Maldives's Nationally Determined Contribution (NDC) Implementation Plan

Ministry of Environment and Energy
Male, Republic of Maldives

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1 Introduction

In December 2015, countries across the globe adopted an international climate agreement in Paris at the 21st Conference of the Parties (COP21) of the United Nations Framework Convention on Climate Change (UNFCCC). In preparation for this agreement, countries provided their climate actions to be committed under the new international agreement, known as their Intended Nationally Determined Contributions (INDCs).

Maldives developed and submitted its INDC to the UNFCCC in September 2015. In this INDC Maldives has committed to reduce the national greenhouse gas (GHG) emission by 10% of its Business As Usual (BAU) by 2030. The INDC also stated Maldives can reduce national GHG emission by an additional 14% of the BAU by 2030 subjected to availability of donor assistance. Maldives INDC also included climate change adaptation actions which are planned to be achieved by 2030.

The Paris Agreement which was adopted in December 2015 in Paris, which Maldives signed and ratified on 22nd April 2016 in New York includes contribution of INDC in the form of Nationally Determined Contributions (NDC).The objective of this NDC implementation plan is to;

- Monitor and evaluate the implementation of the actions proposed in the Maldives NDC;
- Ensure that Maldives meet the commitments to the implementation of the Paris Agreement;
- Prioritize the identified activities required for implementation of the NDC.

This NDC Implementation Plan is being developed to monitor and evaluate the implementation of the actions proposed in the NDC to ensure that Maldives meet the commitments to the implementation of the Paris Agreement.

2 NDC Implementation Plan

2.1 INTRODUCTION

The Maldives will be one of the first countries to suffer the adverse impacts of climate change and the first to be forced to adapt. Indeed, it is already experiencing disruptive changes consistent with many of the anticipated consequences of global climate change, including extensive coastal erosion, coral bleaching and higher sea levels.

While much attention has focused on global warming causing gradual, long-term changes in average conditions, the most immediate and more significant impacts are likely to arise from changes in the nature of extreme events and climatic variability.

The seriousness of this threaten relates to the very survival of the Maldives. At various stages since, this threat has been realised, the Government has developed and facilitated programmes on population migration and consolidation of smaller, isolated and more vulnerable islands to larger islands where there is better opportunity to protect people and provide infrastructure from high sea levels and other detrimental consequences of climate change.

The Maldives almost entirely relies on imported fossil fuel to meet its energy demands. In 2016, 537,060 MT of fuel was imported.[1] The current fuel storage capacity is approximately 28MT which only last for 10 days.[2] The major uses of fossil fuel are for transport and electricity generation. The total emissions for energy sector in 2011 was 1146.512 Gg CO2e.[3]

Maldives achieved provision of 24 hours electricity service throughout the country in 2008. The current installed capacity is 214 MW of diesel generators.

The NDC Implementation Plan addresses the emission reduction target of 10% of BAU unconditionally and additional 14% conditionally as outline in the Maldives NDC.

In addition, NDC Implementation Plan addresses climate vulnerability issues, reflects the urgency for on the ground action, and exploits the opportunities resulting from the high level of political guidance and commitment. It seeks to take advantage of the provision in the Maldives Climate Change Policy Framework[4] which facilitates the mainstreaming of environmental management in national planning and development.

2.2 AIM & STRATEGIES

Climate variability is imposing increasingly untenable social, environmental and economic costs on the Maldives. Without concerted actions, at both national and international levels, this trend is likely to continue well into the future. All plausible climate change scenarios suggest there would be unprecedented and potentially devastating impacts on natural and human systems to most vulnerable countries like the Maldives. Adaptation will be the only means for survival.

1 Maldives Energy Policy & Strategy 2016

2 Island Electricity Data Book 2017

3 Second National Communication to UNFCCC 2016

4 Maldives Climate Change Policy Framework 2015

The Climate Change Policy Framework fosters a programmatic approach that provides institutional and operational contexts for individual projects. The Strategy places emphasis on coordinating activities, and taking advantage of synergies between climate change mitigation and climate change adaptation for sustainable development. It also reflects the need to complement other development efforts, due in part to small size of the economy and the highly integrated nature of the society and economy. The focus is on activities that deliver tangible and visible benefits.

The success of the NDC Implementation dependents on the increased awareness of climate change issues and a commitment to (both at political and societal level) taking action to address them. There is a need to build a cadre of expertise in technical and policy-related aspects of climate change. There is also a need for more emphasis on island-based activities, rather than reinforcing the current more centralised approach. This requires building capacity at the island level, to ensure the ongoing presence of mandated focal points in inhabited islands.

2.3 ACTIONS, POLICIES AND MEASURES

The NDC implementation ensures harmonization and coordination of two parallel and integrated programmes, both of which contribute to addressing the climate change related concerns of the Maldives and also assist in meeting international obligations. These programs include:

- Greenhouse gas mitigation activities designed to enhance sustainability of the Maldives and meet the national target as outlined in the Maldives NDC.
- Adaptation activities designed to reduce, to acceptable levels, the risks associated with the full spectrum of weather, climate and oceanic hazards, from extreme events to the consequences of long-term climate change.

2.4 GOVERNANCE AND IMPLEMENTATION AGENCY

A key to success of the NDC implementation will be continuation of an administrative structure that would ensure its implementation and subsequent monitoring, reporting and verification, which reflect progress made through completion of activities and allows for the identification of new actions to be undertaken. A number of institutions have mandates to undertake programmes related to climate change and sustainable development.

Hence one of the challenges facing the successful implementation of the NDC would be to foster better communication between various institutions to minimize overlapping of programs outlined in the plan. The issues outlined in the implementation plan do not focus on a single area, or institution relating to climate change and sustainable development. The implementation of the NDC implementation plan would require participation of inter-sectoral institutions and linkages between various institutions during the process of implementation. Ways and means of involving NGOs and community stakeholders have to be developed and institutionalised through a gradual process once the implementation commences.

The Ministry of Environment and Energy is the main agency responsible for the planning and execution of activities on environmental protection, preservation, and management. The national focal points of Green Climate Fund (GCF), GEF Operation Focal point and the UNFCCC are at the Ministry. The Climate Change Department at the Ministry of Environment and Energy coordinates activities related to climate

change, in close collaboration with other relevant agencies. Implementation of the NDC would be coordinated through the Climate Change Department, with cooperation and support from other relevant institutions.

The Ministry of Environment and Energy would be central coordinator and lead institution for implementing the Maldives NDC. The Ministry of Environment and Energy would be responsible for implementing following activities:

- Coordinate involvement of other institutions.
- Administer formulation of a Technical Committee for the implementation of the NDC.
- Assist relevant ministries in detailed preparation of individual project proposals.
- Assist in obtaining funding for activities outlined in the strategy.
- Oversee the promotion of the strategy at national and international level.
- Administer the Measurement, Reporting and Verification process.

Specific activities related to adaptation and mitigation would be undertaken by relevant parts of Government, the private sector and civil society, acting jointly or separately, as appropriate to the specific need being addressed. The effectiveness of adaptation and mitigation activities is dependent, in part, on the active participation of the stakeholders best suited to undertake the activities, and of the stakeholders who have an interest in a successful outcome. Apart from the Ministry of Environment and Energy the following institutions with sustainable development related mandates will play key roles in implementing the NDC.

- Ministry of Fisheries and Agriculture
- Ministry of Health
- Ministry of Tourism
- Ministry of Housing and Infrastructure
- National Disaster Management Centre
- Environmental Protection Agency
- Marine Research Centre
- Local Government Authority

2.4.1 NDC Coordination Unit

Implementation of NDC would need to establish a coordination unit at the Climate Change Department of the Ministry of Environment and Energy.

The initial task of the unit will be to undertake a review of ongoing programmes undertaken by different institutions, which could have close linkages with targeted NDC implementation. The review and stocktaking process would be the principle instance to examine the progress of various programmes, identify challenges faced by various programmes and initiate remedial actions

The main functions of the Coordination Unit will be to execute the NDC implementation plan. Monitoring, Reporting and Verification on the implementation would be carried out by the Unit.

Co-ordination Unit, in consultation with other relevant institutions, the Ministry of Environment and Energy will identify and prioritize areas of the strategy which require international assistance and seek for possible assistance from the international organizations.

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2.4.2 Climate Change Steering Committee

The responsibility of implementing various programmes identified in the NDC implementation plan falls within the Climate Change Department at the MEE and thus the Implementation Plan has to be incorporated into their current programmes and work plan. Enhanced coordination is especially important given the dispersed nature of the island settlements and the many players (various Government agencies, and parts of the private sector and civil society) involved in addressing climate change issues, at the policy, technical and operational levels. Such coordination is necessary to avoid potential duplication of effort and formulation of inconsistent or contradictory policies. It is also important that the public and civil society active involvement is necessary in the planning and implementation of activities related to climate change. To facilitate better coordination and communication between different institutions involved in the implementation process, a Climate Change Steering Committee would be established at the Climate Change Department. The committee will comprise of officials from lead institutions. This steering committee will be broadly overseeing and advising on climate change related programmes of MEE. This includes decision making for the implementation of NDC. In relation to implementing the NDC the Climate Change Steering Committee will be mandated with the following tasks.

- oversee the timely implementation of the implementation plan,
- adopt terms of references and work-plans for various programmes proposed under the implementation plan,
- identify project partners,
- reflect progress made through completion of tasks,
- identify new actions to be undertaken,
- identify funding options
- Provide overall direction.

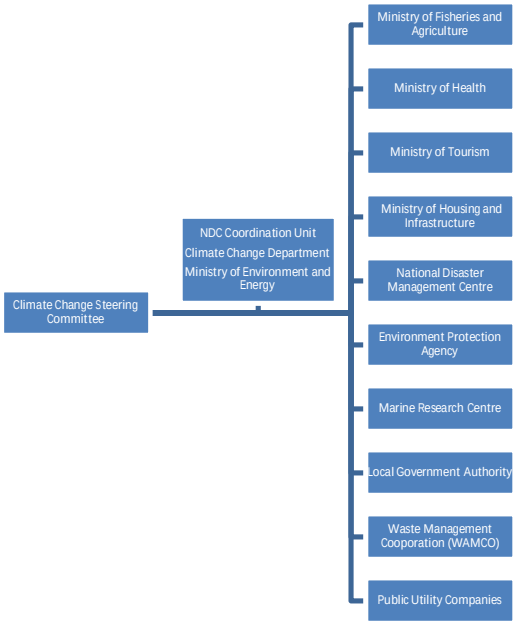

Figure 1: Institutional Arrangement for NDC implementation

2.4.3 Actions strengthening institutional arrangement for implementation of NDC

Action	Lead Agency	Source of Finance	Implementation Period
▪ Restructure and strengthened Climate Change Department at the Ministry of Environment and Energy	MEE	Donor	2018 - 2020
▪ Establishment of NDC Coordination Unit at CCD	MEE	Donor	2018 - 2020
▪ Establishment of Climate Change Steering Committee	MEE	National	2018 - 2020
▪ Develop National mitigation and Adaptation Plans to address immediate, medium and long term adaptation programmes with support from international community.	MEE	Donor	2019 - 2020
▪ Climate change research and technology transfer remains an area, which needs to be strengthened.			
▪ Continue to build capacity at CCD and other institution related to NDC implementation with support from international community	MEE	Donor	2019 - 2030
▪ Evaluate existing climate change adaption strategies in Maldives and other application strategies from international communities and explore possible options available for adaptation in terms of sustainability.	MEE	Donor	2018 - 2022
▪ Identify and promote appropriate technologies to address climate change impacts with support from international community.	MEE	Donor	2018 - 2022

▪ Development of appropriate policy and strategies to address the impacts of climate change on vulnerable groups	MEE	Donor	2018 - 2022
▪ Appoint environmental focal points in all relevant institutions both in the government and the private sector	MEE	National	2018 - 2019
▪ Improve coordination among stakeholders	MEE	National	2018 - 2019
▪ Facilitate effective information and resource sharing among stakeholders	MEE	National	2018 - 2030
▪ Introduce effective mechanisms and procedures for data collection, management, analysis and reporting process	MEE	Donor	2018 - 2020
▪ Establish standard procedures for data collection and management in all concerned agencies in order to provide easy access to required information	MEE	Donor	2018 - 2020
▪ Ensure continuous assessment of vulnerability to climate change by integrating into mandates of relevant government agencies	MEE	Donor	2018 - 2030
▪ Enhance data collection and monitoring capacity through acquisition and upgrading of climatological, surveying, mapping, and GIS equipment and software	MEE	Donor	2018 - 2030

2.5 MITIGATION STRATEGY

2.5.1 Background

According to the Maldives Energy Balance 2011, Maldives contributes about 1.04 million tonnes of CO2 emissions in 2011, which is about 0.003% of global emissions. Diesel consumption contributes to around 80% of the total emission, and 90% of the emission due to diesel consumption comes from electricity generation and the transport sector.

The BAU scenario primary consumption estimates for the year 2030 predict emissions of about 3.3 million tonnes CO_2 equivalent by year 2030.The Maldives is committed to reduce its GHG emission by 10% in 2030 compared to BAU scenario. This 10% commitment is unconditional and include the implementation of the mitigation options through domestic financial support and mitigation due to the policies that it has for development goals. Maldives Low Carbon Development Strategy identified 22 mitigation options that if implemented would have the potential to reduce emissions by 24% compared to the BAU scenario. In addition to domestic funding the implementation of these options depend on external support and financial resources, technology transfer and capacity building.

2.5.2 Objective

To identify and implement actions that reduce the emission of greenhouse gases and, at the same time, make significant contributions to the sustainable development of the Maldives.

2.5.3 Strategy

The mitigation strategy for the Maldives will communicate priority activities (including projects, integration into other activities, capacity building and policy reform) that will contribute to sustainable development of the Maldives, while also reducing greenhouse gas emissions or enhancing the sequestration of carbon. The mitigation strategies to deliver greenhouse gas (GHG) emissions reductions through national and sector plans aligned with development priorities.

2.5.4 Potential Mitigation Initiatives

Following subsections give an overview of the implementation plan of the potential mitigation initiatives.

2.5.4.1 Deployment of Large Solar Heater in Hospitality Industry

Project Description. Larger solar water heaters with electrical back-up has been identified as a replacement for electrical water heating at hotels and at resorts to reduce emissions.

Goals and Objectives. Objective of the project is to reduce electrical energy consumption for water heating at hotels and resorts.

Actions

1. Conduct an energy audit on existing water heaters for sampled resorts.
2. Create awareness amongst tourism facility owners and operators on benefits of using solar water heaters
3. Promote use solar waters through government policies and financial schemes

4. Develop and implement a plan to phase out or reduce conventional water heaters with discussion among hotel and resort owners or management

Implementation Timeframe. 2020-2025

Support Needed & Costs. Financial scheme to promote solar water heaters. Estimated US$670,000.00 assuming about 100 units solar waters heaters will be installed. This is estimated to account for 2.5 KT of CO_2 per year.

Lead Agency. Ministry of Tourism

2.5.4.2 PV installation in outer islands of the Maldives

Project Description. For this option, solar PV systems will be implemented in the islands to cater for 30% of the daytime peak electricity demand of the islands. The project is estimated to reduce 11.2 KT of CO_2 per year.

Goals and Objectives: The objective of the project is to reduce diesel consumption in the island for power generation.

Actions

1. Identify islands where solar PV systems can be implemented
2. Identify power demand of the islands and growth
3. Introduce financial schemes
4. Design and implement solar PV systems for the islands

Implementation Timeframe. 2020-2025

Support Needed & Costs. Financial scheme to promote solar PV systems. Estimated US$13.8 million to establish 9.2MW peak solar PV in the islands

Lead Agency. Ministry of Environment and Energy and Utilities

2.5.4.3 PVs with net meters

Project Description. Net Metering Regulation was published in December 2015. Under this regulation, households can install rooftop solar PV and connect to the grid through net metering. The customers are able to install solar PV with total installation size that can produce up to the total of the average electricity consumed by the customer in the past months. The regulation ensures that up to 30% of the daytime peak demand of the utility's grid of each island to be allocated for net metering installation. This option introduces solar PVs for residential applications under net metering scheme. The option assumes 1000 residential applications of 1kWp each will be implemented by 2030.

Goals and Objectives. Objective of the project is to reduce diesel consumption in the island for power generation. The estimated saving of diesel at power stations is expected to 0.4 ktoe per year.

Actions

1. Conduct an awareness campaign target to households on the financial and environmental benefits of installing solar PV in homes.
2. Explore and introduce financing mechanisms in households for installation of solar PV.

Implementation Timeframe. 2020-2025

Support Needed & Costs. Financial scheme to promote solar PV systems. Estimated US$1.50 million to establish 1.0MW peak solar PV in households

Lead Agency. Ministry of Environment and Energy

2.5.4.4 PV installation in the greater Male (Upgrading Existing Project)

Project Description.

This referred to the Malé region solar PV programme involving installation of minimum 15 MW PV systems (11 MW for Malé and 4 MW for Hulhumalé) and implemented under a FIT-scheme.

Goals and Objectives. Objective of the project is to reduce diesel consumption in Male' for power generation. .

Actions

1. Conduct study to explore availability of roof tops
2. Explore and introduce financing mechanisms for installation of solar PV.
3. Design and implement solar PV systems

Implementation Timeframe. 2020-2025

Support Needed & Costs. Estimated US$22.50 million to establish 15.0MW peak solar PV in greater Male'

Lead Agency. Ministry of Environment and Energy and STELCO

2.5.4.5 PVs installation in Greater Male' Region (New Project)

Project Description. For this option 15 MW solar PV for utility scale was considered**.**

Goals and Objectives. Objective of the project is to reduce diesel consumption in Male' for power generation

Actions

1. Conduct study to explore availability of roof tops
2. Explore and introduce financing mechanisms for installation of solar PV.
3. Design and implement solar PV systems

Implementation Timeframe. 2020-2025

Support Needed & Costs. Estimated US$22.50 million to establish 15.0MW peak solar PV in greater Male'

Lead Agency. Ministry of Environment and Energy and STELCO

2.5.4.6 PV installation on Tourist Resorts

Project Description. For this option integration of solar PV corresponding to 30% of installed capacity of resort islands grids was explored. It is estimated more than 47.8 MW solar PV will be installed in resorts. It is estimated to reduce 58.2 KT of CO_2 per year due to project interventions.

Goals and Objectives. Objective of the project is to reduce diesel consumption in resorts for power generation. The estimated saving of diesel at power stations is expected to 18.8 ktoe per year.

Actions

1. Review related government policies
2. Promote use solar PV through government policies and financial schemes
3. Explore and introduce financing mechanisms for installation of solar PV.
4. Design and implement solar PV systems

Implementation Timeframe. 2020-2030

Support Needed & Costs. Financial schemes for resorts for solar PV. These financial schemes are aimed to reduce the installation cost of PV systems.

Lead Agency. Ministry of Environment and Energy, Tourism Ministry and resorts

2.5.4.7 PVs small islands 100% solar

Project Description. Under the SREP Investment Plan, 10 island grids are envisaged to be targeted full transformation to solar PVs with storage. For this option, this was extended to comprise totally 60 islands categorized as small islands.

Goals and Objectives. Objective of the project is to eliminate diesel consumption in islands for power generation

Actions

1. Design and implement solar PV systems

Implementation Timeframe. 2016-2022

Support Needed & Costs. Currently ongoing

Lead Agency. Ministry of Environment and Energy

2.5.4.8 20 MW wind power & 25 MW LNG

Project Description. It was understood that STELCO is envisaging a wind/gas hybrid system with up to 25 MW LNG plant for base load and up to 20 MW wind power. It is estimated to reduce 26.5 KT of CO2 per year due to project interventions

Goals and Objectives. Objective of the project is to reduce diesel consumption for power generation

Actions

1. Explore financial scheme to finance LNG and wind system
2. Design and implement LNG and wind power system

Implementation Timeframe. 2020-2025

Support Needed & Costs. Financial scheme. Estimated cost US $97.0 million.

Lead Agency. Ministry of Environment and Energy and STELCO

2.5.4.9 15% bioethanol blend in all gasoline

Project Description. The calculation follows the target in the National Strategy for Sustainable Development (NSSD) of 20% biofuel in transport in 2020. In this option we assume that 15% of the gasoline is replaced by bioethanol, in order to stay below the blend wall, the maximum amount of ethanol that can be blended given the legal and practical constraints.

Goals and Objectives. Objective of the project is to reduce gasoline consumption for transport by using bioethanol

Actions

1. Explore financial scheme to finance bioethanol blend
2. Promote bioethanol fuel to use in transport instead of gasoline
3. Introduce mechanism for import and distribute bioethanol fuel

Implementation Timeframe. 2020-2025

Support Needed & Costs. Financial scheme for project implementation.

Lead Agency. Ministry of Environment and Energy and STO

2.5.4.10 20% biodiesel blend in all remaining diesel

Project Description. The calculation follows the target in the National Strategy for Sustainable Development (NSSD) of 20% biofuel in transport in 2020. In this option we assume that 20% of the diesel for road and sea transport is replaced by biodiesel.

Goals and Objectives. Objective of the project is to reduce diesel consumption for transport by using biodiesel

Actions

1. Explore financial scheme to finance bioethanol blend
2. Promote biodiesel fuel to use in transport instead of diesel
3. Introduce mechanism to import and distribute biodiesel fuel

Implementation Timeframe. 2020-2025

Support Needed & Costs. Financial scheme.

Lead Agency. Ministry of Environment and Energy and STO

2.5.4.11 LED tubes for the public sector

Project Description. The purpose of the project is to replace conventional tubes in public service buildings with LED tubes. Replacing conventional tubes in public service buildings with LED tubes reduce energy consumed for lighting.. It is estimated to reduce 8.3 KT of CO2 per year due to project interventions.

Goals and Objectives. Objective of the project is to reduce energy consumption for lighting in public service buildings

Action

1. Conduct a detailed study on the bulbs used in lighting in public service buildings

2. Explore financing mechanism for replacement of the conventional lighting.
3. Develop and implement a plan to phase out conventional lighting.

Implementation Timeframe. To be completed by 2030

Support Needed & Costs. Financial support to purchase and install LED lighting

Lead Agency. Ministry of Environment and Energy

2.5.4.12 Centralised cooling at new service buildings

Project Description. The purpose of the project is to replace conventional air conditioners used in the commercial sector with more energy efficient centralized air conditioning systems. It has been shown that such systems can reduce input energy by about 38%. This project looks into installing such centralised systems in new service buildings

Goals and Objectives. Objective of the project is to reduce energy consumption for cooling

Action

1. Estimate potential monetary savings from installing centralised cooling systems
2. Campaign to obtain government support to install centralised cooling systems in new service buildings
3. Explore and allocate financing mechanism for installing centralised cooling systems

Implementation Timeframe. 2020 - 2030

Support Needed & Costs. High level government support and financial support

Lead Agency. Ministry of Environment and Energy

2.5.4.13 LED tubes for street lighting and harbours

Project Description. Replacement of street lights and harbour lights with efficient LED bulbs could save a significant amount of electrical energy that is being used in the public sector. A 100 W LED tubes saves approximately 60% of the electricity demand of a 250 W Sodium Vapour Lamp. There are around 2200 such applications of Sodium Vapour Lamps for street lighting including 1500 at harbours. For this option, LED tubes were envisaged for all 2200 applications plus for new applications required as per the growth rate assumed for electricity. The estimated emission reduction from this project is 1.3 KT of CO2 per year.

Goals and Objectives. Objective of the project is to reduce energy consumption for lighting in public sector.

Action

1. Conduct a detailed study on the bulbs used in street lighting and harbours.
2. Conduct an awareness campaign target to government offices especially Atoll and Island councils to aware benefit of more energy efficient lighting in public sector.
3. Explore ways to increase availability of affordable LED bulbs and lights

Implementation Timeframe. 2018-2021

Support Needed & Costs. Financial support

Lead Agency. Ministry of Environment and Energy

2.5.4.14 LEDs for efficient lighting in residential areas

Project Description. Compact Fluorescent Lights (CFLs) are mainly used for lighting in households and businesses. CFLs have a useful lifetime of 6000 operating hours equalling 2.3 years. In this option all CFLs were envisaged being replaced with Light-Emitting Diodes (LED) consuming 40% less electricity than CFLs and with lifetime equalling 10 years. The estimated emission reduction from this project is 11.9 KT of CO_2 per year.

Goals and Objectives. Objective of the project is to reduce energy consumption for lighting in households and businesses

Action

1. Conduct a detailed study on the bulbs used in lighting in household and businesses
2. Conduct an awareness campaigns to aware benefit of more energy efficient lighting
3. Explore and introduce financing mechanism for replacement of bulbs.
4. Explore ways to increase availability of affordable LED bulbs and lights

Implementation Timeframe. 2018-2021

Support Needed & Costs. Introduce financial scheme

Lead Agency. Ministry of Environment and Energy

2.5.4.15 Efficient air-conditioning in households

Project Description. Use of air conditioners in residential areas have drastically risen. The purpose of the project is to replace conventional air conditioners used in residential areas with more energy efficient ones. The Coefficient of Performance (CoP) of energy efficient air conditioners was assumed to be 4.0 versus 2.67 for conventional unitary air conditioners that prevails in Maldives.

Goals and Objectives. Objective of the project is to reduce energy consumption for cooling. The estimated emission reduction from this mitigation action is 134.5 KT of CO2 per year.

Action

1. Establish and strengthen the energy efficiency standard and labelling to be implemented by Maldives Energy Authority (MEA).
2. Conduct an awareness campaign to aware benefit of more energy efficient air conditioners
3. Explore ways to increase availability of efficient air conditioners at more affordable prices.
4. Explore and introduce financing mechanism for purchasing more efficient air conditioners.

Implementation Timeframe. 2017-2021

Support Needed & Costs. Introduce financial scheme

Lead Agency. Ministry of Energy and Environment

2.5.4.16 Upgrading system efficiencies in power houses

Project Description. The present thermal efficiencies of diesel generators at outer islands were understood to be 26% on average and distribution losses to be 20%, hence leading to overall system efficiencies of 32%. The generation efficiency can be improved by replacement of inefficient generators, careful combination of the generators during the time of the day to match the demand of the island, and better maintenance of the generators. Similarly, the distribution losses can be improved by upgrading the grids to ensure that the correct sizes of cables and transmission equipment are being used in the distribution. While the projects required for improving the efficiency of these systems requires high capital costs, improving the efficiency of the generation and distribution system will ensure huge savings of diesel consumed by the power houses. This option on efficient generators and grids is an extension of the grid upgrades of the SREP Investment Plan.

Goals and Objectives. Objective of the project is to upgrade system efficiencies in power generation and distribution

Action

1. Conduct a detailed study of Power Houses on the efficiency of the power houses.
2. Conduct an awareness campaigns targeted to utilities on efficient operation of power houses.
3. Explore and introduce financing mechanisms for utilities for projects to improve efficiency in the power system.

Implementation Timeframe. 2017-2027

Support Needed & Costs. Introduce financial scheme

Lead Agency. FENAKA

2.5.4.17 Efficient refrigerators at households

Project Description. For this option annual electricity demand of energy efficient refrigerators was assumed to be 0.3 MWh versus 0.86 MWh of conventional types. The entire stock in 2012 was estimated to comprise some 80,000 refrigerators of which 70% was assumed being conventional types with low energy efficiency. For the mitigation option conventional types were envisaged being replaced by energy efficient types.

Goals and Objectives. Objective of the project is to reduce energy consumption for refrigeration

Action

1. Conduct a study on various types of refrigerators used in households and businesses.
2. Conduct an awareness campaign target to aware benefit of more energy efficient refrigerators.
3. Explore and introduce a financing mechanism for replacement of refrigerators.

4. Explore ways to increase availability of affordable refrigerators in the market

Implementation Timeframe. 2017-2027

Support Needed & Costs. Introduce financial scheme

Lead Agency. Ministry of Environment and Energy

2.5.4.18 Efficient water pumping

Project Description. In outer islands households are supplied with groundwater from individual wells and also in Greater Malé Region households are supplied from wells with groundwater for toilet flushing. Around 49,000 households have their own water pump using this type of groundwater pumping from wells. In this option conventional pumps are envisaged being replaced with energy efficient pumps offering efficiency gains at 60% over conventional pumps.

Goals and Objectives. Objective of the project is to reduce energy consumption from pumping water

Action

1. Conduct a study on various types of water pumps used in households.
2. Conduct an awareness campaign target to aware benefit of more energy efficient water pumps.
3. Explore and introduce a financing mechanism for replacement of water pumps.
4. Explore ways to increase availability of efficient water pumps at more affordable prices in the market

Implementation Timeframe. 2017-2027

Support Needed & Costs. Introduce financial scheme

Lead Agency. Ministry of Environment and Energy

2.5.4.19 Better maintenance of motorbikes

Project Description. In 2012 there were about 36,000 motor bikes on Malé and about 10,000 motor bikes on other islands. Their estimated petrol demand was around 17 million litres which may grow to 25 million litres according to growth expectation for the transport sector. For this option energy consumption was assumed to decrease by means of improved maintenance.

Goals and Objectives. Objective of the project is to reduce energy consumption from vehicles

Action

1. Explore best maintenance practices for motorbikes
2. Conduct an awareness campaign to promote benefits of improved maintenance of motorbikes
3. Establish maintenance service providers that are easily accessible in all parts of the country.

Implementation Timeframe. 2017-2027

Support Needed & Costs. Technical capacity building and financial resources

Lead Agency. Maldives Transport Authority

2.5.4.20 Thilafushi Waste to Energy Plant

Project Description. This project on establishment of a waste-to-energy (WTE) plant at Thilafushi with installed capacity for electricity generation of around 4 MW is envisaged under the SREP Investment Plan.

Goals and Objectives. Objective of the project is to reduce diesel consumption for power generation.

Action

1. Explore and introduce a financing mechanism to implement a WTE plant
2. Design and implement a WTE system

Implementation Timeframe. 2017-2022

Support Needed & Costs. Introduce financial scheme and technical support

Lead Agency. STELCO, WAMCO

2.5.4.21 Regional Waste to Energy Plant

Project Description. The projects on establishment of new regional waste facilities in Hithadhoo and Vandhoo are envisaged under the SREP Investment Plan. The two facilities are supposed to receive about 100 tonnes of waste per day and to jointly provide for 2 MW installed electricity generation capacity.

Goals and Objectives. Objective of the project is to reduce diesel consumption for power generation.

Action

1. Explore and introduce a financing mechanism to implement a WTE plant
2. Design and implement a WTE system

Implementation Timeframe. 2018-2022

Support Needed & Costs. Introduce financial scheme and technical support

Lead Agency. MEE and WAMCO

2.5.5 Mitigation Monitoring Framework

A robust MRV system is being developed to fulfil the reporting obligations under the UNFCCC. This MRV system will be used monitor the level of implementation of the mitigation activities of the NDC. The NDC Implementation proposes 22 mitigation actions aimed at reducing GHG emissions by 24%. Some of these mitigation actions are on-going activities however, these activities will contribute the emission reduction targets prescribed in the NDC. The aim of the MRV system is to see the progress, in terms of level and timeframe, of achieving the target emission reduction.

Thus, MEE would be able to monitor the pathway to reaching the NDC mitigation targets.

2.6 INCREASING RESILIANCE THROUGH ADAPTATION

2.6.1 Background

The Maldives is one of the most vulnerable country for the adverse impacts of climate change. In order, to address the vulnerability of the country, Maldives aims to strengthen adaptation actions and opportunities and build climate resilient infrastructure to address current and future impacts of climate change.

The Maldivian NDC identifies 10 priority areas with potential for adaptation opportunities. They include coastal protection, safeguarding coral reef and its biodiversity, tourism, Fisheries, Early Warning and Systematic Observation and Cross Cutting Issues.

2.6.2 Objective

To manage in a holistic manner, and as an integral part of national development planning, the risks associated with the full spectrum of weather, climate and oceanic hazards, from extreme events to the consequences of long-term climate change.

2.6.3 Strategy

Maldives aims to undertake adaptation actions and opportunities and build climate resilient infrastructure to address the current and future impacts of climate change. Integrated adaptation planning fosters a programmatic approach that provides institutional and operational contexts for reducing climate inducted vulnerability. A programmatic approach reduces administrative and related burdens, gives control over direction taken by individual projects and will also increase the possibility of sustaining benefits of a project, even after funding has ceased.

Increasing resilience for adaptation would help to enhance adaptive capacity of the island communities in harmony with national and local needs and capacities with the support from international organisations and donors. While such a long term and integrated approach is not consistent with the current operational procedures of the major funding sources, it is intended to encourage them to take a differentiated approach that ensures small island countries like the Maldives can benefit from the funding opportunities that are intended for them.

Adaptation activities are designed to reduce, to acceptable levels, the risks associated with the full spectrum of weather, climate and oceanic hazards, from extreme events to the consequences of long-term climate change.

2.6.3.1 Enhancing Food Security

Agriculture and food production is very limited in the Maldives due to land scarcity, poor soil conditions and limited water resources. The Maldives, is a highly import oriented economy with respect to its staple food requirements. Moreover, the extensively scattered and irregular geography results in tremendous barriers and added risks towards adequate storage and distribution facilities to handle unexpected market irregularities.

Outputs	Lead Agency	Source of Finance	Implementation Period
▪ Strengthen existing climate risk insurance mechanism to protect the farmers and reduce the income losses from extreme weather events.	MFA	Donor	2018 - 2022
▪ Establishment of strategic food storage facilities and distribution centres across the country as an adaptive measure to increase accessibility and reduce the risk of food shortages during extreme events.	MFA	Donor	2018 - 2020
▪ Introduction and promotion of alternative technologies to make local agriculture more resilient.	MFA	Donor	2018 - 2020
▪ Establish mechanisms to ensure food security to citizens in case of extreme events and market irregularities.	MFA, NDMC	Donor	2018 - 2020

2.6.3.2 Infrastructure Resilience

Considering the highly vulnerable nature of critical infrastructure in the country, the Maldives require additional protection from the potential adverse impacts of climate change. The Velaana International Airport, other international and domestic airports and sea -ports are crucial infrastructure in the Maldives. Similarly the Maldives telecommunication network depends of microwave antennas, some of them on remote islands increasing resilience of island communities is a critical challenge, which needs to be addressed to meet the adverse impacts of climate change.

Outputs	Lead Agency	Source of Finance	Implementation Period
▪ The Velaana International Airport is planned for expansion to handle additional passenger capacity along with an additional runway. Hard engineering coastal protection measure would be carried out to protect the shoreline of Hulhule as well as for other air and sea ports.	MACL	Donor	2018 - 2030
▪ Malé Commercial Port that handles more than 90 percent of the imported cargo. To increase the capacity and reduce the impacts of high winds and seas to the operation of the port, the commercial port would be relocated to a Thilafushi.	MPL	Donor	2018 - 2021
▪ Establishment of a National Building Code to provide guidance to the planners, architects and engineers to integrate climate and weather related factors into the designs of buildings and facilities.	MEE, MHI	Donor	2018 - 2019
▪ Establishment of National Development Act to facilitate integration of climate change into development planning, considering the economies of scale for public services, land use planning and population consolidation.	MEE	Donor	2018 - 2020
▪ Establish mechanism to mainstream climate resilience into public sector investment programmes and projects	MHI	Donor	2018 - 2020

2.6.3.3 Public Health

Mortalities due to vector borne diseases have been identified as an emerging health challenge while water borne disease incidences are high during extreme weather events its effect magnified by inadequate access to safe water and sanitation. However, due to lack of standardised data it is difficult to use existing health records to research the effects of climate change on human health. There is an urgent need to study the effects of climate change on the prevalence of vector borne diseases in the Maldives.

Outputs	Lead Agency	Source of Finance	Implementation Period
▪ Enhancing and strengthening the vector surveillance program to cover all the islands to address the emergence and re-emergence of vector borne diseases will be formulated and implemented.	MEE	Donor	2018 - 2020
▪ Strengthen the vector surveillance program to address the emergence and re-emergence of vector borne diseases in the islands of the Maldives	HPA	Donor	2018 - 2020
▪ Establish appropriate policies on food safety and establish a monitoring mechanisms to monitor the safety of food produced locally and imported.	MEE	Donor	2018 - 2020

2.6.3.4 Enhancing Water Security

The Maldives has very limited freshwater resources. The country's freshwater resources exist as groundwater in the form of a thin freshwater lenses. In most of the islands, the groundwater is not suitable for potable use due to saltwater intrusion and poor water quality. Climate change is expected to pose further risks to availability, accessibility and quality of water sources.

Rainwater is the main source of drinking water in more than 90% of the outer islands. Groundwater is used for other domestic purposes and agriculture. Changes in average annual and temporal patterns of the rainfall have led to localised water stress in a large number of islands requiring augmentation by desalination alternatives and transportation of water resources to water stressed locations.

Outputs	Lead Agency	Source of Finance	Implementation Period
▪ Development of a water policy and a strategy to address water security and water shortages facing the islands during the dry periods.	MEE	Donor	2018 - 2018
▪ Strengthen Integrated Water Resource Management systems covering rainwater harvesting, groundwater recharging and desalination as to adapt to the water sector to the impacts of climate change.	MEE	Donor	2018 - 2022
▪ Desalinisation has been widely used in the Maldives as an adaptation technology to supplement the existing water resources on the island. Explore, pilot and demonstrate cost effective desalination technologies that could be introduced to the islands as an adaptation technology.	MEE	Donor	2018 - 2022

2.6.3.5 Coastal Protection

The islands of the Maldives are low lying and beach erosion is widespread causing significant loss of land and costal infrastructure. Priority is given to protect the human settlements and infrastructure of inhabited and resort islands.

Outputs	Lead Agency	Source of Finance	Implementation Period
▪ Facilitate financing to invest in coastal protection of inhabited and resorts islands	MEE	Donor	2018 - 2022
▪ Demonstrate land elevation, shore protection and reclamation as an adaptation measures to increase resilience of vulnerable inhabited and resort islands.	MEE, MOT	Donor	2018 - 2020
▪ Continue coastal protection of inhabited islands to reduce the vulnerabilities of coastline due to impacts of climate change through Public Service Investment Programme (PSIP)	MEE	National	2018 - 2030
▪ Continue coastal protection of resorts as to reduce the vulnerabilities of coastline due to impacts of climate change	MOT	Private	2018 - 2030

2.6.3.6 Safeguarding coral reef and its biodiversity

Coral reefs are an important contributor the economy supporting tourism and fisheries. The reefs support rich biodiversity providing food and livelihoods to island communities. This vital ecosystem is highly sensitive to changing sea surface temperature and other climatic factors. The evidence from the reefs of the Maldives supports that warming of the ocean surface leads to significant coral bleaching. In some instances, coral reefs surrounding the islands are stressed due to land based sources of pollution. This makes the already vulnerable ecosystem more susceptible to impact of climate change.

Outputs	**Lead Agency**	**Source of Finance**	**Implementation Period**
▪ Strengthen and enhance coral reef permanent monitoring sites to assess the recovery of coral reefs from bleaching events and to study how coral reefs adapt to changes in climate and sea level	MRC, EPA	National & Donor	2018-2025
▪ Coral reef conservation through establishment and improved management of marine protected site and areas	EPA, MRC, MOT	National & Donor	2018-2030
▪ Increase resilience of coral reef through reef restoration	MRC, MEE	National & Donor	2018-2030
▪ Reduction of sources of pollution through appropriate policies and development of appropriate sewage treatment systems on inhabited islands as an adaption measures to protect the coral reefs	MEE	National & Donor	2018 – 2030
▪ Reduction of sources of pollution through appropriate policies for management and safe disposal of solid waste as an adaption measures to protect the coral reefs	MEE	National & Donor	2018 – 2030

2.6.3.7 Tourism

Climate change would have implications on the tourism industry developed around the clear water surrounding the islands, white sandy beaches and vibrant coral reefs.

Outputs	Lead Agency	Source of Finance	Implementation Period
▪ Establish a finance mechanism to invest in protection of resort island's beach and its coastal infrastructure	MOT	Donor	2018 - 2022
▪ Establish an insurance mechanism to reduce the impacts on the tourism sector through risk sharing and risk management.	MOT	Donor	2018 - 2019
▪ Establish a Green Tax on tourism to finance for environmental management including adaptation.	MOT, MEE	Donor	2018 - 2019

2.6.3.8 Fisheries

Tuna fisheries are an important economic sector in the Maldives. Live bait is a prerequisite for the unique pole and line fishery which is sensitive to the monsoonal changes and climate variability. Tuna is expected to move deeper waters due to impacts of climate change.

Outputs	Lead Agency	Source of Finance	Implementation Period
▪ Support development and management of live bait fishery to support main tuna fishery	MFA	Donor	2018 - 2020
▪ Diversification of the fisheries sector to sustainable use of other available marine resources.	MFA	Donor	2018 - 2020

▪ Facilitation and increase access to finance to invest and develop mariculture industry	MFA	Donor	2018 - 2020
▪ Strengthen fisherman insurance mechanism to ensure minimum monthly income from fishing activities for lost fishing due extreme events.	MFA	Donor	2018 - 2020

2.6.3.9 Research, Systematic Observation and Early warning

Climatological measurements are limited due to capacity constraints and inadequate resources. Improvement of climate data collection, management and forecasting remains a critical gap area.

Outputs	**Lead Agency**	**Source of Finance**	**Implementation Period**
▪ Expand and strengthen the existing meteorological observation network to cover all communities of the Maldives.	MMS	National & Donor	2018-2025
▪ Establishes and implements a properly organized quality management system throughout meteorological observation network to improve the observation, forecasting and early warning capability.	MMS	National & Donor	2018-2025
▪ Expanding Doppler Weather Radar Network to cover the country with additional two radars to monitor approaching weather systems to issue early warnings	MMS	National & Donor	2018-2025
▪ Improve climate forecasting using climate modelling to provide information to support decision making sectors affected by weather and climate variability.	MMS	National & Donor	2018-2025
▪ Expand and strengthen the existing weather related early warning system to cover all communities of the Maldives.	MMS	National & Donor	2018-2025

▪ Research to understand the process contributing to beach erosion and how to effectively manage such problems to facilitate adaptation to these problems.	MEE, EPA, MNU		2018-2030
▪ Establish a framework to gather hydrographic and topographical data of the islands to build up a proper database to know the topographic variation patterns in the Maldives islands.	EPA, MLSA	National & Donor	2018-2025

2.7 MONITORING REPORT AND VERIFICATION (MRV)

2.7.1 Background

A framework is needed to identify the actions and policies contained in this document are making a difference in the area of mitigation of national greenhouse gas emission and reducing our vulnerability to the impacts of climate change in the near-term. Monitoring, reporting and verification (MRV) processes provide the information that countries need to inform their broader climate change and sustainable economic development objectives. MRV enables countries to meet international reporting requirements such as National Communications, Biennial Update Reports (BUR), and National Greenhouse Gas (GHG) Inventories.

The government has a role to play in helping to provide a hub for monitoring of data, which could enable mitigation and adaptation outcomes to be tracked on the ground over the long-term and usefully inform future climate change risk assessments.

Distinguishing the difference between adaptation and development indicators can be a challenge and of little practical benefit, especially in a geographical area where most development interventions are geared towards disaster risk reduction or building adaptive capacity.

2.7.2 Objective

To establish a Monitoring, Reporting and Verification system to track implementation of NDC. The MRV system established would provide access to the information necessary to implement climate mitigation and adaptation programs in their contributions to the sustainable development of the Maldives.

2.7.3 Strategy

There should be a commitment to and ongoing practice of, monitoring, reviewing and strengthening the NDC implementation in ways that emphasise transparency, consistency and accountability, as well as continuous improvement in the efficiency with which outcomes are delivered, and in their contributions to the sustainable development of the Maldives.

To ensure transparency of progress, significant institutional and technical capacity will be required to allow for the regular monitoring and review actions. Such processes should be link into National Greenhouse Gas Inventory, Biennial Update Reporting (BURs), preparation of National Communications and any reporting should there be any in future. Additional capacities would be needed though to respond to specific requirements under the NDC framework.

Climate change governance structures at all levels play an important role in mainstreaming climate change into planning and ensuring that measures of adaptation benefits can be linked from local to national reporting systems.

A comprehensive MRV system that is designed to collect adaptation and mitigation outcomes and climate trend information is crucial if enhanced resilience is to be proved through an evaluation process. This system needs to be resourced with human and financial resources for it to work.

2.7.4 Actions

Action	Lead Agency	Source of Finance	Implementation Period
▪ Institutionalizing national Greenhouse Gas (GHG) Inventory at the Climate Change Department of the Ministry of Environment and Energy to develop an overarching framework under which the mitigation aspects of the NDC MRV can be undertaken.	MEE	National	2018 - 2018
▪ Strengthening collection of data at source to improve tracking and reporting of accurate information on GHG-relevant activities and facilitates the elaboration of national GHG inventories.	MEE	Donor	2018 - 2018
▪ Establish an inter-agency committee to assist in building and to coordinate development of the system design, overseeing the design of guidelines on data sharing protocols, and overseeing the implementation of the MRV	MEE	National	2018 - 2018
▪ Gap analysis of existing MRV processes and systems, including Energy Balance, National GHG inventories and institutional set-ups, considering specific additional NDC requirements to highlight capacity gaps and areas where urgent action is required.	MEE	Donor	2018 - 2018
▪ Development of a national MRV database system linking existing databases at Energy Authority, National Bureau of Statistics, Maldives Customs Services, Waste Management Section of MEE.	MEE	Donor	2020 - 2025
▪ Undertake capacity building in other agencies to developing an understanding of the importance of a national MRV system	MEE	Donor	2019 - 2025
▪ Development of a National Data Sharing Portal to improve data reporting, storage and integration at the national level. The online portal would serve as a central	MEE	Donor	2020 - 2025

database for all climate related documentation, substantially for reporting systems under the climate change convention.			
▪ Establishment of a governance structure for MRV. These governance structures need monitoring frameworks at each level to track adaptation and mitigation benefits and development interventions.	MEE	National	2018 - 2020
▪ Piloting MRV of adaptive capacity indicators in a key ministries	MEE	National	2018 - 2020
▪ Develop a financial strategy to implement the MRV system.	MEE	National	2018 - 2020

2.8 CLIMATE FINANCING MECHANISM

2.8.1 Background

The narrow economic base and associated weakness of the Maldivian economy result in competition for limited financial resources, especially national funds. The low visibility and less obvious economic benefits of environmental projects means they have low priority in the national development plan and in allocation of funds in the national budget. There is also increasing difficulty raising external funds, partly related to possible loss of status as a Least Developing Country (LDC).

Sustainable finance remains a challenge in addressing climate change issues. Domestic budgetary spending on addressing climate change remains an additional burden towards the achievement of sustainable development.

Nevertheless, public finance is being allocated to meet urgent and immediate adaptation actions. However, international support is necessary to address the adverse impacts of climate change.

2.8.2 Objective

The main objective of a financing mechanism is to ensure funding to implement the activities identified in the NDC Implementation Plan.

2.8.3 Strategy

Climate finance frameworks that match support needs against funding streams and include strategies for how best to access them

Creating sustainable financing mechanisms for programmes related to climate change activities.

2.8.4 Actions

Action	Lead Agency	Source of Finance	Finance Requirement (US$)	Implementation Period
▪ Seek financial and technical assistance from related bilateral and multilateral sources.				
▪ Allocate explicitly for climate change related programmes from the annual budget of related government agencies and ensure these funds are utilized fully for the purpose				