



National Climate Change Adaptation Strategy for Sri Lanka 2011 to 2016



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Strategy Development Team:

Nayana Mawilmada - Team Leader/Strategic Planning Specialist, Sithara Atapattu - Deputy Team Leader/Coastal Ecologist, Jinie Dela - Environmental Specialist, Nalaka Gunawardene – Communications & Education Specialist, Buddhi Weerasinghe – Communications & Media Specialist, Mahakumarage Nandana - GIS Specialist, Aloka Bellanawithana - Project Assistant, Ranjith Wimalasiri - EMO/Project Counterpart – Administration and Coordination, Nirosha Kumari - EMO/Project Counterpart – Communications.

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Abbreviations and Acronyms

ADB	Asian Development Bank
CB/IS	Capacity Building/Institutional Strengthening
CBD	Convention on Biological Diversity
CBO	Community Based Organizations
CC	Climate Change
CCD	Coast Conservation Department
CCS	Climate Change Secretariat
CDM	Clean Development Mechanism
CEA	Central Environmental Authority
CEB	Ceylon Electricity Board
CZMP	Coastal Zone Management Plan
DMC	Disaster Management Center
DRR	Disaster Risk Reduction
DWLC	Department of Wildlife Conservation
DSD	Divisional Secretariat Divisions
EIA	Environmental Impact Assessment
EPA	Environmentally Protected Area
ERD	External Resources Department
GIS	Geographic information Systems
GOSL	Government of Sri Lanka
HLP	National Action Plan for Haritha Lanka Programme
IAS	Invasive Alien Species
IEC	Information, Education and Communication
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for Conservation of Nature
IWRM	Integrated Water Resource Management
MC10YP	Mahinda Chintana: A Vision for a New Sri Lanka, a Ten Year Horizon Development Framework 2006-2016
MCBF	Mahinda Chintana: A Brighter Future
MoE	Ministry of Environment
MoF	Ministry of Finance
MoH	Ministry of Health
MOH	Medical Office for Health
NARA	National Aquatic Research and Resources Agency
NBRO	National Building Research Organization
NCCAS	National Climate Change Adaptation Strategy
NGO	Non Governmental Organization
NPD	National Planning Department
NSF	National Science Foundation
NWRB	National Water Resource Board
NWSDB	National Water Supply and Drainage Board
PA	Protected Area
PI	Policy Intervention
PhI	Physical Investment
PPWG	Project Preparatory Working Group
PSC	Project Steering Committee
RDA	Road Development Authority

RPD	Research and Project Development
SAM	Special Area Management
SEA	Strategic Environmental Assessment
SLTDA	Sri Lanka Tourism Development Authority
SNC	Second National Communication (to UNFCCC)
SVP	Sector Vulnerability Profile
SWG	Sector Working Groups
TA	Technical Assistance
UDA	Urban Development Authority
UNFCCC	United Nations Framework Convention on Climate Change

Message from the Hon. Minister of Environment, Sri Lanka

To be received

Message from the Secretary, Ministry of Environment, Sri Lanka

To be received

EXECUTIVE SUMMARY

Living and coping with uncertain impacts of climate change is no longer a choice; it is an imperative.

Sri Lanka is a negligible contributor to global warming. However, as a nation, we are highly vulnerable to the impacts of climate change, which include:

1. increases in the frequency and intensity of disasters such as droughts, floods and landslides;
2. variability and unpredictability of rainfall patterns;
3. increase in temperature; and
4. sea level rise, among others.

Climate change vulnerabilities cut across many sectors in the economy, and threaten to compromise the significant achievements the country has recorded in the last 20 years. Investments currently being deployed as part of our ongoing development drive are also at risk.

This document outlines a comprehensive National Climate Change Adaptation Strategy (NCCAS) which lays out a prioritized framework for action and investment for the 2011-2016 period aimed at systematically moving Sri Lanka and its people towards a climate-change resilient future.

The NCCAS mirrors and supports Sri Lanka's national development strategy as articulated in the Mahinda Chintana and is aimed at ensuring its success and sustainability.

Accordingly, key findings of sector-based analysis were synthesized into an integrated framework, and structured into the following 5 Strategic Thrusts:

1. Mainstream Climate Change Adaptation into National Planning and Development
2. Enable Climate Resilient and Healthy Human Settlements
3. Minimize Climate Change Impacts on Food Security
4. Improve Climate Resilience of Key Economic Drivers
5. Safeguard Natural Resources and Biodiversity from Climate Change Impacts

Under each of the Strategic Thrusts, key Thematic Areas for action, along with priority Adaptation Measures, have been identified.

An estimated 47.7 billion rupees in incremental additional financing, beyond current and ongoing expenditure, will be required to implement the NCCAS over its 6 year duration.

The vast majority of these financial resources are expected to be channeled directly to the broad base of agencies and stakeholders (both within Government and beyond), to finance and implement climate change adaptation interventions of varied scale. The Ministry of Environment will play a facilitation and coordination role in the process.

Hundreds of stakeholders representing a cross section of government institutions, national NGOs, professionals, and academia covering a wide range of sectors were engaged in the process of developing this strategy.

A pipeline of projects related to each Strategic Thrust has also been developed as an integral part of the NCCAS development process, to expedite investment.

Contents

Chapter 1: Introduction	1
Chapter 2: The Development Process	3
Guiding Principles in Strategy Formulation	3
The Climate Change Adaptation Planning Process	3
Sector Vulnerability Profile Development	4
From SVPs to Strategy: Establishing Strategic Priorities	4
Chapter 3: The Strategy	7
Strategic Thrust 1: Mainstream Climate Change Adaptation into National Planning and Development	8
Strategic Thrust 2: Enable Climate Resilient and Healthy Human Settlements	11
Strategic Thrust 3: Minimize Climate Change Impacts on Food Security	14
Strategic Thrust 4: Improve Climate Resilience of Key Economic Drivers	17
Strategic Thrust 5: Safeguard Natural Resources and Biodiversity from Climate Change Impacts	20
The NCCAS at a Glance	24
Chapter 4: Financing Requirement and Implementation Targets	27
Appendices:	
Appendix 1: List of Persons/Institutions Consulted	29
Appendix 2: Detailed Strategic Interventions Table	35
Appendix 3: List of Project Concept Notes Available	52
Appendix 4: Target Implementation Schedule for NCCAS	55
Appendix 5: Estimated Financing Requirements	57

CHAPTER 1

INTRODUCTION



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Having emerged as an environmental concern, climate change is now regarded worldwide as an overarching development challenge. It can seriously affect the economic growth, food security, public health, cultural heritage, social stability and even the national security of countries.

Sri Lanka is a negligible contributor to global warming. However, as a nation, we are highly vulnerable to the impacts of climate change, which include:

- increases in the frequency and intensity of disasters such as droughts, floods and landslides;
- variability and unpredictability of rainfall patterns;
- increase in temperature; and
- sea level rise, among others.

These vulnerabilities cut across many sectors in the economy, and threaten to compromise the significant achievements the country has recorded in the last 20 years in increasing incomes and reducing poverty, as well as our ongoing development drive.

Living and coping with uncertain impacts of climate change is no longer a choice; it is an imperative. Sri Lanka needs to address climate change adaptation to ensure that its economic development can continue without disruption or setbacks, and investments in poverty reduction, food and water security and public health will not be undone.

This document, which outlines a comprehensive National Climate Change Adaptation Strategy (NCCAS), aims to achieve just that. The following pages lay out a prioritized framework for action and investment aimed at systematically moving Sri Lanka and its people towards a climate-change resilient future.

CHAPTER 2

THE STRATEGY DEVELOPMENT PROCESS

Guiding Principles in Strategy Formulation

The strategy development team has followed five principles to guide its activities and planning process. They were to:

- *Pursue pragmatic solutions, in line with the national development agenda*

The NCCAS is focused around supporting the successful implementation of the Mahinda Chintana development framework and ensuring its sustainability for the long term. The National Physical Planning Policy and Plan (NPPP), the National Environment Policy and associated action plan, as well as the National Action Plan for Haritha Lanka Programme (HLP) have also been considered.

- *Initiate process to mobilize significant investments*

Consistent efforts have been made to elevate thinking above a mere advocacy agenda, and to focus on rational means to safeguard Sri Lanka's national interests and mobilize resources to support and sustain development.

- *Mobilize people/institutions to work towards integrated solutions*

Focus has been placed on stimulating stakeholder interest and initiative to identify climate change risks and adaptation measures across key sectors. All efforts have been taken to capture synergies, and position Sri Lanka to take advantage of opportunities to mobilize resources to support climate change adaptation.

- *Harness the wealth of expertise and knowledge already available in Sri Lanka*

The strategy development process has been carried out with clear acknowledgement that a vast body of knowledge resides with a dispersed and diverse range of stakeholders and experts. All efforts have been made to consult as broad a base of stakeholders as feasible.

- *Contribute towards developing the nation*

Adapting to climate change is a contribution towards developing the nation. As such, the process has consistently adopted a pro-active stance in engaging stakeholders across all sectors and seeking ways to ensure that Sri Lanka's development trajectory can be supported and made more climate change resilient.

The Climate Change Adaptation Planning Process

The NCCAS was developed through a three stage process, as follows:

- Preparing Sector Vulnerability Profiles (SVPs) for key sectors, which outline the current status of the sectors and the main potential climate change risks facing Sri Lanka.

- Adopting a participatory process for the above through working groups comprising a range of stakeholders, as well as individual consultations with key people, to refine content of the SVPs and to identify and prioritize areas for future investment.
- Synthesizing these sector based analyses into one cohesive national adaptation strategy, which includes a clear program for priority action and investment based on clearly defined strategic priorities.

Over 500 stakeholders representing a cross section of government institutions, national NGOs, professionals, and academia covering a wide range of sectors were engaged in the process. A list of key persons consulted is in Appendix 1.

Sector Vulnerability Profile Development

SVPs have been developed for the following key groupings of sectors, where climate vulnerabilities are expected to be critical in the Sri Lankan context:

- Agriculture and Fisheries
- Water
- Health
- Urban Development, Human Settlements & Economic Infrastructure
- Biodiversity and Ecosystem Services

These SVPs are concise background documents which support the NCCAS and were developed as a means to document the current status of each key sector and identify the key climate change related issues that need to be addressed.

The set of SVPs provides a summary snapshot of each sector grouping, highlighting their positioning in the national development trajectory, and summarizing information on the nature, scale, and geographic distribution of vulnerability to climate change impacts across key sectors. The documents also provide insight to the background that exists to position adaptation activities/interventions.

From SVPs to Strategy: Establishing Strategic Priorities

As the SVPs evolved and extensive consultations were carried out, several recurrent observations came to the fore, and formed the foundation for establishing strategic priorities for the NCCAS. These observations include:

- Climate change-related risks cannot be considered in isolation. They are often linked to, and will likely aggravate existing development disparities and problems.
- Problems are rarely isolated clearly within one sector—cross sectoral linkages are common
- A multidisciplinary approach is critical in order to effectively understand and address climate change concerns
- Integrated solutions and adaptation measures straddling multiple sectors are necessary to address risks to key national development initiatives

Sri Lanka's development framework as articulated in the Mahinda Chintana Idiri Dekma, and the Mahinda Chintana 10 Year Horizon Development Framework (MC10YP), outlines the overarching development strategy Sri Lanka is pursuing. Several key pillars of the

national development strategy are apparent upon evaluation of the approximately Rs. 4.3 trillion investment framework planned for the 2006-2016 period in the MC10YP.

- Investments in human settlements, which combine initiatives in housing, urban development, and drinking water, among others, total over Rs. 947 billion.
- Investments in food security—combining irrigation, agriculture, fisheries, and nutrition total over Rs. 360 billion.
- Investments in key economic drivers such as transport infrastructure, tourism, and plantations exceed Rs. 1,454 billion.
- While planned investment in environmental and natural resource conservation is a relatively modest Rs. 18.5 billion, conservation and effective management of these resources is recognized as a core principal in the development strategy.

Collectively these core pillars of the MC10YP represent over 65% of the total planned investments in the 10 year plan. In socio-economic terms, these key strategic areas which underpin the national development strategy, effectively reach the entire population of the country. Success and sustainability of the investments are of critical importance.

All of the above key thrusts of Sri Lanka's development framework show vulnerabilities to climate change. Adaptive measures will be necessary to ensure their long term resilience and sustainability in the face of climate change.

In order to effectively bolster Sri Lanka's national development effort and ensure its success and sustainability, the NCCAS aggregates findings across sectors, and addresses them in an integrated manner which reflects the national priorities articulated through the Mahinda Chintana.

CHAPTER 3

THE STRATEGY

The NCCAS mirrors and supports Sri Lanka's national development strategy as articulated in the Mahinda Chintana and is aimed at ensuring its success and sustainability.

Accordingly, key findings of sector-based analysis were synthesized into an integrated framework, and structured into the following **5 Strategic Thrusts**:

- 1. Mainstream Climate Change Adaptation into National Planning and Development**
Includes cross cutting policy measures, capacity building, safeguards, monitoring programs, coordination mechanisms, etc
- 2. Enable Climate Resilient and Healthy Human Settlements**
Includes housing, urban development and planning, public health, drainage, drinking water, urban wetlands, waste management, pollution control, etc.
- 3. Minimize Climate Change Impacts on Food Security**
Includes agriculture, fisheries, irrigation, nutrition, etc.
- 4. Improve Climate Resilience of Key Economic Drivers**
Includes tourism, transport, power, commercial agriculture, etc.
- 5. Safeguard Natural Resources and Biodiversity from Climate Change Impacts**
Includes water resources management, biodiversity conservation, etc.

Under each of the Strategic Thrusts, key Thematic Areas for action, along with priority Adaptation Measures, have been identified. These are outlined in the following pages.

Detailed information on each recommended Adaptation Measure is in Appendix 2. **The overall NCCAS at-a-glance is at the end of this chapter.**

A pipeline of projects related to each Strategic Thrust has also been developed as part of the NCCAS, to expedite investment. An index of climate change adaptation projects/ concepts seeking financing are in Appendix 3, and the compilation of the relevant concept notes, which were developed by a wide range of stakeholders, is available in **a separate volume**. Development of additional adaptation project concepts is an ongoing process.

Mainstream Climate Change Adaptation into National Planning and Development



Photo: Studio Times Ltd.

Following the dawn of peace, Sri Lanka has accelerated its multifaceted development drive, which is expected to transform the country in both physical and economic terms within the next decade. Major investments are being rolled out across many sectors, and ambitious targets are being pursued.

The effects of climate change, however, if unaddressed, will likely have impacts on our development drive and the sustainability of our achievements. Such climate change-induced impacts, which we are already beginning to see, cut across multiple sectors. They also often exacerbate problems that the country is already grappling with. For example:

- Increased frequency and intensity of natural hazards such as droughts, floods, and landslides are causing damage to infrastructure, crops, and livelihoods.
- Vector borne diseases are spreading at an alarming rate, while a changing climate creates conditions more conducive for mosquito breeding.
- Our natural resources, which are the underpinning of our society and major industries such as tourism, are under severe stresses due to growing human settlements and anthropogenic activities. These stresses are compounded by climate change impacts.

An integrated approach is needed to **mainstream climate change adaptation into to national planning and development**, and improve the climate resilience of Sri Lanka's economy and its people. This includes cross-cutting interventions that impact across multiple strategic thrusts and sectors in the economy. Given the scale and significance of potential impacts, climate change adaptation must be considered from the early stages of development planning through the implementation of major projects and programmes. Sri Lanka's society also needs to have more access to information on climate change related threats they may face, and what they can do at household or community levels to adapt and protect themselves.

Thematic Areas for Action:

A. Strengthen national level climate-adaptation planning and implementation capacity

Climate change adaptation planning capacity is very limited, and scattered. The Climate Change Secretariat (CCS) has a mandate to coordinate climate change related activity across the country. However, CCS capacity to execute on this mandate is constrained on many fronts. Technical capacity to effectively deal with climate change is lacking across key sector agencies as well. There is no focal point or unit responsible for ensuring climate resilience criteria are considered in national level planning initiatives. There are no training institutions or programmes locally which are targeted at building the required technical skill base for effective long term management of climate change risks either. A pool of experts and future leaders in this space needs to be developed and nurtured.

Priority Adaptation Measures:

- i Strengthen and restructure CCS
- ii Develop sector specific training programmes on climate change adaptation
- iii Introduce climate change studies at university level

B. Ensure future investments/economic plans are climate resilient

Climate change considerations are largely not included in planning processes across the economy. While knowledge of the concept of climate change seems widespread, awareness about what can and should be done to adapt is still very limited. Adequate guidelines and safeguards are lacking. The Strategic Environmental Assessment (SEA) and Environmental Impact Assessment (EIA) guidelines, for example, do not specifically include any climate change considerations. Often these are the only environmental checks on major investments – various economic sectors depend on them for guidance on environmental sustainability considerations. Understanding of the economics of climate change in the Sri Lankan context is limited. There seems to be a great deal of ‘fatigue’ among stakeholders in talking about climate change. There is weariness on the limited scope for mitigation action. More focus needs to be placed on adaptation and action, and resource mobilization.

Priority Adaptation Measures:

- i. Incorporate climate change concerns into SEA processes
- ii. Increase awareness of climate change issues across all levels of government.
- iii. Quantify economic costs of climate change on specific sectors

C. Systematically research climate change-adaptation options and disseminate knowledge

While climate change-related initiatives and research are being carried out on an ad-hoc basis by various stakeholders, there is little coordination among them. A range of institutions are coordinating initiatives and research related to climate change (e.g. Department of Meteorology, Disaster Management Center, Universities, NBRO, CCS, NSF, etc.). Access to information and lessons from these various initiatives is limited. An improved and more effective platform for the planning, coordinating, sharing, and disseminating of climate change-related knowledge, which is also clearly linked to national planning activity, is urgently needed.

Priority Adaptation Measures:

- i. Establish coordinated research programme with widespread dissemination
- ii. Model possible future climate scenarios
- iii. Conduct regular national forums on climate impacts on various sectors
- iv. Capture, evaluate and disseminate traditional knowledge on adaptive measures

D. Increase financing for climate change adaptation

Availability of financing for climate adaptation is limited, and a key factor for the fatigue and frustration expressed by many stakeholders participating in climate change initiatives. However, Sri Lanka has an opportunity to capture substantial resources specifically targeted towards climate change being made available internationally. The pursuit of such financing opportunities, however, will require a concerted effort, guided by the Ministry of Finance and supported by cross-sectoral expertise. Institutional mechanisms to effectively allocate, manage, and monitor such financing will also need to be established. Non-government stakeholders and smaller players should also be empowered to access financing and implement climate change adaptation interventions.

Priority Adaptation Measures:

- i. Strengthen NPD/ERD to pursuit financing for climate change adaptation
- ii. Establish climate change adaptation small grant facility
- iii. Establish multi-sectoral climate negotiation team for Sri Lanka
- iv. Support climate-change adaptation regulations with incentives, where possible

E. Inform and mobilize stakeholders at multiple levels in support of climate adaptation

The education system, media, and other information ‘multipliers’ are at this point not effectively engaged in disseminating information on climate change. The target groups that need to be mobilized to support climate change adaptation in Sri Lanka are many—ranging from international agencies to local communities. Awareness about technical solutions to climate-induced problems are not available at the local levels, in the local languages and in accessible formats. More effective engagement of civil society organizations is needed, particularly to mobilize for community-level adaptation to climate impacts.

Priority Adaptation Measures:

- i. Effectively engage education system, media, and other information ‘multipliers’
- ii. Make information about adaptation options available at community level
- iii. Promote policy change for climate change adaptation through small group engagement
- iv. Engage existing institutional and community-based mechanisms for coordination
- v. Combat negative anthropogenic activity (such as sand mining)

Enable Climate Resilient and Healthy Human Settlements



Photo: Indika Wanniarachchi

Sri Lanka is unmistakably on a path of rapid urbanization. Aggressive investments in urban development, housing, and healthcare are core tenets of the national development framework. With immense investments planned in line with the Mahinda Chintana and the NPPP, Sri Lanka is expected to become a predominantly urban country within the next decade, if not sooner.

The MC10YP and MCBF outline a range of investments in human settlements, urban development, drinking water supply, and health infrastructure totaling almost a trillion rupees by 2016. Targets include the development of new metro cities, construction of over 600,000 new housing units, and working towards making Sri Lanka the “Wonder of Asia.”

The effects of climate change, however, are expected to have substantial impacts on our human settlements and our development trajectory. Such impacts, which we are already beginning to see, typically cut across multiple sectors. They also often exacerbate problems that the country is already grappling with.

Climate-related impacts related to the country’s human settlements include:

- Increased frequency and intensity of floods and landslides causing extensive asset loss/damage and displacement of people, particularly the poor.
- Increased frequency and intensity of droughts exerting greater pressure on our freshwater resources, and making drinking water shortages more frequent and severe, particularly in the Dry and Intermediate Zones.
- Increases in ambient temperatures resulting in greater energy (electricity) demand for cooling purposes.
- Increases in vector densities due to climatic factors, resulting in the rapid spread of diseases such as dengue, particularly in urban areas.
- Gradual sea level rise and associated effects causing long-term damage to coastal settlements, infrastructure, and livelihoods.

An integrated approach is needed to enable the development of climate resilient and healthy human settlements to ensure Sri Lanka's national interests are not jeopardized by current and potential climate change-induced risks. The range of cross-cutting issues will require interventions spanning across planning, housing, water supply and drainage, health, roads, and several other sectors.

Thematic Areas for Action:

A. Mobilize stakeholders for climate change adaptation of settlements

Various mechanisms for community and household level adaptation to climate change--such as improved construction methods already developed--are not widely in use. This is partly due to poor mobilization of stakeholders on the ground. Sri Lanka has existing institutional mechanisms (such as District Coordinating Committees and local government) which are geared towards ensuring engagement of the local level. However, their engagement in mobilizing stakeholders towards climate change adaptation has not been initiated. The same applies to the extensive grassroots networks of the NGO sector. Systematic and targeted approach to mobilize stakeholders for multi-sectoral adaptation initiatives is needed. Effective regulations and/or incentives to promote adaptation in settlements are lacking.

Priority Adaptation Measures:

- i. Establish coordination body/mechanism for climate change adaptation of settlements
- ii. Promote improved climate resilient construction methods
- iii. Support climate change adaptation interventions with incentives

B. Improve planning to include climate change considerations

Human settlement planning in the Sri Lankan context largely ignores climate change related concerns such as the increased frequency/intensity of natural hazards, changes in rainfall patterns, temperature rise, and sea level rise. This is in part due to a lack of information on possible risks and impacts. While development plans are formulated for the major urban areas in the country, such planning initiatives do not cover areas currently beyond UDA's purview. Inadequacy of land planning is leading to haphazard and sprawling development patterns, degradation of environmental conditions, and increases in the climate change vulnerability of human settlements.

Priority Adaptation Measures:

- i. Develop detailed local-level hazard maps for key settlements
- ii. Stimulate greening of settlements and preservation of natural ecosystems
- iii. Promote land use planning and monitoring for both urban and rural areas
- iv. Research climate change impacts on human settlements and link to planning

C. Ensure adequate quality and quantity of water for settlements

As human settlements rapidly expand, the pressure to ensure adequate quality and quantity of water to fulfill the demand for domestic (and industrial) use also increases. This pressure is exacerbated by the impacts of climate change. Sri Lanka currently has poor management of watersheds and water sources. Principles of IWRM are rarely implemented. Contamination of water sources is a common problem. Awareness and technical

knowledge to conserve water and control pollution is limited. While several agencies carry out water quality monitoring and surveillance, it is inadequate and not carried out in a systematic and coordinated manner. Data sharing among key stakeholders is lacking. The use of water saving methods and rainwater harvesting are also limited.

Priority Adaptation Measures:

- i. Promote water saving technologies including rainwater harvesting
- ii. Improve monitoring/surveillance and sharing of data across sectors
- iii. Promote integrated water resources and watershed management
- iv. Research climate impacts on water availability and develop scalable adaptation models

D. Combat climate change-related health concerns in settlements

Climate change-related health concerns in the Sri Lankan context are not fully understood, although clear links between changing climate and the rapid spread of mosquito, rodent, and water-borne diseases, as well as respiratory diseases, are widely acknowledged. The spread of such climate change-linked communicable diseases is exacerbated due to haphazard development patterns and the associated degradation of environmental conditions. While the health sector collects extensive data to monitor and control health concerns, data collected by MOH area is incongruent with the divisional secretariat boundaries used by most other sectors, making cross-sectoral analysis and cooperation difficult.

Priority Adaptation Measures:

- i. Monitor and control vector borne diseases
- ii. Facilitate data sharing and compatibility between Ministry of Health and other sectors
- iii. Engage health sector experts in local level planning
- iv. Research health impacts of climate change in Sri Lankan context

E. Increase awareness on vulnerabilities and adaptation of settlements

Awareness levels about the impacts of climate change on human settlements are limited among the public, technical service providers, as well as government agencies. Research in this area is limited, and dissemination of findings is lacking. Media engagement or targeted messaging aimed at increasing the resilience of human settlements to climate change is largely absent and inter-sectoral coordination is lacking as well.

Priority Adaptation Measures:

- i. Improve the gathering, processing and dissemination of information related to human settlements
- ii. Enhance awareness and demand for climate resilient construction
- iii. Improve coordination/dissemination through existing institutional mechanisms
- iv. Engage media more proactively with messaging tailored for stakeholders

Minimize Climate Change Impacts on Food Security



Photo: Studio Times Ltd.

Ensuring food security is the core principle behind development of the agriculture, fisheries and irrigation sectors in Sri Lanka's national development agenda. This thrust is further bolstered by the emphasis on nutrition in the health sector. Our national development drive seeks to substantially increase agricultural productivity, increase fisheries yields, and decrease malnourishment. The MC10YP stipulates investments of over Rs. 360 billion during the plan period in non-plantation agricultural productivity enhancements and irrigation alone.

However, climate change impacts may substantially hamper our development aims and performance in this Strategic Thrust. For example:

- Increasing demands on our freshwater resources due to expanding settlements, combined with impacts of droughts and saline intrusion in the coastal areas, will reduce water availability for both agriculture and household use.
- Variability and unpredictability of rainfall regimes impact the reliability of agricultural yields, particularly for crops with specific growing seasons, such as rice.
- Droughts and increased soil erosion will reduce storage capacity in irrigation tanks and canals, which are already low in maintenance.

An integrated approach is needed to minimize the climate change impacts on food security involving irrigation, agriculture, fisheries, nutrition (health) and environment sectors as part of the initiative to ensure Sri Lanka's national interests are adapted to be resilient to potential climate change-induced risks.

Thematic Areas for Action:

A. Ensure ability to meet food production and nutrition demand

Fluctuations in agricultural, livestock, and fisheries production volumes and pricing can be expected as a result of climate change impacts. The irregularity of rainfall patterns, for example, is a major problem particularly for paddy cultivation, requiring the rapid distribution of seed stock of specific varieties depending on the onset of monsoon rains. Yield loss due to drought, flood, and salinity are increasing due to climate change. The impact of climate change on pest populations is not clearly understood. Neither are the impacts of climate change on the livestock and fisheries sectors. Fluctuations in production will inevitably manifest in pricing variations that will make it even more difficult for vulnerable populations to meet their nutritional needs. Crop diversification may be required.

Priority Adaptation Measures:

- i. Increase awareness on alternative options to meet nutrition requirements
- ii. Improve weather forecasting and information dissemination
- iii. Ensure easy access to seed stock alternatives to counter rainfall variability
- iv. Research climate impacts/adaptive measures for agriculture, livestock and fisheries sectors
- v. Conserve genetic resources for future crop and livestock improvement

B. Ensure adequate water availability for agriculture

Ensuring adequate water availability for agriculture despite climate change is a key challenge in ensuring food security. Increased frequency and severity of droughts, combined with increased soil erosion and siltation due to high intensity rains, could limit ground and surface water capacity. Sea level rise is increasing the threat of saline intrusion, and the situation is exacerbated by sand mining in rivers. The irregularity of rainfall patterns is a major problem particularly for paddy cultivation. Sri Lanka's ancient tank systems are not optimally utilized. Integrated management of water resources is generally not practiced and forest cover in catchments is diminishing. While water saving farming practices and crops have been identified, their use is limited.

Priority Adaptation Measures:

- i. Promote water-efficient farming methods and crops to improve water productivity
- ii. Improve maintenance of existing tanks and reservoirs including their watersheds and catchments
- iii. Adopt and promote the principles of IWRM
- iv. Construct new reservoirs and trans-basin diversions to meet demand

C. Mitigate food security-related socio-economic impacts

Over the medium to long term, climate change may impact the competitiveness of Sri Lanka as a producer of certain products in agriculture, while giving it competitive advantages in others. The impact of probable scenarios on entire value chains is not clearly understood. A clear understanding of the scale of socio-economic impacts is also lacking. For example, communities dependent on the marine fisheries industry may be impacted by threats to their settlements and landing sites due to erosion and sea level rise. Other

vulnerable groups throughout the country may be similarly at risk. Initiatives to minimize socio-economic impacts of climate change through diversification or risk transfer are limited.

Priority Adaptation Measures:

- i. Encourage risk transfer methods such as insurance
- ii. Research climate impacts on long-term food security and agriculture value chains
- iii. Identify and help vulnerable fishing communities to adapt or relocate

D. Increase awareness and mobilize communities for climate change adaptation

Communities dependent on agriculture are already feeling the impacts of climate change, but awareness about how to adapt at a community or household level is lacking. Some potential adaptation options for the agriculture sector have been studied, but have not been scaled up. Existing field level coordination mechanisms and the extensive grassroots networks of the NGO sector are not effectively engaged or mobilized to support climate change adaptation.

Priority Adaptation Measures:

- i. Increase awareness on climate impacts on food security and on the potential adaptive measures
- ii. Pilot test and scale up community level agriculture/livestock/fisheries adaptation models
- iii. Improve utilization of field level coordination mechanisms and civil society organizations
- iv. Promote risk transfer initiatives

Improve Climate Resilience of Key Economic Drivers



Photo: Studio Times Ltd.

The MC10YP and MCBF stipulate aggressive investments in much needed economic infrastructure, including transport, power, housing, etc. It has also initiated major initiatives to substantially expand and capture the potential of industries such as tourism and shipping. The total investment stipulated between 2007 and 2016 (the plan period) is over Rs. 1.4 trillion (accounts for over a third of total investments in the MC10YP). A major transformation of the country in both physical and economic terms is widely anticipated as a result of these investments.

While these major investments are being rolled out, adequate consideration of potential climate change induced risks is critical to ensure that our investments and economic growth are sustainable over the long term. Some investments and sectors may be substantially vulnerable to climate change. For example:

- Sea level rise, storm surges and continued coastal erosion will have negative impacts on our coastal infrastructure. Some of our most critical transport infrastructure runs through coastal areas, and are already being impacted by erosion.
- Sri Lanka's tourism industry is underpinned by its natural resources, including beaches and biodiversity, which could be negatively impacted by climate change impacts such as temperature rise, sea level rise, and increased natural hazards.
- Frequent floods and landslides are already causing extensive damage to our infrastructure in regions prone to natural hazards. The impacts will get worse with the increase in frequency and intensity of these hazards due to climate change.

An integrated approach is needed to improve the climate resilience of key economic drivers involving tourism, transport, commercial agriculture and several other sectors to minimize risks to Sri Lanka's development trajectory.

Thematic Areas for Action:

A. Minimize impacts of climate change on infrastructure

Most infrastructure constructed in Sri Lanka to date, including roads, drainage systems, railways, etc. have not factored in climate change considerations. While in some areas it may not matter, in others this is critical. For example, transport infrastructure in certain coastal areas could be under severe threat due to sea level rise. A systematic investment program to adapt infrastructure prone to climate change risks is not available. This will necessarily have to follow after a detailed study, but the investments involved could be substantial. Sectors such as tourism are also under threat, as our beaches and biodiversity which underpin our tourism product are both at risk due to climate change. At a broader level, guidelines and standards for development and engineering of infrastructure currently in use are outdated and do not include climate change risk considerations—thus posing a substantial threat to the sustainability of ongoing investments.

Priority Adaptation Measures:

- i. Identify climate change risks on transport infrastructure, and invest in adaptive measures
- ii. Update standards/guidelines for infrastructure design and development
- iii. Include climate change adaptations in tourism planning guidelines

B. Minimize impacts of climate change on plantation sector

Climate impacts on the major plantation crops such as tea, rubber and coconut are being studied, but awareness on how climate change will impact the various crops is limited particularly among field level stakeholders. Clear plans are not available for scaleable adaptive measures and how and where to deploy them. Climate change may present opportunities as well as threats. Potential opportunities have not been explored. A systematic body of research aimed at ensuring the climate change resilience of Sri Lanka's key plantation industries needs to be pursued.

Priority Adaptation Measures:

- i. Research climate impacts and adaptive measures in plantation sub-sectors
- ii. Pilot test and scale-up sub-sector specific adaptation measures
- iii. Evaluate and exploit potential productivity benefits due to climate change

C. Assist key industries in coping with climate change impacts

A lack of information, coordination, guidance and safeguards inhibit the ability to ensure investments in industries are resilient to climate change. A more comprehensive assessment of climate change impacts on our key industries is needed. Such information needs to be easily accessible to investors, as well as planners and regulators. Community level awareness of potential climate impacts on industries, and how they may adapt is also limited. Energy saving methods and the use of renewable energy sources although recognized as desirable, could be promoted more aggressively as well.

Priority Adaptation Measures:

- i. Make sector-specific climate vulnerability information available to investors/regulators
- ii. Encourage climate change risk transfer options for key industries
- iii. Research potential climate change impacts/adaptive measures for key industries
- iv. Offer incentives for industrial energy saving practices and renewable energy usage

D. Raise awareness about climate vulnerability in key economic sectors

Climate change awareness in key economic sectors is currently low and vague. The capacity within sectors/industries to address climate change concerns is also extremely limited. A sustained and broad-based dialogue to improve awareness, and to mobilize stakeholders within vulnerable industries (such as tourism and plantations) for climate change adaptation is needed. This calls for raising the awareness and understanding of climate vulnerabilities, adaptation options and costs. A balanced and constructive approach is needed.

Priority Adaptation Measures:

- i. Increase climate change awareness at all levels
- ii. Build capacity for climate change adaptation in key economic sectors
- iii. Engage wider stakeholders in dialogue on climate adaptation

Safeguard Natural Resources and Biodiversity from Climate Change Impacts



Photo: Sanjiv de Silva

Land and water are among Sri Lanka's most important natural resources, which together with the island's exceptional biodiversity underpin food security, livelihoods, nutrition and health of the population as well as economic development. This is particularly evident in the fields of agriculture and livestock production, fisheries, forestry, tourism, traditional medicine, most manufacturing industries, and external trade. Sri Lanka's high biodiversity includes a diverse array of ecosystems and species, and provides for a wide range of ecosystem services, such as providing fresh water, ameliorating the climate, containing soil erosion, regulating surface runoff and providing bio-resources. Not surprisingly, the importance of the country's natural resources and biodiversity are recognized in key national planning documents and policies, and over-arching policies and plans that govern environmental management.

The potential climate change vulnerabilities of natural resources and biodiversity include:

- Land degradation due to extreme weather events, natural hazards, and soil erosion that causes loss of soil fertility and agricultural productivity.
- Changes in water quality and quantity in inland freshwaters.
- Degradation of vegetation in watersheds due to climate change.
- Changes in terrestrial, inland wetland and coastal systems, their species and ecosystem services, due to changes in rainfall regimes and rising temperatures.
- Changes in growth rates, reproduction and geographic ranges of species and phenology of plants due to climatic changes.
- Changes in coastal and marine systems, species and ecosystem services due to sea level rise, global warming and ocean acidification, with particular impacts on coral reefs and associated species.

All climate change impacts on biodiversity may not be preventable. However, guidelines provided by the Secretariat to the Convention on Biological Diversity suggest that timely identification of threats, concerted conservation action to increase and maintain the resilience of species and ecosystems, availability of connected and safe protected areas and conducive refugia for affected species, and the use of an integrated ecosystem approach are practical and effective climate change adaptation strategies.

Thematic Areas for action:

A. Ensure adequate quality and quantity of water for human wellbeing and ecosystem services

Sri Lanka, though not a water scarce country, needs to manage its resources effectively to ensure future water security and related ecosystem services in view of climate change. Already, the availability of both ground and surface waters for human needs and ecosystem services is reduced due to declining water quality in all climatic zones, and declining water quantity in the dry and intermediate zones. There is an urgent need to strengthen and centralize the management of water resources in the country with a strong water policy to minimize current confusion on responsibilities in water management. Thereafter, an effective water quality monitoring system, national level IWRM plans to address multiple users and environmental flows, and mechanisms to identify, protection and manage watersheds that lie outside protected areas, have to be initiated.

Priority Adaptation Measures:

- i. Promote efficient water resource use and development using IWRM
- ii. Promote research partnerships on good practices for varied water uses
- iii. Strengthen/establish an institution to coordinate management of water resources

B. Enhance climate change resilience of terrestrial ecosystems and their services

Habitat loss, fragmentation and degradation due to decreased canopy cover and forest conversion to other uses are major anthropogenic threats that undermine and erode terrestrial biodiversity. Resilience of forests and other key terrestrial habitats, as well as the species they contain, need to be enhanced in all climatic zones. The ecosystem approach provides an effective framework for integrated management with the participation of key stakeholders. Special attention should be given to areas with already threatened, endemic, or otherwise important species with high vulnerability to climate change.

Priority Adaptation Measures:

- i. Link/restore/conserves, forests and other habitat refugia to increase resilience of ecosystems and species
- ii. Convert monoculture forest plantations into mixed species plantations
- iii. Promote land use planning for biodiversity conservation and limit inappropriate vegetation conversion
- iv. Establish and/or effectively manage Protected Areas and other important wildlife refuges in all climatic zones

C. Enhance the resilience of coastal and marine ecosystems and associated vulnerable species

Many coastal ecosystems are degraded due to poor land use, coastal erosion, pollution and over-exploitation of resources. With increasing temperature and changing weather patterns coastal ecosystems will inevitably face changes in their physical, chemical and biological functions. Anthropogenic stresses that degrade these systems further need to be minimized. New Special Area Management (SAM) sites should be identified and plans developed. Already existing SAM plans should be effectively implemented encouraging the adoption of the integrated coastal zone management approach. Sustainable use of coastal resources should be promoted at community level.

Priority Adaptation Measures:

- i. Promote integrated coastal resource management, particularly at SAM sites
- ii. Restore and rehabilitate degraded coastal ecosystems and depleted coastal species

D. Enhance climate change resilience of natural inland wetlands and associated species.

Inland wetlands are rich in species and are the source of water for domestic, agriculture and inland fishery related needs. They are often degraded or lost due to multiple anthropogenic threats. The loss of wetlands in urban areas that are important as flood retention areas and habitats for urban biodiversity has resulted in major urban floods in recent years. Pollution of inland wetlands has led to substantial ecosystem and biodiversity degradation. Inland wetlands need to be protected to ensure uninterrupted ecosystem services that sustain us. Special attention needs to be placed on coastal freshwater wetlands and biodiversity that face high risk of salt water intrusion due to over-extraction, inland sand mining, and sea level rise.

Priority Adaptation Measures:

- i. Protect marshes/flood retention areas in urban areas and limit land conversion.
- ii. Prevent the discharge of industrial effluents and solid waste into inland wetlands
- iii. Control and manage salt water intrusion into coastal freshwater wetlands
- iv. Strengthen coordination and streamline management of wetlands across relevant agencies

E. Address socioeconomic concerns resulting from climate change impacts on biodiversity

Biodiversity based livelihoods and communities are bound to be adversely affected by climate change. Sea level rise, for example, will impact fishery processes, livelihoods, and life styles of coastal communities. Unplanned forest clearing in the dry zone has resulted in drastic changes in food habits and migration routes of animals such as elephants, which in turn have increased human-animal conflicts. Adapting in such situations requires skill building to adjust to changes in bio-resources, shifting to alternate means of livelihood, or sometimes relocating to safer places.

Priority Adaptation Measures:

- i. Identify and address climate change impacts on biodiversity that affect local communities
- ii. Help communities to adapt to changes in livelihoods or to relocate when necessary

F. Research, monitor and address impacts of climate change on biodiversity

Extensive research is needed to better understand climate change impacts on the natural resources and biodiversity of Sri Lanka. Research and monitoring activities addressing a wide range of ecosystems, their species and their interactions need to be studied, understood and potential adaptive interventions identified. Research and monitoring of Invasive Alien Species and other potential threats should be strengthened to help develop effective interventions in controlling them. The use of traditional knowledge in conservation should also be explored.

Priority Adaptation Measures:

- i. Research and monitoring programs to strengthen knowledge base on climate change and *terrestrial* biodiversity
- ii. Research and monitoring programs to strengthen knowledge base on climate change and *aquatic* biodiversity
- iii. Minimize entry, establishment and spread of invasive alien species (IAS)

G. Raise awareness and mobilize stakeholders for conservation of biodiversity and ecosystem services

Rising awareness on the importance of natural resources and biodiversity is crucial in effectively protecting and conserving them. Educating all stakeholders on the current problems, how they are expected to worsen with climate change, and how they can help is essential in resolving long-standing problems in ecosystem conservation. While public awareness has risen on conserving species and ecosystems, there is still limited understanding of the newer concepts of ecosystem services. Enhancing this knowledge would help in promoting integrated, ecosystems-based approaches to climate adaptation.

Priority Adaptation Measures:

- i. Focus on minimizing current stresses on ecosystems
- ii. Promote training and awareness on use of the ecosystem approach for conservation
- iii. Build capacity for climate adaptation research among students and staff of conservation agencies
- iv. Increase public awareness about the value of aquatic and marine ecosystems
- v. Engage in dialogue with wider stakeholders

The NCCAS at a Glance

Strategic Thrust 1: Mainstream CC Adaptation into National Planning and Development

- A Strengthening national climate-adaptation planning and implementation capacity**
 - i Strengthen and restructure CCS
 - ii Develop of sector specific training programmes on CC adaptation measures
 - iii Introduce climate change studies at university level
- B Ensure future investments/economic plans are climate resilient**
 - i Incorporate CC concerns into SEA processes
 - ii Increase knowledge and understanding of CC among planners and senior technical staff
 - iii Quantify economic costs of CC on specific sectors
- C Systematically research climate change-adaptation options and disseminate knowledge**
 - i Establish coordinated multidisciplinary research programme with widespread dissemination
 - ii Model possible future climate scenarios
 - iii Conduct regular national forums on climate impacts on various sectors
 - iv Capture, evaluate and disseminate traditional knowledge on adaptive measures
- D Increase financing for CC adaptation**
 - i Strengthen NPD/ERD to pursuit financing for climate change adaptation
 - ii Establish CC adaptation small grant facility
 - iii Establish a multi-sectoral climate negotiation team for Sri Lanka
 - iv Support CC adaptation regulations with incentives, wherever possible
- E Inform and mobilize stakeholders at multiple levels in support of climate adaptation**
 - i Effectively engage education system, media and other information ‘multipliers’
 - ii Make information about adaption options available at community level
 - iii Promote policy change for CC adaptation through small group engagement
 - iv Engage existing institutional and community-based mechanisms for coordination of adaptation activities
 - v Combat negative anthropogenic activity (such as sand mining)

Strategic Thrust 2: Enable Climate Resilient and Healthy Human Settlements

- A Mobilize stakeholders for CC adaptation of settlements**
 - i Establish coordination body/mechanism for CC adaptation of settlements
 - ii Promote improved climate resilient construction methods
 - iii Support CC adaptation interventions with incentives
- B Improve planning to include CC considerations**
 - i Develop detailed local-level hazard maps for key settlements
 - ii Upgrade drainage in key settlements
 - ii Stimulate greening and increase of canopy cover in settlements and preserve natural ecosystems
 - iii Promote land use planning and monitoring for both urban and rural areas
 - iv Research CC impacts on human settlements and link to planning
- C Ensure adequate quality and quantity of water for settlements**
 - i Promote water saving technologies including rainwater harvesting
 - ii Improve monitoring/surveillance and sharing of data across sectors
 - iii Promote integrated water resources and watershed management
 - iv Research climate impacts on water availability and develop scalable adaptation models
- D Combat climate change-related health concerns in settlements**
 - i Monitor and control vector borne diseases
 - ii Facilitate data sharing and compatibility between Ministry of Health and other sectors
 - iii Engage health sector experts in local level planning
 - iv Research health impacts of CC in Sri Lankan context
- E Increase awareness on vulnerabilities and adaptation of settlements**
 - i Improve the gathering, processing and dissemination of information related to human settlements
 - ii Enhance awareness and demand for climate resilient construction
 - iii Improve coordination/dissemination through existing institutional mechanisms
 - iv Engage media more proactively with messaging tailored for stakeholders

Strategic Thrust 3: Minimize CC Impacts on Food Security

- A Ensure ability to meet food production and nutrition demand**
 - i Promote alternative options to meet nutrition requirements
 - ii Improve weather forecasting and information dissemination
 - iii Ensure easy access to seedstock alternatives/advice to counter rainfall variability
 - iv Research climate impacts/adaptive measures for agriculture, livestock and fisheries sectors
 - v Conserve genetic resources for future crop and livestock improvement
- B Ensure adequate water availability for agriculture**
 - i Promote water-efficient farming methods and crops
 - ii Improve maintenance of existing tanks and reservoirs including their watersheds and catchments

- iii Adopt and promote the principles of IWRM
- iv Construct new reservoirs and trans-basin diversions to meet demand

C Mitigate food security-related socioeconomic impacts

- i Encourage development of risk transfer methods
- ii Research climate impacts on long-term food security and agriculture value chains
- iii Identify and help vulnerable fishing communities to adapt or relocate

D Increase awareness and mobilize communities for CC adaptation

- i Increase awareness on climate impacts on food security and on the potential adaptive measures.
- ii Pilot test and scale up community level agriculture/livestock/fisheries adaptation models
- iii Improve utilization of field level coordination mechanisms and civil society organizations
- iv Promote risk transfer initiatives

Strategic Thrust 4: Improve Climate Resilience of Key Economic Drivers

A Minimize impacts of CC on infrastructure

- i Identify CC risks on transport infrastructure, and invest in adaptive measures
- ii Update standards/guidelines for infrastructure design and development
- iii Include CC adaptations in tourism planning guidelines

B Minimize impacts of CC on plantation sector

- i Research climate impacts and adaptive measures in plantation sub-sectors
- ii Pilot test and scale-up sub-sector specific adaptation measures
- iii Evaluate and exploit potential productivity benefits due to CC

C Assist key industries in coping with CC impacts

- i Make sector-specific climate vulnerability information available to investors/regulator
- ii Encourage CC risk transfer options for key industries
- iii Research potential CC impacts/adaptive measures for key industries
- iv Offer incentives for industrial energy saving practices and renewable energy usage

D Raise awareness about climate vulnerability in key economic sectors

- i Increase CC awareness at all levels
- ii Build capacity for CC adaptation in key economic sectors
- iii Engage wider stakeholders in dialogue on climate adaptation

Strategic Thrust 5: Safeguard Natural Resources and Biodiversity from CC Impacts

A Ensure adequate quality and quantity of water for human wellbeing and ecosystem services

- i Promote efficient water resource use and development using IWRM
- ii Promote research partnerships on good practices for varied water uses
- iii Strengthen/establish an institution to coordinate management of water resources

B Enhance CC resilience of terrestrial ecosystems and their services

- i Link/restore/conserves, forests and other habitat refugia to increase resilience of ecosystems and species
- ii Convert monoculture forest plantations into mixed species plantations
- iii Promote land use planning for biodiversity conservation and limit inappropriate vegetation conversion
- iv Establish and/or effectively manage PAs and other important wildlife refuges in all climatic zones

C Enhance the resilience of coastal and marine ecosystems and associated vulnerable species

- i Promote integrated coastal resource management, particularly at SAM sites
- ii Restore and rehabilitate degraded coastal ecosystems and depleted coastal species

D Enhance CC resilience of natural inland wetlands and associated species

- i Protect marshes/flood retention areas in urban areas and limit land conversion.
- ii Prevent discharge of industrial effluents and solid waste into inland wetlands
- iii Control and manage salt water intrusion into coastal freshwater wetlands
- iv Strengthen coordination and streamline management of wetlands across relevant agencies

E Address socioeconomic concerns resulting from CC impacts on biodiversity

- i Identify and address CC impacts on biodiversity that affect local communities
- ii Help communities to adapt to changes in livelihoods or to relocate when necessary

F Research, monitor and address impacts of CC on biodiversity

- i Research and monitoring programs to strengthen knowledge base on CC and terrestrial biodiversity
- ii Research and monitoring programs to strengthen knowledge base on CC and aquatic biodiversity
- iii Minimize entry, establishment and spread of IAS

G Raise awareness & mobilize stakeholders for conservation of biodiversity and ecosystem svcs.

- i Focus on minimizing current stresses on ecosystems
- ii Promote training and awareness on use of the ecosystem approach for conservation
- iii Build capacity for climate adaptation research among students and staff of conservation agencies
- iv. Increase public awareness about the value of aquatic and marine ecosystems
- v Engage in dialogue with wider stakeholders

CHAPTER 4

FINANCING REQUIREMENTS AND IMPLEMENTATION TARGETS

The NCCAS lays out a framework for action for the 2011-2016 period, with the aim of moving Sri Lanka towards a bright and climate change resilient future.

Adaptation to climate change requires concerted action from many corners of Sri Lankan society including politicians and leaders, government agencies, NGOs, researchers, academia, the private sector, as well as communities and households. The NCCAS is expected to lay a broad framework for coordinating and mobilizing this range of stakeholders around a prioritized framework of action.

An estimated 47.7 billion rupees in incremental additional financing, beyond current and ongoing expenditure, will be required to implement the NCCAS over its 6 year duration. This resource pool, which needs to be raised and mobilized, is expected to include investments from Government, international development partners, NGOs, as well as the private sector.

Estimated Financing Requirements (Rs.million)

Strategic Thrust	2011	2012	2013	2014	2015	2016	Total
1: Mainstream CC Adaptation into National Planning & Development	50	554	669	637	820	820	3,550
2: Enable Climate Resilient & Healthy Human Settlements	91	496	2,768	2,434	2,398	2,098	10,285
3: Minimize Climate Change Impacts on Food Security	8	183	2,123	1,690	1,755	7,215	12,974
4: Improve Climate Resilience of Key Economic Drivers	160	375	3,785	3,610	3,875	3,375	15,160
5: Safeguard Nat. Resources & Biodiversity from CC Impacts	20	219	279	1,652	1,770	1,790	5,730
Total	329	1,837	9,604	10,023	10,618	15,298	47,699

The vast majority of these financial resources are expected to be channeled directly to the broad base of agencies and stakeholders (both within Government and beyond), to finance and implement climate change adaptation interventions of varied scale. Such interventions would range from discrete stand-alone projects aimed at climate change adaptation, to add-ons to ongoing projects to bolster their climate resilience. The Ministry of Environment will play a facilitation and coordination role in the process.

Further detail on the estimated financing required is in Appendix 4. A target schedule for implementation of the range of activities in the NCCAS is in Appendix 5.

A pipeline of climate change adaptation projects in line with the NCCAS has been developed to expedite the mobilization of investment. The proposed project concepts seeking financing are listed in Appendix 3 and the compilation of the relevant concept notes, which were developed by a wide range of stakeholders, is available in a separate volume at the Climate Change Secretariat in the Ministry of Environment. Development of additional adaptation project concepts is an ongoing process.

APPENDICES

APPENDIX 1

List of Key Persons/Institutions Consulted

Government Organizations (GOs)

Abayawardana, S. Director/CEO, National Science Foundation (NSF)

Abeyratne, D L P R. Senior Assistant Secretary, Ministry of Tourism

Abeysinghe, I S. Director, Tea Research Institute (TRI)

Abheyathne, D M. Director/Planning, Ministry of Irrigation & Water Management

Alawathugoda, D. Research Officer, Forest Department

Amarasinghe, A. Head-ILD, National Science Foundation (NSF)

Amarawardena, G K D. Additional Secretary, Ministry of Disaster Management and Human Rights

Balanadan, S. Technical officer, Water Resources Board

Balasingham, S. Registrar-Community Medicine, Ministry of Health

Banda, J. Team Leader- Education, Training & Awareness (SNC)

Bandara, R M S. Head-Landslide Studies and Services Division, National Building Research Organization (NBRO)

Bandarathillake, H M. National Project Manager, SNC Project team

Batuwitage, L P. Additional Secretary, Ministry of Environment

Chandradasa, U W L. Director-Tech & Mitigation, Disaster Management Centre, Ministry of Disaster Mgt. & Human Rights

Chandrapala, L. Director, National council for Disaster Management (MDM)

De Costa, H. EMO/ Biodiversity Secretariat, Ministry of Environment

De Silva, S.B.A. Road Development Authority

de Zoysa, I J. Director General, Department of Agriculture

Dharmakeerthi, S. Assistant Director/CCS, Ministry of Environment

Dissanayake, D M T K. Actg. Assistant Director, Central Environmental Authority (CEA)

Dissanayake, K M D P. Senior Engineer, Coast Conservation Department

Dr. Silva, D A C. CEO, Sri Lanka Institute of Tourism and Hotel Management (SLITHM)

Dr. Wijeratne, PM. Deputy Director, Plant Genetic Resources Centre (PGRC)

Fernando, M P S. Conservator General of Forest, Forest Department

Fernando, P J D. Assistant Director, Ministry of Housing and Common Amenities

Fernando, S. EMO, Ministry of Health

Gamage, G. Director/Biodiversity Secretariat, Ministry of Environment

Gamage, M. Director General, Dept. of For. Aid & Budget Mon., Min. of Fin. & Plan.

Gamage, M. Hydrogeologist, Water Resources Board

Gunasekera, H M. Director General – NPD, Ministry of Finance and Planning

Gunasinghe, K G S D. Sri Lanka Institute of Tourism and Hotel Management (SLITHM)

Gunasinghe, W A D S. Director - Public Utility, Ministry of Finance and Planning

Gunawardane, G M J K. Director/ Promotion & Education, Ministry of Environment

Gunawardene, J. Environment Lawyer, Central Environmental Authority (CEA)

Hapuarachchi, L. EMO/Biodiversity Secretariat, Ministry of Environment

Haputhantri, S. Head/MMRD, National Aquatic Resources Research and Development Agency (NARA)

Herath, A. Assistant Director/CCS, Ministry of Environment

Herath, H D B. Coordinator-Disaster Management, Ministry of Health

Hettiarachchi, D K. Sri Lanka Tourism Development Authority (SLTDA)

Hettiarachchi, G. Director General, Disaster Management Centre, Ministry of Disaster Mgt. & Human Rights

Hewapathirana, K. Fishery Biologist, Department of Fisheries and Aquatic Resources

Inoka, T. EMO/CCS, Ministry of Environment

Iqbal, M C M. Team Leader – Vulnerability and Adaptation (SNC)

Jagoda, D. Senior Architect, National Housing Development Authority (NHDA)

Jayasekera, S R. Deputy Director, Ministry of Disaster Management and Human Rights

Jayasinghe, G. Director/Env. Mgt and Assessment, Central Environmental Authority (CEA)

Jayasooriya, B. Ministry of Fisheries & Aquatic Resources

Jayasundara, S. PA/Biodiversity Secretariat, Ministry of Environment

Jayathillaka, M A R D. Former Secretary, Ministry of Environment

Jayathillake, A. Director/ Air Resources Management & International Relations, Ministry of Environment

Jayathunga, S. Director/Sustainable Development, Ministry of Environment

Jayatissa, R. Head-Dep. of Nutrition, Medical Research Institute (MRI)

Jayaweera, D S. Director General – Development Finance, Ministry of Finance and Planning

Kalaiselvam, S. Director General, Sri Lanka Tourism Development Authority (SLTDA)

Kannangara, J A A N. SAS, Ministry of Housing and Common Amenities

Kariyawasam, S H. Director, Ministry of Disaster Management and Human Rights

Kariyawasam, S. Actg. SAS, Water Resources Board

Karunaratne, N. Ministry of Environment

Kasturiarachchi, K. EMO/CCS, Ministry of Environment

Kiriella, M B. Director International Relations & Research, Sri Lanka Tourism Development Authority (SLTDA)

Kotinkaduwa, J D. Assistant Director, Ministry of Finance and Planning

Kulathunga, A A. Director/NRM, Ministry of Environment

Kumara, P. Asst. Gen. Manager, Water Resources Board

Kurukulasuriya, V. Director/Research, National Physical Planning Department (NPPD)

Lekamge, S. Director – Primary Education, National Institute of Education (NIE)

Maheepala, P G. Dep. DG, Ministry of Health

Mallawaarachchi, U N. Assistant Director Planning, Ministry of Transport

Manorathne, R W S M N. Assistant Director, Central Environmental Authority (CEA)

Musthapha, F. Hon. Deputy Minister, Ministry of Environment

Narampanawa, W M V. Additional Secretary, Ministry of Environment

Niranjana, K. Engineer, Ceylon Electricity Board

Nissanka, S. P. Head, Clean Development Mechanism Centre, CDM Centre

Pathirana, U P L D. Director/ Administration, Ministry of Environment

Pathirana, N C. Director, Ministry of Health

Pathirana, S. EMO/CCS, Ministry of Environment

Perera, D. EMO/ Biodiversity Secretariat, Ministry of Environment

Perera, H N R. Acting Project Director, Coast Conservation Department

Perera, H S. Lab Technician, Coconut Development Authority

Perera, K D S R. Director – NPD, Ministry of Finance and Planning

- Perera, N. Director, Central Environmental Authority (CEA)
- Perera, N. Team Leader- GHG Inventory (SNC)
- Perera, S. Director/ERD, Ministry of Finance and Planning
- Perera, W. Assistant Director General, National Institute of Education (NIE)
- Premalal, K H S M. Deputy Director, Department of Meteorology
- Priyalal, N C. Agriculture Development Assistant, Ministry of Agriculture
- Priyantha, K M H G S. Vet Surgeon, Department of Animal Production and Health (DAPH)
- Priyantha, N. Chief Engineer (Renewable Energy Projects), Ceylon Electricity Board
- Priyanthie, S. EMO/P &P, Ministry of Environment
- Prof. Wijesinha, R. Secretary, Ministry of Disaster Management and Human Rights
- Punyawardane, B U R. Head – Climate Change Division, Department of Agriculture
- Rajasuriya, A. Research Officer, National Aquatic Resources Research and Development Agency (NARA)
- Rajkumar, S G J. Assistant General Manager, National Water supply and Drainage Board (NWSDB)
- Ranasinghe, A. SO/NSF, National Science Foundation (NSF)
- Ranasinghe, H. Team Leader- Mitigation (SNC)
- Ranasinghe, I. Director General (Development), Ministry of Fisheries & Aquatic Resources
- Ranawaka, R A S. Senior Engineer (Development), Coast Conservation Department
- Ranawake, P C. Former Hon. Minister, Ministry of Environment
- Ranaweerarachchi, C. Director/Sustainable Development, Ministry of Environment
- Ranbanda, J M. Nutrition Assistant, Medical Research Institute (MRI)
- Randeni, L. EMO/Promotion & Education, Ministry of Environment
- Rathna, D. RA/CCS, Ministry of Environment
- Rathnayake, R M J C. D/A, National Physical Planning Department (NPPD)
- Rathnayake, S. EMO/ Biodiversity Secretariat, Ministry of Environment
- Ratnayake, P U. Director, Sri Lanka Tourism Development Authority (SLTDA)
- Ravindralingam, K. Senior Engineer, Road Development Authority
- Samansiri, S. Ass. Director IT/GIS, Disaster Management Centre, Ministry of Disaster Mgt. & Human Rights
- Samaranayake, J W K. Plant Genetic Resources Centre (PGRC)
- Samaranayake, U M M. Director-Nutrition, Ministry of Health
- Samarappuli, L. Head-Soil & Plant Nutrition, Rubber Research Institute (RRI)
- Samarasinghe, G B. Director General, Department of Meteorology
- Samarathunga, R H S. Secretary, Ministry of Environment
- Sarathchandra, A W M. Director (Planning and Project Implementation), Ministry of Transport
- Sathurusinghe, A. Conservator, Forest Department
- Senanayake, G. Assistant Director/ERD, Ministry of Finance and Planning
- Senevirathne, A. Disaster Management Centre, Ministry of Disaster Mgt. & Human Rights
- Silva, A. Director/Policy & Planning, Ministry of Environment
- Silva, G B E T. CA/Account Division, Ministry of Environment
- Silva, P. Director General, Urban Development Authority
- Siyambalapitiya, N. Deputy Director (Planning), Road Development Authority

Sooriyagoda, T. Additional Project Director, Ministry of Tourism

Sugathapala, K. Head- Human Settlements Division, National Building Research Organization (NBRO)

Sumathipala, W L. Senior Technical Advisor, Ministry of Environment

Tharindu , A T H. EMO/CCS, Ministry of Environment

Tissera, H. Consultant Epidemiologist, Epidemiology Unit, Ministry of Health

Udugahapattawa, U. Assistant Director/ERD, Ministry of Finance and Planning

Uyanwatta, P. Ministry of Tourism

Vinodh, T L C. Engineer(R & D), Coast Conservation Department

Warnasuriya, A R. Meteorologist, Ministry of Disaster Management and Human Rights

Wasalabanda, N. Asst. Gen. Manager, Water Resources Board

Weerasori, I S. Deputy Director General, Urban Development Authority

Weerawardane, N D R. Research Officer, Forest Department

Weragoda, U W B A. Deputy General Manager, Coconut Cultivation Board

Werahera, S M. Assistant Director/Air Resources Management, Ministry of Environment

Wickramaarachchi, N D. Assistant Director/NRM, Ministry of Environment

Wickramasinghe, Department of Agriculture

Wickramewardane, K G R G R. Assistant Director, Ministry of Finance and Planning

Wijesinghe, P R. Community Physician, Epidemiology Unit, Ministry of Health

Wijesoriya, W M. Additional Secretary, Ministry of Environment

Wijesundara, D SA. Director, Department of Botanic Gardens

Wijesundara, S M. Director (NRM), Ministry of Agriculture

Wijewardene, K D D. Chief Engineer (R & D), Coast Conservation Department

Universities

Fernando, S. Researcher, Faculty of Science, University of Peradeniya

Gunaratne, L H P. Senior Lecturer, Faculty of Agriculture, University of Peradeniya

Gunatilleke, I A U N. Professor, Faculty of Science, University of Peradeniya

Gunatilleke, S. Professor, Faculty of Science, University of Peradeniya

Kodithuwakku, S. Senior Lecturer, Faculty of Agriculture, University of Peradeniya

Kotagama, S W. Professor-Zoology Department, Faculty of Science, University of Colombo

Marambe, B. Professor, Faculty of Agriculture, University of Peradeniya

Meegaskumbura, M. Lecturer, Faculty of Science, University of Peradeniya

Padmalal, U K G K. Senior Lecturer, Open University of Sri Lanka

Perera, A. Senior Lecturer, Faculty of Science, University of Peradeniya

Pushpakumara, D K N G. Professor, Faculty of Agriculture, University of Peradeniya

Silva, P. Senior Lecturer, Faculty of Agriculture, University of Peradeniya

Weerahewa, J. Senior Lecturer, Faculty of Agriculture, University of Peradeniya

Research Organizations

Bahir, M M. Researcher, Taprobana Nature Conservation Society

Balasuriya, A. Junior Professional/PIM, Centre for Poverty Analysis (CEPA)

Dr. Ventatesan, R. SASP Coordinator, South Asia Cooperative Environment programme (SACEP)

Eriyagama, N. Water Resources Engineer, International Water Management Institute (IWMI)

Fernando, K. Senior Professional/PIM, Centre for Poverty Analysis (CEPA)

Manthritilleke, H. Head- Sustainable Development Initiative, International Water Management Institute (IWMI)

Matin, M. Manager, GIS/RS/Data Mgt. Unit, International Water Management Institute (IWMI)

Niranjan, F. Senior Research Officer, Sri Lanka Council for Agricultural Research Policy

Perera, N. South Asia Cooperative Environment programme (SACEP)

Rathnadeera, W K. Senior Programme Officer, South Asia Cooperative Environment programme (SACEP)

Senaratne, A. Research Fellow, Institute of Policy Studies (IPS)

Smakhtin, V. Theme Leader, International Water Management Institute (IWMI)

Tissera, J S. Officiating Director General, South Asia Cooperative Environment programme (SACEP)

Weerakkody, R. Senior Research Officer, Hector Kobbekaduwa Agrarian Research and Training Institute (HARTI)

Wickramasinghe, K. Research Officer, Institute of Policy Studies (IPS)

Non Government Organizations (NGOs)

Ajantha, A. Practical Action

Ariyananda, T. Director, Lanka Rain Water Harvesting Forum

Athukorale, K. Convener, Women for Water Partnership

Chandraratne, G. Programme Officer, Sri Lanka Red Cross Society

Chularatne, H M U. Executive Director, SEVANATHA

Cooray, R. Program Co-ordinator (PIP-SL), Asian Disaster Preparedness Centre (ADPC), DMC

Creech, S. Sri Lanka Nature Forum

De Alwis, D. Senior Program Officer, IUCN -The World Conservation Union

De Mel, M. Environmental Scientist, Environmental Foundation Limited

Deraniyagala, R. President, Wildlife and Nature Protection Society

Deraniyagala, Y. Manager (R & T), Munasinghe Institute of Development (MIND)

Ekaratne, K. Senior Program Officer, IUCN -The World Conservation Union

Gunawardane, N. CEO/Director, Television for Education-Asia Pacific (TVE AP)

Hapuarachchi, B. Project Manager- Disaster Risk Reduction, Practical Action

Hidallage, V. Country Director, Practical Action

Jeewanthi, D. Environment Officer, Centre for Environmental Justice

Kariyawasam, T. Director, Sri Lanka Nature Forum

Karunaratne, W. Legal Officer, Environmental Foundation Limited

Kekulandala, B. Co-ordinator – CCA, Practical Action

Liyanage, C. Environment Officer, Centre for Environmental Justice

Miranda, R. Head of Communications, Practical Action

Pallawala, R. Team Leader- Research & Quality Assurance, Practical Action

Perera, R. PM, Practical Action

Preethiviraj, N. Media Coordinator, Sarvodaya

Rathnaweera, E. Practical Action

Salinda, R. Program Manager-CC, Green Movement of Sri Lanka

Seneviratne, A. Head-Media & Communication, Green Movement of Sri Lanka

Tennakoon, A. Regional Director, Sewalanka Foundation

Vidanage, S P. Programme Co-ordinator, IUCN -The World Conservation Union

Vilcassim, R. Environment Officer,
Environmental Foundation Limited
Wickamarathne, A. Programme Officer,
Television for Education-Asia Pacific
(TVEAP)

Private Sector, Media and Professional Organizations

Balan, S. President, Sri Lanka Institute of
Landscape Architecture (SLILA)
Basnayake, H. Former President, Sri Lanka
Institute of Landscape Architecture (SLILA)
de Silva, N. CEO, Survey Research Lanka
(Pvt) Ltd.
De Silva, M. A T. Freelance Consultant
Dias, A. Station Director, MTV Channels
(Pvt.) Ltd.
Gunaratna, L. President, National Academy
of Science
Gunaratne, L. Managing Director, LGA
Consultant (Pvt) Ltd.
Handunnetti, D. Freelance journalist
Madawanarachchi, W. Director, CIC
Agribusiness
Rodgrio, M. Freelance Journalist, The
Sunday Times
Salgado, S. CEO, Ogilvy Action
Uduman, D. Principal Research Officer,
Survey Research Lanka (Pvt) Ltd.
Wanasinghe, D D. Chairman, All Island
Poultry Association

Donor Organizations

Amerasinghe, M. Project Implementation
Officer, Asian Development Bank
Bailey, M. Counselor Development
Cooperation for South Asia, Australian
Agency for International Development,
Australian High Commission
De Silva, D. SASSD, World Bank
Depta, J. Director/Finance and
Administration, GTZ
Dissanaike, T. Consultant, UNDP-Global
Environment Facility (GEF), UNDP

Fortuna, S. Associate programme Officer,
United Nations Environment Programme
(UNEP)
Hansen, D S. Senior Project Manager,
NORAD, Royal Norwegian Embassy
In, L H. Projects Coordinator, KOICA,
Korean Embassy
Jayasinghe, D. Programme Assistant GEF/
SGP, UNDP-Global Environment Facility
(GEF), UNDP
Juntops, M. Research Fellow, United
Nations Environment Programme (UNEP)
Krawanchid, D. Research Assistant, United
Nations Environment Programme (UNEP)
Mallawathantri, A. Assistant Resident
Representative, UNDP-Environment,
Energy & Disaster Management, UNDP
Min – Hyeon, S. Country Representative,
KOICA, Korean Embassy
Peralta, G. Asian Development Bank
Pilapitiya, S. Lead Environmental Specialist,
World Bank
Priya, S. Senior Technical Coordinator,
United Nations Environment Programme
(UNEP)
Ranawana, S. Asian Development Bank
Rodgers, C. Senior Water and Climate
Change Specialist, Asian Development
Bank
Samarasekara, V. Climate Change
Specialist, Asian Development Bank
Samarasuriya, S. National Coordinator
GEF/SGP, UNDP-Global Environment
Facility (GEF), UNDP
Tsuyoshi, H. Representative, Japan
International Cooperation Agency (JICA)
Vijayanathan, L. Senior Advisor, NORAD,
Royal Norwegian Embassy
Vokes, R. Country Director ,Asian
Development Bank
Woo, C S. Country Representative, KOICA,
Korean Embassy
Yakandawala, H. National Professional
Officer, World Health Organization (WHO)

APPENDIX 2

Detailed Strategic Interventions Table

STRATEGIC THRUST 1: MAINSTREAM CLIMATE CHANGE ADAPTATION INTO NATIONAL PLANNING AND DEVELOPMENT			
Intervention	Performance Indicator	Key Partners	Activity Type
A Strengthening national climate-adaptation planning and implementation capacity			
i Strengthen and restructure Climate Change Secretariat The Climate Change Secretariat needs substantial strengthening with an improved structure and adequate staff strength to be able to lead the national climate change adaptation agenda, to effectively coordinate initiatives, and to build its credibility as the primary focal point for authentic climate change related information and analysis.	<ul style="list-style-type: none"> • Cabinet paper for revised CCS structure approved • Qualified staff recruited • New structure operationalized 	MoE, MoF	CB/IS, PI
ii Develop of sector specific training programmes on CC adaptation measures Climate change vulnerability and adaptation measures vary widely across sectors, requiring specific training to ensure the success of adaptation interventions. Training programs will have to be developed and implemented on an ongoing basis in parallel with adaptation interventions. An effective modality and hub for delivery of such trainings also needs to be established.	<ul style="list-style-type: none"> • Number of training programmes conducted • Number of technical personnel trained • Sectors covered" 	Various	CB/IS
iii Introduce climate change studies at university level Climate change studies needs to be established at certificate/diploma level as well as at post-graduate level to develop a human resource pool with the depth of knowledge and competence to spearhead and implement Sri Lanka's climate change adaptation agenda across all key sectors.	<ul style="list-style-type: none"> • Post-graduate degree programme in climate studies established at one or more of the national universities 	Universities	CB/IEC
B Ensure future investments/economic plans are climate resilient			
i Incorporate CC concerns into SEA processes The Strategic Environment Assessment process to be revised to include the consideration of climate change impacts in the early stages of planning for major development initiatives. This will need to be backed by clauses in the Climate Change Policy to make it a requirement for approval.	<ul style="list-style-type: none"> • Climate Change Policy includes requirement for climate change impact consideration • SEA guidelines includes assessment of climate change resilience 	MoE/CEA	PI
ii Increase knowledge and understanding of climate change among planners and senior technical staff A systematic programme to expand knowledge and understanding on climate change vulnerability in the Sri Lankan context, targetted at policy makers, planners and senior technical staff in key agencies, is needed. This will help ensure that climate resilience will also be considered as part of the overall assessment of feasibility.	<ul style="list-style-type: none"> • Awareness programmes developed and executed • Climate change resilience included as part of sectoral planning proposals 	Various	CB/IS
iii Quantify economic costs of climate change on specific sectors A comprehensive assessment and quantification of the economic costs to Sri Lanka due to expected climate change is needed to clarify investment priorities in adaptation. It is also necessary to inform and strengthen Sri Lanka's negotiating position in international climate negotiations.	<ul style="list-style-type: none"> • Assessment of economic impact completed and disseminated 	MoE/CCS, Various	RPD

C Systematically research climate change-adaptation options and disseminate knowledge

i	<p>Establish coordinated multidisciplinary research programme with widespread dissemination</p> <p>A credible hub for national climate change research needs to be established. A systematic, focused, and action oriented research programme on climate change impacts and adaptation measures relevant to each strategic thrust of the CCAS needs to be pursued. Findings need to be fed directly into national planning processes and disseminated widely.</p>	<ul style="list-style-type: none"> National climate change research programme established, with pipeline of research focused on each strategic thrust Research findings 	NSF, Universities, MoE, others	RPD
ii	<p>Model possible future climate scenarios</p> <p>Further research is needed to establish a clearer understanding of possible climate change scenarios that may affect Sri Lanka. This is needed to inform adaptation planning processes locally as well as to inform Sri Lanka's negotiating position in international climate negotiations.</p>	<ul style="list-style-type: none"> Climate scenarios and projections for Sri Lanka published by credible sources 	Dept. of Met., Universities, others	RPD
iii	<p>Conduct regular national forums on climate impacts on various sectors</p> <p>A series of regular national forums on climate change, focused on each strategic thrust, are needed to provide a credible platform for the range of academics, researchers and professionals involved in climate change adaptation to disseminate knowledge and debate ideas. A credible national platform will avert the confusion caused by the proliferation of ad hoc events with little focus.</p>	<ul style="list-style-type: none"> Regular programme of national climate change forums established for each strategic thrust 	CCS, NSF, universities, others	RPD, IEC
iv	<p>Capture, evaluate and disseminate traditional knowledge on adaptive measures</p> <p>Traditional measures used in Sri Lanka to adapt to changing environmental conditions across key sectors need to be researched, and where appropriate as an adaptation to climate change, knowledge disseminated and their use scaled up.</p>	<ul style="list-style-type: none"> Scaleable adaptive measures based on traditional knowledge identified and documented Programmes to promote identified adaptation measures initiated" 	CCS, NSF, NGOs, others	RPD

D Increase financing for climate change adaptation

i	<p>Strengthen NPD/ERD to pursuit financing for climate change adaptation</p> <p>Focused information on climate vulnerabilities in key sectors, supported by well-developed climate change adaptation project proposals to address risks, are needed to enable the Ministry of Finance to allocate and/or pursue potential financing options for major interventions. Such proposals will need to be developed by sector agencies, with support from the Ministry of Environment.</p>	<ul style="list-style-type: none"> Climate change adaptation projects developed and submitted to NPD Volume of financing allocated for climate change adaptation projects 	CCS, MoF, others	CB/IS
ii	<p>Establish climate change adaptation small grant facility</p> <p>A small grant facility, which can be administered by a professional body under MoE, is needed to efficiently finance community and local level adaptation interventions. It is envisaged that the fund will be accessible by all stakeholders including civil society groups; have clear guidelines for competitive allocation of resources; and adequate capacity for disbursement and monitoring and evaluation.</p>	<ul style="list-style-type: none"> Small grant facility established and operational guidelines defined Number of proposals approved Funds disbursed and project outcomes achieved 	MoE, MoF, others	PI, CB/IS

<p>iii Establish a multi-sectoral climate negotiation team for Sri Lanka</p> <p>Assemble a climate negotiation team that include experts from a range of relevant sectors which are impacted by climate change. Such a team to participate in or provide advisory services to national delegations attending all key international negotiations.</p>	<ul style="list-style-type: none"> Climate change negotiating team identified Range of expertise represented 	<p>MoE/CCS, Min. of Foreign Affairs</p>	<p>CB/IS</p>
<p>iv Support climate-change adaptation regulations with incentives, wherever possible</p> <p>Improved regulations and guidelines alone do not ensure action. Providing incentives for climate adaptation measures could stimulate greater adoption of measures being promoted. Incentive measures will need to be developed on a case-by-case basis to support interventions being rolled out by various agencies.</p>	<ul style="list-style-type: none"> Adaptation projects supported by incentives where appropriate 	<p>Various</p>	<p>Other</p>
<p>E Inform and mobilize stakeholders at multiple levels in support of climate adaptation</p>			
<p>i Effectively engage education system, media and other information ‘multipliers’</p> <p>To influence and inspire behaviour change, information needs to be disseminated with the active participation of information multipliers, e.g. education system, informal networks of civil society groups, and all sections of the media. These ‘multipliers’ are well positioned and equipped to engage large numbers across social and income levels. However, they need authentic information and guidance on complex, technical matters.</p>	<ul style="list-style-type: none"> Please refer to Information Education and Communications (IEC) Strategy 	<ul style="list-style-type: none"> Please refer to IEC Strategy 	<p>IEC</p>
<p>ii Make information about adaption options available at community level</p> <p>Climate adaptation would begin, and be sustained, mostly at the local levels by individuals, families, neighbourhoods and other communities who share climate impacts. The specific information of adaptation methods, technologies and practices therefore need to be made available at these levels in the local languages, and in non-technical and non-proprietary forms.</p>	<ul style="list-style-type: none"> Please refer to IEC Strategy 	<ul style="list-style-type: none"> Please refer to IEC Strategy 	<p>IEC</p>
<p>iii Promote policy change for climate change adaptation through small group engagement</p> <p>The recent shift to disaster risk reduction (DRR) in Sri Lanka resulted from sustained efforts in engaging in small group level advocacy with the relevant ministries, departments and other state agencies. A similar nurturing of champions and supporters will be needed for CC adaptation.</p>	<ul style="list-style-type: none"> Please refer to IEC Strategy 	<ul style="list-style-type: none"> Please refer to IEC Strategy 	<p>IEC</p>
<p>iv Engage existing institutional and community-based mechanisms for coordination of adaptation activities</p> <p>Over the years, various formal and informal mechanisms and networks have been developed by the state agencies and some civil society groups engaged in development, conservation or relief work, e.g. in agricultural extension, rural credit, disaster mitigation, water supply and sanitation, etc. It makes sense for the Climate Adaptation Strategy to tap into relevant mechanisms.</p>	<ul style="list-style-type: none"> Please refer to IEC Strategy 	<ul style="list-style-type: none"> Please refer to IEC Strategy 	<p>IEC</p>

- v Combat negative anthropogenic activity (such as sand mining)
 - Please refer to IEC Strategy
 - Please refer to IEC Strategy
- Climate change adaptation requires both pro-active and preventive interventions. The latter involves curbing various activities that take place at the ground level that weaken or damage the environment's resilience. These are often result of ignorance, poverty, greed and weak law enforcement. Targeted awareness raising can help contain these, while also strengthening law enforcement and monitoring.

STRATEGIC THRUST 2: ENABLE CLIMATE RESILIENT AND HEALTHY HUMAN SETTLEMENTS

Intervention	Performance Indicator	Key Partners	Activity Type
A Mobilize stakeholders for climate change adaptation of settlements			
i Establish coordination body/mechanism for climate change adaptation of settlements A lead agency and coordination mechanism is needed to capture synergies in adaptation interventions in human settlements given the wide range of agencies involved. Activation and use of an existing mechanism such as the interministerial coordinating committee in the UDA Act is recommended.	<ul style="list-style-type: none"> • Lead agency and coordination mechanism identified • Meetings regularly conducted and include climate change adaptation on the agenda 	UDA, NWSDDB, NWRB, local government agencies, DMC, MoH, others.	PI, CB/IS
ii Promote improved climate resilient construction methods Development and execution of targeted and trade-specific technical training will be needed on a continuous basis to ensure climate resilience considerations are mainstreamed into housing and settlement development. Guidelines for climate resilient construction methods have been developed by various stakeholders in Sri Lanka, however, they are not widely disseminated or practiced.	<ul style="list-style-type: none"> • Training programmes developed • Training programmes conducted for key sectors • Number of people trained • Information integrated into technical curricula in universities/ vocational institutes 	NBRO, DMC, local gov't agencies, universities and tech./ voc. training institutes, others.	CB/IS
iii Support climate change adaptation interventions with incentives The possibility of offering financial, tax or other incentives for the adoption of climate resilient technologies/practices (such as use of rainwater, water recycling, increasing canopy cover) needs to be explored and pilot tested. Incentives are likely to be a stronger driver of behaviour change than regulations alone.	<ul style="list-style-type: none"> • Incentives for adoption of various technologies/practices offered • Increase in adoption of given adaptive measure 	Various	Other
B Improve planning to include climate change considerations			
i Develop detailed local-level hazard maps for key settlements Mapping of potential climate-related hazards in detail at a local level is needed for effective local level planning to ensure climate resilience of the major human settlements in the country. Methods for mapping have been successfully pilot tested by UDA/Practical Action and several stakeholders already and could be replicated for all major settlements.	<ul style="list-style-type: none"> • Number of settlements with detailed hazard maps completed. • Utilization of hazard maps in planning/ regulation 	DMC, UDA, local gov. agencies, NGOs, universities	RPD

<p>ii Upgrade drainage in key settlements</p> <p>Currently drainage systems nationwide are not planned and constructed for the high intensity rainfall patterns that are emerging as a result of climate change. A systematic assessment of drainage systems in key settlements is needed, followed by investments to upgrade existing drainage systems and build new ones if required.</p>	<ul style="list-style-type: none"> • Assessments of drainage systems in key settlements completed • Drainage systems upgraded 	<p>UDA, DMC local government agencies, others</p>	<p>PhI</p>
<p>iii Stimulate greening and increase of canopy cover in settlements and preserve natural ecosystems</p> <p>Increasing canopy cover at a household and community level will have immediate benefits to local communities in reducing local temperatures and conservation of water resources, while also having far reaching benefits in conserving biodiversity. This can be achieved through a combination of improved regulations, awareness, and incentives.</p>	<ul style="list-style-type: none"> • Visible increase in canopy cover • Revised planning regulations/guidelines 	<p>UDA, local gov., Forest Dept., NGOs, schools, others</p>	<p>PI, PhI</p>
<p>iv Promote land use planning and monitoring for both urban and rural areas</p> <p>Land use planning is currently only mandated in designated urban areas under the control of UDA. Regulatory changes and capacity strengthening at multiple levels are required to enable land use planning in non-UDA areas and to control the unplanned sprawl of settlements which are exacerbating climate change-related vulnerabilities.</p>	<ul style="list-style-type: none"> • Revised regulations calling for land use planning outside UDA areas. • No. of land use plans developed and adopted at local level 	<p>UDA, local gov. agencies, NGOs.</p>	<p>PI</p>
<p>v Research climate change impacts on human settlements and link to planning</p> <p>A concerted body of applied research to better understand climate vulnerabilities specific to Sri Lanka's settlements and to develop pragmatic and scaleable adaptation measures needs to be launched. Such research needs to have a well defined feedback loop into planning processes and agencies. Strengthening this link is vital, as is the commissioning of specific new research that helps monitor human settlements related trends and conditions.</p>	<ul style="list-style-type: none"> • Comprehensive research programme designed and funded • Research findings/recommendations adopted and implemented. 	<p>NSF, NBRO, Universities, NGOs, others</p>	<p>RPD</p>

C Ensure adequate quality and quantity of water for settlements

<p>i Promote water saving technologies including rainwater harvesting</p> <p>Several water saving technologies/options have been developed and tested in the Sri Lankan context, but their use is limited. A stepped up campaign, combined with incentives and regulations, is needed to increase adoption of these technologies, particularly in the Dry Zone.</p>	<ul style="list-style-type: none"> • Level of utilization of water saving technologies by region 	<p>Local Gov. Agencies, NGOs, NWRB</p>	<p>PI, IEC</p>
<p>ii Improve monitoring/surveillance and sharing of data across sectors</p> <p>Monitoring of data such as water quality/quantity, disease incidence, building approvals, etc. are done by various agencies in Sri Lanka. However, such monitoring programs need to be substantially strengthened and streamlined for cross-sectoral comparability. A mechanism for regular sharing of data needs to be developed and initiated and a capable coordinating entity identified and assigned.</p>	<ul style="list-style-type: none"> • Water quality monitoring program established • Mechanism/platform for data sharing established • Regular release/ updating of data • Data publicly accessible 	<p>MoH, NWRB, UDA, local gov., NGOs. others.</p>	<p>RPD</p>

<p>iii Promote integrated water resources and watershed management</p> <p>Integrated water resource management practices are needed to ensure Sri Lanka's settlements can cope with climate change vulnerabilities in the water sector. Pilot-scale initiatives should be encouraged to demonstrate benefits. Engagement with stakeholders to ensure policy and regulatory measures are put in place also need to be pursued.</p>	<ul style="list-style-type: none"> • Pilot-scale IWRM initiatives funded and implemented • Greater awareness and adoption of IWRM principles 	<p>NWRB, Irrigation Dept., UDA, local gov. NGOs, others</p>	<p>PI, IEC</p>
<p>iv Research climate impacts on water availability and develop scalable adaptation models</p> <p>The body of research on climate change impacts on water availability for Sri Lanka's growing settlements is needed--with a clear view towards developing a range of scalable adaptation measures.projects that can be deployed at household and community level, as well as at a larger scale.</p>	<ul style="list-style-type: none"> • Comprehensive research programme designed and funded • Research findings/ recommendations adopted and implemented. 	<p>NSF, NWRB, universities, NGOs, others</p>	<p>RPD</p>
<p>D Combat climate change-related health concerns in settlements</p>			
<p>i Monitor and control vector borne diseases</p> <p>An effective, nationwide, and systematic programme to monitor and control disease vectors (particularly mosquito vectors) which are on the rise with climate change is an urgent need. This will enable better prediction and control of potential outbreaks. Further in-depth research on climate-impacts on vectors is also needed.</p>	<ul style="list-style-type: none"> • Vector monitoring programme established and operational nationwide. • Ability to predict and respond to outbreaks increased • Disease incidence rate down 	<p>MOH, local gov. agencies</p>	<p>Phi, RPD</p>
<p>ii Facilitate data sharing and compatibility between Ministry of Health and other sectors</p> <p>An initiative to clearly map MOH boundaries geographically and to define means to enable cross sectoral comparison of the extensive data between MOH divisions and DSDs is crucial. This would be an intervention that will yield very rapid results and have far reaching benefits for climate change adaptation as well as planning in the health sector.</p>	<ul style="list-style-type: none"> • MOH boundaries mapped and georeferenced 	<p>MOH, Local Gov. Agencies</p>	<p>CB/IS</p>
<p>iii Engage health sector experts in local level planning</p> <p>More active upstream engagement of health professionals is needed in settlement planning and management, to prevent and control the spread of both communicable and non-communicable diseases associated with climate change and poor environmental management.</p>	<ul style="list-style-type: none"> • Participation of health officials in settlement planning/management meetings at local and national level. 	<p>UDA, Local Gov. Agencies, MOH.</p>	<p>CB/IS</p>
<p>iv Research health impacts of climate change in Sri Lankan context</p> <p>A wider body of research into the extent and nature of climate change impacts on Sri Lanka's health sector needs to be pursued.</p>	<ul style="list-style-type: none"> • Comprehensive research programme designed and funded • Research findings/ recommendations disseminated. 	<p>NSF, MOH, Universities</p>	<p>RPD</p>
<p>E Increase awareness on vulnerabilities and adaptation of settlements</p>			
<p>i Improve the gathering, processing and dissemination of information related to human settlements</p> <p>Information on the rapidly urbanizing human settlements is scattered across different sectors and agencies, e.g. demographic, geo-spatial, utilities, public health, etc. The integrated approach to climate change adaptation requires pooling and linking such information, which then becomes the basis of timely, targeted adaptation measures and planning.</p>	<ul style="list-style-type: none"> • Please refer to IEC Strategy 	<ul style="list-style-type: none"> • Please refer to IEC Strategy 	<p>IEC</p>

<p>ii Enhance awareness and demand for climate resilient construction</p> <p>An aggressive and nationwide program to raise awareness of the construction methods, targetted at technical personnel who are the sources of conctruction advice, is needed. These personnel include vocational groups such as masons, carpenters, designers, etc. as well professionals and students of architecture, engineering, and planning.</p>	<ul style="list-style-type: none"> • Please refer to IEC Strategy 	<ul style="list-style-type: none"> • Please refer to IEC Strategy
<p>iii Improve coordination/dissemination through existing institutional mechanisms</p> <p>Improving the currently scattered information gathering and researching processes on human settlements needs to be accompanied by similar measures to enhance the access to resulting information in the public domain. War-time restrictions on geo-spatial data and other information need to be reviewed and removed to enable informed decision making at all levels.</p>	<ul style="list-style-type: none"> • Please refer to IEC Strategy 	<ul style="list-style-type: none"> • Please refer to IEC Strategy
<p>iv Engage media more proactively with messaging tailored for stakeholders</p> <p>Urban sprawl has seen a parallel explosion in niche media outlets, especilly in radio and TV sectors, that target urban audiences. In this multiplicity of outlets, media outreach need not any longer be pursued entirely at all-island level. The urban media can be tapped to deliver specific information to different stakeholders.</p>	<ul style="list-style-type: none"> • Please refer to IEC Strategy 	<ul style="list-style-type: none"> • Please refer to IEC Strategy

STRATEGIC THRUST 3: MINIMIZE CLIMATE CHANGE IMPACTS ON FOOD SECURITY

Intervention	Performance Indicator	Key Partners	Activity Type
A Ensure ability to meet food production and nutrition demand			
<p>i Promote alternative options to meet nutrition requirements</p> <p>Nutritional disorders remain a predominant issue in Sri Lanka and is likely to increase further with climate change induced threats to food security. In order to adapt and and make our communities more resilient and healthy, we need to promote alternative options to meet the nutritional demands, especially of women and children. Household level food security and nutrition needs to to be given priority, in adapting to these threats. To do so, women should be empowered to drive it especially in the poor farming communities of the country.</p>	<ul style="list-style-type: none"> • Prioritization of nutritional issues expected to exacerbate with climate change. • Awareness programs to different population categories implemented • Empowered women in poor farming communities in sustaining household level food security and nutrition 	<p>Nutrition Dept, Metereology Dept, Dept of Agric</p>	<p>IEC</p>
<p>ii Improve weather forecasting and information dissemination</p> <p>Many crop failures currently occur due to the lack of accurate and timely information on the changing rainfall patterns - either due to lack of good forecasting ability or due to the lack of an information dissemination mechnism to the farmers. Improvement fo both forecasting and information dissemination on weather would minimise crop failures helping farmers to adapt to changing conditions.</p>	<ul style="list-style-type: none"> • New/improved forecasting technology adopted • Technical capacity increased in forecasting • Information dissemination mechanism developed 	<p>Min of Disaster Mangt, Min of Agric</p>	<p>RPD, IEC</p>

<p>iii Ensure easy access to seedstock alternatives/advice to counter rainfall variability</p> <p>Easy access to seedstock is necessary to help farming communities to adapt to changing rainfall pattern, droughts and floods. To facilitate the process, community level seed stock programs are necessary with a mechanism for rapid distribution. It is also necessary that the seed stock has seed varieties suitable for varied conditions.</p>	<ul style="list-style-type: none"> • Community level seedstock program • technical capacity building program for community on above" 	<p>Min of Agric, Civil Society, CBOs</p>	<p>RPD,PhI</p>
<p>iv Research climate impacts/adaptive measures for agriculture, livestock and fisheries sectors</p> <p>The impacts of climate change on agriculture is yet not fully understood, especially in fisheries and livestock sectors. This knowledge is vital for us to adapt to climate change. It will facilitate the identification of adaptive measures suitable to scale up. Negative aspects on species as well as potential opportunities that climate change may provide should be explored. Impacts on pests, diseases, and IAS need to be better understood and managed. Traditional practices and community level adaptation interventions should also be explored.</p>	<ul style="list-style-type: none"> • Priority areas for adaptation identified • Areas for further research • Adaptation mechanisms identified" 	<p>Dept of Agriculture, Vet Res Inst, Dept of Animal Prod and Health, NARA, Min of Fish. & Aquat. Res.</p>	<p>RPD</p>
<p>v Conserve genetic resources for future crop and livestock improvement</p> <p>Effective in-situ and ex-situ conservation of relevant germplasm is necessary for future crop and livestock improvement. This will also help them to adapt to the impacts of climate change.</p>	<ul style="list-style-type: none"> • Update genes banks to address needs of climate change • Areas identified and protected for germplasm conservation. 	<p>Dept of Agriculture, Vet Res Inst, Dept of Animal Prod and Health</p>	<p>RPD</p>

B Ensure adequate water availability for agriculture

<p>i Promote water-efficient farming methods and crops</p> <p>With increasing incidence of drought due to climate change and the increasing demand on water, a top priority is to ensure food security with the available water resources. For this, water efficient farming practices such as zero tillage, micro irrigation and SRI should be promoted. It is also necessary to promote water efficient crop varieties for future sustainability.</p>	<ul style="list-style-type: none"> • Water efficient farming techniques promotion program • Mechanism incentives to promote water efficient crop varieties 	<p>Min. of Agric, CBOs, Civil Society</p>	<p>IEC</p>
<p>ii Improve maintenance of existing tanks and reservoirs including catchments and watersheds</p> <p>In order to meet the increasing water demands under changing climatic conditions, the maintenance of existing reservoir and irrigation systems is necessary to ensure maximum storage capacity. Regular monitoring and maintenance through dredging, as well as prevention of siltation with effective erosion control of tanks and the irrigation systems are potential adaptations. It is also important to control anthropogenic activities such as sand mining.</p>	<ul style="list-style-type: none"> • Tanks, reservoirs and irrigation systems assessment for maintenance levels, • Reovation and maintenance activities implemented in priority systems 	<p>Irrigation Department, Power people</p>	<p>PhI</p>
<p>iii Adopt and promote the principles of IWRM</p> <p>With the predicted impacts of climate change it is essential that the available water resources are managed wisely. For this, IWRM was be beneficial in dealing with multiple users and in controlling where the water flows. This should be done with better cross-sectoral coordination and consultation. Water requirements for wetlands should also be considered as they are the base for all available water resources.</p>	<ul style="list-style-type: none"> • IWRM Plan for Sri Lanka • Adoption of IWRM in Priority River Basins 	<p>Irrigation Department, Min. of Agric., Industries, Civil Society</p>	<p>PI, IEC</p>

<p>iv Construct new reservoirs and trans-basin diversions to meet demand To meet increased water demand for food production, new reservoirs may need to be built. With both floods and droughts expected to increase in the country, possible adaptation interventions could be to divert water from flood prone areas to drought prone areas through trans-basin transfers.</p>	<ul style="list-style-type: none"> • Identify potential for trans basin diversions and implement • Assess the need for new reservoirs. • Future water requirement assessment" 	<p>Dept of Irrigation, Min. of Agric., power people</p>	<p>Phl</p>
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C Mitigate food security-related socioeconomic impacts

<p>i Encourage development of risk transfer methods With increasing incidences of disasters associated with climate change, the farming and fishing communities become highly vulnerable. To encourage them to continue with their livelihoods which are essential for national food security, risk transfer options such as insurance should be created and promoted.</p>	<ul style="list-style-type: none"> • Insurance schemes 	<p>Min of Agric., Min. of Fish. & Aquat. Res., Min of Livestock, Insurance Companies, CBOs</p>	
<p>ii Research climate impacts on long-term food security and agriculture value chains Research on impacts of climate change on long term food security should be studied along with the how agricultural value chains are affected. This should study the impacts on all activities and processes that lead to a product or service that reaches the final consumer. Dimensions on impacts on the products pathway to reach the final consumer structure, economic relationships between players in the chain, anticipated changes in the structure, the key threats to the entire value chain, should be well understood in order to determine adaptation interventions necessary.</p>	<ul style="list-style-type: none"> • Different components in the value chain system clearly identified • Adaptation strategies developed to address the various components in the value chain. 	<p>Agri-business Center, University of Peradeniya, Min of Agric.</p>	<p>RPD</p>
<p>iii Identify and help vulnerable fishing communities to adapt or relocate Marine and lagoon fishing communities are especially vulnerable to climate change due to rising sea level rise as their livelihoods as well as their homes become threatened. Alternate livelihood options should be considered, and re-location programmes promoted in highly vulnerable areas.</p>	<ul style="list-style-type: none"> • Awareness programs conducted • Alternative livelihood options identified • Highly vulnerable communities identified and re-located 	<p>Min. of Fish. & Aquat. Res., CBOs, Civil Society,</p>	<p>Phl</p>

D Increase awareness and mobilize communities for climate change adaptation

<p>i Increase awareness on climate impacts on food security and on the potential adaptive measures. Better information provision to farmers has helped achieve higher agricultural yields in recent decades. A similar campaign is needed to inform farmers and fishermen on climate related impacts on their livelihoods and what adaptive measures are available to cope. Communicating this specific information in accessible, practical ways is critical to building resilience among food producers and others in the value chain.</p>	<ul style="list-style-type: none"> • Please refer to IEC Strategy 	<ul style="list-style-type: none"> • Please refer to IEC Strategy 	<p>IEC</p>
<p>ii Pilot test and scale up community level agriculture/livestock/fisheries adaptation models A key lesson from the Green Revolution was the value of demonstrating new methods and practices. This can now be replicated with climate adaptation measures by starting with pilot projects which are then promoted and eventually scaled up.</p>	<ul style="list-style-type: none"> • Please refer to IEC Strategy 	<ul style="list-style-type: none"> • Please refer to IEC Strategy 	<p>IEC</p>

<p>iii Improve utilization of field level coordination mechanisms and civil society organizations Crop farming, livestock and fisheries sectors all have well-established extension and support systems in the state sector, sometimes complemented by civil society networks. Both need to be tapped strategically to improve information provision, coordination and monitoring of climate adaptation measures.</p>	<ul style="list-style-type: none"> • Please refer to IEC Strategy 	<ul style="list-style-type: none"> • Please refer to IEC IEC Strategy
<p>iv Promote risk transfer initiatives Crop and livestock farmers need enhanced insurance support to buffer themselves from climate change impacts. Farmers and insurance industry in Sri Lanka have had limited engagement, so active promotion of new, customised insurance schemes would be needed. This requires working with both insurance operators and farmer organizations or networks.</p>	<ul style="list-style-type: none"> • Please refer to IEC Strategy 	<ul style="list-style-type: none"> • Please refer to IEC IEC Strategy

STRATEGIC THRUST 4: IMPROVE CLIMATE RESILIENCE OF KEY ECONOMIC DRIVERS

Intervention	Performance Indicator	Key Partners	Activity Type
A Minimize impacts of climate change on infrastructure			
<p>i Identify climate change risks on transport infrastructure, and invest in adaptive measures A detailed risk assessment and survey of roads/ highways within regions identified as vulnerable, together with the development of engineering solutions and a pipeline of investments to adapt critical infrastructure is needed.</p>	<ul style="list-style-type: none"> • Investments in climate-proofing road infrastructure deployed 	<p>RDA, CCD Local Gov. Agencies</p>	<p>RPD, PI</p>
<p>ii Update standards/guidelines for infrastructure design and development Revision of and issuance of new planning and design guidelines which factor-in climate change considerations, such as updated rainfall intensity curves, bridge and road construction manuals, etc. needs to be undertaken on an urgent basis. Climate resilience criteria should be included in guidelines for all national infrastructure development programmes, such as Gama Neguma.</p>	<ul style="list-style-type: none"> • Revised guidelines and manuals developed and adopted • Revised manuals become industry standard. 	<p>RDA, Met. Dept, Universities, DMC</p>	<p>RPD, PI</p>
<p>iii Include climate change adaptations in tourism planning guidelines Tourism sector stakeholders need to be made more aware of climate risks and potential adaptive measures they can take at the operator level. The inclusion of climate change adaptive criteria/ measures in tourism planning guidelines will ensure greater resilience of investments being rolled out. Such guidelines will need to be developed, adapting from similar work done for human settlements.</p>	<ul style="list-style-type: none"> • Tourism planning guidelines revised to include climate change considerations 	<p>SLTDA, NBRO, UDA, CCD, Local Gov. Agencies</p>	<p>PI</p>
B Minimize impacts of climate change on plantation sector			
<p>i Research climate impacts and adaptive measures in plantation sub-sectors A wider body of applied research into the extent and nature of climate change impacts on Sri</p>	<ul style="list-style-type: none"> • Comprehensive research programme designed and funded • Research findings/ 	<p>NSF, Research Institutes, NGOs, Universities</p>	<p>RPD</p>

	Lanka's plantation subsectors, their productivity, and their competitiveness needs to be defined and pursued.	recommendations adopted and implemented.		
ii	Pilot test and scale-up sub-sector specific adaptation measures Climate change adaptive measures in the plantation sector need to be developed where vulnerabilities are significant, pilot tested, and findings made available to industry groups.	<ul style="list-style-type: none"> • Pilot tests of adaptation measures in each sub-sector • tested adaptation measures deployed widely in sub-sector. 	NSF, Research Institutes, NGOs, Universities	RPD
iii	Evaluate and exploit potential productivity benefits due to climate change Further research into the potential positive impacts of climate change on each key plantation sub-sector's productivity and value chains need to be explored and any opportunities exploited.	<ul style="list-style-type: none"> • Research programme designed and funded • Opportunities identified and initiatives to exploit launched 	NSF, Research Institutes, NGOs, Universities	RPD

C Assist key industries in coping with climate change impacts

i	Make sector-specific climate vulnerability information available to investors/regulators Aside from general climate risk information, sector-specific analysis, maps, and other data related to climate vulnerability--as well as advice on sector-specific measures to build resilience--need to be disseminated to investors/operators/regulators in relevant sectors.	<ul style="list-style-type: none"> • Sector-specific climate vulnerability information materials developed • Information widely disseminated 	DMC, BOI, UDA, others	IEC
ii	Encourage climate change risk transfer options for key industries Risk transfer options such as insurance need to be promoted more actively as a means to build resilience and adaptive capacity of industries and entrepreneurs in the face of potential climate-induced risks.	<ul style="list-style-type: none"> • Increase of market size for disaster risk and similar insurance 	DMC, Insurance firms, Industry Groups	IEC
iii	Research potential climate change impacts/adaptive measures for key industries The current limited body of research on climate change impacts on Sri Lanka's key industries needs to be expanded to identify and address risks, and exploit potential opportunities as well.	<ul style="list-style-type: none"> • Research programme designed and funded • Further action based on findings initiated by industry groups. 	NSF, Universities, Insutry Groups	RPD
iv	Offer incentives for industrial energy saving practices and renewable energy usage Incentive mechanisms need to be developed and implemented to stimulate greater energy savings and renewable energy use in industry.	<ul style="list-style-type: none"> • Incentive schemes offered • Increased renewable energy use 	CEB, Industry groups, renewable energy tech. vendors	PI

D Raise awareness about climate vulnerability in key economic sectors

i	Increase climate change awareness at all levels Climate awareness in key economic sectors is currently low. This calls for urgent raising of knowledge and understanding of climate vulnerabilities, which will help achieve clarity on adaptation options and costs. A balanced approach is needed that factors climate risks into economic sectors as methodically as possible, just as disaster risks have been incorporated in recent years.	<ul style="list-style-type: none"> • Please refer to IEC Strategy 	<ul style="list-style-type: none"> • Please refer to IEC Strategy 	IEC
ii	Build capacity for climate change adaptation in key economic sectors To accomplish (i) above, there needs to be greater technical capacity within each key economic sector. Building such capacity is a key priority in climate change adaptation.	<ul style="list-style-type: none"> • Please refer to IEC Strategy 	<ul style="list-style-type: none"> • Please refer to IEC Strategy 	IEC

<p>iii Engage wider stakeholders in dialogue on climate adaptation</p> <p>The massive upscaling of economic development in the coming decade involves multilateral donors, private foreign investors, local and foreign engineering consultancy firms and insurance companies. Engaging all these stakeholders in addressing climate vulnerabilities and adaptation measures is necessary.</p>	<ul style="list-style-type: none"> • Please refer to IEC Strategy 	<ul style="list-style-type: none"> • Please refer to IEC Strategy
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**STRATEGIC THRUST 5:
SAFEGUARD NATURAL RESOURCES AND BIODIVERSITY FROM CLIMATE CHANGE IMPACTS**

Intervention	Performance Indicator	Key Partners	Activity Type
A Ensure adequate quality and quantity of water for human wellbeing and ecosystem services			
<p>i Promote efficient water resource use and development using IWRM</p> <p>It is necessary to identify and coordinate multiple water users and establish effective IWRM initiatives to ensure future water security and uninterrupted ecosystem services that uses a landscape level ecosystem approach ; covers efficient ground, surface and rainwater use; trans-basin water transfers; water quality monitoring (including monitoring saltwater intrusion and prevention); conserves wetlands and watersheds; and manages exotic species that affect ground water availability.</p>	<ul style="list-style-type: none"> • Implementation of IWRM Plan • Environmental Flows for major Rivers • At least one project using the ecosystem approach for water I resource management 	<p>Irrigation Department, NWRB, NGOs, others</p>	<p>PI/IEC</p>
<p>ii Promote research partnerships on good practices for varied water uses</p> <p>It is necessary to form and implement research partnerships among multiple stakeholders having various skills and technological facilities that will result in good practices for effective multiple use of ground and surface waters and an uninterrupted flow of ecosystem services in wetlands and watersheds.</p>	<ul style="list-style-type: none"> • A system to promote multi stakeholder research partnerships in place 	<p>CEA, Forest Dept, NSF, universities, others.</p>	<p>RPD, CB/IS</p>
<p>iii Strengthen/establish an institution to coordinate management of water resources</p> <p>It is essential to establish a long-term multi-stakeholder water quality monitoring system for ground and surface waters (island-wide and in coastal waters) through partnerships that enable sharing of technical expertise and facilities. Monitoring should achieve high water quality for human consumption, and enable ecosystem services and biodiversity conservation, by monitoring (a) pollutants/toxins and salinity; (b) water flows (especially in dry weather), and (c) climate change impacts on watersheds. Currently the large number of institutions involved in varied water related activities in the country has created a lack of responsibility and coordination in water management. It is necessary to establish/designate and strengthen a central agency to coordinate management of water resources and watersheds by multiple stakeholders, adhering to relevant national policy and laws.</p>	<ul style="list-style-type: none"> • Institution for the regulation of water resources • Streamlined regulations and policies for water resources 	<p>NWRB, Irrigation Dept., others</p>	<p>CB/IS, PI</p>

B Enhance climate change resilience of terrestrial ecosystems and their services

<p>i Link/restore/conserves, forests and other habitat refugia to increase resilience of ecosystems and species</p> <p>It is necessary to enhance the resilience of forests and other key terrestrial habitats and the species they contain by establishing and effectively managing PAs and other viable wildlife refugia in all climatic zones. The ecosystem approach provides an effective framework for integrated management of PAs, other habitat refuges, and their buffer zones with the participation of all key stakeholders. Special attention should be given to areas with already threatened and or endemic, charismatic, relict and/or possible keystone species with high potential to be affected by climate change and the fragmented wet zone forest patches. The latter could be linked via forest plantations, home gardens and crop plantations through participatory approaches based on public sector/local community and private sector partnerships.</p>	<ul style="list-style-type: none"> • CCD, A strategic plan of interconnected PAs, buffer zones and linkages required to maintain migration routes 	<p>Forest Dept., DWLC, CCD, others</p>	<p>PI/PhI</p>
<p>ii Convert monoculture forest plantations into mixed species plantations</p> <p>There can be adverse impacts of climate change on productivity and resilience of monoculture forest plantations. This can be addressed by converting them into mixed species forest plantations that are also better able to support wildlifed, have less pest issues and cause less land degradation and soil water loss.This should be supported by research on plantation species and site species matching.</p>	<ul style="list-style-type: none"> • Area of monoculture plantations converted 	<p>Forest Dept., Dept. of Agriculture</p>	<p>PhI</p>
<p>iii Promote land use planning for biodiversity conservation and limit inappropriate vegetation conversion</p> <p>There is a need to minimise inappropriate vegetation conversion and land alienation (especially in hill slopes and paddy lands) and to adopt proper landscape level planning to promote conservation of terrestrial biodiversity based on the land use policy. This can be achieved by use of the ecosystem approach that allows for wide stakeholder participation, zoning land use, and integrated management of forests, associated inland wetlands and/or coastal and agricultural ecosystems, and restoration of forests and canopy cover outside forests with appropriate tree species.</p>	<ul style="list-style-type: none"> • Country wide biodiversity based land valuation assessment that takes into account biodiversity valuestakin • High Priority areas of environmental value identified 	<p>MoE, UDA, local gov't agencies, others</p>	<p>PI</p>
<p>iv Establish and/or effectively manage Protected Areas and other important wildlife refuges in all climatic zones</p> <p>It is necessary to enhance the resilience of forests and grasslands and the species they contain by establishing and effectively managing PAs and other viable wildlife refugia in all climatic zones. The ecosystem approach provides an effective framework for integrated management of PAs and other refuges and their buffer zones. Special attention should be given to management of degraded forest fragments in the highly populated wet zone which require enrichment and linkages across forest plantations, home gardens and crop plantations through participatory approaches</p>	<ul style="list-style-type: none"> • Protected area management plans in place • Monitoring programmes ongoing 	<p>Forest Dept., DWLC, others</p>	<p>PI</p>

based on public sector/local community and private sector partnerships.

C Enhance the resilience of coastal and marine ecosystems and associated vulnerable species

i	<p>Promote integrated coastal resource management, particularly at SAM sites</p> <p>All development activities carried out along the coast should be coordinated and approved by the Coast Conservation Department to ensure that they adhere to the National Land Use Plan, requirements in the Coastal Zone Management Plan (CZMP) and EIA procedures. It is also necessary to prepare and implement new Special Area Management (SAM) Plans and implement existing plans. Integrated coastal zone management should be encouraged at SAM sites in consultation with all stakeholders. The implementation of CZMP and EIA procedures should be strengthened to reduce inappropriate coastal zone development and habitat degradation through capacity building of technical and planning personnel in CCD and other relevant agencies, and strengthening institutional coordination across agencies active in the coastal zone.</p>	<ul style="list-style-type: none"> • Implementation of SAM management at 	<p>CCD, NARA,</p>	<p>PI, CB/IS</p>
ii	<p>Restore and rehabilitate degraded coastal ecosystems and depleted coastal species</p> <p>Many coastal ecosystems are degraded due to poor land use, conversion to other uses, coastal erosion, and pollution. Likewise commercially important species are over harvested. Programmes should be developed with stakeholder participation for sustainable use of coastal resources, including introduction of breeding programmes and pilot testing of sustainable harvest levels for commercially important organisms.</p>	<ul style="list-style-type: none"> • Rehabilitation of key coastal ecosystems 	<p>CCD, NARA, others</p>	<p>RPD, Phi</p>

D Enhance climate change resilience of natural inland wetlands and associated species

i	<p>Protect marshes/flood retention areas in urban areas and limit land conversion.</p> <p>The protection of marshes and flood retention areas is particularly important in urban areas as urban flooding is already a serious concern due to reclamation of wetlands, and is expected to increase with climate change. Protection of urban wetlands will also enhance and conserve urban biodiversity, thereby enhancing wetland ecosystems and species' resilience to climate change, and enable provision of vital environmental services for human wellbeing. Marshes and flood retention areas should be protected by restricting development projects in them by declaring them PAs and/or EPAs, or by promoting alternate development (e.g. as recreational sites or urban agriculture) that will enable uninterrupted ecosystem services.</p>	<ul style="list-style-type: none"> • Regulation with penalties in place for urban wetlands • Urban wetlands developed as controlled recreational areas 	<p>UDA, local gov't units, NGOs, others</p>	<p>PI, IEC</p>
ii	<p>Prevent the discharge of industrial effluents and solid waste into inland wetlands</p> <p>It is required to prevent the discharge of industrial effluents, solid waste and other pollutants into inland wetlands by promoting compliance of regulations guiding industrial pollution and wetland conservation, by providing incentives for CSR and strengthening the wetland monitoring system to be effective and regular.</p>	<ul style="list-style-type: none"> • Cost effective purification programmes developed for release of effluent • Waste processing programmes • Strict guidelines developed for waste disposal 	<p>CEA, NGOs, local gov't agencies, others</p>	<p>PI, IEC</p>

<p>iii Control and manage salt water intrusion into coastal freshwater wetlands</p> <p>It is necessary to prevent degradation of coastal freshwater wetlands (both natural modified) and biodiversity due to salt water intrusion by continual monitoring of coastal surface and ground water, and by regulating environmental flows, controlling ground water over-extraction, and river sand mining that exacerbates the problem.</p>	<ul style="list-style-type: none"> • Minimum flows at the coast determined for all river basins • Sand mining controlled 	<p>CCD, Irrigation Dept., others</p>	<p>RPD, PHI</p>
<p>iv Strengthen coordination and streamline management of wetlands across relevant agencies</p> <p>Streamline management of wetlands across relevant agencies, and strengthen coordination mechanisms to enable compliance with the national wetland policy, the National Environmental Act and other policies, plans and laws.</p>	<ul style="list-style-type: none"> • Coordination mechanisms established and operational 	<p>CEA/Min. of Environment</p>	<p>CB/IS, PI</p>

E Address socioeconomic concerns resulting from climate change impacts on biodiversity

<p>i Identify and address climate change impacts on biodiversity that could affect local communities</p> <p>It is necessary to identify the impacts of climate change on livelihoods, cultural aspects, and lifestyles of local communities that are heavily dependent on biodiversity. Possible increase of human-wildlife conflict due to changes in geographic ranges or migration routes of wildlife as a result of climate change also need to be understood. Assessments need to be followed with initiatives to conserve such biodiversity and address issues identified.</p>	<ul style="list-style-type: none"> • Impact assessments for key settlements carried out 	<p>MoE, local gov't agencies, NSF, others</p>	<p>RPD</p>
<p>ii Help communities to adapt to changes in livelihoods or to relocate when necessary</p> <p>It is necessary to engage vulnerable communities to strategize options to address climate change where livelihood options are at risk. They should also be engaged in plans for relocation (if required) in order to adapt to climate change and to shift to other livelihoods if necessary.</p>	<ul style="list-style-type: none"> • Vulnerable communities identified • Pilot programmes on livelihood options 	<p>Various</p>	<p>RPD, PHI</p>

F Research, monitor and address impacts of climate change on biodiversity

<p>i Research and monitoring programs to strengthen knowledge base on climate change and terrestrial biodiversity</p> <p>Research on and monitoring of the impacts of climate change on terrestrial biodiversity is needed to understand where adaptation interventions are most needed. Vitally important are establishing phenological studies on forest tree species, monitoring critical habitats and fauna most liable to be affected examining climate change impacts on different types of forest flora. Indicator species such as amphibians, freshwater crabs etc should be given special attention. Capacity should be built for monitoring climate change impacts through training programmes on species identification, biodiversity monitoring, behavioural ecology, principles of conservation biology, phenological sampling and maintenance of accurate data sets on rainfall and ambient temperature.</p>	<ul style="list-style-type: none"> • Species and ecosystems affected by climate change identified • Prioritised list of adaptation interventions needed tailored to ecosystem/species type 	<p>National Science Foundation, Min. of Environment, others</p>	<p>RPD</p>
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<p>ii Research and monitoring programs to strengthen knowledge base on climate change and aquatic biodiversity</p>	<p>Research and monitoring are required continually to identify threats to freshwater and coastal biodiversity that would be exacerbated by climate change and to understand where adaptation interventions are needed. Monitoring changes in coastal water quality parameters – i.e. acidity, temperature, salinity, is essential. Monitoring of salinity intrusion into surface water is particularly important to enable fishermen to adapt accordingly by selecting appropriate species for aquaculture, and to adapt to changed distribution of species in fishing grounds. Likewise research and dissemination of results are necessary to enable fishermen to change fishing methods and areas, seasons, fishing depths and catch species accordingly. Monitoring freshwater bodies and threatened aquatic species should be encouraged to minimise negative impacts on biodiversity and ecosystem services. Periodic monitoring of ecosystem health in all climatic zones is also vital for early identification of climate change impacts on freshwater species and ecosystems.</p>	<ul style="list-style-type: none"> • Adaptation interventions identified and prioritised for marine, brackish and freshwater ecosystems • Breeding programmes for identified species and scaled up where necessary and feasible • Areas for further research identified 	<p>CCD, NARA, Others</p>	<p>RPD</p>
<p>iii Minimize entry, establishment and spread of IAS</p>	<p>There is a need to step up preventive measures to preclude entry of new IAS; monitor natural and modified ecosystems to detect establishment of new IAS and the further spread of existing IAS; promote and inculcate skills for monitoring of natural and modified ecosystems to detect climate change impacts in forests (e.g. forest die-back can promote spread of invasive species), coastal areas (e.g. coral bleaching and death has led to halimelia invasions, etc), and wetlands that may promote spread of IAS, with the support of universities and researchers with appropriate skills and experience. Capacity building is also needed to promote research to expand understanding of behaviour and physiology of selected IAS, and to enhance skills for adaptive management of IAS within institutions responsible for in-situ and ex-situ conservation of national biodiversity.</p>	<ul style="list-style-type: none"> • IAS monitoring and control programmes established for key areas/ecosystems and agricultural systems 	<p>Forest Dept., DWLC, Agriculture Dept., others</p>	<p>PhI, RPD</p>

G Raise awareness and mobilize stakeholders for conservation of biodiversity and ecosystem services

<p>i Focus on minimizing current stresses on ecosystems</p> <p>It is vital to communicate to all stakeholders the urgent need to resolve long-standing problems in ecosystem conservation before climate change impacts aggravate matters. The key message is: reducing existing stresses on ecosystems will increase natural resilience to climate impacts.</p>	<ul style="list-style-type: none"> • Please refer to IEC Strategy 	<ul style="list-style-type: none"> • Please refer to IEC Strategy
<p>ii Promote training and awareness on use of the ecosystem approach for conservation</p> <p>While public awareness has risen on conserving species and ecosystems, there is still limited understanding of the newer concepts of ecosystem services. Enhancing this knowledge would help in promoting the integrated, ecosystems-based approach to climate adaptation.</p>	<ul style="list-style-type: none"> • Please refer to IEC Strategy 	<ul style="list-style-type: none"> • Please refer to IEC Strategy

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| <p>iii Build capacity for climate adaptation research among students and staff of conservation agencies
Conservation agencies working in forest, wildlife, aquatic and coastal sectors engage in regular monitoring and studies for their operational needs. They now need to add a new layer of study to assess climate impacts on their sectors and to determine the appropriate adaptation measures. Their research capacity needs to be strengthened.</p> | <ul style="list-style-type: none"> • Please refer to IEC Strategy | <ul style="list-style-type: none"> • Please refer to IEC IEC Strategy |
| <p>iv. Increase public awareness about the value of aquatic and marine ecosystems
Sri Lanka's climate conditions are influenced by changes in inland wetlands and the ocean surrounding it. Climate adaptation strategies need to factor this in, and especially consider the value of wetlands, and higher vulnerability of coastal ecosystems to impacts.</p> | <ul style="list-style-type: none"> • Please refer to IEC Strategy | <ul style="list-style-type: none"> • Please refer to IEC IEC Strategy |
| <p>v Engage in dialogue with wider stakeholders
Climate change adaptation can provide a common platform, and new impetus, for pursuing conservation management of biodiversity and ecosystems. An essential first step is to engage all stakeholders, in state, academic, civil society and corporate sectors, on the threats and response options available.</p> | <ul style="list-style-type: none"> • Please refer to IEC Strategy | <ul style="list-style-type: none"> • Please refer to IEC IEC Strategy |

APPENDIX 3

List of Project Concept Notes Available

The following is the index of adaptation project concept notes developed by stakeholders as part of the NCCAS development process. The compilation of concept notes is available in a separate volume with the Climate Change Secretariat at the Ministry of Environment, and includes the contact information of the persons/institutions responsible.

STRATEGIC THRUST 1 - Mainstream Climate Change Concerns into National Planning and Development Processes

MS-1	Mainstreaming climate change adaptation into development planning (<i>The World Conservation Union (IUCN)</i>)
MS-2	Mainstreaming Climate Change Adaptation into Urban Development planning processes (<i>Practical Action</i>)
MS-3	Identification and addressing Research Gaps in Climate Change in Sri Lanka (<i>National Science Foundation</i>)
MS-4	A Study Center on Climate Change, Agriculture and Livelihoods (<i>Agribusiness Centre, Faculty of Agriculture, University of Peradeniya</i>)
MS-5	School-centered climate change adaptation and disaster risk reduction programme (<i>Agribusiness Centre, University of Peradeniya</i>)
MS-6	Masters degree programs in Natural Resource Management with special reference to climate change (<i>Postgraduate Institute of Agriculture, University of Peradeniya</i>)

STRATEGIC THRUST 2 - Improve Climate Resilience and Health of Human Settlements

HS-1	Initiative to Conserve the Livelihood activities of Low Income Communities, through Comprehensive Management of Environment Polluting Substances in Moratuwa Municipal Area in Sri Lanka (<i>SEVANATHA Urban Resource Centre</i>)
HS-2	Adaptation to climate change through Integrated Water Resources Management in Sri Lanka. (<i>Water Resources Board</i>)
HS-3	Best Practices Derived from the Disaster Resilient Settlement Planning and Construction Methods as Adaptation Strategies for Climate Change (<i>National Building Research Organization</i>)
HS-4	Rehabilitation and adaptation of the ecosystem relevant landscape architecture of the traditional small tank cascade system to collection, harvesting, distribution, utilization and recirculation of water (<i>Independent Researcher</i>)
HS-5	Community based Adaptation to Climate Change in Landslide Affected Areas. (<i>Sri Lanka Nature Forum</i>)
HS-6	Pilot program for an Integrated, multi-pronged approach to adapt to Climate Change in the Kalutara District (<i>Green Movement Sri Lanka</i>)
HS-7	Pilot program for an Integrated, multi-pronged approach to adapt to Climate Change in the dry zone. (<i>Green Movement Sri Lanka</i>)
HS-8	Climate change adaptation and disaster preparedness for fishing community in Kalpitiya, Sri Lanka (<i>Green Movement Sri Lanka</i>)
HS-9	Climate Change Adaptation in Human settlements in Mahaweli Watershed (<i>National Building Research Organization</i>)

- HS-10 District climate change and gender dialogues (*NetWwater-Network of Women Water Professionals*)
- HS-11 Enabling Cross Sectoral Analysis of Climate Vulnerability in the Health Sector (*Epidemiology Unit, Ministry of Health*)
- HS-12 Managing Climate-linked Disease Vectors (*Epidemiology Unit, Ministry of Health*)

STRATEGIC THRUST 3 - Minimize Climate Change Impacts on Food Security

- FS-1 Effect of food price increase due to climate change on food security and nutritional status of the population (*Medical Research Institute*)
- FS-2 Adoptions of the alternative paddy cultivation technique that incorporate traditions of zero tillage, and use of straws mulch for low water requirement and pest management method (*Independent Researcher*)
- FS-3 Promoting flood / drought / salinity tolerant rice varieties and adaptive cultivation practices to minimize the impact of Climate Change on food security in Sri Lanka (*Sri Lanka Nature Forum*)
- FS-4 Assessing key climate change impacts on minor irrigation systems and developing a participatory approach for effective construction and management (*Practical Action*)
- FS-5 Traditional organic small scale paddy farming in marginal paddy lands - Scaling up experiences from Southern and Eastern Sri Lanka (*Practical Action*)
- FS-6 climate change impacts on women and food security -a comparative study of three agro ecological zones (*NetWwater -Network of Women Water Professionals*)
- FS-7 Climate Change Risk Management Strategies of Dry Zone Farmers in Sri Lanka (*Institute of Policy Studies*)
- FS-8 Establishment of Farmer Climate Change Resource Center for Food Security in Southern Sri Lanka (*Department of Agricultural Engineering, University of Ruhuna*)
- FS-9 An overview of Climate Change Implications on Food Security in Sri Lanka (*Agribusiness Centre, Faculty of Agriculture, University of Peradeniya*)
- FS-10 Agricultural Research as an Adaptation Mechanism to Climate Change (*Agribusiness Centre, Faculty of Agriculture, University of Peradeniya*)
- FS-11 Demand for climatic information by Farmers for Facilitating the decision Making Related to Cultivation/harvesting (*Agribusiness Centre, Faculty of Agriculture, University of Peradeniya*)
- FS-12 Implications of Climate Change on the Agriculture Sector in Sri Lanka: An Economy wide Analysis (*Agribusiness Centre, Faculty of Agriculture, University of Peradeniya*)

STRATEGIC THRUST 4 - Improve Climate Resilience of Key Economic Drivers

- ED-1 Need assessment for the climate change adaptation in Agricultural practices in Upper Mee Oya Basin (*Central Engineering Consultancy Bureau*)
- ED-2 Empowering rubber smallholders in non-traditional rubber growing areas with knowledge on combating adverse impacts of climate change for better productivity (*Rubber Research Institute*)

- ED-3 Effects of climate change on rural farm incomes: Case study on earnings of workers in rubber plantations in Sri Lanka (*Agribusiness Centre, Faculty of Agriculture, University of Peradeniya*)
- ED-4 Develop applicable strategy for kerosene lamp substitution with low cost Solar PV lighting options with a field test for best product selection (*Sewalanka Foundation*)
- ED-5 Analysis of climatic variations and climate change impacts on tea in different agro-ecological regions in Sri Lanka and implementation of suitable adaptation and mitigation measures (*Tea Research Institute*)
- ED-6 Identification of Major Food-Borne Diseases and Their Severity in Tourism Areas of Sri Lanka in Relation to Climate Changes (*Sri Lanka Institute of Tourism & Hotel Management*)
- ED-7 Community Awareness on Climate Change and Adaptation Intervention in Food-Borne Diseases in Major Tourism Areas of Sri Lanka (*Sri Lanka Institute of Tourism & Hotel Management*)
- ED-8 Improving Climate Resilience of Key Economic Drivers (*University of Colombo*)
- ED-9 Mainstreaming Climate Sensitive DRR in National Development Planning (*Technology and Mitigation, Disaster Management Center*)
- ED-10 Building Climate Change Resilience of Road Infrastructure in Sri Lanka (*Planning Division, Road Development Authority*)

STRATEGIC THRUST 5 -Safeguard Natural Resources and Biodiversity from Climate Change Impacts

- NR-1 Evaluation of Atmospheric Concentration of CO₂ in relation to stomatal density (*National Herbarium, Department of National Botanic Gardens*)
- NR-2 Strategic assessment: Preparedness of our major rivers catchments for CC adaptation (*International Water Management Institute*)
- NR-3 A nation-wide study on small tanks' ability to withstand CC (regulating projected floods and droughts for the next fifty years) (*International Water Management Institute*)
- NR-4 Impact assessment of range change in tauna birds as indicator species, resulting from predicted CC (*The Field of Ornithology Group of Sri Lanka*)
- NR-5 Assessment of ecosystem based adaptation options for climate change in coastal areas of Sri Lanka (*The World Conservation Union*)
- NR-6 Using participatory approaches to build the adaptive capacity of small-scale fisher communities to the impacts of climate change (*Practical Action*)
- NR-7 Safeguarding watershed forests and its ecosystem services from the impacts of climate change by increasing its resilience (*Environmental Foundation Limited*)
- NR-8 Increasing awareness, access to information and understanding of climate change and its local impacts amongst local communities (*Practical Action*)
- NR-9 Identification and designation of North/East landscapes for conservation, sustainable development and ensuring resilience to climatic change impacts (*EML Consultants Pvt Ltd*)
- NR-10 Monitoring of impacts from climate change to sensitive coastal ecosystems around Sri Lanka and associated fisheries and capacity building of the Dept. of Fisheries & Aquaculture to undertake future research needs in coastal and marine ecology, biodiversity & fisheries (*University of Ruhuna*)
- NR-11 Agro forestry as a means of adaptation to climate change shocks (*Agribusiness Centre, Faculty of Agriculture, University of Peradeniya*)

APPENDIX 4

Estimated Financing Requirements

(Rs. Million)

Areas of Intervention	2011	2012	2013	2014	2015	2016	Total
Strategic Thrust 1: Mainstream CC Adaptation into National Planning and Development	50	554	669	637	820	820	3,550
A Strengthening national climate-adaptation planning and implementation capacity	5	10	30	20	15	15	95
B Ensure future investments/economic plans are climate resilient	10	25	10	-	-	-	45
C Systematically research climate change-adaptation options and disseminate knowledge	15	297	377	362	360	360	1,771
D Increase financing for CC adaptation	17	210	205	200	400	400	1,432
E Inform and mobilize stakeholders at multiple levels in support of climate adaptation	3	12	47	55	45	45	207
Strategic Thrust 2: Enable Climate Resilient and Healthy Human Settlements	91	496	2,768	2,434	2,398	2,098	10,285
A Mobilize stakeholders for CC adaptation of settlements	1	50	20	20	-	-	91
B Improve planning to include CC considerations	15	150	2,192	2,150	2,150	2,000	8,657
C Ensure adequate quality and quantity of water for settlements	11	140	505	215	215	65	1,151
D Combat climate change-related health concerns in settlements	60	105	20	20	20	20	245
E Increase awareness on vulnerabilities and adaptation of settlements	4	51	31	29	13	13	141
Strategic Thrust 3: Minimize Climate Change Impacts on Food Security	8	183	2,123	1,690	1,755	7,215	12,974
A Ensure ability to meet food production and nutrition demand	-	85	345	335	300	-	1,065
B Ensure adequate water availability for agriculture	2	23	1,703	1,200	1,200	6,000	10,128
C Mitigate food security-related socioeconomic impacts	-	10	10	25	25	1,000	1,070
D Increase awareness and mobilize communities for CC adaptation	6	65	65	130	230	215	711
Strategic Thrust 4: Improve Climate Resilience of Key Economic Drivers	160	375	3,765	3,610	3,875	3,375	15,160
A Minimize impacts of CC on infrastructure	125	130	3,025	3,000	3,000	3,000	12,280
B Minimize impacts of CC on plantation sector	-	25	25	25	300	300	675
C Assist key industries in coping with CC impacts	-	10	530	510	500	-	1,550
D Raise awareness about climate vulnerability in key economic sectors	35	210	185	75	75	75	655

Areas of Intervention	2011	2012	2013	2014	2015	2016	Total
Strategic Thrust 5: Safeguard Natural Resources and Biodiversity from CC Impacts	20	219	279	1,632	1,760	1,780	5,690
A Ensure adequate quality and quantity of water for human wellbeing and ecosystem services	-	4	4	2	15	10	35
B Enhance CC resilience of terrestrial ecosystems and their services	-	50	100	1,520	1,520	1,520	4,710
C Enhance the resilience of coastal and marine ecosystems and associated vulnerable species	-	10	35	35	100	100	280
D Enhance CC resilience of natural inland wetlands and associated species	15	55	50	-	50	50	220
E Address socioeconomic concerns resulting from CC impacts on biodiversity	-	-	-	25	25	100	150
F Research, monitor and address impacts of CC on biodiversity	-	50	50	50	50	-	200
G Raise awareness & mobilize stakeholders for conservation of biodiversity and ecosystem svcs.	5	50	40	20	10	10	135
Total	329	1,827	9,604	10,023	10,618	15,298	47,699

APPENDIX 5

Target Implementation Schedule for NCCAS

STRATEGIC THRUST 1:

MAINSTREAM CLIMATE CHANGE ADAPTATION INTO NATIONAL PLANNING AND DEVELOPMENT

Intervention	2011	2012	2013	2014	2015	2016
A Strengthening national climate-adaptation planning and implementation capacity						
i Strengthen and restructure Climate Change Secretariat						
ii Develop of sector specific training prog's on CC adaptation measures						
ii Introduce climate change studies at university level						
B Ensure future investments/economic plans are climate resilient						
i Incorporate CC concerns into SEA processes						
ii Increase knowledge of CC among planners and senior tech. staff						
iii Quantify economic costs of climate change on specific sectors						
C Systematically research climate change-adaptation options and disseminate knowledge						
i Establish coordinated multidisc. research prog. with widespread dissemination						
ii Model possible future climate scenarios						
iii Conduct regular national forums on climate impacts on various sectors						
iv Capture, evaluate and disseminate traditional knowledge on adaptive measures						
D Increase financing for climate change adaptation						
i Strengthen NPD/ERD to pursuit financing for climate change adaptation						
ii Establish climate change adaptation small grant facility						
iii Establish a multi-sectoral climate negotiation team for Sri Lanka						
iv Support climate-change adaptation regulations with incentives where possible						
E Inform and mobilize stakeholders at multiple levels in support of climate adaptation						
i Effectively engage education system, media and other information 'multipliers'						
ii Make information about adaption options available at community level						
iii Promote Policy change for CC adaptation						
iv Engage exist.inst. and com.-based mech. for coord. of adaptation activities						
v Combat negative anthropogenic activity (such as sand mining)						
STRATEGIC THRUST 2:						
ENABLE CLIMATE RESILIENT AND HEALTHY HUMAN SETTLEMENTS						
A Mobilize stakeholders for climate change adaptation of settlements						
i Establish coordination body/mechanism for CC adaptation of settlements						
ii Promote improved climate resilient construction methods						
iii Support climate change adaptation interventions with incentives						
B Improve planning to include climate change considerations						
i Develop detailed local-level hazard maps for key settlements						
ii Upgrade drainage in key settlements						
iii Stimulate increase of canopy cover in HS and preserve nat. ecosystems						
iv Promote land use planning and monitoring for both urban and rural areas						
v Research CC impacts on human settlements and link to planning						
C Ensure adequate quality and quantity of water for settlements						
i Promote water saving technologies including rainwater harvesting						
ii Improve monitoring/surveillance and sharing of data across sectors						
iii Promote integrated water resources and watershed management						
iv Research CC impacts on water availability and dev. adaptation models						
D Combat climate change-related health concerns in settlements						
i Monitor and control vector borne diseases						
ii Facilitate data sharing/compatibility between MoH and other sectors						
iii Engage health sector experts in local level planning						
iv Research health impacts of climate change in Sri Lankan context						
E Increase awareness on vulnerabilities and adaptation of settlements						
i Improve the gathering, processing and dissemination of info. related to HS						
ii Enhance awareness and demand for climate resilient construction						
iii Improve coordination/dissemination through existing institutional mechanisms						
iv Engage media more proactively with messaging tailored for stakeholders						
STRATEGIC THRUST 3:						
MINIMIZE CLIMATE CHANGE IMPACTS ON FOOD SECURITY						
A Ensure ability to meet food production and nutrition demand						
i Promote alternative options to meet nutrition requirements						
ii Improve weather forecasting and information dissemination						
iii Ensure easy access to seedstock alternatives/advice to counter rainfall variability						
iv Research CC impacts/adaptive measures for agri., livestock and fisheries sectors						

Intervention	2011	2012	2013	2014	2015	2016
v Conserve genetic resources for future crop and livestock improvement						
B Ensure adequate water availability for agriculture						
i Promote water-efficient farming methods and crops						
ii Improve maintenance of existing tanks and reservoirs						
iii Adopt and promote the principles of IWRM						
iv Construct new reservoirs and trans-basin diversions to meet demand						
C Mitigate food security-related socioeconomic impacts						
i Encourage development of risk transfer methods						
ii Research climate impacts on long-term food security and agri. value chains						
iii Identify and help vulnerable fishing communities to adapt or relocate						
D Increase awareness and mobilize communities for climate change adaptation						
i Increase awareness on CC impacts on food sec. & on adaptive measures						
ii Pilot test and scale up com. level agri./livestock/fisheries adaptation models						
iii Improve utilization of field level coord. mechanisms and civil society org's						
iv Promote risk transfer initiatives						
STRATEGIC THRUST 4: IMPROVE CLIMATE RESILIENCE OF KEY ECONOMIC DRIVERS						
A Minimize impacts of climate change on infrastructure						
i Identify CC risks on transport infrastructure, and invest in adaptive measures						
ii Update standards/guidelines for infrastructure design and development						
iii Include climate change adaptations in tourism planning guidelines						
B Minimize impacts of climate change on plantation sector						
i Research climate impacts and adaptive measures in plantation sub-sectors						
ii Pilot test and scale-up sub-sector specific adaptation measures						
iii Evaluate and exploit potential productivity benefits due to climate change						
C Assist key industries in coping with climate change impacts						
i Make sector-specific CC vul. Info. available to investors/regulators						
ii Encourage climate change risk transfer options for key industries						
iii Research potential CC impacts/adaptive measures for key industries						
iv Offer incentives for ind. energy saving practices and ren. energy usage						
D Raise awareness about climate vulnerability in key economic sectors						
i Increase climate change awareness at all levels						
ii Build capacity for climate change adaptation in key economic sectors						
iii Engage wider stakeholders in dialogue on climate adaptation						
STRATEGIC THRUST 5: SAFEGUARD NATURAL RESOURCES AND BIODIVERSITY FROM CLIMATE CHANGE IMPACTS						
A Ensure adequate quality and quantity of water for human wellbeing and ecosystem services						
i Promote efficient water resource use and development using IWRM						
ii Promote research partnerships on good practices for varied water uses						
iii Strengthen/establish an institution to coord. mgmt. of water resources						
B Enhance climate change resilience of terrestrial ecosystems and their services						
i Link/restore/conserv. forests & other habitat refugia						
ii Convert monoculture forest plantations into mixed species plantations						
iii Promote land use planning for BD cons. and limit vegetation conversion						
iv Est. and/or effectively manage Pas and other important wildlife refuges						
C Enhance the resilience of coastal and marine ecosystems and associated vulnerable species						
i Promote integrated coastal resource management, particularly at SAM sites						
ii Restore and rehab. degraded coastal ecosys. and depleted coastal species						
D Enhance climate change resilience of natural inland wetlands and associated species						
i Protect urban marshes/flood retention areas & limit land conversion.						
ii Prevent the discharge of industrial effluents & solid waste into inland wetlands						
iii Control and manage salt water intrusion into coastal freshwater wetlands						
iv Strengthen coordination and streamline mgmt. of wetlands						
E Address socioeconomic concerns resulting from climate change impacts on biodiversity						
i Identify and address CC impacts on BD that affect local communities						
ii Help com's to adapt to changes in livelihoods or to relocate when necessary						
F Research, monitor and address impacts of climate change on biodiversity						
i Res. & mon. prog's to strengthen knowledge base on CC and terrestrial BD						
ii Res. & mon. prog's. to strengthen knowledge base on CC and aquatic BD						
iii Minimize entry, establishment and spread of IAS						
G Raise awareness & mobilize stakeholders for conservation of biodiversity and ecosystem svcs.						
i Focus on minimizing current stresses on ecosystems						
ii Promote training/awareness on ecosystem approach for conservation						
iii Build cap. for CC research among students & staff of cons. Agencies						
iv. Increase pub. awareness about the value of aquatic and marine ecosystems						
v Engage in dialogue with wider stakeholders						

Resource intensive period

Ongoing activities with recurrent budgets



Photo: Studio Times Ltd.

“Living and coping with uncertain impacts of climate change is no longer a choice; it is an imperative.”

Documents in this series:

National Climate Change Adaptation Strategy for Sri Lanka 2011-2016

Information, Education and Communications Strategy for Climate Change Adaptation in Sri Lanka

NCCAS Brochures

Compilation of Climate Change Adaptation Project Concept Notes

Sector Vulnerability Profiles:

- Urban Development, Human Settlements and Economic Infrastructure
- Agriculture and Fisheries
- Water
- Health
- Biodiversity and Ecosystem Services

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