



SRI LANKA

UPDATED NATIONALLY DETERMINED CONTRIBUTIONS

JULY – 2021

MINISTRY OF ENVIRONMENT

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Executive Summary

Sri Lanka, as Party to the Paris Agreement, presents its updated Nationally Determined Contributions (NDCs) to the United Nations Framework Convention on Climate Change (UNFCCC) through this document reflecting progressive and the highest possible ambition for climate action.

Sri Lanka is ranked among the countries that are most vulnerable to climate change-induced hazards. Being a tropical island in the Indian Ocean, Sri Lanka has consistently been placed among the top ten countries at risk of extreme weather events by the Global Climate Risk Index.¹ Sectors that contribute significantly to Sri Lanka's economy tourism, fisheries, tea plantations and agriculture are climate-sensitive and impacted by the disruption of monsoons and altered rainfall. In 2016 and 2017, Sri Lanka's economy contracted due to prolonged drought and widespread flooding. Climate change projections predict long-term changes to the monsoon pattern and shifting of ecological regions.

Sri Lanka is a low carbon emitting country with per capita emissions of around 1.02 tonnes/per person², and its development pathway has remained low-carbon-intensive. A recent analysis of the interplay between per capita emissions and human development, picks out Sri Lanka as a rare example of a country that has achieved both high human development and managed to keep CO₂ emissions well below the long-term average needed to contain global warming targets of the Paris Agreement³.

Sri Lanka is still on an upward development trajectory with ambitions of achieving upper-middle-income status in five years and further improving its human development outcomes. Demand for energy, clean water, efficient transportation, better connectivity, and waste management is growing among both rural and urban populations. The government has pledged accelerated rural development and provision of better infrastructure in burgeoning cities, suburbs, and villages. The government commits to development that is culturally sensitive and environmentally sustainable in its overarching policy framework '*Vistas of Prosperity and Splendor*' envisioned by His Excellency Gotabaya Rajapaksa, the President of Democratic Socialist Republic of Sri Lanka.

Sri Lanka has some unique advantages and experiences in its journey. Historically, sustainable principles were embedded in land use, agriculture, water management, and other economic practices. Religious and cultural practices value simplicity, non-materialism and sustainable consumption. Public investments in health and education services have created a legacy of high literacy and longevity resulting in high human development and early achievement of the Millennium Development Goals (MDGs). In recent years, however, development investments have been eroded by floods, drought and landslides and the economy has been immensely burdened by disaster relief. Reflecting this trend, the National Climate Change Policy of Sri Lanka leans heavily on adaptation, with a vision to minimize climate change impacts on its fragile ecosystems and economy.

Despite the low carbon footprint and high vulnerability to climate change, Sri Lanka commits to reducing its GHG emissions. In these NDCs, the country presents an enhanced ambition which include 4% unconditional and 10.5% conditional emission reduction commitments with respect to Business-As-Usual (BAU) scenario. This document is organized sector-wise detailing Sri Lanka's climate change mitigation commitments and adaptation needs, loss and damage, and means of implementation. It sets out the process and institutional architecture for implementation; and discusses the critical need for external support with financial, technology transfer and capacity development provision to fully realize these commitments. With such timely support, Sri Lanka is positioned to demonstrate a development pathway that successfully decouples human development and economic prosperity from carbon-intensive consumption and production.

¹ www.germanwatch.org

² Calculated on the basis of total emissions in the 2010 GHG Inventory of the Third National Communication excluding LULUCF.

³ Pascale, A., Chakravarty, S., Lant, P., Smart, S. and Greig, C., 2020. The rise of (sub) nations? Sub-national human development, climate targets, and carbon dioxide emissions in 163 countries. *Energy Research & Social Science*, 68, p.101546

Key Highlights of Sri Lanka's Nationally Determined Contributions and Vision for a Low Carbon Future

Sri Lanka is highly vulnerable to the adverse impacts of climate change. The country focuses on building the resilience of **Agriculture, Fisheries, Livestock, Health, Water, Biodiversity, Coastal and Marine, Tourism, Urban Planning and Human Settlement** sectors

Sri Lanka's per capita greenhouse gas emission in 2010 was **1.02** tons and its global cumulative contribution in 2019 was **0.03%**.

Despite this low carbon footprint and highly vulnerable status, Sri Lanka commits to increase **32%** forest cover by 2030 and reduce greenhouse emissions by **14.5%** for the period of 2021-2030 from **Power (electricity generation), Transport, Industry, Waste, Forestry, and Agriculture**

In order to realize this ambitious target, Sri Lanka further commits;

- To achieve **70%** renewable energy **in electricity generation** by 2030
- To achieve **Carbon Neutrality** by 2050 in electricity generation
- **No** capacity addition of **Coal** power plants

Sri Lanka has already launched following major initiatives;

- Adopting 'Colombo Declaration on Sustainable Nitrogen Management' with an ambition to halve nitrogen waste by 2030
- Banning agro-chemicals and chemical fertilizer
- Promoting organic fertilizer and farming
- Banning single-use plastics
- Promoting E-mobility
- Promoting circular economy

Sri Lanka expects to achieve its **Carbon Neutrality** by 2060

Chapter 1. Introduction

Sri Lanka submitted its initial NDCs in September 2016 as a country that ratified the Paris Agreement. In 2020, the Climate Change Secretariat began a process of updating the NDCs to be submitted to the United Nations Framework Convention on Climate Change prior to the 26th Conference of Parties.

The updated NDCs represent a more ambitious, quantified, and robust assessment of the mitigation potential and adaptation measures for the next decade (2021-2030) informed by up-to-date analysis, improved information and data, and an extensive stakeholder consultation process. These NDCs present new evidence on Sri Lanka's climate vulnerability, based on a recent analysis. Further, the NDCs present opportunities that have emerged through development partner-supported initiatives on low-carbon development pathways for key sectors such as power, transport, industry, waste, agriculture and forestry. They spell out urgent financial, technology transfer, and capacity building requirements, in line with Article 2 of the Paris Agreement, to fully adopt a resilient and low-carbon development pathway to upper-middle-income status.

These NDCs are fully integrated into the country's sustainable development vision and are underpinned by policy targets in the national policy framework '*Vistas of Prosperity and Splendor*' envisioned by His Excellency Gotabaya Rajapaksa, the President of Democratic Socialist Republic of Sri Lanka. The National Climate Change Policy of Sri Lanka (2012) describes the national commitment as "*Adaptation to and mitigation of climate change impacts within the framework of sustainable development*". The recently developed National Policy and Strategy for Sustainable Development (Draft) has adopted a policy goal of achieving '*national commitments on climate change, while ensuring adaptation to and mitigation of climate change impacts*'.

To support NDC implementation and monitoring in 2016, Sri Lanka prepared a Readiness Plan 2016-2019, which detailed out actions to facilitate pre-requirements for achieving the NDCs. This Plan was reviewed at Annual Steering Committee Meetings that convened the key sectors contributing to mitigation, adaptation and loss and damages. To achieve the NDCs, relevant sector agencies at the national and sub-national levels are expected to embed NDCs into the regular development planning framework. This will ensure that mitigation and adaptation priorities are reflected in and integrated into workplans, annual budgets and donor proposals of these agencies.

Sri Lanka's NDCs are expected to be supported by external assistance, public funds, and private sector investment. Sri Lanka will prioritize adaptation needs and resilience-building activities, focusing on key sectors -agriculture, livestock, fisheries, water, health, biodiversity, coastal and marine, urban planning and human settlements, and tourism. For Sri Lanka, focusing on adaptation is critical to ensure that development investments are not eroded by constant exposure to climate extremes and that the country remains on track to achieve its ambitions of economic growth and human prosperity. Investments in mitigation will be prioritized based on emission intensities and the economic, social or environmental co-benefits derived from these actions.

As a global citizen, Sri Lanka recognizes its responsibility to uphold the Paris Agreement's objective of containing global warming. It will strive to steer development, especially post-Covid economic recovery and livelihood needs, along a low-emission trajectory that supports both mitigation of and adaptation to climate change, with a strong focus on reaching high income and human development in the next decade. Therefore, Sri Lanka reaches out to the global community for technical, financial and

additional capacity needs outlined in Chapter 9 for effective NDC implementation and to keep the country on a low carbon trajectory as it strives for greater economic and social well-being of its people.

1.1 Country Context

An island nation of 65,610 square-kilometers and a population of 21.8⁴ million, Sri Lanka is fairly densely populated, especially in the urbanized and industrialized south-western coastline of the country. Situated in the humid tropics at 7° North of the Equator, Sri Lanka receives an average of 1860 mm rainfall annually, amounting to approximately 122 billion cubic meters of water. However, rainfall varies regionally between 5500mm in the central hills to around 950mm in the coastal plains of the northwestern and southeastern ends. Mean annual temperature varies between 24°C-31°C in the plains and 18°C-27°C in the mountainous region. Annual rainfall is spread over four seasons- two monsoons and two inter-monsoons.

For a country of its size, Sri Lanka has a complex climatology giving rise to over 45 agro-climatic zones. However, for general purposes the country is divided into three main climatic zones defined by rainfall - the Wet Zone, in the rain-rich southwestern quarter, the Intermediate Zone separating it from an extensive Dry Zone in the north, north-central and eastern plains. The plains surrounding the coast give way to a central mountainous region that rise to over 2,000 m above sea level. The country claims a marine economic zone nearly twenty times its land area- however this resource is least exploited economically.

A diverse topography and varied tropical climate have given rise to extremely high levels of faunal and floral diversity, and high rates of endemism. Around 30% of the country's land is protected by law as sanctuaries, reserves and national parks. This biodiversity supports a considerable economic benefit through tourism, fisheries, traditional medicine, and provides unaccounted for ecosystem services such as water, aesthetic beauty, climate amelioration and soil conditioning. Threats to biodiversity from the changing climate have not been studied adequately but early research illustrate the significant impact on endemic taxa like fishes, amphibians and reptiles, and drastic changes in coastal habitats such as corals, sea grasses and lagoons.

Sri Lanka is classified as a lower-middle-income country and its economy is largely dependent on services such as shipping, tourism, aviation etc. Services accounted for 58.2% of Sri Lanka's economy in 2019 up from 54.6% in 2010, industry 27.4% up from 26.4% a decade earlier and agriculture declined to 7.4%. Despite a competitive export orientation, especially tea and spices, agriculture has declined in economic importance, despite still employing 30% of the workforce. There are around 2 million farmers and a majority of them are small-scale, cultivating less than 1ha. Successive governments have invested in agriculture and expanding irrigation; however, climate change is already adversely impacting on food security and livelihoods and export revenues. Due to prolonged drought in the tea-growing districts, tea yields in 2020 dropped to a 30-year low. Over one million farmers were impacted by flood events in 2016 and 2017. Sri Lanka is currently ranked 66/113 on the Global Food Security Index (2019), while the FAO estimates that 4.1 million out of the 21 million population (over 25% of the population) do not have nutritious food to maintain healthy lives. Child malnutrition, denoted by high rates of stunting and wasting among children, presents a development challenge. These will be exacerbated by predicted climate change.

Sri Lanka has an impressive track record of tackling poverty. The overall poverty rate is 4.1%⁵ showing commendable progress from 20 years ago (28.8% in 2000). However, there is wide disparity in poverty

⁴ Economic and Social Statistics of Sri Lanka 2020, Central Bank of Sri Lanka

⁵ Department of Census and Statistics, Household Income and Expenditure Survey 2016

incidence; districts characterized by low population density, low service penetration and largely agriculture-dependent display much higher rates of poverty (Moneragala, Mullaitivu, Nuwara Eliya and Batticaloa). These districts display higher vulnerability to climate change due to enhanced sensitivity to climatic parameters and lower capacity to withstand climate hazards. In Sri Lanka, a considerable percentage live just above the poverty line. The World Bank assessed in 2015 that one in four people live on less than \$2.50 per day. This population is negatively affected by economic or climatic shocks, and their ability to recover and resume livelihoods is compromised by lack of safety nets and savings.

Sri Lanka's vulnerability to climate change is exacerbated further by the fact that the majority of its population live in rural areas and continue to engage in small-scale farming, fisheries or are employed in the agricultural value chain. Sri Lanka's low urbanization has contributed in no small measure to its overall low-emission growth trajectory. However, this rural lifestyle is increasingly threatened by extreme weather events and anomalies related to the regular monsoon pattern around which the rural economy is organized.

Sri Lanka's unemployment is low. However, both labour force participation (52.3%) and the contribution of women to the formal labour force (34%) are low for a middle-income country. Unemployment among more educated youth is high (11% in 2019) displaying a widening gap between education attainment and employable skills. Women have higher educational attainment and are more likely to complete 13 years of formal schooling. The investments in free schooling and human capital development through vocational and tertiary education have created a literate and young workforce that can benefit from technologically advanced, green jobs. A high level of Information Communication Technology (ICT) penetration and mobile phone usage in Sri Lanka also provides impetus to this opportunity to provide more gainful employment and environmentally friendly livelihood opportunities, especially for youth living in remote rural areas.

The Covid-19 pandemic has significantly impacted Sri Lanka's economy. Lockdowns, travel restrictions and border closing to manage multiple waves of the disease with increasing ferocity and mortality, have depressed the economy and forced the government to offer lifelines to keep vital sectors afloat. This includes tourism, manufacturing, transportation and remittances from expatriate workers. Products that had good global demand during the pandemic- like tea and coconut- were impacted by drought and low production. 2020 recorded negative economic growth and there is a strong impetus to spur on growth and incentivize domestic production. The government committed to a green development framework around the key environmental issues that impact Sri Lanka. Such policies, if backed with fiscal incentives and technical assistance, can direct recovery efforts towards greater sustainability. There are some concrete areas of investment Sri Lanka could potentially consider during post-Covid recovery situation, which have been discussed during the NDC revision process. These are;

- Ensuring domestic food production systems -agriculture and fisheries- are climate-sensitive and environmentally sustainable;
- Incentives for women to engage in agriculture productivity and food security efforts;
- Promoting efficient water management and irrigation systems;
- Enhancing the capacity of the health sector including digitization of services and sustainable health/hospital waste management;
- Enabling policies and incentives for renewable energy, energy efficiency, waste management, green industry and transportation initiatives etc. to reduce GHG emissions;
- Diversify the economy to generate multiple co-benefits to address the severe negative impacts of Covid-19 on livelihood especially to the tourism sector.

Chapter 2: National Vision and Responses to Climate Change

In response to challenges posed by climate change, Sri Lanka has taken several steps by introducing national policies, strategies and actions such as the National Climate Change Policy of Sri Lanka (2012), National Climate Change Adaptation Strategy for Sri Lanka in 2010, the National Adaptation Plan (NAP) for climate change impacts in Sri Lanka (2016), Technology Needs Assessment and Technology Action Plans for Climate Change Adaptation and Mitigation (2014), Nationally Appropriate Mitigation Actions (NAMA) for energy, and Climate Change Sector Vulnerability Profiles (2010) in order to address climate change-induced impacts.

Sri Lanka's climate change and national sustainable development-related policies seek to mainstream climate change into key sectors such as power, urban planning, waste, transport, industry, coastal and marine, forestry, water, health, tourism and recreation, biodiversity, agriculture, livestock and fisheries. Some of these sectors have already integrated climate change risks and commitments. Importantly, National Energy Policy & Strategies of Sri Lanka (2019) and Long-Term Electricity Generation Expansion Plan 2018-2037, the National Policy on Waste Management (2019), the National Policy on Sustainable Consumption and Production for Sri Lanka (2019), Coastal Zone and Coastal Resource Management Plan 2018, National REDD+ Investment Framework and Action Plan (NRIFAP) 2017, Strategic Action Plan for Adaptation of Irrigation and Water Resources Sector for Climate Change 2018, National Policy on Natural Gas (2019), National Policy on Disaster Management (2013), Sri Lanka Disaster Management Plan 2018-2030, Overarching Agriculture Policy (under revision) have integrated climate change impacts and mitigation measures; and has spelt out strategies for low-emission development. The power sector has recorded some impressive developments in mobilising private investments into renewable energy expansion in recent years. Attractive feed-in tariff rates, solar net-metering and net accounting, attractive financing for solar rooftop expansion, energy efficiency labelling for certain appliances and phasing out incandescent lighting have resulted in a proliferation of renewable energy to the grid and reducing energy demand.

Sri Lanka's conditional NDCs for GHG mitigation will require extensive international support to be realized. In the next ten years, Sri Lanka will seek climate financing and technology transfer support towards exploiting more renewable energy resources, expanding energy storage systems and upgrading its electricity distribution network, efficient and effective waste to energy systems, modernizing public transportation, upgrading its road and railway network etc. Meanwhile, the Government of Sri Lanka has taken multiple measures to address climate vulnerability and the impacts of weather-related hazards on lives and livelihoods. These include investments in developing/fortifying the eroding coastline, expanding irrigation and trans-basin diversions to moderate drought, develop meteorological capacity and early warning capacity for floods/landslides. Resettlement of communities living in landslide and flood-prone areas is on-going. Disaster exposure and by extension climate-related vulnerability is increasingly being factored into the design and implementation of development projects such as roads, reservoirs and new settlements, however often the full range of mitigatory measures is both financially and technologically challenging for a developing country.

Chapter 3: NDC Revision Process

The NDC review process was launched in 2020 through the Climate Change Secretariat of the Ministry of Environment. UNDP’s support to the process was obtained through a global project named *Climate Promise* that sought to support 100 countries to upgrade their climate change ambitions in 2020 ahead of COP 26. This support was launched in February 2020. Working groups consisting of experts and professionals were established for each sector under mitigation and adaptation, while the loss and damage discussion was co-led by the Disaster Management Centre and the Climate Change Secretariat.

As a first step, desk reviews of the 2016 NDCs were undertaken by national consultants based on available materials including national policy documents, sectoral master plans, National Adaptation Plan for Climate Change (2016-2025), Technology Needs Assessment for Climate Change Adaptation and Mitigation, and the draft Third National Communication (TNC) including the inventory of greenhouse gases prepared for the TNC. The findings were verified through discussions with technical working groups for each sector. For efficiency, the NDCs built upon recent discussions and analysis of climate risks and vulnerability, including those completed for the Third National Communication (draft), and Climate Change Risk in Sri Lanka – Sector Risk Profile (draft), Marginal Abatement Cost Curves analysis for energy, Low-Carbon Development Strategy (draft), National Disaster Management Plan (draft) and National REDD+ Investment Framework and Action Plan.

Due to restrictions on physical meetings imposed to control the spread of Covid-19 through March-May 2020, virtual meetings and discussions were held with all working groups and the core NDC team. The draft NDCs were then presented to wider groups of stakeholders (by sector) from July to September 2020 when restrictions were relaxed enabling physical meetings and discussions.

Separate discussions with lead sectoral agencies/Ministries were held to understand the development priorities, institutional structures, public finance availability and financing and capacity needs for NDCs in each sector. Detailed implementation plans will be prepared for each sector with clearly identified actions/sub-actions, targets and responsible agencies. These will be integrated, as fully as possible, into the regular planning cycles of these sectors ensuring smooth delivery. Finally, an assessment of the cost of achieving NDCs in order to develop a financing strategy has been commissioned. The Financing Strategy will be communicated to the international community as an addendum to the NDCs.

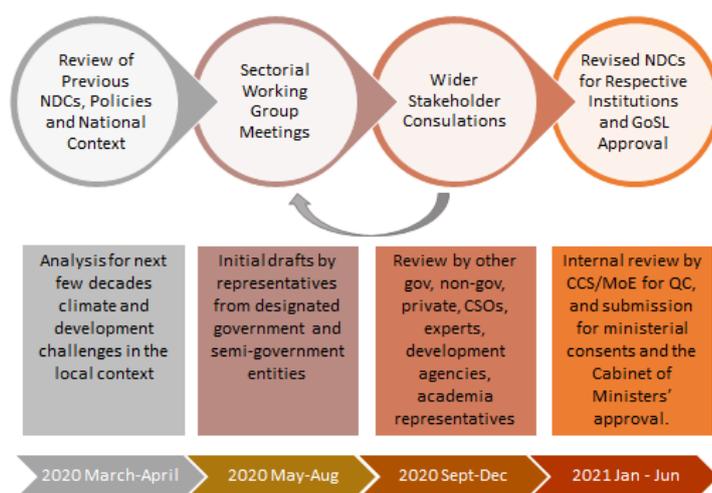


Figure 3. 1: NDC Revision Process

Chapter 4: Mitigation NDCs

4.1 Climate Change Mitigation in Sri Lanka

As described in Chapter 1 and 2, Sri Lanka's economic and human development has been largely 'low-carbon' aided by decades of public investment in education and health, non-reliance on energy-intensive heavy industry for economic growth and continued exploitation of indigenous energy sources such as wind, hydro, solar and biomass. The country is recognized as a rare global example of how human wellbeing and economic prosperity can be decoupled from carbon-intensive development and lifestyles.⁶ However, there is room for further GHG reduction while continuing an upward development trajectory. Therefore, these NDCs present an increased ambition for GHG reduction (over the initial NDC in 2016) generated largely through improved target setting in six sectors; electricity (power; electricity generation and end-use), transport, industry, waste, forestry, agriculture (including livestock). Mitigation actions with high GHG abatement potential and closely aligned with sustainable development objectives of the country have been prioritised for implementation over the period 2021 to 2030.

To develop these NDCs, Sri Lanka's policies and strategies on the above six sectors were reviewed along with the National Environment Policy, National Climate Change Policy, National Policy for Sustainable Development (draft) and National Policy for Sustainable Consumption & Production. In general, low-carbon and energy-efficient practices, circular economy concepts and promotion of GHG sinks by improving forest/tree cover are supported through the above policy directions. In the past five years, Sri Lanka has taken several proactive steps, introduced policy instruments and financial incentives to develop a low-carbon pathway.

The power sector, for example, has enabled private investment in renewable energy by supportive policy instruments such as feed-in tariffs, net-metering and net-accounting. Energy efficiency has been incentivised by high energy rates rationalising consumption, Time-of-Use (TOU) billing etc. and supported through financial incentives to replace incandescent lighting with LED in a short timeframe. Waste-to-energy investments and waste composting measures in key municipalities have substantially increased managed waste in urban areas. Regulatory restrictions and environmental considerations have forced large-scale waste producers- such as livestock farms, hotels- to invest on in-site waste treatment and management.

Industry has embraced energy efficiency, circular economy concepts and cleaner production. Some larger industrial production facilities are now going for 'carbon-neutrality' for marketing advantage and sustainability. The sector pledged to adopt 'green or eco' concepts when investing in new industrial parks.

The transport sector has seen a modal shift from public to private which is in keeping with middle-income development aspirations. Significant investments are lined up to upgrade passenger transport systems including the long ailing railway and expressway network, introduce modern conveyance systems in congested urban centres and promote more hybrid and electric vehicles among private users.

⁶ <https://iopscience.iop.org/article/10.1088/1748-9326/9/1/014011/pdf>

4.2 Unconditional and Conditional Policy Responses

Sri Lanka interprets **unconditional** policy responses as those actions that have been identified in national plans and programmes, prioritised for domestic investments (public and private) which can be implemented with domestic capacity. These actions amount to 4.0%⁷ of GHG emissions reduction with respect to BAU scenario for the period 2021-2030.

Conditional policy responses require external support including financing, technology transfer, and capacity building. Many conditional NDCs are constrained by their lack of market readiness (economic viability) and immaturity of the technology. Conditional NDCs form the majority of the actions described in the following sectors. These actions are important for long-term course-change in key sectors; –power, transport, industry, waste, forestry, agriculture & livestock- towards low-carbon pathways. Sri Lanka is keen to propel its growth towards upper middle-income status by enabling better rural services, improving liveability and efficiency in urban areas and encouraging the growth of services and manufacturing, especially of value-added agricultural products. In this background, conditional NDCs have been framed around an analysis that presents the country’s commitment to maintaining its trajectory of low-emission growth with international financial and technical assistance. These conditional NDC actions account for additional 10.5%⁷ of GHG emissions reduction respective to the BAU scenario for the period 2021-2030.

4.3 Implementing and Monitoring Mitigation NDCs

NDCs will be ‘projectized’ into fundable actions and further developed for private sector investments, public financing through the Government’s budget or through international funding agencies by developing proposals for climate financing. This process will involve detailed feasibility of the actions themselves, a thorough analysis of the sustainable development co-benefits and financing options. This process presents the opportunity to conduct detailed gender and social analyses of the actions and propose any mitigatory steps to overcome risks. Gender and sustainable development co-benefit analysis is mandatorily required in Sri Lanka’s national planning project format.⁸ Environmental and social impact assessments will be carried out as required for the larger projects that involve land conversion or infrastructures.

Around 40 mitigation actions classified under the six sectors mentioned above contribute to Sri Lanka’s total GHG emissions reduction target. However, there will be further GHG emissions reduction from unquantified mitigation actions which cannot be quantified due to lack of baseline and emissions reduction potential information at present. These GHG emission mitigation potentials and actual achievements will be accounted and communicated in the future after baseline data and necessary sectorial MRV mechanisms are fully established with necessary internal and external support. Further, there are certain adaptation actions described in Chapter 5 that contribute to GHG emissions reduction. The emissions reduction from climate adaptation actions in sectors such as livestock, tourism, and urban settlements, have not been accounted for in the overall GHG emission calculations presented above. Hence these mitigation benefits will be additional to Sri Lanka’s total emissions reduction target.

⁷ For the six sectors covered in this revision (power, transport, industry, waste, agriculture & livestock, forestry). Analysis excluding the emissions & emissions reduction activities in certain sub sectors such as some land use categories.

⁸ <http://www.npd.gov.lk/index.php/en/2017-03-02-07-02-41/project-submission-format.html>

4.4 Sectoral Mitigation NDCs

4.4.1 Electricity (Power) Sector

Sri Lanka has achieved nearly 100% electrification for all potential users of the country -barring a few isolated communities. The total installed power generation capacity in 2019 was 4,217 MW, of which around 50% consists of renewable energy including large and small hydro, wind, solar, and biomass. The rest is generated through coal and oil-based thermal power. Sri Lanka's annual electricity demand was approximately 14,611 GWh in 2019. Around 35% of this demand was met by renewable energy resources in 2019. The demand for electricity is expected to grow by 5% annually and future electricity generation expansion programs are expected to meet this demand growth.

Sri Lanka has taken several recent initiatives to implement sustainable energy programmes. Key principles in the Energy Policy (2019) guides the country to further develop indigenous renewable energy sources to the optimum level, diversify the generation mix and minimise dependence on imported fossil fuels. It is stated that renewable energy sources should be developed considering resource potential, economics, maturity of technology and quality of supply. These initiatives are expected to bring renewable energy based power generation to the fore-front, with a target of realizing 70% electricity generation using renewable energy sources by 2030.

Future Outlook and GHG Emissions Reduction Potential in Electricity (Power) Sector: National Energy Policy (2019) primarily focuses on ensuring energy security, equity, and sustainability of the energy supply. As it is essential to maintain a regular power supply with a practical and a balanced energy mix, the firm capacity should be maintained with Liquefied Natural Gas (LNG) or indigenous natural gas, high-efficient coal power, large storage hydro, furnace oil refined from national refinery and non-conventional renewable energy sources⁹ which can provide the firm/ base power requirement. Aligning with the *Vistas of Prosperity and Splendour*, significant growth in increasing power generation through wind, solar, hydro and biomass is expected. In addition, Demand Side Management (DSM) activities, and transmission and distribution loss reduction activities will support emissions reduction. Furthermore, converting existing fuel oil-based combined cycle power plants to natural gas and introducing new natural gas-based power plants will support emissions reduction efforts, contributing to NDCs.

Furthermore, no new coal power plant addition is expected for the future, and converting existing fuel oil based combined cycle power plants to natural gas and introducing new natural gas based power plants will support emission reduction efforts, contributing to NDCs. The long-term target of the power sector is to achieve carbon neutrality in 2050, based on which the National Energy Policy & Strategies has been framed.

Key interventions envisaged for GHG emissions reduction up to the year 2030:

- Development of hydro-power base to its maximum potential through new large and small hydro-power plants amounting to around 300 MW.
- Develop approximately 800MW of wind power generation in Northern and North-Western coastal areas of the island.
- Develop approximately 2,000 MW of solar power capacity using different modalities such as solar rooftops, small scale, and large solar PV power plants.

⁹Small hydro, solar PV, wind, biomass, biogas and other agro-waste power plants.

- Power generation through biomass and municipal solid waste will also be added with an expectation of a reasonable contribution to power generation.
- Facilitate the implementation of pilot-scale projects using new renewable energy sources that have not yet reached commercial maturity and other grid supporting infrastructures including behind the meter (BtM) and grid-scale energy storage solutions to assist more renewable energy integration.
- Pursue Pumped Storage Hydro Power Plant development to accommodate higher level of intermittent and weather-dependent renewable energy to the power generation system.
- Continue the loss reduction initiatives of the transmission and distribution network.
- Convert existing fuel oil-based combined cycle power plants to use natural gas and to develop new natural gas plants as an alternative to planned coal power plants (depending on infrastructure availability for natural gas).
- Implement Demand Side Management activities through a five-year national Energy Efficiency Improvement and Conservation (EEI&C) programme.
- Introduce policy supportive measures such as tax benefits, low-interest financing, etc. to expedite the implementation of renewable energy development and energy efficiency improvement programmes.
- Engage in viable carbon trading mechanisms to promote the shift towards clean energy sources.

In order to achieve NDCs, activities have been identified (Table 4.4.1); some are quantifiable while others, though not quantifiable, are supportive and essential for effective implementation¹⁰.

Table 4.4.1: NDCs in Electricity (Power) Sector

NDC #	NDCs and NDC Actions	Timeline
NDC 1	Enhance renewable energy (RE) contribution to the national electricity generation mix by increasing solar PV, wind, hydro and sustainable biomass-based electricity generation (Target: Develop an additional capacity of 3,867 MW renewable energy over the RE capacity considered in Business-As-Usual scenario, out of which approximately 950 MW are on an unconditional basis and 2,917 MW on a conditional basis) ¹¹	2021-2030
	1.1 Establish wind, solar (rooftop, small-scale and large solar PV), biomass ¹² , large and small hydro power plants	2021-2030
	1.2 Develop required transmission network infrastructure to enable the integration of renewable energy	2021-2030
NDC 2	Implement Demand Side Management (DSM) measures by promoting energy-efficient equipment, technologies, and system improvements in a national Energy Efficiency Improvement and Conservation (EEI&C) programme	2021-2030
	2.1 Realize energy saving of 2,603 GWh by phasing out incandescent bulbs as a conditional measure	2021-2025
	2.2 Realize energy saving of 5,189 GWh by introducing efficient lighting, fans, refrigerators, and chillers as a conditional measure	2021-2030
	2.3 Implement Energy Efficiency Building Code on a mandatory basis	2021-2022

¹⁰ When determining the NDC activities, the unconditional targets were declared based on the financial and technical capability already available in the country. Targets that require external financial and technical support to supplement the domestic capacity are declared as conditional targets. External technical and financial supports are vital factors for the successful accomplishment of these goals, which renders them as conditional

¹¹It should be noted that, conditional target in above NDC Action 1 is based on interim results of ongoing national planning exercises, which shall be validated subjected to grid limitations such as operational flexibility, system stability, etc. In achieving this conditional target, grid reinforcement measures and enabling technologies such as energy storage shall be required

¹²Power generation through sustainable biomass resources

	2.4 Promote High-Efficiency Motors (HEM), Variable Frequency Drives (VFD), tri-generation, and other energy efficiency measures in the industrial sector	2021-2030
NDC 3	Conversion of existing fuel oil-based combined cycle power plants to Natural Gas (NG) and establishment of new NG plants as conditional measures (once the necessary infrastructure is available)	2021-2027
	3.1 Conversion of existing 600 MW of fuel oil-based combined cycle power plants to NG	2021-2026
	3.2 Establishment of new combined cycle power plants in place of anticipated coal power capacity additions in the BAU and gas turbines with approximately 700 MW of capacities to be operated from NG	2021-2027
NDC 4	Transmission and distribution network efficiency improvements (Loss reduction of 0.5% compared with BAU by 2030) as an unconditional measure (Target: Approximately 1,848 GWh energy savings)	2021-2030
	4.1 Carry out developments in the transmission network, re-conducting of existing transmission lines, and reactive power compensation activities	2021-2030
	4.2 Carry out the conversion from bare conductors to bundled conductors, improved construction & maintenance practices in the distribution network	2021-2030
NDC 5	Conduct R&D activities to implement pilot-scale projects for Non-Conventional Renewable Energy (NCRE) sources that have not yet reached commercial maturity and develop other grid supporting infrastructures as conditional measures	2021-2030
	5.1 Conduct R&D activities to implement pilot-scale projects for new renewable energy sources which have not yet reached commercial-scale maturity	2021-2030
	5.2 Develop Pumped Storage Hydro Power Plants and pilot scale storage systems such as Behind the Meter (BtM) and Grid-Scale Energy Storage Solutions to support the integration of renewable energy to the system by improving system flexibility	2021-2030
	5.3 Introduce ICT interventions such as Smart Grid technologies to support the integration of intermittent renewable energy into the system	2021-2030

It is expected that the implementation of updated NDCs will result in GHG emissions reduction against BAU scenario by **25%** in the electricity sector (**5% unconditionally and 20% conditionally**) equivalent to an estimated mitigation level of 9,819,000 MT unconditionally and 39,274,000 MT conditionally (total of 49,093,000 MT) of carbon dioxide equivalent during the period of 2021-2030¹³ (Figure 4.4.1).

¹³ The forecasted emissions of the power sector for the period 2021-2030 is 196,373,000 MT as per the BAU scenario of the Long-Term Generation Expansion Plan 2013-2032 of Ceylon Electricity Board published in October 2013 which was the basis of the first NDC commitment.

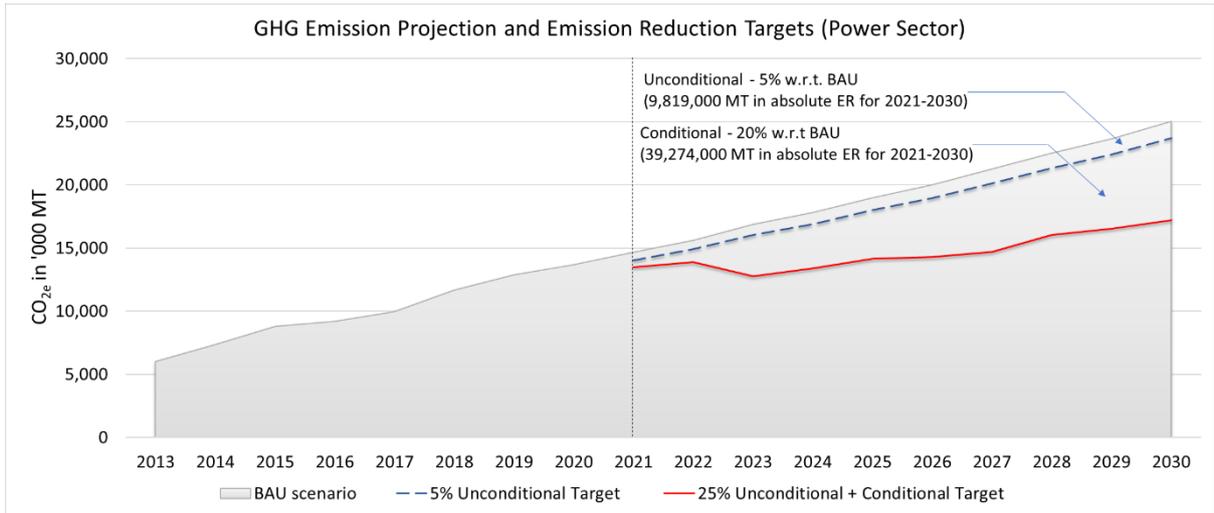


Figure 4.4.1: Emission reduction projections in Electricity (Power) Sector

4.4.2 Transportation Sector

Road transportation is dominant over the railway, air, and sea modalities in Sri Lanka. The present active vehicle fleet of Sri Lanka is around 6.7 million¹⁴, of which 54% are motorcycles, 16% are three-wheelers (motor tricycles), 11% motor cars, and 1% buses. Despite investments and attempts to improve public transportation options, the quality and availability of public transportation are yet below expectation. This and rising per capita income have resulted in a gradual decrease in passengers using public transportation and an increase in private vehicles. In turn, there is increased traffic congestion, a reduction in fuel economy, and higher emissions. All fuel for transport is imported. Although Sri Lanka adopts Euro 4 emission standards and continues with the vehicle emission testing programme, the considerable share of inefficient vehicles in operation leads to higher GHG emissions.

The increase in private vehicle use in urban areas has increased traffic congestion, road accidents and air pollution, and in turn impacts the economy, environment, and society. High dependence on road transport, as against railways or water-based transport modes, tend to increase total energy consumption and air pollution. Though Sri Lanka Railway (SLR) played a dominant role in the past, its share of passenger and freight transportation has shrunk over time. SLR has identified the potential to improve its services as a low-cost mass transportation mode for passengers and goods, and thereby reduce urban and suburban traffic congestion to a great extent. On the other hand, non-motorized transport share is very low in urban areas and is reducing in rural areas. Three-wheelers, school, and office vans are providing substantial services to communities that do not have direct access to buses or trains. Recent infrastructure developments in the sector such as expressways, park & ride facilities, multimodal transport hubs, etc. are expected to reduce the emission footprint while positively contributing to the environment and economy.

Future Outlook and GHG Emissions Reduction Potential in Transport Sector: Under the business-as-usual scenario, the share of public transportation will decline further. However, the updated NDCs are expected to re-invigorate public transportation including railways, buses, and improve intermodal connectivity between rail, road, and water-based transportation. Investments in safe, reliable, accessible, and comfortable public transportation can encourage the shift from private to public. An increase in public transport will reduce traffic delays and congestion. Improvement of energy efficiency/fuel economy in the transport sector becomes a national priority to save foreign exchange contributing to the economy, local and global air pollution, apart from its contribution to GHG emissions reduction as stipulated through the NDCs.

Updated Transport Sector NDCs: The sector has analyzed the abatement costs of different transport sector mitigation options under the Initiative for Climate Action Transparency (ICAT) support. Even though this assessment indicates that there are several emission reduction activities that can be implemented compared to the BAU scenario, the country needs significant financial support to accomplish the identified actions. A comprehensive Measuring Reporting and Verification (MRV) system for the transport sector is being implemented under the same programme. An initial feasibility assessment for the 'Nationally Appropriate Mitigation Actions (NAMA) on Bus Rapid Transport (BRT)' concept was completed in 2015/2016 and expects external support to complete as a comprehensive feasibility and implementation of the same. Strengthening NDCs communicated in 2016 with this evidence/analysis, the following actions (table 4.4.2) are proposed to support transport sector emissions reduction. The development of an environmentally sustainable transport (EST) system, based

¹⁴ <https://www.ntc.gov.lk/corporate/pdf/NTCEnglishReport2017.pdf>

on the concept of “Reduce-Shift-Improve” supports reducing (or avoiding) the need to travel, shifting to more environmentally friendly modes, and improving the energy efficiency of transportation and vehicle technology (focused on system efficiency, trip efficiency, and vehicle efficiency).

Table 4.4.2: NDCs in Transport Sector

NDC #	NDCs and Actions	Timeline
NDC 1	Transport sector system improvement	2021-2030
	1.1 Avoid the need to travel	2021-2030
	1.2 Reduce commuting distances and travel time	2021-2030
	1.3 Improve traffic and traffic light management	2021- 2030
	1.4 Improve parking management	2021- 2030
	1.5 Introduce intelligent transport management systems	2021-2030
	1.6 Improve road architecture (road designs, road signs, signaling, signage, etc.)	2021-2030
NDC 2	Promote public passenger transport	2021-2030
	2.1 Improve public road transport for reliability, affordability, accessibility, availability, comfort and safety	2021-2030
	2.2 Improve railway transport for reliability, affordability, accessibility, availability, comfort and safety	2021-2030
	2.3 Integrate transport modes	2021-2030
	2.4 Improve last mile connectivity	2021-2030
NDC 3	Shift freight to efficient modes	2021-2030
	3.1 Switch back to rail from road transport	2021-2030
	3.2 Promote transporting petroleum products by pipeline	2021-2030
	3.3 Introduce rail-based transport system with inland container depots	2021-2030
NDC 4	Rapid transport for passenger transport	2021-2030
	4.1 Introduce Light Rail Transport in Colombo city	2021-2030
NDC 5	Promote non-motorized transport modes	2021- 2030
	5.1 Promote the use of bicycles	2021-2030
	5.2 Improve the facilities for pedestrian walkways	2021-2030
NDC 6	Introduce taxes and other instruments to promote public transport	2021- 2030
	6.1 Change the existing vehicle emission charging system from the present vehicle based to vehicle type, fuel used and emission-based system plus the total km travel	2021-2030
	6.2 Restrict the entry of individual modes of transport to sensitive areas and congested areas of major cities during peak hours through a levy	2021-2030
	6.3 Develop park and ride infrastructure developments combined with Corden based pricing mechanism	2021-2030
NDC 7	Introduce inland water transport modes	2021-2030
	7.1 Introduce canal-based water transport using diesel or grid electricity-powered boat service for selected canal routes	2021-2030
NDC 8	Modernizing and upgrading of suburban railway	2021-2030
	8.1 Electrification of railway lines	2021-2030
	8.2 Develop new railway lines and expansion of existing railway network	2021-2030
NDC 9	Promote electric mobility and hybrid vehicles	2021-2030
	9.1 Increase tax concessions for electric & hybrid vehicles	2021-2030
	9.2 Facilitate supportive infrastructure developments such as charging stations, battery swapping & replacements	2021-2030
	9.3 Tax & Duty concessions for batteries used for electric and hybrid vehicles after introducing a specific HS code	2021-2030
NDC 10	Improve vehicle fleet efficiency	2021-2030
	10.1 Improve efficiencies of the existing vehicle fleet	2021-2030
	10.2 Promote the import of fuel-efficient vehicles	2021-2030
	10.3 Introduce programmes to change driver behaviours	2021-2030

NDC 11	Road infrastructure development	2021-2030
	11.1 Development of provincial and rural road infrastructure for improved mobility	2021-2030
	11.2 Expansion of expressway network	2021-2030
NDC 12	Reduce GHG emissions from the marine sector	2021-2030
	12.1 Ratify Annex VI of MARPOL convention to enforce provisions in Sri Lanka	2021-2030
	12.2 Study the impact of shipping on GHG emissions (coastal traffic and ports) depending on evidence-based information and introduce measures to address the issues	2021-2030
	12.3 Promote sea transportation	2021- 2030
NDC 13	Generic enabling activities	2021-2030
	13.1 Introduce new national policy or make amendments to relevant existing policies to promote environmentally sustainable transport modes including electric mobility and hybrid vehicles	2021-2030
	13.2 Introduce fuel-based carbon tax	2021-2030
	13.3 Include climate change measures in maritime policy making	2021-2030

It is expected that the implementation of updated NDCs will result in GHG emissions reduction against BAU scenario by **4.0%** in the transport sector (**1.0% unconditionally and 3.0% conditionally**) equivalent to an estimated mitigation level of 1,337,000 MT unconditionally and 4,011,000 MT conditionally (total of 5,348,000 MT) of carbon dioxide equivalent during the period of 2021-2030 (Figure 4.4.2).

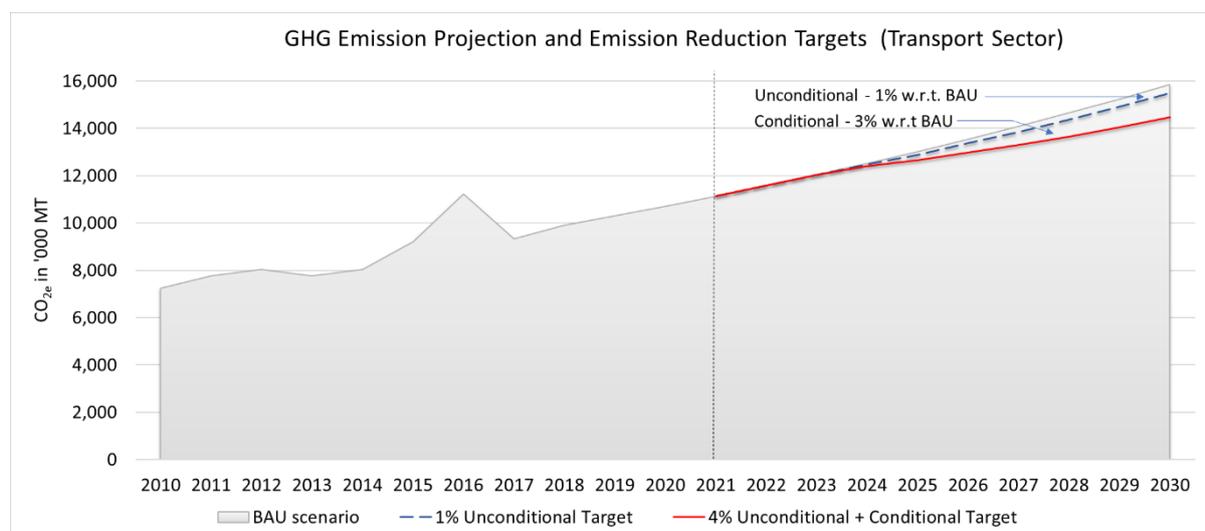


Figure 4.4.2: Emission reduction projections (Transport Sector)

4.4.3 Industry Sector

The industrial survey conducted in 2016 by the Department of Census and Statistics reported 21,295 industrial establishments¹⁵ in Sri Lanka with manufacturing as the largest segment. Industrial production, according to Central Bank Annual Report 2018, is the second-largest contributor to GDP (15.5%) after the service sector (26.1%) and employs 30% of the country's workforce. Textile, apparel, and tea manufacturing are the most significant export-oriented sub-sectors.

As per the Energy Balance 2018 of Sri Lanka Sustainable Energy Authority, the energy required for the industry sector came from three main sources: biomass (33%), petroleum oil (34%) and electricity (33%). Biomass is used in tea and rubber factories, bakeries, tile and brick industries and other small-scale industries. Fossil fuel is used for operating boilers, ovens and furnaces in other industries. The key industries contributing to GHG emissions are cement manufacture, lime production for the construction industry, and industries using limestone and soda ash. However, compared to emissions from industrial energy consumption, industrial processes generate a relatively low level of GHG emissions.

Future Outlook and GHG Emissions Reduction Potential in Industry Sector: The Government of Sri Lanka is focusing on creating a globally competitive, high value-added, innovative, technology, and knowledge-based industry, with a minimal adverse impact on the environment, which could boost the investor confidence and ensure higher export revenues and achieving sustainable development. To reflect this new direction, the Ministry of Industries is now in the process of formulating a National Policy for Industrial Development (NaPID) and a five-year Strategic Implementation Plan to operationalize the NaPID.

Alongside this, the Ministry of Industries is exploring the possibility of implementing industry sector NDCs through the design and implementation of policy, as well as regulatory, technical & financial mechanisms and tools to accelerate the deployment of renewable energy, energy & resource- efficient technologies and best practices. These NDCs (Table 4.4.3) will enhance mitigation ambitions while embracing and incorporating resource efficiency, circular economy and other internationally acclaimed concepts. It is noted that these NDCs are directly or indirectly addressing energy-consumption-based emissions as there are limited avenues and reliable data sources to account for industrial process and product use (IPPU) related actions.

Table 4.4.3: NDCs in Industry Sector

NDC #	NDCs and Actions	Timeline
NDC 1	Continue fuel-switching to sustainable biomass energy and improve user efficiency in selected industrial sub-sectors (tea, rubber, apparel, hotel & tourism, rice processing)	2021-2030
	1.1 Convert industry furnaces to steam boilers and hot-water systems	2021-2030
	1.2 Improve biomass user efficiency by increasing feedstock quality, operation and maintenance practices, system design and automation	2021-2030
	1.3 Introduce biomass "Co-generation" in industries	2021-2030
	1.4 Switch from fossil fuel to biomass energy in government institutions for thermal energy requirements	2021-2030

¹⁵ Annual Survey of Industries (2018) published by the Department of Census and Statistics.

NDC 2	Enhance the application of Resource Efficient Cleaner Production (RECP) practices in selected industrial sub-sectors	2021-2030
	2.1 Conduct RECP and energy audits and develop baselines based on industry classifications & the importance	2021-2023
	2.2 Adopt RECP practices including low carbon technologies and processes	2021-2030
	2.3 Improve water use efficiency in selected industrial subsectors	2021-2030
	2.4 Promote energy-efficient appliances and technologies such as High-Efficient Motors (HEM), Variable Frequency Drives (VFD), efficient chillers and refrigeration technologies	2021-2030
NDC 3	Establish eco-industrial parks and villages	2021-2030
	3.1 Transform existing industrial parks (IPs) incorporating maximum possible green industrial concepts	2021-2030
	3.2 Introduce policy and regulatory regime, including guidelines to ensure all new IPs will be set up as Eco IPs	2021-2023
NDC 4	Introduce Circular Economy concept to selected industrial sub-sectors and selected industrial zones	2021-2030
	4.1 Conduct a survey to identify and determine the potential subsectors to implement the circular economy concept	2021-2023
	4.2 Introduce the life cycle approach for selected subsectors for greening the supply chain	2021-2030
	4.3 Practice industrial symbiosis concept in selected industrial parks and industrial sub-sectors	2021-2030
	4.4 Establish a pilot project on the zero-waste concept in selected industrial parks or industrial subsectors	2021-2025
	4.5 Adopt ISO standards for the circular economy concept (ISO/TC 323)	2021-2030
	4.6 Build industry capacity to adopt the circular economy concept	2021-2030
NDC 5	Introduce tri-generation facilities to selected industrial parks	2021-2030
	5.1 Carry out a rapid assessment of tri-generation potential in 10 industrial parks	2021-2023
	5.2 Carry out a detailed assessment in one of the BOI industrial parks for piloting	2021-2022
	5.3 Develop business models and funding options	2021-2023
	5.4 Implement one Tri-generation facility as a pilot project	2021-2027
	5.5 Depending on the success of the pilot project, expand it into BOI and other industrial parks and other prospective applications	2021-2030
	5.6 Make provisions through policy instruments to have Tri-generation for new industrial zones	2021-2030
NDC 6	Incentivize GHG reduction of clinker production in the cement industry	2021-2023
	6.1 Make necessary amendments to Sri Lanka Standard Institute (SLSI) standards for cement production enabling the increase of ash and other similar materials as substitutes for clinker in line with industry standards and trends worldwide	2021-2023
NDC 7	Generic enabling activities	2021-2023
	7.1 Facilitate industries in selected sub-sectors to adopt relevant ISO systems having a focus on GHG emissions reduction	2021-2023
	7.2 Introduce and promote suitable tax incentives to promote the acquiring of sustainable technologies	2021-2023
	7.3 Facilitating the entry of ISO certified companies to the Green Public Procurement system of Sri Lanka	2021-2023
	7.4 Facilitating transformational investment and favorable loans through financing institutions linking with green financing	2021-2023
	7.5 Introduce a national policy to address siting of industrial parks and stand-alone industries, new concepts like circular economy, industry ecology, RECPs, digitalization, etc.	2021-2023
	7.6 Ensure the availability of sustainable biomass for industry use	2021-2023
	7.7 Promote National Green Reporting System (NGRS)	2021-2023

It is expected that the updated NDCs for 2021 to 2030 will reduce GHG emissions against the BAU scenario by 7% in the industry sector (4% unconditionally and 3% conditionally) equivalent to an estimated mitigation level of 2,088,000 MT unconditionally and 1,482,000 MT conditionally (total of 3,570,000 MT) of carbon dioxide equivalent during that period (Figure 4.4.3) . It should be noted that

there are additional emission reductions from various initiatives which are difficult to be accounted for as no systematic reporting/accounting arrangement is yet in place.

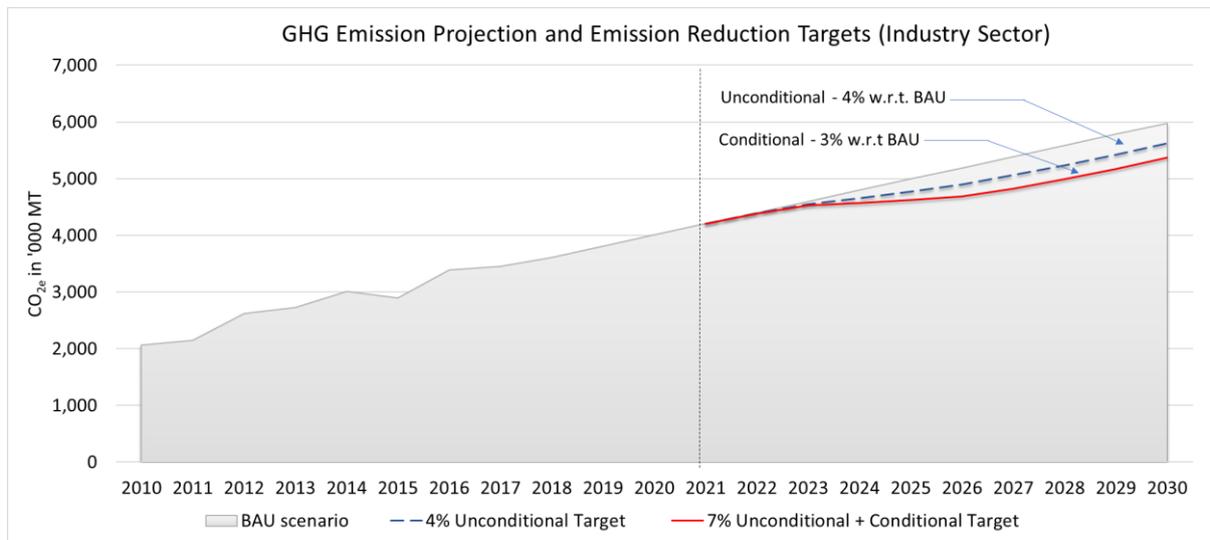


Figure 4.4.3: Emission reduction projections (Industry Sector)

4.4.4 Waste Management

Sri Lanka generates around 9,000 metric tonnes (MT) of municipal solid waste (MSW) per day (equivalent to about 0.41 kg/capita/day¹⁶) with the Western Province accounting for 3,500 MT (40%) of volume. Waste collection by local authorities is about 55% in the Western Province and 25% in the other provinces. With population growth, fast development of infrastructure, rapid urbanization, industrial growth, increase of per capita income, rise in living standards, changing lifestyle, and economic conditions, the generation of municipal solid waste is expected to increase in the next decade 2021-2030. This illustrates the need for a national action plan for solid waste management, that all stakeholders can acknowledge and work towards a common goal. The limited coverage of proper waste segregation and adequate waste collection mechanisms covering the whole island, inadequate public commitment on waste management, and practical difficulties in the application of 3R principles are some underlying issues of the current waste management practice.

Sri Lanka has a legislative and institutional framework with environment-related policies, strategies, and guidelines on waste management. Technologies and methods used for waste management are well accepted, however innovative technologies and strategies are yet to be introduced to streamline and modernize existing waste management practices.

The Waste Management Authority of Western Province (WMAWP) has prepared targets for waste treatment and disposal for the period 2019 to 2023. Accordingly, open dumping of waste will be significantly reduced, and waste will be collected in closed enclosures for mass disposal in respective local authorities and used in waste-to-energy projects after resource recovery steps. Already, two private companies have been granted permission for waste-to-energy generation projects with capacities of 700 and 500 MT/day and the first plant has been just commissioned. In parallel to the plan of the WMAWP, three large-scale compost facilities are in operation, each with 100 MT/day capacity. Presently, about 2% of the waste collected by local authorities is recycled, while the amount recycled by the informal sector is considered to be much higher. The Ministry of Provincial Councils and Local Government plans to establish composting facilities each with the capacity of 50 MT/day in many provinces.

Future Outlook & GHG Emissions Reduction Potential in Waste Sector: The prioritized objectives of the recently approved National Policy on Waste Management (2019) are waste avoidance and reduction. The next level of management recommends adoption of waste recycling and other forms of environmentally-sound disposal; re-use of unavoidable waste to the extent possible; maintain hazardous substances in waste at the lowest possible level and guarantee an environmentally sound residual waste treatment and disposal underlining the gradual shift from a waste generating socio-cultural regime to a new paradigm in which waste disposal is minimized in favour of reuse and reduced consumption.

Along with other measures, awareness through education and attitude change among the public is required to realize a sustainable waste management system. A long-term solution that addresses the issue of open dumping and create economic/fiscal disincentives for waste generation is needed. These NDCs (Table 4.4.4) will enhance mitigation ambitions while embracing circular economy concepts clearly spelt out in the national policies for Waste Management and Sustainable Consumption and Production.

¹⁶ This is based on the judgement of experts of relevant authorities and various studies carried out in the past

Table 4.4.4: NDCs in Waste Sector

NDC #	NDC and Action	Timeline
NDC 1	Improve “Circular economy” practices in all MSW generation sources	2021-2030
	1.1 Prevent, avoid or reduce MSW generation by reducing the growth by 10 % and also by reducing generation growth of industry solid waste and effluent	2021-2030
	1.2 Improve the segregation of MSW at source and increase number of segregation categories	2021-2025
	1.3 Improve MSW collection and transportation system (Up to 75% on generation basis in Western Province and 60% in other provinces)	2021-2030
	1.4 Improve waste recycling to 7% on collection basis in Western Province (WP) and 5.0% in other provinces	2021-2030
	1.5 Implement regulatory framework to control high waste generating products	2021-2023
NDC 2	Manage biodegradable waste component through biological treatments	2021-2030
	2.1 Increase the present level of composting to 30% of compostable waste collected in Western Province and other Provinces	2021-2030
	2.2 Apply suitable treatment facilities for liquid waste such as central / networked sewage and wastewater treatment facilities, night soil treatment facilities for selected Local Authorities (LAs), improve the treatment and appropriate disposal of industrial wastewater, assist LAs that have facilities for feed sludge management, prepare options to use treated waste water, enhance capacities of existing treatment plants with new treatment technologies, enhance the treatment facilities for industrial sludge and introduce volume-based pricing system for liquid waste	2021-2030
	2.3 Adopt biogas technology where composting is not practically applicable	2021-2030
NDC 3	Introduce energy recovery using non-recyclables and waste which cannot be managed by other means	2021-2028
	3.1 Establish already committed two waste-to-energy generation facilities	2021-2028
	3.2 Make policy enhancement to clearly define the purpose of waste-to-energy and plan the phasing out of preferential feed-in-tariffs	2021-2023
	3.3 Regulate the establishment of new waste-to-energy facilities	2021-2025
	3.4 Introduce other thermal treatment technologies	2021-2025
NDC 4	The use of sanitary landfills for the disposal of residual waste will be increased from the current level of 5% to 100% on weight basis	
	4.1 Operationalize policy and regulation for siting and implementation of sanitary landfills	2021-2023
	4.2 Rehabilitate existing waste dump sites	2021-2030
	4.3 Introduce Land-fill Gas recovery systems	2021-2030
NDC 5	Generic enabling activities	2021-2030
	5.1 Update or introduce the required legislation to facilitate and enforce the implementation of NDCs	2021-2023
	5.2 Introduce a mechanism for waste generation forecasting with a tracking system to monitor the generation	2021-2023
	5.3 Introduce legislation to make segregation of waste at household level mandatory	2021-2023
	5.4 Introduce or amend necessary legal framework and instruments to initiate Market-Based Instruments (MBIs) and non-market-based instruments to incentivize and promote sustainable consumption patterns	2021-2030
	5.5 Implement “Polluter Pays Principle” for mixed waste generators	2021-2025
	5.6 Conduct awareness and capacity building programmes for behavioural changes of waste generators as well as waste management personnel	2021-2030
	5.7 Facilitate public-private-partnerships to finance waste sector NDCs	2021-2030

It is expected that the implementation of updated NDCs during the period of 2021 to 2030 will result in GHG reduction against the BAU scenario by 11% reduction in the waste sector (8.5% unconditionally and 2.5% conditionally) equivalent to an estimated GHG emissions reduction of 2,549,000 MT (1,969,000 MT unconditionally and 580,000 MT conditionally) of carbon dioxide equivalent during that period (Figure 4.4.4).

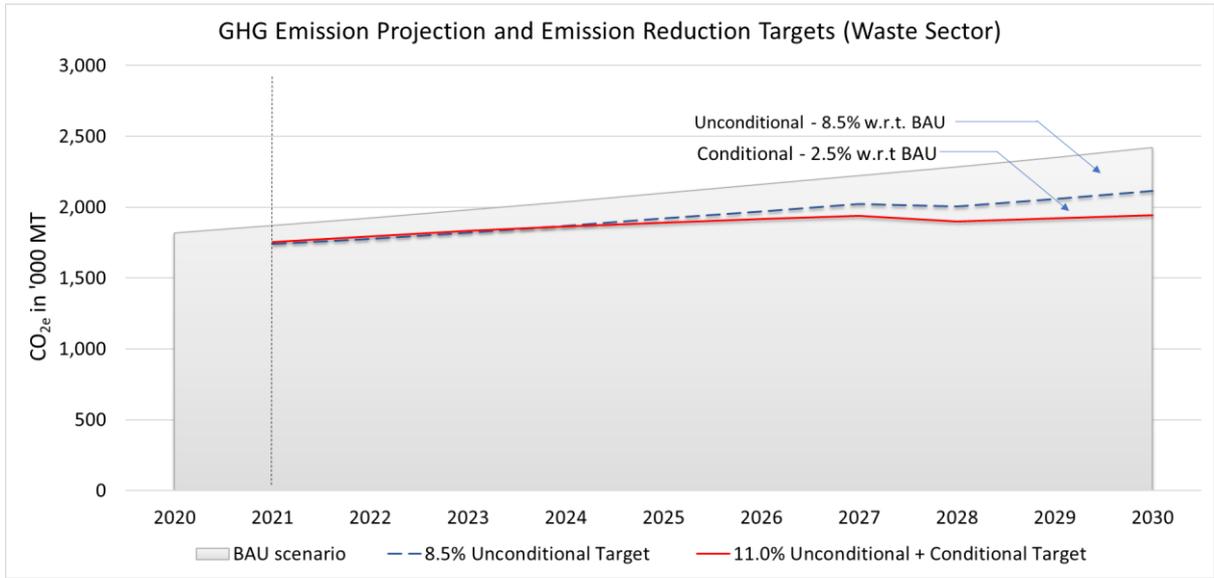


Figure 4.4.4: Emission reduction projections (Waste Sector)

4.4.5 Forestry Sector

Sri Lanka's forest cover (which was 29.15% of land area in 2015)¹⁷ is comprised of dense forest, open and sparse forest, savannah, and mangroves.¹⁷ This natural vegetation displays diversity and distribution under Sri Lanka's three climatic zones; Wet, Dry, and Intermediate. Furthermore, forest-like home gardens and plantations of spices, rubber, timber, etc. also occupy a considerable land extent providing carbon benefits. Sri Lanka is unique in South Asia for its high biodiversity per unit area, and the large extent of high-canopy home gardens. However, over time, forest cover has declined. Some forest cover has been cleared to make way for agriculture and plantations and recently, for larger infrastructure projects (dams, roads, human settlement, etc.).

The main concerns for sustenance/protection of natural forests include deforestation, land degradation and soil erosion, illegal felling, wildlife poaching and mining, forest fire and degradation of coastal forests. Aside from the environmental implications, deforestation in Sri Lanka has caused landslides, soil degradation, flooding, loss of biodiversity and their habitats, pollution, etc. It is the primary threat to the survival of Sri Lanka's biodiversity.

Future Outlook & Carbon Sequestration Potential in Forestry Sector: A large number of legislative instruments, policies and strategies and programmes are in place to protect the forest cover. The Fauna and Flora Protection Ordinance (1993), Forest (Amendment) Act, No 65 of 2009, Forest Ordinance 1907 (No. 16 of 1907) as amended up to 2009, Sri Lanka Forestry Sector Master Plan 1995-2020, National Environmental Act (1980), National Action Plan for combating land degradation in Sri Lanka 2015-2024, National Biodiversity Strategic Action Plan 2016-2022, Forest Conservation and Development Plan, Sustainable Land Management Programme, the National REDD+ Investment Framework and Action Plan are the more recent of these.

The current policy framework of the government provides broad guidelines and directions for sustainable forestry management. It envisions a "Net Carbon Zero Country" and the enhancement of the natural forest cover up to 30% by 2025. There is an emphasis on identifying and reforesting suitable lands, re-establishing and enhancing green cover, restoring barren and abandoned lands for agriculture and forestry, planting trees, establishing urban forests, green paths, green roofs and agroforestry systems, establishing parks in urban and semi-urban areas, developing urban vegetation by planting trees along expressways and in industrial premises -all of which can deliver emissions reduction.

Forestry has enormous adaptation and disaster mitigation co-benefits. Forests protect catchments and ensure water availability downstream. Forests provide food and fuel for many rural communities and ensure biomass-based renewable energy availability. Nature-based solutions are proposed for many natural hazards, landslides, slope instability, flood, coastal erosion- in place of structures of cement and steel. Examples from Sri Lanka show that mangroves have protected communities from coastal degradation and forests on steep slopes have prevented landslides. Adapting traditional tree and food crops in agro-forestry systems can potentially support resilience (drought tolerance), improve food security (high nutrition fruits/food) and combat human-animal conflicts.

The following updated NDCs (Table 4.4.5) focus on carbon sequestration capacity –but the underlying premise is to improve natural forest cover and its quality by conservation of existing forests, restoration

¹⁷ Sri Lanka's Forest Reference Level submission to the UNFCCC, 2017
https://redd.unfccc.int/files/sri_lanka___s_forest_reference_level_submission_to_the_unfccc-06jan2017.pdf

and improvement of degraded forests and establishment of new forest plantations. Engaging the private sector to enhance utility forests and commercial forestry is another option.

Table 4.4.5: NDCs in Forestry Sector

NDC #	NDC and Action	Timeline
NDC 1	Increase forest cover¹⁸ of Sri Lanka up to 32%¹⁹ by 2030	2021-2030
	1.1 Identify land for reforestation/forestation	2021-2022
	1.2 Develop forest management plans for natural forests to ensure sustainable management	2021-2025
	1.3 Implement forest restoration programme (18,000+ ha of non-forest lands will be reforested/afforested including mangroves)	2021-2030
NDC 2	Improve the quality of growing stock of natural forests and plantations	2021-2030
	2.1 Improve the quality of growing stock of degraded forests (200,000 ha)	2021-2030
	2.2 Improve the quality of forest plantations of 78,000 ha in state-owned lands	2021-2030
	2.3 Improve the quality of forest lands of “Regional Plantation Companies”	2021-2030
NDC 3	Strengthen catchment protection of major rivers and cascade systems	2021-2030
	3.1 Identify and prioritize multi-hazards of catchment/ river basins	2021-2022
	3.2 Strengthen lower catchment protection of 10 major rivers through tree planting	2021-2030
	3.3 Strengthen upper catchment protection of water streams running through plantations through tree planting	2021-2030
	3.4 Strengthen catchment protection of cascade systems & isolated tanks through tree planting	2021-2030
	3.5 Continue the “Climate Resilience Multi-Phase Programmatic Approach” project in lower Kelani river basin	2021-2025
NDC 4	Improve and increase of Trees Outside Forests (TROF)	2021-2030
	4.1 Adopt policy instruments and regulations supporting TROF (urban forestry, tree planting along roadside, religious premises, schools and other Government lands, home gardens)	2021-2023
	4.2 Establish an institutional setup and a mechanism to implement such programmes	2021-2024
	4.3 Conduct carbon stock evaluation for TROF	2021-2025
	4.4 Implement TROF programmes	2021-2030
NDC 5	Generic enabling activities	2021-2025
	5.1 Develop and implement a MRV system for forestry NDCs	2021-2025

It is expected that the implementation of updated NDCs of the forestry sector will result in the increase of carbon sequestration capacity by 7% against the BAU scenario (2% unconditionally and 5% conditionally) for the period 2021-2030. This is equivalent to an estimated additional sequestration of 705,000 MT unconditionally and 1,652,000 MT conditionally (total of 2,357,000 MT) of carbon dioxide equivalent during that period (Figure 4.4.5).

¹⁸ As per the FAO definition of forests which includes forest plantations, natural forests including mangroves.

¹⁹ 30.8% to be achieved through forest plantations and natural forests and the rest to be achieved through TROF (Trees Outside Forests)

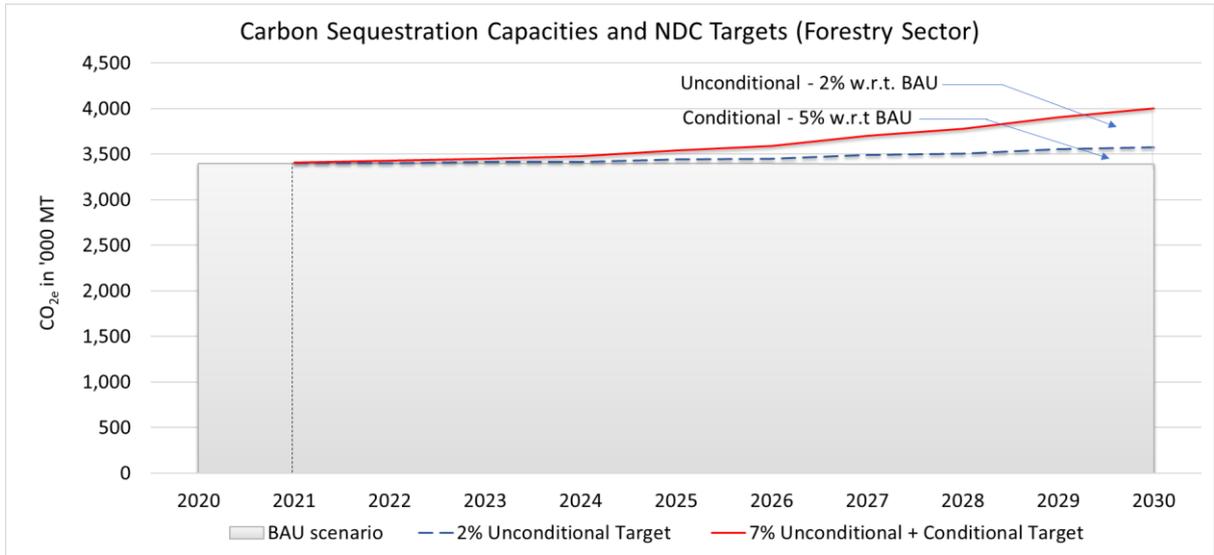


Figure 4.4.5: Carbon Sequestration Capacity Projections (Forestry Sector)

4.4.6 Agriculture Sector

Agriculture contributes around 8% of GDP and it is around 21% in export earnings²⁰. The sector currently employs around 30% of the labour force. Sri Lankan agriculture comprises food crops and plantations (mainly tea, rubber, and coconut). The food crop sector is made up of small holders with average extents less than one hectare. This results in issues of diseconomies of scale and difficulty of mechanization in the face of increasing wages and scarcity of labour. Further, heavy dependence on rain-fed agriculture, lack of diversification into high-value marketable products, high cost of production/ low profitability, low-levels of technology adoption and imperfect market conditions, weak information dissemination and poor value addition are major constraints.

The Livestock sector contribution to the GDP was around 1% in 2019. The major share comes from cattle with 1.4 million animals providing 447 million litres of milk in 2019 which is equivalent to 38% of the national milk requirement. However, the livestock sector is also hindered by substandard breeding and low productivity, low adoption of technology, lack of grazing lands and high feed costs. Unproductive, feral cattle/buffalo population, poor feeding systems, poor animal welfare etc., significantly contribute to GHG emissions in the sector.

Future Outlook & GHG Reduction Potential in Agriculture Sector: The government’s policy framework provides broad guidelines and directions for sustainable agriculture and environmentally conscious farming, with emphasis on modern and advanced technologies, economizing water usage, use of renewable energy, product innovations, value addition and process improvements, management of surplus production through improved post-harvest handling, packaging, transport, storing and delivery. The investments in livestock development are aimed at self-sufficiency in milk production. GHG reduction in the agriculture sector is to be achieved by implementing several key strategies. One such move is to diversify crop production away from water-intensive rice farming to more export-oriented high-value crops. Another is to improve value addition and better integrate small-holder farmers into modern agricultural value-chains reducing crop wastage. Improved technology, modern agricultural practices and waste management in both crop and livestock sectors are considered important strategies for cleaner production in this sector. The Overarching Agriculture Policy (OAP) which is being formulated will focus on improving productivity, self-sufficiency, and safety of food.

Table 4.4. 6: NDCs in Agriculture Sector

NDC #	NDC and Action	Timeline
NDC 1	Reduce post-harvest losses and value addition of fruits and vegetables	2021-2030
	1.1 Planning of cultivation management	2021-2030
	1.2 Improve post-harvest management	2021-2030
	1.3 Managing excess production	2021-2030
	1.4 Product innovation	2021-2030
	1.5 Monitoring of post-harvest management process	2021-2030
	1.6 Introduce policy and other support instruments	2021-2030
NDC 2	Increase crop productivity	2021-2030
	2.1 Identify crops with high productivity improvement potentials	2021-2030
	2.2 Adopt Good Agricultural Practices as a mandatory requirement in productivity enhancement programs of food crops	2021-2030
	2.3 Increase rice / paddy sector land-use productivity (paddy yield tons/ha) by 10% unconditionally and 5% conditionally	2021-2030

²⁰ <https://www.cbsl.gov.lk/en/statistics/statistical-tables/external-sector>

	2.4 Improve fertilizer use-efficiency by 10% unconditionally and 5% conditionally	2021-2030
	2.5 Improvement of water use efficiency	2021-2030
	2.6 Promote precision agriculture	2021-2030
NDC 3	Improve adoption of renewable energy for crop farming/value addition	2021-2030
	3.1 Application of solar PV and wind energy (or hybrid) for agriculture practices	2021-2030
	3.2 Promote grid electricity use in place of fossil fuel driven engine powered pumps	2021-2030
	3.3 Renewable energy powered mini grid for clustered agriculture farming in vulnerable areas (as a pilot)	2021-2030
	3.4 Explore and develop small hydro power potential in irrigation water canals for agriculture purpose	2021-2030
NDC 4	Improve dairy sector productivity by managing herd, herd health, feed and by improving animal comfort and welfare (40% increase of milk yield per cattle by 2030 on unconditional basis and further increase up to 55% on conditional basis. Increase productive milking cow percentage of the herd up to 40% on conditional basis)	2021-2030
NDC 5	Improve productivity of Monogastrics by improving genetic, feed efficiency, animal health, comfort and welfare	2021-2030
NDC 6	Adopt renewable energy for livestock applications E.g. small-scale solar-powered refrigeration to increase the milk storage facilities, solar-powered can-coolers for milk producers, solar energy for milk collection, chilling centres, farm operation and processing; and introducing biogas digesters for large scale livestock & poultry, dairy processing and abattoirs	2021-2023

It is expected that the implementation of updated NDCs during the period of 2021 to 2030 will result in the reduction of GHG emissions against the BAU scenario by **7%** in the agriculture and livestock sector (**4% unconditionally and 3% conditionally**) equivalent to an estimated mitigation level of 2,477,400 MT CO_{2e} unconditionally²¹ and 1,858,000 MT CO_{2e} conditionally (total of 4,335,400 MT CO_{2e}) of carbon dioxide equivalent during that period (Figure 4.4.6).

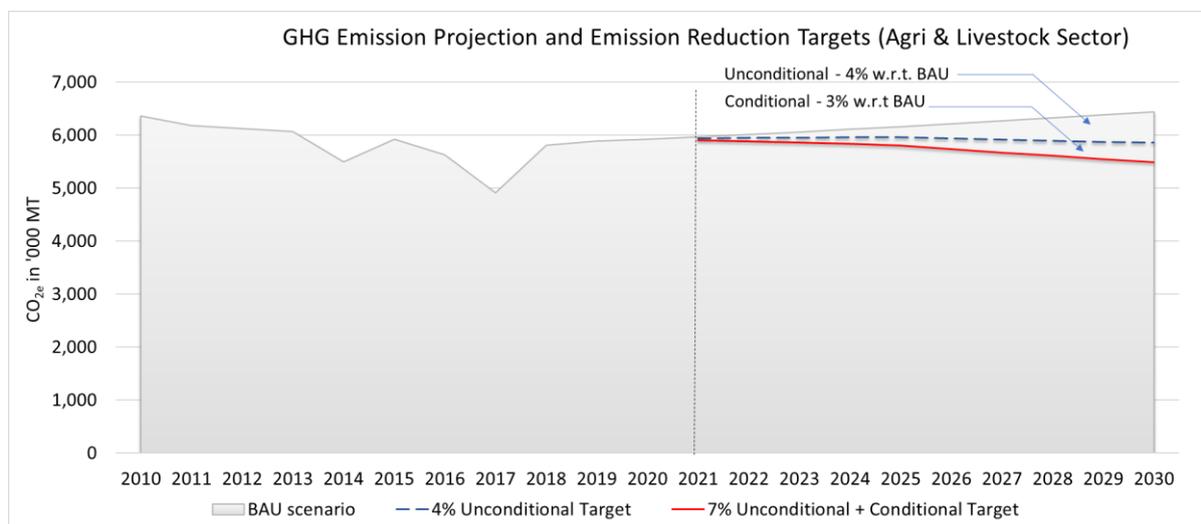


Figure 4.4.6: Emission Reduction Projections (Agriculture and Livestock)

²¹ In the absence of country specific emission factors, the analysis has been based on IPCC 2006 standard emission factors provided for the agriculture and livestock sector which may not accurately represent the country context. Any correction requirement will be made during future communications as required.

Chapter 5: Adaptation NDCs

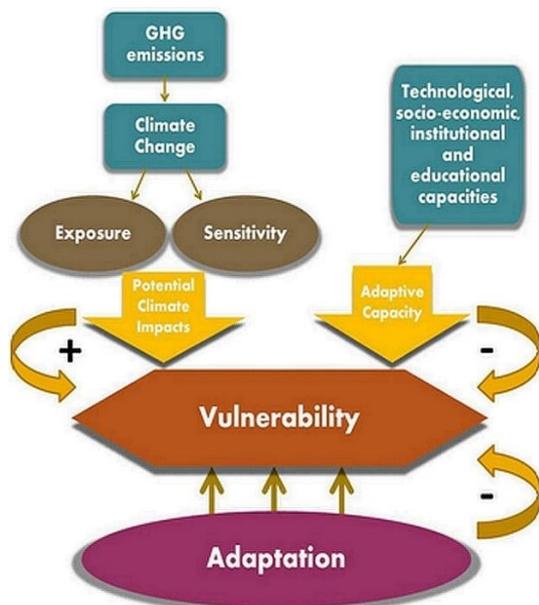
Sri Lanka's vulnerability to climate change is well documented²² and has been presented through national communications to the UNFCCC. Recent vulnerability analysis confirms Sri Lanka's enhanced exposure to climate change parameters. These analyses point to long term changes in rainfall distribution and shifting of ecological boundaries, compounding already observable shifts of the bi-modal monsoon pattern, rainfall intensities and dry periods, the increasing temperature and heat, increasing exposure to climate hazards and sea-level rise. The most critical sectors affected by these changes are agriculture, fisheries, livestock, water, biodiversity, coastal and marine, health, urban planning and human settlements and tourism and recreation. These NDCs present prioritised actions for adaptation identified by related national agencies, experts and other stakeholders in each vulnerable sector.

Climate change poses a serious threat to economic growth and erodes development gains. The long-term policy goal for Sri Lanka is to ensure that the country is protected from adverse impacts of climate change²³. The objective is to facilitate sustainable development in each sector in a way that supports continued economic growth and high human development while protecting the natural resource base on which many of these livelihoods are dependent.

Adaptation priorities outlined below have common underlying requirements for effective implementation. Sector-specific risk information and assessments and localised modelling tools are not widely available for decision-making. Indeed, many sectors and areas require greater availability of data at a disaggregated, local level to make accurate risk-informed investments. An example is the level of accuracy of the information available to make predictions on sea-level rise in Sri Lanka. Risk assessments for developing sectoral strategies (e.g. tourism) and for spatial development (e.g. urban centers) are currently unavailable at the required resolution, therefore have been mentioned as priority adaptation actions. Risk and vulnerability information scaled-down to sub-national level to enable decision making at provincial, river-basin or divisional level are currently not widely available.

²² Global Climate Risk Index 2020 | Germanwatch.

²³ National Climate Change Policy (2012)



Adaptation actions reduces vulnerability to climate change and manages risk to life, property, well-being and key economic sectors. Sri Lanka's adaptation NDCs are designed to intervene at two levels to reduce climate change vulnerability. Firstly, by designing actions that reduce the sector or geography's sensitivity to climate change. Secondly, by increasing adaptive capacities through technological, institutional and information-based interventions, specific to the sectors at risk (as illustrated in figure.5 .1)

The sectoral NDCs described in this section support immediate adaptation needs for Sri Lanka and have been refined from the initial NDC submission in 2016 to reflect emerging needs for downscaled risk information, climate data, planning and prioritizing tools and better technology and financing for urgent adaptation.

Figure 5.1: Climate impacts, adaptive capacities, and vulnerabilities to adaptation actions²⁴

Mainstreaming gender and social safeguards into adaptation priorities is an important strategy. Therefore, it is recommended that down-scaled risk assessments and sectoral plans integrate specific needs, vulnerabilities and capacities of women, young children, disabled and elderly populations. Gender-responsive strategies will take in to account the differentiated needs of men and women within the sector and recommend ways to improve access to knowledge, technology, financing etc in a way that creates enabling conditions for adaptation. Increased capacities among both men and women, improved technical and Science, Technology, Engineering and Mathematics (STEM) education, more funding for vulnerability analysis at the local level etc., to enable greater engagement and contribution of women, allowing the application of skills and capacities that are gender-specific.

In order to ensure adaptation, NDCs should enable contribution by women as well as provide equal access to benefits., the sector will need to invest in gender-responsive training, promote more entrepreneurial skills among women and provide access to technology and finance that supports their participation. Gender-responsive NDCs will enable men and women to equally benefit from new technologies, climate-smart production and water management practices that would include better agriculture productivity, food security and incomes, greater resource management efficiency (water, land, food processing and preservation) etc. As described in section 7.1, it is recommended that sectors undertake detailed gender analysis as part of the process of developing the 10-year NDC implementation plans.

Traditional knowledge in crop types, cropping systems, water management, food preparation and preservation will be important to build resilience in key sectors such as agriculture and food security, water and forestry. Traditionally used but commercially ignored species can be effectively used to improve food security, access, better nutrition, improve biodiversity outcomes and provide local options for forestry and trees outside forests (home gardens, roadsides, boundary fencing etc). Women play a

²⁴ Source: Stéphane Isoard, Torsten Grothmann and Marc Zebisch, Paper presented at the Workshop 'Climate Change Impacts and Adaptation in the European Alps: Focus Water', "Climate change impacts, vulnerability and adaptation: Theory and Concepts", 2008 at UBA Vienna

key role as repositories of such knowledge and can be mobilized to improve nutrition, food preservation and food storage with such information.

The United Nations Framework Convention on Climate Change (UNFCCC) identifies three forms of climate change-induced population movement: displacement, migration, and planned relocation. Migration, permanent or seasonal, has clear interlinkages with the enhanced vulnerability of rural populations exposed to continued climate disasters. It is critical to study the phenomenon of migration to determine the extent of the problem, challenges of enhanced vulnerability for both rural and urban poor) and the rights of those displaced from their homes and uprooted from livelihoods due to exacerbated climate crisis. Increased availability of data and information on climate migration is critical for evidence-based interventions in this regard. Migration related analysis should be included in adaptation sectors, especially agriculture, health, and urban settlements.

There are several sectors where the stated adaptation priorities contribute towards GHG emissions reduction. Such reductions are expected in the urban planning and human settlement sector (sustainable and green building design, and increased tree cover), water sector (energy efficiency and reduced pumping) and tourism sector (energy efficiency and green buildings).

Financing needs for adaptation are enormous and cannot be born solely through public investment. Sri Lanka has over the year accessed climate financing from climate funds, bilateral and multilateral agencies. However, this access has not met the country's demand for adaptation. Indication of financing requirements for adaptation sector resilience building will be expected to be indicated in National Adaptation Plan (NAP) and NDC costing exercises in the future.

5.1 Sectoral Adaptation NDCs

5.1.1 Agriculture Sector

Despite the gradual contraction of its contribution to national GDP, agriculture remains the most important economic activity in Sri Lanka. It employs over 2 million people which is around 30% of the workforce and rural districts provide income and livelihood for over half the population. Agriculture land use is approximately 2.2 million ha which is equivalent to 35% of the country's total land area. A large extent of this land is owned by smallholder farmers, contributing to a major share of annual crop production. The plantations (tea, rubber, coconut, spices, coffee) are confined to the Wet/Intermediate Zones of the country and significantly contributes to the country's export earnings.

Sri Lanka's fiscal policies favour agricultural expansion and productivity with the objective of self-sufficiency in as many crops as possible, reiterated in 2020 through new regulations controlling agricultural imports. The Government's vision²⁵ prioritizes new technology, value addition and efficient storage and transportation, reducing chemical inputs, promoting more sustainable models of agriculture, reducing food importation costs and earning increasing export revenue through agriculture. An Overarching Agriculture Policy (OAP) is under development and will embrace all key agriculture sector institutions from crop, livestock, inland fishery, agro-processing, and allied services such as irrigation, agrarian development, and environment. This new policy will encompass the National Agriculture Policy (2007) which is also being updated, National Agricultural Research Policy (2012), National Livestock Development Policy (2007), and the aspects related to inland fisheries of the National Fisheries and Aquatic Resources Policy (2018).

²⁵ Vistas of Prosperity and Splendour, Ministry of Finance 2019

Climate risks in the Agriculture Sector: Climate change impacts on agriculture has been studied and recorded in somewhat greater detail in Sri Lanka. Temperature increase and high evaporation rates are expected to affect the staple crop- rice. Meteorological records point to 283 dry spells over the period of 30 years since 1974. Erratic and unseasonal rainfall and unpredictability of the monsoons severely impact agriculture (both flooding and drought impacts on crops including paddy) livelihoods and socio-economic conditions of rural smallholders, undermining some of the investments made by the government on agriculture and irrigation. Furthermore, temperature anomalies (lack of cold nights, especially) affect high-value crops, such as upcountry vegetables. Plantations of tea and coconut are affected by long dry spells and rubber by intense rainfall. Tea productivity fell to a 25 year low in 2020 due to longer dry spells in the plantation regions. Lack of rainfall coupled with human-induced activities stoke forest fires and hasten the drying up of streams and water sources. Sea level rise induced salinity is expected to impact coastal agriculture. The Third National Communication to the UNFCCC²⁶ highlights the need for more climate risk related research on crops being currently promoted among farmers such as cinnamon and pepper.

Adaptation in the Agriculture Sector: Resilience building in the agriculture sector is organized under six NDCs (Table 5.1.1) including mainstreaming of climate change considerations into the sector, varietal improvement to address climate vulnerability, sustainable land and water management and enhanced early warning climate risk management. Contribution to the reduction of greenhouse gasses from postharvest losses, enhanced efficiency in production and adopting renewable energy in production processes of the agriculture sector is presented in the Agriculture Sector Mitigation NDCs.

Table 5.1.1: NDCs in Agriculture Sector

NDC #	NDCs and Actions	Target Year
NDC 1	Climate change considerations mainstreamed into agriculture in Sri Lanka	2022
	1.1 National Guidelines on Climate Smart Agriculture (CSA) produced and implementation commenced	2021
	1.2 Climate change resilience building introduced into the criteria for Sri Lanka Good Agriculture Practices (SL GAP) guidelines	2021
	1.3 Promote appropriate crop-livestock integrated farming systems in climate vulnerable regions	2022
	1.4 Promote home gardens as small-scale production systems with value addition and establishment of market channels	2022
NDC 2	Promote Integrated Pest Management (IPM) and Integrated Plant and Nutrition Systems (IPNS) in most vulnerable areas/districts/crops	2025
	2.1 Identify priority areas of vulnerability to resurgence and emergence of pests/disease, weeds and wild animal attacks due to climate change	2021
	2.2 Develop and introduce appropriate IPM and IPNS programmes for the priority areas	2022
	2.3 Increase SL GAP Certified products by 25% from areas that are highly vulnerable to climate change	2025
NDC 3	Develop/introduce varieties resistant/tolerant to biotic and abiotic stresses targeting most vulnerable agricultural crops to climate change	2030
	3.1 Develop, introduce/promote heat tolerant varieties	2030
	3.2 Develop, introduce/promote drought tolerant/escape varieties	2030
	3.3 Develop, introduce/promote excess soil moisture/flood tolerant varieties	2030
	3.4 Develop, introduce /promote salt tolerant varieties	2030
	3.5 Develop and promote pest and disease resistance /tolerant varieties	2030
	3.6 Develop, introduce fodder varieties that withstand extreme climatic conditions	2030

²⁶ Third Nation Communication to UNFCCC, Climate Change Secretariat, (draft).

NDC 4	Revisit the Agro Ecological Regions (AERs) maps of Sri Lanka with current and future climate scenarios and recommend appropriate crops for different regions to reduce vulnerability to climate change impacts	2030
	4.1 Expanding the Agro-met observation network to cover the most vulnerable AER to climate change	2025
	4.2 Conduct studies related to soil moisture regimes covering most vulnerable AER to climate change	2028
	4.3 Most vulnerable AERs are re-demarcated into sub zones to make recommendations for specific crops	2030
NDC 5	Enhance sustainable land and water management practices in areas where anticipated climate vulnerability is severe	2030
	5.1 Promote input efficient farming methods / systems covering the target area by 50% in 2025 and 100% by 2030	2030
	5.2 Promote farm rainwater harvesting to cover the target area by 75%	2025
	5.3 Promote storm water management in 25% of the target area	2025
	5.4 Promote crop diversification with input efficient and climate change tolerant varieties in 50% of the target area	2030
	5.5 Restoration of small tank cascades and individual tanks to cover the entire target area (links to water sector NDC 7)	2030
	5.6 Promote and apply soil conservation measures in 50% of the target area	2028
NDC 6	Enhanced early warning and risk management mechanisms introduced to reduce climate change vulnerability	2025
	6.1 Improved seasonal climate forecasting for Maha and Yala	2023
	6.2 Promote provision of simplified and timely communication to farmers and field-level officials in agriculture	2025
	6.3 Strengthen risk management and risk transfer mechanisms in agriculture	2025
	6.4 Strengthen early warning systems/advisory for climate hazards and pest and disease risks	2025
	6.5 Introduce climate-related crop forecasting to reduce post-harvest losses	2025
	6.6 Promote protected agriculture and other technologies for climate risk management	2025

5.1.2 Fisheries Sector

Sri Lankan fisheries sector covers marine, coastal, inland fishery and aquaculture. Marine fishery covers 517,00 km² sea area while coastal and inland fisheries use 489,000 ha of lagoons, estuaries, reservoirs and riverine areas²⁷. Marine and coastal fishery contributes 80% of the total fish catch and provides 2.4 million direct and indirect employment and 70% of the animal protein intake of the populace. Fishery contributes approximately 1.2% to Sri Lanka's GDP²⁸. There is great potential to develop the sector, with new technology, value addition and aquaculture development. Ministry of Fisheries and Aquatic Resources Development and Department of Fisheries & Aquatic Resources (DFAR) takes charge in guiding the sector development with its National Fisheries and Aquaculture Policy, 2018 and regulations framed under the Fisheries and Aquatic Resources Act No 2 of 2016 and its amendments.

The national policy framework²⁹ indicates achieving better nutrition, food security, foreign exchange earnings, employment and livelihood opportunities, poverty alleviation and enhanced contribution to the national and rural economy as its objectives for the fisheries sector.

Currently, unsustainable fishery practices, over-fishing of certain species, poaching, land-based pollution from rivers, garbage dumping and habitat destruction in coastal areas (mangroves and coral reefs) are the main threats to Sri Lanka's fishery resources.

Climate risks in the Fisheries Sector: Ocean warming, and acidification is already threatening global fishery. These risks will be exacerbated by future warming. Long-term changes in the marine ecosystem will change species distribution. Climate change will alter mangrove and seagrass ecosystems which support breeding grounds for commercially viable fish species. Loss of wetlands in coastal areas, changes in the salinity of lagoons and estuaries affecting fish and shellfish will be greatly felt. Ocean acidification would make it more difficult for shellfish, crabs, lobsters and corals to build calcium carbonate shells, resulting in diminished stocks. Risks are greater if warming reaches beyond 1.5°C with substantial losses predicted for coastal livelihoods and fishery related industry³⁰. In Sri Lanka, shrimp farming on the north-west coast was found to be particularly vulnerable in a recent assessment³¹. Inland fishery is threatened by changes in temperature, droughts, precipitation, run-off and floods on freshwater ecosystems. Risk on inland fisheries would be further aggravated by projected decreased rainfall during North-East Monsoon.

Secondly, increasing natural disasters such as storm surges and high winds/cyclones will cause damage to reefs and thereby increase coastal erosion and salinity of inland soil and freshwater sources. Properties and physical infrastructure of small-scale fishers and their communities would also be threatened with increased frequency of climate-related disasters as well as rising sea levels and creeping salinity in coastal areas.

Adaptation in the Fisheries Sector: Adaptation measures are organized under seven NDCs (Table 5.1.2) including adopting ecosystem-based approaches to fisheries management, expansion of aquaculture and culture-based fisheries for enhanced food security, breeding species for aquaculture to withstand adverse climatic conditions, enhanced safety at sea, better early warning for climate risk management, livelihood diversification and targeted research on impacts on fisheries due to climate change.

²⁷Fisheries Statistics 2019, Ministry of Fisheries and Aquatic Resources Development, 2019.

²⁸ Annual Report 2019, Central Bank of Sri Lanka, 2019.

²⁹ Vistas of Prosperity and Splendor, Ministry of Finance, 2019

³⁰ IPCC website, <https://www.ipcc.ch/reports/>

³¹ Sri Lanka's Third National Communication on Climate Change, Climate Change Secretariat of the Ministry of Environment, 2021.

Table 5.1.2: NDCs in Fisheries Sector

NDC #	NDCs and Actions	Target Year
NDC 1	Ecosystem-based Approach to Fisheries Management (EAFM) adopted in areas of high climate vulnerability to enhance resilience	2030
	1.1 Incorporate EAFM into existing fisheries management areas as declared under Fisheries and Aquatic Resources Act	2022
	1.2 Identify priority areas and define fisheries management units based on ecological principles	2022
	1.3 Develop 5 EAFM plans	2025
	1.4 Implement 5 EAFM plans	2030
NDC 2	Expand aquaculture and culture-based fisheries to address food security issues relating to climate change	2025
	2.1 Promote an appropriate fish fingerling stocking programme for enhancement of culture-based fisheries	2025
	2.2 Establish fish barricade devices for 50 perennial reservoirs impacted with frequent floods to prevent fish escape, in consultation with Irrigation Department	2022
	2.3 Promote culture of species that are resilient to climate change	2025
NDC 3	Breeding of climate change resilient and commercially important aquatic resources	2025
	3.1 Expansion of cryopreservation facility at NAQDA, aquaculture center at Dambulla to stock the sperms of the species whose normal spawning is affected by climate change	2025
	3.2 Establish new fish breeding units with indoor hatchery facilities and design constructions enabling control of temperature and salinity for breeding tolerant strains of selected species	2025
NDC 4	Increase the production capabilities of fisheries, aquatic resources in 30 lagoons that are highly vulnerable to climate change	2030
	4.1 Identify vulnerable lagoons (by 2022) and prepare lagoon profiles for 30 lagoons	2026
	4.2 Carrying capacity assessment of 30 lagoons	2026
	4.3 Declaring and managing 10 lagoons as Co-managed Fishery Management Areas (FMAs)	2030
	4.4 Minimize aquatic pollution in 10 lagoons	2030
	4.5 Promoting aquaculture of selected climate change resilient, high value food species in selected lagoons.	
NDC 5	Enhanced safety at sea against climate change influenced extreme conditions	2025
	5.1 Promote applicable measures to enhance safety at sea	2022
	5.2 Introduce effective early warning transmission systems for fishers (including small boats and traditional crafts) and insurance schemes	2025
	5.3 Establishment of an efficient weather information management and communication system including satellite-based vessel monitoring system to ensure safety at sea	2025
NDC 6	Diversification of livelihoods of fisherfolk to build resilience to climate change	2025
	6.1 Enhance access to credit, inputs training for diversification of livelihoods of the vulnerable fisherfolk	2023
	6.2 Assist in finding high- value markets to deal with reduced yields	2024
	6.3 facilitate value additions through diversification of fisheries related products (fish oil, fish sauce and other value-added products)	2025
NDC 7	Conduct fisheries and aquatic resources research to build resilience to climate change	2030
	7.1 Assess climate impacts on fisheries and aquatic resources	2025
	7.2 Develop reef monitoring systems to provide early warning alerts of bleaching events	2025
	7.3 Identify adaptation measures in fisheries for ocean acidification related impacts	2025
	7.4 Installation of artificial reefs where substrate for settlement of corals larvae is minimal	2025
	7.5 Deployment of fish aggregating devices in identified areas	2030
	7.6 Reduce capital, operation and other costs in fisheries and aquaculture by introducing and promoting fuel- efficient technologies in response to declining yield and productivity in a changing climate	2025

5.1.3 Livestock Sector

The livestock sector is a key contributor to food security and agricultural development also supports poverty alleviation. In Sri Lanka, livestock rearing is mostly managed at small-scale and provides additional income and livelihood support for rural, agricultural households utilizing excess labour, underutilized agricultural by-products and marginal lands. Livestock has shown a nominal growth in the last few years and sector contribution to the GDP is around 1%.³² Cattle farming takes the major share with some 1.4 million animals providing 38% of the national milk requirement in 2019. Poultry is the next major subsector producing chicken meat (225,000MT in 2019) and eggs (2 billion) in 2019.³³ However, the cost of production of both chicken meat and eggs have increased due to low productivity. Beef production is on the decline while pork and mutton production was on the rise in recent years.

The government proposes to enhance the milk production from the present 40% of the requirement to self-sufficiency, development of quality grasses for livestock and improving poultry production for the export market. The National Livestock Development Policy (2007) and the *Livestock Master Plan - A Strategy for Livestock Development towards Self-sufficiency* (2011) provide policy guidance to the sector. With the other agencies under the Ministry of Agriculture, the Department of Animal Production and Health takes the lead in improving the livestock sector development in Sri Lanka. *National Livestock Breeding Policy Guidelines and Strategy for Sri Lanka*, (2010) has been the main guidance for livestock breeding. The Overarching Agriculture Policy (OAP) under preparation is expected to provide the policy framework for all key agriculture sector institutions -crop, livestock, inland fishery, crop processing, and allied services such as irrigation, agrarian development and environment.

Climate risks for the Livestock Sector: Globally it is estimated that there will be a loss of livestock rangelands of around 10% if temperatures rise to 2°C of warming.³⁴ In Sri Lanka, animal production sub-sectors such as dairy, poultry and swine have been assessed for heat stress and exposure to climate related disasters such as flood and drought. Increasing temperature and the associated water scarcity is the most pressing threat for the livestock industry. Dairy is by far the most important and most threatened by temperature rise. Intensification of dairy systems in dry regions using temperate breeds could lead to greater vulnerability to temperature and humidity increases. The Temperature Humidity Index (THI) is predicted to be greater than 72 units in most areas of the Dry Zone in 2030 and heat stress will be detrimental to the industry if temperate breeds are used. There is some threat from flash floods (north-western, western and southern provinces) and prolonged drought, especially in the Dry Zone (north, north-west and eastern provinces).

Adaptation in the Livestock Sector: Livestock sector adaptation priorities are presented under three NDCs (Table 5.1.3) covering climate resilience building in ruminant livestock farming practices, in managing swine and poultry farms, and sector-wide research and development, training and capacity building to adapt livestock practices to climate change. Contribution to the reduction of greenhouse gasses from enhanced efficiency and adopting renewable energy in the livestock sector is presented in the Agriculture Sector Mitigation NDCs.

³² Annual Report 2019, Central Bank of Sri Lanka, 2019.

³³ Livestock Statistical Bulletin 2019, Department of Animal Production and Health, 2019.

³⁴ IPCC website, <https://www.ipcc.ch/reports/>

Table 5.1.3: NDCs in Livestock Sector

NDC #	NDCs and Actions	Target Year
NDC 1	Introduce adaptation measures to address adverse impacts of climate change on ruminant livestock	2025
	1.1 Identify and promote appropriate adaptation measures, technological innovations and resilient farming systems including heat stress management	2022
	1.2 Promote integration of rainwater harvesting ponds into medium and large farms	2023
	1.3 Introduce adaptation measures such as forage conservation, modification of feeding systems to respond to early warning on extreme weather events	2023
	1.4 Introduce/ develop high yielding and climate adaptable new forage and feed resources	2025
	1.5 Continuous monitoring/ improved surveillance by veterinary services to detect and respond to new/re-emerging climate-related diseases	2022
NDC 2	Introduce technological innovations and interventions to build resilience in poultry and swine farming	2025
	2.1 Facilitate small-scale operators to adopt climate-resilient housing and management practices to prevent heat stress	2023
	2.2 Continuous monitoring/ improved surveillance by veterinary services to detect and respond to new/re-emerging climate-related diseases in poultry and swine	2023
	2.3 Promote more widely, existing adaptation measures such as feed conservation, modification of feeding systems to manage available feed in responding to early warning systems on extreme conditions	2025
NDC 3	Improve research, education, awareness and capacity building for climate change adaptation	2030
	3.1 Technology and knowledge transfer to implement adaptation measures, considering gender sensitivity in the livestock sector	2022
	3.2 Conduct awareness and educational programmes on climate resilience in livestock activities	2025
	3.3 Capacity building of all institutions in the livestock sector to promote resilience- building measures discussed in NDC 1 and 2	2030
	3.4 Access to risk management and financing to support adaptation to climate risks and changes	2025
	3.5 Review and revise existing training curricular in universities offering veterinary and animal production-related degree programmes and in the Department of Animal Production and Health in addressing climate vulnerability	2021
	3.6 Improve research and development to identify climate-resilient breeds/varieties and new technologies for livestock management	2022

5.1.4 Water Sector

The water sector includes water resources used for different purposes covering drinking, irrigation and water for other purposes (environment, industry, fisheries, hydropower etc.) Water security has become a serious concern in Sri Lanka amidst erratic weather patterns and increasing demand for water, prompting the need for urgent implementation of improved water management strategies across all its sub-sectors. Government initiatives such as Mahaweli Water Security Improvement Programme, Climate Resilience Improvement Project, Climate Resilient Integrated Water Management Project, Strengthening Climate Resilience for Communities in Vulnerable River Basins, Watershed areas and downstream of the Knuckles Mountain Range and Surakimu Ganga (protect our rivers) are some of the notable ones addressing water security amongst many other.

Authorities are increasingly considering Integrated River Basin Management (IRBM) approaches where water security can be enhanced and balanced between the competing uses of water. Therefore, in these NDCs, the previously (2016 NDCs) individually dealt domestic water (named Water Sector) and Irrigation Sector are presented as a combined single sector. Other water uses covering industry, hydropower, fisheries and energy are addressed in respective sectoral NDCs. Environmental aspects of water management are partly covered under biodiversity NDCs. Furthermore, agriculture sector adaptation NDCs represent some additional measures covering water use efficiency and agricultural water management.

The *Vistas of Prosperity and Splendour*³⁵ highlights the provision of safe drinking water through pipe-borne schemes. Irrigation water use efficiency and use of renewable energy are also highlighted therein. The draft National Policy, Strategies and Institutional Framework for Water Resources Development, Conservation and Management will be the key guiding policy framework when it is finalized. The preparation of an Overarching Agriculture Policy (OAP) will also provide specific guidance on irrigation water use and efficiency. Strategic Action Plan for Adaptation for Irrigation and Water Resources Sector to Climate Change 2019-2025 and beyond provides adaptation action for the sector.

Climate change influenced risks to the Sector: Major risk factors relating to the water sector are expected to further exacerbate the climate change impacts. Hence the allocation of available water between users will become increasingly challenging. Climate change influenced risks to water include water scarcity in terms of quality and quantity, salinity intrusion and damage to water distribution structures by extreme events including floods, droughts and sea-level rise. These are expected to exacerbate with temperature increase and rainfall variation, especially the negative anomaly predicted for the first inter-monsoon. Districts in the Kelani, Nilwala and Walawe basins demonstrate drinking water sector vulnerability to flood events -which are more frequent due to intense rainfall events.

Salinity is an issue throughout the coastal area, but especially where demand for ground water has increased exponentially (Western Province, North Western Province & Eastern Province). Lack of water for sanitation due to drought and flood also has been identified as a health risk of significance in selected districts. The North-Western and North-Central provinces possess a large number of minor and major irrigation schemes some dating back a millennium. Prolonged droughts and changing rainfall patterns threaten the water storage in these reservoir networks. High ambient temperatures lead to high rates of evapo-transpiration from these water bodies. Over siltation due to interrupted land cover reduces the depth of these irrigation tanks aggravating water loss via pan evaporation. Meanwhile floods caused by sudden and intense rainfall events damage irrigation structures such as dams, spills, canals and

³⁵ National Development Framework. Ministry of Finance, 2019

sluices. In the past decade there have been many major flood events in the Dry Zone, leading to high rates of damage to irrigation structures and high rates of siltation in reservoirs.

Adaptation in the Water Sector: As outlined above, water sector adaptation to climate change is organized under two main sub-sectors covering domestic water use and irrigation water use. The main policy drive in water sector adaptation to climate change is provided by adopting Integrated River Basin Management (IRBM) approach in 15 prioritised river basins in Sri Lanka. River basins prioritised were Kelani Ganga, Attanagalu Oya, Gin Ganga, Nilwala Ganga, Malwathu Oya, Deduru Oya, Ma Oya, Gal Oya, Kala Oya, Mahaweli Ganga, Mundeni Aru, Kalu Ganga, Mi Oya, Yan Oya and Kirindi Oya.

The sector has ten NDCs (Table 5.1.4) which includes one overarching NDC covering IRBM; five NDCs on domestic water use including ground water monitoring, climate-resilient water supply schemes, promoting the use of waste water, managing salinity at water intakes, capacity building for climate change adaptation; and four NDCs on irrigation water use including restoration, rehabilitation and augmentation of irrigation systems, the introduction of alternative water sources, improving irrigation efficiency and early warning for river flooding.

Table 5.1 4: NDCs in Water Sector

NDC #	NDCs and Actions	Target Year
<i>Water sector wide IRBM</i>		
NDC 1	Integrated River Basin Management (IRBM) adopted in 15 prioritised river basins in Sri Lanka	2030
	1.1 River basin-wide vulnerability, risks and capacity assessments carried out in 15 river basins in Sri Lanka	2025
	1.2 Climate change adaptation considerations built into integrated river basin management planning initiatives of Sri Lanka	2023
	1.3 Water resource development and management plans for the selected 15 river basins are prepared	2030
	1.4 Integrated River Basin Management (IRBM) plans are prepared (by 2025) for at least five critical river basins and implemented (Five basins identified are Yan Oya, Mi Oya, Malwathu Oya, Gin Ganga and Nilwala Ganga)	2030
	1.5 Establish water flow and sediment load monitoring systems in five priority basins	2025
	1.6 Harness excess water in selected river basins to storage facilities elsewhere through trans-basin diversions	2030
	1.7 Enhancement of water retention/recharge in catchments using appropriate measures such as ecosystem restoration, tree planting, small ponds, check dams to enhance climate resilience	2025
	1.8 Implementation commencement of the five plans addressing climate vulnerability	2030
	1.9 Prepare remaining 10-climate inclusive river basin development plans Ten basins identified are Kala Oya, Ma Oya, Gal Oya, Deduru Oya, Mahaweli Ganga, Mundeni Aru, Kalu Ganga, Kelani Ganga, Attanagalu Oya and Kala Oya	2030
<i>Domestic Water Supply Sub Sector</i>		
NDC 2	Ground and surface water monitoring in the Northern, North Central and North Western provinces and other areas of high drinking water vulnerability to drought	2030
	2.1 Conduct risk assessments and contingency plans for all new drinking water projects in priority areas	2025
	2.2 Seek new water sources and options (i.e. rainwater harvesting and sub surface water) to augment water supply in areas where supply is scarce	2025
	2.3 Mitigation of drought impact by establishing provisional deep wells on risk- prone districts	2025
	2.4 Identify and implement appropriate groundwater recharge systems of the water deficit areas	2024
	2.5 Ensure water security at all times with the required quality and quantity of water	2025

	2.6 Establish sustainable extraction levels of ground water in at least three river basins (by 2025) and expand coverage by further three river basins	2030
NDC 3	Promote climate- resilient water supply schemes	2025
	3.1 Establish new technology in real- time measurements of water quality and level on major water sources in a collaborative manner with water sector institutions	2024
	3.2 Devise mechanisms to supply safe drinking water during floods, droughts and during saltwater intrusion for all water supply schemes vulnerable to floods, droughts and saltwater intrusion	2024
	3.3 Strengthen interagency coordination for early warning on climate and weather-related disasters and health emergencies with timely disaster response	2025
	3.4 Innovative approaches such as Payment for Ecosystem Services (PES) to be explored for catchment protection in vulnerable regions	2025
	3.5 Establish desalination or rainwater facilities in most vulnerable areas with inadequate other sources of potable water	2024
	3.6 Minimize the level of Non-revenue Water (NRW) as a water conservation / efficiency improvement measure in all water supply schemes	2025
NDC 4	Promote the use of wastewater for gardening, sanitary, construction and other purposes to reduce demand for treated water	2026
	4.1 Some policy initiatives at the national level for use of treated water for other purposes piloting in industries, industrial parks and apartment buildings	2024
	4.2 Promotion of most appropriate mechanisms of water conservation / reusing / recycling for different purposes	2025
	4.3 Introduce by-laws and building codes to introduce reuse of wastewater in new industrial constructions including areas under industrial estates	2026
	4.4 Introduce market mechanisms for promoting above	2026
	4.5 Public awareness-raising on private and social benefits of wastewater management	2022
NDC 5	Establish salinity barriers in 03 rivers where intakes are subjected to climate change influenced saline water intrusion during the drought season (covering Kelani Ganga, Kalu Ganga, and Malwathu Oya)	2030
	5.1 Identify best solutions (covering technical and financial) for salinity barriers for each case	2023
	5.2 Establish salinity barriers at each critical river identified	2025
	5.3 Assess and establish regulatory mechanisms to manage ground water extraction in areas with salinity intrusion issue	2027
	5.4 Monitoring and recording of saline water intrusion into drinking water sources especially during drought periods	2030
	5.5 Strengthening interagency coordination in early warning of salinity intrusion and allocation of water for flushing as a priority when needed	2030
NDC 6	Capacity building for water sector personnel and public awareness on building resilience to climate change	2030
	6.1 Capacity needs assessment of the water sector institutions and the personnel on climate resilience building	2022
	6.2 Prepare plans for building capacity in each institution to effectively implement the sector NDCs including that of community water supply schemes	2024
	6.3 Awareness raising and behavioural change campaigns for the public towards sustainable use of water as a climate resilience building for water security	2025
	6.4 Capacity development in communities and Community Based Organizations in addressing climate resilience in water resources	2022
	6.5 Demand-Side Management and promotion of 3R amongst water users in most vulnerable areas for climate change	2030
	6.6 Establish accreditation schemes for water sector technicians/plumbers with awareness on climate change vulnerabilities	2022
	6.7 Supply-Side Management through enhanced efficiency in abstraction, transmission, and distribution of drinking water	2022
	<i>Irrigation Water Sub Sector</i>	

NDC 7	Restore, rehabilitate and augment 25 major /medium reservoirs and 300 minor irrigation systems and 200 km length of irrigation canals of Sri Lanka for enhancing climate resilience in the agriculture sector	2030
	7.1 Prioritize abandoned tanks (including small tank cascade systems) and canals to be rehabilitated in the most critical areas of climate change vulnerability paying attention to productivity gains in restoration	2021
	7.2 Prepare indicative cost estimations, means of implementation with national capacity and international support needed for the priorities for restoration	2021
	7.3 Restoration of 50 tanks and canals of 100km length with periodic (every 2 yr) targets with agencies responsible (DAD, PDoI, DoI, MASL and special projects)	2030
	7.4 Augment capacity of irrigation tanks to enhance climate change resilience covering 25 major/medium reservoirs and 50 minor irrigation systems	2030
NDC 8	Introduce or promote alternative water resources as a climate change resilience building intervention for domestic and supplementary irrigation	2030
	8.1 Carryout feasibility studies for use of alternative sources of water for irrigation and ground water recharge for building climate resilience	2024
	8.2 Assessment & identify priority domestic water supply and priority supplementary irrigation schemes to be supported by groundwater resources (by means of tube wells/deep wells) as a climate change resilience building intervention	2023
	8.3 Regulate provision of groundwater through Agro wells for irrigation based on water availability and safe abstraction levels	2030
NDC 9	Enhance water management in 40 irrigation schemes	2025
	9.1 Increase system water use efficiency in irrigation by 10% to cover at least 45,000ha of irrigated land	2025
	9.2 Introduce water- saving applications like micro- irrigation system (sprinkle) and low water intensive crops	2025
	9.3 Farmer training and awareness on water saving applications	2025
	9.4 Introduce efficient distribution of water among farmer organizations through better water allocation mechanisms	2025
	9.5 Promote market-based instruments for the adoption of new irrigation technologies (water Subsidy schemes and tax reliefs)	2025
NDC10	Assess river floods and mitigation measures and early warning systems for possible flash floods for five priority basins (covering Kelani Ganga, Attanagalu Oya, Kalu Ganga, Kirindi Oya and Malwathu Oya on pilot basis)	2030
	10.1 Install river and reservoir gauges and collect rainfall data and river flow data for the five priority basins	2025
	10.2 Prepare digital elevation maps for all priority basins and establish automated early warning systems	2025
	10.3 Conduct capacity building programs for newly established early warning systems associated technological applications and dissemination	2025
	10.4 Introduce flood mitigation structures to handle climate change influenced risks	2030

5.1.5 Biodiversity Sector

Sri Lanka is a global biodiversity hotspot. Species diversity, distribution and natural evolution depend on climatic and microclimatic factors and is mostly concentrated in the Wet Zone or south western quarter of the country. Change in macro-environmental parameters, especially precipitation, humidity, temperature and pH, can influence the distribution and survival of species that depend on specific habitat/micro climatic conditions and increase the threats from invasive species to sensitive habitats. Studies on several rare, endemic species detailed in Sri Lanka's Third National Communication to the UNFCCC, National Biodiversity Strategic Action Plan 2016-2022 and Technology Needs Assessment for Climate Change Adaptation show that the habitat ranges will shrink and shift for both higher plants, insects, amphibians and reptiles as temperature increases and rainfall becomes more erratic.

The national policy framework commits to biodiversity conservation including restoring and rehabilitating degraded ecosystems and integrating biodiversity conservation into tourism, education and cultural events in a planned and systematic manner. There are many policies related to biodiversity conservation in Sri Lanka. The key policies include the National Forestry Policy of 1995, the National Wildlife Policy of 2000, the National Environmental Policy of 2003, the National Policy on Invasive Alien Species (IAS) in Sri Lanka of 2016. The National Biodiversity Strategic Action Plan, 2016-2022 is the overall strategy for conserving biodiversity in Sri Lanka under the leadership of the Biodiversity Secretariat of the Ministry of Environment. The Ministry of Wildlife and Forest Conservation together with the Department of Wildlife Conservation (DWC) and Department of Forest Conservation (FD) are the key government institutions. Fauna and Flora Protection Ordinance No 22 as amended in 2009 and Forest Conservation Ordinance No 65 as amended in 2009 are the key legislature enabling the DWC and FD respectively in the conservation of biodiversity in Sri Lanka.

Climate risks in the Biodiversity Sector: There are recent studies³⁶ indicating a shift of ecological zones due to climate change. With a dearth of reliable data to identify vulnerable species and habitat changes, Sri Lanka's NDCs have focused on the potential impacts of the predicted shifts in climatic zones. Such changes are quite likely to bring about changes in species and habitat and could have negative impacts on the overall biodiversity of Sri Lanka, if adequate measures are not taken to identify and manage these changes in manner that will make both species and habitats more resilient to predicted changes. Habitat restoration is likely to enhance carbon sequestration and therefore will confer an added advantage in terms of Sri Lanka's national contribution to combat climate change- driven changes. Whilst making Sri Lanka more resilient to climate change these actions will also contribute indirectly to achieve national conservation targets as defined in the National Biodiversity Strategic Action Plan.

Adaptation in the Biodiversity Sector: Resilience building actions for biodiversity are presented under five NDCs (Table 5.1.5) covering management of climate- sensitive areas and restoration of degraded areas within and outside the protected areas, increased connectivity for species migration accommodate climate driven changes, possible expansion of protected areas to build the resilience of biodiversity as a system of protected areas, strengthening *ex-situ* conservation of fauna and flora and effective management of Invasive Alien Species (IAS). Some of the mitigation co-benefits of biodiversity including carbon sequestration is captured under Forestry Sector under the mitigation NDCs, where the adaptation co-benefits of forest conservation are described in NDCs below.

³⁶ Climate Change Risk in Sri Lanka: sector risk profiles. MoE/ADB (unpublished)

Table 5.1.5: NDCs in Biodiversity Sector

NDC #	NDCs and Actions	Target Year
NDC 1	Management of climate- sensitive areas and restoration of degraded areas inside and outside the protected areas (PAs) network to conserve habitats that are highly vulnerable to climate change	2030
	1.1 Identify habitats using existing maps that are most vulnerable to climate change-driven changes and adaptive measures taken in response to climate change to inform priority sites that need to be restored or rehabilitated both within and outside PAs	2022
	1.2 Prepare maps indicating terrestrial, wetland landscapes, coastal and marine areas such as mangroves, seagrass beds, fog-interception areas, villus etc. that should be the focus of priority actions identified above in order to enhance their resilience	2022
	1.3 Identification of species of fauna and flora that are highly vulnerable to climate change	2023
	1.4 Encourage research and studies on the most vulnerable species and habitats identified in 1.1 and 1.3	2030
	1.5 Establish long-term monitoring plots and mechanisms in climate sensitive areas to identify climate change driven changes in species and habitats	2025
	1.6 Restoration of at least 25% each of degraded terrestrial and wetland landscapes including coastal & marine habitats identified above and based on current extent and prioritized according to biodiversity value, ecosystem values and climate change vulnerability	2030
	1.7 Restore the natural ecosystem in fog interception zones at least by 25%	2030
NDC 2	Increase connectivity in the zones that will be subjected to climate-driven changes according to current predictions through landscape approaches	2030
	2.1 Conduct a feasibility assessment (based on 1.2 above) to identify connectivity corridors on a landscape level using the river basins located in the climate-sensitive areas	2023
	2.2 Restore climate-vulnerable riparian and instream areas that can act as corridors based on the above feasibility study covering at least 25% of the identified area	2027
	2.3 Monitor such corridors for their efficacy to serve as biodiversity corridors and making adaptive changes to enhance movement	2030
NDC 3	Expansion of Protected Area (PA) extent to enhance the ability of the PA network to function as a buffer for climate change	2030
	3.1 Identify ecologically/environmentally sensitive areas (based on 1.2) within the climate sensitive areas that can be annexed (included) to existing PAs	2023
	3.2 Annex (include) identified areas to existing PAs / declare as new PAs under mandated agencies	2030
NDC 4	Strengthen ex-situ conservation programmes covering climate-vulnerable taxa and regions	2030
	4.1 At least two facilities to be established for ex-situ conservation of flora in the climate vulnerable regions (botanical gardens and arboreta) within 5 years	2025
	4.2 At least two facilities to be established for ex-situ conservation of fauna in the climate vulnerable regions (ex-situ conservation centres) within 5 years	2025
	4.3 Establishing a mechanism to assist translocation/reintroduction of climate sensitive or threatened fauna and flora	2027
	4.4 Introduction of three new number of Veterinary/ Epidemiology facilities for Ex-situ Conservation Centers	2030
	4.5 Develop Gene Banks in National Museums and National Botanical Gardens and Plant Genetic Resources Center (PGRC)	2030
NDC 5	Effective management of the spread of Invasive Alien Species (IAS) triggered by favorable climatic conditions	2030
	5.1 Conduct a desk assessment based on the available distribution maps of IAS to identify IAS that are likely to undergo range expansion or whose range expansion can be facilitated by climate change and anthropogenic activities	2022
	5.2 Implement programs in critical areas as identified in 5.1 to enhance the resilience of ecological and economical systems towards possible biological invasions triggered by climate change	2030

5.1.6 Coastal and Marine Sector

Sri Lanka has 1,620 km of coastline and a vast exclusive economic zone of 517,000 sq.km. Over 80% of the total national fish catch comes from marine and coastal fishery³⁷ and it supports the livelihoods of many who engage directly or indirectly in fishery. The coastal region extends about 50 km inland from the coastline, which is approximately 23% of the total land area of the country, while accommodating over 25% of the population. The coastal zone is home to a major share of the industries and the country's tourist establishments³⁸ and contributes approximately 40% to the national GDP. Coastal beach tourism includes deep sea sport fishing, observing sea mammals, sailing, diving of varying types, boating and numerous recreational sports, sunbathing, and turtle watching in the shallower reef waters. It is estimated that coastal tourism, representing nearly 60% of total sector revenues, offers a rich gamut of value-added products³⁹.

Sri Lanka's national policy framework⁴⁰ highlights that the ocean resources should be utilized more effectively under the blue-green economy concept while investing in coastal conservation and pollution prevention. Coastal Zone Management Plan of 2016 sets out the framework and guiding principles for coastal zone management while the Coast Conservation Act No. 57 of 1981 and Amendments / CCD Regulations, Marine Pollution Prevention Act No. 35 of 2008 and Amendments and the Marine Environmental Protection Authority Regulations together with Fisheries and Aquatic Resources Act No 2 of the 2016 and the regulations therein provide the key legal provisions for coast conservation. Sri Lanka is now in the process of claiming an extensive, though yet to be determined additional extent of seabed area under the United Nations Convention on Law of the Sea, which will bring greater economic opportunity for the country.

Climate impacts on Coastal and Marine Sector: Impacts associated with sea-level rise and increased coastal hazards are predicted with climate change. Changes to the salinity of coastal ground water, increased flooding and damage to infrastructure are predicted with a high degree of confidence for island countries.⁴¹ Coastal storms and surges could damage infrastructure and cause severe erosion. A detailed risk assessment for the sector⁴² focused on identifying the degree of future risks and vulnerable areas and impacts on key economic activities in the coastal area. Tourism, coastal rice paddies, drinking water and lagoon fishery activities are most threatened. There could be potential migration of communities away from coastal areas as coastal erosion and salinity due to sea-level rise become more severe due to climate change.

During the El Nino in 1998, high sea surface temperatures (3-5° C above normal) wiped out coral reefs; Bar Reef marine sanctuary (95%); Hikkaduwa marine sanctuary (90%); Weligama (60%) and Rumassala (80%)⁴³. Increased temperature and sea-levels will impact the inter-tidal areas with mangroves and other coastal vegetations undermining coastal resilience and protection provided by these ecosystems (against storms and tides).

Adaptation in the Coastal and Marine Sector: Coastal and marine sector adaptation priorities have been formulated under four NDCs (Table 5.1.6) covering mainly technical skills and systems development for monitoring and responding to climate change and variability. These include

³⁷ Fisheries Statistics 2019, Ministry of Fisheries and Aquatic Resources Development, 2019.

³⁸ Policy, Strategies and National Action Plan for Marine Environment Protection in Sri Lanka (Draft), Marine Environmental Protection Authority, 2018.

³⁹ World Bank, 2017. Sri Lanka: managing coastal natural wealth, Environment and Natural Resources Global Practice, South Asia Region Series

⁴⁰ Vistas of Prosperity and Splendour, Ministry of Finance 2019

⁴¹ Climate Change 2014: synthesis report, Intergovernmental Panel on Climate Change, 2014.

⁴² Third National Communication to UNFCCC, Climate Change Secretariat, Ministry of Environment, 2021.

⁴³ Status of coral reefs in Sri Lanka in the aftermath of the 1998 coral bleaching in Coral Reef Degradation in the Indian Ocean (CORDIO): Status Report 2005. Rajasuriya, A. 2005.

establishment of accurate sea level rise forecasting systems, preparation of updated vulnerability and risk maps, strengthened shoreline management measures and conserving unique areas of natural value in vulnerable coastal areas. Soft solutions for shoreline management such as mangrove restoration has mitigation co-benefits under Forestry Sector and contributing to Biodiversity Sector related adaptation benefits.

Table 5.1. 6: NDCs in Coastal and Marine Sector

NDC #	NDCs and Actions	Target Year
NDC 1	Establish an accurate sea level rise forecasting system for Sri Lanka	2025
	1.1 Establish the required database with historical tidal level data	2023
	1.2 Measure and record present Mean Sea Level (MSL) and assess and publish Sea Level Rise (SLR) measurements	2025
	1.3 Identify and establish additional sea-level measurement stations, to cover the coastline of Sri Lanka in addition to the existing stations	2023
	1.4. Estimate SLR predictions for Sri Lanka using global best practices	2025
NDC 2	Prepare updated vulnerability and risk maps for the coastal belt of Sri Lanka	2026
	2.1 Update inundation maps covering coastal area according to the sea level rise forecast	2023
	2.2 Identification of areas vulnerable to Sea Level Rise	2024
	2.3 Prepare SLR influenced risk maps for the coastal zone with 0.5m contour intervals and take appropriate actions	2025
	2.4 Use findings in 2.3 to update the existing coastal development setbacks	2026
NDC 3	Adopt optimal shoreline management works/measures covering affected length of shoreline using a combination of hard & soft solutions to prevent coastal erosion in areas most vulnerable to SLR	2030
	3.1 Start required long term data collection programmes, including wave measurements and a sediment transport study	2022
	3.2 Update the erosion management plan	2026
	3.3 Establish programs (in collaboration with universities and other research agencies) for monitoring of coastal erosion and collect related data/information on: coastal erosion trends and status, scientific investigations of sediment balances and assessments of sediment sources, threats to dwellings, land use and critical habitats from erosion, bathymetric & hydrologic conditions	2030
	3.4 Restoration of coastal ecosystems including mangroves covering 1,000ha. (this action is linked to action 1.6 of the Biodiversity Sector NDC 1)	2030
NDC 4	Identify and declare coastal and marine natural areas of high priority for building resilience for climate change impacts	2027
	4.1 Prepare appropriate criteria and list of candidate sites to be declared as high priority natural areas	2025
	4.2 Declare and manage high priority natural areas as required through gazette notifications	2027

5.1.7 Health Sector

Sri Lanka has a pluralistic healthcare system that combines allopathic/western medicine, with traditional forms of treatment such as Ayurveda, Siddha, Unani and Homeopathy. However, the majority of investments and improvements have led to the expansion of the allopathic system and access to free healthcare for all citizens. The national health system is well advanced due to advanced social policies in the post-independence era and consists of 603 public hospitals (3.6 beds for every 1,000 persons) with one qualified doctor for every 1,203 persons/one nurse for every 570 persons in 2019. Further, there are 105 government Ayurvedic hospitals with 4,485 beds and 1,759 qualified Ayurvedic doctors⁴⁴. Sri Lanka performed well in its efforts to attain the health-related Millennium Development Goals (MDGs), and the targets set for 2015 for child mortality, maternal mortality, reproductive health, and eradication of malaria were successfully met with a well-established healthcare system. Infant mortality is 7 per 100 live births, maternal mortality is 35 per 100,000 live births. However, malnutrition among children and women is inexplicably high in Sri Lanka and vector-borne diseases like dengue and leptospirosis claim many lives annually. Major concerns include pregnant women with low BMI on or before 12 weeks of pregnancy (15%), low birth weight of newborns (nearly 12%), underweight infants (6.4%), young children aged 1-2 (12%), aged 2-5 (19%) can be highlighted⁴⁵. Addressing these areas of concern in the health sector will be challenging as food security becomes vulnerable to climate change.

The national policy framework identifies the healthiness of the population to be of paramount importance. It expands indicating that health care will be provided free for all citizens as per the national health policy. Ministry of Health operates with guidance from the National Health Policy 2016-2025 and the National Health Sector Master Plan 2016-2025.

Climate change impacts on the Health Sector: Any increase in global average temperature is projected to affect human health with negative consequences. Heat-related morbidity and mortality, ozone depletion related mortality and risks for vector-borne diseases increasing in numbers and range are all predicted with a high level of confidence. Undernutrition and risks of water-and-vector borne diseases will substantially increase with global average temperature rise by 2°C⁴⁶. In Sri Lanka, major risk factors relating to climate change are; high temperature related heat stress, temperature and humidity-related vector population increase, migration of vector-borne disease range to higher altitudes and other areas (dengue/filaria) or resurgence of presently controlled vector-borne diseases (malaria), water-borne diseases such as chronic kidney disease, typhoid, climate induced disaster frequency and intensity increase related health risks such as floods/droughts/poor water quality. Climate change could exacerbate existing nutrition-related issues, poor nutrition due to persistent disaster exposure and chronic undernutrition from food insecurity. Air pollutants, higher temperatures and humidity increase could worsen respiratory diseases.

Adaptation in the Health Sector: Health sector adaptation targets are presented under six NDCs (Table 5.1.7) covering policy level initiatives to mainstream targeted climate resilience actions, improved capacity to manage climate influenced health and disease conditions, addressing air pollution related health impacts and reduce morbidity and mortality from climate induced disasters.

⁴⁴ Annual Report 2019, Central Bank of Sri Lanka, 2019.

⁴⁵ Family Health Bureau, Ministry of Health and Nutrition website, <https://fhb.health.gov.lk/index.php/en/statistics>

⁴⁶ IPCC website, <https://www.ipcc.ch/reports/>

Table 5.1.7: NDCs in Health Sector

NDC #	NDCs and Actions	Target Year
NDC 1	Policy initiatives for enhancing the climate resilience of the health sector promoted and integrated to all related sectors	2030
	1.1 Development and implementation of the Heat – Health Action Plan (HHAP) for Sri Lanka	2030
	1.2 Development and implementation of the National Strategic Plan for Health, Environment and Climate Change (NHSPEC)	2030
	1.3 Development and implementation guidelines and standards to make Green and Healthy Hospitals	2030
	1.4 Health action plan prepared to reduce the disease burden due to air pollution and implementation commenced	2030
NDC 2	Improved capacity to manage non-communicable diseases (NCD) and health conditions directly attributable to climate change	2024
	2.1 Identify diseases and health conditions expected to aggravate due to climate change	2021
	2.2 Develop management guidelines for the prioritized diseases and health conditions including clinical and preventive guidelines	2024
	2.3 Capacity building of public health system in addressing climate change influenced diseases and health conditions	2024
	2.4 Identify potential at-risk categories/vulnerable groups (elderly, children, vulnerable worker groups, and other vulnerable categories) and to develop a road map in managing climate change-induced NCDs	2024
	2.5 Strengthen research capacity on generating evidence on climate change and health impacts	2022
NDC 3	Manage the worsening of under-nutrition and malnutrition due to climate change	2023
	3.1 Develop a mechanism to receive and analyze food availability related early warning to minimize nutrition- associated health issues	2023
	3.2 Social welfare systems strengthened to cover vulnerable groups including families below the poverty line, elderly, disabled people, nursing mothers and young children in Medical Officer of Health (MOH) areas identified as vulnerable to food insecurity	2022
	3.3. Strengthen the public health system to identify and intervene early in nutrition-related issues	2023
NDC 4	Strengthen surveillance and management of climate-sensitive vector and rodent borne diseases (dengue, malaria, filaria, leishmaniasis and leptospirosis)	2024
	4.1 Strengthen vector borne disease surveillance system for the above diseases	2022
	4.2 Develop early warning systems at MOH level based on rainfall/temperature forecast for each climate sensitive vector borne disease	2023
	4.3 Capacity building of the public health system, local authorities and other stakeholders in prevention of occurrence of outbreaks and to rapidly respond to early warnings through effective interventions in prevention and control infectious diseases	2024
	4.4 Strengthen public health risk communication regarding vector borne disease control during predicted outbreaks	2024
	4.5 Inter-sectoral coordination and information system linked to the surveillance system for coordination with public health, local authorities, and other stakeholders	2024
NDC 5	Reduce morbidity and mortality from extreme weather/climate events (floods, droughts, landslides and other climate-related emergencies)	2023
	5.1 Strengthening timely and accurate early warning receipt and dissemination to health sector on possible extreme events or rainfall variability and linking them to national, regional, MOH and village level interventions	2022
	5.2 Risk assessment for all hazards including climate-related events for the health sector	2022
	5.3 Improved health preparedness for all hazards including climate related events at national, subnational, MOH and village level both in curative and preventive sectors	2023

	5.4. Public awareness on health impacts of climate change and promotion of resilience designed and disseminated through traditional, electronic and social media on how to address immediate disaster risks	2023
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5.1.8 Urban Planning and Human Settlement Sector

Sri Lanka's urban population is 18.7% and expected to reach 21% in 2030⁴⁷. The above statistics are based on the existing definition of 'urban' counting populations living in defined Municipal Councils (MCs) and Urban Councils (UCs). It is believed that the actual urban population is higher. Urban sprawl is increasingly evident throughout the country giving rise to many issues including increased demand for services, increased congestion and disaster-related impacts, health risks, inappropriate housing, urban heat island effect and low-living standards of urban poor.

The government, in its new policy framework,⁴⁸ emphasise rural development and providing services and infrastructure facilities equally across the urban and rural sectors. The concept of *agro industrialization* has been proposed to de-urbanize burgeoning cities and the government has launched many projects to bridge the infrastructure and service divide. Ministry of Urban Development and Housing sets the policies for urban development. National Physical Planning Policy (2019) and the National Physical Plan 2017–2030 provides the overall framework and guidelines for spatial planning. Urban Development Authority Act (Amended) No. 36 of 2007 and respective Urban Development Authority Planning and Building Regulations provides the mandate for the Urban Development Authority (UDA) to undertake urban planning and land allocation.

Climate change in the Urban sector: Outmigration in agriculture-dependent communities as climatic threats worsen is expected to overpopulate cities across the world. This could lead to the expansion of unplanned, low-income settlements in urban centres that face a multitude of vulnerabilities.⁴⁹

Human settlements have two distinct and obvious threats from climate change. Higher temperatures will create inhospitable conditions in both urban/suburban areas across the country. Urban heat islands will amplify the impact of heatwaves in cities. Day and night-time temperatures increase will have an impact on energy consumption for cooling. In the Dry Zone, higher temperatures, high evaporation rates and longer dry spells will cause water shortages. Drought related water shortages are already evident in cities located in the higher watersheds -such as Nuwara Eliya and Badulla. Large and expanding urban areas in the Wet Zone may also face similar challenges as demand grows with urban expansion.

The second climate-related risk to human settlements is the increased frequency of weather-related disasters, increased risk of flood, drought and landslides.⁵⁰ Positive rainfall anomalies for the Wet Zone indicate that towns already at flood risk in the south-western quarter of the country will have heightened risks. Plantation worker housing in the hill country is particularly susceptible to landslides, and their vulnerability is higher due to poor housing conditions and economic status. Sri Lanka's coastal zone is densely populated, especially in the western/southern areas. Amongst other climate change-related issues in coastal areas, drinking water schemes are highly vulnerable to sea-level rise and salinity intrusion.

Adaptation in the Urban Planning and Human Settlement Sector: Adaptation measures are organized under four NDCs (Table 5.1.8). They reflect the need for improved planning, integrating disaster risk reduction and future climate threats, enhancing climate resilience in the built environment and minimizing impacts of slow-onset climate change events. Some of these adaptation measures (urban

⁴⁷ UN HABITAT, 2020. World Cities Report 2020: The Value of Sustainable Urbanization

⁴⁸ Vistas of Prosperity and Splendour, Ministry of Finance 2019

⁴⁹ IPCC website, <https://www.ipcc.ch/reports/>

⁵⁰ Ministry of Environment, Third National Communication of Sri Lanka, 2021

forestry, environmentally friendly transportation and green buildings) will have certain climate mitigation benefits which are not accounted for in the targets set in Chapter 4.

Table 5.1.8: NDCs in Urban Planning and Human Settlement Sector

NDC #	NDCs and Actions	Target Year
NDC 1	Enhance the resilience of human settlements and infrastructure through mainstreaming climate change adaptation into national, sub-national and local level physical planning	2025
	1.1 Integrate most current climate change risk and vulnerability into physical planning at all levels	2022
	1.2 Prepare the sub-national and local plans considering climate risks and vulnerability and the recommendations of the National Physical Plan (NPP)	2025
	1.3 Adhere to the guidelines prescribed by the NPP and UDA in all urban infrastructure projects and programmes	2022
	1.4 Introduce adaptation measures such as urban zoning incorporating disaster risk, forest parks, ground water recharge, air passages/wind corridors, wise use of wetlands and roadside planting into urban planning to build resilience to climate change	2023
	1.5 Integrate and adhere to the Guideline for Climate Resilient Human Settlement and Infrastructure developed by the Climate Change Secretariat	2022
NDC 2	Incorporate Disaster Risk Reduction (DRR) into the urban and human settlement planning/implementation in areas of high vulnerability to climate change risks	2025
	2.1 Develop Guidelines on Climate Change influenced Disaster Risk Management (DRM) for urban and human settlement planning	2022
	2.2 Design and maintain infrastructure giving due consideration to the runoff system/drainage and flooding	2024
	2.3. Incorporate slope stability and soil conservation measures in developing infrastructure in hilly areas	2023
	2.4. Assess landslide / flood risk to human settlement and infrastructure and introduce measures to reduce the vulnerability in high- risk areas	2025
	2.5. Assess drought risk to human settlement and introduce measures to reduce vulnerability in high-risk areas	2025
NDC 3	Establish a climate-resilient built environment	2030
	3.1 Integrate climate risk projections into climate-resilient built environment strategies implemented by respective stakeholder institutions	2022
	3.2 Review and update climate-resilient design strategies to address emerging climate risks	2022
	3.3 Amend and gazette existing human settlement plans to integrate climate-resilient strategies 3.2	2023
	3.4 Review, update and enforce existing rules and regulations to prevent built environments in areas highly vulnerable to climate change	2025
	3.5 Include sustainable built environment concepts into Architecture and Engineering curriculums	2024
	3.6 Promote vertical housing solutions, where appropriate to communities living in high climate risk areas	2030
NDC 4	Minimize the impact of slow onset events (sea-level rise) on coastal settlements and infrastructure	2030
	4.1 Design coastal settlements and associated infrastructure considering future sea-level rise	2025
	4.2 Demarcate protection areas from sea level rise to facilitate for shifting urban densification inward	2030
	4.3 Prepare and commence implementation of risk management plans for existing coastal infrastructure and settlements	2025

5.1.9 Tourism and Recreation Sector

The tourism sector was the third-largest foreign exchange earner in 2019 for Sri Lanka. The sector's contribution and foreign exchange earnings have nearly doubled in four years from US\$ 2.4 billion in 2014 to US\$ 4.3 billion in 2018. The number of tourists also grew over this period from 1.5 million to 2.3 million. Sri Lanka Tourism Development Authority estimated that the sector employs 250,000 people directly and up to 2 million, indirectly.⁵¹ Tourism in Sri Lanka has had several major setbacks including the Easter Sunday terrorist attacks in 2019 and the Covid-19 pandemic in 2020-2021. Investment in tourism-related enterprises/infrastructure and the government's vision to grow tourism into its top foreign exchange earner will support the industry to recover from the current crisis. However, post-Covid tourism development will need to give due recognition to climate risks such as rising temperatures, sea-level rise and increasing natural disasters.

Tourism has been identified as one of the most important service sectors for earning foreign exchange in the current development policy framework, which sets a very ambitious target of USD 10 billion annual earnings from the sector by 2025. Further, it highlights the potential for catering to the growing health tourism sub-sector and community-based tourism. The strategic positioning of Sri Lanka in the international tourism market is provided by the Tourism Strategic Plan 2017-2020 (currently being updated), and the new tourism policy which is under development. Sri Lanka's next five-year tourism strategic plan and policy framework will incorporate the guiding principles spelt out in the Roadmap for Covid-19 recovery *Putting People First: Building a More Resilient Tourism Sector in Sri Lanka* and the Tourism Strategic Action Plan (2020-2022) developed by Sri Lanka Tourism Development Authority for post-Covid tourism.

Climate risks to the Tourism Sector: Global warming has already affected tourism, with anticipated increased risks projected even under 1.5°C of warming, and impacting seasonal tourism depending on sun and beach. Risks for tourism activities in tropical and sub-tropical regions will increase due to heat extremes, storms, loss of beaches and degradation of coral reef resources.⁵²

The majority of tourist destinations in Sri Lanka (approximately 60%) are in coastal areas where elevation is less than 2m from the sea-level. In addition, climate change impacts on the natural resources that tourism depends upon, such as inland water bodies, rivers, mountains, forests, marine biodiversity including coral reefs, are significant and already visible. Long droughts will impact visitation in wildlife parks and forest reserves. Meanwhile, due to warmer temperatures and heat stress, the sector vulnerability could be further increased. Furthermore, meeting water requirements for tourism establishments in drier destinations (north, north-west and east) will become increasingly challenging. Tourism establishments could face higher insurance costs against frequent disasters such as floods (Kalutara, Ratnapura, Kegalle, Batticaloa and Ampara districts) and landslides (Nuwara Eliya, Ratnapura, Kandy, Matale, Badulla districts). Therefore, the NDCs for the sector address building resilience of the sector to anticipated changes.

Adaptation in the Tourism Sector: Tourism sector adaptation targets are presented under three NDCs (Table 5.1.9) covering sustainable tourism practices, sector risk reduction and resilience building measures incorporating the green building concept. The NDCs for the tourism sector includes energy efficiency and green building, landscaping-related activities which will provide mitigation co-benefits but are not accounted for in the mitigation actions described in Chapter 4.

⁵¹Annual Statistical Report, 2019, Sri Lanka Tourism Development Authority, 2019.

⁵² IPCC website, <https://www.ipcc.ch/reports/>

Table 5.1.9: NDCs in Tourism Sector

NDC #	NDCs and Actions	Target Year
NDC 1	Build resilience through sustainable tourism practices and improved risk preparedness in destinations of high climate change vulnerability	2025
	1.1 Undertake studies to assess climate impacts on tourism, carrying capacity studies and identification of tourism facilities in areas that are vulnerable to climate change	2022
	1.2 Identification and promotion of adaptation measures in the above areas	
	1.3 Advocate diversified tourist attractions and products (e.g: Cultural, Adventure, Lifestyle, Festivals and Marine Tourism etc.) as alternatives to identified vulnerable destinations	2025
	1.4 Inclusion of guidelines/principles for sustainable tourism practices relevant to different stakeholders	2025
	1.5 Increased number of tourism establishments and destinations certified under the National Sustainable Tourism Certification Scheme by Sri Lanka Tourism Development Authority (SLTDA) in collaboration with Global Sustainable Tourism Council (GSTC)	2025
NDC 2	Introduce risk reduction and risk transfer mechanisms for climate-induced disasters affecting tourism	2025
	2.1 Strengthen early warning systems and capacity building in most vulnerable tourism destinations	2024
	2.2 Implement coastal rehabilitation and protection measures together with Coast Conservation Department (CCD) and Marine Environment Protection Authority (MEPA) in critical areas	2025
	2.3 Expand development of coastal tourism zonal planning with CCD, Urban Development Authority (UDA) and SLTDA covering all vulnerable coastal areas	2025
	2.4 Develop climate inclusive insurance scheme for risk management in tourism	2025
NDC 3	Promote climate resilience in the tourism sector by introducing green building design to all new constructions and refurbishments	2024
	3.1 Review and update existing Green Building Guidelines (GBG) specific to tourism to include climate change and ecological aspects	2022
	3.2 Legalize GBG specific to tourism	2023
	3.3 just Enforce the above guidelines for all new constructions and refurbishments in the tourism sector	2024
	3.4 Initiate programmes for the Architects and Engineers responsible for designing tourism-related structures through their respective professional associations on the Green Building Codes on tourism	2022
	3.5 Dissemination of Green Building Code on tourism with planning committees of the relevant local authorities	2023

Chapter 6: Loss and Damage NDCs

Climate-related hazards pose a significant threat to Sri Lanka's economic and social development. The Global Climate Risk Index Report ranks Sri Lanka second among the countries most affected by extreme weather events in 2017, and one of ten countries most affected in 2018. There were several large-scale disaster events in recent years such as severe droughts in 2011 and 2016, and major floods and landslides in 2011, 2014, 2016, and 2017. Extended drought and floods in 2016 and 2017 disrupted two rice cultivation cycles and affected over 2 million people according to government estimates, curtailing economic growth and causing food inflation⁵³. The estimated damages and losses from the floods and landslides in May 2016 were over USD 473 million and in May 2017 it was estimated at USD 368 million⁵⁴. Reconstruction needs respectively were estimated at US\$ 960 million and US\$ 790 million. In 2017, the contingent liability of the government was LKR 23.8 billion (US\$ 149 million) or approximately 1% of total government expenditure⁵⁵. Historical data show an increasing trend in the frequency and severity of floods. Further, Sri Lanka needs to confront slow-onset climate hazards such as sea-level rise, salinization, desertification etc. which could lead to severe consequences such as lack of potable water, loss of agriculture and food production, loss of biodiversity and habitats.

World Bank study on South Asia's Hotspots⁵⁶ estimated that 87% of Sri Lanka's population lives in moderate or severe hotspots. It is reported that, there were 64 extreme weather events over the period from 2000 to 2015. By 2050, potential impacts due to climate change are foreseen to be approximately a 1.2 % loss of annual GDP. It is estimated that the government could be facing US\$380 million losses each year from climate-related disasters. If infrequent disasters such as cyclones or severe floods occur, this will be much larger. Further, it is estimated that Sri Lanka could face housing/roads/ losses and relief needs related to natural disasters of more than SL Rs 237 billion (US\$ 1.8 billion) once every 100 years. This is equivalent to 2.4% of GDP and 14.2% of total government expenditures, taken as the total 2013 estimated expenditure figure⁵⁷. These estimates do not include long term losses related to economic displacement, effects on levels of poverty, social security, implications on health, education, gender and other social issues. Further, eroding of natural assets, watersheds, cultural monuments, tourism hotspots/ beaches etc., have not been accounted for in these calculations.

Loss and Damage revisions in 2020

The Nationally Determined Contributions (NDC) revision process is an opportunity to draw attention to the national relevance of averting, minimizing, and addressing disaster losses and damages. These revisions are built around recent work on understanding disaster losses and damages that include:

- Disaster Information Management System - DesInventar Database (<http://www.desinventar.lk>) contains historical information on losses from natural and man-made disasters in Sri Lanka since 1974. Work is in progress to develop an online sector-wise loss and damage (L&D) reporting system by the Disaster Management Centre supported by the World Bank.

- Ongoing projects such as the Climate Resilience Multiphase Programmatic Approach supported by the World Bank. The project components include forecasting and early warning of high impact

⁵³ International Monetary Fund, Sri Lanka: Third Review Under the Extended Fund Facility and Request for Modification of Performance Criterion. Washington, DC.2018 quoted in: Asian Development Bank, The Enabling Environment for Disaster Risk Financing in Sri Lanka, ADB Country Diagnostics Assessment February 2019

⁵⁴ Ministry of National Policies and Economic Affairs, Ministry of Disaster Management, Post Disaster Recovery Plan Sri Lanka floods and Landslides, 2017

⁵⁵ World Bank, Contingent Liabilities from Natural Disasters Sri Lanka, 2018

⁵⁶ World Bank, *South Asia's Hotspots: The Impact of Temperature and Precipitation Changes on Living Standards*. South Asia Development Matters (2018)

⁵⁷ World Bank, *Fiscal disaster risk assessment and risk financing options* (2016)

<http://documents.worldbank.org/curated/en/430141467229470955/Fiscal-disaster-risk-assessment-and-risk-financing-options>

weather, floods, and landslides; upgrading and expanding the hydrological and meteorological observation networks to ensure that these networks are well functioning and interoperable.

- ‘Improving Meteorological Observation, Weather Forecasting & Dissemination Project’ supported by JICA was initiated in 2014 to provide equipment and training to the Department of Meteorology aiming at the build-up of reliable observation and forecast techniques for extreme weather phenomena (heavy rain, strong wind, thunder, etc.) and proper dissemination of information on weather in a user-friendly manner.
- Post Disaster Needs Assessments conducted following floods and landslides in 2016 and 2017 assessed the damages and losses that occurred in the social, productive, infrastructure sectors and the implications related to cross-cutting issues. Further, key development sector professionals have been trained by the UNDP in 2017 on conducting damage and loss assessment as part of the Post Disaster Needs Assessment (PDNA) methodology.

The recommended approach for managing climate-related L&D is to take a comprehensive approach similar to the framework for managing climate and disaster risk (Figure 6.1) that builds on the current technical investments and operational framework for disaster risk management. Understanding the full spectrum of risk, and future damage and losses due to climate change require a broader process and greater data availability. However, Sri Lanka will base its current NDCs (2021-2030) on institutional and coordination mechanisms that operationalizes the Sendai Framework for Disaster Risk Reduction (2015-2030) and the Warsaw International Mechanism. This includes a comprehensive understanding of risks associated with hydro-meteorological disasters aggravated by climate change, natural processes impacted by climate change contributing to new hazards and disasters, a strong data collection and reporting system, capacities for forecasting and early warning, risk mitigation and risk transfer mechanisms to inform and enable risk-informed national and local development planning and investments. The updated loss and damage NDCs are presented in Table 6.1.

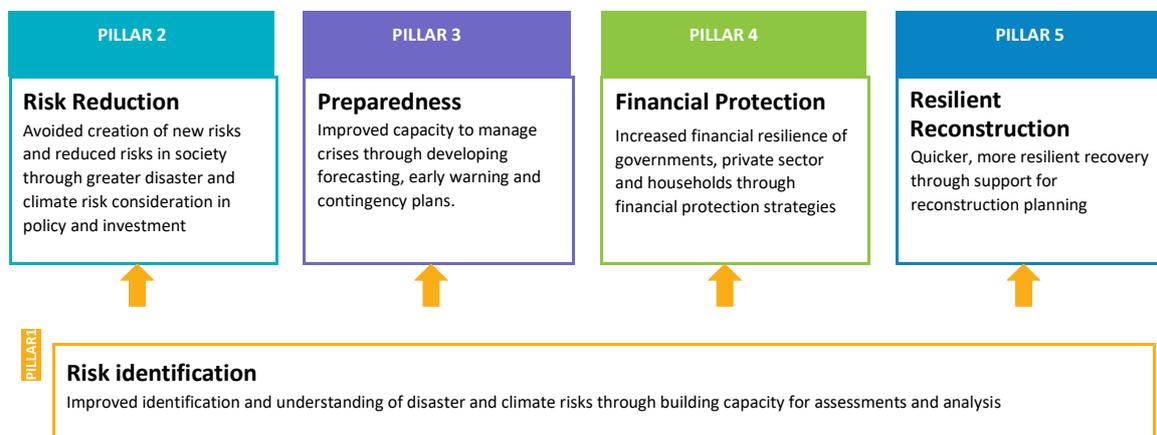


Figure 6.1: An operational framework for managing climate and disaster risk (World Bank, 2013)⁵⁸

⁵⁸ World Bank, Building Resilience: Integrating climate and disaster risk into development. Lessons from World Bank Group experience, 2013

Table 6.1: NDCs in Loss & Damage Sector

NDC #	NDCs and Actions	Timeline
NDC 1	<p>Conduct a gap analysis to assess the current status and understanding of L&D: This includes weather and climate-related extreme events, slow-onset disasters and natural processes attributed to climate change. The analysis would cover;</p> <ul style="list-style-type: none"> i) awareness and capacity on L&D; ii) data collection and analysis; iii) policy, institutional arrangements and mandates. 	2021-2023
NDC 2	<p>Strengthen the existing weather and climate forecasting system:</p> <ul style="list-style-type: none"> i) to improve early warning and user services; ii) to improve capabilities to predict and record damages and losses for weather and climate-related extreme events, slow-onset disasters and natural processes attributed to climate change; iii) to determine losses and damages attributable to climate change. 	2021-2025
NDC 3	<p>Improve data management systems to record losses and damages per sector: This involves taking 2015 as the base year, to assess and quantify both economic and non-economic losses and to inform disaster and climate risk management strategies and incorporate into national development planning process</p>	2021-2025
NDC 4	<p>Establish an overarching, nationally appropriate, functional institutional mechanism for L&D in line with the ‘Warsaw International Mechanism for Loss and Damage’ (based on the Gap analysis – NDC 1). This institutional mechanism will have the mandate to coordinate with multiple sector entities, in addition to monitoring functions, it will have financial and budgetary authority</p>	2021-2030
NDC 5	<p>Develop a Comprehensive Risk Management Framework founded on the provisions of the 2005 Disaster Management Act but expanded to include the entire spectrum of climate-related extreme events, slow-onset disasters and natural processes attributed to climate change and anticipated future losses and damage.</p> <p>This will support mainstreaming of disaster management strategies/ adaptation plans implemented nationally and locally by all relevant sectoral agencies</p> <ul style="list-style-type: none"> i) as a basis to minimize L&D; ii) to enable and ensure development investments are risk-sensitive and to recover residual L&D by incorporating appropriate mechanisms for risk transfer (Social protection, Risk retention, economic options such as insurance, contingency/emergency funds). 	2021-2030

Chapter 7: Integrating Sustainable Development Goals and Gender to the NDCs

The NDC revision process provided an opportunity to closely examine the alignment of proposed climate actions with Sustainable Development Goals (SDGs) and their targets, and to analyze the gender dimensions of mitigation and adaptation priorities.

The Paris Agreement calls for gender equality and women’s empowerment and urge member states to adopt gender-responsive approaches. The UNFCCC’s Gender Action Plan recommends gender mainstreaming in all climate change processes. Sri Lanka’s NDC review process, therefore, presented an opportunity to analyse gender disparities from a national development context, to narrow down existing disparities and identify ways to realize the optimum potential of men and women through climate action. The NDCs also provide a means to benefit from the knowledge and capabilities, specifically of Sri Lanka’s educated and literate female population, when implementing mitigation and adaptation measures. Further, gender-responsive planning and implementation of NDCs ensure that climate actions do not contribute to creating or widening gender disparities, and that they contribute to achieving the national gender equality goals and commitments.

The government of Sri Lanka has advanced its policy commitments to gender equality and women’s empowerment. The National Development Policy Framework *Vistas of Prosperity and Splendor* aspires women to be economically and socially empowered and specifies strategies that recognize and enable women’s contribution to the economy and society. The NDCs provide a vehicle to support these national policy commitments on gender equality. Analysis conducted during the NDC revision process, proposes a multi-step approach to integrate gender into 10-year NDC implementation plans by sector. This includes sector-specific gender analysis where needed, developing gender-responsive actions, improving capacities to engage women in planning and monitoring of NDCs and allocating budgets/resources for gender-responsive actions (Figure.7.1).

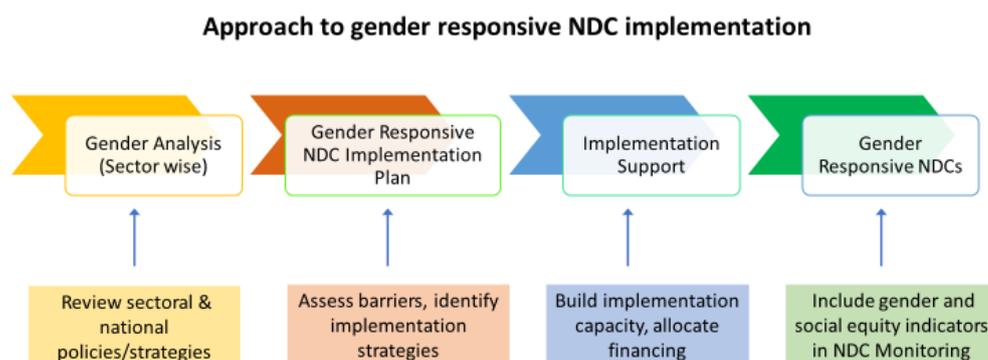


Figure 7. 1: Approach to gender responsive implementation

NDC-SDG Interlinkages

Sri Lanka achieved many of the Millennium Development Goals (MDGs) ahead of time. The country was signatory to the new global development agenda in 2015 committing to achieve the Sustainable Development Goals and targets therein by 2030.

Sri Lanka has instituted a number of mechanisms to support the coordination and achievement of the Sustainable Development Goals (Agenda 2030) presented at the United Nations General Assembly 2015. In 2017, the Parliament passed the SUSTAINABLE DEVELOPMENT ACT, No. 19 OF 2017 which established a High-Level Sustainable Development Council headed by the Secretary to the Executive President and constitutes membership from academia, civil society and provincial councils. The National Policy and Strategy for Sustainable Development is available in draft form and the Department of Census and Statistics has measured Sri Lanka's progress against SDG indicators with available data in 2018⁵⁹. Sri Lanka presented a voluntary national review to the High-Level Policy Forum on SDGs in 2018. The National Policy and Strategy for Sustainable Development adopts several policy targets around climate change that include, building greater resilience to climate-induced hazards and integrating climate change into national strategies, plans and programmes. Accessing climate finance, increased awareness and focusing on vulnerable groups such as women, children etc., are also mentioned as policy priorities.

In 2018, a study of which factors would accelerate the pace of SDG achievement in Sri Lanka, found climate change integration into development planning to be among the top ten such 'accelerators'.⁶⁰ It transpired through this study that integrating climate change measures into national policies, strategies and planning (SDG target 13.2) and ensuring sustainable food production systems and implement resilient agricultural practices (SDG Target 2.4) were among the ten most important development accelerators for Sri Lanka.

During the NDC revision process alignment of the proposed climate actions with the SDG framework of 17 goals and 169 targets was reviewed. A more detailed review was undertaken for mitigation targets proposed in these NDCs to determine if these actions negatively impact SDG achievement. The analysis used the SDG Climate Action Nexus tool (SCAN-tool).⁶¹ The analysis found over 270 interlinkages with the majority being positive interactions complementing the SDG targets. Strong positive interlinkages were observed on SDG 7 (affordable and clean energy), SDG 8 (decent work and economic growth), SDG 9 (industry, innovation and infrastructure) and SDG 11 (sustainable cities and communities) whereas some trade-offs or mixed interactions were observed on SDG 1 (no poverty), and SDG 15 (life on land). Agriculture sector NDC actions have numerous synergies and interlinkages to most SDGs except for SDG 1 and SDG 15. Transport sector actions indicate a few trade-offs for SDG 6, 14 and 15. Nevertheless, the sector has a large number of complementing activities to SDGs. Even though a significant contribution of the power (electricity) sector's NDC actions can be expected for many SDGs, some trade-offs on SDG 1, 2, 3, 6 and 14 are observed, indicating that renewable energy proliferation may have impacts on agriculture and water. It is important to understand negative correlations and institute necessary safeguard mechanisms during implementation. Industry, forestry, and waste NDC actions are mostly synergistic with SDGs.

⁵⁹ Department of Census and Statistics 2018

⁶⁰ Understanding SDG interactions in Sri Lanka: initial results from network analysis. Stockholm Environmental Institute and UNDP 2019 (unpublished)

⁶¹ https://ambitiontoaction.net/scan_tool/

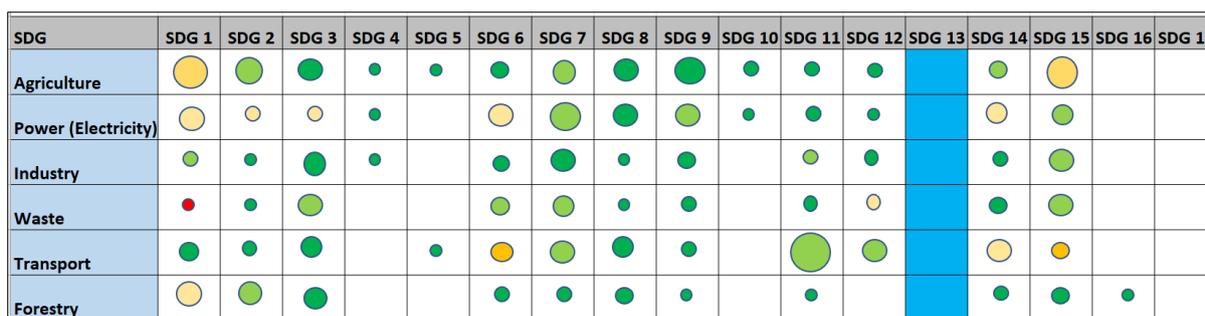
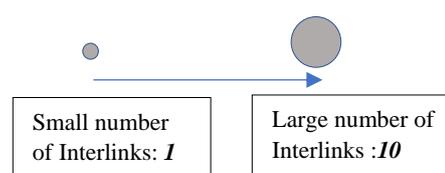


Figure 7.2: Summarized interactions between main sectors and their mitigation actions and SDGs

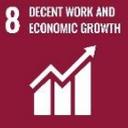
Colour chart depicting colour codes for the different level of NDC-SDG interlinks

Colour	Interlink
100%	Strong interlinks, and all positive aspects complementary to SDGs
75-99%	Strong interlinks and synergies and active contributions to SDGs though a few trade-offs
50-75%	Moderate contribution to SDGs/SDG targets
25-49%	Trade-off outweigh synergies, and has some negative impacts
0-24%	Mostly negative or trade-offs, and may have a negative impact on SDG targets
	No Interlink



In this document, development co-benefits of adaptation NDCs are descriptively tagged with corresponding SDG targets (see table 7.1 below) to demonstrate direct positive correlations and possible trade-offs. In general, all adaptation NDCs respond to targets on understanding vulnerability and improving resilience under Goal 13 on climate action. Another SDG target that positively correlates to a number of NDC actions is Target 1.5 on reducing death and damages from extreme weather events and promoting the resilience of vulnerable people. Sectoral adaptation measures, generally, align with targets under sector-specific SDGs. This is strongly observed in NDCs for Agriculture, Health, Biodiversity, Coastal, Fishes, Urban Settlements and Water. There are areas, where SDG achievement may exacerbate climate vulnerability or impact climate action. SDGs emphasize continued economic growth and development prioritizing food security, incomes, water and sanitation facilities, housing, energy and industrial growth. Achieving these development goals could well compromise long term resilience, especially of fragile eco-systems (coastal, forests and watersheds) and expose more communities to climate hazards in the future. The country’s National Sustainable Development Policy, therefore, underscores the need for climate-resilient and risk-incorporated development investments.

Table 7.1: Linkages between SDGs and adaptation NDCs

NDC Sector	Corresponding SDGs (+)
All adaptation NDCs	 13.1/13.2/ 13.3 & 13b
Agriculture	   1.5 2.4/2.5 6.4/6.5
Biodiversity	  14.2/ 14.5 15.1/15.2/15.3/15.4/15.5 and 15.8
Coastal	  14.2/14b 11.9
Fisheries	 14.2/14.4/ 14.5
Health	  3.3/ 3.4/3.9 and 3d 2.2
Livestock	 2.4 and 2a
Water & Irrigation	 6.1/6.3/6.4/6.5/ 6.6 & 6a/ 6b
Urban	 11.3/11.5/11.6/11.9/11.10
Tourism	  8.9 9.4

Chapter 8: Means of Implementation

To fully implement the climate actions contained in these NDCs, Sri Lanka will require finance, technology transfer and capacity building in line with Article 4 of the UNFCCC and Articles 9, 10 and 11 of the Paris Agreement. These articles are explicit on supporting developing countries to implement climate change actions and increasing mitigation ambition, considering *‘the common but differentiated responsibilities and their specific national and regional development priorities, objectives and circumstances’*. Paragraph 5 of Article 4 of the Paris Agreement specifically states that *“support shall be provided to developing country Parties for the implementation of this Article, in accordance with Articles 9, 10 and 11, recognizing that enhanced support for developing country Parties will allow for higher ambition in their actions.”*

While Sri Lanka presents increased mitigation ambition in this Nationally Determined Contribution, and seeks international support to realise this ambition, the country more urgently requires support for adaptation and reducing losses and damages from climate-induced disasters. This includes adaptation in agriculture, food production, water for drinking and irrigation, health and human settlements, biodiversity, and coastal protection. Improved climate forecasting, climate risk communication and early warning and comprehensive risk management framework is especially important for a country facing multiple climate hazards.

Finance: Finance is a crucial factor in achieving the more ambitious targets. The Sri Lankan government commits public finances to support certain climate actions which are aligned with national development priorities. However, to increase ambition beyond this, the country requires external financial assistance. As a developing country that is highly vulnerable to adverse effects of climate change, enhanced finance for adaptation and low-carbon development are prerequisites to achieving the targets set out in this document. As part of the NDC revision process, extensive analysis and consultations are being undertaken to produce cost estimates for conditional and unconditional mitigation measures through 2021 and 2030.

To meet its conditional contribution, Sri Lanka needs to mobilize substantial climate finance from mechanisms set up by the UNFCCC, the Paris Agreement and leverage bi-lateral agreements for low-carbon development. Sri Lanka’s National Adaptation Plan (NAP) will be updated with the Green Climate Fund (GCF) supported NAP Readiness Project which will develop a long-term pipeline of adaptation priorities for technical and financial assistance.

Technology: Sri Lanka requires access to innovative adaptation technologies to build resilience; and requires mitigation-related technology transfer to enable the country to leapfrog the fossil fuel dependent technologies and steer the country towards a low-carbon economy. The NDCs can be attained with the right mix of access, affordability and scale/mix of technologies pertaining to climate smart agriculture, modern crop management methods, climate forecasting and early warning, water and irrigation conveyance, climate-smart cities and tourism infrastructure, energy generation (new renewable energy technologies) and energy storage facilities, low carbon transport and urban infrastructure, coastal resilience improvement and cutting edge agro-technology. NDC implementation and monitoring plans will outline the technology availability and needs for each NDC. Enabling the transfer of appropriate, cost-effective, and modern technology is vital to achieving low carbon development and resilience building in vulnerable countries such as Sri Lanka.

Capacity Building: It is critical that the Paris Agreement’s capacity-building provisions are implemented successfully to enable developing countries to better implement and monitor NDCs.

Additional technology transfer and capacity building are required to fully implement Sri Lanka’s mitigation and adaptation contributions. Some specific national needs include:

Generic capacity-building needs to deliver the NDCs include:

- Institutional development and strengthening, especially for overall coordination, monitoring and reporting;
- Developing human resources through education, training, and research;
- Networking, partnerships, and sharing of experiences across sectors and beyond;
- Web-based tools/ICT applications/online courses to improve technical understanding and new knowledge.

Table 8.1: Some urgent capacity needs to implement mitigation & adaptation actions

Capacity needs for mitigation actions	Capacity needs for adaptation actions
<u>Industry knowledge and applications</u> on off-shore wind resource development, SMART grid, energy storage including pumped hydro technology, tri-generation, modern transport sector infrastructure developments such as LRT, BRT systems, circular economy practices, eco-industry park concepts, Design for Sustainability (D4S), Life Cycle Approach (LCA), circular economy, and digital economy, precision agriculture and mechanization, value addition and modern recycling technologies, advance composting and waste thermal treatment (e.g pyrolysis technology for energy recovery), Land-fill Gas technology, and centralized sewage treatment etc.	Developing climate forecasting and early warning systems, vulnerability analysis and adapting development investments for climate resilience, establish baselines, climate data gathering and monitoring for adaptive actions.
<u>Baseline assessments, certification, and standard settings:</u> eco-certification system, minimum performance and energy efficiency labelling programmes, green building & Building Management System (BMS), site-specific designing and planning for eco-industrial parks including baseline assessments, fuel economy labelling, transport sector baseline settings, MRVing of most technology-applications.	Establish sectoral databases, determine baselines, building climate information systems, establish long term monitoring plots for identifying climate-driven ecosystem changes, capacity building in the public health system in addressing climate change influenced diseases and health conditions.
<u>R&D and knowledge transfer:</u> vehicle performance and fuel economy labelling, energy efficiency testing of appliances, energy storage (grid and behind the meter), renewable energy resource development activities, precision agriculture, genetic improvement of herds/breeds of livestock and monogastric.	Research and development of new crop cultivars, enhanced productivity and agrotechnology, climate- resilient urban and coastal development, nature-based solutions for climate hazards, conservation of land and sea biodiversity etc.

Capacity building is also required to access climate finance through national institutions and the private sector. Private sector capacity building to develop innovative proposals on climate risk management and increasing capabilities within government and non-governmental organisations in Sri Lanka to design, cost, review and monitor climate actions leading to greater resilience is essential. Developing core capacities within the governance structure detailed below to support climate change-related awareness and communication; appraise projects, collect and disseminate data, monitor NDC-related progress and effectively communicate country-specific information, data and needs to international forums is urgently required.

Capacity development relating to data generation and data management is essential for all sectors implementing mitigation, adaptation and loss and damage related actions. The lack of adequately refined timely and standardized data hinders development planning and execution in general. Baselines. Recent climate and disaster- related assessments⁶² demonstrate a lack of data on key indices to

⁶² Third National Communication 2020; Post Disaster Needs Assessment 2016

determine losses and damages, vulnerability and adaptation capacity, sensitivity to climatic parameters etc.

There is significant scope to build capacity across sectors in Measuring, Reporting and Verification (MRV) of climate change actions and Monitoring and Evaluation (M&E) systems that support mitigation, adaptation, and loss and damage sectors. This is critical to deliver the 10-year NDC implementation and monitoring plans effectively and efficiently. Robust MRV systems will enhance investor confidence and improve resource mobilization opportunities. Some of the capacity needs specific to MRV/ M&E systems and resource mobilization include;

- Developing local climate vulnerability/resilience assessments using data and analytical tools;
- Tools and analysis to differentiate between business-as-usual development scenarios vs climate change impacts and forecasted impacts;
- BAU emissions scenario and potential GHG emission reduction pathways for some mitigation sectors and mitigation actions;
- Putting in place procedures to facilitate data availability to measure the impact (to measure change through time).

The consultations undertaken through the NDC revision process have created momentum for ongoing engagement in climate actions in each sector. It is important to recognize that technical knowledge resides with national experts and sector specialists. Any capacity building and effective application of technology for mainstreaming climate change must draw from the in-country experience and facilitate cross learning between climate change experts and subject matter experts from sectors. Building on the momentum created through the NDC revision process, it is important that sector specialists are enabled to guide the mainstreaming of climate actions (NDCs) into sectoral plans and strategies.

Implementation Mechanism

Sri Lanka has taken several steps to strengthen the country's readiness to face climate change. The Climate Change Policy of Sri Lanka (2012) provides the overarching framework that guides country priorities. In order to support NDC implementation and monitoring and to support the mainstreaming of climate actions into sectoral plans, Sri Lanka prepared a Readiness Plan 2016-2019 to identify and meet the pre-requirements for NDC implementation. The implementation and monitoring of the revised NDCs presented in this document will be supported through the below institutional framework (Figure 8.1), which builds on the experience of the Readiness Plan. This institutional architecture will be coordinated by the Ministry of Environment as the national focal point for the UNFCCC.

1) National Steering Committee for NDC Implementation

The Government of Sri Lanka will establish an inter-agency National Steering Committee (NSC) chaired by the Secretary, Ministry of Environment to oversee the implementation of NDCs. The NSC will have representation from secretaries of line ministries in charge of NDC sectors. Further, the NSC will have representation from and closely coordinate with the Ministry of Finance, National Planning Department, Department of Fiscal Policy, National Council for Sustainable Development.

The National Steering Committee will be responsible to oversee the implementation of NDCs in their intended manner, with adequate inter-agency cooperation on actions that require collaboration between multiple agencies. The NSC will further ensure policy coherence at the highest level, prevent duplication of efforts, present practical solutions to implementation barriers, monitor overall progress against timelines. From a national development perspective, it is important to consider synergies and

development co-benefits between climate action and other sustainable development goals – including gender equality and women’s empowerment. These are identified as preconditions for successful implementation of the Paris Agreement and the achievement of the SDGs⁶³. Therefore, the NSC will ensure safeguards are in place for actions that may compromise SDG achievements, and liaise with the National SDG Council to report back on climate-related SDGs.

2) Ministry of Environment & Climate Change Secretariat

The Ministry of Environment is the national focal point for the UNFCCC. In 2008, the Climate Change Secretariat (CCS) was established as a dedicated division under this ministry. The CCS has since then instituted National Experts Committees (NECs) on Climate Change mitigation and adaptation, and an Inter-Agency Committee on Climate Change. The CCS was established to support the Ministry of Environment’s role as the national focal point to UNFCCC and climate funds (Green Climate Fund and Adaptation Fund, etc.) and is tasked with developing national GHG inventories, supporting technology transfer to adaptation and mitigation sectors, facilitate the implementation of GHG reduction and resilience building actions, climate data and knowledge repository and dissemination. The CCS also develops regular communications to the convention and the Paris Agreement. Within this institutional structure, CCS will function as the facilitator, coordinator and communicator supporting implementation and monitoring of climate action.

3) Sectoral Planning and Monitoring Committees

Each NDC sector will have a Planning and Monitoring Committee (PMC). These PMCs will include the relevant heads of the departments and/or institutions. The 10-year NDC implementation and monitoring plans will be supported by the above PMCs, and these plans will be fully integrated into the development plans currently being developed for each sector/line ministry covering the period 2021-2025/ 2030. Integration of climate actions into the regular planning framework of all sectors above, will ensure that the NDCs are prioritised for domestic/public financing or international donor assistance. Each sectoral PMC will be headed by the Secretary of the lead ministry and be tasked with executing h the NDC implementation plans with support from the government and private sector. Each PMC should make a detailed assessment of financial, technical, and capacity requirements for NDC implementation and ensure that these needs are communicated to the NSC and CCS. The Sectoral PMC is also expected to keep records of implementation bottlenecks and ensure safeguards are in place for climate actions that could compromise sustainable development.

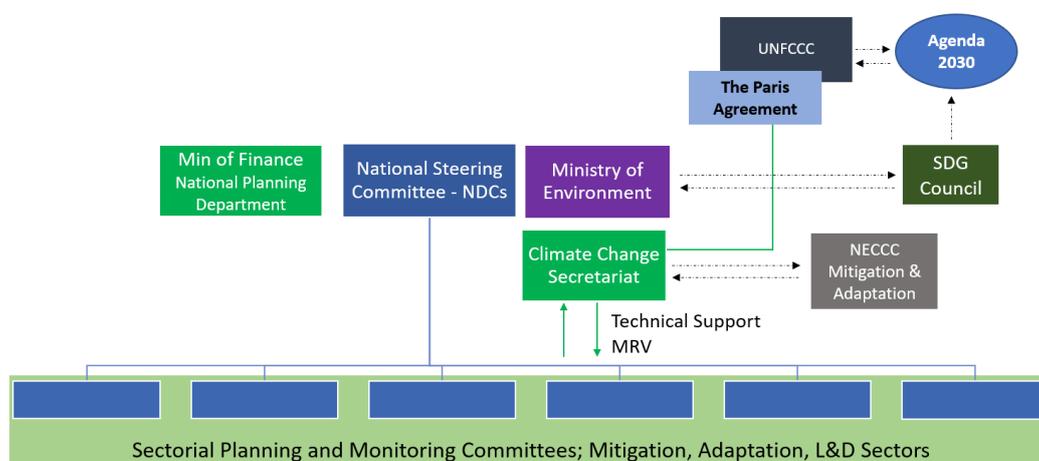


Figure 8.1: Institutional architecture for climate response

⁶³ UN Women, Leveraging Co-Benefits Between Gender Equality and Climate Action for Sustainable Development, Mainstreaming Gender Considerations in Climate Change projects, 2016

Acronyms

ADB - Asian Development Bank
AER - Agro-Ecological Regions
BAU - Business as Usual Scenario
BMS – Building Managing System
BRT - Bus Rapid Transit
BRT - Bus Rapid Transport
BtM - Behind-the-meter
CCC - Climate Change Secretariat
CCD - Department of Coast Conservation and Coastal Resource Management
CO₂ - Carbon dioxide
COP26 - 26th Conference of Parties
CSA – Climate-Smart Agriculture
DAD – Department of Agrarian Development
DoI – Department of Irrigation
DRM - Disaster Risk Management
DRR - Disaster Risk Reduction
DSM - Demand Side Management
DWC - Department of Wildlife Conservation
EAFM - Ecosystem-based Approach to Fisheries Management
EI&C - Efficiency Improvement and Conservation Programme
EST - Environmentally Sustainable Transport
FD - Department of Forest Conservation
FMA - Fishery Management Areas
GBG - Green Building Guidelines
GCF - Green Climate
GDP - Gross Domestic Production
GFDRR- Global Facility for Disaster Reduction and Recovery
GHG - Greenhouse Gas
GSTC - Global Sustainable Tourism Council
GWh - Gigawatt hours
HEM - High-Efficiency Motors
HHAP - Heat – Health Action Plan
IAS - Invasive Alien Species
ICAT - Initiative for Climate Action Transparency
ICT - Information Communication Technology
IP - Industrial Parks
IPM - Integrated Pest Management
IPNS - Integrated Plant and Nutrition Systems

IPPU - Industrial Process and Product Use
IRBM - Integrated River Basin Management
ISO - International Organization for Standardization
L&D - Loss and Damage
LA - Local Authorities
LCA -Life-cycle assessment
LED - Light-emitting diode
LKR - Sri Lankan Rupee
LNG - Liquefied Natural Gas
LRT - Light rail transit
M&E - Monitoring and Evaluation
MASL - Mahaweli Authority of Sri Lanka
MC - Municipal Council
MDGs - Millennium Development Goals
MoE - Ministry of Environment
MoH - Ministry of Health
MRV - Measuring, Reporting, and Verification
MSL - Mean Sea Level
MSW - Municipal Solid Waste
MT - Metric Tons
MW - Megawatt
NAMA - Nationally Appropriate Mitigation Actions
NAP - the National Adaptation Plan
NaPID - National Policy for Industrial Development
NAQDA- National Aquaculture Development Authority
NCD - Non-Communicable Diseases
NDC- Nationally Determined Contributions
NEC - National Experts Committees
NG - Natural Gas
NGRS - National Green Reporting System
NHSPEC - the National Strategic Plan for Health, Environment and Climate Change
NPP - National Physical Plan
NRW - Non-revenue Water
NSC - National Steering Committee
OAP - Overarching Agriculture Policy
PA - Protected Areas
PDNA - Post Disaster Needs Assessment
PDOL- Provincial Department of Irrigation
PES - Payment for Ecosystem
PMC - Planning and Monitoring Committee

R&D - Research & Development
RECP – Resource Efficient Cleaner Production
SDG - Sustainable Development Goals
SL GAP - Sri Lanka Good Agriculture Practices
SLR - Sri Lanka Railway
SLTDA - Sri Lanka Tourism Development Authority
SMART - Specific, Measurable, Achievable, Realistic, and Timely
STEM - Science, technology, engineering, and mathematics
TC – Technical Committee
THI - Temperature Humidity Index
TNC - Third National Communication
ToU - Time of Use
TROF - Trees Outside Forests
UC - Urban Council
UDA - Urban Development Authority
UN - United Nations
UNDP - United Nations Development Programme
UNFCCC - United Nations Framework Convention on Climate Change
USD - U.S. Dollar
VFD - Variable Frequency Drives
WMAWP - Waste Management Authority of Western Province
WP - Western Province