



# Sector Action Plan

Environment and Climate Change

**Agriculture, Water Resources and Rural Institutions Division**  
Bangladesh Planning Commission  
Government of the People's Republic of Bangladesh





# Sector Action Plan on Environment and Climate Change

**Agriculture, Water Resources and Rural Institutions Division**  
Bangladesh Planning Commission  
Government of the People's Republic of Bangladesh

June 2023

## Sector Action Plan Environment and Climate Change

### Editorial Board

Dr. Anjan Kumer Dev Roy, Additional Secretary, AWRRID, Planning Commission  
Mohd. Enamul Haque, Joint Chief, AWRRID, Planning Commission  
Md. Mofidul Islam, Chief (Rtd.), Government of the People's Republic of Bangladesh  
Md. Samsul Islam, Deputy Chief and Project Director, AWRRID, Planning Commission  
Md. Saiful Islam Mondal, Deputy Chief and Deputy Project Director, AWRRID, Planning Commission

### Prepared and Published by

Agriculture, Water Resources and Rural Institutions Division  
Bangladesh Planning Commission  
Government of the People's Republic of Bangladesh  
Sher-e-Bangla Nagar, Dhaka 1207, Bangladesh  
[www.plancomm.gov.bd](http://www.plancomm.gov.bd)

Copyright © Agriculture, Water Resources and Rural Institutions Division, Bangladesh Planning Commission, June 2023

*All rights are reserved. However, we encourage use of the Sector Action Plan by any interested person, but no part of this publication may be reproduced or transmitted in any form or by any means without prior permission in writing from the publisher.*

### Cover Designed by

Agriculture, Water Resources and Rural Institutions Division  
Bangladesh Planning Commission  
Government of the People's Republic of Bangladesh

**Published:** June 2023

### Printed by

**Turtle**  
67/D (3<sup>rd</sup> Floor), Green Road, Dhaka-1205



**M. A. Mannan, MP**

Minister

Ministry of Planning

Government of the People's Republic of Bangladesh &

Vice Chairman, Bangladesh Planning Commission

## Message

It is of immense pleasure to know that the Agriculture, Water Resources and Rural Institutions Division (AWRRID) of the Planning Commission is publishing the Sector Action Plan for the Environment and Climate Change sector to establish linkage with the strategies of the Eighth Five Year Plan (2020 - 2025).

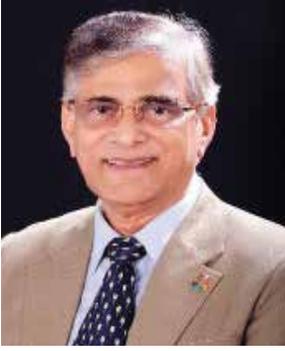
The Sector Action Plan for the Environment and Climate Change sector has been provided with valuable inputs on streamlining the sector planning and guiding the annual development program with a focus on the targets set by the 8<sup>th</sup> FYP and Vision 2041. The SAP will make it easier to identify the areas of intervention and propose some policy recommendations on how to achieve the targets set by the government in the 8<sup>th</sup> Five-Year Plan.

Bangladesh has made commendable progress in MDGs. The success also continues in the SDG period which is reflected by the SDG Progress Award received by the Honorable Prime Minister Sheikh Hasina from Sustainable Development Solution Network. Despite the achievement, we have to go a long way to materialize the dream of the Father of the Nation to become a happy and prosperous nation. We should not be complacent as we have to carry out the ongoing rapid transformation of the country. I hope this plan will be a useful reference for the policymakers, respective agencies, development partners, academics, and researchers alike to further research endeavors and enhance national development and I would like to see the continuation of such publications in the future as well.

On this occasion, I would like to take the opportunity to express my sincere thanks and gratitude to the Honorable Prime Minister Sheikh Hasina for providing strategic guidance and inspiration. My sincere appreciation goes to the AWRRID officials for their encouraging engagement in preparing the document.

(M. A. Mannan, MP)





**Dr. Shamsul Alam**

State Minister

Ministry of Planning

Government of the People's Republic of Bangladesh

## Message

The Agriculture, Water Resources and Rural Institutions Division (AWRRID) of the Bangladesh Planning Commission is going to publish Sector Action Plan for the Environment and Climate Change sector in connection with the country's Eighth Five Year Plan (2020 - 2025). This SAP will act as a bridge between the 8<sup>th</sup> FYP and ADP.

The SAP preparation was undertaken for generating an elaborate action plan focusing on the targets set by the 8<sup>th</sup> FYP along with potential monitoring indicators for the Environment and Climate Change sector. An urge for the sector action plans for all the planning sectors was already felt in the 7<sup>th</sup> Five-Year Plan.

Renowned climate change experts and development practitioners in the relevant fields with a longstanding flair were assigned to conduct the studies. In light of Vision 2041 and the Eighth Plan, the SAP intends to tackle the negative impacts of climate change and ensure food and water security. This Plan (SAP) has set a vision; "Tackling environment and climate change risk and vulnerabilities on Agriculture and Fisheries, and Livestock managing land, water, environment, and ecosystems in an integrated way for achieving food and nutrition security" towards sustainable and climate resilient agriculture in line with the development vision of the nation, i.e., Vision 2041, the Delta Vision, and SDGs. To achieve the status of upper-middle income country by 2031 envisaged by the Government, this Plan has focused on environmental management, agriculture, land, and water management. I believe this type of structured planning will assist the national development processes further to achieve the targets.

I congratulate AWRRID for taking up this pragmatic and timely initiative. I would like to thank the authors and also the organizations who have contributed to preparing this Sector Action Plan. Well Documented SAP will also be helpful for policy planners, respective agencies, development practitioners, international development partners, researchers, and academicians as well. I expect that the SAP will be valuable for the officials of respective government agencies and AWRRID officials. I believe that other relevant officials will be immensely benefited with SAP for upgrading and updating their knowledge and professional competencies.

Finally, I convey my gratitude to the Honorable Prime Minister Sheikh Hasina for her visionary guidance and continued encouragement to our national planning initiatives. My gratitude also goes to our Honorable Minister, Ministry of Planning, Mr. M.A. Mannan, MP for his continuous support in making this publication a reality.

(Dr. Shamsul Alam)





**Satyajit Karmaker**

Secretary  
Planning Division  
Ministry of Planning  
Government of the People's Republic of Bangladesh

## Message

I am enlightened to know that the Agriculture, Water Resources and Rural Institutions Division (AWRRID) of Bangladesh Planning Commission is going to publish the Sector Action Plan on the Environment and Climate Change sector. Following the directives from the 7<sup>th</sup> Five Year Plan, AWRRID has taken a useful initiative to prepare the Sector Action Plan. This Plan will facilitate effective implementation of the Eighth Five Year Plan (2020 - 2025).

Developing a strategic plan is important; however, it's essential to have an operational plan to help manifest the strategic vision. Without an action plan, the goals and milestones meticulously mapped out in the planning process may remain neutral. An action pursues the strategies and encourages more specific activities, such as projects and programs, that follow the preferred direction of change and include estimates of the resource requirements and the time frame. It helps understand the road map in the sector planning process.

This SAP is well prepared and, will assist the readers to understand the rationale for the choice of the specific domain underlying the Plan and the design of the policy package adapted for the Plan for reconciling the goals to achieve the national targets. The Plan will help anyone interested in understanding the environmental management, climate change, and development challenges of Bangladesh.

I am certain that the use of the SAP will improve the existing process of project selection in line with the strategic directions of the 8<sup>th</sup> FYP. Qualitative changes in the whole process of project preparation, appraisal and implementation will be ensured through this effort and in turn it will promote achieving of the goals of 8<sup>th</sup> FYP.

  
(Satyajit Karmaker)





**A K M Fazlul Haque**

Member (Secretary)

Agriculture, Water Resources and Rural Institutions Division,  
Bangladesh Planning Commission

## Message

I am happy to know that the Agriculture, Water Resources and Rural Institutions Division (AWRRID) of Bangladesh Planning Commission is going to publish the Sector Action Plan on the Environment and Climate Change sector which will help implement the country's Eighth Five Year Plan (2020 - 2025). AWRRID has taken a useful initiative to prepare the Sector Action Plan.

For developing the Plan several broad themes have been identified and also 95 actions have been marked and prioritized. Among these actions, 50 are short-term, 32 are medium term and 13 are long-term actions. To assist in the monitoring of the Plan, a result-based framework has been developed with specific indicators.

This SAP is rich in content and, if made available, will enrich the knowledge base relating to development challenges and development options for the Environment and Climate Change sector. This plan will help the readers to understand the rationale for the choice of the specific domain underlying the Plan and the design of the policy package adapted for the Plan for reconciling the goals to achieve the national targets.

I hope that the relevance of the issues and the diverse contents and analyses would make the plan useful for the respective government agencies, policymakers, and others who are interested in understanding the environmental management, climate change, and development challenges of Bangladesh.

(A K M Fazlul Haque)





**Md. Sayduzzaman**

Chief (Additional Secretary)  
Agriculture, Water Resources and Rural Institutions Division  
Bangladesh Planning Commission

## Foreword

The Sector Action Plan (SAP) for the Environment and Climate Change sector is going to be published by the Agriculture, Water Resources, and Rural Institutions Division (AWRRID) of the Bangladesh Planning Commission. This SAP will bridge the link with the Eighth Five-Year Plan (2020 - 2025).

The SAP preparation has followed a comprehensive and stakeholder-driven approach to develop the Plan with a focus on environmental management and addressing climate change impacts in agriculture, fisheries, and livestock-related themes. The Plan has identified a total of 95 priority actions with a total estimated cost of BDT 58,240 crores and an implementation period spanning over two five-year planning cycles, i.e., 8<sup>th</sup> FYP (2020-2025) and 9<sup>th</sup> FYP (2025-2030). Among these actions, 50 are short-term, 32 are medium term and 13 are long-term actions. To assist in the monitoring of the Plan, a result-based framework has been developed comprising 82 unique indicators and a total of 126 indicators.

It is expected that the SAP will enhance the knowledge base relating to development challenges and development options for the Environment and Climate Change sector. This plan will help the readers to understand the rationale for the choice of the specific domain underlying the Plan and the design of the policy package adapted for the Plan for integrating the goals to achieve Vision 2041.

Finally, I am grateful to Mr. M. A. Mannan MP, Hon'ble Minister, Ministry of Planning and Dr. Shamsul Alam, Hon'ble Minister of State, Ministry of Planning for their constant guidance in finalizing the Sector Action Plan. I would like to express my deep gratitude to the authors and reviewers of the plan for their sincere efforts in finalizing the manuscripts in time. I am also indebted to the relevant officials of AWRRID for their untiring support and cooperation in managing the study. I strongly believe that this Sector Action Plan will smoothen the 8<sup>th</sup> Five Year Plan Implementation and facilitate the sector agencies and others as well.

  
(Md. Sayduzzaman)





**Md. Samsul Islam**

Deputy Chief and Project Director  
FSP&CD Project  
Agriculture, Water Resources and Rural Institutions Division  
Bangladesh Planning Commission  
Government of the People's Republic of Bangladesh

## Preface

It is the privilege to express my heartfelt thanks to the Secretary of the Planning Division, Ministry of Planning and Member (Secretary) of the Agriculture, Water Resources and Rural Institutions Division, Bangladesh Planning Commission for providing their guidance and valuable support for completing this Sector Action Plan for Environment and Climate Change. I would like to thank all the members of the Technical Committee and Editorial Board for their guidance to the study and to provide an endeavor to ensure quality elements in this document.

The Sector Action Plan on Environment and Climate Change has been prepared by the Agriculture, Water Resources and Rural Institutions Division of the Bangladesh Planning Commission to achieve the goals set in the 8<sup>th</sup> Five Year Plan. Perspective Plan, Sustainable Development Goal and Five-Year Plan are used to achieve long term goals of socio-economic development. Goals and objectives of these plans are achieved by implementation of Annual Development Program. Sector Action Plans will help to establish linkage between the national plans and Annual Development program. In this regard, Sector Action Plans will play a vital role as the sector implementation path.

We strongly belief that this Sector Action Plan will help our policymakers, development partners and all relevant stakeholders to identify projects and programmes in line with the actions within it for attaining goals and assessing accomplishments set forth in Eighth Five Year Plan and beyond.

In conclusion, I would like to recall the contribution of all the Project Directors involved in this project in past, Deputy Project Director and the officials of AWRRID for their continuous support and cooperation in conducting the study effectively.

(Md. Samsul Islam)



## Executive Summary

Bangladesh has made significant socio-economic development in recent decades. Bold steps initiated by the present government have established a new development paradigm through innovative approaches to bring about a cohesive and integrated management system to ensure long-term sustainability, backed by rapid socio-economic development in recent decades. This has also driven the country's sustainable development agenda by striking a “right balance” between equitable national economic progress and human development.

The country experienced an increase in per capita income from USD 754 in 2009<sup>1</sup> to USD 2657 in 2022<sup>2</sup> and expansion of adult literacy from 58% to 75.6%. This has resulted in reduced poverty incidence from 35% to 18.7%<sup>3</sup>, and declined extreme poverty rate from 18% to 5.6%<sup>3</sup>. The 8<sup>th</sup> Five Year Plan has been prepared to realize the present government's Vision 2041 and the associated Perspective Plan 2041 (PP2041) that sets the road map to become an Upper Middle-Income Country (UMIC) and eliminate extreme poverty by FY2031 and to achieve a High-Income Country (HIC) status by FY2041. The economy of Bangladesh has grown at an average pace of 7% per year and is amongst the fastest in the world in the last decade. As a result, Bangladesh moved out from the World Bank-defined list of low-income countries (LIC) to Lower Middle-Income Countries (LMIC)

Bangladesh ranks 7<sup>th</sup> on the 2021 World Climate Risk Index, even though it contributes to a small share of global emissions. Despite such remarkable achievements, adverse climate change impacts and natural disasters plague Bangladesh due to its geographic location and flat, low-lying topography. Natural disasters such as tropical cyclones and storm surges, monsoon floods, flash floods, droughts, sea-level rise, salinity intrusion, ocean acidification, etc., are exerting stress on the country's impressive development trajectory, impeding socioeconomic progress and human well-being, and further exacerbating by climate change. Furthermore, high population density, poverty, and reliance on climate-sensitive sectors, such as water resources, agriculture, fisheries, and livestock for water and food security, increase the country's vulnerability to climate change.

Therefore, intending to tackle the negative impacts of climate change and ensure food and water security, the Government of Bangladesh has decided to prepare a Sector Action Plan (SAP) for each sector mentioned in the 8<sup>th</sup> five-year plan (2020-2025). This Sector Action Plan (SAP) has set a vision; “Tackling environment and climate change risk and vulnerabilities on Agriculture, Fisheries and Livestock managing land, water, environment and ecosystems in an integrated way for achieving food and nutrition security” towards sustainable and climate resilient agriculture in line with the development vision of the nation, i.e., Vision 2041, the Delta Vision, and SDGs. To achieve the status of upper-middle income country by 2031 envisaged by the Government, this Sector Action Plan has been prepared for the Environment and Climate Change sector, focusing on agriculture, land, and water management.

The SAP has been devised into 3 broad themes with 10 specific sub-themes and identifies 53 strategies that have been formulated in alignment with the current agenda. Strategies for promoting conventional agriculture, innovations, technologies, and practices have been prioritized. The strategies have been devised with priority to minimizing yield gaps among research lab and farm level, strengthening crop extension services, fisheries integrating livestock, and integrating pest, diseases, and nutrient

1 GED, 2020. 8<sup>th</sup> Five Year Plan (July 2020 – June 2025)

2 BBS, 2023. Gross Domestic Product (GDP) of Bangladesh 2022-2023 (Provisional)

3 BBS, 2023. Household Income and Expenditure Survey 2022

management. Despite the continuous effort and important initiatives from GoB for environmental pollution control, several issues and challenges still need to be addressed. Changing citizen behavior and corporate social responsibilities for pollution control and waste management, management of solid, liquid, plastic, and e-waste with zero discharge policy, managing hospital waste, hazardous and toxic waste, pollution from feces, persistent organic pollutants (PoPs), fecal sludge management at the local level, ensuring installing and functionalities of effluent treatment plants (ETPs), air quality improvement, proper monitoring of industrial pollution, enforcement of punishments to polluters, replacement of traditional brick kilns and rice parboiling units, halting open incineration of municipal solid waste (MSW), stormwater quality control, managing environmental risk to health, etc. are major issues that are considered to be addressed.

Integrating the “Polluters Pay” and “Beneficiary Pay” principles, such as payment for ecosystem services, will control pollution from industries, urban areas, agricultural waste, and livestock waste. Forest, ecosystem, and biodiversity conservation and management are significant and integral parts of ECC sector interventions for protecting forest-dependent livelihood and income generation, maintaining ecosystem services, and halting biodiversity loss/ degradation. Strong coordination and monitoring among inter-agency and ministries, especially with local government, are emphasized considering multi-stakeholders’ engagement.

The implementation of Bangladesh Delta Plan 2100 has been given special attention to facilitate integrated land and water resources management for agriculture. Creating an enabling environment for climate-smart agriculture practices to address adaptation and emission reduction is envisaged as part of formulating strategies for this sector. Further, private sectors are highlighted to be engaged for investment mainly in parallel to public investment. The SAP includes promoting knowledge sharing and capacity development, encouraging research and innovative activities, Compliance, and obligations under MEAs and UN conventions/ protocols. Field-based skill development of farmers, hands-on training, and knowledge management initiatives are acknowledged in a transformative way for capacity development and sustainable knowledge management.

A total of 95 actions have been identified and prioritized under this SAP ECC, which account for a total estimated cost of BDT 58,240 crores with 10 years of implementation period spanning over two five-year planning cycles, i.e., 8<sup>th</sup> FYP (2020-2025) and 9<sup>th</sup> FYP (2025-2030). The action plan allocates a major portion (25%) of the budget for the Sustainable Land and Water Management (C1T3) theme to facilitate the integrated and sustainable management of the land and water resources around the country to maintain the environmental standards and to preserve ecosystem and biodiversity from pollution and degradation. Research, Innovation, Knowledge Management, and Capacity Development (C3T10) theme cover 15.5% of the total investment to further strengthen the innovation, knowledge, and capacity building on climate change adaptation, mitigation, and environmental issues. The Enhanced Finance (C3T7) theme receives an 11% budget with a focus on proper implementation of the recommended actions, expansion of climate-smart technologies, strengthening extension services, innovative research, capacity, and skill development. Setting up a crisis management fund for the management of the post-COVID-19 regime and Delta fund for proper implementation of Bangladesh Delta Plan 2100 as envisioned in the 8<sup>th</sup> Five Year Plan (2020-2025) and Perspective Plan (2021-2041), contributed to this allocation. Around 11% of the investment will go to Climate Smart Agriculture (C1T2) and Green Growth and Low Carbon Development (C1T4) each, around 7.5% allocation goes to Pollution Control, Pest and Diseases Management (C2T5) and Ecosystem and Biodiversity Conservation and Forest Management (C2T6). Institutions and Governance (C3T6) theme will receive 5.6% investment. Enhancing Local Level Climate Change Adaptation and

Resilience (C1T1) and Compliance and obligations under MEAs and UN conventions/ protocols (C3T9) themes will receive 2.6% and 1.7% investment respectively.

Ministry of Environment, Forest and Climate Change (MoEFCC) will receive BDT 21,330 crore allocation (36.6%) for spearheading environmental protection and addressing climate change impacts, along with the special responsibilities of introducing Environmental Fiscal Framework to include the environmental cost into budget and revenue through the development of different financial instruments in coordination with Ministry of Finance (MoF). A total of BDT 20,515 crore (35.2%) has been allocated to the Ministry of Agriculture (MoA) and BDT 5,745 crore (9.8%) to the Ministry of Fisheries and Livestock (MoFL) as key stakeholders for combating climate change impacts in livestock and fisheries sub-sectors with the extension of climate-smart technologies and practices. In contrast, the Ministry of Water Resources (MoWR) has got BDT 3,150 crore (5.4%) for ensuring integrated land and water management, increasing water use efficiency for food security, and poverty reduction. Ministry of Local Government, Rural Development and Cooperatives (MoLGRDC) has got BDT 2,550 crore (4.4%). Ministry of Planning (MoP) will receive 4% of the investment, as the Establishment of Delta Fund has been vested to the General Economics Division (GED) under this ministry. Ministry of Disaster Management and Relief (MoDMR) will receive 3.4% of the allocation to tackle climate-induced disasters and sudden shocks like COVID-19. However, the involvement of many other ministries is foreseen as supporting or coordinating entities for the successful implementation of this SAP ECC. Moreover, a total of 21 actions have been identified with potential for private sector investment/ engagement.

In terms of project implementation duration, a total of BDT 24,570 crore will be required for short-term (up to 3 years) actions, BDT 22,370 crore for medium-term (up to 6 years) actions, and BDT 11,300 crore for long-term (up to 10 years) actions. A total of 50 short-term, 32 medium term and 13 long-term actions have been proposed. There is a gap between 8<sup>th</sup> FYP allocated budget for the ECC sector and the estimated budget in this SAP. This is due to the fact that a lot of the initiatives are done by other ministries and will be included in the respective sector budget. Besides, as climate change impacts are creating more pressure on the sustainable development of the country, more financing sources from the international arena and private sector should be actively harnessed.

To enhance the management, implementation, coordination, and monitoring of the SAP ECC, a new unit/ committee named the National Environment and Climate Change Unit (NECCU) has been proposed in the SAP ECC. NECCU will function under the supervision of the National Steering Committee on Environment and Climate Change (NSCECC) and Technical Advisory Committee, comprising high-level policymakers and relevant 5 separate cells to carry out its functions: Management and Coordination Cell, Planning, Appraisal, and Project Selection Cell, External Coordination, and Finance Cell, Monitoring and Evaluation Cell and Technical Support cell.

A recommendation is in place for strong monitoring and evaluation of this plan to be headed by IMED through the Monitoring and Evaluation Cell. Project implementation monitoring can be done by both IMED and Agriculture, Water Resources and Rural Institutions Division (AWRRID) in coordination with implementing agencies and relevant stakeholders. A result-based monitoring framework has been developed to facilitate the M&E and reporting process. This result-based M&E framework followed the Theory of Change approach and selected SMART (Specific, Measurable, Achievable, Relevant, and Time-Bound) indicators aligned with National Priority Indicators (NPI), SDGs indicators, indicators introduced inside the Annual Performance Agreements (APA) of relevant stakeholders, etc. The National Adaptation Plan (NAP) monitoring framework can also be aligned and synchronized with the monitoring frame of this plan.

The developed result-based framework comprises 82 unique indicators and a total of 126 indicators. Efforts have been made to create this framework based on existing indicators with already available data. However, baseline data are not present for some indicators, which must be collected through responsible agencies. The Environment, Climate Change and Disaster Statistics Cell (ECCDSC) of the Bangladesh Bureau of Statistics (BBS) can be engaged to collect those data as national data and statistics organization to facilitate the M&E process. Regular updates of this action plan, as well as a knowledge management plan, is envisaged in every 5 years. However, project monitoring, evaluation, and reporting are envisaged to be performed every year. The system-level monitoring may be facilitated through tracking consistent progress with the National Priority Indicators (NPI) for Environment and Climate Change sector stated in the 8<sup>th</sup> Five Year Plan.

# Contents

<b>Executive Summary</b>	<b>xv</b>
<b>Abbreviations and Acronyms</b>	<b>xxiii</b>
<b>Glossary</b>	<b>xxxii</b>
<b>Chapter 1: Introduction</b>	<b>3</b>
1.1 Background of the Study	3
1.2 Rationale	3
1.3 Scope of Works	3
1.4 Methodology	4
1.4.1 Approach	4
1.4.2 Planning Horizon	5
1.4.3 Guiding Principles	5
1.5 Goals	6
1.6 Limitations	7
<b>Chapter 2. Environment and Climate Change</b>	<b>11</b>
2.1 Scoping and Challenges	11
2.1.1 Addressing Climate Change Consequences	11
2.1.2 Environmental Pollution Control, Biodiversity Conservation and Forest Management	14
2.1.3 Cross Cutting Issues	16
2.2 Risk and Vulnerabilities	17
2.2.1 Environmental Hazards	17
2.2.2 Natural Disasters	21
2.2.3 Climatic Hazards and Impacts	21
2.3 Stakeholder Mapping	26
2.3.1 Power Map 1: Ministries and Departments	27
2.3.2 Power Map 2: NGO, INGO and CSO	27
2.3.3 Power Map 3: Research Institutes and Academia	28
2.3.4 Power Map 4: Development Partners	29
2.3.5 Power Map 5: Private Sector	29
<b>Chapter 3: Assessment of Priority Area for Sector Actions</b>	<b>33</b>
3.1 National Policy Landscape of ECC Sector	33
3.2 Achievements of Past Initiatives	33
3.3 Institutional Capacity Need	41
3.3.1 Methodology Used for Stakeholder Participation and the Institutional Analysis	42
3.3.2 Insights on Institutional Capacity Needs	43

3.4 Alignment with National Goals and Targets	45
3.5 Maintaining Linkage with SDGs	47
3.6 Priority Strategies of the 8 <sup>th</sup> Five Year Plan	48
3.7 Gap Analysis	50
<b>Chapter 4: Development of Action Plan</b>	<b>59</b>
4.1 Introduction	59
4.2 Strategies for Action	59
4.3 Prioritization of Action and Investment Plan	64
4.4 Investment Phasing	66
<b>Chapter 5: Implementation Strategies for the Sector Action Plan</b>	<b>69</b>
5.1 Introduction	69
5.2 Implementation Framework	69
5.2.1 Management and Coordination Cell	70
5.2.2 Planning, Appraisal and Project Selection Cell	70
5.2.3 External Coordination and Finance Cell	70
5.2.4 Monitoring and Evaluation Cell	71
5.2.5 Technical Support Cell	71
5.3 Capacity Building and Strengthening of Institutions	73
5.4 Potential Sources of Fund and Financing Strategies	75
5.4.1 Potential Sources of Fund	75
5.4.2 Strategies for Financing	81
5.5 Strategies for Delta Fund Establishment	84
5.6 Strategies for Private Sector Engagement	85
5.7 Monitoring and Evaluation	87
5.8 Way Forward	88
<b>Annexure</b>	<b>91</b>
<b>Annex 1: National Policy Framework aligned with the Themes of SAP ECC</b>	<b>91</b>
<b>Annex 2: Sector Actions and Indicative Projects</b>	<b>100</b>
<b>Annex 3: Result Based Monitoring and Evaluation Framework</b>	<b>131</b>
<b>References</b>	<b>159</b>

## List of Tables

Table 2.1: Acceptable Sound Limit in Bangladesh	18
Table 2.2: Noise Levels in Divisional Headquarters of Bangladesh	18
Table 2.3: Water Quality Status for Some Important Rivers of Bangladesh (2020)	19
Table 2.4: Projected Annual Surface Warming (°C) in Maximum Temperature	22
Table 2.5: Projected Annual Surface Warming (°C) in Minimum Temperature	22
Table 2.6: Projected Annual Change (%) in Rainfall	22
Table 3.1: Past Initiatives in Bangladesh Related to ECC Sector	33
Table 3.2: List of Indicators for Institutional Analysis	42
Table 3.3: Identified Gaps in Different Clusters and Sub-Clusters of ECC Sector	51
Table 5.1: Potential Funding Sources for the Thematic Areas	80

## List of Figures

Figure 1.1: Overall Approach	4
Figure 1.2: Guiding Principles for Sector Action Plan	5
Figure 2.1: Thematic Areas Relevant to Environment and Climate Change	11
Figure 2.2: Power Map of Ministries and Departments	27
Figure 2.3: Power Map of NGO, INGO and CSO	28
Figure 2.4: Power Map of Research Institutes and Academia	28
Figure 2.5: Power Map of Development Partners	29
Figure 2.6: Power Map of Private Sector	30
Figure 3.1: List of Indicators for the Assessment	41
Figure 3.2: The Sustainable Development Goals	48
Figure 4.1: Theory of Change Diagram	60
Figure 4.2: Phasing of Investment for Implementation of SAP ECC	66
Figure 5.1: Institutional Framework for Implementing the SAP ECC	69
Figure 5.2: Climate Funds Flow in Bangladesh	76
Figure 5.3: Steps to Enhance Private Sector Engagement	85
Figure 5.4: The Kampala Principles for Effective Private Sector Engagement (PSE)	86
Figure 5.5: Success Stories of Kampala Principles	87

## Abbreviations and Acronyms

AAB	Action Aid Bangladesh
AAL	Alpha Agro Limited
AAS	Agriculture Advisory Society
ACIL	ACI Limited
ADB	Asian Development Bank
ADP	Annual Development Programme
AF	Adaptation Fund
AF	Arannayk Foundation
AFP	Ahmed Food Products
AIS	Agriculture Information System
AMG	A Monem Group
APA	Annual Performance Agreement
ARIs	Agriculture Research Institutes
ASC	Army Services Corps
AWD	Alternating Wetting and Drying
AWRRID	Agriculture, Water Resources and Rural Institutions Division
BA	Bigbiz Agro
BADC	Bangladesh Agriculture Development Corporation
BANHRDB	Bangladesh Applied Nutrition and Human Resources Development Board
BARC	Bangladesh Agricultural Research Council
BARCIK	Bangladesh Resource Centre for Indigenous Knowledge
BARI	Bangladesh Agriculture Research Institute
BAU	Bangladesh Agricultural University
BBS	Bangladesh Bureau of Statistics
BC	British Council
BCAS	Bangladesh Centre for Advanced Studies
BCCSAP	Bangladesh Climate Change Strategy and Action Plan
BCCT	Bangladesh Climate Change Trust
BCIC	Bangladesh Chemical Industries Corporation
BCIP EFCC	Bangladesh Country Investment Plan for Environment, Forestry and Climate Change
BCSAA	BCS Administration Academy
BDHS	Bangladesh Household Survey
BDP2100	Bangladesh Delta Plan 2100
BDPC	Bangladesh Disaster Preparedness Center
BDPP	Bangladesh Delta Plan 2100 Project
BDT	Bangladeshi Taka
BEHEP	Bangladesh Environment, Health and Education Program
BELA	Bangladesh Environmental Lawyers Association
BFD	Bangladesh Forest Department

BFDC	Bangladesh Fisheries Development Corporation
BFRI	Bangladesh Forest Research Institute
BFRI	Bangladesh Fisheries Research Institute
BG	Bashundhara Group
BGEF	Bright Green Energy Foundation
BHDC	Bandarban Hill District Council
BIDS	Bangladesh Institute of Development Studies
BINA	Bangladesh Institute of Nuclear Agriculture
BIRTAN	Bangladesh Institute of Research and Training for Applied Nutrition
BIWTA	Bangladesh Inland Water Transport Authority
BJRI	Bangladesh Jute Research Institute
BLRI	Bangladesh Livestock Research Institute
BM	Bengal Meat
BMD	Bangladesh Meteorological Department
BMDA	Barind Multi-Purpose Development Authority
BNH	Bangladesh National Herbarium
BORI	Bangladesh Oceanographic Research Institute
BPATC	Bangladesh Public Administration Training Centre
BPD	Bangladesh Power Division
BPDB	Bangladesh Power Development Board
BPL	Bengal Plastics Ltd.
BRDB	Bangladesh Rural Development Board
BRRI	Bangladesh Rice Research Institute
BSAE	BRAC Seed and Agro Enterprise
BSCIC	Bangladesh Small and Cottage Industry Corporation
BSMRAU	Bangabandhu Sheikh Mujibur Rahman Agricultural University
BSMRMU	Bangabandhu Sheikh Mujibur Rahman Maritime University
BSRI	Bangladesh Sugarcane Research Institute
BTRI	Bangladesh Tea Research Institute
BUET	Bangladesh University of Engineering and Technology
CA	Christian Aid
CAL	Century Agro Limited
CAMET	Climate Change Adaptation, Mitigation, Experiment and Training Park
CARE	CARE, Bangladesh
CB	Caritas Bangladesh
CBA	Community Based Adaptation
CC	Climate Change
CCA	Climate Change Adaptation
CCAFS-CGIAR	CGIAR Research Program on Climate Change, Agriculture and Food Security
CCDB	Christian Commission for Development in Bangladesh

CCEC	Centre for Coastal Environmental Conservation
ccGAP	Climate Change and Gender Action Plan
CCM	Climate Change Mitigation
CD	Cabinet Division, GoB
CDB	Cotton Development Board
CDC	Centre for Disease Control and Prevention
CDM	Clean Development Mechanism
CEGIS	Center for Environmental and Geographic Information Services
CFF	Climate Fiscal Framework
CG	City Group
CIAT	International Center for Tropical Agriculture
CIDA	Canadian International Development Agency
CIF	Climate Investment Fund
CIMMYT	International Maize and Wheat Improvement Center
CIRDAP	Centre on Integrated Rural Development for Asia & the Pacific
CLEAN	Coastal Livelihoods and Environmental Action Network
CNRS	Center for Natural Resource Studies
CPD	Centre for Policy Dialogue
CPRD	Center for Participatory Research and Development
CREL	Climate Resilient Ecosystem and Livelihood
CSD	Centre for Sustainable Development
CSRL	Campaign for Sustainable Rural Livelihoods
CT	COAST Trust
CTCN	Climate Technology Center and Network
CUET	Chittagong University of Engineering and Technology
CW	CONCERN – Worldwide
DAE	Department of Agriculture Extension
DAM	Department of Agriculture Marketing
DBECC	Development of Biotechnology & Environmental Conservation Centre
DBHWD	Department of Bangladesh Haor and Wetlands Development
DDM	Department of Disaster Management
DGHS	Directorate General of Health Services
DIA	Disaster Impact Assessment
DLS	Department of Livestock Services
DMB	Disaster Management Bureau
DoE	Department of Environment
DoF	Department of Fisheries
DPHE	Department of Public Health Engineering
DRR	Disaster Risk Reduction
DSS	Department of Social Services

DU	University of Dhaka
DWA	Department of Women Affairs
DYD	Department of Youth Development
EbA	Ecosystem based Adaptation
ECA	Ecologically Critical Area
ECC	Environment and Climate Change
ECCDS	Environment, Climate Change and Disaster Statistics
ECF	Environment Concern Foundation
ECOSOC	United Nations Economic and Social Council
EFCC	Environment Forestry Climate Change
EFR	Environmental Fiscal Reform
EG	Eon Group
EIA	Environmental Impact Assessment
EKN	Embassy of Kingdom of Netherlands
EQI	Environmental Quality Index
ERD	Economic Relations Division
ESDO	Environment & Social Development Organization
EU	European Union Delegation to Bangladesh
FAO	Food and Agriculture Organization
FCDO	Foreign, Commonwealth & Development Office, U.K.
FF	Fresh Foods
FFWC	Flood Forecasting & Warning Centre
FYP	Five Year Plan
GCF	Green Climate Fund
GCM	General Circulation Model
GED	General Economics Division
GEF	Global Environment Facility
GIZ	German Society for International Cooperation GmbH (English)
GLUK	Green Life-UK
GoB	Government of Bangladesh
GS	Grameen Shakti
GSB	Geological Survey of Bangladesh
GUK	Gana Unnayan Kendra
GW	Groundwater
HIC	High Income Country
HMSS	Bangladesh Health and Morbidity Status Survey
HORTEX	Horticulture Development Foundation
HSD	Health Service Division
ICCCAD	International Centre for Climate Change and Development, IUB
ICDDR,B	International Center for Diarrhoeal Diseases Research, Bangladesh

ICM	Integrated Crop Management
ICT	Information and Communication Technology
IDCOL	Infrastructure Development Company
IDM	Integrated Diseases Management
IES	Institute of Environmental Science, Rajshahi University
IFAD	International Fund for Agricultural Development
IFC	International Finance Corporation
IFPRI	International Food Policy Research Institute
IFRC	The International Federation of Red Cross and Red Crescent Society
IMED	Implementation, Monitoring and Evaluation Division
INDC	Intended Nationally Determined Contributions
IOM	International Organization for Migration
IPCC	Intergovernmental Panel on Climate Change
IPM	Integrated Pest Management
IRB	Islamic Relief Bangladesh
IRD	Internal Resources Division
IRRI	International Rice Research Institute
IUCN	International Union for Conservation of Nature
IWFM	Institute of Water and Flood Management, BUET
IWM	Institute of Water Modelling
JCM	Joint Crediting Mechanism
JICA	Japan International Cooperation Agency
JIRCAS	Japan International Research Center for Agricultural Sciences
JJS	Jagrata Juba Shangha
JU	Jahangirnagar University
KA	Kazi Agro
KF	Kazi Farms
KFW	Kreditanstalt Fuer Wiederaufbau
KUET	Khulna University of Engineering & Technology
LAPA	Local Adaptation Plans of Action
LDC	Least Development Country
LDCF	Least Development Country Trust Fund
LGD	Local Government Division
LGED	Local Government Engineering Department
LGIs	Local Government Institutes
LGRD	Local Government, Rural Development and Co-operatives Division
LTSL	Lal Teer Seed Limited
MDG	Millennium Development Goals
MFA	Marine Fisheries Academy
MICS	Multiple Indicator Cluster Survey

MIE	Multi-Lateral Implementing Entity
MJF	Manusher Jonno Foundation
MoA	Ministry of Agriculture
MoC	Ministry of Commerce
MoCHTA	Ministry of Chittagong Hill Tracts Affairs
MoDMR	Ministry of Disaster Management and Relief
MoEFCC	Ministry of Environment, Forest and Climate Change
MoF	Ministry of Finance
MoFL	Ministry of Fisheries and Livestock
MoFood	Ministry of Food
MoHFW	Ministry of Health and Family Welfare
MoHPWD	Ministry of Housing and Public Works
MoI	Ministry of Industries
MoL	Ministry of Land
MoLGRDC	Ministry of Local Government, Rural Development and Cooperatives
MoLJPA	Ministry of Law, Justice and Parliamentary Affairs
MoP	Ministry of Planning
MoPA	Ministry of Public Administration
MoPEMR	Ministry of Power, Energy and Mineral Resources
MoRTB	Ministry of Road, Transport and Bridges
MoS	Ministry of Shipping
MoSW	Ministry of Social Welfare
MoWCA	Ministry of Women and Child Affairs
MoWR	Ministry of Water Resources
NACOM	Nature Conservation Management
NAP	National Adaptation Plan
NAPA	National Adaptation Programme of Action
NARS	National Agricultural Research System
NASP	National AIDS/STD Programme
NATA	National Agriculture Training Academy
NBR	National Board of Revenue
NbS	Nature based Solutions
NCCB	Network on Climate Change Bangladesh
NDA	National Designated Authority
NG	Nilsagor Group
NIB	National Institute of Biotechnology
NIE	National Implementing Entity
NILG	National Institute of Local Government
NIRAPAD	Network for Information Response and Preparedness Activities on Disaster
NPI	National Priority Indicator

NRCC	National River Conservation Commission
NSDS	National Sustainable Development Strategy
NSTU	Noakhali Science and Technology University
NTP	National Tuberculosis Control Program
OGB	Oxfam GB Bangladesh
PA	Protected Area
PA	Practical Action, Bangladesh
PAIL	Petrochem Agro Industries Limited
PC	Planning Commission
PD	Programming Division
PES	Payment for Ecosystem Services
PHC	Primary Health Care
PI	Plan International
PKSF	Palli Karma Sahayak Foundation
PM2.5, PM10	Particulate Matter
PMO	Prime Minister's Office
PP2041	Second Perspective Plan, 2041
PPP	Public Private Partnership
PPPA	Public Private Partnership Authority
PRG	PRAN-RFL Group
PSTU	Patuakhali Science and Technology University
PWD	Public Works Department
QF	Quality Feeds
RCM	Regional Climate Model
RCP	Representative Concentration Pathways
RDGD	Rural Development and Cooperative Division
RDFP	Rangpur Dairy & Food Products
RDRS	RDRS Bangladesh
RFFPI	Riverine Fish & Food Processing Industries
RHD	Roads and Highway Department
RREL	Rahimafrooz Renewable Energy Limited
RRI	River Research Institute
SA AFL	SA Agro Feeds Ltd.
SAC	SAARC Agricultural Information Centre
SAP	Sector Action Plan
SAP ECC	Sector Action Plan for Environment and Climate Change
SAU	Sher e Bangla Agricultural University
SAU	Sylhet Agricultural University
SCA	Seed Certification Agency
SDGs	Sustainable Development Goals

SEB	South East Bank
SG	Square Group
SID	Statistics and Informatics Division
SIDA	Swedish International Development Agency
SKSF	SKS Foundation
SLCPs	Short Lived Climate Pollutants
SMRC	SAARC Meteorological Research Centre
SPARSO	Space Research and Remote Sensing Organization
SRDI	Soil Resource Development Institute
SREDA	Sustainable and Renewable Energy Development Authority
SUST	Shahjalal University of Science & Technology
SVRS	Sample Vital Registration System
SW	Surface water
SWOT	Strength, Weakness, Opportunity & Threat
TAL	Tanzan Agro Limited
UMIC	Upper Middle Income Country
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCC	United Nations Framework Convention on Climate Change
UNH	UN HABITAT
UNW	UN Women
USAID	United States Agency for International Development
WAB	Water Aid, Bangladesh
WARPO	Water Resources Planning Organisation
WASA	Water Supply and Sewerage Authority
WB	World Bank
WC	Waste Concern
WF	World Fish
WFP	World Food Programme
WG	Walton Group
WHO	World Health Organization
WMO	World Meteorological Organisation
World Fish	World Fish Center
WT	Wild Team
WVB	World Vision Bangladesh
YPSA	Young Power in Social Action

## Glossary

<b>Adaptation</b>	It's an adjustment process to the actual or expected climate and its effects. In human systems, adaptation seeks to moderate harm or exploit beneficial opportunities. In natural systems, human intervention may facilitate adjustment to the expected climate and its effects.
<b>Adaptive capacity</b>	The ability of systems, institutions, humans, and other organisms to adjust to potential damage, take advantage of opportunities, or respond to consequences.
<b>Adaptive management</b>	Refers to the process of iteratively planning, implementing, and modifying strategies for managing resources in the face of uncertainty and change. Adaptive management involves adjusting approaches in response to observations of their effect and changes in the system brought on by resulting feedback effects and other variables.
<b>Biodiversity</b>	The whole variety of life encompassing all genetics, species and ecosystem variations, including plants and animals.
<b>Biomass</b>	Living matter within an environmental area, for example plant material, vegetation, or agricultural waste used as a fuel or energy source.
<b>Climate change</b>	Climate change refers to a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forces such as modulations of the solar cycles, volcanic eruptions, and persistent anthropogenic changes in the atmosphere's composition or land use. The Framework Convention on Climate Change (UNFCCC), in its Article 1, defines climate change as a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over a comparable period. The UNFCCC thus makes a distinction between climate change attributable to human activities altering the atmospheric composition and climate variability attributable to natural causes.
<b>Climate model</b>	It is a numerical representation of the climate system based on its physical, chemical, and biological properties, interactions, feedback processes, and accounting for some of its known properties. The climate system can be represented by models of varying complexity; that is, for any one component or combination of components a spectrum or hierarchy of models can be identified, differing in such aspects as the number of spatial dimensions, the extent to which physical, chemical, or biological processes are explicitly represented, or the level at which empirical parameterizations are involved. Coupled Atmosphere-Ocean General Circulation Models (AOGCMs) provide a representation of the climate system that is near or at the most comprehensive end of the spectrum currently available. Climate models are applied as a research tool to study and simulate the climate, and for operational purposes, including monthly, seasonal, and inter annual climate predictions.

**Climate scenario**

A plausible and often simplified representation of the future climate, based on an internally consistent set of climatological relationships that has been constructed for explicit use in investigating the potential consequences of anthropogenic climate change, often serving as input to impact models. Climate projections often serve as the raw material for constructing climate scenarios, but climate scenarios usually require additional information such as the observed current climate.

**Coping**

The use of available skills, resources, and opportunities to address, manage and overcome adverse conditions aims to achieve the basic functioning of people, institutions, organizations, and systems in short to medium term.

**Coping capacity**

The ability of people, institutions, organizations and systems to can address, manage, and overcome adverse conditions in the short to medium term by using available skills, values, beliefs, resources, and opportunities. This glossary entry builds from the definition used in UNISDR (2009) and IPCC (2012a).

**Detection and attribution**

Detection of change is defined as the process of demonstrating that climate or a system affected by climate has changed in some defined statistical sense without providing a reason for that change. An identified change is detected in observations if its likelihood of occurrence by chance due to internal variability alone is determined to be small, for example, <10%. Attribution is defined as the process of evaluating the relative contributions of multiple causal factors to a change or event with an assignment of statistical confidence.

**Ecosystem-based adaptation**

It refers to biodiversity and ecosystem services as part of an overall adaptation strategy to help people adapt to climate change's adverse effects. The ecosystem-based adaptation uses the range of opportunities for the sustainable management, conservation, and restoration of ecosystems to provide services that enable people to adapt to the impacts of climate change. It aims to maintain and increase the resilience and reduce the vulnerability of ecosystems and people in the face of the adverse effects of climate change. Ecosystem-based adaptation is most appropriately integrated into broader adaptation and development strategies.

**Emission scenario**

It manifests a plausible representation of the future development of emissions of potentially radiatively active substances (e.g., greenhouse gases, aerosols) based on a coherent and internally consistent set of assumptions about driving forces (such as demographic and socioeconomic development, technological change) and their key relationships. Concentration scenarios derived from emission scenarios are used as input to a climate model to compute climate projections. In IPCC First Assessment Report, a set of emission scenarios was presented, used as a basis for the climate projections (1996). These emission scenarios are referred to as the IS92 scenarios. In the IPCC Special Report on Emission Scenarios, the so-called SRES scenarios were published, some of which were used, among others, as a basis for the climate projections presented in Chapters 9 to 11 of IPCC TAR and Chapters 10 and 11 of IPCC AR4.

<b>Emission scenario</b>	New emission scenarios for climate change, the four Representative Concentration Pathways, were developed for the present IPCC assessment.
<b>Exposure</b>	The presence of people, livelihoods, species or ecosystems, environmental services and resources, infrastructure, or economic, social, or cultural assets in places that could be adversely affected.
<b>Hazards</b>	The potential occurrence of a natural or human-induced physical event or trend, or physical impact, may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, and environmental resources. The term hazard usually refers to climate-related physical events or trends or their physical impacts.
<b>Impacts (Consequences, Outcomes)</b>	Effects on natural and human systems. The term impact is used primarily to refer to the effects on natural and human systems of extreme weather and climate events due to climate change. Impacts generally refer to effects on lives, livelihoods, health status, ecosystems, economic, social, and cultural assets, services (including environmental), and infrastructure due to the interaction of climate changes or hazardous climate events occurring within a specific period and the vulnerability of an exposed society or system. Impacts are also referred to as consequences and outcomes. The impacts of climate change on geophysical systems, including floods, droughts, and sea-level rise, are a subset of impacts called physical impacts.
<b>Low regret policy</b>	Refers to a policy that would generate net social and/or economic benefits under the current climate and a range of future climate change scenarios.
<b>Maladaptive actions (or maladaptation)</b>	Actions that may lead to increased risk of adverse climate-related outcomes increased vulnerability to climate change, or diminished welfare, now or in the future.
<b>Predictability</b>	It refers to the extent to which a system’s future state may be predicted based on knowledge of the current and past conditions of the system. Since the climate system’s past and current state-related knowledge is generally imperfect, the models utilize this knowledge to produce a climate prediction. Since the climate system is inherently nonlinear and chaotic, the predictability of the climate system is inherently unpredictable limited. Even with arbitrarily accurate models and observations, there may still be limits to the predictability of such a nonlinear system
<b>Projection</b>	A projection is a potential future evolution of a quantity or set of quantities, often computed with the aid of a model. Unlike predictions, projections are conditional on assumptions concerning, for example, future socioeconomic and technological developments that may or may not be realized. See also Climate prediction and Climate projection.

<b>Resilience</b>	The capacity of a social-ecological system to cope with a hazardous event or disturbance, responding or reorganizing in ways that maintain its essential function, identity, and structure, while also maintaining the capacity for adaptation, learning, and transformation
<b>Risk</b>	<p>It refers to the potential for negative consequences where something of human value (including humans themselves) is at stake and where the outcome is uncertain.</p> <p>Risk is often represented as the probability of hazardous events or trends multiplied by the consequences of these events. IPCC Assessment Reports assesses climate-related risks.</p> <p>The degree to which climate variability or change affects a system or species adversely or beneficially. The effect may be direct (e.g., a change in crop yield in response to a change in the mean, range, or variability of temperature) or indirect (e.g., damages caused by an increase in the frequency of coastal flooding due to sea-level rise).</p>
<b>Sensitivity</b>	
<b>System of interest</b>	The ‘system of interest’ is the unit or space chosen to assess concerning a specific question. Depending on the objective of the analysis, the system of interest may be determined at different levels, e.g. a single crop system, an ecosystem, a region.
<b>Transformation</b>	A change in the fundamental attributes of a system, often based on altered paradigms, goals, or values. Transformations can occur in technological or biological systems, financial structures, and regulatory, legislative, or administrative regimes.
<b>Trend</b>	Changes in climate that show a similar direction over time. An <i>observed/historic trend</i> could be, for example, the later arrival of rainfall over the last five years. <i>Projected trends</i> give a possible future direction, e.g. decreasing rainfall in summer. If combined with a data range (decrease of 10 days of rain or reduction of X amount of rain) can help to devise adaptation measures.
<b>Vulnerability</b>	It refers to the propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts, including sensitivity or susceptibility to harm and lack of capacity to cope and adapt.

# Chapter 1

## Introduction



# Chapter 1: Introduction

## 1.1 Background of the Study

Bangladesh is highly vulnerable to natural disasters because of its geographical location, flat and low-lying landscape, population density, economic condition etc. Bangladesh experiences several natural disasters almost every year. The increased frequency of such events imposed by climate change significantly impacts on the country's economy. Consequent environmental degradation is also concerning, especially regarding the growing population, urbanisation and industrial development. Climate change and environmental concerns are now the cross-cutting issue for all development sectors.

Mainstreaming climate change, ensuing impacts and consequent adaptation are now of prime concern for national plans and policies. With the recent approval of the National Adaptation plan (NAP) of Bangladesh, the 8<sup>th</sup> Five Year Plan has been formulated with tackling climate impacts at the helm of the development think tank. As gradually this plan will be put to fruition by the subsequent ADPs, strong connection is to exist between these two, linking concept with application. This Sector Action plan aims to bridge the gap and guide the country's structured development going into the future. The plan will particularly address the impact of climate change on the agriculture sector, as it holds a prime role in ensuring the country's food security. This Sector Action Plan will thus contribute to accelerating the achievement of the upper middle-income status of Bangladesh by 2031, as envisaged by the Government.

## 1.2 Rationale

The Government of Bangladesh uses Perspective Plan and Five Year Plan to achieve the long term goals of socio- economic development. These Plans, by definition, are the philosophical directions and guidelines for the economy to attain the country's broad goals. These plan goals and objectives are implemented by the Annual Development Program. There is a missing link between Five Year Plan and ADP. This Sector Action Plan will fill-up the missing link.

This framework plan identifies public policy initiatives and projects for public sector interventions including the role of government agencies in partnership with other government institutions, the private sector, development partners, local government bodies and non-government organizations. Against the backdrop that environment and climate change is vast and transcends the boundaries between the varying development sectors, the plan tries to establish a linkage among the different sectors under the umbrella of sustainable and adaptive interventions.

## 1.3 Scope of Works

The scope of works for Sector Action Plan preparation includes the following topics:

- Stocktaking of the sector/situation analysis
- Overall and specific objective(s) and planned impact of intervention
- Review of Policies/strategies/laws supporting the sector/Ministries/Divisions
- Analysis of Sector institutions, coordination and capacity
- Assessment of Scopes, challenges and way forward
- A clear path from the national policy to the action (link the Plan with implementation)

- Prioritizing the intervention actions by the Ministries/Divisions
- Addressing the cross-cutting issues (establish the links with other sectors)
- Identifying indicators for monitoring in line with the FYP and SDGs
- Identifying of projects and programmes for the intervention
- Estimating resource requirement of the Sector

## 1.4 Methodology

### 1.4.1 Approach

The Sector Action Plan (SAP) preparation comprise several steps and follows an organized sequential methodology. Figure 1.1 illustrates the overall approach followed in SAP preparation.

The process is initiated with devising the sectoral boundary and identifying specific themes; followed up by situation analysis (present and past condition of environment and climate change) in consultation with stakeholders; review previous plan and existing national policies/strategies and analysis of sectoral cross-cutting issues. Based on this information, an overall analysis of the scopes and challenges for the sector is prepared. This also led to the institutional capacity analysis for the sector.

Based on these and following the Theory of Change approach, a set of program or actions have been formulated under each strategic theme. In preparing the program/ actions linkage with national plans and policies, SDGs and 8<sup>th</sup> FYP has been ensured. A probable budget and an implementation mechanism along with result-based monitoring framework has been prepared following the Theory of Change approach.

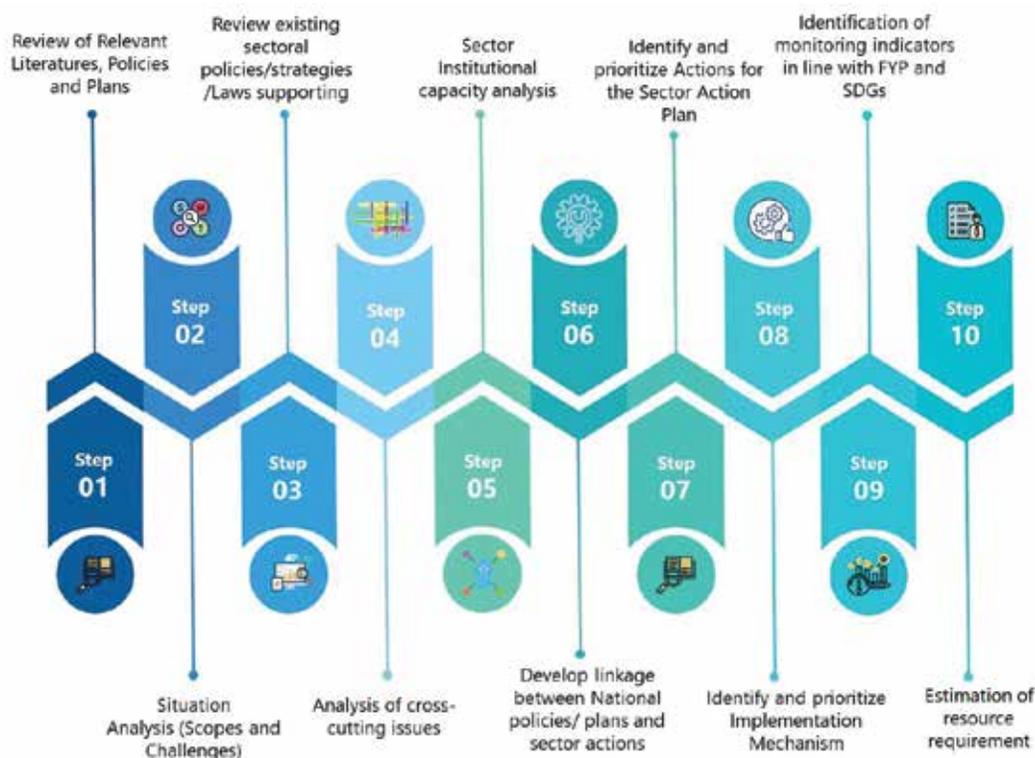


Figure 1.1: Overall Approach

### 1.4.2 Planning Horizon

Planning horizon has been considered in compliance with the Eighth Five Year Plan period from July 2020 to June 2025. Some longer-term actions might expand beyond 2025 up to 2030. So, the proposed actions under SAP will be implemented within 8<sup>th</sup> and 9<sup>th</sup> FYP. The Sector Action Plan is contextualized to bridge Five Year Plans and Annual Development Programmes. The economic development of Bangladesh has been classified into fourteen sectors both in Five Years Planning cycle and the Annual Development Programme. The planning horizon proposed in this Sector Action Plan will also facilitate the national strategic goals for LDC graduation in 2026 and the SDG goals in 2030. The SAP facilitates the strategies and action particularly emphasizing on agriculture and water sector affected by climate change and contribute in sustainable environment.

### 1.4.3 Guiding Principles

SAP has been developed following the principles described below. The principles have been identified based on understanding of the national goals & targets and international agenda and goals.

*Comprehensive and People Centred:* During the preparation of the SAP, a comprehensive situation analysis of different levels of people in the context of climate change and environmental degradation has been performed to make it people centric. These principles involve engagement of multiple stakeholders from different levels to analysis the coping strategies adopted by them. This will allow for better understanding of which actions and strategies will be more acceptable to people.

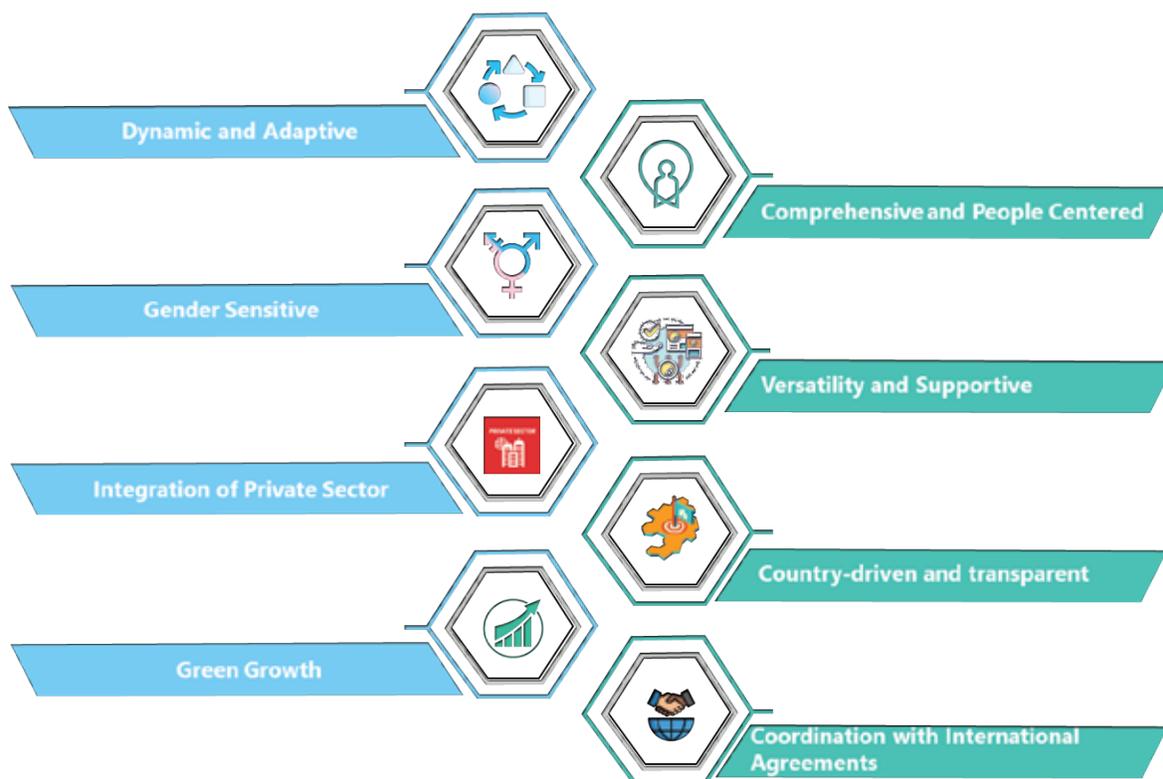


Figure 1.2: Guiding Principles for Sector Action Plan

*Versatility and Supportive:* Environment and Climate Change (ECC) itself is considered as multiple and cross cutting sector and warrants involvement of multiple agencies. Therefore, to enhance the

coordination and supportive nature among the key agencies, strategies will be developed that will require the sharing of the perspectives and roles of different agencies.

*Country-driven and transparent:* The planning process of the SAP is country-driven and transparent aligning with all relevant national plans and policies. SAP can contribute to national development, priority, particularly the goals and vision of the national plans and policies like Vision 2021 & 2041, LDC Graduation by 2024 while preparing the strategies.

*Coordination with International Agreements:* In order to fulfil international commitments of the Government through alignment with agreements exist like Paris Agreement, Sendai Framework on Disaster Risk Reduction etc., the strategies and actions developed in the SAP will adhere to similar development agenda.

*Dynamic and Adaptive:* The dynamic and unpredictable nature of climate change and ensuing impacts warrants that this document follows similarly, if not equally, adaptive traits in its concept and formulation of interventions.

*Gender Sensitive:* A gender sensitive approach will be considered during developing the strategy and action as women, child and disable people are most vulnerable to climate change and thus strategies must reduce the vulnerabilities of women, child and disable people.

*Integration of Private Sector:* Private sector has much potential to contribute to the planning, development and implementation of climate adaptation strategies through sector specific expertise, financing, technology, efficiency, entrepreneurship and in financing through PPP projects. As such, strategies developed in this SAP should encourage private sector financing.

*Green Growth:* Proposed strategies and actions should promote green growth as implementation of ecosystem-based initiatives entails benefit to the environment. Also, adhering to a green growth principle will facilitate in reduction of emission and subsequent achievement of NDC emission targets.

## 1.5 Goals

The Sector Action Plan on Environment and Climate Change has set target towards sustainable and climate resilient agriculture in line with the development vision of the nation i.e., Vision 2041, the Delta Vision and SDGs. SAP has been envisioned for *tackling environment and climate change risk and vulnerabilities on Agriculture, Fisheries and Livestock by managing land, water, environment and ecosystem to achieve food and nutrition security.*

The specific goals to achieve the SAP vision include –

- **Goal 1:** Promoting and enhancing local level climate change adaptation and resilience
- **Goal 2:** Development and expansion of Climate Smart Agriculture
- **Goal 3:** Promoting sustainable land and water management to achieve land degradation neutrality
- **Goal 4:** Environmental pollution control and conservation of ecosystem and biodiversity
- **Goal 5:** Promoting green growth and low carbon development
- **Goal 6:** Establishment of sustainable financing mechanism and strengthening institutions for environment and climate change risk management

## 1.6 Limitations

The Environment and climate change sector cover actions and issues related to environmental conditions and climate change. So, this sector has close relationship with future planning and actions in different sectors like agriculture, water resources, fisheries, livestock, disaster management etc. For this intrinsic relations, environment and climate change is also considered as cross-cutting issue for many sectors. As covering all sector related issues and actions is a huge task, the Sector Action Plan preparation study has concentrated on covering mainly environmental challenges and climate change adaptation and mitigation actions for the agriculture, fisheries and livestock sectors as these are the most affected by the negative impacts of climate change. There are other sectors impacted by climate change, which has not been covered in this Plan and is expected to be covered by Sector Action Plan of the respective sector.



## **Chapter 2**

# **Environment and Climate Change**



## Chapter 2. Environment and Climate Change

### 2.1 Scoping and Challenges

It has already been acknowledged that SAP acts as a connecting bridge between 8<sup>th</sup> FYP and Annual Development Programme (ADP). Thereby the scoping of ECC sector will be aligned with environment and climate change related activities, particularly in agriculture and water resources related strategies and action relevant for environment and climate change.

In order to extract the scoping and challenges of ECC sector, the boundary for ECC sector to prepare this SAP has been devised in three broad themes with eight specific sub-themes under the broad themes as presented in Figure 2.1.

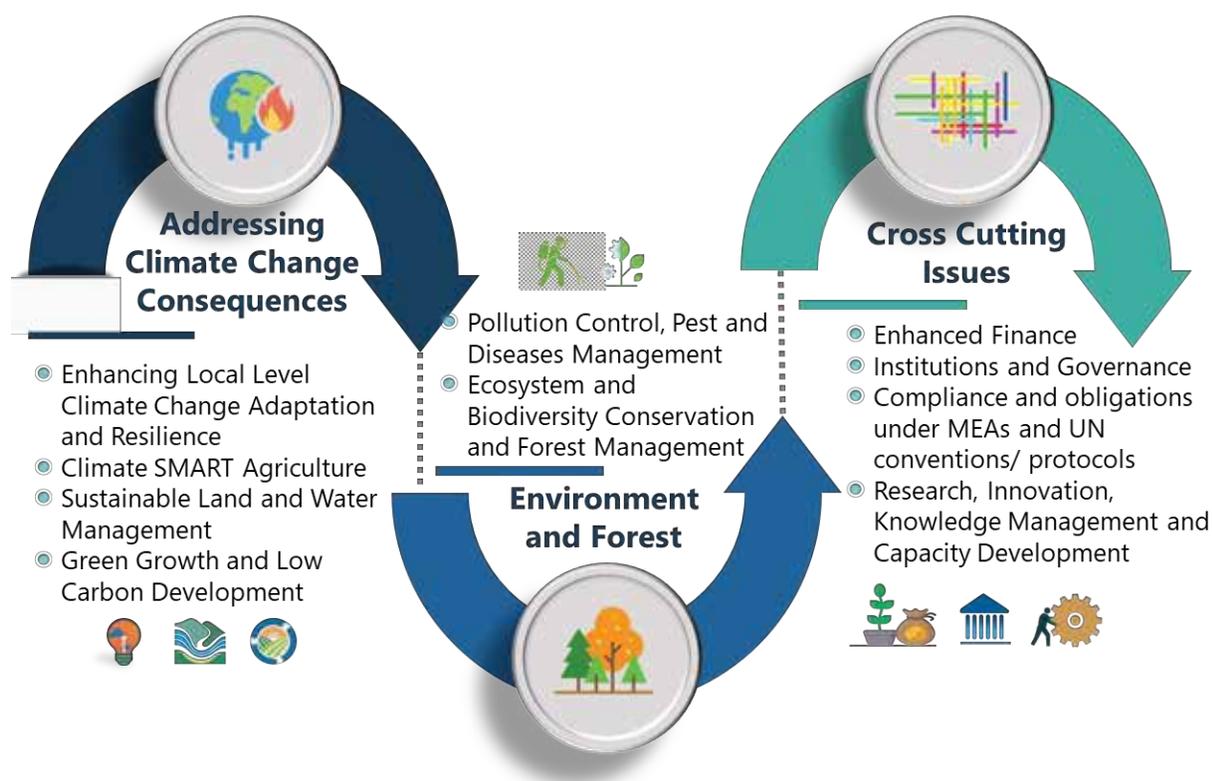


Figure 2.1: Thematic Areas Relevant to Environment and Climate Change

#### 2.1.1 Addressing Climate Change Consequences

The 8<sup>th</sup> Five Year Plan has conceived a sustainable development agenda, simultaneously highlighting both climate change adaptation and mitigation. Despite contributing less to global emissions, Bangladesh is recognized as one of the most vulnerable countries to climate change and to reduce said vulnerabilities the country needs to give more focus to climate change adaptation. The Government has also recognized that sustained economic progress warrants a balance between climate change adaptation and climate change mitigation.

Bangladesh is considered one of the most climate-vulnerable countries due to ensuing natural calamities and slow onset adversities. Constantly aggravating climate-induced disasters, coastal

tropical cyclones, monsoon flooding, flash floods, droughts, sea level rise, salinity intrusion, urban floods, etc., are causing catastrophic losses to many socio-economic sectors.

These adverse effects especially pose challenges to agriculture, food security and livelihood. Agriculture is one of the most vulnerable sectors to climate variability. Changes in temperature, rainfall patterns, and increase in floods and droughts. Changes in crop calendar, crop phenology and pollination; crop damage during floods; pest infestation and diseases; abnormal growth and breeding for fisheries; deoxygenation and pH imbalances; and deaths of livestock and poultry under extreme heat occur recurrently. This creates a crisis for food and nutrition security and agriculture-dependent livelihoods, as also projected by IPCC.

Strategies and actions will thus be developed to enhance the process of mainstreaming climate change adaptation and mitigation into national plans and policies, especially akin to the agriculture sector, to introduce climate smart agricultural practices and reinforce climate resiliency and to better facilitate reduction of GHS emissions.

Thereby focus will be given on increased coordination among the institutions and policies, mainstreaming environmental and climate change issues in their institutional mandates, which will enforce them to take the environment and climate change concerns in their activities, ensuring participation of all stakeholder considering gender aspects and other marginalised groups. The activities under this theme will be further divided in three sub-themes i.e., enhancing local level climate change adaptation and resilience, climate smart agriculture; sustainable land and water management and green growth and low carbon development.

- **Enhancing Local Level Climate Change Adaptation and Resilience**

This theme aims at transforming prioritization of strategic actions for climate change adaptation from national level to local level to enhance local level climate resilience through integrating climate change adaptation into local development planning process; engaging community, gender and people to make gender inclusive and participatory planning and development; shared learning to promote participation of all stakeholders including community; ensuring development of climate resilient market system and value chain and make available climate friendly products; incorporating native and indigenous knowledge of adaptation into systematic scientific technological innovations; reducing loss and damages due to climate change induced disasters; curbing internal migration and displacement; increasing alternating income generating activities among communities and so on.

Identification and adoption of climate-adaptive and resilient measures suitable to the local contexts and needs are key challenges for Bangladesh. Therefore, Local Adaptation Plans and Community Based Adaptation (CBA) involve the empowerment of vulnerable communities with knowledge and support to become more adaptive, protection measures for the displaced people or urban vulnerable community due to extreme and slow-onset climate events keeping with the relevant national and international policies/ initiatives. Protection and security of the community and the society from the climate change induced disasters will be intensified through the actions of this theme following suggested measures in the National Adaptation Plan (NAP) and the Mujib Climate Prosperity Plan (MCPSP).

- **Climate SMART Agriculture** – Agriculture is highly sensitive to climate variability as crop require sustained ambient temperature for their growth, and abrupt heat or cold waves

hamper productivity. Disease outbreak are also highly sensitive to temperature and moisture content and severity varies across regions. To ameliorate such predicaments, adoption of Climate Smart agricultural practices and technologies such as construction of mini-pond in crop field, cultivation of less water loving crops in north and north-west drought prone areas; zero or minimum tillage technology for flood prone area; sarjan method cultivation for salinity prone area; floating garden method for flood and water-logged prone area and creating Climate Smart Villages where farming will be developed. Integrated farming services will reduce the pressure on land and administer certain level of environmental protection through effective recycling of waste from animal activities like poultry and duck rearing. On the other hand, fisheries, aquaculture and livestock management will ensure nutritional security. The Livestock sector is highly vulnerable to climate change due to disease outbreak, production loss, feed shortage. Thereby, to increase the resilience and adaptive capacity of agriculture sector, development of stress tolerant varieties of crops, fodder, cattle and poultry and their effective extension; integrated farming; introducing climate smart technology and climate smart village; fisheries, aquaculture and livestock management along with climate smart health and feed management; gender inclusion is needed to ensure participatory planning and development. Adaptations devised in the NAP will be considered under this theme to ensure overall productivity of agriculture against climate change events.

- **Sustainable Land and Water Management** – Both water and land are widely used for agricultural and other economic activities. Approximately 70-80 percent of total fresh water used in Bangladesh is for irrigation purpose. Due to lack of sufficient knowledge and awareness, some farmers use excessive amount of water for irrigation, consequently hampering eco-system services. Integration of water valuation process can reduce the wastage of water to a great extent. In addition, land management is also crucial for achieving sustainability in agricultural production. It has also been addressed in 8<sup>th</sup> FYP that climatic and environmental factors such as water logging, depletion of groundwater and soil fertility, erosion, salinity along with increasing population and economic growth is creating pressures on agricultural land that ultimately lowers the production rate. Land degradation, loss of soil fertility, salinity intrusion, unavailability of water in drought prone areas and cyclone induced storm surges in south-western region discourages people in further engaging in farming activities and promote internal displacement for adopting diversified livelihood resulting in lack of man power in agriculture sector and declination of productivity. Bangladesh has already prepared national targets and action plans for achieving Land Degradation Neutrality (LDN). The integrated land and water management approaches; different ways to implement BDP2100 for ensuring food security through water and land management; exploring the potentialities of marine fisheries and blue economy that will reduce the pressure on water resources; initiatives to promote water valuation and reduce land degradation; different Ecosystem based Adaptation, Community based Adaptation and different ways to tackle migration or internal displacement will be considered under this theme through aligning with 8<sup>th</sup> FYP while developing strategies and actions.
- **Green Growth and Low Carbon Development** – The Updated NDCs of Bangladesh has specified actions to reduce greenhouse gas emissions following a low carbon development pathway. Bangladesh has committed to reducing greenhouse emissions from energy, agriculture, livestock and urban waste management along with the development of forestry resources and in this regard is exploring all avenues including mechanisms under

REDD (Reducing Emission from Deforestation and Forest Degradation). Agriculture and livestock sectors can be recognized as both a victim of and a contributor to climate change since it produces a substantial amount of greenhouse gas emissions, which contribute to global warming and climate change. CH<sub>4</sub> emissions from cultivated rice fields; N<sub>2</sub>O and CO<sub>2</sub> emissions from Nitrogen-based fertilizer use; enteric fermentation of livestock; CH<sub>4</sub> and N<sub>2</sub>O emissions from livestock manure management are four major sources of GHG emission from agriculture sector of Bangladesh. CH<sub>4</sub> as a prime GHG is produced through anaerobic decomposition of organic material in flooded rice fields, through enteric fermentation process and through anaerobic decomposition of manure. Considerable amount of CH<sub>4</sub> is also released from paddy fields depending on several factors such as climate, characteristics of soil, paddy and agricultural practices, particularly water regime. Additionally, the conversion of non-agricultural land such as forest into agricultural land also contributes to emission. However, aligning with 8<sup>th</sup> FYP and considering the above issues, focus will be given on low carbon development, Afforestation, reforestation and increasing tree cover areas, boosting crop productivity that emits less amount of GHG, reduction of emission from rice and paddy field, replacement of low yielding cattle with high yielding, climate smart health and feeding management, manure and livestock management, fertilizer management, increasing on farm energy efficiency, introduction of smart monitoring of emission under this theme.

### 2.1.2 Environmental Pollution Control, Biodiversity Conservation and Forest Management

Reduced forest coverage and degradation of environment intensifies climate change impacts. On the other hand, forest and environment are one of the major and integral part of the ECC sector that are under threat due to adverse impacts of climate change. The 8<sup>th</sup> FYP focuses on acting to mitigate the threat to environment and forest, which is also a major concern of this SAP. This theme is further divided into two sub themes –

- **Pollution Control, Pest and Diseases Management** – Due to the growing food demand, it has been observed that farmers are using excessive amounts of pesticides in the fields to increase the productivity, which ultimately deteriorates/depletes the nutrients of the soil and increase various types of plant diseases. The two most important environmental factors in the development of plant diseases epidemics are temperature and moisture, which are changing continuously as a result of climate change. Climate change also has a significant influence on the behavior of insects, as insects are cold-blooded organisms and are particularly sensitive to temperature changes. Through direct effects on the life cycle of insects, climate change can impact the distribution and severity of infestations of crops, in addition to indirect climatic effects on hosts, natural enemies, competitors, and insect pathogens. Thereby, integrated pest management can be explored to address the issues and region specific GIS mapping of plant and crop disease should be included in the process. Apart from identifying the disease, the resistivity of the host plants need to be increased so that they can avoid, tolerate or recover from the attacks of insects that will be considered in this theme.

In spite of the continuous effort and noteworthy initiatives from GoB like shifting tannery industries from inside to outside of Dhaka, central ETP installation, adopted 3R strategy for waste management, strict and systematic solid waste collection and disposal system in city corporations and municipalities, regular river water quality monitoring, surface water clean-up drive, imposing strict enforcements and punishments through mobile court, several issues and challenges are still need to be addressed to get rid of environmental pollution.

Changing citizen behavior and corporate social responsibilities for pollution control and waste management, management of solid, liquid and e-waste with zero discharge policy, managing hospital waste, hazardous and toxic waste, pollution from faeces, persistent organic pollutants (PoPs), faecal sludge management at local level, ensuring installing and functionalities of effluent treatment plants (ETPs), air quality improvement, proper monitoring of industrial pollution, enforcement of punishments to polluters, replacement of traditional brick kilns and rice parboiling units, halt open incineration of municipal solid waste (MSW), storm water quality control, managing environmental risk to health etc. are major challenges under this theme which are considered to be addressed. Integration of “Polluters Pay” and “Beneficiary Pay” principle such as payment for ecosystem services will control the pollution occurring from industries, urban areas, agricultural waste, livestock waste will be included under this theme. However, different payment principles alone cannot control the situation until citizen behavior is changed and the polluters realize their responsibilities towards environment. This can be achieved by the extended producer responsibility approach, application of stringent environmental compliance and smart monitoring. Private sector can play an important role in activities related to pest and disease management and controlling pollution through providing plant protection advisory services to the farmers and promoting pest control methods in combination with chemical control, which will also be considered under this theme.

- **Ecosystem and Biodiversity Conservation and Forest Management** – Bangladesh has been divided into 30 agro-ecological zones and 88 sub-zones based on physiography, soil properties, soil salinity, depth and duration of flooding which are relevant for land use and for the assessment of agricultural potential. The general agro-ecological variations of Bangladesh range from below sea-level basins to small hills that are more or less exposed to climate change induced catastrophe and human activities, ultimately hampering the existing ecosystem services. On the other hand, forest and trees stabilize soil, prevent erosion, enhance lands capacity to store water, which eventually creates an enabling environment that is required for effective agricultural production together with safe living conditions for humans. But climate change induced rise in - sea levels and temperature, as well as increased incidence of storms and flooding will cause damage to forest resources and harm species sensitive to the climate.

Forest, ecosystem and biodiversity management is one of the major and integral parts of ECC sector interventions for protecting forest dependent livelihood and income generation, maintaining ecosystem services and halting biodiversity loss/ degradation. The world's largest mangrove forest, the Sundarbans, is protecting millions of people's life and property from recurrent storm surges, providing opportunities for alternative income generation activities, sequestering carbon and providing many other ecosystem services. In addition, the large haor, beel and wetlands are providing many tangible and intangible benefits through diversified ecosystem services like flood control, crops production, fish production, rendering habitats for different species to conserve biodiversity, adding value to the recreational activities i.e. eco-tourism etc. These vast resources are vital for the economy and lifeline of the country. Hence, this theme urges to take strategic actions for natural resource management attributed from forest and its ecosystem, protecting and conserving Ecologically Critical Areas (ECAs), management of land and wetlands ecosystem, conservation of biodiversity and its habitat, reducing wild life crime, utilization of smart technologies for

wild life and biodiversity management, expansion of forest coverage and greenbelt creation and maintenance, REDD+ mechanism, hill forest management and research on indigenous species etc. Additionally, priority is needed to be given on expanding social forestry and urban forestry, promoting Nature based Solutions (NbS), ecological risk assessment for ecosystems, managing wetlands for sustainable agriculture, aquaculture and other ecosystem services and promoting IT for ensuring precision agricultural under this theme.

### 2.1.3 Cross Cutting Issues

ECC sector has a wide a scope to contribute in many other sectors to boost up the resilience of the country against climate change as it is cross cutting. Climate change is directly related to water resources management, agriculture and disaster risk reduction. Thereby strengthening the coordination among the line ministries and agencies is highly required and the possible ways of increasing the coordination among the line ministries and agencies along with other important aspects regarding the cross-cutting issues like harnessing international funds, Institutional governance, promotion of knowledge sharing and capacity development, encouraging research and innovative activities, Compliance and obligations under MEAs and UN conventions/ protocols will be discussed within this broad theme –

- **Enhanced Financing** – It has been recognized in the 8<sup>th</sup> FYP that agricultural research has been a neglected area with low budgetary allocation and comparatively lower research and financial facilities for the scientists. Though uses of technology in agriculture sector have substantially increased in recent years, still there prevails resource scarcity, which limits the scope of institutions within the government to support a comprehensive set of activities for sound environmental management, particularly that ensures agricultural sustainability and execute climate change adaptation programs. Thereby, with a view to enhancing the finance for ECC, GoB has prioritized some initiatives in the 8<sup>th</sup> FYP. These initiatives include sustainable fund harness and mobilization of GCF and other available funds; regular mobilization and increased monitoring of BCCT fund utilization; promoting financing solutions; fund harness and mobilization for NbS from Environment and Biodiversity Fund; establishment of Delta Fund that will also be explored under this theme.
- **Institutions and Governance** – Prevailing lack of coordination and proper institutional arrangement hinder the emergence of institutions and policies that GoB has introduced to address the environmental challenges that the country is facing. It is also recognized in the 8<sup>th</sup> FYP that inadequate coordination between the MoEFCC and the other key ministries have undermined the state of environment management. In accordance to enhancing the institutional coordination and overall governance of Environmental Fiscal Reforms (EFRs); inter-sectoral and inter-ministerial coordination; increased coordination of MoEFCC with LGs; establishment of Delta wing; establishment of Water and Sanitation Regulatory Agency (WARSA); decentralized environmental management; strengthening Governance and increased partnerships with CSOs and NGOs will be promulgated under this theme.
- **Compliance and obligations under MEAs and UN conventions/ protocols** – On behalf of the GoB, MoEFCC is responsible for carrying out the compliance and obligations under different Multilateral Environmental Agreements (MEAs) and UN conventions and protocols. There are a set of targets or actions plans that need to be implemented to satisfy these compliances and obligations. Under this theme, a set of actions to facilitate these compliances and obligations will be included.

- **Research, Innovation, Knowledge Management and Capacity Development** – Research, innovation and capacity development is a continuous and gradual process to be integrated throughout the planning period. ECC related knowledge generation through research and publications, management of knowledge through proper database, Management Information System (MIS), digital library and inventory innovative technology and transfer of technology, capacity development of institutions and skill development of officials, training or awareness building programs for community, improvement of training facilities, shared knowledge generation and management etc. are key issues that need to be focused. A lack of knowledge and inadequate capacity to address environmental challenges exist in the current system. In the 8<sup>th</sup> FYP, it was acknowledged that MoEFCC, and its main agency for environmental management, the Department of Environment (DoE), have inadequate capacities, technical knowledge and staffing due to very limited resources availability. Thereby initiatives under this theme will promote the following –
  - a) Environmental Fiscal Reforms (EFRs);
  - b) technology transfer through CTCN and JCM;
  - c) biosafety measures implementation;
  - d) research on innovation on environment and climate change;
  - e) proper knowledge management through ensuring knowledge generation, sharing, communication and utilization;
  - f) improved coordination and knowledge sharing at local levels;
  - g) establishment of Delta Knowledge Hub and Delta Coalition and finally sensitize LGIs about climate change.

## 2.2 Risk and Vulnerabilities

### 2.2.1 Environmental Hazards

#### *Waste pollution*

Increasing solid wastes in urban areas are of major concern with the growing population of Bangladesh. The total volume of municipal solid wastes in urban areas of Bangladesh is approximately 23,688 tons/day generated by a total of 41.94 million urban population and averaging 0.56 kg/capita/day waste generation rate in 2014 (Waste Concern, 2014). According to DoE (2010), the rate of waste collection in other major cities ranges from 44.3% to 76.47% of total municipal waste (43.5% for Dhaka City), leaving huge amounts uncollected and untreated. Recent statistics from Dhaka North City Corporation shows improvement in waste collection to 80% (DNCC, 2020). The amount of municipal waste will grow up to 47,000 tons/day (0.82 kg per capita per day) by 2025 (Waste Concern, 2014). The majority of urban waste is from food waste (77.7%), followed by plastics (7.3%), paper (4.8%), wood (2.7%), fabric (2.56%), e-waste (0.64%), metal (0.44%) and others (3.74%) (Waste Concern, 2014). This ratio of wastes is changing in recent times with increases in shares of plastics and e-wastes. Current solid waste management facilities include inadequate collection system and uncontrolled landfilling except for the sanitary landfill at Matuail and Amin Bazar site in Dhaka. It should be noted that, treatment, recycling and disposal of hazardous waste is still of serious concern for Bangladesh.

## Sound pollution

Noise pollution has become a significant problem in divisional headquarters of Bangladesh where sound levels are far beyond the acceptable level for the human ear. Road, rail, and air traffic, industry, construction, hydraulic horns etc. are the major sources of sound pollution. Frequent long-term exposure to high levels of noise reduces hearing, causes cardiovascular diseases, sleep disturbance, annoyance and occupational health hazards. Dhaka city has one of the highest population densities in the world and in busy areas, the average sound level is 80-110dB, which is far beyond human tolerance levels (60dB). Previous studies also found that 500-1,000 vehicles honk at the same time when stuck in traffic in Dhaka. According to Noise Pollution (Control) Rules 2006, the acceptable sound limit in Bangladesh is as described in **Table 2.1**.

**Table 2.1: Acceptable Sound Limit in Bangladesh**

Areas	Sound limit (Night-Day)
Residential areas	45dB-55dB
Educational institutions, hospitals, place of worship	40dB-50dB
Public areas	60dB-70dB
Commercial or industrial areas	70dB-75dB

**Table 2.2** shows the noise level ranges in the divisional headquarters of Bangladesh. The table shows that, the highest noise levels in the cities are far beyond acceptable limits.

**Table 2.2: Noise Levels in Divisional Headquarters of Bangladesh**

City	Noise Levels
Dhaka	43.5-135.6 dB
Chattogram	41.9-132.1 dB
Sylhet	42.2-130.6 dB
Khulna	40.6-133.2 dB
Barisal	44.5-133.8 dB
Rangpur	37.3-130.1 dB
Rajshahi	44.2-134.4 dB
Mymensingh	47.0-130.7 dB

Source: Report on Noise, DoE (2017)

## Land degradation

Land degradation is a special challenge for Bangladesh especially because it is one of the most densely populated countries in the world. The per-capita availability of arable land is gradually declining. The present availability of net cultivable land is only 15 decimals per person in Bangladesh. Waterlogging, salinity encroachment, landslides, soil erosion etc. are the natural factors of land degradation. Cropping pattern, infrastructure construction, industrialization, solid waste disposal is also responsible for land degradation. Major causes of land degradation include soil erosion, water pollution, river bank erosion, coastal salinization, soil pollution, acid sulphate soil, acidification, water logging, depletion of soil fertility, sedimentation, deforestation etc. In the North-Western parts of Bangladesh, there are about 50,000 km<sup>2</sup> of lands below the threshold for sustainable land management. In this area, the average change of cropland to other uses is nearly 690 km<sup>2</sup> during 2000-2010. This change is causing organic matter depletion. In this area about 5,000 km<sup>2</sup> (<10% of total national degraded area) of land

is also projected to decline in productivity (DoE, 2019). According to SRDI (2012) out of 2.86 million hectares of coastal and offshore lands, about 1.056 million hectares of arable lands (~37%) are affected by varying degrees of salinity. Around 97,147 hectares of land are affected by water logging and 8.36 million hectares of arable land are affected by acidification in Bangladesh (SRDI, 2020). The average rate of soil erosion in Bangladesh was between 7-120 tons/ha/year (Banglapedia, 2015). All of these factors are resulting in land degradation.

### Urban air pollution

Urban air environment in major cities of Bangladesh is one the most polluted in the world. Air pollution can cause chronic respiratory disease, lung cancer, heart disease, and even damage to the brain, nerves, liver, or kidneys. Outdoor air pollution causes 4.2 million premature deaths (29% of all deaths and disease from lung cancer, 17% of all deaths and disease from acute lower respiratory infection, 24% of all deaths from stroke, 25% of all deaths and disease from ischemic heart disease, 43% of all deaths and disease from chronic obstructive pulmonary disease) around the world (GED 2020). The use of fossil fuel for energy, emissions from industrial plants, especially brick kilns; emissions from transport vehicles without adequate emission control mechanisms, and gaseous releases from the improper treatment and disposal of solid and liquid wastes are the main factors contributing to outdoor air pollution. The two major air quality parameters to identify the level of air pollution are PM<sub>2.5</sub> and PM<sub>10</sub>. According to the annual report 2017-2018 of DoE, although the other indicators of pollution were within the limit, these two parameters have exceeded the permissible limit by a large margin. The main reason behind this is the number of industries, brick kilns and volume of traffic in that area. The permissible limit of average PM<sub>10</sub> and PM<sub>2.5</sub> is 100 and 50 µg/m<sup>3</sup> respectively. For heavily industrialized, densely populated areas like Dhaka, Gazipur and Narayanganj PM<sub>10</sub> varied in the range of 150 to 220 µg/m<sup>3</sup> and PM<sub>2.5</sub> varied in the range of 80 to 90 µg/m<sup>3</sup> in 2017(DoE,2017). In 2020, PM<sub>10</sub> in these cities, varies in the range of 154 to 312 µg/m<sup>3</sup> and PM<sub>2.5</sub> varies in the range of 107 to 210 µg/m<sup>3</sup>. In 2021-2022, PM<sub>2.5</sub> varies in the range of 50 to 350 µg/m<sup>3</sup> in Dhaka city during most period (annual report 2021-2022, DoE, 2022). The air pollution reaches higher values during winter/ dry periods (October-March) and remains below 100 µg/m<sup>3</sup> during wet season (April-September). The Air Quality Index (AQI) value of 100 or below is considered as healthy. According to Annual report of DoE (2022), in Dhaka, AQI was more than 100 for 82% days in 2021-22. Similar situation was also present in Mymensingh (93%), Rangpur (83%), and Rajshahi (73%). Every year, the situation gets worse and the air quality is tremendously deteriorating during the dry period (November to March).

### Water Pollution

Water pollution in Bangladesh mostly occurs due to industrial discharges, municipal wastes, agrochemicals, salinity intrusion and arsenic contamination. These have severely undermined the quality of the rivers over the years. Table 2.3 presents the water quality situation in the major rivers of Bangladesh.

**Table 2.3: Water Quality Status for Some Important Rivers of Bangladesh (2020)**

River	pH	DO (mg/l)	BOD (mg/l)
Padma	7.52-7.66	7.0-7.5	2.1 - 50
Karnafuli	6.73-8.5	0.78-8.48	4.0-49
Surma	5.8-9.5	6.03-8.94	1.4-4.0
Buriganga	6.5-7.79	0.0-5.79	3.0-56

River	pH	DO (mg/l)	BOD (mg/l)
Turag	6.88-7.79	0.0-5.56	4.4-62
Balu	6.96-8.61	0.0-6.32	2.0-76
Shitalakhya	6.88-7.82	0.0-4.8	6.0-49
Karatoa	7.44-7.66	0.78-7.82	2.0-6.3
<b>Environmental Quality Standards (EQS) for fisheries</b>	<b>6.5-8.5</b>	<b>≥5 mg/l</b>	<b>≤6 mg/l</b>

Source: Department of Environment, 2022, Annual Report 2021-22

Growing industrialization is the key reason behind serious degradation of river water quality over the years. In the dry season, the overall inland surface water quality drops below the permissible limit of Department of Environment (DoE) standards. However, it improves in the wet/monsoon season slightly.

Being the capital, Dhaka City and its surrounding areas consisting of major economic hubs, is heavily industrialized with lots of tanneries, fabric dyeing industries, apparel washing and chemical processing industries, plastic industries, etc. These industrial areas are mostly contributing to the degradation of river water quality. The major rivers surrounding Dhaka Buriganga, Turag, Shitalakhya and Balu have degraded at a rapid rate over the years. The dissolved oxygen (DO) concentrations of these rivers are very low and the Biological Oxygen Demand (BOD) levels are at very high level and is very damaging for the ecosystem and environment. Other water quality parameters like Chemical Oxygen Demand (COD) and Total Dissolved Solid (TDS) were within the permissible limit for the major rivers but the limits largely exceeded for the rivers around Dhaka city. The water quality in the Karnafuli, karatoa and Surma River is also deteriorating with increasing industrialization along the river banks. However, the river water quality of the north-eastern region is mostly within water quality standards.

The rivers, khals and water bodies around the industrial regions are heavily polluted due to uncontrolled disposal of solid/ liquid wastes and heavy metals. The environmental law enforcement was not strict in the past, and this has resulted in the present degradation of water quality. But at present, various initiatives are ongoing in relevant ministries and agencies to enforce the environmental laws and ensure quality of industrial wastewater discharge.

### Overuse of groundwater

Overuse of groundwater causes decline of groundwater table. Both the pre-monsoon and post-monsoon groundwater tables have declined gradually, because of overexploitation of groundwater. In case of Dhaka city, this decline has been very rapid. Groundwater level fluctuates between 5 to 15 meters below ground level in intensively irrigated areas, in some places during peak dry season irrigation, it even goes down to 23 meters. Groundwater levels have fallen to 80 m below ground level in the central part of Dhaka city (GED 2018). This has happened because about 85% of the water supply in this city depends on groundwater. The explosive growth of the number of tube wells for drinking water supply is a major reason for this issue (GED 2018).

### Impact of industries in residential areas

In the major metropolitan cities of Bangladesh, many industries are established in residential areas. Industrial sites cause several negative externalities, such as traffic noise disturbance, congestion, and obstruction of view. Industries are directly or indirectly connected with biophysical ecosystems as they largely depend on ecosystem resources. Socio-ecological problems are created when industries conflictly interact with local ecosystems (nearby rivers, wetlands, lakes, forests etc.). Untreated

industrial effluents cause serious degradation of the three components of the natural environment — air, water and soil, and has resulted in adverse consequences for human health and economy of our country. For example, Chowdhury et al., (2020) has reported that polluted river water around Dhaka causes yield reduction up to 27% for rice and 38% for cabbage compared to freshwater. Water quality of many other rivers have been affected by the nearby industrial effluent, fertilizer and pesticide overuse etc.

### 2.2.2 Natural Disasters

#### River bank erosion

Every year, a significant portion of fertile lands and settlements are being lost due to river bank erosion. The major rivers form islands or chars between their braiding channels. Many of these chars are inhabited. They are extremely sensitive to changes in the river conditions and move with the river flow. Accretion compensates for the erosion processes, but these are very unpredictable. Every year in Bangladesh, around 10,000 hectares of land is eroded by rivers (NWMP, 2001). In the erosion prone area along the Jamuna River, the districts Kurigram, Gaibandha, Jamalpur, Bogra, Sirajganj, Tangail, Pabna and Manikganj are more vulnerable. Along the left bank, the erosion of total area and settlement is higher compared to that of the right bank. These are the districts of Rajbari, Faridpur, Manikganj, Dhaka, Munshiganj, Shariatpur and Chandpur along the Padma River.

According to CEGIS estimates, between 1973 and 2021, erosion along the Jamuna River was 93,965 ha and accretion was 14,545 ha. During this period, erosion along the Ganges River was 30,300 ha while accretion was 29,100 ha. On the other hand, along the Padma River, erosion was 33,585 ha and accretion were 5,485 ha respectively.

#### Earthquake

Bangladesh is situated at the juncture of several active tectonic plate boundaries and it sits on the world's largest river delta close to sea level, facing both the risk posed by a quake and tsunamis and flooding in the quake's aftermath. Since 2003 to 2017, 3 major earthquakes occurred in Nepal, India, Myanmar and Tripura. Large numbers of people felt the tremors in Bangladesh while these earthquakes occurred and there were several casualties. The number of earthquakes has been increasing significantly over the last 20 years. According to Geological Survey of Bangladesh, the country has experienced at least 465 earthquakes of minor-to-moderate magnitudes between 1971 and 2006 (Islam et al., 2016). The MRVAM study (2015) showed that, major seismic risk is coming from the Dauki fault that affects the nearby areas of Sylhet and Mymensingh. The cities of Bogra, Mymensingh, and Rangpur face the greatest seismic hazard in Bangladesh. Dhaka is within the zone of impact for this. Overall, the general consensus is that rapid urbanization of Bangladesh has created a greater vulnerability to seismic events because urban planning and preparedness of the essential services have not been at par with the risks, at all.

### 2.2.3 Climatic Hazards and Impacts

#### Rising temperatures and Rainfall Variability

The Sixth Assessment Report of the International Panel for Climate Change (IPCC) reports a rise in temperature of 0.99°C during 2001-2020 with respect to 1850-1900. Global surface temperature was 1.09°C higher in 2011– 2020 than 1850–1900, with larger increases over land (1.59°C) than over the ocean (0.88°C).

For the future, the IPCC projected global warming for 2046-2065 range from 1.0 to 1.4°C whereas it ranges from 1.0 to 3.7°C for the period 2081-2100.

Extreme temperatures, erratic rainfall, floods and droughts, more intense tropical cyclones, rising sea levels, and ocean acidification are the results of climate change in Bangladesh and these are causing serious negative impacts on lives and livelihoods of millions, and gradually putting negative footprint on socio-economic development of Bangladesh. An ADB study projected that, Bangladesh is likely to face 2.0% loss of annual GDP by 2050 and more than 9% of GDP by 2100 under business-as-usual scenario (Ahmed and Suphachalasai, 2014). According to IPCC, Bangladesh would experience a net increase in poverty of approximately 15% by 2030 (IPCC, 2014) due to the impacts of climate change.

Based on IPCC AR6 based downscaling model results, the region-wise annual changes in temperature and rainfall during 2030s and 2050s under low (SSP1-2.6) and high (SSP5-8.5) emission climate scenario are prepared by CEGIS (2021) and presented in the following tables.

**Table 2.4: Projected Annual Surface Warming (°C) in Maximum Temperature**

Hydrological Region	Base*(°C)	SSP1-2.6		SSP5-8.5	
	1981-2010	2030s	2050s	2030s	2050s
North West (NW)	29.52	0.63	1.41	0.08	1.75
North Central (NC)	29.51	0.71	1.39	0.31	1.82
North East (NE)	28.79	0.74	1.36	0.42	1.91
South West (SW)	30.00	0.55	1.20	0.14	1.56
South Central (SC)	29.25	0.66	1.27	0.31	1.65
South East (SE)	28.68	0.67	1.28	0.32	1.69
Eastern Hills (EH)	27.99	0.65	1.19	0.40	1.79
Bangladesh (BD)	29.11	0.65	1.29	0.27	1.72

\*Regional/ Country Average (Source: CEGIS, 2021)

**Table 2.5: Projected Annual Surface Warming (°C) in Minimum Temperature**

Hydrological Region	Base*(°C)	SSP1-2.6		SSP5-8.5	
	1981-2010	2030s	2050s	1981-2010	2030s
North West (NW)	20.25	0.80	1.49	0.65	2.37
North Central (NC)	20.68	0.78	1.46	0.69	2.32
North East (NE)	20.10	0.89	1.59	0.84	2.52
South West (SW)	21.57	0.73	1.41	0.61	2.25
South Central (SC)	22.21	0.67	1.32	0.58	2.11
South East (SE)	22.14	0.71	1.32	0.64	2.18
Eastern Hills (EH)	22.98	0.71	1.25	0.65	2.14
Bangladesh (BD)	21.58	0.74	1.38	0.65	2.24

\* Regional/ Country Average (Source: CEGIS, 2021)

**Table 2.6: Projected Annual Change (%) in Rainfall**

Hydrological Region	Base*(mm)	SSP1-2.6		SSP5-8.5	
	1981-2010	2030s	2050s	1981-2010	2030s
North West (NW)	1958	1.50	3.24	5.04	5.61
North Central (NC)	2239	-0.40	1.03	1.08	3.04
North East (NE)	3653	-1.81	-0.82	-1.35	0.61
South West (SW)	1826	0.68	4.05	1.11	3.95

Hydrological Region	Base*(mm)	SSP1-2.6		SSP5-8.5	
	1981-2010	2030s	2050s	1981-2010	2030s
South Central (SC)	2380	-0.42	2.34	0.39	3.12
South East (SE)	2925	-0.29	2.23	0.24	3.10
Eastern Hills (EH)	3527	0.21	2.28	1.37	3.12
Bangladesh (BD)	2579	0.12	2.38	1.41	3.50

\* Regional/ Country Average (Source: CEGIS, 2021)

The tables show that, both maximum and minimum temperature is rising in all regions in the future in Bangladesh. The annual warming is much higher during mid-century and some regions will face more intense changes during summer. The rainfall pattern is going to be more variable and erratic in the future. There is an indication that, pre monsoon and monsoon rainfall will increase. On annual basis, the rainfall is expected to increase in most regions except NE. Under the high emission scenario (SSP5-8.5), as temperature rise will be higher, and more erratic behaviour of rainfall along with changes in rainfall amounts is expected. These basic changes in the climate in future will aggravate the climate induced disasters and hazards.

### Flood

Flood is a recurrent phenomenon of Bangladesh that occurs in almost every other year, if not every year. Each year in Bangladesh about 26,000 square kilometres (around 18% of the country) is flooded; which rises up to 55 percent to 67 percent during severe and catastrophic flood events respectively (MoWR, 2015). These flood events take heavy toll on the people of Bangladesh including death, loss of properties and livestock, loss of agricultural resources etc. The floods of 1987, 1988, 1998, 2004 and 2007 are the major floods that occurred in our country. In 1987, the major parts of Bangladesh received heavy rainfall and about 39% of the country was inundated. In 1988, a devastating flood occurred in Bangladesh, inundating 61% area. In 1987, the magnitude of flooding was associated with high rainfall within the country, while in 1988 it was associated with heavy rainfall in the upper catchments outside the country. During the 1988 floods, embankments of 1990 km (17.5%), irrigation canals/drainage channels of 283 km (5.3%), 1465 (10%) structures, protection works of 265 km (24.8%) of BWDB were partially or fully damaged. In April 2004, due to heavy rainfall from 11 April in the Meghna basin, flash floods occurred in the north-eastern region causing record damage to Boro crops in Sunamganj, Sylhet and Habiganj. During the month of July 2004, the Brahmaputra and the Meghna basins experienced 30% and 42% higher rainfall than their monthly normal and out of 86 water level monitoring points of BWDB, 35 points crossed the danger level. During the 2004 floods embankments of 3158 km (27.7%), irrigation canals/drainage channels of 341 km (6.4%), 562 number of structures (3.8%) and protection works of 178 km (16.6%) partially or fully damaged. In August 2007, the flood mainly occurred in north-west region inundating around 42% area of the country and the death toll was around 405. The increase of monsoon precipitation over Bangladesh and increase of the same in the adjacent region of sub-Himalayan west Bengal, Sikkim and gangetic west Bengal have increased the vulnerability of the country to severe floods. The magnitude and frequency of mega floods is increasing due to climate change, human causes like construction of dam in upper riparian countries, unplanned urbanization in illegally encroached floodplains, lack of combination of structural and non-structural measures etc. – and all these are aggravating the situation.

The estimated damage due to flood events of 1988, 1998, 2004, 2007 and 2017 were US\$1.2, US\$ 2.8, US\$ 6.6, US\$1 and US\$0.9 billion respectively. The flood of 2020 has been an alarming event for the

country where around 5 million people were affected and 41 people lost their lives. In addition to that, evidently, frequency and magnitude of flood events have also increased as a consequence of climate change. During 1960-1985, only 1 mega flood event occurred; whereas 8 mega flood events took place in last 35 years (1986-2020). On top of that, future climate change may incur additional 5-10% flood inundation in terms of area, as the future rainfall is increasing along with its distribution. Other man-made causes like construction of dams in upper riparian countries, unplanned urbanization in illegally encroached floodplains, lack of combination of structural and non-structural measures etc. are aggravating the situation.

### Flash Floods

In the eastern and northern hilly regions, flash floods occur. Flash floods generally have high velocities and a rapid increase in water levels but also have a relatively short duration. At local levels, this makes them very destructive. Due to flash floods, the people living in the haor and adjoining haor areas are the most affected population and most of them live below the poverty level. This causes more distress among the flood affected people. Mostly in the haor area, about 55% of Boro crop area is highly vulnerable due to flash floods. At the districts of Brahmanbaria and Habiganj, about 20% of Boro crop area is moderately vulnerable and in the Netrokona and Kishoreganj districts 25% of Boro crop area is less vulnerable due to flash flood. Flash floods occurred in the north-eastern region of the country causing record damage to Boro crops in Sunamganj, Sylhet and Habiganj, in April 2004, due to heavy rainfall from 11th April in the Meghna basin. For 2 to 10 days, the Surma River at Kanaighat and Sylhet, the Kushiya River at Amalshid and Sheola, the Manu River at Manu Railway Bridge and the Khowai at Habiganj peaked above the danger level. More than 15% of the lands at several Haor districts were flooded by flash flood events in 2006, 2007, 2010 and 2015 (CEGIS, 2017). Flood flash event of 2017 was the most devastating, damaging roads and embankments, pre-mature Boro crops in six Haor districts worth 13,000 crore Taka which posed a serious threat for the overall food security of the country. Separate instances of flooding occurred in 2020 and damaged crops.

### Drought

Agricultural droughts occur in Bangladesh, which are also termed as severe moisture stress. As a major water deficiency related issue, the occurrences of drought, is the most severe in the North-west region (WARPO, 2001). This area has the lowest average annual rainfall in the country. Due to the combined effect of presence of soils with low moisture holding capacity (<200 mm available moisture), increasing number of dry days (precipitation <0.5 PET) and occurrence of extreme summer temperature of more than 40°C, the drought situation of the area becomes extremely severe during April-May. Nineteen droughts occurred in Bangladesh between 1960 and 1991. The average occurrence of drought in the country is once in 2.5 years. Bangladesh experienced severe droughts in the year of 1951, 1957, 1961, 1972, 1976, 1979, 1989 and 1997. A rise of temperature by 0.016 °C/year, 0.02 °C/year and 0.012 °C/year for mean annual temperature, mean maximum temperature and mean minimum temperature respectively was seen from analysis on the data of BMD over a 32-year period from 1977 to 2008. Statistically rising trend was found in 19 stations out of 31 stations for mean annual temperature. A rising trend was found for 17 stations out of 31 stations for minimum and maximum temperature. The ten most drought affected upazilas in Bangladesh are: Niamatpur, Porsha, Patnitala and Sapahar in Naogaon, Tanore in Rajshahi, Nachole and Shibganj in Chapai Nawabganj, Baliadangi in Thakurgaon, Hakimpur in Dinajpur and Panchbibi in Joypurhat. A 2015 study assessed climate change induced drought impact on crop yield for some selected crops – BR11 (Transplanted Aman), BR14 (Boro Rice), and BR29 (Boro rice) in years 2030 and 2050. With respect to base condition (1979-2008) for BR11 and

BR14, there was an overall decrease in production ranging from less than 10% to greater than 40%, while for BR29, the range of reduction is from less than 10% to 30-40%. Changes in temperature and precipitation affects the occurrence of droughts, which in turn affects food security in the country. So, climate change plays a huge role in this regard.

### *Sea level rise*

One of the most important impacts of climate change for Bangladesh, is sea level rise, due to which, the coastal region is facing salinity intrusion, land degradation, severe water logging, crop damage, scarcity of drinking water etc. Sea level rise is caused by global warming which affects two main processes. First of all, higher ocean water temperature causes thermal expansion and secondly, atmospheric warming results in the melting of land ice.

According to IPCC AR6, global mean sea level has risen by 0.2 m between 1901 and 2018. The average rate of sea level rise was 1.3 mm/yr between 1901 and 1971, increasing to 1.9 mm/yr between 1971 and 2006, and further increasing to 3.7 mm/yr between 2006 and 2018.

A recent study of DoE (2016) has found that the overall trend of sea level rise in the coastal area of Bangladesh is 6-20 mm/year. The trend is much higher in the Chattogram coastal plain area than the Ganges and Meghna subzones. Sea level rise in Bangladesh is slightly higher than global average mean. By 2050 sea level rise could be up to 4 cm higher than global mean and by the end of the century up to 10 cm.

### *Ingress of salinity in coastal areas*

The average salinity concentrations of the rivers in the coastal area are higher in the dry season than in the monsoon because of lack of freshwater flow from upstream. Salinity level generally increases almost linearly from October to late May with the gradual reduction of freshwater flow from the upstream. Observation of salinity shows an increase of salinity in Khulna from 0.7 ppt to 16.8 ppt in the Rupsa River from 1962 to 2011 (50 years). The levels of river salinity in the adjacent south-central and south east coastal zones remain low. The low salinity (0 to 2 ppt) level in the south-central zone, i.e., in much of the Barisal area for the whole year, results from the significant volume of freshwater flow from the Padma River and the Lower Meghna River through the Arial Khan, Buriswar, and Bishkhali Rivers. The problem of river salinity is most severe in the southwest zone. Salinity intrusion reduces the freshwater area that results in decrease of agricultural production in many parts of the coastal zone, especially the Khulna region and the extreme south of the Patuakhali region, and locally in the Noakhali and Chittagong regions. Climate change will significantly increase river salinity during dry season by 2050. According to studies, 19.3% of Khulna Division would be exposed to salinity concentration greater than 1 ppt. This means decreases of fresh water availability in the river system due to future climate change. 13.5% area is likely to be affected for shortage of irrigation water due to increase of salinity in the coastal regions. Soil salinity map for the period of 1973, 2000 and 2009 produced by Soil Resources Development Institute (SRDI) shows that severity of soil salinity has been increasing in Jashore, Magura, Narail, Faridpur, Gopalganj and Jhalokati over last 24 years.

### *Storm surge and cyclone*

The entire southern boundary of Bangladesh is exposed to the Bay of Bengal and eventually to the Indian Ocean. During the period 1961-2013, a total 61 tropical cyclones hit Bangladesh and its close neighbouring territories with a range of 1.5 to 10m high storm surges. The cyclone that hit greater

Barisal in 1970 caused nearly 300,000 deaths. However, the one with almost the same severity in terms of wind speed hit in 2007 (the SIDR) took lives of nearly 3,406 people. This is credited briefly to a combination of these factors: improved cyclone warnings, more cyclone shelters, awareness building, and highly developed disaster risk management capabilities. Cyclone “Amphan” occurred in 2020 and affected more than a million people in 26 districts (including the most severely affected districts of Satkhira, Bagerhat and Patuakhali). More than 26 people were killed; 55,667 houses, 149,000 ha agricultural lands, 180,500 hatcheries, a total of 150 kms of embankments, 200 bridges and culverts, 100 km of roads were damaged causing a total loss of BDT 11 billion (IFRC, 2020).

Strom surges with 10 m height hit Bangladesh coast once in 20 years and storm surges with 7m height hit Bangladesh coast once in 10 years. Previous records indicate that the greatest damage during cyclones has resulted from the inundation caused by cyclone-induced storm surges. Though time-series records of storm-surge height are scarce, existing literature indicates a 1.5 m to 9 m height range during various severe cyclones.

### 2.3 Stakeholder Mapping

A total of 209 stakeholders have been identified through internal consultations, brainstorming sessions and KIIs. For the convenience of the whole process, these stakeholders have been categorized into seven categories that are mentioned below:

- Ministries
- Departments
- Research Institutes and Academia
- NGO
- INGO
- CSO
- Development Partners
- Private Sector

After identifying and categorizing the stakeholders, assessment was done to identify their Level of Influence, Impact and Level of Support in the ECC sector. Based on the outcome of this analysis, a power map has been prepared to highlight which stakeholders are powerful or influential in ECC sector. The level of influence of the stakeholders is crucial to understand their influence in decision making from the perspective of the ECC sector. Likewise, the criteria ‘impact’ will guide the SAP by giving an analytical overview of these stakeholders regarding their impact on the community or society regarding climate change-related vulnerability reduction. The criteria ‘Current Level of Support’ tries to identify the level of cooperation among stakeholders (both government or others) in their ECC related operations. The detailed assessment criteria are as follows:

Level of Influence	Impact	Current Level of Support
1 = No decision-making authority or Influence	1 = Very low	1 = Negative
2 = Some influence but not critical	2 = Low	2 = Resistant
3 = influence but no decision authority	3 = Medium	3 = Compliant
4 = Medium level decisions and influences decisions	4 = High	4 = Interested
5 = Key decisions and critical in influencing	5 = Very high	5 = Positive

Depending on the category, stakeholders may have varying responsibility, power/influence, and impact, which suggests different ways to deal with these stakeholders. Stakeholders with high power/influence and low impact must be considered sincerely due to their high level of influence/power by informing them and inviting them in collaboration. Those with low interest and low power shall be only involved with minimum effort. A stakeholder with low power but high interest shall be kept informed and involved (if possible). Finally, the high influence/power, high-interest stakeholders shall be closely involved and informed. The outcome of the whole process is five power maps that are explained below:

### 2.3.1 Power Map 1: Ministries and Departments

Ministries are the top tier stakeholders in ECC related activities. Departments under the ministries work closely with them. So, a power map (Figure 2.2) containing departments and ministries has been prepared to understand their power or influence. The most influential/ powerful ministries for the ECC sector are the Ministry of Environment, Forest and Climate Change (MoEFCC) and all the agencies under the ministry; Ministry of Agriculture (MoA) and the relevant agencies under the ministry; Ministry of Fisheries and Livestock (MoFL) and the relevant agencies under the ministry; Ministry of Water Resources (MoWR) and the relevant agencies under the ministry; Ministry of Land (MoL) and the relevant agencies under the ministry; Ministry of Disaster Management and Relief (MoDMR) and the relevant agencies under the ministry; Ministry of Local Government, Rural Development and Cooperatives (MoLGRD) and the relevant agencies under the ministry; Ministry of Finance (MoF) and the relevant agencies (e.g., IDCOL) under the ministry and Ministry of Planning (MoP) etc. Moreover, departments such as BWDB, BRDB, DoF, DoE, BCCT, DLS, DAE, LGED, WARPO, BRRI, BARI, BARC, BFCF, FD and PKSF, BIDS, etc. have been identified as stakeholders with high impact and support while having less influence/power in ECC sector than the ministries.

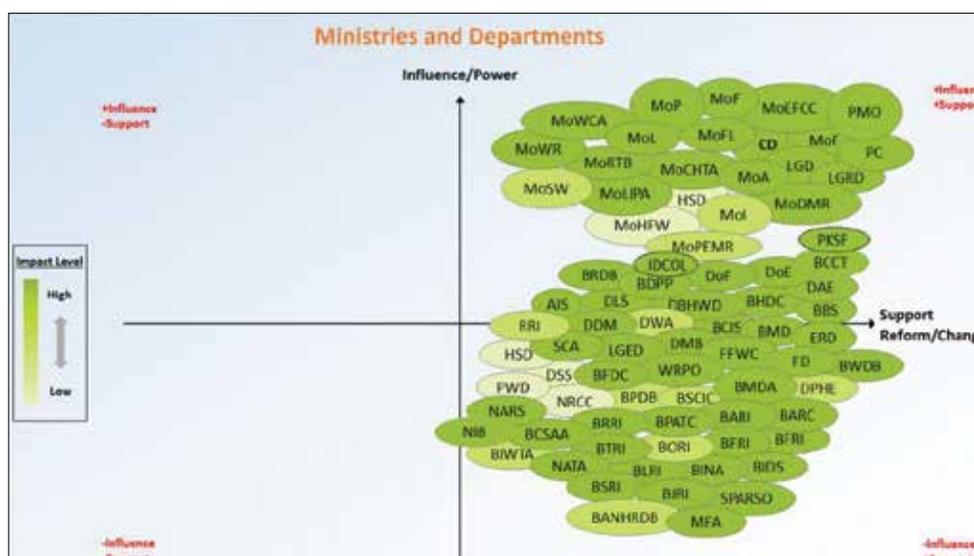


Figure 2.2: Power Map of Ministries and Departments

### 2.3.2 Power Map 2: NGO, INGO and CSO

As NGOs, INGOs, and CSOs work closely, in some cases conduct, fulfil, or observe similar responsibilities, they are kept in the same power map (Figure 2.3). NGO and INGOs such as CIRDAP, BRAC, IUCN, CARE,

CCDB, USAID, RDRS, NACOM, BCAS, UKAID and Embassy of the Kingdom of Netherlands, etc. have high influence/power, impact, and support in ECC sector. In contrast, there are so many organizations with a lower power/influence with different level of impact and supports in the ECC sector. CSOs such as Bangladesh Environment, Health and Education Program (BEHEP), Bangladesh Environmental Lawyers Association (BELA), Environment Concern Foundation, Environment & Social Development Organization etc., has a comparatively lower level of power/influence with a medium level of influence and compliant in supporting or interested.

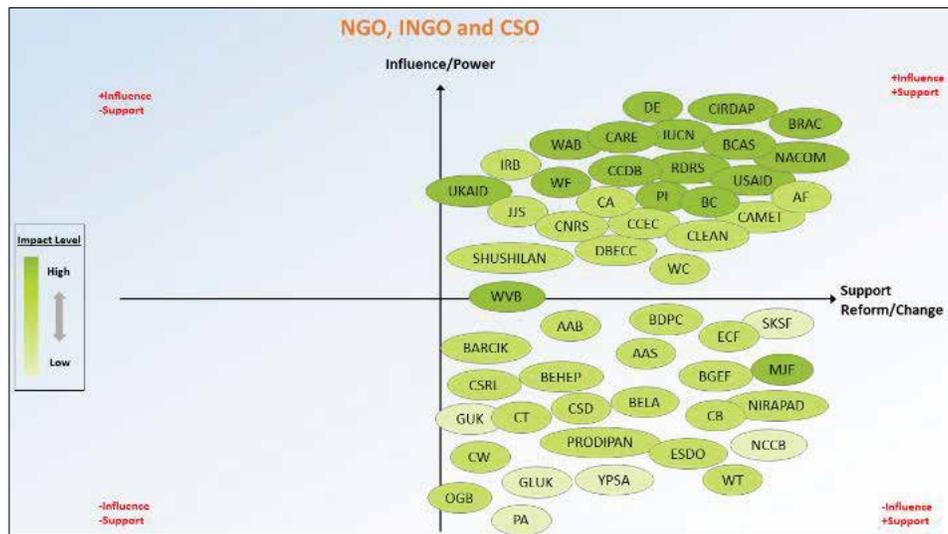


Figure 2.3: Power Map of NGO, INGO and CSO

### 2.3.3 Power Map 3: Research Institutes and Academia

All the stakeholders under this category have a positive level of support with a high to medium level of impact. The power/influence, however, varied. For example, BUET, BAU, SBAU, IWM, CEGIS, SAU, SRDI, BSMRAU, CPRD, C3ER, CPD and ICCCAD etc., have been identified as the most influential or powerful stakeholders in ECC sector. The Figure 2.4 shows the associated power map.

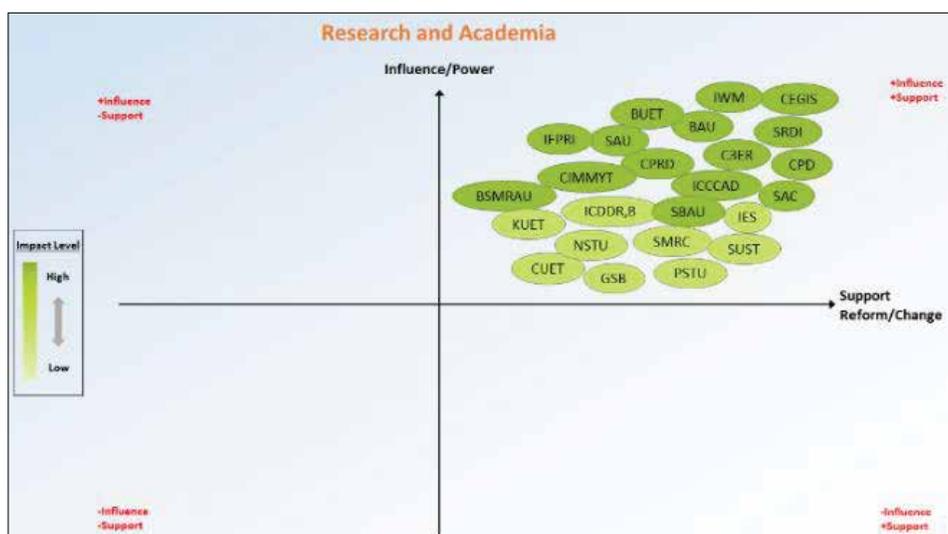


Figure 2.4: Power Map of Research Institutes and Academia



Figure 2.5: Power Map of Development Partners

#### 2.3.4 Power Map 4: Development Partners

Development partners such as the World Bank, GCF, SIDA, FAO, FCDO, ADB, UNDP, IFAD, IFC, EU, USAID, KFW, WFP etc. have been identified as the most influential ones from the stakeholder’s list (Figure 2.5). They have a high level of impact and support. While development partners like JICA, GIZ, CIDA, IOM, UNW, WHO and UNH, etc., have comparatively low influence and a high level of impact and interest in support.

#### 2.3.5 Power Map 5: Private Sector

The Government has taken initiatives to ensure that ministries, department, agencies build relationships with the private sector, NGOs, and the research community in the areas of monitoring compliance and knowledge management, including data collection and policy research during the tenure of 8<sup>th</sup> FYP. Among an enormous list of private sector stakeholders, focus has been given on agriculture, water and land management as well as environment and climate change while shortlisting the stakeholders of private sector (Figure 2.6). Private sector stakeholders such as Abdul Monem Group, ACI Ltd., Walton Group, BRAC Seed and Agro Enterprise, Bashundhara Group, Square Group, Lal Teer Seed Ltd., etc. have been identified as the most influential ones from the stakeholder’s list. They have a high level of impact and support. Stakeholders like BRAC Bank Ltd, Southeast Bank Ltd., the City Group also have a high level of support but their level of impact is medium. In contrast to that, Kazi Agro, Nilshagor Group, Tanzan Agro Ltd. etc. have comparatively low influence and a medium to low level of impact and interest in support.

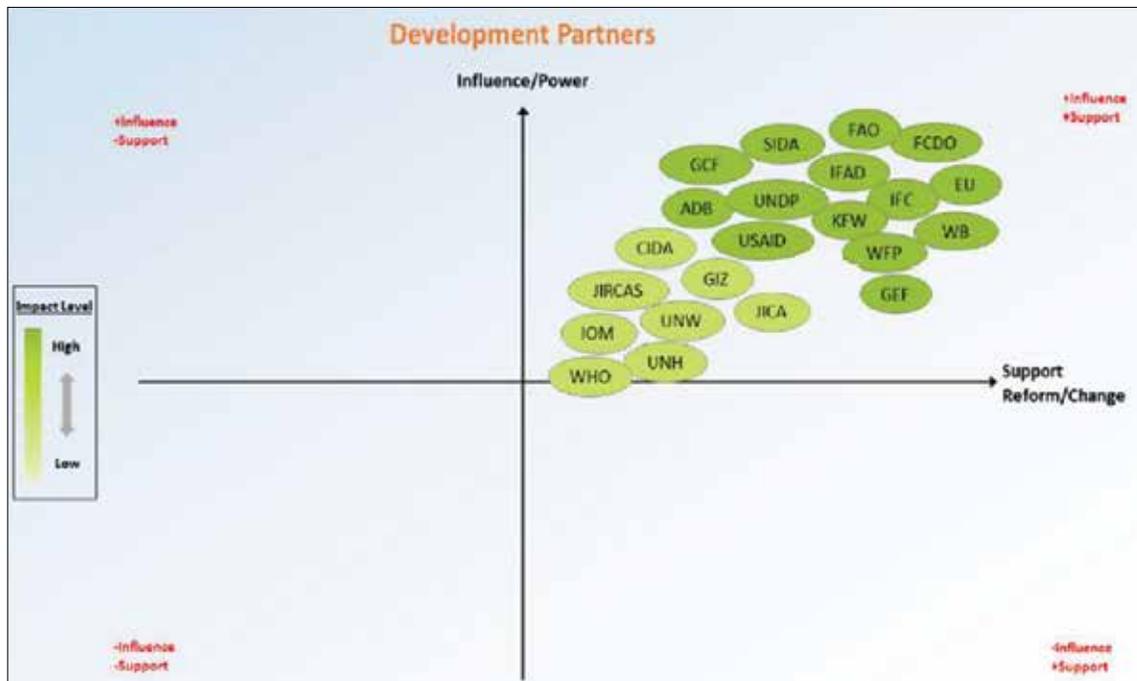


Figure 2.6: Power Map of Private Sector

## **Chapter 3**

# **Assessment of Priority Area for Sector Actions**



## Chapter 3: Assessment of Priority Area for Sector Actions

### 3.1 National Policy Landscape of ECC Sector

A large number of policies, legislations, plans or strategic documents are already present in Bangladesh, which directly or indirectly are aligned with the different thematic boundaries of this plan. A total of 130 latest policy documents till 2022 have been reviewed to understand the alignment of the policy documents with the objectives of this SAP ECC (presented in Annex-1). These documents cover legislation, policies, plans and strategies. This reflects gaps or future needs to address or integrate in some of the relevant policy documents through necessary reforms or update to accommodate various important, emerging and cross cutting agenda of this plan.

### 3.2 Achievements of Past Initiatives

Due to being highly vulnerable to climate change, the government has recognized that noteworthy initiatives to tackle the adverse effects of climate change are in dire need for the continuation of the current growth pace. In this context, Bangladesh government has started to take significant initiatives since 2008 which include preparation of NAPA, formulation of BCCSAP and its implementation, development of Bangladesh Climate Change Trust Fund (BCCTF) and Bangladesh Climate Change Resilience Fund (BCCRF), initiation of NAP process, selection of NDA, submission of INDC and NDC update, formulation of Bangladesh Delta Plan (BDP) 2100 etc.

Apart from developing plans and policies considering climate change adverse impacts, GoB has also given emphasis on agriculture sector to address the climatic effects on the production and ensure food security. As water and land have linkages on agriculture production, some noteworthy initiatives have also been taken by GoB addressing climate induced stresses on water and land. A brief discussion is presented in Table 3.1 on the past initiatives so far taken in Bangladesh focusing on ECC sector:

**Table 3.1: Past Initiatives in Bangladesh Related to ECC Sector**

Thematic Cluster	Sub-Cluster	Year	Landmark Initiatives	Major/Key Achievements
Climate Change Adaptation and Mitigation	Climate Smart Agriculture	2019	Agricultural support project for small farmers in the south-western region of Bangladesh (DAE)	Utilization of fallow land, increasing crop intensity and amount of fertile land through application of new techniques of crop cultivation and saline tolerant varieties in 58 upazilas of 9 districts of south-western region
		July 2017- June 2022	Pilot project on expansion of solar energy and water-saving modern technology to increase crop production (DAE)	Saving the use of fuel oil/electricity through using solar energy, increasing irrigation efficiency through introducing modern water management technology, increasing the use of surface water for irrigation purpose and reducing the usage of ground water, reducing irrigation cost and enhancing conservation of nature

Thematic Cluster	Sub-Cluster	Year	Landmark Initiatives	Major/Key Achievements
Climate Change Adaptation and Mitigation	Climate Smart Agriculture	July 2017- June 2022	Research, expansion and popularization of vegetable and spice cultivation in floating bed project (DAE- Wing)	Increased diversification of crop production in submerged condition, encourage small scale farmers to cultivate vegetables and spices in a floating manner, encouraging women in agricultural activities to empower them in development and economic activities
		July 2016 - June 2021	Improving agro-meteorological information system project (DAE)	Provide information on agro-climatic conditions to farmers in order to make agricultural production sustainable, increase the ability of farmers to adapt the adverse effects of weather and climate, increasing DAE's capacity through improving agro-meteorological information system
		October 2018 - June 2023	Safe crop production project through adapting environment friendly strategies (DAE)	Ensuring food and nutrition safety of the people, increasing farmer's technical skills, increasing women involvement and income opportunity
		July 2015- June 2021	Irrigation expansion project with surface water through double lifting (BADC)	Reduced use of groundwater for irrigation purpose
Climate Change Adaptation and Mitigation	Land and Water Management	January 2017- June 2018	Climate Smart Agricultural Water Management Project (CSAWMP) (BWDB)	Reduced vulnerability and enhanced livelihood opportunities for the beneficiaries, enhance agriculture & aquaculture production by improving the irrigation water use efficiency, create a favorable environment for improved water resources management by the core water institutions, in partnership with the beneficiaries
		January 2011- December 2016	Char Development and Settlement Project-4 (CDSP-4)	Reduced social, institutional and environmental vulnerability of char areas

Thematic Cluster	Sub-Cluster	Year	Landmark Initiatives	Major/Key Achievements
Climate Change Adaptation and Mitigation	Land and Water Management	January 2013 - June 2018	Blue Gold Program (BWDB Component)	Increased sustainability of the development of the polders through effective community participation, effective use of the water resources and protection against flooding, increased farmers income and strengthened livelihoods through improved farm, improved living environment productivity
		July 2013- June 2020	Coastal Embankment Improvement Project (Phase-1) (BWDB)	Increased area is protected in selected polders from tidal flooding and frequent storm surges, which are expected to worsen due to climate change, improved agricultural production by reducing saline water intrusion in selected polders, improved capacity of the government of Bangladesh to respond promptly and effectively to an eligible crisis or emergency
		July 2014 - June 2018	Flood and River Bank Erosion Risk Management Investment Program (BWDB)	Improved stability of the country's main rivers including Jamuna, Padma, Ganges and Meghna through financing & completion of the construction of riverbank revetments and flood embankments or levees
		July 2014 - June 2022	Haor Flood Management and Livelihood Improvement Project (BWDB Part)	Flood Management in 29 Haors, agricultural Promotion and Income Generation Activities
		July 2014- June 2019	Irrigation Management Improvement Program (IMIP) (BWDB)	Modernize the Muhuri-Kahua Irrigation Project in Chittagong and finance the feasibility study and detailed design for the upgrade of Ganges-Kobadak and Teesta irrigation projects in Khulna and Rangpur, establishment of performance-based irrigation management and agriculture support services

Thematic Cluster	Sub-Cluster	Year	Landmark Initiatives	Major/Key Achievements
Climate Change Adaptation and Mitigation	Land and Water Management	July 2015- June 2017	Model Validation on Hydro-Morphological Process of the River System in the Subsiding Sylhet Haor Basin (DBHWD)	To know the inherent morphological process of the river system in the Haor areas in order to manage the rivers more efficiently, Enhance the knowledge on hydro-morphological behavior of the Surma and Kushiara rivers in the Sylhet basin
		July 2015 - December 2017	Classification of Wetlands of Bangladesh (DBHWD)	Classification of Wetlands of Bangladesh, strengthened role of Department of Bangladesh Haor and Wetland Development as a primary source of information on wetlands resources
		June 2015- 2019	Study for Investigation of Groundwater and Surface Water Irrigation in Habiganj, Maulvibazar, Sylhet, Sunamganj, Netrokona and Kishorganj District (DBHWD)	The present situation of surface and ground water investigated and a mathematical model developed
		2015-2020	Study of Interaction Between Haor and River Ecosystem Including Development of Wetland Inventory and Wetland Management Framework	Inventory of the wetlands in place through classification of satellite images, delineations of wetlands, study of interaction between haor and river ecosystems and LiDAR survey of Tanguar haor for an area of approximately 120 sq. km. for empirical data collection
		2020-2024	Establishment of Digital Land Management System (MoL)	Ensuring collection, scanning, digitization, database creation, editing plot checking, geo-referencing mouza map, matching of mouza map, and field checking of some 1,38,412 sheets of maps
		2015-2020	Gucchagram (Climate Victims Rehabilitation) Project (MoL)	Living accommodation in place for the climate victims and river eroded victims who have become landless, homeless, without a permanent address on khas land, making all such rehabilitated families owner of a piece of homestead land and settled

Thematic Cluster	Sub-Cluster	Year	Landmark Initiatives	Major/Key Achievements
Climate Change Adaptation and Mitigation	Green Growth and Low carbon Development	2018	Biogas-Based Power Projects (IDCOL)	Biogas based electricity plants established in the poultry farms in order to reduce dependency on fossil fuel used forerunning captive generators
		2018-2021	Afforestation in Coastal Region including the Newly Accreted Chars of Bay of Bengal (BFD)	Accelerated accretion and stabilized newly accreted char land, increase green vegetation coverage as protective shelter belt against cyclone and tidal surge as adaptive measures against adverse effects of climate change, increase carbon sink to help mitigate climate change impacts
Environmental Pollution Control, Biodiversity Conservation and Forest Management	Pollution Control, Pest and Diseases Management	2020-2021	Development and Expansion of Bio-Rational Based Integrated Pest Management Technologies of Vegetables, Fruits and Betel Leaf (BARI)	Awareness raised through organizing day long Trainers training workshop (ToTs) for the teachers of different educational institutions titled 'Insects and diseases management by using bio pesticides-based technology in fruits and vegetables'
		2010-2018	CDM Project Using Municipal Organic Waste of Towns (City Corporation/ Municipality) in Bangladesh (Phase-1)	Municipal organic waste converted to resources and the production of Green House Gas (GHG) emission reduced; National 3R (reduce, reuse and recycle) Strategy for Waste Management implemented, and alternative income for poor people of urban areas created
		2012-2019	Strengthening Phytosanitary Capacity in Bangladesh Project (DAE)	Awareness raised about plant health at global, national and regional level and support implementation of International Plant Protection Convention (IPPC) through Pest Risk Analysis of listed 133 insect and mite pests on cereal crops, 83 on pulse crops, 125 on oilseed crops, 76 on fiber crops, 69 on sugar crops, 39 on tuber crops, 190 on vegetable crops, 313 on fruit crops, 75 on spices crops, 87 on flower crops, 546 on forest trees, 71 on narcotics and beverage crops and 133 on medicinal plants

Thematic Cluster	Sub-Cluster	Year	Landmark Initiatives	Major/Key Achievements
Environmental Pollution Control, Biodiversity Conservation and Forest Management	Ecosystem and Biodiversity Conservation and Forest Management	2016-2020	Ecosystem based development, management and conservation of the Saint Martin's Island (DoE)	Enhanced biodiversity of the Saint Martin's Island (Narikel Jinjira); community engaged in conservation initiatives and community members livelihood improved and eco-tourism promoted; Waste management system developed at Saint Martin's Island
		2013-2018	Climate Resilient Ecosystems and Livelihood (CREL) in ECA (DoE)	Ecological Critical Areas (ECAs), wetlands and Protected Areas (PA), improve governance of natural resources and biodiversity, and increase resilience to climate change through improved planning and livelihoods diversification to realize Bangladesh to become a knowledge-based, healthy, food-secure, and climate-resilient middle-income Country
		2013-2018	Implementation of the National Biosafety Framework of Bangladesh (DoE)	Implementation of the National Biosafety Framework in compliance with the Cartagena Protocol on Biosafety through enhancing the existing capacity on Biosafety at the institutional, individual and systemic levels of Bangladesh as well as to address national needs and priorities on conservation of biological diversity and protecting human health
Cross Cutting	Enhanced Finance	2009	Bangladesh Climate Change Trust Fund (BCCTF)	Till 2022, 790 projects have been approved (more than 700 projects have been implemented by government ministries and the rest are implemented by NGOs)

Thematic Cluster	Sub-Cluster	Year	Landmark Initiatives	Major/Key Achievements
Cross Cutting	Enhanced Finance	2014	Nomination of Economic Relations Division (ERD) to GCF	Broad strategic oversight of the funds' activities provided in Bangladesh; convene relevant public, private and civil society stakeholders to identify priority sectors to be financed by the fund; financed by the fund; Communicate nomination letters to entities seeking accreditation to the fund under direct access; implement the no-objection procedure on funding proposals submitted to the fund; ensure consistency of funding proposals with national climate change plans and priorities; provide leadership on the deployment of readiness and preparatory support funding in the country
	Institutions and Governance	2008	National Adaptation Programme and Action	38 adaptation measures, 16 under implementation (8 short term and 8 medium term projects)
		2013	Climate Change and Gender Action Plan	Gender equality in climate change related policies, strategies and intervention ensured
		2009	Bangladesh Climate Change Strategy and Action Plan	44 programs (short, medium and long term)
		2018	Bangladesh Delta Plan 2100	BDP2100 proposes the long term strategy for the country's development considering various issues and challenges including future climate change. Among the 80 projects, 34 projects have been identified as linked to environment and climate change.
		2012	Haor Master Plan	Main focus is agricultural development for ensuring food security, biodiversity enhancement and wetland management in the haor area

Thematic Cluster	Sub-Cluster	Year	Landmark Initiatives	Major/Key Achievements
Cross Cutting	Institutions and Governance	2021-2022	Mujib Climate Prosperity Plan	The MCPP proposes a shift in Bangladesh's trajectory from one of vulnerability to resilience to prosperity (VRP). The Plan's principal aims are to secure Bangladesh's prosperity by 2041, launching an economic transformation with proposed actions under 6 key priority areas. The actions follow climate resilience, adaptation and green growth.
	Compliance and obligations under MEAs and UN conventions/ protocols	2015	Intended Nationally Determined Contribution (INDC)	Bangladesh prepared and submitted INDC pursuant to the pledge made before the Paris agreement on limiting the global GHG emission and global warming.
		2020-2021	Updating of Nationally Determined Contribution (NDC)	The country has taken an initiative to update the NDC commitments incorporating all economic activities and enhance the target for GHG emission reduction.
		2020-2022	National Adaptation Plan (NAP)	A total of 23 adaptation strategies with a total of 113 interventions have been proposed under 8 devised sectors for achieving these strategies and achieving 6 goals and vision of the NAP. The NAP has been developed in a stakeholder driven process incorporating scientific knowledge and innovation.
		2014	Bangladesh National Action Plan for Reducing Short Lived Climate Pollutants	16 key measures (7 measures for reducing CH <sub>4</sub> from major sources) have been proposed.
		2017	Bangladesh Biodiversity Act	A sophisticated GMO Dictation Lab established in Department of Environment for enhancement of biosafety, establishment of Web Based Networking System

Thematic Cluster	Sub-Cluster	Year	Landmark Initiatives	Major/Key Achievements
Cross Cutting	Research, Innovation, Knowledge Management and Capacity Development	2015-2018	National Capacity Development for Implementing Rio Conventions through Environmental Governance	Institutional capacities developed for management of global environment; Mainstreaming of global environmental conventions (Rio conventions) into human resource development
		2016-2018	Strengthening Institutional Capacity to Reduce Short-Lived Climate Pollutants (SLCPs)	Main Objective of the SLCP project is to sustainability increase the level of the action taken in Bangladesh to reduce SLCPs by further promoting the coordination and the scaling up of activities to reduce SLCPs at the National level
		2018- 2021	Strengthening the activities of Agricultural Training Institutes (DAE)	Activities of Agricultural Training Institutes strengthened, and infrastructure and facilities developed through creating skilled manpower with technical knowledge on agriculture

### 3.3 Institutional Capacity Need

The selected vital ministries, department and agencies have been reviewed using the information provided on their websites and in accessible documents. Furthermore, the study team has organized several virtual KII sessions to explore the organizations’ strengths, weaknesses, opportunities, and threats. A set of indicators have been used for the KII sessions (Figure 3.1) using six leading indicators and multiple sub-indicators. Several sub-indicators have been used to get the real insights for assessing the capacity needs. Moreover, 8<sup>th</sup> Five Year Plan (FYP) has been reviewed to identify different aspects of sector-specific institutional capacity needs. The review outcome helped the study team create a synergy between the national plan and identified institutional capacity needs.



Figure 3.1: List of Indicators for the Assessment

### 3.3.1 Methodology Used for Stakeholder Participation and the Institutional Analysis

CEGIS and C3ER extensively reviewed the organizations' websites and accessible documents. Furthermore, officials from CEGIS and C3ER had several virtual KII sessions to explore the organizations' strengths, weaknesses, opportunities, and threats. Finally, for the SAP institutional setting has been prepared at the institutional level using this information.

For the assessment, a set of indicators were developed. After a thorough assessment, using six main indicators and multiple sub indicators, the following Table 3.2 resulted, presenting the indicators.

**Table 3.2: List of Indicators for Institutional Analysis**

Primary Indicators	Sub Indicators
Issues and Challenges Need to Be Addressed Related to ECC Sector	<ul style="list-style-type: none"> <li>• What are the issues and challenges needed to be addressed in respect to sector ECC and functions of your organization?</li> <li>• What strategies and which type of projects should be emphasized to be included inside the ECC sector?</li> </ul>
Institutional arrangements	<ul style="list-style-type: none"> <li>• What is the type of organization, i.e. implementing/ monitoring/ regulatory?</li> <li>• Is there any ECC related unit within the organization?</li> </ul>
Policy and Legal Framework	<ul style="list-style-type: none"> <li>• Is there any specific mandate on climate change/ environment within the organization?</li> <li>• What is the level of the jurisdiction of the organization, i.e., national/ sub-national/ local?</li> <li>• What is the priority working areas/sectors of the organization?</li> <li>• What is the mechanism of prioritization of environment and climate change-related projects? Is there any mechanism exists?</li> </ul>
Project Implementation	<ul style="list-style-type: none"> <li>• Does the organization have a specific plan for the next 5 years for ECC related projects?</li> <li>• How many ECC related projects so far has been completed by the organization and allocation/disbursement of budget against 7<sup>th</sup> FYP?</li> </ul>
Challenge/Problems	<ul style="list-style-type: none"> <li>• What challenges/problems is the organization experiencing at the time of preparing, implementing (resources mobilization like financing, technical resources, Technology Transfer or Extension, institutional framework, and coordination) and monitoring, etc. of ECC related activities/projects.?</li> </ul>
Knowledge/Capacity	<ul style="list-style-type: none"> <li>• Is there adequate skilled Human Resource for project planning, implementation, evaluation and monitoring of the projects?</li> <li>• Is there adequate skilled Human Resource for development of Terms of Reference (ToR), concept note, proposal, Development Project Performa (DPP), preparation of the budget, and conducting feasibility study, etc.?</li> <li>• What are your institutional capacity development needs in respect to sector ECC?</li> </ul>
Accountability	<ul style="list-style-type: none"> <li>• What is the Monitoring and evaluation mechanism (APA or Result based framework) of the organization?</li> </ul>

### 3.3.2 Insights on Institutional Capacity Needs

According to the 8<sup>th</sup> Five Year Plan, agriculture is a key supply-side determinant of food security and nutrition; water resource and land management are the most important input to agriculture but has much broader implications due to climate change and natural disasters (GED, 2020). Thus, this section mainly focuses on the institutional capacity needs on agriculture (agriculture, fisheries and livestock), water resources and land management aligned with the environment and climate change issues. The following is an overview of institutional capacity needs for various ministries, departments, agencies, non-governmental organizations (NGOs), international non-governmental organizations (INGOs), development partners, training/research institutes, and academia.

- **Promoting Sustainable Agriculture:** Several technologies and methods, such as organic farming, Integrated Pest Management (IPM), Alternative Wetting and Drying (AWD), and others, were identified and suggested in current plans and policies. Those documents emphasized coordination and collaborative activities of various government ministries and agencies, including the Ministry of Agriculture (MoA), the Ministry of Environment, Forest and Climate Change (MoEFCC), the Ministry of Land (MoL), the Ministry of Water Resources (MoWR), and the Local Government Division, for the success. The actual adoption status, however, has not achieved the required level. Moreover, fostering collaboration between public-private and international organizations is also critical in this regard. Furthermore, comprehensive capacity building initiatives (through knowledge and skill enhancement) for the employees of these organizations are required, especially on the following:
  - Practices for protecting and conserving the environment by promoting technologies such as sex pheromone, botanical pesticides, biological control, etc.
  - Surface and rainwater utilization
  - Solar energy utilization
  - Rain-fed agriculture
  - Better protection of biodiversity (plant, animal, fisheries, pollinator, etc.)
  - Food safety, nutrition, and dietary diversification
  - Natural resource management (land, water and biodiversity)
  - Sustainable but economically profitable farming practices
- **Conducting Research on Advanced Varieties and Increase Productivity:** It is essential to conduct research to develop area-specific advanced varieties and increase productivity. Institutes of the National Agricultural Research System (NARS) and agricultural universities must play a significant role in developing relevant new technologies. The Department of Agricultural Extension (DAE) could oversee new technology diffusion at the agricultural field level. The MoA may take the lead in ensuring adequate coordination among the other ministries. For example, in rice, a short-duration variety of Aus rice to prevent climate uncertainty during the late summer is critical. Research is also required to reduce the yield gap by enhancing productivity and employing modernized and relevant technology. Research is also required to close the production gap by enhancing productivity and implementing modern and suitable farm-level technology. It is crucial to develop a skilled employee base for MoA, DAE, research institutes and academia, etc. to efficiently carry out such research and coordination.

- **Water Usage Optimization:** Bangladesh Water Development Board (BWDB), under the MoWR looks after the flood control, drainage and irrigation projects to increase productivity in agriculture and fisheries. Local Government Engineering Department (LGED) under MoLGRDC is one of Bangladesh's largest public sector organizations entrusted with planning and implementing local-level rural-urban and small-scale water resources infrastructure development programs. The DAE under MoA offers efficient and effective needs-based extension services to all farmers to help them maximize resource utilization and promote sustainable agricultural and socio-economic development. So, coordination between MoWR, MoLGRDC and MoA and their agencies is crucial for ensuring optimal water resources management for agriculture. In addition to coordination, comprehensive and transformative capacity building for the ministries mentioned above and agencies are required. Technologies such as crop diversification, enhancing irrigation efficiency, enhancing conveyance efficiency (e.g., buried pipe, PVC/plastic/polythene pipe, etc.), and on-farm water use efficiency (e.g., drip irrigation, fertigation through drip irrigation system for the non-cereal crops, etc.) can be included for the capacity building and skill development activities. It is equally important to emphasize conservation and sustainable management for water for inland fisheries.
- **Sustainable Seed Production and Fertilizer Usage:** The Bangladesh Agricultural Development Corporation (BADC), DAE, and other relevant government organizations must improve their capacity for seed production in compliance with adaptation to climate change-related challenges. Research and capacity development for relevant agencies are required for environmentally friendly practices like reducing urea use and increasing non-urea fertilizers, etc.
- **Sustainable Land Use Management and Crop Zoning:** Given the rising need for food production, it is critical to encourage optimal land use and conservation to increase production efficiency. Priority needs to be given to comprehensive land use planning that incorporates economic, ecological, environmental, social, and cultural aspects into production. The 8FYP emphasized soil and water conservation, land development, drainage and flood management, and reclamation initiatives. Land-use planning has also been encouraged, and crop zoning as a tool to control production programs. MoL, in collaboration with MoA and their agencies, can work on these aspects through their transformative capacity building actions. Other ministries such as MoWR, MoEFCC and/or their agencies can also be invited to collaborate.
- **Introducing Good Agricultural Practices (GAP):** A remaining agenda from 7FYP and emphasized on 8FYP is introducing the Good Agricultural Practices (GAP). GAP is built on four pillars, i.e., economic viability, environmental sustainability, social acceptability, and food safety and quality. Research, extension, and knowledge base development are expected to facilitate the approach. Coordination and combined approach of various government ministries and agencies, including the MoA, MoEFCC, MoL, MoWR, and the Local Government Division is required to carry out these activities. GAP implementation will ensure the safety and quality of food and other agricultural goods, capture new market possibilities for farmers and exporters, and enhance natural resource utilization, etc. It would also be a significant endeavor to encourage regenerative agriculture, which attempts to absorb carbon in soil and aboveground biomass to reverse present worldwide patterns of atmospheric buildup.
- **Post-Harvest Management and Agro-Processing:** Agricultural research institutes such as BARI and BRRI need to conduct research on post-harvest management technology development,

such as packaging and agro-processing. For a successful output, need-based capacity development and fund management must be arranged for these organizations. However, some technologies are already available in these organizations to develop and expand the agro-processing industry. Nonetheless, some specialized extension efforts, such as those connected to fruit and vegetable industries, might be entrusted to the private sector. In that case, close and efficient collaboration and coordination between the mentioned government agencies/institutions/ministries and the private sector is a must.

- **Research and Development to Enhance Livestock Productivity:** The research capacities of BLRI and other universities and research institutions engaged in relevant research activities needs to be strengthened to address national priorities and harness the enormous potential of regional livestock resources. Such capacity-building initiatives are also required to ensure the safe and environment-friendly production of animal products and by-products, animal protein supplements, feed additives, premixes, probiotics, mineral and vitamin supplements, etc. Initiatives can be launched to promote and facilitate private organizations and non-governmental organizations (NGOs) conducting livestock research.
- **Promoting climate smart health management:** Emerging and remerging disease outbreak is one of the main impacts of climate change on livestock. Frequent disease outbreak increases animal death and reduce productivity remarkably. Regular vaccination, deworming, biosecurity, health practice can reduce climate induced disease outbreak and increase productivity of livestock.
- **Introducing climate smart feed management:** Enteric fermentation is one of the main sources of methane emission from large ruminants. Balanced ration can help optimizing productivity and minimizing CO<sub>2</sub> eq emission from /kg production. Some feed additives like sea algae, charcoal, minerals, some grasses and other ingredients can reduce enteric methane emission remarkably and can also increase production of milk, meat and eggs.
- **Breed upgradation:** Native cattle produce minimum amount of milk, meat and egg. If we can replace our native breed with high yielding variety then productivity will increase and emission will decrease. Artificial insemination and breed upgradation technology can help to uplift production with minimum emission.

### 3.4 Alignment with National Goals and Targets

Sector specific several targets have been developed under 8<sup>th</sup> Five Year Plan to boost up the current economic growth considering all the existing and possible hindrance mostly focusing on climate change. Climate Change is impacting agriculture, livestock, fisheries and water sector are the most vulnerable sectors. The specific targets developed under 8<sup>th</sup> FYP considering environment and climate changes effects are summarized in the following sections.

#### *Agriculture sector*

Agriculture sector strategies in relation to Environment and Climate Change include the following:

- development of crop varieties for rice (25 varieties) and non-rice (2000 genetic resources, 100 climate resilient varieties);
- introduction of organic fertilizer use and organic pest management system;

- extending credit facilities to farmers through banks and other financial institutions at a low rate of 2 per cent;

achieving expanded digitalization of market access and market linkage activities and establishing e-agricultural marketing;

- providing services to farmers regarding balanced fertilizer application through Online Fertilizer Recommendation System (OFRS) and Offline Fertilizer Recommendation System (Mobile Apps);

conducting reconnaissance soil survey of the whole country, detailed/semi-detailed soil surveys of development project, for updated information and locating areas of problem soils (e.g., toxic, saline, alkaline or peat soils) and investigating soil degradation and erosion especially in hilly areas for planning reclamation, conservation and watershed management;

conducting several program for updating Upazila soil and land utilization guide; land, soil and fertilizer recommendation guide at union level; soil analysis and fertilizer card distribution; Upazila wise updated soil and land related data entry for OFRS; updated soil and water salinity data generation for coastal saline areas; fertilizer sample analysis for quality control; demo plot for soil fertility management; farmers’ training on balanced fertilizer use and adulterated fertilizer identification; training of DAE/SRDI officers on Upazila Nirdeshika, Technology generation and transfer for sustainable soil management both for coastal saline areas and hilly area for ensuring sustainable soil management;

- Increasing crop productions by 2025 according to the following table.

Crop	Production in 2019 (Million MT)	Production Target (2025) (Million MT)
Rice	38.70	41.73
Wheat	1.25	1.46
Potato	10.29	12.54
Oil seed	1.15	1.29
Vegetables	18.45	23.96
Maize	5.40	6.89
Spices	3.95	4.36
Pulses	1.05	1.25
Jute	6.82*	8.03*

\* in Million bales

### Livestock Sector

Considering the livestock issues revealed due to climate change, the 8FYP plan sets a target to expand the production of milk from 9.92 million MT in 2018-19 to 16.37 mil. MT in 2024-25; meat production from 7.5 to 8.51 million MT, and egg production from 17,109.7 to about 22,400 million pieces through enhancing productivity by using modern biological techniques, adopting appropriate disease diagnosis and treatment, and by addressing climate smart livestock interventions for safeguarding nutritional food security.

## Fisheries Sector

The 8FYP Plan targets to increase the participation of women in aquaculture production, fisheries, CBOs/Co-management and fish/ shrimp processing industries by 30% along with increasing the production from 1.28 million MT in 2020-21 to 1.36 mil. MT by 2024-25 for open water areas, from 2.57 to 2.91 million MT by 2024-25 from aquaculture and from 6.97 to 7.3 million MT by 2024-25 from marine fisheries in order to increase resilience of fisheries sector against climate change. In addition, Good Aquaculture Practice (GAP) and Good Manufacturing Practice (GMP) will be promoted at all stages of fish/shrimp supply chain to comply international standards.

## Water Sector

Agricultural practices in Bangladesh are largely determined by the hydrological cycle. There is a need to strengthen the protection measures against various climate change event, such as farmer's protection against flooding in wet seasons, irrigation in dry seasons, supplementary irrigation even in wet seasons, protection against saline water intrusion in coastal areas, proper drainage both in wet and dry seasons, protection against river erosion, and safeguard measures against the water-related hazards (storm surge/cyclone) in the coastal belt.

Thereby, some extensive targets have been developed under 8<sup>th</sup> FYP for water sector considering climate change effects, which includes

- protecting riverbank from erosion through integrated long-terms measures and conduct 2,356 km bank protection work each year during 8<sup>th</sup> FYP period;
- adapting strategies to mitigate climate change impacts;
- developing modern early warning systems to minimize economic losses from flood and other disasters;
- prevention of salinity intrusion through augmenting the freshwater flow in the southwest region including the Sundarbans; ensuring conjunctive use of surface and ground water for sustainable irrigation,
- securing groundwater conservation and implementing integrated coastal zone management strategies.

### 3.5 Maintaining Linkage with SDGs

The sustainable development goals are one of the major global goals for progress. Bangladesh government has adopted a whole of society approach to implement these goals. The SDGs were integrated with the country's 7<sup>th</sup> Five Year Plan (7FYP, 2015-2020) and these were given emphasis while setting the priority areas of the 7FYP such that the achievement of Plan objectives and targets also can contribute towards the achievement of the SDGs. A Development Results Framework (DRF) was also embedded in the Plan and the outcomes and targets in the DRF were aligned with the SDGs.

Bangladesh's implementation of the 2030 Agenda reflects the adoption of a coordinated approach in which partnership has been integral to 5Ps (people, prosperity, peace, partnership and planet) to define the overall architecture of sustainable development. During the period, the country has taken specific steps to ensure the required institutional framework including resource mobilisation, technology, capacity building, trade and systemic coherence. The systemic issues are sequenced as policy and institutional coherence, multi-stakeholder partnerships and data, and monitoring and accountability.

In this context, Bangladesh has taken several measures through embedding SDGs into the 7FYP (2015-2020), 8FYP (2020-2025) and the 2nd Perspective Plan (2021-2041); accomplishing mapping of ministries/agencies by targets; preparing action plans for all relevant ministries/agencies; and putting in place the needed monitoring and evaluation framework. Therefore, the Sector Action Plan should keep active linkage with SDGs and integrate the relevant targets in the sector actions and programs.



Figure 3.2: The Sustainable Development Goals

To ensure Sustainable Development Goals in Bangladesh by leaving no one behind in shortest possible time, a set of 39 indicators have been selected, under the instructions of SDG Working Committee of the Prime Minister’s Office. Under these indicators, some are selected from the global Sustainable Development Goals and some are selected after modification on Bangladesh perspective. All relevant ministries are connected with this process. These indicators have been considered in preparing the Sector Action Plan.

### 3.6 Priority Strategies of the 8<sup>th</sup> Five Year Plan

The 8<sup>th</sup> FYP reflects well thought actions and strategies to address the issues of environment, climate change adaptation and mitigation, and disaster risk reduction in a broader development context as well as maintaining harmony between economic growth and environmental sustainability that is essential to achieve the government’s aspiration of being a High-Income Country by 2041. Strategies promoting green growth has also been incorporated and emphasized in 8<sup>th</sup> FYP as the government has acknowledged that a sustainable economic growth can only be ensured when it is interlinked with environmental integrity.

In the 8<sup>th</sup> FYP, the strategy and activities formulated for the entire ECC sector have been segregated in three major sub sectors i.e., environment, climate change and forest. The prioritized strategy and activities for environmental subsector under 8<sup>th</sup> FYP include; Adoption for Environmental Fiscal Reforms (EFR) for Sustainable Development and implementation of necessary Administrative reforms for EFR, Environmental Institutional Reforms, Context-Specific Environmental and WASH Technologies/ Interventions, Implementation of the Bangladesh Delta Plan 2100 and Specific Activities to Improve Green Growth.

For the climate change sub sector, priority strategies and activities include; Strengthening of the Climate Change Trust Fund (CCTF) with additional funds and enhanced monitoring, enhanced partnership with international organizations to support knowledge and experiences sharing, facilitating the formulation and advancement of NAP process, initiatives to accelerate funding from GCF, enhancing activities related to technology transfer through CTCN and JCM, enhancing the understanding of climate change impacts on the livelihoods of local communities, actions to identify localized solutions for adaptation and improved coordination and knowledge sharing at the local levels through increasing the partnership with NGOs and civil society actors, enhancing women's knowledge of environmental management and conservation, Investing in education, capacity building, training, technology transfer and environmental projects focusing on women, Enhancing plantation and social forestry related actions to conserve and expand forest and tree coverage area and productivity, Activities for conservation of biodiversity in the Sundarbans with special attention to the Royal Bengal Tiger, Actions for facilitating migrant integration into the city, Undertaking a gender transformative climate action in the coastal districts, Mainstreaming the Leaving No One Behind principle across climate actions of the government, Enhancing the capacity and role of parliament, IMED, and OAG for improving governance mechanism for climate finance, Mainstreaming climate budget report, increasing the monitoring and remedial actions for arsenic removal in arsenic-prone areas on a routine basis, Basin-wide management of water resources, Increasing the protection of the resource base of surface water in greater Dhaka, Taking measures for protection and recovery of public water bodies from encroachment, Exploring options for harvesting rainwater, Establishment and implementation of effective regulations to control the discharge of cooling water from the power stations, Improvement of the compliance monitoring system for industries and development projects and its effective implementation, Developing strategy for managed aquifer recharge and introducing natural and artificial aquifer recharge systems using rainwater harvesting, Developing stringent water quality criteria for ECAs and RAMSAR sites, Reducing the use of harmful chemicals in agriculture, Establishment and implementation of CETP in industrial zones, Execution and enforcement of the 'Noise Pollution Control Regulation-2006', Building facilities for the treatment of waste in all major cities complemented with tax rebates and financial incentives for the production of environmentally friendly products, including energy efficient appliances, recycled materials, sustainable paper products etc. and establishment of waste-based power plants.

For the forest sub sector, priority strategies and activities include; Preparation of site specific protection plans for hill forests, Reviewing and improvement of legal provisions relevant to forest protection, Strengthening the protection and management of the Sundarbans, Regulation the navigation of ships to minimize chances of oil spills, Implementation of watershed co-management activities to regulate water, increase tree cover and halt the deforestation and forest degradation in hill forest, Reducing Emission from Deforestation and Forest Degradation (REDD+) mechanism to support the forest restoration, Reassessment of the extent of land needing reforestation or restoration and adoption of different approaches for reforestation/ afforestation, Carrying out Coastal afforestation with climate resilient mangrove and other species on unused public lands and char lands, expansion of Protected Area up to 25% of state forests within the plan period of Wildlife Master Plan 2015, Identification of wildlife corridors, habitat and marine resources for biodiversity conservation through feasibility study, Development of management framework to manage the marine protected areas, Conduct of National Forest Inventory, tree cover assessment and mapping for monitoring the forest and tree resources and policy formulation for forest management, Conduction of Green House Gas inventory for forest sector to update the forest reference level, Updating and improving the BFIS, Increasing strip plantations, riparian forest buffer along the bank of all the rivers and hill forest restoration and conservation and Enhancing forest related research.

Though environment is directly impacted by climate change, some other sectors like agriculture, fisheries, livestock and water are also influenced by climate change. So, these sectors also have some activities and strategies relevant to environment and climate change. The Agriculture sector activities and strategies related to environment and climate change include; Promoting sustainable agriculture and green growth, enhancing public-private partnership, Protecting and conserving environment by promoting ICM, INM, IDM, IPM, surface and rainwater utilization, use of solar energy in farm activities etc., promoting initiatives for improving irrigation water efficiency and surface water use, enhancing mechanization, value chain, urban agriculture, crop zoning, precision agriculture, Good Agricultural Practice (GAP), regenerative agriculture, agro-processing and enhancing extension activities of climate proof crop varieties.

Likewise, the livestock sector also faces challenges due to climate change. Accordingly, some strategies have been prioritized under the 8<sup>th</sup> FYP including; Enhancing productivity through research and development, developing good quality breed, promoting poultry and livestock farming, improving veterinary services and animal health, supporting small and medium farmers and Improving management practice.

In the fisheries sector, some strategies have been prioritized under the 8<sup>th</sup> FYP including; Adopting and implementing Fish health management strategy and aquaculture policy for sustaining development of the fisheries sector, Encouraging cage culture in the flood plains, Encourage sustainable and community-based flood plain aquaculture combined with maintaining sanctuaries and restocking of indigenous species, Conserving natural breeding, spawning, nursery and grow-out areas allowing natural reproduction of fish, Supporting Community organizations of shrimp farmers and other primary stakeholders with technology, input, financing and market linkage by contract growing system operated by the processing plants and monitored by the DOF and partner NGOs, Developing and implementing fish conservation strategy, Regular and long-term study/ research on change of biodiversity, impact of sanctuary, habitat restoration; physical, chemical & biological changes of haor basin, fish production, fish migration and socio-economic condition of fisher and ICT based dissemination system for fisheries information and technological suggestions in the remote areas.

As the major climate induced disasters are related water, there is a huge role of Water sector in relation to climate change. Accordingly, the Water resources sector has several strategies and activities planned for climate change. These are, Develop, improve, redesign and modification of embankments, barriers and other water control structures to ensure protection against climate change impacts, Adopt spatial planning and flood hazard zoning, Extension of the flood warning lead time, Improve operation and maintenance, Restoration of water bodies and connectivity, River management, excavation and smart dredging, Ensuring safe water to sustainable drinking water and sanitation, Maintaining water quality for health and nutrition, livelihoods and ecosystems, Increase drainage capacity and reduce flood risk in the coastal zone, Expansion of Surface Water Irrigation, Reclaim new land in the coastal zone, Strengthening river and estuaries management in the newly accreted char areas, Protect agriculture and vulnerable communities in haor and flash flood areas, Implementing NRCC recommendations for conservation of rivers, water and biodiversity and Strategy for water resources in Chattogram Hill Tracts and trans boundary water management.

### 3.7 Gap Analysis

Development of strategies and actions for the ECC sector, which has further divided in four clusters i.e. Climate Change Adaptation, Climate Change Mitigation, Environment and Forest and Cross Cutting

issues; requires an extensive desk review of past initiatives and gap analysis of the line ministries and agencies to address the existing issues for this particular sector. In this regard, to process the gap identification of the concerned line ministries and agencies, a selection was made through analyzing their role in ECC sector and then the team carried out Key Informant Interviews (KII) with stakeholders and professional of each of the selected ministry and agency. To conduct the KII sessions, a checklist had also been prepared to find out all the activities that the ministry or agency is doing for the improvement of ECC sector, and identifying the gaps that lie within those activities so that while developing the strategies and actions the identified gaps can be considered.

The checklist covers the priority issues and challenges that needed to be addressed in respect of the ECC sector for each of the organization and further type of projects that the interviews think would be beneficial for the further development of ECC section. Besides, a rigorous analysis has been done on the institutional arrangements; available policy and legal framework; the organizations implementation process; their existing capacity for implementation ECC related projects; the challenges for preparing, implementing and monitoring the ECC projects and their monitoring and evaluation mechanism of the organization through performing KIIs. After conducting KII, gaps have been found which are presented in the following Table 3.3.

**Table 3.3: Identified Gaps in Different Clusters and Sub-Clusters of ECC Sector**

Cluster	Sub-Cluster	Identified Gaps
Climate Change Adaptation and Mitigation	Climate smart agriculture	<ul style="list-style-type: none"> <li>Stress tolerant varieties and extension services need to be enhanced</li> <li>Integrated farming services should be increased</li> <li>Application of climate Smart technologies need to be intensified</li> <li>Climate smart villages can be increased</li> <li>Fisheries and aquaculture management can be improved</li> <li>Livestock management can be improved</li> <li>Gender inclusion in agriculture practices should be more enhanced</li> </ul>
	Land and Water Management	<ul style="list-style-type: none"> <li>Integrated land and water management should be focused more</li> <li>Valuation of water need to be implemented</li> <li>More attention on Blue Economy</li> <li>Increased land degradation</li> <li>Increased migration or internal displacement</li> </ul>
	Green Growth and Low carbon Development	<ul style="list-style-type: none"> <li>Efficiency of crop productivity could be improved</li> <li>Increased emission from paddy field</li> <li>Livestock and manure management need to be improved</li> <li>Fertilizer management need to be improved</li> <li>Lower on farm energy efficiency</li> <li>Monitoring mechanism of emission from agriculture need to be established</li> </ul>

Cluster	Sub-Cluster	Identified Gaps
Environmental Pollution Control, Biodiversity Conservation and Forest Management	Pollution Control, Pest and Diseases Management	<ul style="list-style-type: none"> <li>● Integrated pest management need to be enhanced</li> <li>● Tracking mechanism of region specific disease outbreak need to be enhanced</li> <li>● Lower resistant of host plants</li> <li>● Pricing policy for waste management need to be introduced</li> <li>● Pollution monitoring mechanism need to be enhanced</li> <li>● Environmental compliance need to be enhanced</li> <li>● Citizens need to be aware on pollution control and their roles</li> <li>● Private sector engagement in pollution control need to be enhanced</li> </ul>
	Ecosystem and Biodiversity Conservation and Forest Management	<ul style="list-style-type: none"> <li>● Forest coverage need to be expanded</li> <li>● Coastal greenbelt need to be expanded in more areas</li> <li>● Social forestry need to be expanded</li> <li>● Urban forestry need to be expanded</li> <li>● Biodiversity and ecosystem condition need to be maintained</li> <li>● Agro-forestry condition need to be maintained</li> <li>● Ecological risk assessment should be enhanced</li> <li>● Wetlands management should be more emphasized</li> <li>● Use of IT for precision agriculture need to be enhanced</li> <li>● Mainstreaming and implementation of biosafety rules need to be strengthened</li> <li>● Precautionary measures need to be enhanced</li> <li>● Agro-Chemicals use reduction need to be enhanced</li> <li>● Environmental risk management for health need to be enhanced</li> <li>● Ecosystem and Biodiversity Conservation activities need to be enhanced</li> </ul>
Cross Cutting	Enhanced Financing	<ul style="list-style-type: none"> <li>● Fund harness and mobilization from international funds need to be enhanced</li> <li>● Mobilization and monitoring of fund utilization need to be enhanced</li> <li>● Financing solution related actions need to be enhanced</li> <li>● Fund harness and mobilization for EbA, NbS, CBA etc. need to be enhanced</li> <li>● Delta Fund mobilization need to be enhanced</li> </ul>

Cluster	Sub-Cluster	Identified Gaps
Cross Cutting	Institutions and Governance	<ul style="list-style-type: none"> <li>• Environmental Fiscal Reforms (EFRs) need to be strengthened</li> <li>• Coordination among inter-sectoral and inter-ministerial need to be improved</li> <li>• Coordination of MoEFCC, MoA, with LGIs need to be improved</li> <li>• Water and Sanitary Regulatory Agency (WARSA) need to be established</li> <li>• Governance Activities can be improved</li> <li>• The partnerships with CSOs and NGOs need to be improved</li> </ul>
	Research, Innovation, Knowledge Management and Capacity Development	<ul style="list-style-type: none"> <li>• Capacity building initiatives need to be enhanced for implementation of biosafety measures, agro-ecosystem management, Environmental Fiscal Reform, enhanced financing etc.</li> <li>• Research on innovative technology on agriculture need to be enhanced</li> <li>• Knowledge management initiatives need to be enhanced</li> <li>• Coordination and knowledge sharing at local levels need to be enhanced</li> <li>• Delta Knowledge Hub and Delta Coalition need to be established</li> </ul>

After identifying the gaps for each specific cluster and sub-cluster, need assessment for the organization have been done which outlines that there is a need of the development of stress (Heat, Saline, Cold, Less Water Incentive) tolerant variants along with strengthening the extension services. There is also a need to develop a proper framework for the active participation of women along with men in agriculture practices. Additionally, integrated farming practices; reducing the emission from agriculture sector; assessing risk and vulnerabilities of fisheries, aquaculture and livestock; assessing the climate change impacts on meat and milk production along with identifying appropriate adaptation options; accelerating the implementation of National Adaptation Plan (NAP) are in dire need for the development of ECC sector particularly for the sub-cluster climate smart agriculture. In terms of land and water management, the most needed action required is to improve the efficiency of farm water use through adopting different irrigation techniques both for rice and non-rice crop; optimize the overexploitation of water through integrating different water saving techniques; both ensuring and enforcing water valuation particularly for irrigation system and water stressed areas. However, being the most vulnerable to climate change, enhancement of water resources in the coastal area including marine fisheries is also needed to give top most priority. The need of introducing the techniques for rainwater harvesting to reduce pressure on ground and surface water, particularly for irrigation purpose; proper aquifer and catchment management; development of alternative livelihood options particularly for south-west, Barind, Haor, and hard to reach areas; identifying the causes of land degradation for sustainable soil and land management; exploration of various ecosystem based adaptation and community based adaptation to reduce the adverse impacts of climate change on agriculture, water and land fall in this sub-cluster.

Under the Climate Change Mitigation cluster, it is already known that considerable amount of GHG is now being emitted from agriculture and thereby, the need of identifying different techniques that will reduce emission from agriculture is significant. Additionally, the need of development of less

emission generating technology; minimizing yield gap; enhancing carbon sequestration through development of agro-forestry; promoting smart monitoring technique of GHG emission from agriculture and livestock are also identified through assessing gap under this cluster. Techniques to reduce pollution and extensive use of agro-chemicals; developing payment system for different ecosystem services; promoting organic farming and several nature based solution to enhance agro-ecosystem management; identifying crop, fisheries and livestock susceptibility induced due to climate change; adoption of Integrated Pest Management (IPM) and Integrated Disease Management (IDM) are needed to increase the resilience of agriculture, livestock and fisheries sector against climate change. Establishment of implementation and enforcement of Biosafety rules for minimizing risk to health and ecosystem and promoting research to reduce extensive use of chemicals in agriculture are needed to ensure biosafety and health.

Enhancing the financing mechanism for EFCC is in dire need for the overall enhancement of the ECC sector. Thereby, increasing the fund harness of different international fund sources, including Green Climate Funds (GCFs); establishment of Delta Fund; integration of environment and climate change related cost into national budgeting; increasing monitoring mechanism for government owned CCTF Fund are required particularly for enhancing EFCC financing. Additionally, establishment of Delta Wing; strengthening EFCC governance; increased partnership of MoEFCC with NGOs and CSOs; strengthening Bangladesh National Herbarium and Rubber Board; Establishing a separate regulatory agency for water and sanitation services in municipalities are needed to be given emphasis for the improvement of institutions and governance. Apart from all the initiatives, enhancing the knowledge and building capacity particularly for the ECC sector is required for successful implementation of ECC initiatives addressed above and for this, capacity building of MoEFCC with its lined ministries and agencies, promoting research and innovation on ECC sector; encouraging knowledge sharing and utilization at local level, identifying technology for capacity building is needed for entire knowledge management and capacity development for the ECC sector.

Selected key implementing agencies need to be strengthened considering the gaps identified during the gap analysis and review of the 8<sup>th</sup> FYP. Some significant recommendations, which may strengthen the existing institutional arrangement, are as follows:

- A comprehensive data management infrastructure for ECC sector is needed. For example, the MoEFCC is a designated ministry that works substantially on the environment and climate change in collaboration with other agencies. However, it still lacks a central database for ECC related projects or activities.
- For an impactful project planning and implementation, practical and robust coordination between significant agencies and other line agencies is required.
- Capacity-building projects are frequently undertaken by various government and non-government organizations without coordination with other relevant institutions. The training sessions are explicitly offered on an ad-hoc basis. There is a need to build efficient and robust coordination between research and extension connections to convey innovative technology to farmers, private sector businesses, and non-governmental organizations (NGOs). On the other hand, agricultural research has been a neglected subject with little budgetary allocation and comparably lesser research and financial facilities for scientists.
- Linkage of the project with ECC plans and policies needs to be ensured. There should be a clear understanding of which part of the development framework will be satisfied through

these projects mentioned in the plans and policies. Training on the environment and climate change for the relevant staffs need to be organized regularly in such a way so that staffs can build a linkage between ECC issues and their specific working field. This practical knowledge and implementation-based capacity development on the ECC approach will enhance the quality of the performance.

- Technical expertise, skilled employees, baseline information, and potent Management Information Systems (MIS) to devise, implement, and monitor ECC related project activities are in shortage at many of the relevant ministries/departments and other organizations, such as the MoEFCC, MoWR, MoA, BWDB, DAE, DoE, DoF, and DLS etc. In addition, there is also a lack of expertise and understanding about the relationship between climate change adaptation and the development efforts of their specific organization, which needs urgent focus.
- Proper recording and dissemination of ECC related activities undertaken by government or non-government organizations is insufficient and needs a collaborative focus to overcome the issue.
- For successful project management and to comprehend the project's outcome and develop a prospective road map based on the experience, a comprehensive, holistic, and systematic monitoring and evaluation mechanisms must be developed in addition to robust coordination mechanisms. Moreover, lack of training on project management and monitoring and evaluating the projects is an issue that needs to be addressed.
- Sometimes, capacity-building sessions for government officials are only offered to higher-ranking officials. Staff working at the field level for DoF, DAE, DLS, BWDB, LGED, DLS etc., typically do not receive adequate ECC related training, even though they are directly responsible for ECC related actions on the field level.
- Major climate-sensitive government organizations, i.e., MoA, MoWR or MoEFCC, has no specific course or training scope for their staffs within their organizations. So, there is now an urgent need for separate capacity development initiatives on climate change adaptation within the organizations.
- It is necessary to ensure that long-term or permanent strategies are prioritized amid short-term response-based approaches or strategies.
- Agencies already having ECC related issues in their mandates should take steps to update them (if required) to address ECC related issues better. Otherwise, mandates should be modified to address the issue.
- There is considerable unexplored potential for including the private sector in ECC-related projects like the blue economy, which should be promoted.
- Fund constraint can slow down any development works. Therefore, particular focus should be given to the arrangement of more funds in research or development regarding ECC issues.
- The success of the SAP depends on the committees and units referenced in the implementation mechanism section and the functions and responsibilities of relevant agencies. They all have to work together holistically and facilitate each other to ensure success.



## **Chapter 4**

# **Development of Action Plan**



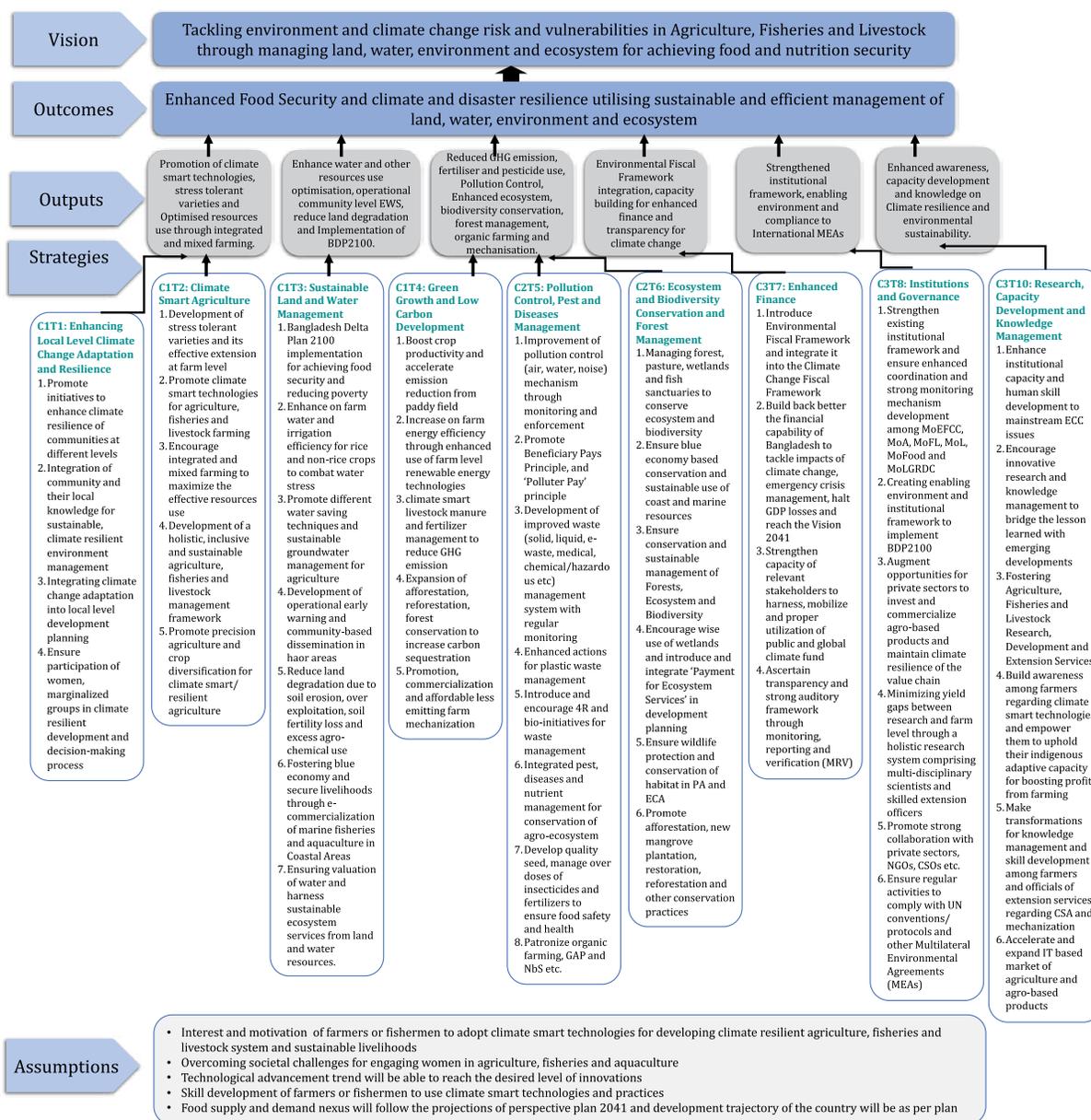
## Chapter 4: Development of Action Plan

### 4.1 Introduction

Being the harbinger of harmony amongst planning and implementation akin to the environment and agriculture sector, the SAP has identified numerous strategies to go about in developing the sector and has laid out a comprehensive action plan with spatially, temporally and financially segregated implementation agenda. This chapter describes the formulated strategies and developed action plan. The Action Plan has been developed following the Theory of Change approach and structured guidelines. The action plan comprises the identified actions to be implemented under this plan along with its investment plan, result based monitoring framework, implementing agencies and potentiality of private sector engagement in financing. Figure 4.1 illustrates the Theory of Change developed for the Sector Action Plan.

### 4.2 Strategies for Action

This SAP ECC identifies 53 strategies to address issues and challenges devised under scopes of each of the ten (10) subthemes discussed in Chapter 2 (Section 2.1). The strategies are aligned with the development vision of the government portrayed in the Perspective Plan (2021-2041) of Bangladesh, 8<sup>th</sup> Five Year Plan (2020-2025), Bangladesh Delta Plan 2100, Bangladesh Country Investment Plan for Environment, Forestry and Climate Change (2016-2020), National Adaptation Plan (NAP), Updated BCCSAP, Updated NDCs, Mujib Climate Prosperity Plan (MCP), National Agriculture Policy (2018) and SDG Action Plan (2017). These strategies particularly focus on tackling environment and climate change risk and vulnerabilities on Agriculture, Fisheries and Livestock managing land, water, environment and ecosystem in an integrated low carbon development pathway for achieving food and nutrition security.



**Figure 4.1: Theory of Change Diagram**

Identified strategies are as follows:

### C1T1: Enhancing Local Level Climate Change Adaptation and Resilience

- Promote initiatives to enhance climate resilience of communities among cross-cutting sectors and different levels
- Integration of community and their local knowledges for sustainable climate resilient environment management
- Integrating climate change adaptation into local level development planning
- Ensure participation of women, marginalized groups in climate resilient development and decision-making process

### **C1T2: Climate Smart Agriculture**

1. Development of stress tolerant varieties and ensure its effective extension at farm level
2. Promotion of climate smart technologies for agriculture, fisheries and livestock farming practices
3. Encourage integrated and mixed farming to maximize the utilization of resources tackling adverse impacts of climate change in climate vulnerable areas
4. Development of a holistic, inclusive and sustainable agriculture, fisheries and livestock management framework for Bangladesh
5. Promotion of precision agriculture and crop diversification to make the agriculture system more climate smart and resilient up to farm level

### **C1T3: Sustainable Land and Water Management**

1. Implementation of Bangladesh Delta Plan 2100 for achieving food security and reducing poverty tackling deep uncertainties of climate change
2. Enhance on farm water and irrigation efficiency for rice and non-rice crops to combat water stress due to climate change
3. Promotion of different water saving techniques (such as AWD, drip irrigation, mulching, reduce tillage, buried pipe etc.) and sustainable groundwater management for agriculture practices
4. Development of operational early warning and community-based dissemination system in haor areas
5. Reduce land degradation due to soil erosion, over exploitation, soil fertility loss and excess agro-chemical use
6. Fostering blue economy and secure livelihoods through e-commercialization of marine fisheries and aquaculture in Coastal Areas
7. Harness ecosystem services from land and water resources in a sustainable way through ensuring valuation of water

### **C1T4: Green Growth and Low Carbon Development**

1. Boost crop productivity and accelerate emission reduction from the paddy field
2. Increase on farm energy efficiency through enhanced use of renewable energy-based technologies at farm level
3. Managing livestock manure and fertilizer in a climate smart way to halt GHG emission
4. Expansion of afforestation, reforestation, forest conservation to increase carbon sequestration, and
5. Promotion, commercialization and affordable less emitting farm mechanization

### **C2T5: Pollution Control, Pest and Diseases Management**

1. Improvement of pollution control (air, water, noise) mechanism through regular and effective monitoring and enforcement

2. Promote Beneficiary Pays Principle, and ‘Polluter Pay’ principle
3. Development of improved waste (solid, liquid, e-waste, medical, chemical/hazardous etc.) management system with regular monitoring
4. Enhanced actions for plastic waste management in alignment with the “Multisectoral Action Plan for Sustainable Plastic Management”
5. Introduce and encourage 4R and bio-initiatives for waste management to turn ‘waste’ into ‘energy’
6. Integrated pest, diseases and nutrient management for conservation of agro-ecosystem
7. Develop quality seed to strengthen climate change shield, manage excess use of agrochemical (insecticides, fertilizers etc.) to ensure food safety, ecosystem conservation and health
8. Patronize organic farming, good agriculture practices (GAP) and nature-based solutions (NbS) as climate change adaptation measures in agriculture, promote locally led adaptation and enriched quality food, nutrition and health

### **C2T6: Ecosystem and Biodiversity Conservation and Forest Management**

1. Managing forest, pasture, wetlands and fish sanctuaries to conserve ecosystem and biodiversity
2. Ensure conservation and sustainable use of coast and marine resources following blue economy principles
3. Ensure conservation and sustainable management of Forests, Ecosystem and Biodiversity
4. Encourage wise use of wetlands and introduce and integrate ‘Payment for Ecosystem Services’ in development planning
5. Ensure wildlife protection and conservation of habitat in PA and ECA, along with specific focus on endangered species
6. Promote afforestation, new mangrove plantation, hill and sal forest restoration, reforestation and other conservation practices for forest management

### **C3T7: Enhanced Finance**

1. Introduce Environmental Fiscal Framework and integrate it into the Climate Change Fiscal Framework
2. Build back better the financial capability of Bangladesh to tackle impacts of climate change, emergency crisis management, halt GDP losses and reach the Vision 2041
3. Strengthen capacity of relevant stakeholders to harness, mobilize and proper utilization of public and global climate fund
4. Ascertain transparency and strong auditory framework through monitoring, reporting and verification (MRV)

### **C3T8: Institutions and Governance**

1. Strengthening existing institutional framework and ensure enhanced coordination and strong monitoring mechanism development among MoEFCC, MoA, MoFL, MoL, MoFood and MoLGRDC

2. Creating enabling environment and institutional framework to implement BDP2100 successfully
3. Improvement of governance of environment related acts, rules or policies through integrated and coordinated enforcement mechanism, effective use of enforcement tools and techniques, increased transparency and accountability
4. Augmenting opportunities for private sectors to invest and commercialize agro-based products and maintain the value chain resilient to the adverse impacts of climate change
5. Minimizing yield gaps between research field and farm level through introducing a holistic research system comprising multi-disciplinary scientists and skilled extension officers
6. Promoting strong collaboration with private sectors, NGOs, CSOs, academia etc.

### **C3T9: Compliance and obligations under MEAs and UN conventions/ protocols**

1. Ensure regular activities to comply with obligations of MoEFCC under UN conventions/ protocols and other Multilateral Environmental Agreements (MEAs).

### **C3T10: Research, Innovation, Knowledge Management and Capacity Development**

1. Enhance institutional capacity and human skill development to mainstream climate change and environmental issues into development planning and implementation process
2. Encourage innovative research and knowledge management to bridge the lesson learned with emerging developments in environment and climate change
3. Enhance opportunities for collaborative research with academia
4. Fostering Agriculture, Fisheries and Livestock Research, Development and Extension Services focusing on climate change adaptation and mitigation
5. Build awareness among communities regarding climate smart technologies and empower them to uphold their adaptive capacity
6. Make transformations for knowledge management and skill development among communities and officials of extension services regarding climate smart agriculture (CSA) and mechanization
7. Accelerate and expand IT based market of agriculture and agro-based products to generate employment, engage gender and youth to become resilient to climate change

Formulated strategies include priorities for promotion of climate smart agriculture and climate smart village including research, innovations and development of climate smart technologies and practices in an inclusive way. Minimizing yield gaps in research lab and farm level, strengthening extension services for crop, fisheries, and livestock and integrated pest, diseases and nutrient management are considered under these strategies. Strong coordination and monitoring among inter-agency and ministries especially with local government are emphasized considering the engagement of multi-stakeholders foreseen. Implementation of Bangladesh Delta Plan 2100 has received special attention to facilitate integrated land and water resources management for agriculture. Creating enabling environment for climate smart agriculture practices and BDP2100 implementation addressing both adaptation and emission reduction are envisaged to be developed as part of strengthening existing institutions and governance. Further, private sectors are highlighted to be engaged for investment, largely parallel to public investment. Field based skill development of farmers, hands on training

and knowledge management initiatives are acknowledged in a transformative way for capacity development and sustainable knowledge management.

### 4.3 Prioritization of Action and Investment Plan

A set of actions have been identified under this SAP ECC to implement the devised strategies smoothly after stocktaking of present progress and achievements for environment and climate change management for agriculture and food security. A thorough review and series of consultations with relevant stakeholders facilitated this actions identification process. Similar or desired actions or projects with estimated cost outlined in previous plans or strategic documents like the 8<sup>th</sup> Five Year Plan, Bangladesh Delta Plan 2100, Bangladesh Country Investment Plan for Environment, Forestry and Climate Change (2016-2020), National Agriculture Policy (2018), SDG Action Plan (2017), Action Plan for Agriculture, Blue Economy Action Plan, available action plans of relevant ministries or agencies etc. were taken into considerations to finalize the set of actions along with the recommendations of consulted stakeholders and outcome of gap and need analysis. Identified set of actions/ projects will fulfill the need and address challenges identified in previous chapters to achieve the short vision and ease the way to achieve long-term vision.

In addition, 11 criteria have been devised to formulate/ prioritize these actions, according to which they have to be/ must possess:

- Country demand driven and aligned with national development agenda
- Ability to facilitate green growth and environment friendly development
- Aligned with global commitments
- Ability to transform and build climate smart agriculture
- Able to fulfill farmer's need
- Able to manage environment and climate change risk efficiently
- Built on existing strategic pathway and developments
- Ability to facilitate climate change adaptation and mitigation
- Attractive for private sector investment
- Have opportunities for social and gender inclusion
- Flexible and adaptive to institutionalize

A total of 95 actions or projects have been identified and prioritized following the strategies, which would require a total investment of BDT 58,240 crores with 10 years' implementation period spanning over two consecutive five-year planning cycles, i.e., 8<sup>th</sup> FYP (2020-2025) and 9<sup>th</sup> FYP (2025-2030). Following this, a list of indicative projects and investment plan comprising Action code, Project name, Responsible agencies and ministries, tentative cost, project implementation period and private sector engagement potentiality have been prepared and presented in Annex-2.

The action plan allocates major portion (25%) of budget for Sustainable Land and Water Management (C1T3) theme to facilitate the sustainable management of the land and water resources around the country to maintain the environmental standards and to preserve ecosystem and biodiversity from pollution and degradation. This theme focuses mostly on managing land, water and soil in an integrated way so that on-farm efficiency of water use increases, land degradation reduces and soil

nutrient remains intact. Research, Innovation, Knowledge Management and Capacity Development (C3T10) theme cover 15.5% of the total investment to further strengthen the innovation, knowledge and capacity building on climate change adaptation, mitigation and environmental issues. The Enhanced Finance (C3T7) theme receives 11% budget with a focus on proper implementation of the recommended actions, expansion of climate smart technologies, strengthening extension services, innovative research, capacity and skill development. Setting up crisis management fund for management of post-COVID19 regime and Delta fund for proper implementation of Bangladesh Delta Plan 2100 as envisioned in the 8<sup>th</sup> Five Year Plan (2020-2025) and Perspective Plan (2021-2041), contributed to this allocation. Around 11% investment will go to Climate Smart Agriculture (C1T2) and Green Growth and Low Carbon Development (C1T4) each, around 7.5% allocation goes to Pollution Control, Pest and Diseases Management (C2T5) and Ecosystem and Biodiversity Conservation and Forest Management (C2T6). Institutions and Governance (C3T6) theme will receive 5.6% investment. Enhancing Local Level Climate Change Adaptation and Resilience (C1T1) and Compliance and obligations under MEAs and UN conventions/ protocols (C3T9) themes will receive 2.6% and 1.7% investment respectively.

Ministry of Environment, Forest and Climate Change (MoEFCC) will receive BDT 21,330 crore allocation (36.6%) for spearheading environmental protection and addressing climate change impacts, along with the special responsibilities of introducing Environmental Fiscal Framework to include environmental cost into budget and revenue through development of different financial instruments in coordination with Ministry of Finance (MoF). A total of BDT 20,515 crore (35.2%) has been allocated for Ministry of Agriculture (MoA) and BDT 5,745 crore (9.8%) for Ministry of Fisheries and Livestock (MoFL) as key stakeholders for combating climate change impacts in livestock and fisheries sub-sectors with extension of climate smart technologies and practices. In contrast, Ministry of Water Resources (MoWR) has got BDT 3,150 crore (5.4%) for ensuring integrated land and water management, increasing water use efficiency for food security and poverty reduction. The role of Local Government is also important for successful extension services towards farm level. Thus, Ministry of Local Government, Rural Development and Cooperatives (MoLGRDC) has got BDT 2,550 crore (4.4%). Ministry of Planning (MoP) will receive (4%) of investment, as Establishment of Delta Fund has been vested upon to General Economics Division (GED) under this ministry. Ministry of Disaster Management and relief (MoDMR) will receive 3.4% of the allocation to tackle climate induced disaster and sudden shocks like COVID-19. The rest of the budget is distributed among Ministry of Commerce (MoC), Ministry of Industries (MoI) and Ministry of Food as lead ministries. However, involvement of many other ministries are foreseen as supporting or coordinating entities for successful implementation of this SAP ECC. Moreover, a total of 21 actions have been identified with potential for private sector investment/ engagement.

In terms of project implementation duration, a total of BDT 24,570 crore will be required for short term (up to 3 years) actions, BDT 22,370 crore for medium term (up to 6 years) actions and BDT 11,300 crore for long term (up to 10 years) actions. A total of 50 short term, 32 medium term and 13 long term actions have been proposed.

There is a gap in 8<sup>th</sup> FYP allocated budget for the ECC sector and the estimated budget in this SAP. This is due to the fact that, a lot of the initiatives are done by other ministries and will be included in the respective sector budget. Besides, as climate change impacts are creating more pressure on the sustainable development of the country, more financing sources from international arena and private sector should be actively harnessed.

#### 4.4 Investment Phasing

Phasing of investment has been done based on the defined planning horizon comprising two five year planning cycles, i.e. 8<sup>th</sup> FYP (2021-2025) and 9<sup>th</sup> FYP (2025-2030). Short term actions are envisaged to be initiated immediately after approval of this plan. Last financial year of 8<sup>th</sup> FYP i.e., FY2024-25 would require higher investment arrangement for multi-stakeholders. Delta Fund Establishment process has been anticipated to initiate from the financial year FY2023-24. Similarly, Emergency crisis management fund creation for post COVID19 risk management for climate induced issues is anticipated to start from the FY2023-24. Gradual increased investment for climate smart agriculture, land and water management, pollution control and ecosystem management, extended and collaborative research for tackling environmental and climate change risk until end of 8<sup>th</sup> FYP would facilitate substantially to achieve the graduation of Least Development Country (LDC) status by 2026. Investment for green growth and low carbon development may be higher after the FY2026. Further, update of this plan before the 9<sup>th</sup> FYP would add and adjust new investment plan capturing the dynamics of risk and vulnerabilities. Following figure illustrates a potential phasing of investment for this sector action plan.

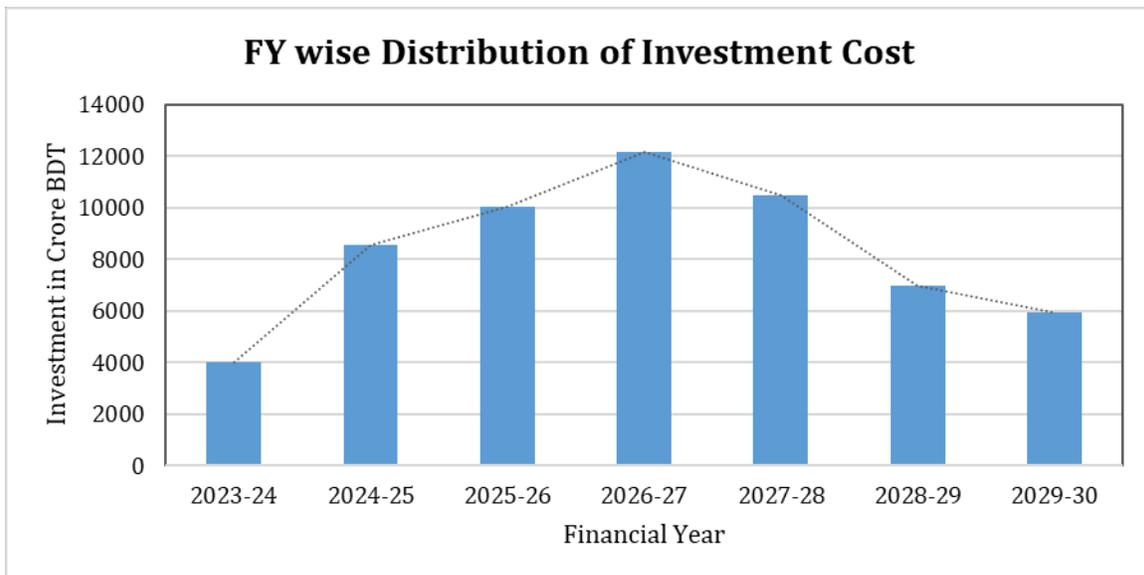


Figure 4.2: Phasing of Investment for Implementation of SAP ECC

**Chapter 5**  
**Implementation Strategies for the Sector Action  
Plan**



## Chapter 5: Implementation Strategies for the Sector Action Plan

### 5.1 Introduction

This chapter elaborates on effective strategies for successful implementation of the Sector Action Plan, including the overall implementation process and framework required for institutional capacity building and coordination. It also stresses on the framework for reducing implementation risk and challenges, harnessing potential sources of public, private and international funds and monitoring and evaluation framework for ensuring progressive development and transparency. The chapter also discusses the strengthening of existing institutional and coordination framework for fruitful implementation of this plan.

### 5.2 Implementation Framework

In order to execute the management, implementation, coordination and monitoring of the SAP ECC, a new unit/committee named National Environment and Climate Change Unit (NECCU) had been proposed in the SAP ECC. The NECCU will advance implementation of this SAP ECC via maintaining constant communication and guidance from the Agriculture, Water Resources and Rural Development Division of Planning Commission. The Technical Support Cell/committee should include identified line ministries, agencies, NGOs, CSOs, development partners, private sectors, research institutions and academia.

Figure 5.1 illustrates the proposed ‘National Environment and Climate Change Unit’ within the current institutional and coordination framework. The NECCU will function under the supervision of the National Steering Committee on Environment and Climate Change (NSCECC) and the Technical Advisory Committee (TAC) comprising of high-level policy makers and relevant experts.

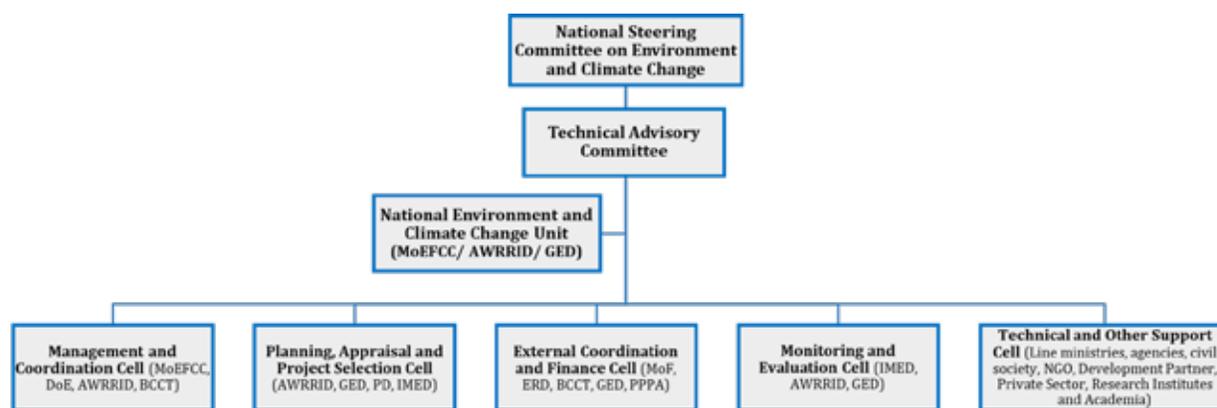


Figure 5.1: Institutional Framework for Implementing the SAP ECC

The National Environment and Climate Change Unit (NECCU) will oversee the development, implementation, M&E of SAP ECC, and will comprise of 5 separate cells to carry out its functions. These include the Management and Coordination Cell; Planning, Appraisal and Project Selection Cell; External Coordination and Finance Cell; Monitoring and Evaluation Cell; and Technical Support Cell. Proposed functions of these cells with specific role and responsibilities are described below.

### 5.2.1 Management and Coordination Cell

The Management and Coordination Cell/ committee can include DoE, BFD, BCCT and AWRRI division, under the leadership of the MoEFCC. The cell will coordinate with key ministries, divisions, agencies related to SAP ECC to coordinate their activities for smooth implementation. Moreover, specific relevant crosscutting ministries such as the MoA, MoFL, MoL, MoFood, SREDA, MoWR, MoLGRDC, MoWCA, MoCHTA etc. will be directly coordinated by this cell. The cell will also manage implementation of ECC related projects and will work closely with the ministries and divisions to align ADP portfolios with SAP ECC policy objectives. The cell may create a knowledge hub, conduct information management activities, and partake in coordinating knowledge and data sharing and exchange of knowledge among parties relevant to the ECC sectors. In addition, this cell would connect with the ECDS cell of BBS to get access to the updated environment, climate change and disaster related statistics and information. This cell will facilitate adaptation and mitigation technology transfer from developed countries through Climate Technology Centre and Network (CTCN) and Joint Crediting Mechanism (JCM).

### 5.2.2 Planning, Appraisal and Project Selection Cell

AWRRID can take lead of this cell with Programming Division of Planning Commission and IMED as members. The main function of this cell would be to conduct review, analysis and research of ECC-related policies to facilitate the planning, appraisal and selection of projects for implementation. It can assist relevant negotiation teams in national and international platforms as well as plan and prepare the documents needed for negotiation and policy development. The cell will also conduct research regarding ECC related projects and use the data and knowledge for future planning. The AWRRID can oversee the alignment of the project planning with the relevant national plans like updated BCCSAP, National Adaptation Plan (NAP), Mujib Climate Prosperity Plan, and the Bangladesh Delta Plan 2100 to avoid potential investment overlapping. PD and IMED can advocate to include projects within the ADP in an inclusive way through examining proper resources allocation and ensuring appraisal of the projects within prescribed format. Inclusion of dedicated climate change and disaster risk screening through proper tool like DIA framework will need to be ensured as part of the appraisal and project selection process. The cell will prepare a common prioritization mechanism for project selection for the ministries, division or agencies working in the sector. The key implementing entities of this plan i.e., MoA and MoFL should establish a dedicated Climate Change Unit (CCU) to coordinate all planning, budgeting and appraisal related activities along with this Cell. These units can take technical support from renowned knowledge and research institutes in relevant areas such as CEGIS, C3ER, ICCCAD, BCAS etc.

### 5.2.3 External Coordination and Finance Cell

The Ministry of Finance will lead this cell, with support from the ERD, GED BCCT and PPPA. Arrangement of funding, financial assessment for the projects will be the main duty of this cell, which will also look in on accessing foreign funds i.e., GCF, Adaptation Fund, Environment or Biodiversity related funds, Delta Funds etc. GED has been included in this Cell additionally to establish the Delta Funds through its planned Delta Wing and thereby finance implementation of Bangladesh Delta Plan 2100. The cell will maintain liaison with national implementing entities (NIEs) like IDCOL, PKSf and will try to manage accreditation from more NIEs from potential parties. The close collaboration with the development partners, PPPA under PMO, and private sectors for arrangement of funding will also be taken care of by this cell.

#### 5.2.4 *Monitoring and Evaluation Cell*

IMED can take the lead of this cell. As the lead in preparation of this SAP, the AWRRID can also assume an important role in M&E. The cell will prepare a common internal M&E mechanism and guideline, as well as provide policy guidance for the relevant ministries, agencies and divisions to track the progress of implementation. They will compile the progress and implementation reports of sectoral agencies and submit it to AWRRID so that AWRRID can provide policy feedback as per requirement. They will also seek suggestion from the External Coordination and Finance Cell for assistance in fund allocation for the M&E mechanism. The cell will also conduct overall M&E for the projects with the input of IMED utilizing the prescribed result-based M&E framework of the SAP ECC. This cell should also coordinate with the ECCDS cell and SDGs tracker to be aligned and consistent with the national progress. The system level monitoring may be facilitated through tracking consistent progress with the National Priority Indicators (NPI) for Environment and Climate Change sector stated in 8<sup>th</sup> Five-year Plan.

#### 5.2.5 *Technical Support Cell*

This cell will consist of multi-disciplinary members from various line ministries, agencies, civil society, development partners, private sector, academia etc. to support the other cells. The line ministries are also implementing climate relevant programs through ADPs. The environment and climate change focal points for each ministry and agency can work together in the cell headed by MoEFCC. It can improve and build-on the current Development Project Proforma (DPP) formulation for climate change adaptation (CCA) projects as well as streamline mainstreaming of climate change considerations in projects. The cell can also assist in M&E of projects. This cell and also support different programmes interventions via successful piloting of research outputs in, and facilitate partnerships and knowledge sharing among different stakeholders related to environment and climate change for enhancing the overall quality of implementation. Hence, this multi-stakeholder cell will act as an important part of SAP implementation by providing expert support to all the other cells of the NECCU.

Analyzing the scopes and investment plan of this SAP ECC under different thematic areas, the key implementing entities found include DoE and BFD under MoEFCC, DAE, Agriculture Research Institutes (ARIs) like BARC, BRRI, BARI, BINA, BJRI, BSRI, SRDI, BMDA, DAM, CDB, BIRTAN, BADC, NATA, AIS, SCA, Hortex Foundation under MoA and DoF, DLS, BFRI, BLRI, and BFDC under MoFL as prime stakeholders of this plan considering climate smart agriculture. However, other ministries and line agencies are also integrated with this cross cutting sectoral plan. They are: DBHWD, WARPO, BWDB, CEGIS, IWM under MoWR, LGD, City Corporations, WASAs, RDCD, LGED, DPHE under MoLGRDC, SREDA under MoPEMR, DDM under MoDMR, MoI, BBS under MoP, Prime Minister's Office (PMO) etc. While, many other stakeholders are identified as supporting or coordinating entities which include, AWRRID, GED and PD of Planning Commission, MoWCA, MoS, MoC, MoRTB, LGIs, District Administration, Academia like BAU, SAU, private sectors, IUCN, ICCCAD, C3ER, CCAFS CGIAR, CIMMYT, FAO, IRRI, World Fish, IFPRI, IDCOL, PKSF etc. The SAP ECC will not remain limited to these mentioned agencies or ministries only, rather keep close liaison and coordination with other agencies as per requirement for fruitful implementation of the plan such as development partners, civil society, private sectors, regional and global network, NGOs or INGOs are also have strong role on this.

Besides, the research institutes and universities have a significant role in transforming knowledge into practice through new and innovative ideas for battling climate change impacts. Partnership and knowledge sharing among different research or academia related to environment and climate change could enhance the overall quality of implementation. Bangladesh Country Investment Plan

for Environment, Forestry and Climate Change (2016-2020) listed relevant research institutes and universities those are engaging in the endeavour of environment and climate change areas, blended with those this SAP ECC identified an updated list which are as follows:

- Bangladesh Academy for Rural Development (BARD), Cumilla
- Bangladesh Agricultural University (BAU), Mymensingh
- Bangladesh Agriculture Research Council (BARC)
- Bangladesh Agriculture Research Institute (BARI)
- Bangladesh Centre for Advanced Studies (BCAS)
- Bangladesh Development Research Centre (BDRC)
- Bangladesh Fisheries Research Institute (BFRI)
- Bangladesh Forest Research Institute (BFRI)
- Bangladesh Institute for Development Studies (BIDS)
- Bangladesh Institute of Nuclear Agriculture (BINA)
- Bangladesh Livestock Research Institute (BLRI)
- Bangladesh Rice Research Institute (BRRI)
- Bangladesh Sugarcane Research Institute (BSRI)
- Bangladesh Jute Research Institute (BJRI)
- Cotton Development Board (CDB)
- Bangladesh Institute of Research and Training on Applied Nutrition (BIRTAN)
- Bangladesh University of Engineering and Technology (BUET)
- Center for Climate Change & Sustainability Research, DUET
- Center for Environmental and Climate Change Research (CECCR), CUET
- Center of Energy Research (CER), UIU
- Centre for Climate Change and Environment Research (C3ER), BRAC University
- Centre for Environmental and Geographic Information Services (CEGIS)
- Centre for Policy Dialogue (CPD)
- Climate Change & Health Promotion Unit, Ministry of Health
- Climate Resilient Local Infrastructure Center (CreLIC), LGED
- Department of Agroforestry & Environment at Bangabandhu Sheikh Mujibur Rahman Agricultural University
- Bangabandhu Sheikh Mujibur Rahman Maritime University
- Department of Disaster Management, Begum Rokeya University Rangpur
- Department of Forestry and Environmental Science at Shahjalal University of Science and Technology, Sylhet
- Department of Geography and Environment, Jahangirnagar University
- Forestry and Wood Technology Discipline, Khulna University
- Institute for Forestry and Environmental Sciences at Chattogram University
- Different departments and Institutes of University of Dhaka
- Institute of Environmental Science, University of Rajshahi
- Institute of Water and Flood Management (IWFM), BUET
- Institute of Water Modeling (IWM)
- International Centre for Climate Change and Development (ICCCAD), Independent University
- International Centre for Diarrhoeal Diseases Research, Bangladesh (ICDDR, B)
- National Academy for Planning and Development (NAPD)
- National Agriculture Training Academy (NATA)
- National Agriculture Research System (NARI)

- National Institute for Local Government (NILG)
- Policy Research Institute (PRI)
- Research Centre, North South University
- River Research Institute (RRI), Faridpur
- Rural Development Academy (RDA), Bogura
- Sylhet Agricultural University Research System (SAURES)
- Sher e Bangla Agriculture University (SAU)

### 5.3 Capacity Building and Strengthening of Institutions

Earlier chapter outlined the capacity needs for institutions after thorough gap analysis and consulting stakeholdery. Further, the 8<sup>th</sup> Five Year Plan was substantially reviewed to get planned strategies for capacity building and strengthening of institutions in respect to sector ECC focusing on environment and climate change risk management for agriculture, land and water. This plan recommends some priority areas for capacity building and institutional strengthening. This plan also recognizes the need for transformative capacity building of relevant sectoral stakeholders, and has identified the following priority areas–

#### *Adequate Human Resources and Skill Development of Key Stakeholders*

The crisis of inadequate human resources hinders the overall development pace and generate less effective outcome of any initiatives. Especially, inadequate work force is reported in agriculture extension services. A Sub-Assistant Agricultural Officer (SAAO) serves on an average 1,162 farm holdings, which is an impossible target as outlined inside the 8<sup>th</sup> Five Year Plan (BBS, 2019; DAE, 2017). Similar situation is prevailing for other stakeholders as well, like DoF, DLS, BFRI, BLRI, DoE, LGD or LGIs. Therefore, adequate human resources should be recruited and necessary skill development trainings should be introduced for them to increase their efficiency. Furthermore, special capacity building initiatives should be undertaken among mid-level and young officials to develop their skills on climate change negotiation process and related aspects.

#### *Development of Holistic Research System to Minimize Yield Gaps and Achieve Nutrition Security*

The Government initiated the National Agricultural Technology Programme-Phase 2 Project (NATP2) to disseminate different rice yield gap minimization technologies. The project claims to minimize yield gaps in the demonstration plots by 1.05 t/ha (through 25% yield increase over conventional farmer practices), 1.20 t/ha (22% yield increase) and 0.61 t/ha (17% yield increase) for Aman, Boro and Aus season, respectively. However, the widespread adoption of the technologies remains a concern, particularly when the extension services in the country is yet considered to be moderately efficient. Increasing the efficiency of existing extension services would ensure proper demonstrations of the invented technologies and their farm level requirement to get expected yield similar to research lab. On the other hand, agriculture researches are being conducted by NARS institutes form a holistic team of multi-disciplinary scientists in a limited manner. Taking care of all aspects of research products like nutrient contents of a newly invented HYV or stress tolerant varieties become difficult to maintain or check in most of the cases. Similar situation prevails in case of livestock research as well. There has been very limited research on livestock management for potential impacts on production due to regenerative changes by climate change. Hence, a holistic research system needs to be developed comprising multi-disciplinary scientists to keep intact all potential nutrient and mineral contents instead of high focus of increasing productivity only.

### *Intensive Research and Piloting on CSA and Enhanced Investment for Research*

Intensive research and implementation level piloting programs should be undertaken for introducing and expanding climate smart agriculture, especially in terms of different emerging practices and technologies like floating seed bed, vertical farming, increasing on-farm water use efficiency, quality seed, crop diversification and intensification based on future demand, livestock cross breeding, marine fisheries and aquaculture, regenerative changes of livestock and fisheries and its impact on dairy products and protein and nutrition demand, innovative soil and livestock manure management, AWD, IPM, Nature based solutions like floating agriculture, agro-forestry development etc. Thus, allocation of adequate budget should be kept to facilitate these research and piloting programs. Apart from research, adequate budget should be there to manage any sudden crisis like post-COVID-19 regime with respect to keeping up the food security assurance. More research on developing climate resilient agriculture for post-COVID-19 sustainable Bangladesh will need to be conducted. Collaborative research and piloting programs with IFAD, CIAT, FAO, CCAFS CGIAR, IRRI, World Fish, CIMMYT, IFPRI, WFP etc. need to be developed in this regard. Establishment of Delta Fund will also accelerate the investment crisis for land and water management to fight climate induced disasters.

### *Enhancing Knowledge and Awareness of Private Sectors*

Private sectors are less interested to invest in large scale adaptation programs, where lack of knowledge and awareness related to potential risk management and getting desired return in short time instigate them to be more conservative. Frequent knowledge development and awareness building programs should be organized to equip them about different available tools and techniques for risk transfer. They should be well sensitized regarding the priority areas of climate smart agriculture, value chain, commercialization, agri-business or others mentioned in sub-sections later with potential incentives mechanism for engaging them in different level of project implementation.

### *Capacity Development of Farmers and Fishermen Regarding Climate Smart Agriculture*

Capacity building initiatives, especially hands on or field level demonstrations for farmers or fishermen or livestock farmers regarding climate smart agriculture practices, mechanization, maintenance of machineries, should be undertaken parallel to strengthening the extension services. These capacity building initiatives will increase the adaptive capacity of farmers or fishermen, support to minimize yield gaps ensuring application of appropriate technologies and developing desired environment at farm level, minimize land degradation and maintain agro-ecosystem. On the other hand, it will also increase the efficiency of the intuitions responsible for extension. Accelerated initiatives for Alternative Income Generation Activities (AIGA) and low interest-based credit access facilities will need to be undertaken engaging NGOs, CSOs and private sectors to tackle environmental and climate change risk in agriculture system and potential loss of income and employment.

### *Data and Information Management and Smart Agriculture Market Development based on ICT*

Development of a smart system utilizing the power of ICT can contribute to the booming of agriculture market through e-commercialization, ensuring desired value of production at farm level and maintaining sustainable value chain, ease the export industries and increasing the contribution towards GDP, food and nutrition security. Small or Medium Entrepreneurs should be promoted and provisions of adequate incentives or subsidies should be made available in this regard. Development of umbrella e-markets, mobile apps, fast and efficient delivery mechanism and ensuring consumer rights properly should be done to facilitate this process. On the other hand, agriculture information services are also important

to equip the farmers or fishers with required information on agro meteorology, technologies, fertilizer or soil management etc. Management Information System (MIS) should be developed for relevant stakeholders to manage and disseminate such data, information and knowledge to farmers. Farmers should be well trained to avail these services and understand the provided information. Development of Fertilizer Use Information System, Livestock Manure Management System, Online Integrated Pest and Diseases Management System, Smart Monitoring System of Emission from Agriculture, Mobile Apps etc. are foreseen to be initiated to extend climate smart agriculture all over Bangladesh.

#### *Development of Gender and Youth Inclusive Planning Framework*

Inclusion of women, as well as disable and indigenous people in farming, fisheries, poultry and livestock practices are in the plan. Department of Youth Development can play significant role in providing training and engaging youth in this process. This plan envisages to develop gender and youth inclusion framework for integration in agriculture, fisheries and livestock planning process.

#### *Increased Partnership, Networking and Coordination*

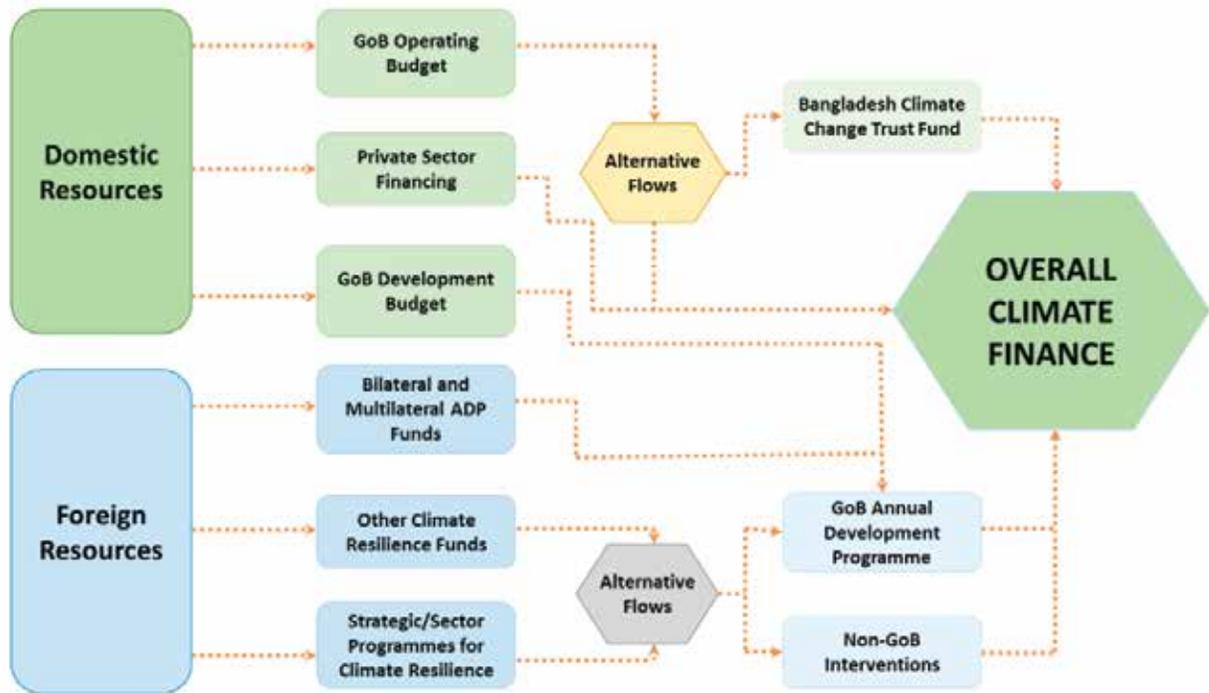
Last but not the least, partnerships and networking with national and global networks, CSOs, Platforms, business networks, entrepreneurs, research institutes should be increased for showcasing, demonstrating and exchanging knowledge, data and information related to climate smart agriculture and agro-ecosystem management with other similar countries. Development of Delta knowledge hub, increased collaboration with Delta Coalition countries, collaborative research with international research programs will support this process. Furthermore, it stressed on maintaining strong coordination among multi-level and multi sectoral stakeholders as identified during stakeholder mapping and implementation framework of this plan.

All these recommended interventions for capacity building and strengthening institutions are incorporated inside the investment plan of this plan to be started immediately.

## **5.4 Potential Sources of Fund and Financing Strategies**

### **5.4.1 Potential Sources of Fund**

Due to increased the vulnerabilities of the country imposed by climate change, Government is always giving emphasis on increasing the budget allocation to tackle the climate change phenomenon and reduce its adverse impacts on environment and physical systems. Government currently spends US\$1 billion a year, around 6 to 7 per cent of its annual budget (MoF, 2020), on climate change adaptation, which is nearly a fifth of the US\$5.7 billion, that the World Bank estimates Bangladesh will need as adaptation finance by 2050. Three-quarters of money spent on climate change in the country comes directly from the government, while the rest comes from international development partners. The Bangladesh Bank and other private and state-owned banks are also providing green financing for climate change related businesses and projects.



Source: CFF, 2020

**Figure 5.2: Climate Funds Flow in Bangladesh**

GoB has established the Bangladesh Climate Change Trust Fund (BCCTF) in 2009 for funding climate change related activities particularly implementation of BCCSAP (2009). The Government channels every year resources for significant investment in projects/programs for ensuring climate resilience. Up to FY2020-21, BCCTF received a total allocation of Tk. 3,900 crore and till August 2020, a total of 789 projects under BCCTF have been approved of which 728 projects are implemented by the Government Ministries/Divisions while the remaining 61 projects were implemented by different NGOs under the supervision of Palli Karma Sahayak Foundation (PKSF). Food Security, Social Protection and Health received the highest allocation across the years under review followed by Infrastructure. It appears that out of the total climate change relevant allocation, the share of Food Security, Social Protection and Health is 41.3 percent and that of Infrastructure is 26.0 percent in FY2020-21.

Apart from BCCTF, the Government of Bangladesh can access required funds from various internal funding windows for implementation of this plan. The Adaption Fund, Climate Investment Funds, UN-REDD Readiness Program, Green Climate Fund (GCF), Global Environment Facility (GEF), Adaptation for Smallholder Agriculture Program (ASAP), Global Climate Change Alliance (GCCA), Bio-carbon Fund, Clean Technology Fund, Forest Carbon Partnership Facility Fund, Critical Ecosystem Partnership Fund, European Union Global Climate Change Alliance Plus (EUGCC+), Nature+Accelerator Fund, International Fund for Agriculture Development (IFAD), Blue Action Fund, Least Developed Countries Fund (LDCF) etc. are some of the noteworthy potential sources of funding for environment and climate change related projects. Some of these funds are not large enough for bigger projects and should be considered for small scale projects on research, study, capacity building, institutional strengthening etc.

In order to tackle the planet's most pressing environmental problems the **Global Environment Facility (GEF) Trust Fund** was established on the eve of the 1992 Rio Earth Summit providing support to government agencies, civil society organizations, private sector companies, research institutions, among the broad diversity of potential partners, to implement projects and programs in recipient countries. Global Environment Facility (GEF) Trust Fund has funded 43 projects in Bangladesh, with a total of US\$160 million in the form of grant and US\$1037 million as additional co-financing. GEF also manages the UNFCCC funds including the Least Developed Countries Fund (LDCF), the Special Climate Change Fund (SCCF) and the Adaptation Fund. These funds have smaller amounts of funding available.

**Green Climate Fund (GCF)** was created to support the efforts of developing countries to respond to the challenge of climate change, helps them to limit or reduce their greenhouse gas (GHG) emissions and adapt to climate change (CFF, 2020). Bangladesh has so far received US\$ 94.7 million as grant from GCF for four projects that include Enhancing Adaptive Capacities of Coastal Communities, Especially Women, to cope with Climate Change Induced Salinity. The fund can be accessed either through Economic Relations Division (ERD) as National Designated Authority (NDA) of GCF and through Accredited Entities of the country which are Infrastructure Development Company Limited (IDCOL) and Palli Karma-Sahayak Foundation (PKSF).

Founded under the Kyoto Protocol of the United Nations Framework Convention on Climate Change (UNFCCC) **Adaptation Fund** is an international fund that finances projects and programs in order to help developing countries to adapt to the harmful effects of climate change. Since 2010, the Adaptation Fund has committed more than US\$ 830 million for climate change adaptation and resilience projects and programs, including more than 120 concrete, localized projects in the most vulnerable communities of developing countries around the world with 28 million total beneficiaries. It also pioneered Direct Access, empowering countries to access funding and develop projects directly through accredited national implementing entities. In 2014, it launched the Readiness Program for Climate Finance, designed to capture and share the growing experiences of AF direct access and other climate finance in order to strengthen the capacity of national and regional entities to receive and manage climate financing. Adaptation Fund finances climate adaptation projects comprising agriculture; coastal zone management; disaster risk reduction; food security; forests; multisector projects; rural development; urban development; water management sector. So far, Bangladesh has accessed the AF for the project titled "Adaptation Initiative for Climate Vulnerable Offshore Small Islands and Riverine Char land in Bangladesh". Countries must submit proposals through an accredited institution such as the National Implementing Entities (NIEs); Regional Implementing Entities (RIEs); Multilateral Implementing Entities (MIEs).

**Climate Investment Fund-** Till now, 9 projects in Bangladesh are funded by CIF and the government of Bangladesh is investing CIF funds in climate resilience planning and projects across critical sectors and in developing domestic renewable energy resources in addition to poverty reduction and achieving sustainable development objectives. A total of \$110 million in grants and near-zero interest credits from the PPCR is improving climate resilient agriculture and food security; strengthening the security and reliability of fresh water supply, sanitation, and infrastructure; and enhancing the resilience of coastal communities and infrastructure. Another \$75 million in grants and low-cost financing from the SREP is helping to kick-start investment in utility-scale renewable energy projects and expand off-grid solar markets. By targeting regulatory, financial, and technical barriers, SREP financing aims to attract early investors, keep the cost of energy more affordable for customers, and demonstrate market potential to stimulate future investment.

To support the adaptation needs of 48 developing countries classified as LDCs the **Least Developed Countries Fund (LDCF)** was established in 2001 by the UNFCCC Conference of the Parties. LDCF has financed \$159.46 million through granting 5 projects and co-financing 5 projects in Bangladesh. As Bangladesh is graduating from LDC countries, in future, scope for this fund will reduce.

Additionally, several bilateral and multi-lateral technical agencies and financial institutions provide funding in the form of both grants and loans, which are recognized as international funding. There are international private financial institutions that also provide loans in different forms. Some of these financial institutions provide financial services in the means of equity or risk sharing. Also, there are international insurance agencies that provide different types insurance packages.

**Bilateral and Multilateral Channels-** In addition to these funds, other significant channel of climate funding for Bangladesh are bilateral development assistance agencies such as DFID of the United Kingdom, USAID of the United States, Swedish SIDA, GIZ of Germany etc. Multilateral banks such as the World Bank and Asian Development Bank (ADB) and UN agencies such as UNDP, UNEP etc. also provide climate funding.

**Private Funding-** Private sector funds from developed countries to developing countries are likely to become a significant source of climate funding. This is primarily because of the fact that the investment community is realizing that they are living in a situation, which is highly volatile, and this may further aggravate due to climate change. However, given the profit motive, which drives private investments, they will mostly be investing in mitigation rather than in adaptation activities, as it is quite difficult to generate revenue from adaptation intervention.

**CSR funds** from the private sector at present are typically being used for socio-economic development, such as construction of schools. There is a window of opportunity for funding to be obtained from the private sector, by encouraging more private sector on spending their CSR funds in collaborative way for climate change related projects. Apart from the different climate financing sources, funding for implementation of this ECC sector plan can be harnessed and mobilized through different Environment or biodiversity fund.

Moreover, the financing should be performed in a coordinated way so that climate financing can be done as part of financial solutions like investment in solid waste management, which have co-benefits of climate change adaptation and mitigation, further investment from climate funding sources may not be required or may be reduced. The resources may be harnessed from other funds as well. Such as,

**“Debt-for-nature”** swaps have proved successful, for example, although most such swaps have been fairly small, relative to both the debt of many developing countries and their conservation and development needs.

**The Environment Fund** is a true green investment – and benefits all nations or member states of the United Nations Environment Program (UNEP). In 2020, the Environment Fund provided US\$ 74.2 million, or 15 percent, of UN Environment Program’s (UNEP) total income. This fund also channelizes funds for capacity building and transfer of technological innovations.

**Nature+ Accelerator Fund** is going to be launched in 2021 by IUCN to promote and invest in nature-based solutions including the following areas: Marine conservation and coastal resilience; smallholder production systems and sustainable agriculture; ecosystem conservation and restoration; and innovation in services, finance, and technology.

This fund will create evidence of a suite of nature-based solutions (NbS) aligned with the IUCN Global Standard for Nature-based Solutions while creating significant impact on biodiversity and ecosystem conservation, reducing the risk of extinction of species, Sustainable Development Goals (SDGs), the UN Decade on Ecosystem Restoration and the UNFCCC Paris Agreement.

**International Fund for Agriculture Development (IFAD)** Smallholder farmers are on the frontline of climate change and environmental risk from increasing temperature, erratic rainfall, pest infestations, rising sea levels, and extreme events such as floods, droughts, landslides, typhoons and heat waves. Thereby, The Adaptation for Smallholder Agriculture Program (ASAP) is IFAD's flagship program for channeling climate and environmental finance to smallholder farmers focusing on policy engagement; climate risk assessment; women's empowerment; private sector engagement; climate services; natural resource management and governance and knowledge management activities. So far, IFAD has been investing in poor rural women and men in Bangladesh for almost 40 years aiming to enable poor people in vulnerable areas to better adapt their livelihoods to climate change; help small producers and entrepreneurs benefit from improved value chains and greater market access; and empower marginalized groups, including poor rural women, both economically and socially. IFAD has invested in infrastructure benefiting extremely poor people in Bangladesh, particularly women; value chains supporting landless and marginal farmers, smallholder producers and rural entrepreneurs.

In addition, IFAD also has a number of research and grant-funded activities in Bangladesh, including partnerships with the International Rice Research Institute (IRRI), World Fish, World Food Program, the World Bank and Bangladesh Bureau of Statistics. Smallholder Agricultural Competitiveness Project; Promoting Resilience of Vulnerable Community through Access to Infrastructure, Improved Skills and Information; National Agricultural Technology Program - Phase II Project; Promoting Agricultural Commercialization and Enterprises Project; Haor Infrastructure and Livelihood Improvement Project - Climate Adaptation and Livelihood Protection; Char Development and Settlement Project IV are some of the noteworthy projects that IFAD has provided fund in Bangladesh.

**Blue Action Fund** supports marine conservation projects that are implemented by NGOs in their efforts to conserve the ocean and improve the livelihoods of coastal communities in developing countries. Blue Action Fund provides grants to selected conservation projects in marine protected areas (MPAs) and their buffer zones, targeting the most sensitive coastal waters of Africa, Latin America and Asia/Pacific and focusing on projects with measurable outcomes. The fund prioritizes those projects that are realized in an area with significant biodiversity that is recognized as an MPA or has the potential to achieve formal recognition as an MPA during the lifetime of the project; contribute to marine protection and sustainable livelihoods in coastal communities; tested and scalable; show a measurable impact within the duration of the project; and ask for a Blue Action Fund contribution of €1–3 million and have a duration of three to five years while providing grants. In case of non-governmental organizations (NGOs) the priority criteria will be well-grounded in the target country; have experience of the size and type of project proposed; and are willing to fund at least 25% of the total project costs ('match funding').

A list of possible funding organization under the thematic areas of this Action Plan is presented in the following **Table 5.1**.

**Table 5.1: Potential Funding Sources for the Thematic Areas**

<b>Broad Categories</b>	<b>Thematic Area</b>	<b>Potential Funding Windows</b>
Addressing Climate Change issues	C1T1: Enhancing Local Level Climate Change Adaptation and Resilience	<ul style="list-style-type: none"> <li>● ADB Climate Change Fund</li> <li>● IFC Climate Investment Fund</li> <li>● Adaptation Fund</li> <li>● International Fund for Agriculture (IFAD)</li> <li>● Least Developed Countries Fund (LDCF)</li> <li>● Green Climate Fund (GCF)</li> </ul>
	C1T2: Climate Smart Agriculture	<ul style="list-style-type: none"> <li>● ADB Climate Change Fund</li> <li>● IFC Climate Investment Fund</li> <li>● Adaptation Fund</li> <li>● International Fund for Agriculture (IFAD)</li> <li>● Least Developed Countries Fund (LDCF)</li> <li>● Green Climate Fund (GCF)</li> </ul>
	C1T3: Sustainable Land and Water Management	<ul style="list-style-type: none"> <li>● ADB Climate Change Fund</li> <li>● IFC Climate Investment Fund</li> <li>● Adaptation Fund</li> <li>● Least Developed Countries Fund (LDCF)</li> <li>● Blue Action Fund</li> <li>● Green Climate Fund (GCF)</li> </ul>
	C1T4: Green Growth and Low Carbon Development	<ul style="list-style-type: none"> <li>● ADB Climate Change Fund</li> <li>● IFC Climate Investment Fund</li> <li>● Green Climate Fund (GCF)</li> <li>● Bio Carbon Fund</li> <li>● Clean Technology Fund</li> <li>● REDD+ Fund</li> </ul>
Environmental Pollution Control, Biodiversity Conservation and Forest Management	C2T5: Pollution Control, Pest and Diseases Management	<ul style="list-style-type: none"> <li>● Adaptation Fund</li> <li>● Nature + Accelerator Fund</li> <li>● International Fund for Agriculture Development (IFAD)</li> <li>● Least Developed Countries Fund (LDCF)</li> <li>● World Bank</li> <li>● Green Climate Fund (GCF)</li> <li>● ADB Climate Change Fund</li> </ul>
Environmental Pollution Control, Biodiversity Conservation and Forest Management	C2T6: Ecosystem and Biodiversity Conservation and Forest Management	<ul style="list-style-type: none"> <li>● IFC Climate Investment Fund</li> <li>● Adaptation Fund</li> <li>● Nature + Accelerator Fund</li> <li>● Critical Ecosystem Partnership Fund</li> <li>● International Fund for Agriculture Development (IFAD)</li> <li>● Least Developed Countries Fund (LDCF)</li> <li>● World Bank</li> <li>● Green Climate Fund (GCF)</li> <li>● ADB Climate Change Fund</li> <li>● REDD+ Fund</li> </ul>

Broad Categories	Thematic Area	Potential Funding Windows
Cross Cutting	C3T7: Enhanced Financing	<ul style="list-style-type: none"> <li>● Global Environment Facility (GEF)</li> <li>● Green Climate Fund (GCF)</li> <li>● World Bank</li> <li>● ADB Climate Change Fund</li> </ul>
	C3T8: Institutions and Governance	<ul style="list-style-type: none"> <li>● International Fund for Agriculture Development (IFAD)</li> <li>● Global Environment Facility Trust Fund (GEF)</li> <li>● Green Climate Fund (GCF)</li> <li>● World Bank</li> <li>● ADB Climate Change Fund</li> </ul>
	C3T9: Compliance and obligations under MEAs and UN conventions/ protocols	<ul style="list-style-type: none"> <li>● Global Environment Facility (GEF)</li> <li>● United Nations (UN)</li> </ul>
	C3T10: Research, Innovation, Knowledge Management and Capacity Development	<ul style="list-style-type: none"> <li>● ADB Climate Change Fund</li> <li>● Global Environment Facility (GEF)</li> <li>● Adaptation Fund</li> <li>● International Fund for Agriculture (IFAD)</li> <li>● Least Developed Countries Fund (LDCF)</li> <li>● Green Climate Fund (GCF)</li> <li>● Nature + Accelerator Fund</li> <li>● REDD+ Fund</li> </ul>

#### 5.4.2 Strategies for Financing

Accessing international climate finance can be a challenging task; the complicated architecture of international climate and environment finance appears to be a kind of barrier for countries such as Bangladesh. Fund delivery modalities induce competitive environment for the developing countries and their delivery partners in managing their shares in international climate finance. Enhanced institutional capacity is a pre-condition to overcome the access barriers as most of these funds follow high standard fiduciary systems and environmental and social safeguards. Good management practice, transparency, and track records all are essential to gain direct access to international climate finance. Many multi-lateral development partners run global readiness programs for LDCs to enable them to access international climate finance. For example, GIZ, UNDP, and GCF offer readiness support which mainly focus on enhancing institutional capacity of the focal point and NDA (national designated authority), identifying the potential NIEs (national implementing entities) and their capacity building and developing strategic framework or project pipeline for the funds. It depends on the country capacity to make the best use of readiness support and get equipped for direct access to climate funds.

National Designated Authority (NDA) is a government-designated institution or agency in a country with the role of facilitating interface and function as the main point of communication between the country and the GCF. The Economic Relations Division of Ministry of Finance is the NDA for Bangladesh.

On the other hand, National Implementing Entities (NIE) are accredited entities that are expected to mobilize and manage GCF finance in a country. Till date, two institutions in Bangladesh have been accredited as NIEs. The NIEs are: Infrastructure Development Company Ltd. (IDCOL) and Palli Karma-

Sahayak Foundation (PKSF). Other potential NIEs are: Local Government Engineering Department (LGED), Bangladesh Bank, Bangladesh Climate Change Trust (BCCT) and Department of Environment (DoE). In addition, Multilateral Implementing Entities are also operating in Bangladesh to facilitate the mobilization of fund for climate financing. They are:

- United Nations Environment Programme (UNEP)
- Asian Development Bank (ADB)
- Food and Agriculture Organization of the United Nations (FAO)
- International Bank for Reconstruction and Development (IBRD) and International Development Association (IDA) - World Bank (WB)
- International Finance Corporation (IFC)
- International Fund for Agricultural Development (IFAD)
- Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
- European Investment Bank (EIB)
- International Union for Conservation of Nature (IUCN)
- Japan International Cooperation Agency (JICA)
- Kreditanstalt für Wiederaufbau (KfW)
- United Nations Development Programme (UNDP)
- World Food Programme (WFP)
- World Meteorological Organization (WMO)
- Agence Française de Développement (AFD)
- HSBC Holdings plc

Coordination and collaboration with the NDA, NIEs or MIEs in case of climate funds or accessing other assistance tools for environment and biodiversity conservation related funds are thus very important and highly recommended to ensure proper financing of proposed actions along with the Government's contribution. In this regard, strengthening of existing NIEs and accreditation of other NIEs are envisaged to be done gradually through this plan implementation period.

However, updated Climate Fiscal Framework (2020) stated that the main challenge for the government departments is the mismatch between accessing criteria and the country systems and practices in relation to public finance systems. Bangladesh will be deprived of the climate funding from GCF if the public-sector entities of the country meet those criteria. While the public-sector entities of the country have quite a robust planning, budgeting, monitoring and evaluation framework, they all have solid experience of implementing projects using this framework. Considering the existing systems and procedures of the country, the accessing criteria introduced by the GCF should be reconsidered for Bangladesh given its extreme vulnerability to climate change.

Loss and damages caused by frequent and intense climate change induced disasters can put significant risk on public finances with major fiscal implications in the short-term and wider long-term implications for development. Transfer of risk through appropriate financial instruments can ease the immediate financial burden reducing or avoiding long-term costs to public financial stability, economic growth and human development (CFF, 2020). There is an overriding need to test risk cover innovation beyond

traditional credit mechanism and disaster-relief programs to effectively safeguard the rural population in Bangladesh. Insurance may stand in good stead to provide risk cover for the rural farmers.

The absence of insurance support retards development because smallholders cannot take risk in investing in fixed capital or concentrating on profitable activities and crops for fear of losing them and falling into debt. Thus, a critical task for the public sector will be to support the private sector in financial risk sharing. The greater involvement of the private sector is critical if Bangladesh is to prepare itself for both the challenges and opportunities of climate change. The companies in Bangladesh are yet to consider the impact of climate change on their existing activities. While the benefit and importance of private sector engagement in the battle against climate change is much debated, the reality is that in Bangladesh, most of the private entities perceive climate change either as an irrelevant, or at best, an extension of their Corporate Social Responsibility (CSR).

The existing insurance policy neither adequately addresses climate issues, nor does it target the differentiated impact of climate change on different socio-economic groups such as women and people with disabilities and ethnic minorities. The existing insurance policy, therefore, needs to be reviewed, in partnership with Insurance Development and Regulatory Authority (IDRA), to identify areas where innovative tools related to climate risk transfer issues can be included.

Parallel to the tax or insurance instruments, provision of introducing climate bonds is also recommended for reducing challenges regarding inactiveness of secondary capital market, increasing coordination among the key market players/stakeholders in the public and private sector, and introducing appropriate rules and regulations for ensuring good governance and building trust among the potential investors. Updated Climate Fiscal Framework 2020 suggested to revisit and update the existing medium-term debt strategy including climate bonds as promising financing windows.

Similar to the Climate Fiscal Framework (CFF, 2020), the 8<sup>th</sup> Five Year Plan (2020-2025) specifically outlines strategic actions to introduce Environmental Fiscal Reforms (EFR), which can reduce pricing distortions at present undermining sound environmental management, as current fiscal policy lacks adequate instruments to achieve environmental sustainability. Introduction and proper implementation of ‘Polluters Pay Principles’ and ‘Beneficiary Pay Principles’ would reinforce this effort, i.e. to incentivize Green Growth by sustainable production and consumption.

On this front, this plan includes two relevant actions for Agroecosystem management in a sustainable way e.g. Piloting of Polluter’s Pay Principle and Beneficiaries Pay Principle for Reducing Pollution and Over Agro-Chemicals Use and Development of Payment for Ecosystem Services (PES) scheme for Breeding of Carp Fisheries in Halda River supporting Livelihoods of Fishermen. Development and implementation of pricing policies of water supply, sanitation and waste management will supplement the gradual transformation of Green Public Financial Management (GPFM). In parallel to this, introducing Environmental Pay Item (EPI) for inside the schedule of rates for any infrastructure development related project could also be an effective instrument along with appropriate tax or incentives tool. Integration and coordination of CFF and EFR are very important through this process. However, following priority actions are emphasized in the 8<sup>th</sup> FYP to successfully turn the Environmental Fiscal Reform (EFR) into operation:

- Coordinating NAP, BCCSAP, CIP, NAP and NDC with BDP 2100
- Mainstreaming EFR within Ministry of Finance (MoF) developing effective partnerships with several local research institutions that can support with EFR policy formulation

- Improving the capacity of MoEFCC and Increased Partnerships for MoEFCC
- Increasing the role of LGIs through establishing WASAs in 7 divisional cities by 2025, introducing adequate financial accounting and reporting standards, developing MIS system for each urban LGI that provides basic information on the water production and consumption, water use efficiency, pricing, quality and demand etc. and strengthening the capabilities of the MoLGRDC that provides oversight to LGIs for providing better guidance, supervision and monitoring of LGIs.
- Development of “Water and Sanitation Regulatory Agency” (WASRA) for regulating public and private utilities engaged with supply water and sanitation services and setting prices ensuring equitable pricing policy engaging both public and private sectors
- Decentralization of Environmental Management establishing formal coordinating mechanism between the national and local government environmental agencies, adopting participatory approach and policy reforms to engage LGIs for oversight of environmental management

Further, the Ministry of Planning is preparing different sector action plans, which is aimed to be implemented through ADP. The fund allocated there relevant to environment and climate change can also be optimized before selecting projects for this plan. Key stakeholders of this plan for resources optimization should maintain a strong coordination with GED, PD, MoEFCC and MoF.

## 5.5 Strategies for Delta Fund Establishment

The General Economics Division (GED) under the Planning Commission has already taken the lead of this fund establishment process. It has been estimated that around 2.5% of GNI will be required till 2030. This plan further extends the efforts to accelerate the process of the delta fund establishment with some specific strategic guidelines, which are as following:

- Establishment of Delta Wing in GED and required policy and regulatory framework like the Delta Act for the Bangladesh Delta Fund taking lessons learnt from Dutch Delta Fund and Delta Works Commission
- Increased partnerships, coordination and collaboration with 13 member countries of Delta Coalition to foster their aspirations to increase opportunities for financing in order to facilitate implementation of projects that will reduce vulnerability to climate change
- A total 34 projects among 80 have been identified as climate relevance projects amounts to around \$US 2.5 billion can be channelized from public climate fund like BCCTF and international climate funds such as Green Climate Fund (GCF), Adaptation Fund or other ones as mentioned in earlier sections. Therefore, capacity building of relevant institutions and agencies to access global climate funds
- Special agreement can be done with the GCF or GEF for financing delta plan projects aiming to tackle adverse impacts of climate change and water related disasters and achieve food security
- Bi-lateral and multi-lateral agreements need to be explored and performed with development partners such as the Asian Development Bank, World Bank, German Governments, UNDP to provide low interest and high grace period concessional loans or grants to form the fund
- Apart from public allocations through Annual Development Program (ADP) and climate funds, several environment and biodiversity funds, Agri research funds, Nature+ Accelerator

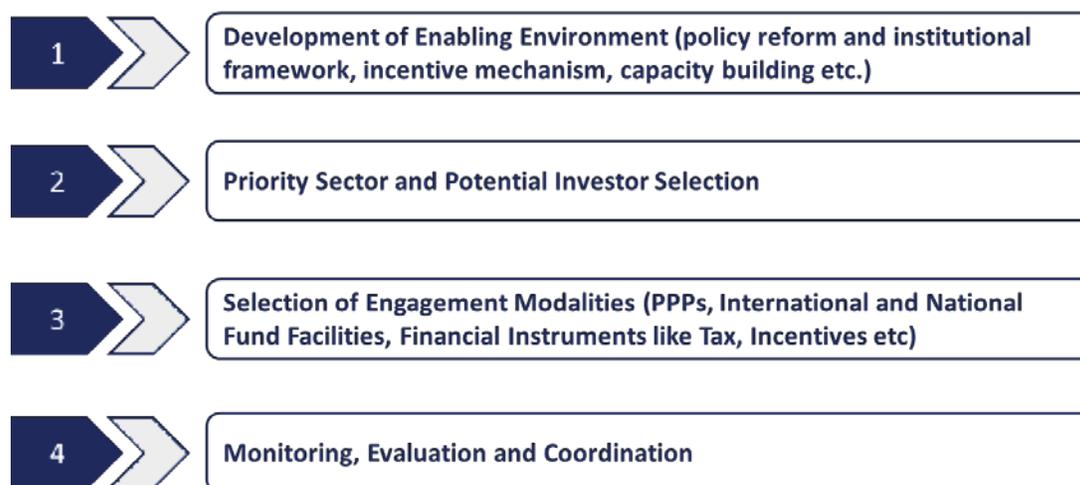
etc. may also be explored to access and mobilize funds to Delta Funds with systematic oversight of utilization through GED, IMED, PD and LGIs.

- More opportunities to engage private sectors are needed to be established to invest for delta projects introducing proper financial instruments for earning desired profits or co-benefits from their investment
- Extending the participatory water management and developing business model for community-based funding for small scale projects and actions under delta plan

## 5.6 Strategies for Private Sector Engagement

Private sector has a huge potential on ECC sector investment, particularly for climate smart agriculture, emission reduction, strengthening extension services, social inclusion etc. This plan identified 21 actions, which are suitable for Private Sector Engagement (PSE).

Bangladesh still lacks necessary policy interventions and institutional arrangements to popularize this process. Private sector investors mainly engage in mitigation projects rather than going for adaptation projects, as mitigation projects are comparatively easy and requires short-term monitoring and fast return. Thereby, to increase private sector investment in both adaptation and mitigation projects/processes addressing the prevailing challenges, more concentrated efforts should start immediately. These should introduce proper policy, legal and institutional framework, increasing networking and partnerships by Public-Private-Partnership Authority (PPPA), capacity building, knowledge enrich and awareness building of relevant private sector investors and stakeholders, proper and easy to follow selection criteria development for investors selection, developing required financial instruments such as taxation or incentives, ease the modalities of engagement, and finally, ensuring the proper monitoring, transparency, evaluation and coordination. Following four steps (Figure 5.3) should be followed to enhance the private sector engagement.



**Figure 5.3: Steps to Enhance Private Sector Engagement**

To develop enabling environment for private sector investments and potential risk management, Government has developed policy and strategies for Public-Private-Partnership (PPPs) in 2010. These strategies offer different types of incentives such as Viability Gap Fund to provide financial subsidy up to 30% of total project cost for PPP projects having high socio-economic value, Public Private Partnership Technical Assistance Financing, Fiscal Incentives like tax benefit following CSR provisions etc. Further,

government has permitted the submission of unsolicited proposals for the delivery of PPP projects and the unsolicited bidder is incentivized through the application of either the Swiss Challenge System or Bonus System to encourage the private investor participation and innovation in PPP projects.

Moreover, some implementation modalities have also been developed like Build-Own-Operate (BOO), Build-Operate-Transfer (BOT), Build-Own-Operate-Transfer (BOOT), Design-Build-Finance-Operate-Maintain (DBFOM). Among these modalities, DBFOM is quite popular specially to attract private finance in selected projects of BDP2100 where private company will be responsible for financing, building, and operating a facility to provide services to users. The DBFOM structure also provides incentives to ensure proper operations and maintenance. In addition, international climate funds like GCF or GEF or LDCF and development fund like UNDP, World Bank, ADB have their own mechanism to engage private sectors like the Private Sector Facility of GCF. Private agencies can start their engagement by following required steps with the GCF through the Private Sector Facility (PSF), specifically established to engage the local and global private sector to support climate change mitigation and adaptation projects in developing countries. Economic Relations Division (ERD) can play a significant role to sensitize private sectors to attract them for investment as NDA of GCF.

**The Kampala Principles** promote ownership of private sector engagement (PSE) through development of co-operation by partner countries, ensure the alignment of PSE projects, and programs with national sustainable development priorities. These Principles build upon and complement the Busan principles for effective development co-operation, address key challenges and opportunities presented by PSE in development co-operation, recognize the heterogeneity and diversity of the private sector, are geared towards supporting national and global sustainable development priorities, including the 2030 Agenda and the spirit of helping those furthest behind, are suggested for voluntary use by the diverse range of development co-operation and private sector actors engaged in country-level partnerships.



**Figure 5.4: The Kampala Principles for Effective Private Sector Engagement (PSE)**

Successful application of these principles in 3 countries including Bangladesh are illustrated in the following infographics (Figure 5.5), whose lessons learnt can be applied in many other areas and initiatives of this plan.



**Figure 5.5: Success Stories of Kampala Principles**

Focusing on agriculture, land, water, soil and agro-ecosystem management private sectors can be engaged in popularizing the various climate smart agriculture (CSA) agenda such as involving in cross-breeding, solar irrigation system, development of renewable energy-based farm system, bio-gas plants, popularization of AWD, IPM, buried pipe and mulching, e-commercialization of agriculture productions, marine fisheries and aquaculture and dairy products etc. Sometimes, seed growers face difficulties in obtaining seeds from government research institutes and in that case increased coordination and involvement of private sector would improve farmers' access. Farm mechanization, capacity building of farmers for machineries uses and maintenance, index-based insurance introduction, easing low interest-based credit access, promoting efficient fertilizer use, precision agriculture, livestock manure management, investing in sustainable food and ensuring food safety are some priority areas where the private sectors can engage and invest. Expansion of organic farming, floating seedbed for flood resilience, floating vegetable farming and executing different nature-based solutions for climate change adaptations are also suitable areas where the private sectors can play significant role beside the direct investment to large projects or in terms of financing to distribute burden over public investments. Further, the private sector can play a significant role in providing different income generation options and its related training for capacity development, different loan schemes for farmers, women and marginal groups, knowledge management initiatives to collect and restore indigenous knowledge through advertising, awareness building programs, social resources mapping and vulnerability mapping at the community level etc.

## 5.7 Monitoring and Evaluation

Monitoring and evaluation of SAP is recommended to be headed by the Agriculture, Water Resources and Rural Development Division under the Monitoring and Evaluation Cell. Project implementation monitoring can be done by IMED in coordination with implementing agencies and relevant stakeholders. A result-based monitoring framework has been developed to facilitate the M&E and reporting process. This result-based M&E framework will apply Theory of Change selecting SMART (Specific, Measurable, Achievable, Relevant and Time Bound) indicators aligned with National Priority Indicators (NPI), SDGs indicators, indicators introduced inside the Annual Performance Agreements (APA) of relevant stakeholders. The monitoring framework of National Adaptation Plan (NAP) can also be aligned and synchronized with the monitoring frame of this plan. Regular update of this action plan as well as knowledge management plan is envisaged in each 5 years. However, monitoring, evaluation and reporting of project are envisaged to be performed every year.

The developed result-based framework comprises of 82 unique indicators and a total of 126 indicators, with available status of base years (Annex-3). Efforts have been made to develop this framework based on predefined set of indicators, values of which are predetermined and readily available. The major data sources for the indicators are Annual Performance Agreements of MoEFCC, MoA, MoFL, MoWR, MoL, MoLGRDC, MoWCA, MoI, MoC, MoFood, MoP, MoF, MoCHTA, BBS, 8<sup>th</sup> FYP, BDP2100, NAP, NDC, SDG Tracker, NWRD, Perspective Plan 2041 etc. However, the baseline data are not present for some newly proposed indicators, which will need to be collected through the responsible agencies. The Environment, Climate Change and Disaster Statistics Cell (ECCDSC) of Bangladesh Bureau of Statistics (BBS) can also be given responsibilities to collect those data as national data and statistics organisation to facilitate the M&E process. The planned targets have been set based on the targets of 8<sup>th</sup> FYP, Perspective Plan, BDP2100, NAP and NDC, SDGs etc.

## 5.8 Way Forward

The Sector Action Plan has accumulated a set of actions following the National vision and sustainable development goals for the environment and climate change sector. As the sector has wide implications on agriculture, fisheries and livestock production and livelihoods, the proposed actions cover these major domains relevant for national development. The SAP have been prepared following the theory of change approach and a result-based monitoring framework with potential indicators has been proposed. The SAP is expected to assist in bridging the gap between the Eighth Five Year Plan and annual development plan implementation. The relevant stakeholders could utilise this plan in their project preparation in line with the Eighth Five Year Plan.

**Annexure**



## Annex 1: National Policy Framework aligned with the Themes of SAP ECC

SI No	Policy/Legislations/Plan or Strategic Framework	Type of Document				Category C1: Addressing Climate Change Consequences				Category C2: Environmental Pollution Control, Biodiversity Conservation and Forest Management				Category C3: Cross Cutting			
		Legislation	Policy	Plan	Strategy/ Framework	T1: Enhancing Local Level Adaptation	T2: Climate-Smart Agriculture	T3: Land and Water Management	T4: Green Growth	T5: Pollution, Pest and Diseases Management	T6: Ecosystem, Biodiversity Conservation and Forest Management	T7: Enhanced Financing	T8: Institutions and Governance	T9: Compliance to MEAs	T10: Research, Knowledge Management and Capacity Development		
1	Bangladesh Climate Change Strategy and Action Plan 2009 (BCCSAP)		✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
2	Bangladesh Climate Change and Gender Action Plan (ccGAP: Bangladesh) (2013)		✓			✓	✓	✓		✓		✓	✓	✓	✓		
3	The Sustainable and Renewable Energy Development Authority (SREDA) Act, 2012	✓					✓	✓	✓		✓				✓		
4	Bangladesh Energy and Power Research Council (EPRC) Act, 2015	✓							✓								
5	Disaster Management Act, 2012	✓				✓						✓			✓		
6	Standing Orders on Disaster, 2019	✓				✓						✓			✓		
7	Disaster Management (Committee Structure and Functions) Rules, 2015	✓										✓			✓		
8	(Draft) Disaster Management Fund Rules, 2015	✓										✓			✓		
9	Bangladesh Climate Change Trust Act, 2010	✓				✓	✓	✓	✓		✓	✓			✓		
10	Bangladesh Oceanographic Research Institute Act, 2015	✓					✓	✓		✓			✓		✓		
11	National Co-operative Policy, 2012		✓			✓						✓			✓		
12	National Women Development Policy, 2011		✓			✓	✓	✓							✓		

SI No	Policy/Legislations/Plan or Strategic Framework	Type of Document				Category C1: Addressing Climate Change Consequences				Category C2: Environmental Pollution Control, Biodiversity Conservation and Forest Management				Category C3: Cross Cutting			
		Legislation	Policy	Plan	Strategy/ Framework	T1: Enhancing Local Level Adaptation	T2: Climate-Smart Agriculture	T3: Land and Water Management	T4: Green Growth	T5: Pollution, Pest and Diseases Management	T6: Ecosystem, Biodiversity Conservation and Forest Management	T7: Enhanced Financing	T8: Institutions and Governance	T9: Compliance to MEAs	T10: Research, Knowledge Management and Capacity Development		
13	Nationally Determined Contributions (NDC) 2015		✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
14	Renewable Energy Policy of Bangladesh, 2008		✓					✓									
15	National Disaster Management Policy, 2015		✓			✓						✓			✓		
16	Cyclone Shelter Construction, Maintenance and Management Policy, 2011		✓									✓			✓		
17	Perspective Plan of Bangladesh: Vision 2041			✓		✓	✓	✓	✓	✓		✓			✓		
18	8 <sup>th</sup> Five Year Plan			✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
19	Bangladesh Country Investment Plan for Environment, Forestry and Climate Change (BCIPEFCC) 2016-2020			✓		✓	✓	✓	✓	✓		✓			✓		
20	National Social Security Strategy (NSSS), 2015				✓												
21	National Sustainable Development Strategy (NSDS), 2013				✓	✓	✓	✓	✓	✓		✓			✓		
22	Bangladesh Delta Plan 2100			✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
23	National Adaptation Programmes of Action (NAPA) 2005			✓		✓	✓	✓	✓	✓		✓			✓		
24	Bangladesh Climate Fiscal Framework, 2014				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
25	Energy Efficiency and Conservation Plan Up to 2030, 2016								✓			✓			✓		
26	(Draft) National Plan for Disaster Management (2016-2020);			✓	✓	✓						✓			✓		

SI No	Policy/Legislations/Plan or Strategic Framework	Type of Document				Category C1: Addressing Climate Change Consequences				Category C2: Environmental Pollution Control, Biodiversity Conservation and Forest Management				Category C3: Cross Cutting			
		Legislation	Policy	Plan	Strategy/ Framework	T1: Enhancing Local Level Adaptation	T2: Climate-Smart Agriculture	T3: Land and Water Management	T4: Green Growth	T5: Pollution, Pest and Diseases Management	T6: Ecosystem, Biodiversity Conservation and Forest Management	T7: Enhanced Financing	T8: Institutions and Governance	T9: Compliance to MEAs	T10: Research, Knowledge Management and Capacity Development		
27	(Draft) Plan of Action to Implement Sendai Framework for Disaster Risk Reduction, 2015-2030			✓		✓						✓	✓	✓	✓		
28	Plan of Action on Disaster and Climate Risk Management in Agriculture for Department of Agricultural Extension, 2015			✓		✓	✓	✓	✓	✓		✓	✓	✓	✓		
29	Updated Nationally Determined Contribution (2021)			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
30	Roadmap and Action Plan for Implementing Bangladesh NDC (Transport, Power and Industry Sectors), 2018			✓			✓	✓	✓	✓		✓	✓	✓	✓		
31	Mujib Climate Prosperity Plan			✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
32	Bangladesh Environment Court Act, 2010	✓							✓	✓		✓					
33	Bangladesh Biosafety Rules, 2012	✓					✓			✓		✓					
34	Brick Manufacturing and Brick Kilns Establishment (Control) Act, 2013	✓						✓		✓		✓					
35	The Ship Breaking and Recycling Rules, 2011	✓								✓		✓					
36	Bangladesh Environment Conservation Act (1995)	✓					✓	✓		✓		✓					
37	Environment Conservation Rules (1997)	✓					✓	✓		✓		✓					
38	National Environmental Policy, 2018		✓				✓	✓		✓	✓	✓	✓	✓	✓		

SI No	Policy/Legislations/Plan or Strategic Framework	Type of Document				Category C1: Addressing Climate Change Consequences				Category C2: Environmental Pollution Control, Biodiversity Conservation and Forest Management				Category C3: Cross Cutting			
		Legislation	Policy	Plan	Strategy/ Framework	T1: Enhancing Local Level Adaptation	T2: Climate-Smart Agriculture	T3: Land and Water Management	T4: Green Growth	T5: Pollution, Pest and Diseases Management	T6: Ecosystem, Biodiversity Conservation and Forest Management	T7: Enhanced Financing	T8: Institutions and Governance	T9: Compliance to MEAs	T10: Research, Knowledge Management and Capacity Development		
39	Hazardous Waste and Ship Breaking Waste Management Regulations, 2011		✓						✓	✓							
40	Bangladesh National Action Plan for Reducing Short-Lived Climate Pollutants (SLCPs), 2018			✓		✓	✓	✓	✓	✓		✓	✓	✓	✓		
41	Bangladesh Water Act, 2013	✓					✓			✓		✓					
42	The National River Protection Commission Act, 2013	✓										✓	✓		✓		
43	Marine Fisheries Act 2020	✓				✓	✓	✓		✓		✓					
44	Marine Protected Area (MPA) 2019 through S.R.O. No. 211-Law/2019	✓				✓	✓	✓	✓	✓			✓		✓		
45	National Water Policy (NWPO), 1999		✓			✓	✓	✓	✓	✓		✓		✓	✓		
46	Integrated Small Scale Irrigation Policy, 2014		✓				✓	✓		✓		✓		✓	✓		
47	Public Water body Management Policy, 2009		✓				✓	✓		✓							
48	Coastal Zone Policy (CZP), 2005		✓			✓	✓	✓	✓	✓		✓		✓	✓		
49	National Fisheries Policy 1998		✓			✓	✓	✓	✓	✓		✓		✓	✓		
50	National Shrimp Policy 2014		✓			✓	✓	✓	✓	✓		✓		✓	✓		
51	Jalmahal Policy, 2009		✓			✓	✓	✓	✓	✓		✓		✓	✓		
52	RAMSAR Convention	✓					✓	✓	✓	✓			✓		✓		
53	Forest Act 1927	✓					✓	✓	✓	✓							
54	Wildlife (Preservation & Security) Act, 2012	✓					✓	✓	✓	✓		✓					
55	Biodiversity Act, 2017	✓					✓	✓	✓	✓		✓					
56	Balumohal and Soil Management Act, 2010	✓					✓	✓	✓	✓		✓					

SI No	Policy/Legislations/Plan or Strategic Framework	Type of Document				Category C1: Addressing Climate Change Consequences					Category C2: Environmental Pollution Control, Biodiversity Conservation and Forest Management				Category C3: Cross Cutting			
		Legislation	Policy	Plan	Strategy/ Framework	T1: Enhancing Local Level Adaptation	T2: Climate-Smart Agriculture	T3: Land and Water Management	T4: Green Growth	T5: Pollution, Pest and Diseases Management	T6: Ecosystem, Biodiversity Conservation and Forest Management	T7: Enhanced Financing	T8: Institutions and Governance	T9: Compliance to MEAs	T10: Research, Knowledge Management and Capacity Development			
57	Ecological Critical Area Management Rules, 2016	✓					✓			✓		✓						
58	Natural Water Body Protection and Preservation of Open Spaces and Playground Act, 2000	✓					✓	✓		✓		✓						
59	Chittagong Hill Tracts Regulation Act, 1990	✓					✓	✓				✓						
60	Fisheries Hatchery Act 2010	✓				✓	✓			✓		✓						
61	Fisheries Hatchery Rules 2011	✓				✓	✓			✓		✓						
62	The Protection and Conservation of Fish (Amendment) Act, 2002	✓						✓		✓		✓						
63	National Forestry Policy 2017		✓					✓	✓	✓		✓	✓		✓			
64	Coastal Development Strategy (CDS), 2006				✓			✓		✓		✓			✓			
65	Bangladesh Country Investment Plan: A road map towards investment in agriculture, food security and nutrition (2011)		✓					✓		✓	✓	✓			✓			
66	National Livestock Extension Policy (Final Draft) (2013)		✓					✓		✓		✓			✓			
67	Slaughter Act 2011	✓						✓				✓						
68	National Poultry Development Policy 2018		✓					✓		✓		✓			✓			
69	Animal Feed Act 2012	✓								✓		✓						
70	Animal Disease Rule 2008	✓								✓		✓						
71	Animal Disease Act 2005	✓								✓		✓						
72	Bangladesh Animal and Animal Product Quarantine Act, 2005	✓								✓		✓						
73	National Livestock Development Policy, 2007		✓					✓		✓		✓			✓			

SI No	Policy/Legislations/Plan or Strategic Framework	Type of Document				Category C1: Addressing Climate Change Consequences				Category C2: Environmental Pollution Control, Biodiversity Conservation and Forest Management				Category C3: Cross Cutting			
		Legislation	Policy	Plan	Strategy/ Framework	T1: Enhancing Local Level Adaptation	T2: Climate-Smart Agriculture	T3: Land and Water Management	T4: Green Growth	T5: Pollution, Pest and Diseases Management	T6: Ecosystem, Biodiversity Conservation and Forest Management	T7: Enhanced Financing	T8: Institutions and Governance	T9: Compliance to MEAs	T10: Research, Knowledge Management and Capacity Development		
74	National Biodiversity and Strategy and action plan of Bangladesh (2016-2021)		✓			✓	✓	✓		✓		✓	✓	✓	✓		
75	Haor Master Plan		✓			✓	✓			✓		✓		✓	✓		
76	The Bangladesh Agricultural Research Council Act, 2012	✓					✓					✓					
77	Bangladesh Agricultural Research Institute (BARI) Act, 2017	✓				✓	✓	✓				✓		✓	✓		
78	Fisheries and Livestock Feed Act 2010	✓				✓	✓	✓		✓		✓		✓	✓		
79	Fisheries Feed Rules 2011	✓					✓			✓		✓					
80	Fisheries Quarantine Act 2018	✓				✓	✓	✓	✓	✓		✓					
81	Fish and Fish Products (Inspection and Quality Control) Act-2020	✓					✓	✓		✓		✓					
82	Climate Resilient Crop Variety and Technology Development Policy, 2010		✓			✓	✓	✓	✓			✓		✓	✓		
83	National Agriculture policy 2018		✓			✓	✓	✓		✓		✓		✓	✓		
84	National Agriculture Extension Policy 2020		✓			✓	✓	✓		✓		✓		✓	✓		
85	National Agricultural Mechanization Policy 2020		✓			✓	✓	✓						✓	✓		
86	Agricultural Important Person Policy-2019		✓									✓					
87	Underground Water Management Act for Agricultural Use 2019	✓						✓				✓					
88	Underground Water Management Rules 2018	✓						✓				✓					

SI No	Policy/Legislations/Plan or Strategic Framework	Type of Document				Category C1: Addressing Climate Change Consequences				Category C2: Environmental Pollution Control, Biodiversity Conservation and Forest Management				Category C3: Cross Cutting			
		Legislation	Policy	Plan	Strategy/ Framework	T1: Enhancing Local Level Adaptation	T2: Climate-Smart Agriculture	T3: Land and Water Management	T4: Green Growth	T5: Pollution, Pest and Diseases Management	T6: Ecosystem, Biodiversity Conservation and Forest Management	T7: Enhanced Financing	T8: Institutions and Governance	T9: Compliance to MEAs	T10: Research, Knowledge Management and Capacity Development		
89	Master Plan for Agricultural Development in the Southern Region of Bangladesh, 2012		✓			✓	✓	✓	✓	✓	✓	✓		✓			
90	Plan of Action for Implementation of Agriculture Policy, 2018		✓			✓	✓	✓	✓	✓	✓	✓		✓			
91	National Seed Policy, 1999		✓			✓						✓		✓			
92	National Integrated Pest Management (IPM) Policy, 2002		✓					✓		✓		✓		✓			
93	National Crop and Forest Biotechnology Policy Instructions 2012		✓							✓		✓		✓			
94	Integrated Micro Irrigation Policy, 2017		✓				✓					✓					
95	National Organic Agriculture Policy, 2016		✓				✓	✓		✓		✓		✓			
96	Fertilizer (Control) Ordinance, 1999	✓						✓		✓		✓					
97	Fertilizer Dealer Appointment & Fertilizer Distribution Integrated Policy 2009		✓									✓					
98	Amendment/ Supplement/ Clarification of Fertilizer Dealer Appointment & Fertilizer Distribution Integrated Policy (From 2009 to 2011)	✓										✓					
99	Fertilizer (Management) Act, 2006	✓					✓			✓		✓					
100	Fertilizer (Management) Guidelines, 2007	✓					✓	✓		✓		✓		✓			

SI No	Policy/Legislations/Plan or Strategic Framework	Type of Document				Category C1: Addressing Climate Change Consequences				Category C2: Environmental Pollution Control, Biodiversity Conservation and Forest Management				Category C3: Cross Cutting			
		Legislation	Policy	Plan	Strategy/ Framework	T1: Enhancing Local Level Adaptation	T2: Climate-Smart Agriculture	T3: Land and Water Management	T4: Green Growth	T5: Pollution, Pest and Diseases Management	T6: Ecosystem, Biodiversity Conservation and Forest Management	T7: Enhanced Financing	T8: Institutions and Governance	T9: Compliance to MEAs	T10: Research, Knowledge Management and Capacity Development		
101	Fertilizer (Management) (Amendment) Ordinance, 2008	✓					✓			✓		✓					
102	Fertilizer (Management) (Amendment) Act, 2009	✓					✓			✓		✓					
103	Non-Urea Fertilizer Import, Sell and Subsidy Distribution/ Giving Method	✓					✓			✓		✓					
104	Fertilizer (Management) Guidelines, 2007 Amendment	✓					✓			✓		✓					
105	The Destructive Insects and pests Rules, 1966 (Plant Quarantine)	✓					✓			✓		✓					
106	The Destructive Insects and pests Rules, 1966 (Plant Quarantine) Amendment, 1989	✓					✓			✓		✓					
107	Plant Quarantine Act, 2011	✓								✓		✓					
108	Plant Quarantine Rules, 2018	✓								✓		✓					
109	Climate Change Responsive Early and Short Duration Variety and Technology Development Policy, 2010		✓				✓		✓						✓		
110	Seed Standard and Field Standard of Notified and Non-Notified Crops	✓					✓								✓		
111	Seed Act, 2018	✓								✓		✓			✓		
112	Seed Rules, 1998	✓								✓		✓					
113	Nursery Guidelines, 2008	✓								✓		✓					
114	Bangabandhu National Agricultural Award Trust Act, 2016	✓												✓	✓		
115	Ground Water Management in Agriculture Production Act, 2018	✓					✓							✓	✓		

SI No	Policy/Legislations/Plan or Strategic Framework	Type of Document				Category C1: Addressing Climate Change Consequences				Category C2: Environmental Pollution Control, Biodiversity Conservation and Forest Management				Category C3: Cross Cutting			
		Legislation	Policy	Plan	Strategy/ Framework	T1: Enhancing Local Level Adaptation	T2: Climate-Smart Agriculture	T3: Land and Water Management	T4: Green Growth	T5: Pollution, Pest and Diseases Management	T6: Ecosystem, Biodiversity Conservation and Forest Management	T7: Enhanced Financing	T8: Institutions and Governance	T9: Compliance to MEAs	T10: Research, Knowledge Management and Capacity Development		
116	Weather Act, 2018	✓					✓					✓					
117	National Livestock Extension Policy (2013)		✓				✓			✓		✓			✓		
118	The Pesticides Ordinance, 1971	✓								✓	✓	✓					
119	The Pesticides (Amendment) Ordinance, 2007	✓								✓	✓	✓					
120	The Pesticides (Amendment) Act, 2009	✓								✓	✓	✓					
121	The Pesticides (Amendment) Ordinance, 2021 (Draft)	✓								✓	✓	✓					
122	The Pesticide Rules, 1985	✓								✓	✓	✓					
123	The Pesticide Rules, 1985 Amendment 2010	✓								✓	✓	✓					
124	The Pesticide Act, 2018	✓								✓	✓	✓					
125	The Pesticide Rules 2019 (Draft)	✓								✓	✓	✓					
126	Bangladesh Good Agricultural Practices Act 2020	✓								✓	✓	✓		✓	✓		
127	Agricultural Firm Labourer Recruitment and Governance Policy 2017		✓									✓					
128	Integrated Minor Irrigation Policy-2017		✓									✓					
129	Poisons Act, 1919	✓								✓		✓					
130	Bangladesh Updated Climate Change Fiscal Framework, 2020				✓					✓	✓	✓		✓	✓		

## Annex 2: Sector Actions and Indicative Projects

Strategy/ Goal of 8YFP	Thematic Category/ Thematic area	Action Code	Action/ Project	Tent- ative Cost in Crore BDT	Imple- mentation period	Aligned to		Expected Outcome	Responsible Agency	Private sector engag- ement
						SDG's target	BDP 2100 measure			
Developing Gender- Inclusive Climate Change Response Framework	Addressing Climate Change Consequences (Enhancing Local Level Climate Change Adaptation and Resilience)	C1T1.1	Development of Gender Inclusion Framework for Enhanced Participation of women and marginalized groups in local level adaptation and climate smart agriculture	30	Short (FY 2024-25)	SDG5, SDG 1.21, SDG8.1.1, SDG6.1.1, SDG11, SDG13, SDG15	FR3, FW1, FW2	Enhanced participation woman, gender group, vulnerable communities	MoEFCC, MoA, MoFL, DoE, DAE, DoF, DLS	
		C1T1.2	Piloting and Establishment of 10 Climate Smart Village (CSV) for local level climate change adaptation with Climate Smart Agriculture Technologies	1000	Medium (FY 2023-24 to 2027- 28)	SDG 1.21, NPT4, SDG8.1.1, SDG6.1.1, SDG13, SDG15	Strategies under Agriculture, Food Security, Nutrition and Livelihoods	Establishment of CSV and climate smart technologies	MoEFCC, DoE, ARIs, DAE, BLRI, BFRI, DLS, DoF, BMIDA, SRDI, DAM, CDB	Y
Promoting sustainable agriculture and green growth		C1T1.3	Introducing Suitable New crop in Coastal Area (e.g. sugar beet at coastal saline area that has salinity tolerance up to 14 ds/m)	500	Medium (FY 2023-24 to 2027- 28)	SDG1, SDG2, SDG13	Strategies under Agriculture, Food Security, Nutrition and Livelihoods	Increase climate resilience of coastal communities	ARIs, DAE, DoE	

Strategy/ Goal of 8YFP	Thematic Category/ Thematic area	Action Code	Action/ Project	Tent- ative Cost in Crore BDT	Imple- mentation period	Aligned to		Expected Outcome	Responsible Agency	Private sector engag- ement
						SDG's target	BDP 2100 measure			
Promote measures to expand mechanization and value chain development		C1T2.4	Development and Popularization of Technologies for Farm Mechanization in Agriculture and Reduce Production Cost	800	Short (FY 2023-24)	SDG13	strategies under Agriculture, Food Security, Nutrition and Livelihoods	Reduce climate change induced risk by increased production	DAE, BADDC	
Promoting poultry and livestock farming	Addressing Climate Change Consequences (Climate Smart Agriculture)	C1T2.5	Development and Enhanced Promotion of Integrated and Mixed Farming (Crop, Fisheries, Vegetable, Urban, Livestock and Poultry) Practices in Suitable Areas	600	Medium (FY 2023-24 to 2027- 28)	SDG 1.21, NPT4, SDG8.1.1, SDG6.1.1, SDG13, SDG15	Strategies under Agriculture, Food Security, Nutrition and Livelihoods	Food security can be achieved by sustainable resources management, Chances of pest infestation will greatly reduce, Integrated and mixed farming will be increased	ARIs, DAE, BLRI, BFRI, DLS, DoF, BMIDA, SRDI, DAM, CDB	
Promoting poultry and livestock farming		C1T2.6	Construction of Killa (Elevated Platforms) for Livestock and Poultry Rearing in Flood Prone Areas	1000	Short (FY 2024-25)	SDG9, SDG2, SDG11	Strategies under Agriculture, Food Security, Nutrition and Livelihoods	ensure protection for Livestock and Poultry	LGD, MoDRR, DLS, DDM	Y

Strategy/ Goal of 8FYP	Thematic Category/ Thematic area	Action Code	Action/ Project	Tent- ative Cost in Crore BDT	Imple- mentation period	Aligned to		Expected Outcome	Responsible Agency	Private sector engag- ement
						SDG's target	BDP 2100 measure			
Agricultural research		C1T2.7	Development and Extension of Stress (heat, cold, salinity, waterlogging, etc.) tolerant crop varieties and livestock breed development and Strengthening Extension Services	500	Medium (FY 2023-24 to 2027- 28)	SDG 1.21, NPT4, 8.1.1, SDG13	Increasing resilience of agricultural production systems	Food Security can be achieved, Salinity, drought and water logging tolerant HW crop varieties will be invented	ARIs, DAE, BLRI, BFRI, DLS, DoF, BMIDA, SRDI, CDB	
Support sustainable growth in fish and shrimp production with other aquatic resources	Addressing Climate Change Consequences (Climate Smart Agriculture)	C1T2.8	Nationwide Climate Change Risk and Vulnerability Assessment for Fisheries and Aquaculture in Bangladesh	30	Short (FY 2023-24 to 2024- 25)	SDG8.1.1, SDG13, SDG15	Improved farm practices and technologies for mediating negative impacts of Climate Change	Enhance knowledge on risk and vulnerability of Fisheries and Aquaculture in Bangladesh due to climate change impacts	DoF, BFRI	
Formulation and Advancement of NAP Process		C1T2.9	Mainstreaming and Implementation of National Adaptation Plan (NAP) for Agriculture in Bangladesh	1000	Long (FY 2023-24 to 2029- 30)	SDG 1.21, SDG8.1.1, SDG6.1.1, SDG13, SDG15	FR1, FR2, FR3, FW1, FW2, FW3 and cross cutting strategies	More focused projects on Climate change adaptation and mitigation for agriculture	MoA, MoFL	Y

Strategy/ Goal of 8FYP	Thematic Category/ Thematic area	Action Code	Action/ Project	Tent- ative Cost in Crore BDT	Imple- mentation period	Aligned to		Expected Outcome	Responsible Agency	Private sector engag- ement
						SDG's target	BDP 2100 measure			
Enhancing productivity through research and development		C1T2.10	Assessment of Climate change impact on Livestock and poultry, it's Impact on Production of Meat, Milk and egg and Formulation of Adaptation Measures	15	Short (FY 2023-24 to 2024- 25)	SDG 1.21, SDG8.1.1, SDG6.1.1, SDG13, SDG15	Strategies under Agriculture, Food Security, Nutrition and Livelihoods	Enhance knowledge on climate change impacts on livestock and poultry and possible and possible adaptation	DLS, BLRI	
Introduction of adaptive aquaculture technologies and fisheries management system for the	Addressing Climate Change Consequences (Climate Smart Agriculture)	C1T2.11	Sustainable Fisheries and Aquaculture Management in Haor and Coastal Areas of Bangladesh	200	Medium (FY 2024-25 to 2027- 28)	SDG 1.21, SDG8.1.1, SDG6.1.1, SDG13, SDG15	Strategies under Agriculture, Food Security, Nutrition and Livelihoods	Enhance the Sustainability of Fisheries and Aquaculture Management	DoF, MoI, MoC	
Crop zoning and land use planning Promotion of precision agriculture		C1T2.12	Land Use Planning, Crop Zoning, and Promotion of Precision Agriculture practices in climate stress areas for achieving land degradation neutrality.	500	Short (FY 2023-24 to 2024- 25)	SDG 1.21, SDG8.1.1, SDG6.1.1, SDG2, SDG13, SDG15	Strategies under Sustainable Land Use and Spatial Planning; Agriculture, Food Security, Nutrition and Livelihoods	enhancement of Land Use Planning, Crop Zoning, and Promotion of Precision Agriculture	MoL, SRDI, DAE, BADC, BMIDA	

Strategy/ Goal of 8FYP	Thematic Category/ Thematic area	Action Code	Action/ Project	Tent- ative Cost in Crore BDT	Imple- mentation period	Aligned to		Expected Outcome	Responsible Agency	Private sector engag- ement
						SDG's target	BDP 2100 measure			
Ensuring production of enough staples and diversifying to the non- crop sector	Addressing Climate Change Consequences (Climate Smart Agriculture)	C1T2.13	Crop Intensification in water stress areas through Diversifying High Value non-Rice Crops like Pulses, Oilseeds, Spices and Vegetables and promotion of reduction of ground water use	700	Medium (FY 2023-24 to 2027- 28)	SDG 1.21, SDG2, SDG8.1.1	Strategies under Agriculture, Food Security, Nutrition and Livelihoods	Reduce food/ nutrient source vulnerability	ARIs, DAE, BMIDA, BADDC, DAM, BIRTAN	Y
Introduction and popularization of Good Agricultural Practices (GAP)		C1T2.14	Conservation of Indigenous Knowledge and Expansion of Good Agricultural Practices (GAP) for Climate Change Adaptation	500	Short (FY 2024-25)	SDG2, SDG15	Strategies under Agriculture, Food Security, Nutrition and Livelihoods	Expansion of GAP and enhance knowledge on indigenous practices	ARIs, DAE	
Sustaining agricultural growth and developing nutrition sensitive agriculture		C1T2.15	Assessment of Climate Change Impact on Nutrients availability in crops	50	Short (FY 2025-26)	SDG2	Strategies under Agriculture, Food Security, Nutrition and Livelihoods	enhance knowledge on Climate Change Impact on Nutrients availability in crops	ARIs, BIRTAN, MoFood	

Strategy/ Goal of 8YFP	Thematic Category/ Thematic area	Action Code	Action/ Project	Tent- ative Cost in Crore BDT	Imple- mentation period	Aligned to		Expected Outcome	Responsible Agency	Private sector engag- ement
						SDG's target	BDP 2100 measure			
Improving management practice	Addressing Climate Change Consequences (Climate Smart Agriculture)	C1T2.16	Expansion of Climate Resilient Livestock Rearing and Management Practices (diversification, intensification and/ or integration of pasture management, altering the timing of operations, provision of shade and water to reduce heat stress, rotational grazing, changes in livestock/ herd composition etc.)	1000	Medium (FY 2023-24 to 2027- 28)	SDG1, SDG2, SDG13	Strategies under Agriculture, Food Security, Nutrition and Livelihoods	Expansion of Climate Resilient Livestock Rearing and Management Practices	DLS, BLRI	
Ensuring optimal use of water resources	Addressing Climate Change Consequences (Sustainable Land and Water Management)	C1T3.17	Sustainable land management through different agronomic practices	500	Medium (FY 2023-24 to 2027- 28)	SDG1, SDG2, SDG13	Strategies under Sustainable Land Use and Spatial Planning; Agriculture, Food Security, Nutrition and Livelihoods	Sustainable land management	DAE, BADG, BMIDA, BW/DB, LGED	Y

Strategy/ Goal of 8YFP	Thematic Category/ Thematic area	Action Code	Action/ Project	Tent- ative Cost in Crore BDT	Imple- mentation period	Aligned to		Expected Outcome	Responsible Agency	Private sector engag- ement
						SDG's target	BDP 2100 measure			
Ensuring production of enough staples and diversifying to the non- crop sector		C1T3.18	Improve on Farm Water Use Efficiency for non-Rice Crop (through Introduction of Sprinkler and Drip Irrigation System, Mulching etc. )	500	Medium (FY 2023-24 to 2027- 28)	SDG1, SDG2, SDG13	Strategies under Agriculture, Food Security, Nutrition and Livelihoods	Improved on Farm Water Use Efficiency for non-Rice Crop	DAE, BADC, BMIDA, BWDB, LGED	Y
		C1T3.19	Strengthening Operational Flash Floods Early Warning and Community based Dissemination System for Farmers and Fishermen of Haor Areas	150	Short (FY 2024-25 to 2025- 26)	SDG1, SDG2, SDG13	FR1-4, Strategies under Haor and Flash Flood Areas; Agriculture, Food Security, Nutrition and Livelihoods	enhance EWS and dissemination in communities	FFWC, BWDB	
Protect agriculture and vulnerable communities in Haor and flash flood areas	Addressing Climate Change Consequences (Sustainable Land and Water Management)	C1T3.20	Development of Opportunities for Alternative Livelihood Generation Activities for Southwest, Barind, Haor and other Hard to Reach Areas to Halt Internal Displacement and Ensure Engagement of Vulnerable Communities for Alternative Livelihood Generation Activities	800	Medium (FY 2024-25 to 2027- 28)	SDG2, SDG1.2.1, SDG13	FR3; strategies under coastal zone, Barind and Drought Prone Areas; Haor and Flash Flood Areas	enhance opportunities for Alternative Livelihood Generation Activities	MoEFCC, DoE, MoA, MoFL, LGD, BMIDA, DAE	Y

Strategy/ Goal of 8YFP	Thematic Category/ Thematic area	Action Code	Action/ Project	Tent- ative Cost in Crore BDT	Imple- mentation period	Aligned to		Expected Outcome	Responsible Agency	Private sector engag- ement
						SDG's target	BDP 2100 measure			
Mainstreaming Valuing Water into Public Investment Decision Making in collaboration with Planning Commission		C1T3.21	Mainstreaming of Valuing Water through Developed Shadow Water Pricing Framework by WARPO into Agriculture and Irrigation Policies and Implementation of Pricing for Irrigation in Barind and other Water Stressed Areas	100	Medium (FY 2023-24 to 2027- 28)	SDG6	FW1	Implement water pricing and ensure equitable use	MoEFCC, DoE, MoA, BADC, BMIDA, WARPO	
Developing strategy for managed aquifer recharge and introducing natural and artificial aquifer recharge systems using rainwater harvesting for groundwater recharge	Addressing Climate Change Consequences (Sustainable Land and Water Management)	C1T3.22	Development of Strategies and Expansion of Managed Aquifer Recharge (MAR) and Rainwater Harvesting for Artificial Groundwater Recharge in Drought Prone Barind Areas	300	Medium (FY 2023-24 to 2027- 28)	SDG6	FW1; strategies under Barind and Drought Prone Areas	Enhance MAR and rainwater harvesting	MoEFCC, DoE, BMIDA, BWDB	

Strategy/ Goal of 8FYP	Thematic Category/ Thematic area	Action Code	Action/ Project	Tent- ative Cost in Crore BDT	Imple- mentation period	Aligned to		Expected Outcome	Responsible Agency	Private sector engag- ement
						SDG's target	BDP 2100 measure			
Increase water use efficiency		C1T3.23	Development and Extension of Water Saving Techniques (e.g, AWD, Drip Irrigation, Buried Pipe or Hose Pipe Irrigation, Canal Lining or Fertigation)	700	Medium (FY 2023-24 to 2027- 28)	SDG6	FW1; strategies under Barind and Drought Prone Areas	Extension of Water Saving Techniques	BMDA, BWDB, LGED, BADC, DAE	
		C1T3.24	Expansion of Small- scale Irrigation Technology and Increase Surface Water use for Irrigation	1500	Short (FY 2023-24 to 2025- 26)	SDG2, SDG15	Strategies under Agriculture, Food Security, Nutrition and Livelihoods	Increase Surface Water use for Irrigation	LGED, BMDA, DAE	
Expansion of Surface Water Irrigation	Addressing Climate Change Consequences (Sustainable Land and Water Management)	C1T3.25	Rehabilitation of existing surface water irrigation project particularly Muhuri, Manu, Bhola, Barisal, Chandpur, Meghna- Dhonagoda, Teesta, GK	1500	Medium (FY 2023-24 to 2027- 28)	SDG6	FR3; FW1; FW2; strategies under Agriculture, Food Security, Nutrition and Livelihoods	Rehabilitation of existing surface water irrigation project	BWDB	
		C1T3.26	Rainwater harvesting through re-excavation of canal, pond, small river etc. and construction of dug well	600	Short (FY 2024-25)	SDG6, SDG13, SDG15	FW1.3	Rainwater harvesting	BMDA, DAE, LGED	

Strategy/ Goal of 8YFP	Thematic Category/ Thematic area	Action Code	Action/ Project	Tent- ative Cost in Crore BDT	Imple- mentation period	Aligned to		Expected Outcome	Responsible Agency	Private sector engag- ement
						SDG's target	BDP 2100 measure			
Expansion of Surface Water Irrigation		C1T3.27	Enhance marine and ocean resources mapping for supporting Blue economy	500	Medium (FY 2024-25 to 2027- 28)	SDG14	FR3; FW1; FW2; strategies under Food Security, Nutrition and Livelihoods		DoE, DoF, BORI, BFRI	
Continuing and strengthening river dredging to enhance navigability and to facilitate water transportation	Addressing Climate Change Consequences (Sustainable Land and Water Management)	C1T3.28	Revitalization and Rationalization of wetland ecosystems.	1000	Medium (FY 2024-25 to 2027- 28)	SDG6	FW1; strategies under Barind and Drought Prone Areas	Sustainable wetland management	MoEFCC, DoE, DBHWD, BWDB	
Strategy for water resources in Chattogram Hill Tracts		C1T3.29	Development of Catchment Management Plans and Kaptai Lake Rehabilitation Study with Pilot Project	1500	Medium (FY 2024-25 to 2027- 28)	SDG6	FR3; FW1; FW2; strategies under Chattogram Hill Tracts	Better and efficient water management in the projects	BWDB	

Strategy/ Goal of 8FYP	Thematic Category/ Thematic area	Action Code	Action/ Project	Tent- ative Cost in Crore BDT	Imple- mentation period	Aligned to		Expected Outcome	Responsible Agency	Private sector engag- ement
						SDG's target	BDP 2100 measure			
1. Technology generation and transfer for sustainable soil management in hilly areas 2. Demo plot for soil fertility management	Addressing Climate Change Consequences (Sustainable Land and Water Management)	C1T3-30	Sustainable Soil and Land Management for Increased Crop Productivity and Enhance Integrated Plant Nutrient System (IPNS)	600	Short (FY 2024-25 to 2025-26)	SDG2, SDG15	Strategies under Agriculture, Food Security, Nutrition and Livelihoods	Increased Crop Productivity, Enhance IPNS	SRDI, BIRTAN	
		C1T3-31	Promoting reduction of ground water use and increasing surface water use in Barind and other water scarcity areas	1000	Medium (FY 2024-25 to 2027-28)	SDG2, SDG6, SDG13	Strategies under Agriculture, Food Security, Nutrition and Livelihoods; Urban Areas	Expansion and Commercialization of Urban Agriculture	BMIDA, BW/DB, LGED, BADC, DAE	
Undertake Activities to Reduce Land Degradation		C1T3-32	Assessment of Causes and Impact of Land Degradation and Development and Implementation of Mitigation Measures	600	Medium (FY 2024-25 to 2027-28)	SDG2, SDG13, SDG15	strategies under coastal zone, Barind and Drought Prone Areas;	mitigate land degradation	DoE	

Strategy/ Goal of 8FYP	Thematic Category/ Thematic area	Action Code	Action/ Project	Tent- ative Cost in Crore BDT	Imple- mentation period	Aligned to		Expected Outcome	Responsible Agency	Private sector engag- ement
						SDG's target	BDP 2100 measure			
The capacity development of fishermen in deep sea		C1T3-33	Development of Niche Market and E-commerce of Marine Fisheries and Aquaculture for Coastal Areas	1200	Short (FY 2024-25 to 2025- 26)	SDG2, SDG14	Strategies under Agriculture, Food Security, Nutrition and Livelihoods	establish sustainable e commerce for Marine Fisheries and Aquaculture for Coastal Areas	DoF, BFDC	Y
Identify conservation needs and methods that can be effectively administered and regularly monitored	Addressing Climate Change Consequences (Sustainable Land and Water Management)	C1T3-34	Assessment of Marine Fish Stocks and Assessment of Climate Change Impacts on Fish Stocks	1000	Short (FY 2023-24 to 2024- 25)	SDG2, SDG13; SDG14	Strategies under Agriculture, Food Security, Nutrition and Livelihoods; Advancing the Blue Economy	enhance knowledge	DoF, BFDC, MFA	
Increased Partnership with the NGOs and Civil Society Actors		C1T3-35	Expansion of Community based Adaptation (CbA) and Ecosystem based Adaptation (EBA) Actions to Tackle Adverse Impact of Climate Change on Agriculture, Land and Water	500	Medium (FY 2024-25 to 2026- 27)	SDG8, SDG13, SDG15	FR3; FW1; FW2	enhance EbA and CbA	DoE, DAE, BADC, BMIDA, SRDI, BWDB, BFD	Y

Strategy/ Goal of 8FYP	Thematic Category/ Thematic area	Action Code	Action/ Project	Tentative Cost in Crore BDT	Imple- mentation period	Aligned to		Expected Outcome	Responsible Agency	Private sector engag- ement
						SDG's target	BDP 2100 measure			
Ensuring production of enough staples and diversifying to the non- crop sector		C1T3-36	Increasing Crop Productivity and Using Modern and Appropriate Technologies for reduction of GHGs at the Farm Level	600	Short (FY 2024-25)	SDG2	strategies under Agriculture, Food Security, Nutrition and Livelihoods	Increasing Crop Productivity	ARIs, DAE, DoE, BADC, BMIDA	
Promoting sustainable agriculture and green growth	Addressing Climate Change Consequences (Green Growth and Low Carbon Development)	C1T4-37	Assessment, Smart Monitoring and Management of GHG Emission from Agriculture and Livestock	500	Short (FY 2023-24)	SDG13	strategies under Agriculture, Food Security, Nutrition and Livelihoods	Monitoring and Management of GHG Emission	DoE, ARIs, DAE, BLRI, DLS	
Ensuring optimal use of water resources		C1T4-38	Enhanced Implementation of Alternating Wetting and Drying (AWD) Techniques for GHG Emission Reduction from Paddy Field and Water Resources Optimization	500	Medium (FY 2023-24 to 2025- 26)	SDG13	strategies under Agriculture, Food Security, Nutrition and Livelihoods	GHG Emission Reduction from Paddy Field	ARIs, DoE, DAE, BMIDA, BADC	
Promoting sustainable agriculture and green growth		C1T4-39	Installation of Solar Energy System for Irrigation and Farm Management and Increasing on Farm Energy Efficiency	1000	Short (FY 2024-25 to 2025- 26)	SDG13	strategies under Agriculture, Food Security, Nutrition and Livelihoods	enhance Solar Energy System for Irrigation	DAE, DoE, BMIDA, BADC, Private sector	Y

Strategy/ Goal of 8FYP	Thematic Category/ Thematic area	Action Code	Action/ Project	Tent- ative Cost in Crore BDT	Imple- mentation period	Aligned to		Expected Outcome	Responsible Agency	Private sector engag- ement
						SDG's target	BDP 2100 measure			
Improved Waste Management and Introduction of Circular Economy		C1T4-40	Establishment of Bio-gas Plants at Farm Level for Livestock Manure Management and Support Energy Need	1000	Short (FY 2024-25 to 2025- 26)	SDG13	strategies under Agriculture, Food Security, Nutrition and Livelihoods	enhance implementation of Bio-gas Plants	DLS, DoE, Private sector	Y
1. Promoting sustainable agriculture and green growth 2. Promote measures to expand mechanization and value chain development	Addressing Climate Change Consequences (Green Growth and Low Carbon Development)	C1T4-41	Promotion and popularized Deep Placement of Guti Urea through Mechanization	200	Short (FY 2023-24 to 2024- 25)	SDG13	strategies under Agriculture, Food Security, Nutrition and Livelihoods	Increase fertilizer use efficiency and reduce GHG emissions	SRDI, DAE, BADC, BMIDA	Y
Conservation and protection of forests		C1T4-42	Expansion of afforestation, reforestation and forest conservation actions	2000	Long (FY 2023-24 to 2029- 30)	SDG15		Increase forest coverage and Enhance Carbon Sequestration	BFD	

Strategy/ Goal of 8FYP	Thematic Category/ Thematic area	Action Code	Action/ Project	Tent- ative Cost in Crore BDT	Imple- mentation period	Aligned to		Expected Outcome	Responsible Agency	Private sector engag- ement
						SDG's target	BDP 2100 measure			
Agricultural Research	Addressing Climate Change Consequences (Green Growth and Low Carbon Development)	C1T4-43	Development of Integrated Agro- forestry with Crop and Livestock Farming to Enhance Carbon Sequestration	700	Medium (FY 2025-26 to 2027- 28)	SDG13	strategies under Agriculture, Food Security, Nutrition and Livelihoods	Enhance Carbon Sequestration	DAE, DLS, BFD, BADC	
Reducing Overuse of Chemicals in Agriculture		C2T5-44	Piloting of Polluter's Pay Principle and Beneficiaries Pay Principle for Reducing Pollution and Over Agro-Chemicals Use	500	Short (FY 2025-26)	SDG13	strategies under Agriculture, Food Security, Nutrition and Livelihoods	Piloting of Polluter's Pay Principle and Beneficiaries Pay Principle	DoE, BADC	Y
Improved Air Quality	Environment and Ecosystem (Environmental Pollution Control)	C2T5-45	Enhancing regular monitoring of air quality and implementing effective measures to improve air quality	500	Long (FY 2023-24 to 2029- 30)	SDG 3-9, 11.6	Reducing environmental pollution	Regular monitoring of Air quality and improvement in air quality	DoE	
Improved Management of Water Pollution		C2T5-46	Enhancing regular monitoring of surface water quality of rivers and implementing effective measures to improve river water quality	500	Long (FY 2023-24 to 2029- 30)	SDG 6.3	Reducing environmental pollution	Regular monitoring of surface water quality and improvement in water quality	DoE	

Strategy/ Goal of 8FYP	Thematic Category/ Thematic area	Action Code	Action/ Project	Tent- ative Cost in Crore BDT	Imple- mentation period	Aligned to		Expected Outcome	Responsible Agency	Private sector engag- ement
						SDG's target	BDP 2100 measure			
Controlling Noise Pollution	Environment and Ecosystem (Environmental Pollution Control)	C2T5-47	Enhancing regular monitoring of noise pollution and implementing effective measures to improve condition	300	Long (FY 2023-24 to 2029- 30)	SDG 11	Reducing environmental pollution	Regular monitoring of noise pollution and improvement in condition	DoE	
Improved waste management		C2T5-48	Monitoring and research on effective waste (solid, liquid, e-waste, medical, chemical, plastic etc.) management	1000	Medium (FY 2025-26 to 2029- 30)	SDG 12	Reducing environmental pollution	Enhancing recycling and safe disposal of waste	DoE	Y
Reducing Overuse of Chemicals in Agriculture	Environment and Ecosystem (Pest and Diseases Management)	C2T5-49	Strengthening of Smart Field Monitoring Mechanism for Quality Seed, Fertilizer, Pesticides and Feed	400	Short (FY 2025-26)	SDG13	strategies under Agriculture, Food Security, Nutrition and Livelihoods	ensure Quality Seed, Fertilizer, Pesticides and Feed	DAE, BADC	
Promoting sustainable agriculture and green growth		C2T5-50	Extension of Integrated Pest Management (IPM) and Integrated Diseases Management (IDM) Practices in Agriculture and Livestock Management	700	Short (FY 2026-27)	SDG2	strategies under Agriculture, Food Security, Nutrition and Livelihoods	Reduce over use of chemicals	DAE, DLS	

Strategy/ Goal of 8FYP	Thematic Category/ Thematic area	Action Code	Action/ Project	Tent- ative Cost in Crore BDT	Imple- mentation period	Aligned to		Expected Outcome	Responsible Agency	Private sector engag- ement
						SDG's target	BDP 2100 measure			
Promotion of precision agriculture	Environment and Ecosystem (Pest and Diseases Management)	C2T5.51	Use of ICT for Pest and Diseases Mapping for Crop, Fisheries and Livestock Susceptibility due to Climate Change all Over Bangladesh	25	Short (FY 2024-25)	SDG2	strategies under Agriculture, Food Security, Nutrition and Livelihoods	enhance knowledge on Pest and Diseases prevalence	ARIs, DAE, DLS	
			Protecting and Conserving Agro- ecosystem by Promoting ICM, INM, IDM, IPM (sex pheromone, botanical pesticides, biological control)	600	Medium (FY 2026-27 to 2029- 30)	SDG2	strategies under Agriculture, Food Security, Nutrition and Livelihoods	Protecting and Conserving Agro- ecosystem	DoE, DAE, BADC	
Special importance/ consideration will be given to the livelihoods of the fishermen	Environment and Ecosystem (Ecosystem Management)	C2T6.53	Development of Payment for Ecosystem Services (PES) scheme for Breeding of Carp Fisheries in Halda River supporting Livelihoods of Fishermen	800	Short (FY 2024-25 to 2025- 26)	SDG2	strategies under Agriculture, Food Security, Nutrition and Livelihoods; River Systems and Estuaries	Payment for Ecosystem Services (PES) scheme for Breeding of Carp Fisheries in Halda	DoF, DoE	Y

Strategy/ Goal of 8FYP	Thematic Category/ Thematic area	Action Code	Action/ Project	Tent- ative Cost in Crore BDT	Imple- mentation period	Aligned to		Expected Outcome	Responsible Agency	Private sector engag- ement
						SDG's target	BDP 2100 measure			
Promoting sustainable agriculture and green growth	Environment and Ecosystem (Ecosystem Management)	C2T6.54	Expansion and Commercialization of Organic Farming and Nature based Solutions (NbS) like hydroponic culture of vegetables, floating agriculture etc. to Enhance Climate Resilience in Agriculture, Nutrition Security and Food Safety	700	Short (FY 2026-27)	SDG2	strategies under Agriculture, Food Security, Nutrition and Livelihoods	Expansion and Commercialization of Organic Farming and Nature based Solutions (NbS)	DAE, BADC, BMIDA	
Fish and wetland sanctuaries which will be established with complete ban on fishing in certain eco- sensitive areas		C2T6.55	Conservation of Wetlands, Fish Sanctuaries and Forests for Sustainable Ecosystem Management	1000	Medium (FY 2024-25 to 2027- 28)	SDG2, SDG15	strategies under Agriculture, Food Security, Nutrition and Livelihoods; River Systems and Estuaries	Conservation of Wetlands, Fish Sanctuaries and ecosystem	DoE, DBHWD, BFD, BWDB, DoF	

Strategy/ Goal of 8FYP	Thematic Category/ Thematic area	Action Code	Action/ Project	Tent- ative Cost in Crore BDT	Imple- mentation period	Aligned to		Expected Outcome	Responsible Agency	Private sector engag- ement
						SDG's target	BDP 2100 measure			
Development of Biosafety Policy and Biosafety guidelines	Environment and Ecosystem (Ecosystem Management)	C2T6.56	Mainstreaming and Implementation of Biosafety Rules to Minimize Risk Handling and Transfer of Genetically Modified Organism to Health and Ecosystem	300	Short (FY 2026-27)	SDG2, SDG15	strategies under Agriculture, Food Security, Nutrition and Livelihoods	Mainstreaming and Implementation of Biosafety Rules	DAE, DLS, DoF, BINA	
Increased resources in the management of ecosystem and biodiversity conservation	Environment and Ecosystem (Biodiversity Conservation and Forest Management)	C2T6.57	Ecosystem and biodiversity conservation	1000	Long (FY 2023-24 to 2029- 30)	SDG2, SDG15	strategies under River Systems and Estuaries	Conservation of ecosystem	DoE, BFD	
		C2T6.58	Wildlife protection and conservation endangered species (flora and fauna)	500	Long (FY 2023-24 to 2029- 30)	SDG2, SDG15		Conservation of ecosystem	DoE, BFD	
Monitoring and evaluation of Government funds	Cross Cutting (Enhanced Finance)	C3T7.59	Establishment of Regular Monitoring Mechanism of Utilization of Government Owned CCTF Fund through Third Party and Ensure Regular Mobilization	1000	Short (FY 2023-24 to 2025- 26)	SDG13, SDG8, SDG17	Developing Climate change resilient Bangladesh through optimal use of natural resources	better management of CCTF	MoEFCC	

Strategy/ Goal of 8YFP	Thematic Category/ Thematic area	Action Code	Action/ Project	Tent- ative Cost in Crore BDT	Imple- mentation period	Aligned to		Expected Outcome	Responsible Agency	Private sector engag- ement
						SDG's target	BDP 2100 measure			
1. Initiation of the process for establishing the Delta Fund led by GED 2. Implementation of the Bangladesh Delta Plan 2100 (BDP2100)	Cross Cutting (Enhanced Finance)	C3T7.60	Establishment of Delta Fund to Facilitate the Implementation of environment and climate change related programs of BDP2100	1000	Long (FY 2023-24 to 2029-30)	SDG13, SDG8, SDG17	Elaborated in Investment Cost of the BDP 2100 and Financing Options	Establishment of Delta Fund and BD2100 implementation	GED, MoF	
Minimizing the impact of the COVID-19 pandemic		C3T7.61	Establishment of Crisis Management Fund to Tackle Sudden Severe Crisis like COVID19 for climate induced disasters	2000	Medium (FY 2025-26 to 2029-30)	SDG13, SDG8, SDG17	-	Establishment of Crisis Management Fund	MoDMR, MoEFCC, MoA, MoWR,	

Strategy/ Goal of 8FYP	Thematic Category/ Thematic area	Action Code	Action/ Project	Tent- ative Cost in Crore BDT	Imple- mentation period	Aligned to		Expected Outcome	Responsible Agency	Private sector engag- ement
						SDG's target	BDP 2100 measure			
Support vulnerable communities affected by climate change	Cross Cutting (Enhanced Finance)	C3T7.62	Development of Incentives and Insurance (Index based Insurance or Climate Smart Insurance) Mechanism to Support Marginal Farmers and Fishermen Affected by Adverse Impacts of Climate Change in constrained ecosystem (Drought Prone Barind, Coastal, Haor and Chittagong Hill Tracts Areas)	1000	Medium (FY 2025-26 to 2029- 30)	SDG2, SDG8, SDG13, SDG17	Elaborated in Investment Cost of the BDP 2100 and Financing Options	ensure Incentives and Insurance Mechanism to Support Marginal Farmers and Fishermen	DAE, BMIDA, MoEFCC, Insurance Companies	
			C3T7.63	Popularization of Low Interest Rate based Credit Access Mechanism to Climate Vulnerable Marginal Farmers for Agricultural Inputs, Machinery Purchase and Maintenance	1000	Short (FY 2025-26 to 2027- 28)	SDG2, SDG8, SDG13, SDG17	Elaborated in Investment Cost of the BDP 2100 and Financing Options	Popularization of Low Interest Rate based Credit Access Mechanism	MoA, MoFL

Strategy/ Goal of 8YFP	Thematic Category/ Thematic area	Action Code	Action/ Project	Tent- ative Cost in Crore BDT	Imple- mentation period	Aligned to		Expected Outcome	Responsible Agency	Private sector engag- ement
						SDG's target	BDP 2100 measure			
Utilizing the Green Climate Fund (GCF)		C3T7.64	Fund Harness and Mobilization from Green Climate Fund (GCFs) and other Global Funds for Implementing Environment and Climate change related important projects as per NAP and NDC	100	Short (FY 2023-24 to 2024- 25)	SDG2, SDG8, SDG13, SDG17	Elaborated in Investment Cost of the BDP 2100 and Financing Options	Fund Harness and Mobilization from global funds	MoEFFCC, ERD, DoE, BFD, MoA, MoFL,	
Integrating Environment and Ecosystem Conservation and Climate Change Issues in Planning and Budgeting	Cross Cutting (Enhanced Finance)	C3T7.65	Integration of Both Environmental and Climate Change Related Cost for Budgeting and Resources Allocation through Development and Adoption of Environmental Fiscal Reforms and Green Public Financial Management	500	Short (FY 2023-24 to 2024- 25)	SDG2, SDG8, SDG13, SDG17	Elaborated in Investment Cost of the BDP 2100 and Financing Options	Environmental Fiscal Reforms and Green Public Financial Management	MoEFFCC, DoE, MoF	

Strategy/ Goal of 8FYP	Thematic Category/ Thematic area	Action Code	Action/ Project	Tent- ative Cost in Crore BDT	Imple- mentation period	Aligned to		Expected Outcome	Responsible Agency	Private sector engag- ement
						SDG's target	BDP 2100 measure			
Increased collaboration among different ministries		C3T8.66	Establishment of Institutional Framework with EFCC Unit in LGIs for Enhanced Coordination with MoEFCC, MoA, MoL, MoFL and MoWR to Facilitate Decentralized Environment and Climate Change Management	500	Short (FY 2023-24 to 2024- 25)	SDG2, SDG8, SDG13, SDG17	Discussed in Institutional reform	Establishment of Institutional Framework	MoEFCC, LGD, LGIs	
Promoting sustainable agriculture and green growth	Cross Cutting (Institutions and Governance)	C3T8.67	Establishment of Partnership among the Public-Private and International Organizations to Provide Extension Services for High Value Crops, Fruits and Vegetables to Make Sustainable Agriculture	100	Short (FY 2024-25)	SDG2, SDG8, SDG13, SDG17	Linked to Investment Cost of the BDP 2100 and Financing Options	enhance PPP for extension Services for High Value Crops, Fruits and Vegetables	BADC, DAE, DAM	Y
Capacity building of farmers		C3T8.68	Development of Farmers Association and Network focusing on Climate resilience	500	Short (FY 2023-24 to 2024- 25)	SDG2	strategies under Agriculture, Food Security, Nutrition and Livelihoods	Farmers Association and Network	DoE, DAE	

Strategy/ Goal of 8FYP	Thematic Category/ Thematic area	Action Code	Action/ Project	Tentative Cost in Crore BDT	Imple- mentation period	Aligned to		Expected Outcome	Responsible Agency	Private sector engag- ement
						SDG's target	BDP 2100 measure			
Implementation of the Bangladesh Delta Plan 2100		C3T8.69	Establishment of Delta Wing with GED, Planning Commission for Providing Technical Support, Guidance and Coordination for the Implementation of the BDP2100	600	Short (FY 2024-25)	SDG2, SDG8, SDG17	Discussed in Institutional reform	Establishment of Delta Wing	GED	
Ensuring safe water to sustainable drinking water and sanitation	Cross Cutting (Institutions and Governance)	C3T8.70	Establishment of Water and Sanitation Regulatory Agency (WARSA) for Regulating the Public and Private Utilities Engaged with Supply Water and Sanitation Services and Setting Prices for Establishing Equitable Market for Private Investment	500	Short (FY 2024-25)	SDG2, SDG8, SDG17	Discussed in Institutional reform	Establishment of WARSA	AWRRID, LGD	
Increase of research based activities		C3T8.71	Development of Holistic Research System targeting climate resilient agriculture and its Extension through Proper Piloting and Evaluation to Minimize Yield Gap between Research Lab and Farm	500	Short (FY 2024-25 to 2026- 27)	SDG2	strategies under Agriculture, Food Security, Nutrition and Livelihoods	Holistic Research System and its Extension	ARIs, BFRI, BLRI	

Strategy/ Goal of 8YFP	Thematic Category/ Thematic area	Action Code	Action/ Project	Tent- ative Cost in Crore BDT	Imple- mentation period	Aligned to		Expected Outcome	Responsible Agency	Private sector engag- ement
						SDG's target	BDP 2100 measure			
Ensuring safe water to sustainable drinking water and sanitation		C3T8.72	Development of Water Supply, Sanitation and Sewerage Pricing Policies and Rules for Bangladesh	50	Short (FY 2024-25)	SDG6	FW1	Water Supply, Sanitation and Sewerage Pricing Policies and Rules	LGD	
Increased Partnership with the NGOs and Ministries	Cross Cutting (Institutions and Governance)	C3T8.73	Enhanced Partnership of MoEFCC with NGOs, CSOs and academia	50	Short (FY 2024-25)	SDG17	-	Enhanced Partnership among govt. and NGOs/ CSOs	MoEFCC, DoE, BFD	Y
Increased collaboration among different ministries		C3T8.74	Establishment of Climate Change Unit for MoA & MoFL Well Coordinated with MoEFCC for Project Design, Budgeting and Accession of Funds	500	Short (FY 2024-25 to 2025- 26)	SDG17	Linked to Investment Cost of the BDP 2100 and Financing Options	Establishment of Climate Change Unit for MoA & MoFL	MoA. MoFL, MoEFCC	
Increasing Resources for the Ministry of Environment, Forest and Climate Change (MoEFCC)	Cross Cutting (Compliance and obligations under MEAs and UN conventions/ protocols)	C3T9.75	Addressing Compliance and obligations under MEAs and UN conventions/ protocols	1000	Long (FY 2023-24 to 2029- 30)	SDG13	Related to Institutional Reform	Compliance and obligations under MEAs and UN conventions/ protocols	MoEFCC, DoE, BFD	

Strategy/ Goal of 8FYP	Thematic Category/ Thematic area	Action Code	Action/ Project	Tent- ative Cost in Crore BDT	Imple- mentation period	Aligned to		Expected Outcome	Responsible Agency	Private sector engag- ement
						SDG's target	BDP 2100 measure			
Increasing Resources for the Ministry of Environment, Forest and Climate Change (MoEFCC)	Cross Cutting (Capacity Development)	C3T10.76	Capacity Building of MoEFCC and LGIs for Environmental Fiscal Reform and Climate Negotiation	100	Medium (FY 2024-25 to 2026- 27)	SDG13	Related to Institutional Reform	Capacity Building of MoEFCC and LGIs	MoEFCC, DoE, LGIs	
Support vulnerable communities affected by climate change	Cross Cutting (Knowledge Management and Capacity Development)	C3T10.77	Development and Transformation to E-commerce based Market at Farm Level to Ensure Profit of Marginal and Small- holder Farmers	800	Short (FY 2023-24 to 2024- 25)	SDG2, SDG13	strategies under Agriculture, Food Security, Nutrition and Livelihoods	E-commerce based Market at Farm Level	MoEFCC, MoC	Y
Capacity building of farmers		C3T10.78	Institutional Capacity Building and Awareness Raising Program for Food Safety Measures Implementation	600	Short (FY 2024-25)	SDG2, SDG13	Key elements of the governance and institutions under the BDP 2100	Institutional Capacity Building and Awareness Raising	MoFood	

Strategy/ Goal of 8YFP	Thematic Category/ Thematic area	Action Code	Action/ Project	Tent- ative Cost in Crore BDT	Imple- mentation period	Aligned to		Expected Outcome	Responsible Agency	Private sector engag- ement
						SDG's target	BDP 2100 measure			
Increasing Resources for the Ministry of Environment, Forest and Climate Change (MoEFCC)	Cross Cutting (Knowledge Management and Capacity Development)	C3T10.79	Establishment and operationalize Training Academy on Environment and Climate Change	500	Long (FY 2023-24 to 2029- 30)	SDG2, SDG13	Key elements of the governance and institutions under the BDP 2100	Capacity Building	MoEFCC, DoE	
							Key elements of the governance and institutions under the BDP 2100			
Enhancing capacity building programs	Cross Cutting (Research and Innovation)	C3T10.80	Research initiatives on important aspects of Climate change	2500	Long (FY 2023-24 to 2029- 30)	SDG2, SDG13	Key elements of the governance and institutions under the BDP 2100	Research on Climate Change	MoEFCC, DoE, BFD	
							Key elements of the governance and institutions under the BDP 2100			
Enhancing capacity building programs	Cross Cutting (Knowledge Management and Capacity Development)	C3T10.81	Capacity Building of Policy Maker, Researcher, Extension Professionals for Planning, Development and Extension of Climate Smart Technologies	70	Medium (FY 2024-25 to 2026- 27)	SDG2, SDG13	Key elements of the governance and institutions under the BDP 2100	Capacity Building	NATA, DAE, ARIS	
							Key elements of the governance and institutions under the BDP 2100			
Enhancing capacity building programs		C3T10.82	Capacity Building for MoEFCC and its Agencies for Harnessing Fund from GCFs and other Available Funds and Proper Utilization to Facilitate Enhanced Financing for ECC	50	Short (FY 2024-25)	SDG13	Key elements of the governance and institutions under the BDP 2100	Capacity Building	DoE, IDCOL, PKSF	
							Key elements of the governance and institutions under the BDP 2100			

Strategy/ Goal of 8FYP	Thematic Category/ Thematic area	Action Code	Action/ Project	Tent- ative Cost in Crore BDT	Imple- mentation period	Aligned to		Expected Outcome	Responsible Agency	Private sector engag- ement
						SDG's target	BDP 2100 measure			
Agricultural Research and promotion of sustainable agriculture	Cross Cutting (Research and Innovation)	C3T10.83	Research, Innovations and Introducing Quality Seed and New Crop in Climate Change Affected Area (like. sugar beet at coastal saline area; it can grow up to 14 ds/m)	600	Medium (FY 2024-25 to 2026- 27)	SDG2, SDG13	strategies under Agriculture, Food Security, Nutrition and Livelihoods	Research, Innovations and Introducing Quality Seed and New Crop in Climate Change Affected Area	BADC, BIRTAN, ARIs	
			Introduce and Strengthen Bio- fortification Research Particularly of Protein, Iron, Zinc Improvement Considering Impacts of Climate Change	500	Medium (FY 2024-25 to 2026- 27)	SDG2, SDG13	strategies under Agriculture, Food Security, Nutrition and Livelihoods	Strengthen Bio- fortification Research	ARIs, BIRTAN, BIDS	
Enhancing awareness and capacity building of farmers	Cross Cutting (Knowledge Management and Capacity Development)	C3T10.85	Awareness Raising Program among the Farmers Regarding Climate Smart Agriculture (CSA) and Climate Smart Village (CSV)	500	Short (FY 2026-27)	SDG2, SDG13	strategies under Agriculture, Food Security, Nutrition and Livelihoods	Awareness Raising Program among the Farmers	DAE	Y

Strategy/ Goal of 8FYP	Thematic Category/ Thematic area	Action Code	Action/ Project	Tent- ative Cost in Crore BDT	Imple- mentation period	Aligned to		Expected Outcome	Responsible Agency	Private sector engag- ement
						SDG's target	BDP 2100 measure			
Implementation of the Bangladesh Delta Plan 2100		C3T10.86	Establishment of Delta Knowledge Hub for Hosting and Offering Intellectual Support to the Implementation of the Delta Plan by Hosting, Updating, Collecting and Sharing New Data and Information	50	Short (FY 2024-25)	SDG2, SDG13	Key elements of the governance and institutions under the BDP 2100	Delta Knowledge Hub	GED, WARPO	
Implementation of the Bangladesh Delta Plan 2100	Cross Cutting (Knowledge Management and Capacity Development)	C3T10.87	Establishment of Delta Coalition with 13 Countries for Mutual Benefit and Transfer of Knowledge through Exchange of Water Technologies for Improved Production and Consumption of Clean Water	200	Short (FY 2024-25 to 2025- 26)	SDG2, SDG13	Key elements of the governance and institutions under the BDP 2100	Delta Coalition	GED, WARPO	
Improved Understanding of Climate Change in the Local Level		C3T10.88	Maintaining CCIKM data portal by Hosting, Updating, Collecting and Sharing New Data and Information	200	Long (FY 2023-24 to 2029- 30)	SDG2, SDG13	Key elements of the governance and institutions under the BDP 2100	Operationalize CCIKM	MoEFCC, DoE, BMD, BWDB, BIWTA	

Strategy/ Goal of 8FYP	Thematic Category/ Thematic area	Action Code	Action/ Project	Tent- ative Cost in Crore BDT	Imple- mentation period	Aligned to		Expected Outcome	Responsible Agency	Private sector engag- ement
						SDG's target	BDP 2100 measure			
Improved Understanding of Climate Change in the Local Level	Cross Cutting (Research and Innovation)	C3T10.89	Establish climate and hydrological data collection, monitoring and using this information in Impact Modelling	300	Long (FY 2023-24 to 2029-30)	SDG13	Key elements of the governance and institutions under the BDP 2100	Facilitate Research on Climate Change	MoEFCC, DoE, BMD, BWDB, BIWTA, SRDI	
			Development of Online Fertilizer Recommendation System (OFRS) and Offline Fertilizer Recommendation System (Mobile Apps)	70	Short (FY 2024-25)	SDG2	strategies under Agriculture, Food Security, Nutrition and Livelihoods	Online Fertilizer Recommendation System	SRDI, BARC	
Enhancing awareness and capacity building of farmers	Cross Cutting (Knowledge Management and Capacity Development)	C3T10.91	Capacity Building of Farmers for Adoption and Implementation of Climate Smart Technologies at Field Level (Seed, fertilizer, biocides and irrigation application)	400	Short (FY 2026-27)	SDG2, SDG13	Key elements of the governance and institutions under the BDP 2100	Capacity Building	NATA, DAE, ARIs	Y
			Awareness Building and Extension Programs for Encouraging Farmers to Use Balanced Doses of Chemical Fertilizers	300	Medium (FY 2026-27 to 2028-29)	SDG2, SDG13	Key elements of the governance and institutions under the BDP 2100	Awareness Building and Extension	BIRTAN, BADC, DAE	Y

Strategy/ Goal of 8FYP	Thematic Category/ Thematic area	Action Code	Action/ Project	Tent- ative Cost in Crore BDT	Imple- mentation period	Aligned to		Expected Outcome	Responsible Agency	Private sector engag- ement
						SDG's target	BDP 2100 measure			
Enhancing agricultural research and food security	Cross Cutting (Research and Innovation)	C3T10.93	Research on Changing Dietary Pattern and Crop Diversification to Achieve Future Food and Nutrition Security under Climate Change Scenarios	300	Short (FY 2026-27)	SDG2, SDG13	Key elements of the governance and institutions under the BDP 2100	Research on Changing Dietary Pattern	BIRTAN, ARIS, MoFood	
Expanding capacity building programs	Cross Cutting (Knowledge Management and Capacity Development)	C3T10.94	Human Resources Development, Skill Strengthening Extension Services for climate change adaptation and mitigation	500	Short (FY 2024-25 to 2025- 26)	SDG2, SDG13	Key elements of the governance and institutions under the BDP 2100	Human Resources /skill Development	All department under MoA and MoFL	
Developing good quality breed	Cross Cutting (Research and Innovation)	C3T10.95	Intensive Research on Cross-Breeding and Changed Livestock Rearing Practices	500	Short (FY 2024-25 to 2025- 26)	SDG2, SDG13	Key elements of the governance and institutions under the BDP 2100	Develop climate resilient breeds and Rearing Practices	BLRI, DLS	

### Annex 3: Result Based Monitoring and Evaluation Framework

Thematic Category	Thematic Area	Action Code	Action/ Project	Indicators	Unit	Base		Target		Responsible Agency	Assumptions
						Year	Status	2025	2030		
Addressing Climate Change Consequences and Resilience	Enhancing Local Level Climate Change Adaptation and Resilience	C1T1.1	Development of Gender Inclusion Framework for Enhanced Participation in Climate Smart Agriculture Practices	Women received soft loans	No	2020	11400	9200	8000	MoA, MoFL	1) Interest and motivation of farmers or fishermen to adopt climate smart technologies for developing climate resilient agriculture, fisheries and livestock system and sustainable livelihoods 2) Overcoming societal challenges for engaging women in agriculture, fisheries and aquaculture
				Trained women beneficiaries	No	2020	11250	18800	30000		
	C1T1.2	Piloting and Establishment of 10 Climate Smart Village (CSV) for local level climate change adaptation with Climate Smart Agriculture Technologies	Invented technology	No.	2020	60	67	75	ARIs, DAE, BLRI, BFRI, DLS, DoF, BMDA, SRDI, DAM, CDB		
			Established solar irrigation facilities and well	No.	2020	160	190	250			
			Supplied Fertilizer	MT (lacs)	2020	51	52	55			
	C1T1.3	Introducing Suitable New crop in Coastal Area	Supplied Seed	MT (lacs)	2020	1.4	1.48	1.55	ARIs, DAE		
			Registered Stress Tolerant Crop varieties	No	2020	50	67	100			

Data Sources: 8<sup>th</sup> FYP National Priority Performance Indicators, SDG Indicators, APA Indicators from respective ministries and departments

Thematic Category	Thematic Area	Action Code	Action/ Project	Indicators	Unit	Base		Target		Responsible Agency	Assumptions	
						Year	Status	2025	2030			
Addressing Climate Change Consequences	Climate Smart Agriculture	C1T2.7	Development and Extension of Stress (heat, cold, salinity, waterlogging, etc.) tolerant crop varieties and livestock breed development and Strengthening Extension Services	Registered Stress Tolerant Crop Varieties	No	2020	50	67	100	ARIs, DAE, BLRI, BFRI, DLS, DoF, BMDA, SRDI, CDB	3) Technological advancement trend will be able to reach the desired level of innovations 4) Skill development of farmers or fishermen to use climate smart technologies and practices 5) Food supply and demand nexus will follow the projections of plan 2041 and development trajectory of the country will be as per plan	
				Livestock semen production	Lacs	2020	43-79	47	55			
				Fish fry release	MT	2020	258.8	230	270			
				GHG emission reduction than BAU scenario (unconditional)	%	2012	93.09 MTCO 2e	3	6.7			DAE, BADC
				Rice production	MT (lacs)	2020	376.12	399.25	441			ARIs, DAE, BLRI, BFRI, DLS, DoF, BMDA, SRDI, DAM, CDB
	Potato Production	MT (lacs)	2020	98.87	113.25							
	Vegetable Production	MT (lacs)	2020	197.19	190	200						
	Per Capita Daily Fish Availability	gm/ Day	2020	63	68	75						
	Per Capita Daily Meat Availability	gm/ Day	2020	136.18	144	155						
	Climate Smart Agriculture	C1T2.5	Development and Enhanced Promotion of Integrated and Mixed Farming (Crop, Fisheries, Vegetable, Urban, Livestock and Poultry) Practices in Suitable Areas	Rice production	MT (lacs)	2020	376.12	399.25	441	ARIs, DAE, BLRI, BFRI, DLS, DoF, BMDA, SRDI, DAM, CDB	ARIs, DAE, BLRI, BFRI, DLS, DoF, BMDA, SRDI, DAM, CDB	ARIs, DAE, BLRI, BFRI, DLS, DoF, BMDA, SRDI, DAM, CDB
Potato Production				MT (lacs)	2020	98.87	113.25					
Vegetable Production				MT (lacs)	2020	197.19	190	200				
Per Capita Daily Fish Availability				gm/ Day	2020	63	68	75				
Per Capita Daily Meat Availability				gm/ Day	2020	136.18	144	155				

Data Sources: 8<sup>th</sup> FYP National Priority Performance Indicators, SDG Indicators, APA Indicators from respective ministries and departments

Thematic Category	Thematic Area	Action Code	Action/ Project	Indicators	Unit	Base		Target		Responsible Agency	Assumptions
						Year	Status	2025	2030		
Addressing Climate Change Consequences	Climate Smart Agriculture	C1T2.6	Construction of Killa (Elevated Platforms) for Livestock and Poultry Rearing in Flood Prone Areas	Per Capita Daily Meat Availability	gm/ Day	2020	136.18	144	155	LGD, DLS	
				No of Elevated or Flood Proofed Livestock/ Poultry Sheds	No		4000	10000			
				Per Capita Daily Milk Availability	ml/ Day	2020	193.38	230	275		
				Publication of CRVA report for F&A at national level and sub-national level	No	2020	0	31	34		
	C1T2.8	Nationwide Climate Change Risk and Vulnerability Assessment for Fisheries and Aquaculture in Bangladesh	Number of NAP interventions integrated into ADP for MoA	No	No	2020	0	7	12	MoA, MoFL	
				Per Capita Daily Meat Availability	gm/ Day	2020	136.18	144	155		
	C1T2.9	Mainstreaming and Implementation of National Adaptation Plan (NAP) for Agriculture in Bangladesh	Per Capita Daily Meat Availability	gm/ Day	2020	136.18	144	155			
				Assessment of Climate change impact on Livestock and poultry, It's Impact on Production of Meat, Milk and egg and Formulation of Adaptation Measures	ml/ Day	2020	193.38	230	275	DLS, BLRI	
	C1T2.10	Assessment of Climate change impact on Livestock and poultry, It's Impact on Production of Meat, Milk and egg and Formulation of Adaptation Measures	Per Capita Daily Meat Availability	ml/ Day	2020	193.38	230	275			
				Per Capita Daily Milk Availability	ml/ Day	2020	193.38	230	275		

Data Sources: 8<sup>th</sup> FYP National Priority Performance Indicators, SDG Indicators, APA Indicators from respective ministries and departments

Thematic Category	Thematic Area	Action Code	Action/ Project	Indicators	Unit	Base		Target		Responsible Agency	Assumptions
						Year	Status	2025	2030		
Addressing Climate Change Consequences	Climate Smart Agriculture	CtT2.11	Sustainable Fisheries and Aquaculture Management in Haor and Coastal Areas of Bangladesh	Per Capita Daily Fish Availability	gm/Day	2020	63	68	75	DoF, MoI, MoC	
				Beel Nursery Establishment	No	2020	171.22	515	800		
				Invented F&A Technologies	No	2020	2	3	5		
				Hilsha Conservation Enforcements/ Mobile Court	No	2020	15400	16400	18000		
				Fish Sanctuary	No	2020	194	200			
				Length of over ground and underground irrigation canal	km	2020	1070	850	700		
		CtT2.12	Land Use Planning, Crop Zoning, and Promotion of Precision Agriculture practices in climate stress areas.	Established solar irrigation facilities and well	No	2020	160	190	250	MoL, SRDI, DAE, BADC, BMDA	
				Invented technology	No	2020	60	67	75		
				Pulses production	MT (lacs)	2020	4-5	10	22.6		
		CtT2.13	Crop Intensification in water stress areas through Diversifying High Value non-Rice Crops like Pulses, Oilseeds, Spices and Vegetables and promotion of reduction of ground water use	Oil Seeds production	MT (lacs)	2020				ARIs, DAE, BMDA, BADC, DAM, BIRTAN	
				Spices production	MT (lacs)	2020					
				Vegetable Production	MT (lacs)	2020	197.19	190	200		

Data Sources: 8<sup>th</sup> FYP National Priority Performance Indicators, SDG Indicators, APA Indicators from respective ministries and departments

Thematic Category	Thematic Area	Action Code	Action/ Project	Indicators	Unit	Base		Target		Responsible Agency	Assumptions
						Year	Status	2025	2030		
Addressing Climate Change Consequences	Climate Smart Agriculture	C1T2.14	Conservation of Indigenous Knowledge and Expansion of Good Agricultural Practices (GAP) for Climate Change Adaptation	Trained farmers in CHT	No	2020		500	1000	ARIs, DAE	
				Publish report on AEZ	No	2020		20	10	ARIs, BIRTAN, MoFood	
		Expansion of Climate Resilient Livestock Rearing and Management Practices (diversification, intensification and/or integration of pasture management, altering the timing of operations, provision of shade and water to reduce heat stress, rotational grazing, changes in livestock/herd composition etc.)	No of Elevated or Flood Proofed Livestock/ Poultry Sheds	No	2020		4000	10000			
	C1T2.16	Artificial Insemination Expansion	No	2020	44.41	46	55			DLS, BLRI	
			Per Capita Daily Milk Availability	ml/ Day	2020	193.38	230	275			
			Per Capita Daily Meat Availability	gm/ Day	2020	136.18	144	155			

Data Sources: 8<sup>th</sup> FYP National Priority Performance Indicators, SDG Indicators, APA Indicators from respective ministries and departments

Thematic Category	Thematic Area	Action Code	Action/ Project	Indicators	Unit	Base		Target		Responsible Agency	Assumptions	
						Year	Status	2025	2030			
Addressing Climate Change Consequences	Sustainable Land and Water Management	C1T3-17	Sustainable land management through different agronomic practices	Agriculture Machineries Supply	No	2020	4500	6200	10000	DAE, BADC, BMDA, BWDB, LGED	1) Interest and motivation of farmers or fishermen to adopt climate smart technologies for developing climate resilient agriculture, fisheries and livestock system and sustainable livelihoods 2) Institutional capacity already in place and will be strengthened in due course of time 3) Technological advancement trend will be able to reach the desired level of innovations	
				On Farm Water Use Efficiency for Rice Crops	%	2020	30	50	70			
				Irrigated crop area coverage	%	2020	60.4	61.72	62.5			
		C1T3-18	Improve on Farm Water Use Efficiency for non-Rice Crop (through Introduction of Sprinkler and Drip Irrigation System, Mulching etc. )	Agriculture Machineries Supply	No	2020	4500	6200	10000	DAE, BADC, BMDA, BWDB, LGED		
				On Farm Water Use Efficiency for Non-Rice Crops	%	2020	50	50	70			
				Irrigated crop area coverage	%	2020	60.4	61.72	62.5			
		C1T3-19	Strengthening Operational Flash Floods Early Warning and Community based Dissemination System for Farmers and Fishermen of Haor Areas	Early Warning Information Received by Farmers and Fishermen	%							FFWC, BWDB

Data Sources: 8<sup>th</sup> FYP National Priority Performance Indicators, SDG Indicators, APA Indicators from respective ministries and departments

Thematic Category	Thematic Area	Action Code	Action/ Project	Indicators	Unit	Base		Target		Responsible Agency	Assumptions
						Year	Status	2025	2030		
Addressing Climate Change Consequences	Sustainable Land and Water Management	C1T3-19	Strengthening Operational Flash Floods Early Warning and Community based Dissemination System for Farmers and Fishermen of Haor Areas	Early Warning Information Received by Farmers and Fishermen	%			40	80	FFWC, BWDB	4) Skill development of farmers or fishermen to use climate smart technologies and practices 5) Food supply, water availability and demand nexus will follow the projections of perspective plan 2041 and development trajectory of the country will be as per plan
		C1T3-20	Development of Opportunities for Alternative Livelihood Generation Activities for Southwest, Barind, Haor and other Hard to Reach Areas to Halt Internal Displacement and Ensure Engagement of Vulnerable Communities for Alternative Livelihood Generation Activities	Annual Per Capita Income of farmers and fishermen from alternative occupation	BDT (Lacs)			0.3	0.45	BMDA, DAE, MoA, MoFL, LGD	6) Adequate cultivable lands are available despite development trajectory and socio-economic barriers

Data Sources: 8<sup>th</sup> FYP National Priority Performance Indicators, SDG Indicators, APA Indicators from respective ministries and departments

Thematic Category	Thematic Area	Action Code	Action/ Project	Indicators	Unit	Base		Target		Responsible Agency	Assumptions
						Year	Status	2025	2030		
Addressing Climate Change Consequences	Sustainable Land and Water Management	C1T3-21	Mainstreaming of Valuing Water through Developed Shadow Water Pricing Framework by WARPO into Agriculture and Irrigation Policies and Implementation of Pricing for Irrigation in Barind and other Water Stressed Areas	Pricing policy published for different sectors	No			3	5	MoA, BADC, BMDA	
								10	25		
		C1T3-22	Development of Strategies and Expansion of Managed Aquifer Recharge (MAR) and Rainwater Harvesting for Artificial Groundwater Recharge in Drought Prone Barind Areas	MAR Implementation	No						BMDA, BWDB
		C1T3-23	Development and Extension of Water Saving Techniques (e.g., AWD, Drip Irrigation, Buried Pipe or Hose Pipe Irrigation, Canal Lining or Fertigation)	On Farm Water Use Efficiency for Rice Crops	%	2020	30	50	70	BMDA, BWDB, LGED, BADC, DAE	

Data Sources: 8<sup>th</sup> FYP National Priority Performance Indicators, SDG Indicators, APA Indicators from respective ministries and departments

Thematic Category	Thematic Area	Action Code	Action/ Project	Indicators	Unit	Base		Target		Responsible Agency	Assumptions
						Year	Status	2025	2030		
Addressing Climate Change Consequences	Sustainable Land and Water Management	C1T3-24	Expansion of Small-scale Irrigation Technology and Increase Surface Water use for Irrigation	Surface water used for irrigation	km <sup>3</sup>	2016	6.62	9-5	12	LGED, BMIDA, DAE, BWDB, BADC	
				Surface water used for irrigation	km <sup>3</sup>	2016	6.62	9-5	12	LGED, BMIDA, DAE, BWDB, BADC	
		C1T3-26	Rainwater harvesting through re-excitation of canal, pond, small river etc. and construction of dug well.	Re-excavated irrigation canal	km	2020	367	400	350	BMDA, DAE, LGED	
				Dredged or Re-excavated ponds and small rivers	km	2020	1000	1500	2000		
		C1T3-28	Revitalization and Rationalization of wetland ecosystems.	Project implementation status	%			40%	100%	DBHWD	
		C1T3-29	Development of Catchment Management Plans and Kaptai Lake Rehabilitation Study with Pilot Project	Study completion status	%				100%	BWDB	

Data Sources: 8<sup>th</sup> FYP National Priority Performance Indicators, SDG Indicators, APA Indicators from respective ministries and departments

Thematic Category	Thematic Area	Action Code	Action/ Project	Indicators	Unit	Base		Target		Responsible Agency	Assumptions	
						Year	Status	2025	2030			
Addressing Climate Change Consequences		C1T3-30	Sustainable Soil and Land Management for Increased Crop Productivity and Enhance Integrated Plant Nutrient System (IPNS)	Rice production	MT (lacs)	2020	376.12	399.25	441	SRDI, BIRTAN		
				Potato Production	MT (lacs)	2020	98.87	113.25				
				Vegetable Production	MT (lacs)	2020	197.19	190	200			
		C1T3-31	Promoting reduction of ground water use and increasing surface water use in Barind and other water scarcity areas	Surface water used for irrigation	km3	2016	6.62	9.5	12	DAE, BADC, BMDA, BWDB, LGED		
				Irrigated crop area coverage	%	2020	60.4	61.72	62.5			
		Sustainable Land and Water Management	C1T3-32	Assessment of Causes and Impact of Land Degradation and Development and Implementation of Mitigation Measures	Research/ Study Report published	No	2020	1	5	10	DoE	
		C1T3-33	Development of Niche Market and E-commerce of Marine Fisheries and Aquaculture for Coastal Areas	E-commerce based F&A Business	No				500	1000	DoF, BFDC	
	C1T3-34	Assessment of Marine Fish Stocks and Assessment of Climate Change Impacts on Fish Stocks	Research/ Study Report published	No	2020			5	10	DoF, BFDC, MFA		

Data Sources: 8<sup>th</sup> FYP National Priority Performance Indicators, SDG Indicators, APA Indicators from respective ministries and departments

Thematic Category	Thematic Area	Action Code	Action/ Project	Indicators	Unit	Base		Target		Responsible Agency	Assumptions
						Year	Status	2025	2030		
Addressing Climate Change Consequences	Sustainable Land and Water Management	C1T3-35	Expansion of Community based Adaptation (CbA) and Ecosystem based Adaptation (EbA) Actions to Tackle Adverse Impact of Climate Change on Agriculture, Land and Water	Practices of EbA and CbA	No	2020		20	50	DoE, DAE, BADC, BMDA, SRDI, BWDB, BFD	1) Interest and motivation of farmers or fishermen to adopt climate smart technologies for developing climate resilient agriculture, fisheries and livestock system and sustainable livelihoods 2) Institutional capacity already in place and will be strengthened in due course of time 3) Technological advancement trend will be able to reach the desired level of innovations
				Prevalence of moderate or severe food insecurity in the population, based on the Food Insecurity Experience Scale (FIES)	%	2018	10.2	10	9.8		
Addressing Climate Change Consequences	Green Growth and Low Carbon Development	C1T4-36	Increasing Crop Productivity and Using Modern and Appropriate Technologies for reduction of GHGs at the Farm Level	Yield Gap at Farm Level	%	2020	55	40	20		

Data Sources: 8<sup>th</sup> FYP National Priority Performance Indicators, SDG Indicators, APA Indicators from respective ministries and departments

Thematic Category	Thematic Area	Action Code	Action/ Project	Indicators	Unit	Base		Target		Responsible Agency	Assumptions
						Year	Status	2025	2030		
Addressing Climate Change Consequences	Green Growth and Low Carbon Development	C1T4.37	Assessment, Smart Monitoring and Management of GHG Emission from Agriculture and Livestock	GHG emission reduction than BAU scenario (unconditional)	%	2012	93.09 MTCO 2e	3	6.7	DoE, ARIs, DAE, BLRI, DLS	4) Skill development of farmers or fishermen to use climate smart technologies and practices 5) GHG emission trends and future reduction trajectory as per updated NDCs will follow with planned mitigation action plan 6) Behavioral change of communities will happen
						2012	93.09 MTCO 2e	3	6.7	ARIs, DAE, BMDA, BADC	
		C1T4.39	Installation of Solar Energy System for Irrigation and Farm Management and Increasing on Farm Energy Efficiency	Established solar irrigation facilities and well	No	2020	160	190	250	DAE, BMDA, BADC, Private sector	
						2020	160	190	250	DAE, BMDA, BADC, Private sector	
		C1T4.40	Establishment of Bio-gas Plants at Farm Level for Livestock Manure Management and Support Energy Need	Established biogas plants	No	2020	100	100	300	DLS, Private sector	
						2020	100	100	300	DLS, Private sector	
C1T4.41	Promotion and popularized Deep Placement of Gutti Urea through Mechanization	GHG emission reduction than BAU scenario (unconditional)	%	2012	93.09 MTCO 2e	3	6.7	SRDI, DAE, BADC, BMDA			

Data Sources: 8<sup>th</sup> FYP National Priority Performance Indicators, SDG Indicators, APA Indicators from respective ministries and departments

Thematic Category	Thematic Area	Action Code	Action/ Project	Indicators	Unit	Base		Target		Responsible Agency	Assumptions		
						Year	Status	2025	2030				
Addressing Climate Change Consequences	Green Growth and Low Carbon Development	C1T4-42	Expansion of afforestation, reforestation and forest conservation actions	Forest area as a proportion of total land area	%	2015	14.1	15.2		BFD			
		C1T4-43	Development of Integrated Agro-forestry with Crop and Livestock Farming to Enhance Carbon Sequestration	Percentage of forests that are protected	%	2020	3.06	3-4		BFD			
Environment and Ecosystem	Environmental Pollution Control, Pest and Diseases Management	C2T5-44	Piloting of Polluter's Pay Principle and Beneficiaries Pay Principle for Reducing Pollution and Over Agro-Chemicals Use	GHG emission reduction than BAU scenario (unconditional)	%	2012	93.09 MTCO 2e	3	6.7	DAE, DLS, BFD, BADC	1) Interest and motivation of farmers, fishers and institutions to adopt pollution prevention measures 2) Institutional capacity already in place and will be strengthened in due course of time		
			Enhancing regular monitoring of air quality and implementing effective measures to improve air quality	Use of Agro-chemicals								BADC, BIRTAN	
		C2T5-45	Operational Polluters Pay Principles	Mean Urban Air pollution of particulate matter PM10					100				DoE
				Mean Urban Air pollution of particulate matter PM2.5						120			

Data Sources: 8<sup>th</sup> FYP National Priority Performance Indicators, SDG Indicators, APA Indicators from respective ministries and departments

Thematic Category	Thematic Area	Action Code	Action/ Project	Indicators	Unit	Base		Target		Responsible Agency	Assumptions	
						Year	Status	2025	2030			
Environment and Ecosystem	Environmental Pollution Control, Pest and Diseases Management	C2T5-49	Strengthening of Smart Field Monitoring Mechanism for Quality Seed, Fertilizer, Pesticides and Feed	Established Smart field monitoring system	%			100		DAE, BADC	3) Technological advancement trend will be able to reach the desired level of innovations 4) Skill development of farmers or fishermen to use climate smart technologies and practices 5) GHG emission trends and future reduction trajectory as per updated NDCs will follow with planned mitigation action plan 6) Responsible citizenship exist	
		C2T5-50	Extension of Integrated Pest Management (IPM) and Integrated Diseases Management (IDM) Practices in Agriculture and Livestock Management	Practices of IPM and IDM						DAE, DLS		
		C2T5-51	Use of ICT for Pest and Diseases Mapping for Crop, Fisheries and Livestock Susceptibility due to Climate Change all Over Bangladesh	Published Maps	%			2020	100			ARIs, DAE, DLS
		C2T5-52	Protecting and Conserving Agro-ecosystem by Promoting ICM, INM, IDM, IPM (sex pheromone, botanical pesticides, biological control)	Agro-ecological landscape restoration initiatives implemented	No			2020	2	5		DoE, DAE, BADC

Data Sources: 8<sup>th</sup> FYP National Priority Performance Indicators, SDG Indicators, APA Indicators from respective ministries and departments

Thematic Category	Thematic Area	Action Code	Action/ Project	Indicators	Unit	Base		Target		Responsible Agency	Assumptions	
						Year	Status	2025	2030			
Environment and Ecosystem	Ecosystem Management	C2T6.53	Development of Payment for Ecosystem Services (PES) scheme for Breeding of Carp Fisheries in Halda River supporting Livelihoods of Fishermen	Operational PES for Halda River	%			100		DoF, DoE		
				Organic Farms	No		500	1500				
		C2T6.54	Expansion and Commercialization of Organic Farming and Nature based Solutions (NbS) like hydroponic culture of vegetables, floating agriculture etc. to Enhance Climate Resilience in Agriculture, Nutrition Security and Food Safety	Annual Income or Revenue of Farmers from Organic Farming	BDT (Lacs)		0.1	0.25			DAE, BADC, BMDA	
				Per Capita Daily Fish Availability	gm/ Day	2020	63	68	75			
C2T6.55	Conservation of Wetlands, Fish Sanctuaries and Agro-Forestry for Sustainable Ecosystem Management	Beel Nursery Establishment	No		171.22	515	800		DBHWD, BWDB, DoF			
				Fish Sanctuary	No	2020	194	200				

Data Sources: 8<sup>th</sup> FYP National Priority Performance Indicators, SDG Indicators, APA Indicators from respective ministries and departments

Thematic Category	Thematic Area	Action Code	Action/ Project	Indicators	Unit	Base		Target		Responsible Agency	Assumptions
						Year	Status	2025	2030		
Environment and Ecosystem	Ecosystem Management	C2T6.56	Mainstreaming and Implementation of Biosafety Rules to Minimize Risk Handling and Transfer of Genetically Modified Organism to Health and Ecosystem	Mainstream biosafety rules in projects	No	2020		20	35	DAE, DLS, DoF, BINA	1) Adaptation finance need will be similar to as projected by NAP and NDC 2) Key stakeholders are keen to accelerate financing process 3) Development trajectory of Bangladesh remains as per perspective plan 4) Capacity of key stakeholders is developed 5) Responsible citizenship exist
Cross Cutting	Enhanced Finance	C3T7.59	Establishment of Regular Monitoring Mechanism of Utilization of Government Owned CCTF Fund through Third Party and Ensure Regular Mobilization	Operational M&E of BCCTF	%			100		MoEFCC	
Cross Cutting	Enhanced Finance	C3T7.60	Establishment of Delta Fund to Facilitate the Implementation of environment and climate change related programs of BDP2100	Established Delta Fund	%			30	50	GED, MoF	
Cross Cutting	Enhanced Finance	C3T7.61	Establishment of Crisis Management Fund to Tackle Sudden Severe Crisis like COVID19 for climate induced disasters	Established Crisis Management Fund	%			40	60	MoDMR, MoA, MoWVR, MoEFCC	

Data Sources: 8<sup>th</sup> FYP National Priority Performance Indicators, SDG Indicators, APA Indicators from respective ministries and departments

Thematic Category	Thematic Area	Action Code	Action/ Project	Indicators	Unit	Base		Target		Responsible Agency	Assumptions
						Year	Status	2025	2030		
Cross Cutting	Enhanced Finance	C3T7.62	Development of Incentives and Insurance (Index based Insurance or Climate Smart Insurance) Mechanism to Support Marginal Farmers and Fishermen Affected by Adverse Impacts of Climate Change in constrained ecosystem (Drought Prone Barind, Coastal, Haor and Chittagong Hill Tracts Areas)	Coverage of insurance or recovery mechanism for marginal farmers and fishermen	%			60	40	DAE, BMDA, Insurance Companies	6) Climate actions by countries around the world are being implemented as per plan and pledge made by developed country is truly mobilized 7) Climate risk and vulnerabilities remain same as per NAP and NDC projections with very less variability 8) Stable political condition
			Popularization of Low Interest Rate based Credit Access Mechanism to Climate Vulnerable Marginal Farmers for Agricultural Inputs, Machineries Purchase and Maintenance	Received soft loans by Farmers	No			1000	5000	MoA, MoFL	

Data Sources: 8<sup>th</sup> FYP National Priority Performance Indicators, SDG Indicators, APA Indicators from respective ministries and departments

Thematic Category	Thematic Area	Action Code	Action/ Project	Indicators	Unit	Base		Target		Responsible Agency	Assumptions
						Year	Status	2025	2030		
Cross Cutting	Enhanced Finance	C3T7.64	Fund Harness and Mobilization from Green Climate Fund (CCFs) and other Global Funds for Implementing Climate Smart Agriculture and Establishment of Climate Smart Village	Harnessed international climate funds	billion USD/ year			5	8	MoA, DoE	
			Integration of Both Environmental and Climate Change Related Cost for Budgeting and Resources Allocation through Development and Adoption of Environmental Fiscal Reforms and Green Public Financial Management	Environmental Fiscal Reform Implemented	%			60	40	DoE, MoF	
		C3T7.65									

Data Sources: 8<sup>th</sup> FYP National Priority Performance Indicators, SDG Indicators, APA Indicators from respective ministries and departments

Thematic Category	Thematic Area	Action Code	Action/ Project	Indicators	Unit	Base		Target		Responsible Agency	Assumptions
						Year	Status	2025	2030		
Cross Cutting	Institutions and Governance	C3T8.66	Establishment of Institutional Framework with EFCC Unit in LGIs for Enhanced Coordination with MoEFCC, MoA, MoL, MoFL and MoWR to Facilitate Decentralized Environment and Climate Change Management	Action accomplished and operational	%			70	30	LGIs	1) Interest and motivation of stakeholders and institutions for generation of climate knowledge and capacity building 2) Cognitive revolution or behavioral change will work as per plan to enable transformative adaptation 3) Interest of stakeholders for climate resilient development in Bangladesh
		C3T8.67	Establishment of Partnership among the Public-Private and International Organizations to Provide Extension Services for High Value Crops, Fruits and Vegetables to Make Sustainable Agriculture	Action accomplished and operational	%			80	20	BADC, DAE, DAM	
C3T8.68	Development of Farmers Association and Network	Action accomplished and operational	%			100		DAE			
C3T8.69	Establishment of Delta Wing with GED, Planning Commission for Providing Technical Support, Guidance and Coordination for the Implementation of the BDP2100	Action accomplished and operational	%			80	20	GED			

Data Sources: 8<sup>th</sup> FYP National Priority Performance Indicators, SDG Indicators, APA Indicators from respective ministries and departments

Thematic Category	Thematic Area	Action Code	Action/ Project	Indicators	Unit	Base		Target		Responsible Agency	Assumptions
						Year	Status	2025	2030		
Cross Cutting	Institutions and Governance	C3T8.70	Establishment of Water and Sanitation Regulatory Agency (WARSA) for Regulating the Public and Private Utilities Engaged with Supply Water and Sanitation Services and Setting Prices for Establishing Equitable Market for Private Investment	Access to safe WASH services	%	2020	70	90	100	AWRRRID, LGD	1) Interest and motivation of stakeholders and institutions for generation of climate knowledge and capacity building 2) Cognitive revolution or behavioral change will work as per plan to enable transformative adaptation 3) Interest of stakeholders for climate resilient development in Bangladesh
			Action accomplished and operational	%			70	30			
		C3T8.71	Development of Holistic Research System and its Extension through Proper Piloting and Evaluation to Minimize Yield Gap between Research Lab and Farm	Action accomplished and operational	%				40	60	
		C3T8.72	Development of Water Supply, Sanitation and Sewerage Pricing Policies and Rules for Bangladesh	Action accomplished and operational	%			100		LGD	

Data Sources: 8<sup>th</sup> FYP National Priority Performance Indicators, SDG Indicators, APA Indicators from respective ministries and departments

Thematic Category	Thematic Area	Action Code	Action/ Project	Indicators	Unit	Base		Target		Responsible Agency	Assumptions
						Year	Status	2025	2030		
Cross Cutting	Institutions and Governance	C3T8.73	Enhanced Partnership of MoEFCC with NGOs, CSOs and academia	Action accomplished and operational	%			100		DoE, MoEFCC	2) Cognitive revolution or behavioral change will work as per plan to enable transformative adaptation
		C3T8.74	Establishment of Climate Change Unit for MoA Well Coordinated with MoEFCC for Project Design, Budgeting and Accession of Funds	Action accomplished and operational	%			70	30	MoA	
	C3T10.76	Capacity Building of MoEFCC and LGIs for Environmental Fiscal Reform and Climate Negotiation	Trained officials	No				50	150	DoE, LGIs	1) Interest and motivation of stakeholders and institutions for generation of climate knowledge and capacity building
	C3T10.77	Development and Transformation to E-commerce based Market at Farm Level to Ensure Profit of Marginal and Small-holder Farmers	No of E-commerce based Agri-business	No				400	1000	MoC	
	C3T10.78	Institutional Capacity Building and Awareness Raising Program for Food Safety Measures Implementation	Trained officials	No				50	100	MoFood	

Data Sources: 8<sup>th</sup> FYP National Priority Performance Indicators, SDG Indicators, APA Indicators from respective ministries and departments

Thematic Category	Thematic Area	Action Code	Action/ Project	Indicators	Unit	Base		Target		Responsible Agency	Assumptions
						Year	Status	2025	2030		
Cross Cutting	Research, Innovation, Knowledge Management and Capacity Development	C3T10.81	Capacity Building of Policy Maker, Researcher, Extension Professionals for Planning, Development and Extension of Climate Smart Technologies	Trained officials	No			300	750	NATA, DAE, ARIs	2) Cognitive revolution or behavioral change will work as per plan to enable transformative adaptation 3) Interest of stakeholders for climate resilient development in Bangladesh
		C3T10.82	Capacity Building for MoEFCC and its Agencies for Harnessing Fund from GCFs and other Available Funds and Proper Utilization to Facilitate Enhanced Financing for ECC	Trained officials	No			30	50	DoE, IDCOL, PKSF	
		C3T10.83	Research, Innovations and Introducing Quality Seed and New Crop in Climate Change Affected Area (like. sugar beet at coastal saline area; it can grow up to 14 ds/m)	Research/ Study Report published	No				2	5	

Data Sources: 8<sup>th</sup> FYP National Priority Performance Indicators, SDG Indicators, APA Indicators from respective ministries and departments

Thematic Category	Thematic Area	Action Code	Action/ Project	Indicators	Unit	Base		Target		Responsible Agency	Assumptions
						Year	Status	2025	2030		
Cross Cutting	Research, Innovation, Knowledge Management and Capacity Development	C3T10.84	Introduce and Strengthen Bio-fortification Research Particularly of Protein, Iron, Zinc Improvement Considering Impacts of Climate Change	Research/ Study Report published	No			2	5	ARIs, BIRTAN, BIDS, MoFood	
				Awareness raising program participated	No			100	400	DAE	
		C3T10.86	Establishment of Delta Knowledge Hub for Hosting and Offering Intellectual Support to the Implementation of the Delta Plan by Hosting, Updating, Collecting and Sharing New Data and Information	Operational Delta Knowledge Hub	%				100		GED, WARPO

Data Sources: 8<sup>th</sup> FYP National Priority Performance Indicators, SDG Indicators, APA Indicators from respective ministries and departments

Thematic Category	Thematic Area	Action Code	Action/ Project	Indicators	Unit	Base		Target		Responsible Agency	Assumptions
						Year	Status	2025	2030		
Cross Cutting	Research, Innovation, Knowledge Management and Capacity Development	C3T10.87	Establishment of Delta Coalition with 13 Countries for Mutual Benefit and Transfer of Knowledge through Exchange of Water Technologies for Improved Production and Consumption of Clean Water	Established Delta Coalition	%			50	100	GED, WARPO	
		C3T10.90	Development of Online Fertilizer Recommendation System (OFRS) and Offline Fertilizer Recommendation System (Mobile Apps)	operational OFRS	%			100		SRDI, BADC	
		C3T10.91	Capacity Building of Farmers for Adoption and Implementation of Climate Smart Technologies at Field Level (Seed, fertilizer, biocides and irrigation application)	Trained farmers	No				2000	10000	NATA, DAE, ARIS

Data Sources: 8<sup>th</sup> FYP National Priority Performance Indicators, SDG Indicators, APA Indicators from respective ministries and departments

Thematic Category	Thematic Area	Action Code	Action/ Project	Indicators	Unit	Base		Target		Responsible Agency	Assumptions	
						Year	Status	2025	2030			
Cross Cutting	Research, Innovation, Knowledge Management and Capacity Development	C3T10.92	Awareness Building and Extension Programs for Encouraging Farmers to Use Balanced Doses of Chemical Fertilizers	Trained farmers	No			4000	20000	BIRTAN, BADC, DAE		
			Research on Changing Dietary Pattern and Crop Diversification to Achieve Future Food and Nutrition Security under Climate Change Scenarios	Research/ Study Report published	No			3	10	BIRTAN, ARIs, MoFood		
		C3T10.94	Human Resources Development, Skill Strengthening Extension Services for climate change adaptation and mitigation	Trained officials	No				100	500	All department under MoA and MoFL	
			Intensive Research on Cross-Breeding and Changed Livestock Rearing Practices	Research/ Study Report published	No				5	10	BLRI, DLS	
		C3T10.95										

Data Sources: 8<sup>th</sup> FYP National Priority Performance Indicators, SDG Indicators, APA Indicators from respective ministries and departments



## References



## References

- Ahmed S. (2018). Environmental Fiscal Reforms in Bangladesh. PRI-EDGG-UKAID, Dhaka, Bangladesh
- Ahmed, Mahfuz; Suphachalasai, Suphachol. 2014. Assessing the Costs of Climate Change and Adaptation in South Asia. Asian Development Bank. <http://hdl.handle.net/11540/46>.
- Ali, A. (1999). Climate change impacts and adaptation assessment in Bangladesh. *Climate Research*, 12(2/3), 109-116. Retrieved May 27, 2021, from <http://www.jstor.org/stable/24866005>
- Anderson, G., Mack, C., Khan, M. Z., Khondker, R., & Hyman, E. (2017). Climate Finance in Bangladesh: Situation Analysis. Washington, DC: USAID.
- Asaduzzaman, M., Munir, Q., Hossain, M.Sk.G., Khan, M.F.A., Rashid, M.A., Rahaman, A.Z., Akand, M.K. 2016. "An Action Plan for Adaptation in Bangladesh Agriculture under Climate Change." Center for Environmental and Geographic Information Services. <https://hdl.handle.net/10568/82900>.
- BBS (2019). Statistical Yearbook Bangladesh 2019. Statistics & Informatics Division (SID), Ministry of Planning. Government of the People's Republic of Bangladesh.
- BBS (2020). Bangladesh Environment Statistics, 2020. Statistics and Informatics Division, Government of the People's Republic of Bangladesh
- Bristow, L. & Callbeck, Cameron & Larsen, M. & Altabet, M. & Dekaezemacker, Julien & Forth, Michael & Gauns, Mangesh & Glud, Ronnie & Kuypers, M. & Lavik, Gaute & Milucka, J. & Naqvi, S.W.A. & Pratihary, Anil & Revsbech, Niels & Thamdrup, Bo & Treusch, Alexander & Canfield, Donald. (2016). N<sub>2</sub> production rates limited by nitrite availability in the Bay of Bengal oxygen minimum zone.
- Brown S, Nicholls RJ., (2015), Subsidence and human influences in mega deltas: The case of the Ganges–Brahmaputra–Meghna. *Science of The Total Environment* 2015; 527-528: 362-374.
- Brown, S. N. (2016). Projected changes in area of the Sundarban mangrove forest in Bangladesh due to SLR by 2100. *Climate Change*, Springer Link, pp 279-291.
- Bruin, K. De, R. B. Dellink, A. Ruijs, L. Bolwidt, A. Van Buuren, J. Graveland, R. S. De Groot, et al. 2009. "Adapting to Climate Change in the Netherlands: An Inventory of Climate Adaptation Options and Ranking of Alternatives." *Climatic Change* 95 (1–2): 23–45.
- CEGIS (2005). Prediction for Bank Erosion and Mor-phological Changes of the Jamuna and Padma River. Dhaka.
- CEGIS (2013). Vulnerability to Climate Induced Drought Scenario & Impacts. Dhaka, Bangladesh
- CEGIS (2015). Prediction of Riverbank Erosion 2016 (Jamuna, Ganges and Padma Rivers)
- CEGIS (2021). CEGIS Technical note on Future Climate Change scenarios under IPCC SSP scenario for Bangladesh, CEGIS, Dhaka, Bangladesh.
- Chowdhury, F. A. (2012). Climate Change Finance and Governance: Bangladesh Perspectives. Dhaka: Institute of Governance Studies, BRAC University.

- Chowdhury, M.A.H., Rahman, M.A., Chowdhury, T., Saha, B.K., Sultana, T. (2020). Pollution of four river-water surrounding Dhaka city and the effects of heavy metals on the yield and their concentrations in rice and cabbage. *Journal of Bangladesh Agricultural University*, 18(2): 296–303.
- Chowdhury, S, N, Mahmood, Sharif, Abu, Uddin, Mohammad, Ullah, Mohammad, MH, Islam, 2003. A review of research works on water quality of the Lotic, Estuarine and Marine environment in Bangladesh.
- Christensen, J.H., B. Hewitson, A. Busuioc, A. Chen, X. Gao, I. Held, R. Jones, R.K. Kolli, W. T. Kwon, R. Laprise, V. Magaña Rueda, L. Mearns, C.G. Menéndez, J. Räisänen, A. Rinke, A. Sarr and P. Whetton, 2007. Regional Climate Projections. In: *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
- CIAT, (2017), *Climate-Smart Agriculture in Bangladesh. CSA Country Profiles for Asia Series*. International Center for Tropical Agriculture (CIAT); World Bank. Washington, D.C. 28 p.
- Cruz RV, Harasawa H, Lal M, Wu S, Anokhin Y, Punsalmaa B, Honda Y, Jafari M, Li C, Huu Ninh N (2007) Asia. In: Parry ML, Canziani OF, Palutikof JP, van der Linden PJ, Hanson CE (eds) *Climate change 2007: impacts, adaptation and vulnerability. Contribution of working group II to the fourth assessment report of the intergovernmental panel on climate change*. Cambridge University Press, Cambridge, UK
- Dasgupta, S. H. (2013). Cyclones in a changing climate: the case of Bangladesh. *Climate and Development*, vol-6, pp 96-110.
- Dasgupta, Susmita; Zaman, Asif; Roy, Subhendu; Huq, Mainul; Jahan, Sarwar; Nishat, Ainun. 2015. *Urban Flooding of Greater Dhaka in a Changing Climate: Building Local Resilience to Disaster Risk*. *Directions in Development--Environment and Sustainable Development*; Washington, DC: World Bank. © World Bank.
- Dastagir, M. R. (2015). Modeling recent climate change induced extreme events in Bangladesh: A review. *Weather and Climate Extremes*, Pages 49-60.
- Daze, Angie, Terton, A., & Maass Malte. (n.d.). *Coordinating Climate-Resilient Development Alignment to Advance Climate-Resilient Development*. Retrieved May 13, 2020, from <http://napglobalnetwork.org/wp-content/uploads/2018/08/napgn-en-2018-alignment-to-advance-climate-resilient-development-overview-brief.pdf>
- DBHWDB (2017), *Impact Assessment of Structural Interventions on Haor Ecosystem and Innovations for Solutions*, Department of Bangladesh Haor and Wetlands Development, Government of the People's Republic of Bangladesh.
- DDM (2016). *Multi Hazard Risk and Vulnerability Assessment and Mapping*, Department of Disaster Management, Government of the People's Republic of Bangladesh, Dhaka, Bangladesh.
- Dhaubanjari, S. and Pandey, V.P. and Bharati, L. (2018), *Evaluation and Correction of Biases in CORDEX-*

- SA RCM Projections Using Station Data for Western Nepal, American Geophysical Union, Fall Meeting 2018, abstract #H13U-2046, <https://ui.adsabs.harvard.edu/abs/2018AGUFM.H13U2046D>
- DMB-MoFDM. (2010). National Plan for Disaster Management 2010- 2015. Disaster Management Bureau, Disaster Management and Relief Division, Ministry of Food and Disaster Management. [http://www.dmb.gov.bd/reports/Nataional Plan for Disaster \(2010-2015\) Final Version.pdf](http://www.dmb.gov.bd/reports/Nataional%20Plan%20for%20Disaster%20(2010-2015)%20Final%20Version.pdf)
- DNCC (2020). Waste Report 2018-19, Dhaka North City Corporation, Dhaka.
- DoE (2015a), Bangladesh Standards and Guidelines for Sludge Management, Ministry of Environment and Forest, Government of the People’s Republic of Bangladesh
- DoE (2015b), River Water Quality Report, 2015, Ministry of Environment, Forest and Climate Change, Government of the People’s Republic of Bangladesh
- DoE (2016), Surface and Ground Water Quality Report, 2016, Ministry of Environment, Forest and Climate Change (MoEFCC), Government of the People’s Republic of Bangladesh
- DoE (2017), Report on Noise, Ministry of Environment, Forest and Climate Change (MoEFCC), Government of the People’s Republic of Bangladesh
- DoE (2019), National Report on Land Degradation Neutrality Target Setting Programme, Ministry of Environment, Forest and Climate Change (MoEFCC), Government of the People’s Republic of Bangladesh
- DoE, (2016). Assessment of Sea Level Rise on Bangladesh Coast through Trend Analysis: Department of Environment
- DoE. (2018). Annual report 2017-2018, Dhaka: Department of Environment
- DoE. (2022). Annual report 2021-2022, Dhaka: Department of Environment
- EDGG-UKAID (2017). Financing Green Growth in Bangladesh: Challenges and Opportunities. Dhaka, Bangladesh
- Ericson, Jason & Vörösmarty, Charles & Dingman, Stanley & Ward, Larry & Meybeck, Michel. (2006). Effective Sea-level Rise and Deltas: Causes of Change and Human Dimension Implications. *Global and Planetary Change*. 50. 63-82. 10.1016/j.gloplacha.2005.07.004.
- Field, C.B., V.R. Barros, K.J. Mach, M.D. Mastrandrea, M. van Aalst, W.N. Adger, D.J. Arent, J. Barnett, R. Betts, T.E. Bilir, J. Birkmann, J. Carmin, D.D. Chadee, A.J. Challinor, M. Chatterjee, W. Cramer, D.J. D, and G.W. Yohe. 2014. “IPCC 2014 Impacts - Technical Summary.” *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, 35–94.
- GED (2015). Seventh Five Year Plan: FY2016 – FY2020. General Economics Division (GED), Planning Commission.
- GED (2018a), Bangladesh Delta Plan 2100, General Economics Division, Planning Commission, Government of the People’s Republic of Bangladesh

- GED (2018b), Bangladesh Delta Plan 2100: Baseline Studies; Volume 2: Disaster and Environmental Management, General Economics Division, Planning Commission, Government of the People's Republic of Bangladesh
- GED (2020a), Eighth Five Year Plan, General Economics Division, Planning Commission, Government of the People's Republic of Bangladesh
- GED. (2020b). Second Perspective Plan of Bangladesh, 2021-2041 Dhaka: General Economics Division (GED), Planning Commission.
- Germanwatch (2020). Global Climate Risk Index, 2020, ISBN 978-3-943704-77-8, Bonn, Germany. Accessible at: [www.germanwatch.org/en/cr](http://www.germanwatch.org/en/cr)
- GIZ. (2016). SNAP: Stocktaking for National Adaptation Planning Assessing Capacity for Implementing NDCs. [https://www.adaptationcommunity.net/?wpfb\\_dl=362](https://www.adaptationcommunity.net/?wpfb_dl=362)
- Hammill, A., Daze, A., & Dekens, J. (2020). The National Adaptation Plan (NAP) Process: Frequently Asked Questions. Web Article, NAP Global Network. <http://napglobalnetwork.org/2019/12/the-national-adaptation-plan-nap-process-frequently-asked-questions/>
- Hedger, M., & Rabbani, G. (2012). Country-driven approaches to climate finance: insights from Bangladesh. Eschborn: GIZ.
- Holgate SJ, Matthews A, Woodworth PL, Rickards LJ, Tamisiea ME, Bradshaw E, Foden PR, Gordon KM, Jevrejeva S, Pugh P (2013) New data systems and products at the permanent service for mean sea level. *J Coast Res* 29:493–504. <https://doi.org/10.2112/JCOASTRES-D-12-00175.1>
- Hossain, Md & Reza, Md & Rahman, Sania & Kayes, Imrul. (2012). Climate Change and Its Impacts on the Livelihoods of the Vulnerable People in the Southwestern Coastal Zone in Bangladesh. 10.1007/978-3-642-22266-5\_15.
- Huq, Saleemul & Rabbani, GOLAM. (2014). Climate adaptation technologies in agriculture and water supply and sanitation practice in the coastal region of Bangladesh. 10.1201/b18053-12.
- International Institute for Sustainable Development (IISD): Jo-Ellen Parry, Angie Dazé, Julie Dekens and, Anika Tertton, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH: Michael Brossmann and Sascha, and Oppowa. 2017. "FINANCING NATIONAL ADAPTATION PLAN PROCESSES."
- IPCC (2019a). Summary for Policymakers. In: Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems [P.R. Shukla, J. Skea, E. Calvo Buendia, V. Masson-Delmotte, H.-O. Pörtner, D. C. Roberts, P. Zhai, R. Slade, S. Connors, R. van Diemen, M. Ferrat, E. Haughey, S. Luz, S. Neogi, M. Pathak, J. Petzold, J. Portugal Pereira, P. Vyas, E. Huntley, K. Kissick, M. Belkacemi, J. Malley, (eds.)].
- IPCC (2019b). Summary for Policymakers. In: IPCC Special Report on the Ocean and Cryosphere in a Changing Climate [H.-O. Pörtner, D.C. Roberts, V. Masson-Delmotte, P. Zhai, M. Tignor, E. Poloczanska, K. Mintenbeck, A. Alegría, M. Nicolai, A. Okem, J. Petzold, B. Rama, N.M. Weyer (eds.)].

- IPCC, 2007: Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, Pachauri, R.K and Reisinger, A. (eds.)]. IPCC, Geneva, Switzerland, 104 pp.
- IPCC, 2013: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1535 pp.
- IPCC, 2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp.
- Islam, Raihanul & Islam, Md. Nazrul & Islam, M.. (2016). Earthquake Risks In Bangladesh: Causes, Vulnerability, Preparedness and Strategies for Mitigation. Asian Research Publishing Network (ARPN). 5. 75-90.
- IWM and CEGIS (2007). Investigating the Impact of Relative Sea Level Rise on Coastal Communities and their Livelihoods in Bangladesh, IWM, CEGIS, Dhaka.
- Karim, M.F. and Mimura, N., (2008), Impacts of climate change and sea-level rise on cyclonic storm surge floods in Bangladesh, *Global Environmental Change*, Volume 18, Issue 3, (2008), Pages 490-500, ISSN 0959-3780, <https://doi.org/10.1016/j.gloenvcha.2008.05.002>.
- Khan, A, Khan, B F, Uddin D N, Azim G I A, Islam, S (March 2017). Financing Green Growth in Bangladesh: Challenges and Opportunities. EDGG-UK Department for International
- LEG. (2012a). National Adaptation Plans: Technical Guidelines for the National Adaptation Plan Process.
- LEG. (2012b). The National Adaptation Plan Process: A Brief Overview.
- Lewis, D. (2016). Routledge Handbook of Contemporary Bangladesh. London: Routledge.
- LGED (2020). Assessment of Community based Climate Change Risk in Agriculture and Fisheries Sector in Haor Areas and Participatory Scenario Development (Draft), Local Government Engineering Department, Government of the People's Republic of Bangladesh, Bangladesh.
- Lopa, F. G., & Mokbul Morshed Ahmad. (2016). Participation of CSOs/NGOs in Bangladeshi climate change policy formulation: co-operation or co-optation? *Development in Practice*, 26(6), 781-793
- Ludwig, F., Terwisscha, C., and Quadir, D.A. (2018), Baseline Study 08: Climate Change of Bangladesh Delta Plan 2100, General Economics Division, Planning Commission, Government of the People's Republic of Bangladesh.
- MacGregor, J., Firoz, F., Uddin, N., Islam, S., Sattar Md. A. M. (2016). Green Growth Diagnostic: Bangladesh. Retrieved from <http://www.greengrowthknowledge.org/resource/green-growth-diagnostic-bangladesh>
- Mallick, B. A. (2017). Living with the risks of cyclone disasters in the south-western coastal region of Bangladesh. *Environment*.

- Mélanie Becker, Fabrice Papa, Mikhail Karpytchev, Caroline Delebecque, Yann Krien, Jamal Uddin Khan, Valérie Ballu, Fabien Durand, Gonéri Le Cozannet, A. K. M. Saiful Islam, Stéphane Calmant and C. K. Shum (2020), Water level changes, subsidence, and sea level rise in the Ganges–Brahmaputra–Meghna delta, *Proceedings of the National Academy of Sciences* Jan 2020, 117 (4) 1867-1876; DOI: 10.1073/pnas.1912921117
- MoCAT. (2010). National Tourism Policy. Dhaka: The Ministry of Civil Aviation and Tourism
- MoDMR. (2016). Multi-hazards Risk and Vulnerability Assessment, Modeling and Mapping, Final Report. Dhaka: Department of Disaster Management, Ministry of Disaster Management and Relief
- MoDMR. (2017). National Plan for Disaster Management (2016-2020). [https://modmr.portal.gov.bd/sites/default/files/files/modmr.portal.gov.bd/policies/0a654dce\\_9456\\_46ad\\_b5c4\\_15ddfd8c4cod/NPDM \(2016-2020\) -Final.pdf](https://modmr.portal.gov.bd/sites/default/files/files/modmr.portal.gov.bd/policies/0a654dce_9456_46ad_b5c4_15ddfd8c4cod/NPDM%20(2016-2020)-Final.pdf)
- MoEF. (2005). National Adaptation Programme of Action (NAPA). <https://unfccc.int/resource/docs/napa/ban01.pdf>
- MoEF. (2009). Bangladesh Climate Change Strategy and Action Plan 2009. <https://moef.gov.bd/site/page/97b0ae61-b74e-421b-9cae-f119f3913b5b/BCCSAP-2009>
- MoEFCC. (2010). Bangladesh Climate Change Trust Act, Dhaka: Bangladesh Climate Change Trust
- MoEFCC. (2013). The National Sustainable Development Strategy. Dhaka: The Ministry of Environment and Forest
- MoEFCC. (2014). National Action Plan on Short-lived Climate Pollutants. Dhaka: The Department of Environment
- MoEFCC (2015). Intended Nationally Determined Contributions (INDC), Ministry of Environment, Forest and Climate Change, Government of the People’s Republic of Bangladesh, Dhaka, Bangladesh.
- MoEFCC. (2016). Assessment of Sea Level Rise on Bangladesh Coast through Trend Analysis, Dhaka: Department of Environment
- MoEFCC. (2017). Bangladesh Country Investment Plan for Environment, Forest and Climate Change (2016-2021). Dhaka: Ministry of Environment and Forest and Climate Change
- MoEFCC. (2018a). Third National Communication of Bangladesh to the United Nations Framework Convention on Climate Change. Dhaka: Ministry of Environment, Forest and Climate Change
- MoEFCC (2018b). Nationwide Climate Vulnerability Assessment in Bangladesh. [https://moef.gov.bd/sites/default/files/files/moef.portal.gov.bd/notices/d31d6ofd\\_df55\\_4d75\\_bc22\\_1b0142fd9d3f/Draft%20NCVA.pdf](https://moef.gov.bd/sites/default/files/files/moef.portal.gov.bd/notices/d31d6ofd_df55_4d75_bc22_1b0142fd9d3f/Draft%20NCVA.pdf)
- MoEFCC (2020a), Projections of Sea Level Rise and Assessment of it’s Sectoral Impact, Department of Environment, Ministry of Environment, Forest and Climate Change, Government of the People’s Republic of Bangladesh
- MoEFCC (2020b), Update of Bangladesh Climate Change Strategy and Action Plan (Draft), Ministry of Environment, Forest and Climate Change, Government of the People’s Republic of Bangladesh

- MoF. (2016). National Industry Policy. Dhaka: Ministry of Finance
- MoF. (2018). Bangladesh Economic Review 2018, Dhaka: Finance Division, Ministry of Finance.
- MoF. (2019). Climate Financing for Sustainable Development: Budget Report 2019-20. Dhaka: Finance Division Ministry of Finance, Bangladesh.
- MoPEMR. (2008). Renewable Energy Policy. Dhaka: The Ministry of Power, Energy and Mineral Resources
- MoPEMR. (2015). Energy Efficiency and Conservation Master Plan up to 2030. Sustainable and Renewable Energy Development Authority (SREDA) and Power Division. Dhaka: Ministry of Power, Energy and Mineral Resources
- MoWR, (2015). River Bank Improvement Program (RBIP): Environmental Impact Assessment (EIA) (Draft).
- Nishat, A. and Mukherjee, (2013), Climate Change Impacts, Scenario and Vulnerability of Bangladesh. In: (Climate Change Adaptation Actions in Bangladesh, Shaw et al. Editors), 15-41.
- Persson, Å. (2019). Global adaptation governance: An emerging but contested domain. Wiley Interdisciplinary Reviews: Climate Change, 10(6). <https://doi.org/10.1002/wcc.618>
- PROVIA. 2013. PROVIA Guidance on Assessing Vulnerability, Impacts and Adaptation to Climate Change. United Nations Environment Program. <http://www.unep.org/provia>.
- Rabbani M.G., Rahman A.A., Shoef I.J., Khan Z.M. (2015) Climate Change and Food Security in Vulnerable Coastal Zones of Bangladesh. In: Habiba U., Hassan A., Abedin M., Shaw R. (eds) Food Security and Risk Reduction in Bangladesh. Disaster Risk Reduction (Methods, Approaches and Practices). Springer, Tokyo. [https://doi.org/10.1007/978-4-431-55411-0\\_10](https://doi.org/10.1007/978-4-431-55411-0_10)
- Rahaman, A. Z. (2019). Study on climate anomalies of Bangladesh using statistically downscaled climate projections for representative concentration pathways (RCPs) of IPCC fifth assessment report. Dhaka, Bangladesh: Department of Water Resources Engineering, Bangladesh University of Engineering and Technology (BUET), <http://lib.buet.ac.bd:8080/xmlui/handle/123456789/5407?fbclid=IwARoAadWddJ27Tgc6kslqqQixBeNU2rc3msGg8NTqMEy5EHXvMsVeliUSAnU>.
- Rahman, M. R. (2015). Climate change in Bangladesh: a spatio-temporal analysis and simulation of recent temperature and rainfall data using GIS and time series analysis model. Theoretical and Applied Climatology, Springer Link, vol-128, pp 27-41.
- Rahman, M.A., Kang, S., Nagabhatla, N. et al., (2017), Impacts of temperature and rainfall variation on rice productivity in major ecosystems of Bangladesh. Agric & Food Secur 6, 10 (2017). <https://doi.org/10.1186/s40066-017-0089-5>
- Rahman, M.R., Lateh, H., (2016), Spatio-temporal analysis of warming in Bangladesh using recent observed temperature data and GIS. Clim Dyn 46, 2943–2960 (2016). <https://doi.org/10.1007/s00382-015-2742-7>
- Raneesh KY (2014) Impact of Climate Change on Water Resources. J Earth Sci Clim Change 5: 185. Doi: 10.4172/2157-7617.1000185

- Reliefweb, (2020). Bangladesh: Cyclone Amphan - Operation Update Report (DREF Operation n° MDRBD024) Retrieved from <https://reliefweb.int/report/bangladesh/bangladesh-cyclone-amphan-operation-update-report-dref-operation-n-mdrbd024>
- Rihanul (2016). Earthquake risks in Bangladesh: causes, vulnerability, preparedness and strategies for mitigation, Government of the People's Republic of Bangladesh
- Roy, K., Gain, A.K., Mallick, B. et al. (2017), Social, hydro-ecological and climatic change in the southwest coastal region of Bangladesh. *Reg Environ Change* 17, 1895–1906 (2017). <https://doi.org/10.1007/s10113-017-1158-9>
- Saha, M.K. and Khan, N.A. (2014), Changing Profile of Cyclones in the Context of Climate Change and Adaptation Strategies in Bangladesh, *Journal of Bangladesh Institute of Planners*, Vol. 7, December 2014, pp. 1-12, Bangladesh Institute of Planners, ISSN 2075-9363
- Shahid, S., Wang, X., Harun, S.B. et al., (2016) Climate variability and changes in the major cities of Bangladesh: observations, possible impacts and adaptation. *Reg Environ Change* 16, 459–471 (2016). <https://doi.org/10.1007/s10113-015-0757-6>
- SRDI (2020). Land Degradation in Bangladesh: Baseline Study of Land Degradation, Ministry of Agriculture, Government of the People's Republic of Bangladesh
- Susmita Dasgupta, Mainul Huq, Zahirul Huq Khan, Manjur Murshed Zahid Ahmed, Nandan Mukherjee, Malik Fida Khan & Kiran Pandey (2014) Cyclones in a changing climate: the case of Bangladesh, *Climate and Development*, 6:2, 96-110, DOI: 10.1080/17565529.2013.868335
- Thomson, S. (2019). Bangladesh is a world leader in climate change adaptation. This is how it did it. Web Article, Global Commission on Adaptation. <https://gca.org/global-commission-on-adaptation/solutions/bangladesh-is-a-world-leader-in-climate-change-adaptation-this-is-how-it-did-it>
- Trading Economics (2019). Bangladesh GDP Growth Rate. Retrieved from <https://tradingeconomics.com/bangladesh/gdp-growth>
- UKCIP. 2007. "Identifying Adaptation Options." Policy Paper, 1–35.
- UNDP. (2019). National Adaptation Plan for medium and long term climate change adaptation investment. Press Release by UNDP Bangladesh. <https://www.bd.undp.org/content/bangladesh/en/home/presscenter/pressreleases/2019/10/26/national-adaptation-plan-for-medium-and-long-term-climate-change.html>
- UNDP-UNEP. (2010). National Capacity Self-Assessments: Results and Lessons Learned for Global Environmental Sustainability. <https://www.undp.org/content/dam/aplaws/publication/en/publications/environment-energy/www-ee-library/mainstreaming/national-capacity-self-assessment-synthesis-report/NCSA-101209.pdf>
- UNDP-UNEP. (2011). Mainstreaming Climate Change Adaptation into Development Planning: A Guide for Practitioners. [https://www.undp.org/content/undp/en/home/librarypage/environment-energy/climate\\_change/adaptation/mainstreaming\\_climatechangeadaptationintodevelopmentplanninggui.html](https://www.undp.org/content/undp/en/home/librarypage/environment-energy/climate_change/adaptation/mainstreaming_climatechangeadaptationintodevelopmentplanninggui.html)
- UNEP (2018). Environmental Consequences of Ocean Acidification: A Threat to Food Security

- UNFCCC. (2010). The Cancun Agreements: Outcome of the work of the Ad Hoc Working Group on Long-term Cooperative Action under the Convention. <https://unfccc.int/resource/docs/2010/cop16/eng/07a01.pdf#page=4>
- UNFCCC. (2011, a). Report of the Conference of the Parties on its seventeenth session, held in Durban from 28 November. <https://unfccc.int/resource/docs/2011/cop17/eng/09a01.pdf>
- UNFCCC. (2011, b). “Assessing the Costs and Benefits of Adaptation Options. An Overview of Approaches,” 37.
- UNITAR. (2015). Skills Assessment for National Adaptation Planning: How Countries can Identify the Gap. <https://www.unclearn.org/sites/default/files/inventory/nap16062015.pdf>
- Vissa, N. K. (2013). Intensity of tropical cyclones during pre- and post-monsoon season in relation to accumulated tropical cyclone heat potential over Bay of Bengal. *Natural Hazards*, pp 351-371.
- Wesselink, A., Paavola, J., Fritsch, O., & Renn, O. (2011). Rationales for Public Participation in Environmental Policy and Governance: Practitioners’ Perspectives. *Environment and Planning A: Economy and Space*, 43(11), 2688–2704. <https://doi.org/10.1068/a44161>
- WHO (2016). Ambient air pollution: A global assessment of exposure and burden of disease
- WMO and GWP, 2016. Handbook of Drought Indicators and Indices (M. Svoboda and B.A. Fuchs). Integrated Drought Management Programme (IDMP), Integrated Drought Management Tools and Guidelines Series 2. Geneva.
- World Bank (2010), Bangladesh - Economic of adaptation to climate change: Main report (English). Washington, D.C.: World Bank Group. <http://documents.worldbank.org/curated/en/841911468331803769/Main-report>
- Zaman, Md. Abdullah & Monira, Nusrath. (2017). A Study of Earthquakes in Bangladesh and the Data Analysis of the Earthquakes that were generated In Bangladesh and Its’ Very Close Regions for the Last Forty Years (1976-2016). 06. 10.4172/2381-8719.1000300.





**Agriculture, Water Resources and Rural Institutions Division**  
Bangladesh Planning Commission  
Government of the People's Republic of Bangladesh