MoE	MPWT	No
	11. Scale up the market for biodigesters (household, commercial, industrial).		√		MoE	MPWT, Local authorities	No
	12. Effectively treat 70 percent of urban wastewater.		√		MoE	MPWT, Local authorities	No
	13. Treat 15 percent of rural domestic wastewater and fecal sludge using decentralized systems.		√		MoE	MPWT, Local authorities	No
	14. Effectively treat 100 percent of urban wastewater.			√	MoE	MPWT, Local authorities	No
	15. Treat 25 percent of rural domestic wastewater and fecal sludge using decentralized systems.			√	MoE	MPWT, Local authorities	No
	16. Strengthen waste minimization, cleaner production, and wastewater treatment in larger industries.		√		MoE	MPWT, Local authorities	No

3.7 CROSS-SECTORAL

	ACTIONS	TIMESCALE	LEAD ENTITY	COLLABORATING ENTITIES	PART OF Updated NDC TARGETS (YES/NO)
1.	Update the LTS4CN	Prior to each update of the NDC	NCSD		**Yes** (only actions planned till 2030)
2.	Report progress in achieving the objectives of the LTS4CN	Prior to updating the LTS4CN	NCSD		No
3.	Update the NDC and LTS4CN tracking system	Routine maintenance done regularly, major updates as per needs	NCSD		No
4.	Gender assessments conducted of the progress in integrating gender equality concepts in the implementation of the LTS4CN	Prior to reporting progress on the LTS4CN	NCSD		No
5.	Strategic environmental assessment conducted of key policies being developed that contribute to the LTS4CN	Prior to the adoption of new policies, review of existing policies and when needed	NCSD		No
6.	Build capacity for line ministries on updated NDC and LTS4CN Tracking System.	Up to 2030	NCSD	Line Ministries	No

4 FINANCIAL SOURCES TO SUPPORT THIS IMPLEMENTATION PLAN

In December 2015, under the Paris Climate Agreement reached at COP21, developed countries reiterated their commitment to "lead in mobilizing climate finance from a wide variety of sources, instruments and channels, noting the significant role of public funds" (Paris Agreement, Article 9.3). Also, the commitment from COP15 to mobilizing an annual USD100 billion by 2020 was extended to 2025. Beyond that, the Paris Agreement signaled a "progression beyond previous efforts" in climate finance. Developed countries also agreed "to achieve a balance between adaptation and mitigation, taking into account country-driven strategies, and the priorities and needs of developing country Parties" (Paris Agreement, Article 9.4).

The actions of this plan are expected to be funded by development partners, financial institutions, donor community, private sector, and other key stakeholders, apart from funding by the Royal Government of Cambodia through state budget and state-owned enterprises. Some examples of potential financial sources include:

1. Grants for capacity building and technical assistance: ADB, GCF, WB/IFC, GEF, Adaptation Fund, LDCF, KOICA, CIDCA47, EIB, SIDA, USAID, UN entities (UNDP, UNESCAP, UNEP, UNIDO, UNCRD, FAO, UN Habitat, UN Women, etc.), GIZ, JICA, UK-DFAT, AU-DFAT, CTCN, International Climate Initiative, Global Climate Change Alliance, NDC Partnership, Climate Finance Readiness Program, South-South Cooperation for Climate Action, International Solar Alliance, etc.;
2. Non-government grants for investment: GCF, GEF, WB/IFC, EIB, CIDCA, KOICA, etc.;
3. Guarantees for credit: ADB, WB, IFC, EIB, GCF, etc.;
4. Guarantees for export;
5. Concessional loans: ADB, WB, IFC, EIB, GCF, etc.;
6. Commercial and retail loans: commercial banks and financial entities, etc.;
7. State budget & funds from state owned enterprises, etc.;
8. Taxation; and
9. Private sector investment, public-private partnerships, and co-finance of the communities.

5 COORDINATING MECHANISM

1) The existing institutional framework established, the National Council for Sustainable Development (NCSD), its Secretariat (GSSD), (2015) (the Royal decree No. NorSor/RorKorTor/0515/403 and the sub-decree No. 59 OrNorKrar.BorKor) and the Council's Climate Change Technical Working Group (CCTWG) (2017) (Prakas NO.002 S.S.R NCSD) will be harnessed to coordinate the implementation of this plan.
2) The CCTWG is an integral part of the NCSD's structure coordinated by the General Secretariat of Sustainable Development, and it facilitates the review, formulation, and implementation of policies, strategies, action plans, and programs to enhance climate change response. The CCTWG is also assigned to coordinate and facilitate the implementation of this plan as well as its actions with the line ministries.
3) The line ministries are responsible for following the plan and providing annual information on the progress made towards the LTS4CN targets to NCSD through the NDC/LTS4CN tracking system.
4) The coordination of the multi-stakeholder's level, including the non-governmental organizations and the private sector will be designed and a specific framework set.

6 MEASUREMENT, REPORTING AND VERIFICATION (MRV)

The overall coordination of the Measurement, Reporting and Verification (MRV) of the LTS4CN will be managed by the NCSD. The line ministries are responsible for reporting the progress related to the relevant parameters and indicators using sector specific methodologies based on the international guidance.

A tracking system has been developed for the MRV of the LTS4CN, covering --- parameters and indicators that will be monitored annually. This tracking system has been integrated with the existing tracking system for the updated NDC.

In addition, a descriptive report will be prepared every year that will highlight overall progress in relation to the carbon reduction goals and actions requiring specific attention.

Data and estimates through the MRV system will be made available to all relevant stakeholders.