Climate Change Handbook for Members of Parliament

2022

Citation: National Assembly and Ministry of Environment (2022) Climate Change Handbook for Members of Parliament, Phnom Penh, Ministry of Environment.

©National Assembly and Ministry of Environment 2022

The Climate Change Handbook for Members of Parliament may be copied or printed for personal use, including for archiving, presentation, website contents and teaching purposes, while the copyright is under the National Assembly and the Ministry of Environment.

Table of Contents

PREFACE I

ACKNOWLEDGMENTS IV

KEY TERMINOLOGIES VI

CHAPTER 1. INTRODUCTION 1

1.1 Background and Objectives of the Handbook 1
1.2 A General Overview of Climate Change 2
1.3 Parliaments and Climate Change 3
1.4 Brief History of Climate Change 5

CHAPTER 2. THE BASICS OF CLIMATE CHANGE SCIENCE 8

2.1 Global Warming 8
2.2 Greenhouse gases 10
2.3 Greenhouse effect 12
2.4 Impacts of Global Warming 14

CHAPTER 3. REDUCING GREENHOUSE GAS EMISSIONS 19

3.1 Climate Change Response Overview 19
3.2 Greenhouse gas inventory 20
3.3 National Greenhouse Gas Reduction Strategy 22
3.4 Sectoral Greenhouse Gas Emission Reduction Plan 27
3.5 Mitigation Activities by Individuals 31

CHAPTER 4. VULNERABILITY AND ADAPTATION TO CLIMATE CHANGE 32

4.1 Vulnerability 32
4.2 National Adaptation Strategy 35
4.3 Sector Adaptation Plan 37
4.4 Individual adaptation activities 44

CHAPTER 5. ROLES OF PARLIAMENTS IN CLIMATE CHANGE 45

5.1 Roles of Parliaments in Developed Countries 45
5.2 The Role of Parliaments in Developing Countries 47
5.3 The role of the ASEAN Inter-Parliamentary Assembly for MPs in the ASEAN region 49

5.4 The Role of the Cambodian Parliament in Climate Change 52
5.5 Legal Framework and International Conventions 64

CHAPTER 6. CLIMATE FINANCE 68

6.1 Economic Analysis in the Context of Climate Change 68
6.2 Global Financial Mechanism..... 71
6.3 National budget for climate actions..... 72
6.4 Climate Change Development Partners..... 73

List of Tables

TABLE 3.1 MAJOR GHGS CONTRIBUTING TO GLOBAL WARMING 21

TABLE 4.1 PRIVATE SECTOR AND PROACTIVE ADAPTATION OPTIONS.....38

TABLE 5.1 SECTORAL DISCUSSION POINTS RELATED TO CLIMATE CHANGE 58

TABLE 5.1 CHRONOLOGICAL ORDER OF ALL MAJOR COPS EVENTS.....66

Table of figures

FIGURE 1.1 BRIEF HISTORY OF CLIMATE CHANGE.....7

FIGURE 2.1 GLOBAL TEMPERATURE CHANGE DATA REPORT (COMPARED TO 1850-1900).....9

FIGURE 2.2 GHG CONCENTRATION TREND IN MAUNA LOA, 1760 - 2020.....10

FIGURE 2.3 GLOBAL WARMING FROM THE INTERACTIONS BETWEEN SOLAR RADIATION AND GHGS 13

FIGURE 2.4 IMPACTS OF CLIMATE CHANGE ON THE NATURE AND PEOPLE 15

FIGURE 3.1 RELATIONSHIP BETWEEN CC AND SOCIO-ECONOMIC DEVELOPMENT.....20

FIGURE 3.2 CARBON MARKET MECHANISM, EMISSION TRADING.....24

FIGURE 3.3 CARBON MARKET MECHANISM, CLEAN DEVELOPMENT MECHANISM.....26

FIGURE 4.1 CLIMATE CHANGE VULNERABILITY ASSESSMENT FRAMEWORK.....34

.....34

FIGURE 4.2 CLIMATE CHANGE RESPONSE POLICY DEVELOPMENT CYCLE 36

FIGURE 5.1 THE ROLE OF PARLIAMENTS IN CLIMATE CHANGE IN DEVELOPED COUNTRIES 47

FIGURE 5.2 UGANDAN PARLIAMENT'S ROLE IN CLIMATE CHANGE.....48

FIGURE 5.3 ROLES OF CAMBODIAN PARLIAMENTS IN CC 52

FIGURE 5.4 FLOW CHART OF REVIEW AND APPROVAL PROCEDURES.....54

FIGURE 5.5 BUDGET APPROVAL PROCESS.....56

FIGURE 5.5: NATIONAL BUDGET APPROVAL PROCESS 56

FIGURE 5.6 PERCEPTION OF REGIONAL CLIMATE CHANGE (INCREASE IN % ONLY) 62

FIGURE 6.1 IMPACTS OF CLIMATE CHANGE ON GDP.....70

FIGURE 6.2 STEPS IN THE CC PROJECT PLANNING PROCESS 72

PREFACE

Cambodia is among the countries most vulnerable to climate change. Vulnerability is due in part to the fact that climate hazards are becoming more frequent and intense, and also to the limited capacity of the state and its people to adapt. Recognizing the vulnerabilities, the Royal Government of Cambodia has made every effort to address climate change, as set out in the National Strategic Development Plan and Government Rectangular Strategy since its first mandate to the present. Climate change has since become increasingly a priority for the Royal Government of Cambodia.

While effort has been made by the Royal Government of Cambodia to address climate change, understanding of the like by the public at large and the private sector remains low and as a result they are not well prepared. Limited awareness is also presented in the KAP study on "Understanding Public Perspectives on Climate Change in Cambodia: Knowledge, Attitude and Practice". Meanwhile, members of the National Assembly and the Senate also see their roles to contribute to tackling climate change. In this regard, the Climate Change Handbook for Members of the Parliaments has been developed with the technical and financial support of the Ministry of Environment and the United Nations Development Program, supported by the regional programme on the Governance of Climate Finance and the Cambodia Climate Change Alliance (CCCA) – Phase 3 and also the Department of Climate Change

The Handbook was developed in a three-phase consultation process. First, it involved key informant interviews (KII) with members of Parliament - the Third, Second and Seventh Commissions of both houses, senior officials and management of the Ministry of Environment, advisors to the National Assembly and experts from the Research Departments of the Parliament. The KII was an assessment of the needs of Members of Parliament in relation to climate change. From here, there was an agreement on the content for the Handbook, and the role of the Parliament in accelerating actions to mitigate and adapt to climate change. The second phase involved gathering of inputs on the roles of Members of Parliament at the sub-national level, in particular at the local level, where much of the impacts of climate change are felt. The purposes of this phase are to explore the key messages that the Members of the Parliaments should bring to people and how local leaders could work with the government to address environmental issues, in particular in response to climate change. The third phase was a workshop, consultation and field visit to the climate change impact areas including areas impacted by sea level rise with participation from the National Assembly.

It was agreed to develop the Handbook into six chapters. Chapter 1 provides a general overview of climate change, in particular a brief history of climate change. Chapters 2 through 4 present the basic science of climate change, and climate change mitigation and adaptation. Chapter 5 describes the lessons learned on the roles of Parliament in climate change, drawing on practices from developed and developing countries, with the focus on the question of learning from other Parliaments for use in the Cambodia

context. The last chapter summarizes the sources of climate finance.

I would like take the opportunity to thank and appreciate the representatives of ministries, agencies, development partners and resource people who have provided their valuable inputs and support and actively participated in the process for the successful and timely delivery of this handbook. We hope that this material will be highly useful to stakeholders, especially members from both houses of Parliament, as well as technical officials as a means to contribute to tackling climate change.

Phnom Penh, ….22…… December 2022
Chairman of the Third Commission
of the National Assembly



Loy Sophath

ACKNOWLEDGMENTS

The National Assembly and the Senate would like to express their profound gratitude the Ministry of Environment, Development Partners, NGOs, parliamentary working groups of both houses, and all stakeholders involved in the process to develop the Climate Change Handbook for Members of the Parliaments.

This Handbook has gone through a consultation process, receiving inputs from experts of all levels, especially MPs including **H.E. Hou Sry**, Vice-Chairman of 3rd Commission, **H.E. Khut Chandara**, member of 3rd Commission, **Lok Chumteav Ly Kim Leang**, Secretary of 2nd Commission and **H.E. Mann Chhoeurn**, Vice-Chairman of 7th Commission of Senate. We are grateful to you all for taking the time and effort to provide indispensable inputs to developing the material.

I would like also express my profound thanks to the resource people from the Ministry of Environment (MoE) who also provided essential inputs to the creation of this material, especially **H.E. Tin Ponlok**, Secretary of State, Ministry of Environment and 2nd Vice-Chair of the National Council for Sustainable Development, **H.E. Ken Serey Ratha**, Director General of the General Directorate of Environmental Knowledge and Information, **Dr. Hak Mao**, Director of the Climate Change Department, **H.E. Keo Piseth**, Advisor to the National Assembly, **H.E. Pen Prakath** and **Mr. Sok Pisal**, who provided all the necessary logistical support in the whole development process.

Finally, our heartfelt thanks go to the United Nations Development Program (UNDP), with the coordination provided by the third phase of the Cambodia Climate Change Alliance, especially the regional project of the United Nations Development Program and Sweden on the Governance of Climate Finance, for its continued support to the Cambodian Parliament.

Phnom Penh, ……22……. December 2022

Secretary General of the National Assembly



Leng Peng Long

KEY TERMINOLOGIES

Adaptation

The process of adapting to the current climate or anticipated effects of the climate.

People adapt to minimize impact or seek beneficial opportunities. In the natural system, human intervention can help to adapt to the climate that will occur and respond to its effects.

Adaptation Fund

Founded in 2001 under the framework of the Kyoto Protocol, it provides financing to developing countries that are vulnerable to climate change.

Carbon budget

The maximum amount of greenhouse gases emitted by human activity into the Earth's atmosphere, which does not cause global warming to go beyond the limit that will make it irreversible. In the Paris Agreement, it was agreed that the average temperature on Earth should not exceed 2 degrees Celsius, or about 900 gigatons of carbon in the atmosphere. In the 2021 IPCC report, about 400 gigatons was estimated to be left to release. Every year, the world emits about 36 gigatons, or we have about 11 years left, which is a very difficult stage.

Carbon market

A trading system in which countries can buy or sell greenhouse gas emissions in an effort to meet national emissions limits under the Kyoto Protocol or under other

agreements such as: Agreement of the Member States of the European Union.

The term is used because carbon dioxide is the most abundant of the greenhouse gases, and other gases are measured in units of carbon dioxide equivalent.

Carbon offset

Refers to the purchase of carbon from the market of an individual, company or country to offset the amount of carbon that they emit. For example, a person traveling by plane contributes to greenhouse gas emissions. Normally the airfare is only $100, the airline always asks if you want to contribute to the carbon offset, if you do the ticket price can go up to $110.

Carbon sequestration

Absorption and confinement of carbon from the atmosphere in carbon reservoirs (such as oceans, forests, or soil) through physical or biological processes such as photosynthesis. In principle, carbon sequestration refers to the storage of carbon, otherwise it will be released into the atmosphere. There are three main methods of development and discovery in different situations: first, short-term confinement in the terrestrial biosphere, where plants absorb carbon dioxide and stored in biomass and in the soil; second, long-term confinement in the soil is found by pumping carbon dioxide into existing reservoirs or drilling deep into the soil layer; and third, long-term confinement in the ocean is found through injection of carbon dioxide thousands feet or hundreds meters deep in to the ocean and is absorbed by water.

Climate

Atmospheric conditions and all mean seasonal meteorological phenomena are the average statistics of any area observed over a period of 30 years. Atmospheric conditions / climatic anomalies include atmospheric pressure, solar temperature, humidity, rainfall, clouds, and wind. Geologists have divided the climate into five groups: 1-warm tropical climate; 2-sub-tropical climate; 3-temperate climate; 4-cold climate; and 5-mountain climate.

Climate change

Climate change is identifiable (through statistical tests) through changes in the average of climatic variables, and will continue for decades or longer.

Climate change may be due to natural internal processes, external forcing, or to persistent anthropogenic change in the composition of the atmosphere or land use, such as emissions from factories and so on. Article 1of the United Nations Framework Convention on Climate Change (UNFCCC) defines climate change as "a change in climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is additional to natural climate variability observed over comparable time periods." This convention makes a distinction between climate change attributable to human activities altering the atmospheric composition, and climate variability attributable to natural causes.

Climate Finance

Refers to national or international finance received from the state, the private sector, or other sources to cover climate change adaptation and mitigation actions.

Conference of Parties (CoPs)

The supreme body of the UNFCCC, in which voting members have ratified or adopted the convention. The first CoP was held in Berlin (1995) and subsequent annual meetings were held elsewhere.

Emission budget

The total amount of greenhouse gases a country can emit every five years. The allocation of the budget is based on the principle of "shared responsibility, but with differentiated responsibility" and in accordance with individual country capacity. This means that climate change is caused by developed countries through the Industrial Revolution since 1900, especially the use of coal-fired power. Thus, developed countries must reduce or stop using that energy and develop technologies to capitalize on renewable energy, but this does not mean that developing countries must stop using coal-fired power. At the same time, the Paris Agreement requires all countries to commit to reducing their greenhouse gas emissions as much as possible through the Nationally Determined Contributions - NDC (UNFCCC). In addition, developed countries will provide assistance to developing countries to adapt to climate change or invest in clean energy development projects in developing countries to avoid the use of fossil fuels. This emission budget is usually shown in the

NDC document. Some countries have set zero emissions by 2050, such as Cambodia.

Emission inventory

A report that details on the types and quantities of pollutants released into the environment.

Fossil fuel

Fuels containing carbon from fossil hydrocarbons, including coal, decomposed plants, oil, and natural gas.

Global Environmental Facility (GEF)

Institutions that provide grants to developing countries to support projects related to biodiversity, climate change, international waters, land degradation, ozone layer and persistent organic pollutants.

The Global Environment Facility was established in 1991 to help fund developing countries for global environmental protection projects and programs.

Global Warming

Changes in temperature of surface atmosphere are called global warming due to the rise in greenhouse gases released into the atmosphere.

Global Warming Potential

An index, based upon radiative properties of a well-mixed greenhouse gas, measuring the radiative forcing of a unit mass of a given well-mixed greenhouse gas in the present-day atmosphere integrated over a chosen time horizon, relative to that of carbon dioxide. The GWP represents the

combined effect of differing times these gases remain in the atmosphere and their relative effectiveness in absorbing outgoing thermal infrared radiation. The Kyoto Protocol is based on the GWP from pulse emission over a 100-year time line.

Green Climate Fund

Funding institutions to support projects, programs, policies and activities of developing countries in response to climate change. This fund is governed by the Board of Directors of the Green Climate Fund.

At the 16th Conference of the Parties in Cancun in 2010, governments established a Green Climate Fund, which acts as an operating unit for financial mechanisms as set out in Article 11 of the UNFCCC.

Greenhouse effect

The phenomenon of increasing surface temperature in a closed environment covered with glass or clear plastics, which allows the sun's rays to pass through but not the long-wavelength rays to reflect back.

The term is used to identify similar phenomena that occur in the Earth's atmosphere. Most scholars claim that the remarkable increase in heat since the beginning of this century was due to the increase in carbon dioxide, chlorine, fluorocarbon, methane, nitrous oxide, etc. and act like a greenhouse, that originates from human activities, especially from burning fossil fuels. When the greenhouse gas layer in the atmosphere rises above the natural level, the heat reflected from the earth surface cannot escape into the upper

atmosphere and radiate back to the earth, causing an increase in air temperature in the lower atmosphere.

Greenhouse gases - GHG

Gases in the atmosphere that occur naturally or by human activity and are absorbed and emitted at specific wavelengths within the spectrum of thermal infrared radiation emitted by the Earth's surface, the atmosphere itself, and by clouds. These phenomena cause greenhouse effects.

Water vapor (H2O), carbon dioxide (CO2), nitrous oxide (N2O), methane (CH4) and ozone (O3) are the primary greenhouse gases in the Earth's atmosphere. In addition, there are a number of entirely human made greenhouse gases in the atmosphere, such as halocarbon and other chlorine- and bromine-contained substances, deals with under the Montreal Protocol. Basic CO2, N2O and CH4, the Kyoto Protocol deals with the greenhouse gases sulfur hexafluoride (SF6), hydrofluorocarbons (HFCs), and perfluorocarbons (PFCs).

Intergovernmental Panel on Climate Change (IPCC)

A leading international body for climate change assessment, established by the United Nations Environment Program (UNEP) and the World Meteorological Organization (WMO) to provide the world with a clear scientific perspective on current climate change knowledge and potential environmental and socio-economic impacts. The IPCC is a group of scientists tasked with reviewing and evaluating the latest scientific, technical, and socio-economic information related to climate change for the world.

The UN General Assembly approved the activities of the World Meteorological Organization (WMO) and the United Nations Environment Program (UNEP) to establish a joint IPCC.

Least Developed Countries Fund

A budget package for developing countries to implement projects included in the National Program of Action for Adaptation to Climate Change (NAPA), which is funded by the GEF.

Net Zero

As greenhouse gas emissions are almost zero, although they are absorbed from the atmosphere through forests or the sea. Under the Paris Agreement, it is expected that by 2050 zero emissions will be achieved and the global average temperature will rise by 1.5 degrees Celsius. However, according to the current emission budget, net zero will have to be achieved by 2030 to maintain a warming by 1.5 degrees Celsius.

Sensitivity

The degree to which a system is positively or negatively affected by climate variabilities or climate change.

Impacts may occur directly, such as changes in crop yields in response to moderate temperature variations or temperature variabilities, or indirectly, such as damage caused by frequent coastal flooding due to sea level rise.

Vulnerability

A tendency or process that is susceptible or prone to negative impact, including many different notions, including

sensitivity or vulnerability and lack of ability to deal with and adapt.

Weather

Atmospheric conditions at any time, in the short term, and at any place, as evidenced by meteorological phenomena such as atmospheric pressure, solar, temperature, humidity, rain, clouds, wind, and so on. In most places the weather can change according to the time of day and the season. For example, Cambodia is very hot during the day in April.

CHAPTER 1. INTRODUCTION

1.1 BACKGROUND AND OBJECTIVES OF THE HANDBOOK

Recent interactions between the National Assembly (NA) and the Ministry of Environment (MoE), the Department of Climate Change (DCC) of the General Department of Policy and Strategy (GDPS), MoE, resulted in a workshop held, on March 10, 2022, with the 3rd Commission of the National Assembly, Bokor City, Kampot Province, to understand and share knowledge on "National Park Management and Climate Change". Building on the outcomes of the workshop, the Commission and MoE agreed to follow on with two main activities: (1) developing a Climate Change Handbook for Cambodian Members of Parliament and (2) Organizing another workshop to seek to understand and share knowledge and consultative meetings with the parliamentarians and relevant stakeholders of the Cambodian Parliament, as well as study visits to climate change (CC) related projects.

With the above two activities, the parliament identified the need for general knowledge on CC, especially the scientific basis and the effects of CC. Both houses of the Parliament also expressed their need to understand how to adapt to and mitigate CC, and how to access funding to support CC initiatives. They also wanted to know what the Parliaments could do to address CC, building on lessons in both developed and developing countries.

The Climate Change Handbook for Members of the Parliament is designed to meet these needs, in particular for the Commissions tasked with tackling CC at all levels - international, regional, national, and sub-national, and also

for MPs to respond to the public when visiting their constituencies. Awareness of all CC aspects would enable MPs to respond immediately and appropriately in the national interest and to create an environment conducive to tackling CC.

1.2 A General Overview of Climate Change

Climate change responses in Cambodia can be traced back to the time when the country supported the United Nations Framework Convention on Climate Change (UNFCCC) in 1992, and its ratification in 1995 (UNFCCC approved on 1992) through its ratification in 2002 of the 1997 Kyoto Protocol on CC by actively participating in the 2016 Paris Agreement on CC, with its ratification by the country in 2015, regardless of the fact that it is not a high emitter of greenhouse gases (GHG) unlike the developed nations.

Climate change is complex and relevant to almost every sector. The Royal Government of Cambodia (RGC) places great importance on tackling CC at both national and global levels, with MoE serving as national lead agency in charge of the task, and the GDPS's DCC playing a facilitation role. To perform this role, MoE has established a CC Technical Working Group (as can be seen on the MoE's website[15]). Other Ministries / agencies also participate in carrying out various relevant functions

In terms of documentation, Cambodia's submissions to the UNFCCC secretariat include its responses to domestic impacts of CC and contribution to global CC mitigation. The first type of submission is the National Communication (for

[15] https://ncsd.moe.gov.kh/ncsd/ncsd-organizational-chart

which three submissions have been made to date in 2002, 2015 and 2022), detailing the country status, Cambodia's greenhouse gas (GHG) inventory and mitigation actions, vulnerabilities and adaptation assessments and methodologies, climate projections, and other data and information on Cambodia's efforts to ensure it addresses CC effectively. Cambodia also commits itself to reducing GHG emissions through its Nationally Determined Contributions (NDC) but with a more detailed elaboration on how the country plans to reduce its GHG emission and also the country's needs, both technically and financially, in addressing CC. Cambodia also submitted to the UNFCCC secretariat a long term strategy for carbon-neutrality and a biennial update report along with its National Adaptation Plan of Action and has received funding to support a number of adaptation projects since 2006.

1.3 Parliaments and Climate Change

The Parliaments are the legislative body overseeing the roles played by the executive branch in delivering its services to the people. Both houses work to propose and pass legal proposals into laws to ensure prosperity of the people and the country as a whole. CC is as much important as a global issue, as a domestic one. It is therefore, the MPs plays an important role to monitor the compliance with international instruments on CC domestically, such as the Paris agreement on CC or the Law on Protected Areas, which not only serve the interests of Cambodians but also help mitigate global CC.

In some countries, parliaments have been actively involved in addressing CC, through holding public forums to seek people participation in tackling CC. In other cases, governments are summoned to address CC before the parliament, and called to pay attention to compliance with international agreements, for example the German parliament, Singapore, or Malaysia. For the case of the Cambodian parliament, the Minister of Environment was also invited to provide justification before the endorsement of the Paris Agreement on Climate Change in 2016.

Every time parliamentary commission members visit their constituency; they listen to challenges facing the people and share their recommendations to address them. This is also the case for Cambodian members of parliament. Mainstreaming CC adaptation and mitigation through MPs can be effective because the Cambodian people trust information from their leadership, those with knowledge and the elders. MPs also have the opportunity to comment on local development, in particular with the village and commune authorities, because when MPs go on field visit, they meet and share with local leaders, formally and informally. Recommendations made by MPs could be entry points for development plans for commune, district and provincial level, in particular development activities related to climate issues, because the local government official may have limited knowledge in these regards.

Local development would be more sustainable once CC is taken into account in all development plans. In fact, some developments may affect the environment, but that does not

mean development shall not take place rather it could proceed as long as conservation principles are adhered to in the development process. In this sense, a defined scale of forest cover will have to be maintained to ensure environmental integrity while options to mitigate GHG emissions are being looked into. For example, the construction of the Kamchay hydro-dam in Kampot province, resulted in some forest loss but in exchange clean energy is generated. If the same extent of forest is kept the volume of carbon dioxide sequestered would be insignificant compared to its emission to generate the same amount of electricity from coal burning.

Therefore, the roles of MPs and senators are critically important to address climate change. These roles include being well informed about the trend of changing climate, endorsing national and international regulation/law, mainstreaming the climate change measures to local communities, and incentivizing local investment on sustainable development.

1.4 Brief History of Climate Change

Global climate change could have begun with the birth of the steam engine in 1712, developed by Thomas Newcomen in England. In 1824, physicist Joseph Fourier showed that the earth's temperature rises as light enters the earth and bounces back and forth in a multi-layered atmosphere (later called the "greenhouse effect"). In 1896, Svante Arrhenius claimed that the coal industry would expand the greenhouse effect and that people would benefit from burning coal. In 1938, Guy Callendar reported rising temperatures compared to previous centuries and also showed an increase in carbon dioxide

concentrations. But Callendar's discovery was denied. In 1958, Charles David measured carbon dioxide levels in Mauna, Loas, and Antarctica, and presented indisputable evidence that GHG concentrations were rising. In 1972, the first international environmental conference was held in Stockholm, but CC was not on the agenda, and only some hazardous substances, such as radioactive substances from atomic bombs, were mentioned. In 1975, American scientists wrote the term "global warming" for the first time in the public domain.

In 1987, the Montreal Protocol banned ozone-depleting substances, and in 1998 the Intergovernmental Panel on Climate Change (IPCC) was formed. In 1990, the Panel published its first assessment and claimed that the global average temperature rose by 0.3 to 0.6 degrees Celsius from the previous century. In 1992, at the Earth Summit in Rio de Janeiro, the participating governments agreed to establish the United Nations Framework Convention on Climate Change (UNFCCC), which was signed by 158 countries. The Convention entered into force in 1994, and in 1995 the first Conference of the Parties (CoP) was held in Berlin, focusing on an international legal framework and requiring signatories to implement the Convention. The CoP is held annually with the participation of key heads of government in different cities. Member states agreed in CoP3 on the 1997 Kyoto Protocol, which requires developed countries to reduce their GHG emissions by 5 percent between 2008 and 2012. Another major event, CoP21 in 2015, took place in Paris, where 195 countries signed the Paris accord on CC.

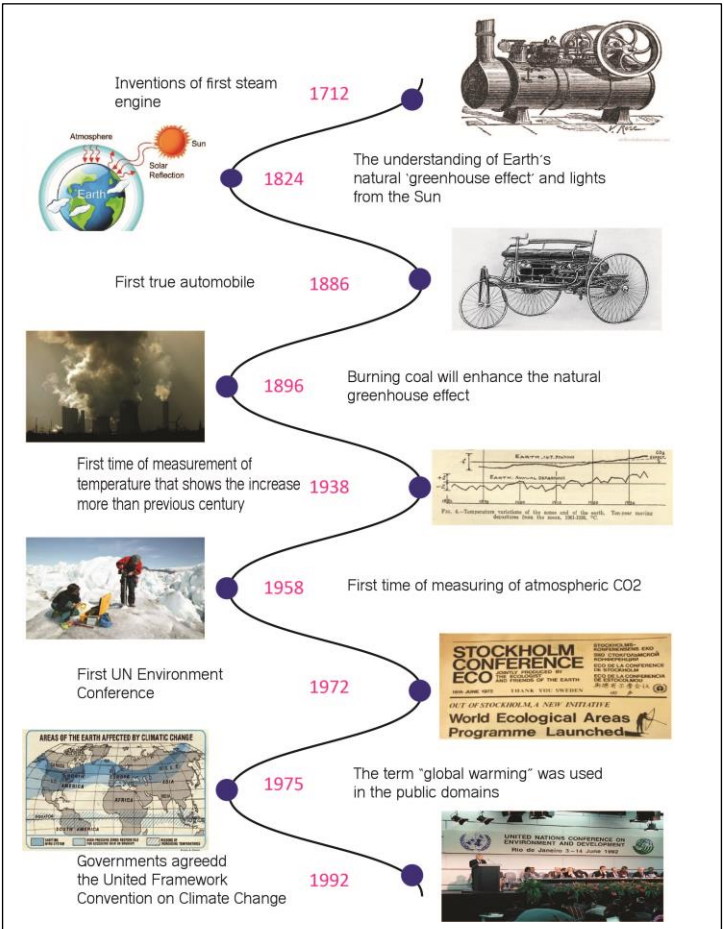


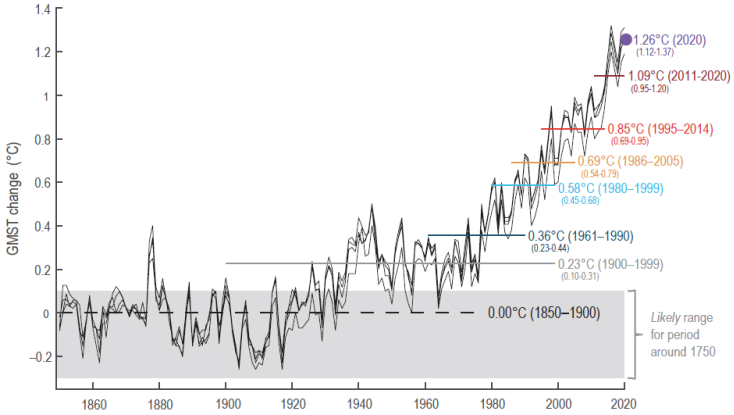
Figure 1.1 Brief history of climate change

CHAPTER 2. THE BASICS OF CLIMATE CHANGE SCIENCE

2.1 GLOBAL WARMING

Global warming is an increase in the average temperature of the air and sea near the Earth's surface from the middle of the 20th century to the present. Scientists calculated global warming by taking the previous temperature before the Industrial Revolution (1850-1900) relative to the global surface temperature from that time to the present. For example, between 2011 and 2020, global temperatures rose by 1 degree Celsius compared to 1850-1900 (Figure 2.1), i.e., it increases every decade. If the surface temperature rises by 1.59 degrees Celsius, the sea level would rise by 0.88 degrees Celsius.

Figure 2.1 Global temperature change data report (compared to 1850-1900)



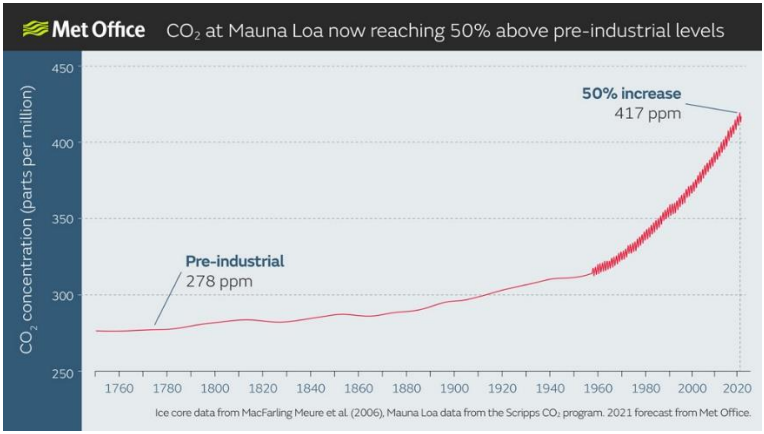
Source: Climate Change 2021 – The Physical Science Basis

In Figure 2.1, four different data sets are presented. The shaded grey areas indicate the maximum and minimum temperatures in the 1750s, while the dashed line is the benchmark, or zero line, for comparing temperatures after the Industrial Revolution. Every line above the zero line indicates an increase in temperature every decade. By 2022, global temperatures will have risen to 1.26 degrees Celsius.

This increase in global temperature is closely related to the increase in the amount of carbon dioxide in the atmosphere. The IPCC's fifth assessment report shows that the concentration of GHGs in the atmosphere increased to 410 parts per million for carbon dioxide (meaning 410 molecules of carbon per million air molecules), 1866 parts per million of methane, and 332 parts per million of nitrous oxide. Figure 2.2 shows evidence of the amount of carbon dioxide in

Mauna Loa, Hawaii, USA (the station monitoring carbon monoxide concentration) increased by about 50% compared to the amount of carbon dioxide before the Industrial Revolution.

Figure 2.2 GHG concentration trend in Mauna Loa, 1760 - 2020



Source : https://www.carbonbrief.org/met-office-atmospheric-co2-now-hitting-50-higher-than-pre-industrial-levels/

2.2 GREENHOUSE GASES

Greenhouse gases are gases that can absorb and emit long wavelength ultraviolet radiation in the atmosphere. Major GHG include carbon dioxide, methane, nitrous oxide and ozone. They can stabilize the Earth's surface temperature, i.e., without them, the Earth's temperature would be about 33 degrees Celsius colder than it is now.

Rise in GHG can be attributable to two sources, natural and human made. Naturally released GHG can be sourced from respiration or photosynthesis of plants, in small quantities, decaying plants, and from the sea. Naturally occurring GHG include water vapor, carbon dioxide, methane, and nitrous

oxide. Volcanic eruptions also emit carbon dioxide and other gases.

The second source is from human activities. Since the Industrial Revolution, the concentrations of carbon, methane, and nitrous oxide from human activity have risen rapidly. Burning of fossil fuels, land use changes, agricultural expansion and population growth are the main reasons for the increases. GHGs emitted from fossil fuels add about 65 percent carbon dioxide in the atmosphere. About 35 percent of GHG emissions come from deforestation, change in status of grasslands and dense evergreen forests, and the transformation of forest ecosystems into agricultural production areas. Loss or change in land use causes the release of carbon dioxide from plant biomass into the atmosphere through decomposition in the nature and in combustion. Natural ecosystems can store or absorb 20 to 100 times more carbon dioxide per acre (e.g. per hectare) than agricultural areas.

Rice farming emits about 20 percent of methane gas from the nature and from human activities. When the floodwaters inundate the rice under anaerobic conditions, the bacteria release methane gas. Accurate estimates of the amount of methane emitted from rice are less precise. Rice in India and China accounts for more than 60 percent of the world's rice production, but scientific data is hard to come by. Many scientists believe that rice contributes the most methane emissions because crop production has doubled since the 1950s. Excessive methane emissions from rice crops are difficult to address, as the area under cultivation has to be expanded because rice production is to meet the growing demand of the people.

Methane is released from landfills when organic wastes are decomposed under anaerobic conditions. Methane emissions depend on a number of factors, such as waste type, residual moisture level, landfill preparation and management. Reduce methane emissions from some landfill is achieved by burning them to generate electricity. Currently, the average concentration of nitrous oxide is increasing by 0.2 to 0.3 percent per year. Nitrous oxide is derived from the fertilization in ecosystem interactions, nitrogen fertilizer and manure. Nitrous oxide can also come from changes in land use, fossil fuels and biomass combustion. Most of the nitrous dioxide added to the atmosphere comes from deforestation, shifting of Savana and grassland ecosystems to agricultural land. The use of nitrate and ammonium to enhance plant growth is also another major source of nitrous oxide. Some analysts estimate that fertilizer use contributes about 50 percent of the world's annual nitrogen dioxide emissions.

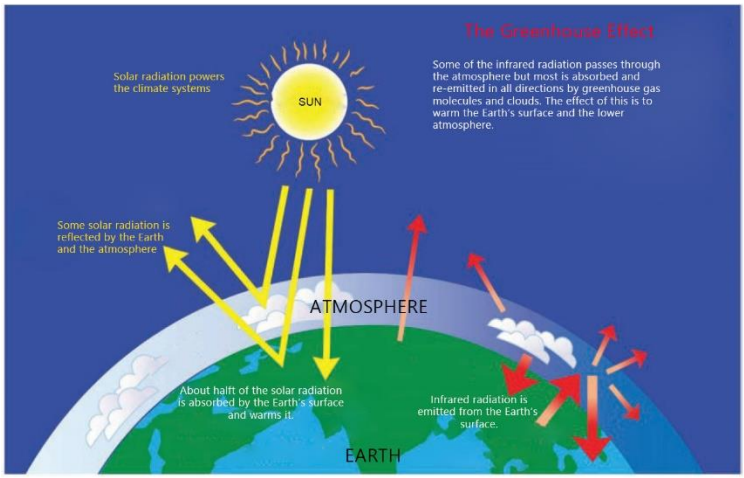
2.3 GREENHOUSE EFFECT

The term "greenhouse gases" is used in CC, as atmospheric gases are comparable to a glass house covering the earth. During the day the earth receives heat from the sun, and at night some of the heat remains on the earth's surface due to the GHGs in the atmosphere, the so-called "greenhouse effect".

Greenhouse effect is the process by which the sun's rays reach the earth's surface, are absorbed by GHGs, and reflect back into space in the form of infrared-long-wavelength rays. These gases absorb part of the infrared radiation emitted from the earth and emit heat, causing the atmosphere to warm up

and eventually the earth's surface to receive this heat and the earth's temperature to rise. The sun shines on the earth, generating energy, and about 40 percent of the energy is reflected back into the atmosphere in the form of long-wavelengths (this calculation is based on the amount of light shining on the earth in square meters). About 75% of that energy is absorbed and reflected by water vapor, methane, carbon dioxide and other GHGs. As the long-wavelength radiations are in contact with gaseous molecules, they radiate in all directions, back and forth. At the end, the reciprocating mechanism of long-wave radiation produces about 50 percent of the energy returned to the Earth's surface in a near-Earth atmosphere for global warming.

Figure 2.3 Global warming from the interactions between solar radiation and GHGs



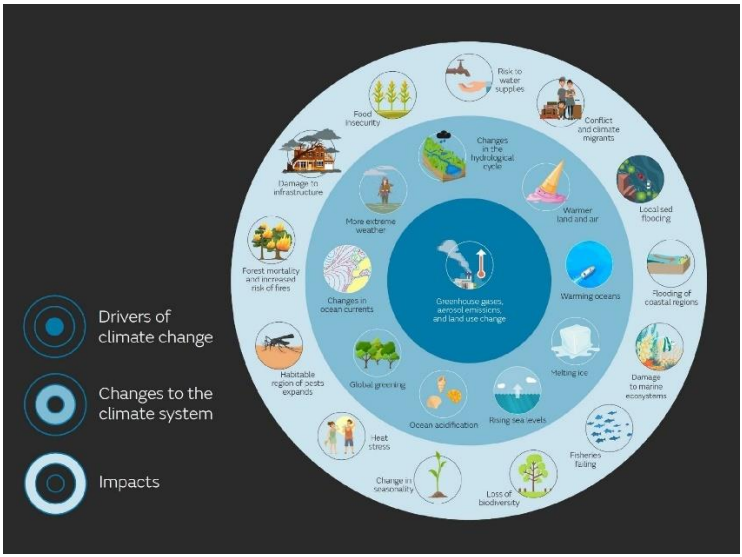
Source: Climate change education material for high school

2.4 Impacts of Global Warming

Warming is expected to increase further in the Arctic, causing melting glaciers, ice sheets and sea ice. Global warming varies between regions around the world, although the variability of those regions is uncertain. Global warming causes three consequences: changes in local rainfall patterns, rising sea levels and increase in average temperatures. These factors affect water resources, agricultural production, human health, coastal areas, forests and ecosystems.

Water Resources: Global warming will lead to changes in the water cycle. Precipitation will increase in some areas but decrease in others. This will lead to frequent fluctuations and severity of floods and droughts. Seasonal variations can affect groundwater distribution as well as surface water. Water quality can also vary with the amount and timing of rainfall. Variations in water temperature can affect the survival rate, richness and productivity of freshwater ecosystems. Rising sea levels will affect freshwater supplies in coastal areas due to seawater intrusion. Declining freshwater will put more pressure on the population, agriculture and the environment. The most vulnerable areas are arid, semi-arid, low-lying coastal areas, deltas and islets.

Figure 2.4 Impacts of climate change on the nature and people



Source:www.metoffice.gov.uk/weather/climate-change/effects-of-climate-change

In Cambodia, the provinces most vulnerable to floods are around the Tonle Sap and the Mekong. Kandal, Kampong Thom, Battambang and Kratie provinces are most affected by floods. The provinces most affected by drought are Kampong Speu, Takeo and Battambang. Other provinces not mentioned here are affected by floods and droughts too, to a lesser extent and intensity, such as Banteay Meanchey, Prey Veng or Kampong Cham.

In addition to floods, climate change impacts on the water cycle may also contribute to riverbank erosion, together with human activities. This requires more study to assess to what extent climate change is a contributing factor, compared to human activity. According to a study, riverbank erosions in Cambodia are 150 hectares per year between 1990 and 2020.

Areas prone to erosions are in Peam Koh Sna, Kampong Reap, Koh Sotin and Russey Srok of Kampong Cham province. Every year, some families living along the Mekong have to move their houses, some lose their farmland, and significant physical infrastructure are also lost due to the riverbank erosions.

Agricultural production: High temperatures and changes in rainfall patterns will affect crop yields and productivities. Crop yields may decline due to drought occurrence, especially when there is insufficient supplementary irrigation. Also, the increase in rainfall (increasing runoff) causes soil erosion and loss of nutrients due to loss top soils, as well as crop damage due to increased erratic weather. Rising sea levels will also lead to the loss of arable land in low lying coastal areas. The most vulnerable groups are the landless, the poor and those in remote areas of developing nations. These countries usually have weak infrastructure, limited access to technology and information, and some are in armed conflict. These factors make it even more difficult for people to deal with the agricultural consequences of CC.

Human health: The direct effects of CC on human health include increased heat stress, increased cardiovascular disease, respiratory system allergies and airborne infections. Increased frequency and / or intensity of erratic weather events can result in loss of life, injuries, trauma, and damage to public health infrastructure. Tropical diseases such as malaria and dengue are also likely to increase due to increased habitats for mosquitoes and vector-borne diseases such as insects as temperatures rise. Food and waterborne infections will also increase due to warmer temperatures, reduced water supply, and the multiplication of

microorganisms. The poor will be more vulnerable to health effects than the rich. But rich countries will also be more vulnerable, especially as the population ages.

Coastal areas: Observations show that the global average sea level increased by 10 to 25 cm in the last century, which is generally due to the increase in global average air temperature of about 0.3-0, 6 degrees Celsius since 1860. The IPCC 2021 report shows that global sea levels rose between 15 and 25 centimeters between 1901 and 2018. In the case of the strongest GHG emissions, scientists predict that sea levels will rise by at least 2 meters by 2100. Sea levels rise due to the expansion of seawater as it warms up and the inflow of fresh water from melting glaciers and ice sheets. Low altitude coastal areas and islets are most vulnerable to sea level rise. It is projected that if the sea level rises by one meter, it will inundate 6 percent of the Netherlands, 17.5 percent of Bangladesh and more than 50 percent of archipelagos.

In Cambodia, all coastal provinces face risks, especially saline intrusion into freshwater or farmland. According to the MoE's report on "State of the Environment, CC and the Third Coastal Socio-Economic Report", at least 14,575 hectares of coastal lowlands in the four provinces will be affected from rising sea levels. Another study by the MoE also shows that most salt fields will lose productivity due to rising sea levels, especially in Kep and Kampot.

Forests and ecosystems: Forests play an important role in the climate systems. Forests are the main source of carbon sink. Forests have been directly affected by climate at the local, regional and continental levels, which can be adversely affected by surface temperatures, evapotranspiration, heat reflection, cloud formation and precipitation. The adaptation

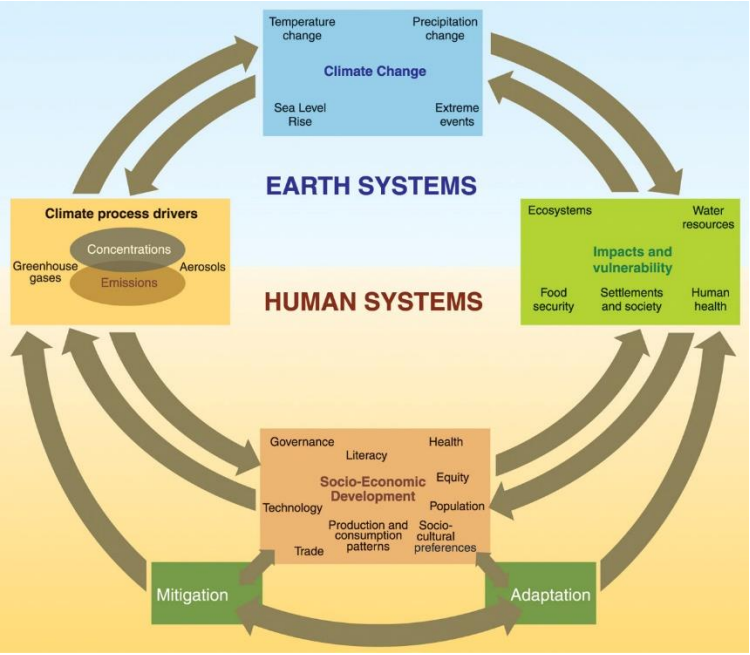
composition and geographical distribution of the ecosystem will change as individual species and plants react to new climatic conditions. At the same time, the habitat will be degraded and fragmented by CC, deforestation and other environmental stresses. Extinction is likely to occur in some species of plants and animals that cannot withstand the impact of CC.

CHAPTER 3. REDUCING GREENHOUSE GAS EMISSIONS

3.1 Climate Change Response Overview

Reducing GHG emissions is part of tackling CC (Figure 3.1). Reduction refers to measures to prevent or reduce the release of GHGs into the atmosphere or to reduce the concentration of GHGs in the atmosphere. Reduction can take the form of new technologies, using renewable energy, recycling old appliances to consume less energy, changing management practices or product behaviors, reducing fossil fuel consumption, reforestation or forest protection. The following sections will cover some activities related to reducing GHG emissions, especially in the Cambodian context, starting with an understanding of how to measure GHG emissions.

Figure 3.1 Relationship between CC and socio-economic development



Source: IPCC 2001

3.2 GREENHOUSE GAS INVENTORY

In 2001, Cambodia completed its GHG inventory in five sectors: energy, industrial processing, agriculture, waste, and forest and land use change. In 2019, Cambodia updated this inventory by combining the agricultural sector with the land use change, and the industrial sector with Industrial Processes and Product Uses (IPPU). The greenhouse gases recorded by Cambodia in the national inventory include carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O) and hydro-chlorofluorocarbons (HCFCs), while other greenhouse gases are not yet available for the estimation.

Table 3.1 Major GHGs contributing to global warming

Gas	Lifespan in the atmosphere	Warming potential	Major source
Carbon dioxide (CO_2)	Indefinite	1	Fuel and forest
Methane (CH_4)	12 years	28	Waste and agriculture
Nitrous oxide (N_2O)	109 years	273	Agriculture
Chlorofluorocarbons (CFCs)	From 3 weeks to thousands of years	From 675 to 4470	Industry

Overall, the GHG inventory report records the amount of GHG in carbon dioxide equivalent, meaning that once a gas volume is obtained, it is converted to carbon equivalent value based on the potential rate of global warming, as shown in Table 3.1.

Through past GHG inventories in 2001 and 2019, based on 1994 and 2016 data, Cambodia emits significantly more GHGs from the forest and land use sectors from 2010 onwards, while other sectors seem to remain the same. Forest and land use change account for about 80 percent of total GHG emissions.

It should be noted that the world's most GHG emitting countries are China, the United States, the European Union, India, Russia, Brazil, South Africa and the United

Kingdom[16]. Cambodia emits less GHGs, about 0.02% of global emissions.

When talking of reducing GHG emissions, there are two cases, the first and most widely used is the reduction of emissions per unit of gross domestic product - GDP (GDP-based emission) and the second is to reduce emissions per unit of consumption (per capita consumption - based emissions) meaning what one person consumes per year and the amount of GHG emissions is calculated accordingly. In the first case, China, the world's largest producer of goods, has to reduce its emissions proportionate to the volume of its GDP. At the same time, the benefits go to consumers in developed countries, because developed countries consume the most products, especially those from developing countries that produced the goods. This is why some argue it is more equitable to consider GHG emissions through consumption.

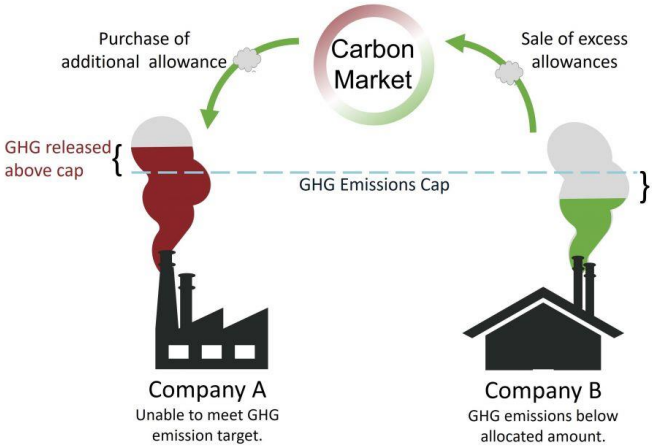
3.3 National Greenhouse Gas Reduction Strategy

Reducing GHG emissions takes many forms between different international agreements. Under the 1992 UNFCCC, countries have no clear mechanism for reducing emissions of GHGs, and there are no legal standards: each country only reports on GHG emissions and others measured reductions, especially in developed countries. In the 1997 Kyoto Protocol to reduce GHGs, three mechanisms were introduced: 1) Carbon Trading, 2) Clean Development Mechanism, and 3) Joint Implementation.

[16] https://www.worldometers.info/co2-emissions/co2-emissions-by-country/

Carbon trading: According to Article 17 of the Kyoto Protocol, emissions take place among developed countries that are committed to reducing GHG emissions, as set out in Annex B of the protocol. Under this mechanism, the government restricts the emissions from companies operating in the country, or in other words, each company has the right to emit GHGs by state regulations. In case the company releases less than the quota, the company can sell the remaining amount to other companies to release more. Emissions quota are getting less from year to year, so that the country will emit GHGs in accordance with the commitments made with the UNFCCC in due course. The selling price of carbon depends entirely on the market. This mechanism encourages companies to innovate to ensure that their operations are more efficient, that is, to reduce GHG emissions. At the same time, it also facilitates the transfer of companies from developed countries to countries that do not have good emissions controls or countries that are not under contract to reduce GHG emissions with the UNFCCC.

Figure 3.2 Carbon market mechanism, emission trading



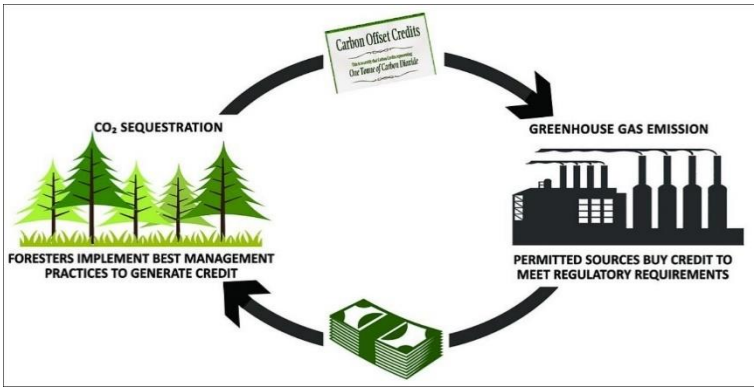
Source : https://www.siecap.com.au/carbon-services/

The emissions trading mechanism is similar to the "Polluter Pays Principle", which was established in the 1992 Rio Declaration to address pollution. In principle, those who emit GHGs are required to pay taxes on the amount of pollution or to purchase a license that limits the amount of pollution so that the company or institution can operate. This principle is not widely used, but it is the basis used in this gas emission trade mechanism.

Clean Development Mechanism (CDM): According to Article 12 of the Kyoto Protocol, companies in developed countries can partner with developing countries to help offset their emissions through the CDM. Under this mechanism, developed countries will purchase carbon credits through Certified Emission Reduction (CER) from developing

countries. The advantage of this mechanism is that developed countries have more options to reduce their emissions as required by the government by bringing in new technologies or buying carbon credits from developing countries through sustainable projects. In Cambodia, there are at least five CDM projects implemented in the past, such as the T.T.Y Cambodia Biogas Project, which reduced emissions by 50,036 tons of carbon dioxide equivalent per year between 2008 and 2015, or the Stung Tatai hydropower project, which Reduced emissions by 266,472 tons, equivalent to CO2 per year, between 2013 and 2020. It should be noted that there are seven hydropower dams operating in Cambodia including Kirirum 1, Kirirum 3, Kamchay Stung Atai, Stung Tatai, Rusey Chrum Krom, and Sesan Krom 2 with the capacity of 1,331.70 Megawatt in 2021. Only Tatai hydropower dam was under the CDM mechanism.

Figure 3.3 Carbon market mechanism, clean development mechanism



Source : www.coldhollowtocanada.org/what/news/article/carbon-sequestration-for-climate-mitigation

Joint Implementation: Article 6 of the Kyoto Protocol allows developed countries to formulate GHG reduction plans to offset excess emissions. For example, a Canadian company emits more than the quota, it could set up a project in Australia (possibly under the assumption that Canada has better technology transfer to help reduce greenhouse gas emissions in Australia). Reduced GHGs transferred to Canada are called reduced emissions.

Joint Crediting Mechanism: After the 1997 Kyoto Protocol and the implementation of the carbon market mechanism, new mechanisms have been put in place to participate in GHG reduction activities. At least one of the most widely implemented new mechanisms is the Joint Crediting Mechanism. In this mechanism, Cambodia actively participated in the signing of a bilateral agreement with Japan

between the MoE and the Embassy of Japan in 2014 on a low-carbon development partnership. Japan, for example, has developed a joint crediting mechanism for a -1megawatt solar power system and a high-efficiency centrifugal chiller. The project will run for 15 years at a Japanese supermarket in Sen Sok district and could reduce emissions by 663 tons of carbon dioxide equivalent per year from 2019 to .2030

3.4 Sectoral Greenhouse Gas Emission Reduction Plan

Energy Sector: The Ministry of Mines and Energy (MME) has taken active steps to reduce the emissions. In the process of reducing GHG in the energy sector, MME has identified the following key activities: increasing the use of renewable energy, increasing energy efficiency, transfer of environmentally friendly technologies, and connecting rural electricity services to the national grid, and raise consumer awareness of energy saving and the garment sector. The MoE vowed with the UNFCCC during a CoP26 meeting in Glasgow that Cambodia would not build new coal-fired power plants in addition to the approved projects.

Industry: The industrial sector in Cambodia is steadily advancing and is also a priority sector of the RGC. Nowadays, the industry is mostly textiles, especially garments. The reduction in this sector is largely related to the use of electricity, meaning that the government is trying to encourage entrepreneurs to promote Cambodia's green industry by emitting less carbon dioxide, using renewable energy and diversifying energy, including storing renewable energy for production processes.

Waste sector: The amount of GHG emissions from waste is the smallest compared to other sectors, about 2.1% in Cambodia in 2016. In general, waste in Cambodia originates from urban areas, especially cities such as Phnom Penh or Battambang. Most of the waste is organic that emits carbon dioxide and methane due to their decomposition. To manage and reduce waste, the Ministry has promoted the National Strategy on 3R: Reduce, Reuse and Recycle. Rural waste, especially manure, is a source of methane, so the relevant ministries, especially the Ministry of Agriculture, Forestry and Fisheries (MAFF), have expanded their biodigester activities by turning the manure into energy for cooking.

Agriculture: In Cambodia, agriculture is one of the major emitters of GHG after forestry and land use and energy. The main source of emissions in this field is the use of fertilizers, especially fertilizers containing nitrous oxide or called nitrogen fertilizer. To reduce GHG emissions in the agricultural sector, MAFF has taken a number of activities related to soil conservation with agricultural land management, smart and climate-resilient agriculture with planting cover crops to reduce soil tillage, application of sludge from biodigesters. Fertilizer deep placement method is also an activity being strengthened and expanded with farmers by MAFF.

Forest and land use: The GHG inventories shows that GHG emissions in this sector are the highest, especially since 2010. Forests store and absorb carbon when they are living, but they are also a source of emitting GHG if they are felled. To ensure

that Cambodia can manage and use its forest resources sustainably and secure livelihood of the people while contributing to CC mitigation, MoE together with MAFF, has developed Cambodia's REDD+ Strategy 2017-2026.

REDD stands for Reducing Emission from Deforestation and Forest Degradation and the plus sign indicates the results of the REDD project: conservation of forest carbon reservoir, sustainable forest management and increasing forest carbon stock. Forests related GHG emissions around the world are about 17% per year (80% in Cambodia compared to other sectors), which means that protecting forests is helping to slow down CC. The REDD+ projects are an option for carbon sequestration that is considered to be highly efficient and inexpensive compared to other carbon sequestration measures such as engineering methods.

It should also be noted that a mechanism called REDD was first introduced in 2005 at CoP11. There are still many loopholes in the mechanism, as it was implemented only at the national level, i.e., the budget was provided only those countries that have reduced the rate of deforestation, especially countries in the pre-determined regions. This way, some forest was still happening in the outlying areas because there was no incentive to preserve them under the REDD mechanism. On the other hand, many stakeholders in forestry were not included in this mechanism, especially local people. Having seen the gaps, a new mechanism called REDD+ was launched.

Cambodia is one of the leading countries in implementing REDD+ projects, i.e., Cambodia has gone through four major

stages: developing the REDD+ strategy, documenting the national forest reference level, establishing the REDD+ safeguards and the national forest monitoring system). Having gone through the four stages, Cambodia has sold to Volunteer Market for $ 11.6 million in carbon credits between 2016 and 2019 from the REDD+ in Protected Areas, among other projects[17]. Cambodia has been a member of the UN-REDD and the World Bank FCPF program since 2009. Cambodia's National Forest Reference Document shows that at least 10 million tons of carbon credit per year could be secured. The market price of 1 ton of carbon is still uncertain, but it can be sold for $5 or more.

As Cambodia is not on the UNFCCC Annex I list, the country has no legal obligation to reduce GHG emissions. Although CC is not a separate priority of the Cambodian government, Cambodia has a number of measures and activities to contribute to reducing GHG emissions, as in other countries: Cambodia has established and managed 23 protected areas (PAs) which covers 18% of the country's land area. Cambodia has legal standards for forest management, waste and air pollution, energy efficiency and renewable energy development.

It should be noted that Cambodia has increased the number of PAs from 23 in 1994 to 73 by 2021, with a total area of 7,297,314 hectares, equivalent to 41% of the total area of Cambodia. In its first biennial report to the UNFCCC in 2020, Cambodia committed to increasing the PAs to 60 percent of the total area by .2030Establishment of nature resources in

[17] https://cambodia-redd.org/

Cambodia is not a new activity. Cambodia established six national parks in the 1950s, covering about 12 percent of Cambodia's land area among PAs and wildlife sanctuaries.

3.5 Mitigation Activities by Individuals

Everyone emits greenhouse gases through his/her daily activities, such as using electricity, gas / firewood / charcoal, cooking or heating a home, using a car, a plane, or eating. The above section outlines various ways to reduce global warming, requiring the RGC to provide assistance in enforcing laws and regulations. In addition, individuals play an important role in reducing GHG emissions. Some recommendations include using less energy for home heating and cooling, using less fuel, supporting the use of renewable energy sources, buying local goods to reduce their transportation footprint, turning off the lights when not needed, and some other activities.

CHAPTER 4. VULNERABILITY AND ADAPTATION TO CLIMATE CHANGE

4.1 VULNERABILITY

The Intergovernmental Panel on Climate Change (IPCC) defines "vulnerability" as the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate variability (extreme heat) and CC (extreme heat that has not been experienced in the last 30 years). Vulnerability to something (a space, a species, or an ecosystem) is measured as a function of three factors: a set of hazards (or called exposure), a set of sensitivities, and a set of adaptive capacity, as shown in Figure 4.1.

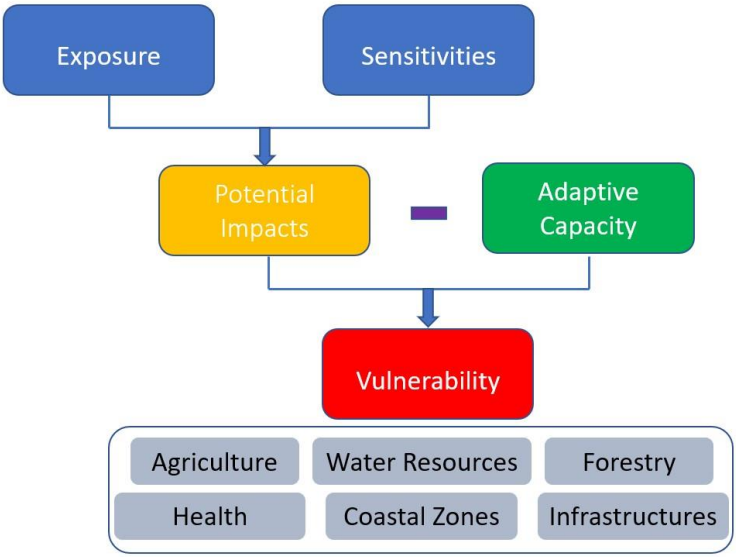
An exposure to a hazard by a person, an ecosystem or an organism refers to the encounter or expectation that the like encounters one or more erratic weather events, including the frequency and intensity of that event. Sensitivity is the degree to which a person, an ecosystem or an organism is affected, both positively and negatively, caused by the weather. Potential impacts can occur directly (for example, changes in rice yields due to change in the means temperature or a range of temperatures between minimum and maximum intervals), indirectly (damage caused by increase in frequency in coastal floods due to rising sea level).

Adaptive capacity can be considered as the capacity of a system, organization or an organism to make an adjustment or modification in response to a changing situation. This change is potentially very damaging to the like if the adaptive capacity is weak. When the system, organization or organism

is highly adaptable, it can seize opportunities from the change. For example, Cambodian farms are often rain fed. With CC, Cambodia will see a change in rainfall, i.e., less monthly rainfall would occur in the dry season. To adapt to the change, Cambodia needs to build reservoirs to store water for use in the dry season. Farmers will be able to capitalize on the built infrastructure for farming in the rainy season, i.e., they could use the stored water to irrigate their field where there is water shortage in the early rainy season.

The defined vulnerability may deviate from the IPCC definition but its principle remains the same. In Cambodia, vulnerability is defined as something that is harmful or affects an individual, a group or a province in their respective livelihood or access. According to the RGC's policies and priorities and the country's circumstances, vulnerability can be assessed taking into account a number of factors including poverty, child malnutrition, educational needs and vulnerability to natural disasters. However, the Cambodia National Social Protection Strategy (NSPS) defines vulnerable populations as (1) people living below the poverty line; (2) people who are unable to cope with or are at high risk (people living below or near the poverty line are more likely to be vulnerable; and (3) infants and children, women and girls of reproductive age, food insecure households, indigenous peoples, the elderly with chronic diseases, people living with / carrying HIV and people with disabilities.

Figure 4.1 Climate change vulnerability assessment framework



The sectors at risk of CC described in the 2001 Cambodia Climate Change Vulnerability and Adaptation Assessment are: water resources, agriculture and food security, wetlands and freshwater ecosystems, coastal and marine ecosystems, housing, energy and industry, insurance and other financial services, and human health.

Past assessments of Cambodia's vulnerability to climate change identified four main types of hazards: floods, droughts, wind storm and seawater intrusion. Cambodia is agrarian based economy, with limited human and financial resources, and infrastructure and adequate access to technology remain lacking. In addition, the risks posed by the hazards could reduce its gross domestic product (GDP)

growth. In terms of GDP impacts, it is around 0.4 percent in 2020, 2.5 percent in 2030 and can potentially reach 9.8 percent in 2050. In case of damage, the country prospect to become a middle-income country could be delayed. As this is being felt, Cambodia has developed a national adaptation plan building on the national program of actions for adaptation to climate change.

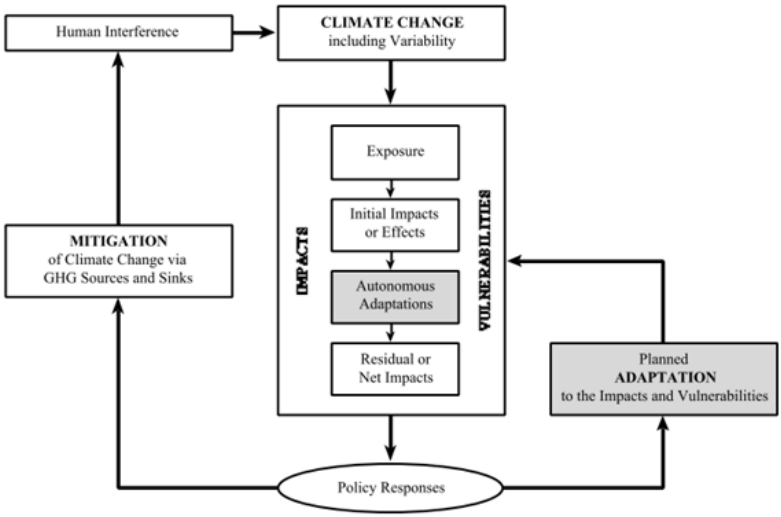
4.2 National Adaptation Strategy

Adaptation is considered an important strategic response option to CC impacts. Even if reducing GHG emissions to the defined level is attainable, scientists predict that global temperatures will continue to rise. Thus, severe weather events are likely to occur and sea level rise will continue. Therefore, a proactive adaptation strategy will have to be developed to address the risks along with GHG mitigation measures. For Cambodia, CC adaptation is a priority. Article 4.1 of the UNFCCC requires the contracting parties to cooperate and implement "coordinated measures to ensure appropriate and adequate adaptation to CC." The Kyoto Protocol (Article 10) also requires member states to promote and facilitate adaptation and dissemination of adaptation technologies to address CC.

Prior to developing a national adaptation strategy, a general vulnerability study and assessment has to be made and led by the MoE. With the findings, a national adaptation strategic plan (as shown in Figure 4.2) may be developed. With this assessment, we should know who, what ecosystems, what organisms, and what places are at risk to what climate variability, and how much funding is needed to take

appropriate adaptation measures. For example, the 2006 National Program of Action for Adaptation to Climate Change identified 39 projects worth about 196 million US dollars.

Figure 4.2 Climate change response policy development cycle



Source: IPCC 2001

Adaptation can be reactive and proactive. The differences between the two are not only related to motivating factors, whether past or future weather effects, they also relate to social responses. Proactive adaptation aims to reduce future risks. For example, avoiding development in flood-prone areas. Reactive strategies are intended only to mitigate the impacts occurred, for example, providing emergency assistance to flood victims. Sometimes an autonomous response can exacerbate climate risks, for example, helping to repair and build homes in flood-affected areas is

"maladaptation" because climate factors are not incorporated in the repair project. Lessons show that proactive adaptation requires large initial investment, but effectively reduces risks and costs in the future.

4.3 Sector Adaptation Plan

Sector adaptation measures build on sectoral vulnerability studies. For example, in agriculture, rainfall will decrease and evaporation will intensify, which means expansion of irrigation scheme is required (as detailed in Table 4.1). In coastal areas, rising sea levels or storm surges also mean that we need to develop coastal protection, such as replanting mangrove or building sea dike. The activities referred to in Table 4.1 are taken from various documents, in particular the MoE's documents and other international journal articles.

Typically, a country's CC strategic plan outlines key actions by sector. Multidisciplinary measures may include the development of systematic monitoring and communication systems, scientific research and development, and technological innovations, such as the development of drought resistant crops or new technologies against seawater intrusion, education and training to help build stakeholder capacity (as outlined in the National Strategic Development Plan 1 through 4), campaign to raise public awareness to raise public and stakeholder awareness on CC and adaptation, strengthening or changing in the fiscal sectors, such as new insurance options and disaster risk management as outlined in the Climate Change Strategic Plan for Disaster Management.

Table 4.1 Private sector and proactive adaptation options

Vulnerable sector	Private adaptation	Proactive adaptation
Water resource	• Protect groundwater resources • Enhance the management and maintenance of existing water supply systems. • Protect catchment area • Enhance water supply • Increase rainfall harvesting	• Use treated water • Conservation of catchment areas • Development of water management system • Reform water policy, including pricing and irrigation policies. • Strengthen and develop flood management and drought monitoring
Agriculture and food security	• Erosion control • Build reservoir for irrigation • Change in fertilizer use and application • Use of new crops	• Development of resistant crops (to drought, salinity and insects / pests) • Research and development

Vulnerable sector	Private adaptation	Proactive adaptation
	• Soil fertility maintenance • Change planting and harvesting calendar • Switch to alternative crops • Develop education and outreach programs on soil and water conservation and management.	• Manage land and water resources • Polyculture and intensification of food and commodity crops • Incentive policy measures and subsidies to access free market • Develop an early warning system
Health	• Reform public health management • Improve housing and living conditions • Improving emergency responses	• Improve early warning system • Increase surveillance and control of diseases / pathogens • Improve environment quality • Change city and housing management

Vulnerable sector	Private adaptation	Proactive adaptation
Terrestrial ecosystem	• Improve management systems such as deforestation management, afforestation and reforestation. • Promote agro-forestry to capture forest goods and services • Develop / improve national forest fire control plans • Improve forest carbon reservoirs	• Develop parks / reserves, protected areas and biodiversity corridors • Identification / development of climate resilient species • Better assessment of system vulnerabilities • Biodiversity monitoring • Development and maintenance of seed bank • Incorporate socio-economic factors into management policy
Coastal and marine ecosystem	• Protect economic infrastructure • Increase public awareness to	• Participatory coastal zone management

Vulnerable sector	Private adaptation	Proactive adaptation
	promote protection of coastal and marine ecosystems • Build sea dikes and stabilize beaches • Protect and conserve corals, mangroves, seagrass and coastal vegetation	• Planning and zoning of coastal areas • Develop coastal protection laws • Research and monitor beaches and coastal ecosystems

In addition to sectoral adaptation, CC adaptation can also be classified by regional, national and local levels. Adaptation actions at the regional, national and local levels are mostly in the form of communication, cooperation, sharing and advocacy.

- **At the regional level**
  - Cooperation between industrialized and developing countries to rationalize between regional and local priorities. Policies / sciences are also set and public awareness is also raised on issues ranging from CC, mitigation to adaptation.

- Integrate regional institutions for regional adaptation, including research and financing policy coordination.
- Eliminate international trade barriers. Sustainability and adaptation capacity will be strengthened through improved market conditions and effort is made to accelerate technology transfer to developing countries.
- Effective regional economic participation. Promote financial benefits and transfer technical and management skills in conjunction with the "learning by doing" process.

➢ **At the national level**

- Develop a CC policy that identifies the country's most vulnerable sectors with an emphasis on poverty reduction.
- Develop comprehensive monitoring and communication systems (e.g., participatory drought monitoring and early warning systems)
- Develop public policy that encourages and supports adaptation at the local or community level and by private sector.
- Move towards a sustainable economic growth that allows for the allocation of resources for the development of adaptive technologies and innovations.

➢ **Sub-National level**

- Establish institutions and social organizations that empower local communities and prevent the loss of opportunities for local communities. The organization requires consideration of the decision-making committee representatives and protects the flexibility of local institutional functions.
- Encourage citizens to seek income sources (reduce the risk of focusing only on a single livelihood option), especially in areas vulnerable to local CC.
- Encourage people to mobilize and create local social security packages, both formal and informal.

➢ **Local Level**

- Identify and prioritize local adaptation measures and provide feedback to higher authorities. The efforts will be reinforced with adequate support of knowledge, technology, policy and finance.
- It is important to note that the National Committee for Sub-National Democratic Development has now developed a paper for mainstreaming climate resilience at the provincial, district and commune levels[18].
- Another important document is the "Safe Village-Commune" policy[19], which has seven main elements, 6 of which relate to environmental protection and disaster reduction.

[18] https://ncsd.moe.gov.kh/resources/document/national-and-sub-national-schemes-mainstreaming-climate
[19] https://www.interior.gov.kh/news/detail/2225

4.4 INDIVIDUAL ADAPTATION ACTIVITIES

Individual adaptation actions are rarely mentioned in national or local policies, and this does not mean that individual or household or private company adaptation actions are unimportant. Adaptation actions by the government are usually not sufficient, so individuals need to understand CC and try to take the following adaptation measures:

- Seek information on CC and vulnerable areas and find ways to adapt to those hazards
- Build homes that are resistant to wind storms, flood, drought or fire
- Participate in restoring, maintaining and expanding irrigation schemes
- Participate in restoring, maintaining and expanding pond, reservoir, lack at the pagoda or within the communities
- Learn new skills to diversify livelihoods
- Seek opportunities to shift from farming in saline field to aquaculture in the same.

CHAPTER 5. ROLES OF PARLIAMENTS IN CLIMATE CHANGE

5.1 Roles of Parliaments in Developed Countries

Both houses of parliament play an important role in drafting, proposing and passing laws to ensure the prosperity of the people and the country as a whole. Each and every MP's basic technical knowledge is indispensable to ensure that all laws are effective, fair and applicable, in this case, knowledge on CC. This section will highlight active involvement by MPs in CC.

In developed countries, especially democratic nations, the parliament plays a very important role in developing, implementing and monitoring CC responses. Representing the people, MPs inform citizens of the national negotiations on international agreements. This will build people's trust and thus their continued support to vote for the MPs. Compliance by government to the international agreements or conventions requires legal support, budget allocation, and parliamentary oversight. Parliament is one of the pillars that makes environmental governance strong and indispensable in promoting democracy in environmental affairs.

In the meetings of the Conference of the Parties (CoP), Parliaments may share their inputs or support for the country's negotiating position. In some cases, the Parliaments conduct studies with findings built into recommendations to further strengthen negotiating position. On the other hand, the government may hold fora with the people in the presence of MPs. Such events present an opportunity for the government to make public its negotiating position for the CoP, for

feedback. MPs may also join the Cambodian delegation in relevant meetings of the CoP, where they would learn the negotiating positions by various governments or may also represent their countries at the event. In the course of CoP meetings, there are also parliamentary meetings, mostly organized by the Inter-Parliamentary Union and the Global Legislators (GLOBE).

Below are the activities of some parliamentarians in developed countries who have been actively involved in CC actions, especially related to the 2015 Paris Agreement.

Germany: The German CC law states that the Parliament has the duty to monitor actions on each emission target in accordance with the national emission budget and also to monitor the annual sectoral emissions of the relevant ministries. The government is required to report its annual climate activity to the Parliament by June 30, detailing each sector and also the progress of the climate action program implementation. If there is an excess in emissions in a given sector in a reported year, the government must take mitigation actions for the sector in question or for another sector and also report to the Parliament. The CC Law requires a CC Expert Council to be established with the responsibility to monitor emission data and to conduct independent evaluations and report to the Parliament and the government. The Parliament may also require the council to submit a report. From 2021, the government is required to present on March 31 to the Parliament every two years a climate and GHG emissions projection report and specific policy to address the issue.

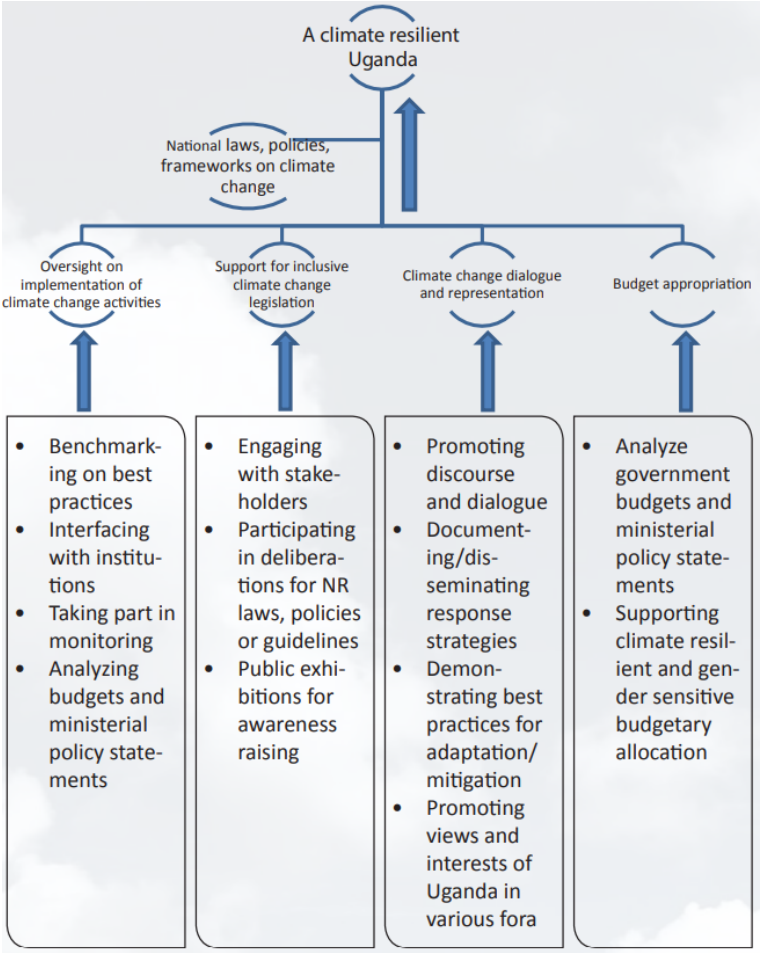
Figure 5.1 The role of parliaments in climate change in developed countries



5.2 The Role of Parliaments in Developing Countries

Climate change impacts are felt in every country in the world, in particular the developing countries. Parliaments in these countries play a critical role in their response to CC, but they often face challenges in addressing the issue. Here below are some of the challenges facing the Parliament of Uganda, a developing country, in their response to CC.

Figure 5.2 Ugandan Parliament's role in Climate Change



Uganda[20] is one of the poorest countries in Central Africa, with about 38 percent of the population living below the poverty line in 2012. The Ugandan Parliament has always

[20] https://pfccparliament.go.ug/wp-content/uploads/2019/04/STRATEGIC-PLAN-2018.pdf

been involved in CC, setting up the Natural Resources Commission. Besides, Uganda established the Parliamentary Forum on Climate Change of Uganda (PFCC-U) in 2008. The PFCC-U considers the role of Parliament as a mechanism to mainstream climate change into national and global development frameworks, including national development plan, sustainable development goals, and Uganda's Nationally Determined Contributions (NDC), and Green Growth Strategy. To ensure that Uganda is resilient to CC, the PFCC-U has developed a four-pillar development framework supported by law and policy (Figure 5.2).

In addition to domestic agenda, the Ugandan Parliament is also active in the international arena. MPs are often involved in studies and sharing CC best practices with other countries, in particular advocacy including their practical activities to advocate with the government on projects or interventions to address CC impacts. The Ugandan Parliament considers the forum a venue linking agencies and where actions and solutions on CC are shared.

5.3 The role of the ASEAN Inter-Parliamentary Assembly for MPs in the ASEAN region

The main role of the parliament, in any country, is to legislate and monitor the government on application of the laws at the national or international level. At the regional level, MPs play an important role in law-making and regional law enforcement. The ASEAN Inter-Parliamentary Assembly (AIPA) is an institution for parliamentarians to understand regional issues, propose solutions in the ASEAN region, and potentially bring the solutions to incorporate into their

domestic laws. At AIPA summits, lawmakers share issues and proposed solutions from their respective country, and often conclude with proposed joint resolutions at the end of the meetings. For example, at the 40th Meeting in Bangkok, AIPA members outlined the ASEAN 2025 Master Plan: Forging Ahead Together, in which key activities for the three ASEAN communities are identified - ASEAN Political Security Community (APSC), the ASEAN Economic Community (AEC) and the ASEAN Socio-Cultural Community (ASCC). CC related actions are a part of the ASCC. Solutions raised by members of the meeting regarding climate change include:

- Raise awareness with the public of climate actions, develop mitigation and adaptation measures and improve CC resilience.
- Encourage countries to strengthen cooperation in addressing the challenges posed by CC and to build mechanisms for inter-parliamentary cooperation for CC responses.
- Encourage MPs to develop incentives and monitor the implementation of GHG mitigation projects in ASEAN countries, namely the implementation of the NDC.
- Recommend for AIPA to act as a platform to explore and expand carbon pricing initiatives.

In addition to AIPA, Cambodia is also a member of the Asia-Pacific Parliamentary Forum (APPF) in which it has been actively involved. In 2018, Cambodia hosted the 27th APPF Forum in Siem Reap. Cambodia proposed, among others, actions to address CC as follows:

- Members of the Forum to work collectively to address environmental issues in the Asia-Pacific region by implementing national policies and mechanisms, i.e., use of parliamentary power for CC mitigation and adaptation.
- Commit to building resilient infrastructure, expanding sustainable and inclusive industrialization, and supporting innovations to address CC vulnerabilities and ensure people well-being, food security, and natural resource conservation.
- Encourage MPs to build stronger capacity to address environmental issues, share information and technology, and provide support to address environmental issues for the marginalized countries, as agreed in the "Partnership for Global Climate Actions in Marrakesh".
- Calls on the Asia-Pacific Parliaments to expedite the drafting of climate laws and regulatory reforms in line with the UNFCCC, the Kyoto Protocol and the Paris Agreement on CC.

5.4 The Role of the Cambodian Parliament in Climate Change

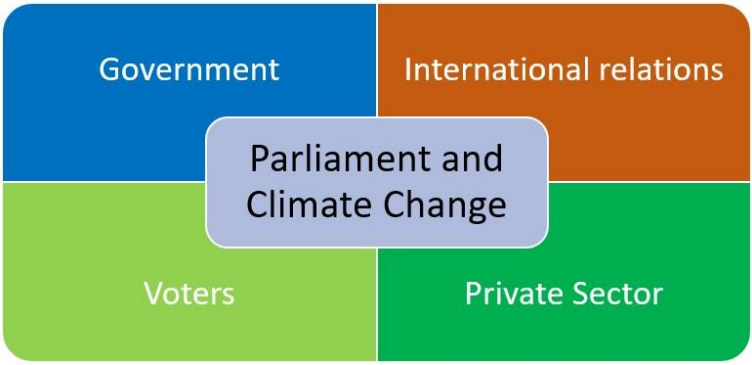


Figure 5.3 Roles of Cambodian Parliaments in CC

Climate Change is one of the priority issues being addressed by the government. All National Strategic Development Plans (NSDPs) from 2006 to the present have included CC adaptation and mitigation. The Cambodian Parliament has played an important rolein the country and internationally to connect with the private sector, NGOs and the people who are voters as presented in Figure 5.3. Cambodian MPs also participate actively in activities with Asian[21] and European[22] Parliaments.

Legislating role in cooperation with the Royal Government

Members of the NA or Senate or the Royal Government may initiate law making or draft laws. For sectoral laws, the relevant Ministry develops a draft that is then submitted to and passed by the Parliaments. In the drafting process, the

[21] https://asianparliament.org/member-parliaments/
[22] https://www.ipu.org/national-parliaments

relevant parliamentary commission plays an important role in reviewing and commenting on the draft laws.

Draft law or Bill

A- Draft law

A host ministry alone or in cooperation with relevant ministries and agencies develop the draft law. Once the draft has been reviewed internally or in inter-ministerial/agency meeting, and with the help of the legal team, is shall be sent to the Office of the Council of Ministers. The Council of Ministers will convene a plenary session to review in one or more meetings and decide. Once approval by the Council of Ministers is secured, the Prime Minister shall forward the draft law to the President of the National Assembly for review and approval.

B- Proposed bill by Law Makers

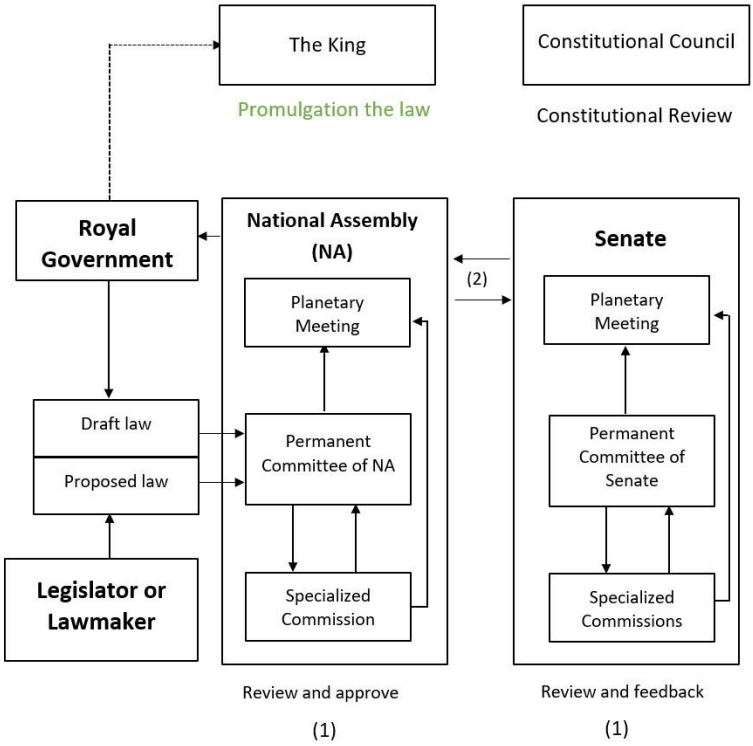
A bill is submitted for a review by a legal team against the legal aspects in force. Upon final decision on the bill, the law maker team or representatives of the PMs and signatories shall forward the proposed bill to the President of the National Assembly for review and approval.

Procedures for reviewing and approving laws in the National Assembly

The President of the National Assembly convenes a meeting of the NA Standing Committee to make a review and decide on sending the draft law or the proposed bill to the specialized committee for review. Once the review is by the specialized committee is made the National Assembly Standing Committee shall hold a meeting to review and approve on including the draft in the agenda of the National Assembly

session. Representatives of the RGC or of the MPs, signatories and the chairpersons of the specialized committees shall collaborate to defend the draft law or the proposed bill (Figure 5.4).

Figure 5.4 Flow chart of review and approval procedures



Note: Process of draft law or proposed law:

(1) Process of each parliamentary

(2) Rotation process between the National Assembly and Senate

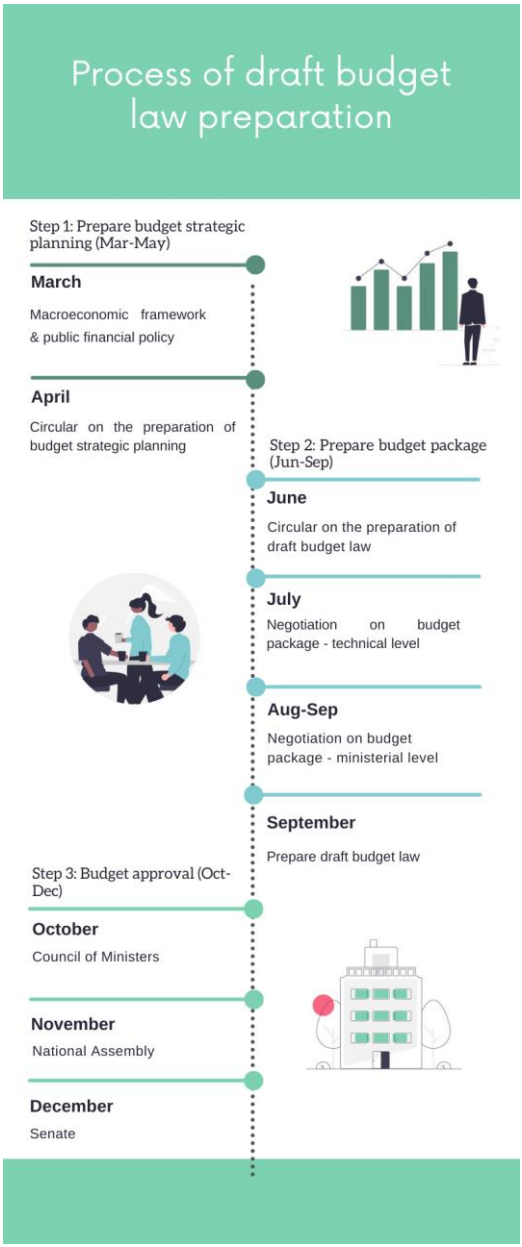
Source: National Assembly of the Kingdom of Cambodia

Referral to the Senate for Review and Comments

The text of the draft law or the proposed bill having been approved by the NA for the first time shall be forwarded to the Senate for review and feedbacks. A draft law or a proposed bill may be referred back and forth between the Senate and the NA to account for the Senate's comments. The referral process between the two houses shall take no longer than one calendar month. This period shall be reduced to ten days only for matter of national budget and finances, and even further to only two days if it is urgent. An approved law or bill will be promulgated.

According to the Law on Public Financial System 2008, the process of approving the National Budget Law takes place annually. Cambodia's fiscal budget calendar is January 1 –

Figure 5.5 Budget approval process



December 31. The national budget process is divided into three stages: strategic budget planning, budget allocation and budget approval (Figure 5.5).

MPs, in particular the Third Commission, can influence in each of the budgeting process to make query and support the allocation for climate change-related activities proposed by the relevant ministries. It is important to note that ministries, agencies, or equivalent public entities and the sub-national administrations have the right to develop their respective detailed plan on potential revenue and expenditure, but must adhere to the macro-economic policy framework and medium-term public financial policy. The fact that MPs bring to the knowledge of the local level, in particular matters related to government spending, is to enable sub-national administrations to prepare for their budget to address local issues.

Promulgation Procedure

The President of the NA shall send a letter attached with the approved law to the Prime Minister for him to proceed with a request for His Majesty the King to sign on a Royal Kram for promulgation of the law. For the Law on Institutional Organization and the Rules of Procedure for the Parliament, it is required that the law is sent to the President of the Constitutional Council to review for constitutionality prior to its promulgation.

The law promulgated by the King shall enter into force in Phnom Penh within ten days and throughout the country within twenty days of its promulgation. Subject to its level of urgency, this law may take effect immediately throughout the

country on the date of its promulgation (new Article 93 of the Constitution).

Ratification of international agreements

To participate in an international agreement, it is important that the relevant ministry take stock of the potential benefits it brings to the nation, and respond to questions on this issue from both houses of parliament. This was the case for the 2015 Paris Climate Agreement. The Minister of Environment defended the draft law before the NA and the Senate in 2016.

Table 5.1 Sectoral Discussion Points Related to Climate Change

Sector	**Relevant to Climate Change**	**Potential Issues for discussion**
Forestry	Mitigation: Carbon sequestration by forests Adaptation: The role of forests in rainwater harvesting, disaster management, local livelihoods	The size of the protected area and allocation of the resources The role of communities in forest management
Agriculture	Adaptation: Climate resilient application Mitigation: Soil carbon sequestration and low carbon techniques / energy	Measures to expand agro-ecosystems, encourage low-carbon

		technology application Regulations on low GHG emission implements
Investment	Mitigation and adaptation: expand green investment	Green Investment Incentives
Energy	Mitigation: Renewable energy, energy efficiency Adaptation: Drought / Flood Resistant Energy System	Energy mix (regulation), energy efficiency policies and incentives
Communication	Mitigation: Low carbon communications Adaptation: Resilient roads and infrastructure	Incentives for electric and low-carbon vehicles
Land Management and Urban Planning	Mitigation: Public transport infrastructure, regulations on green	Regulations and incentives for city planning and builders

	space and infrastructure Adaptation: Flood management, including green spaces	Special measures for coastal adaptation

On the international stage

Through regional and international parliamentary networks, Parliaments play an important role in sharing national issues and proposing solutions with regional and international parliaments. For example, on subject matters related to CC the Cambodian Parliament, on 13 June 2018, participated in the 27th Annual Meeting of Regional Cooperation at the Asia-Pacific Parliamentary Forum (APPF) held in Siem Reap. H.E. Sous Yara selected two of four options of interest and required by APPF members including[23]:

1. Promote the role of MPs in CC response (mitigation and adaptation)
2. Uphold parliamentary cooperation to promote multiculturalism and tourism in the Asia-Pacific region.

Following the meeting in Siem Reap, the forum proposed solutions in 14 areas, including CC and disaster risk management[24].

[23] www.en.nac.org.kh/article/169
[24] http://www.appf.org.pe/

Recently, Cambodian MPs also attended a meeting with the 11th Asia-Europe Parliamentary Partnership on "Addressing Water-Food-Energy Nexus with Climate Change". In her message, Her Excellency Lok Kheng made a call, on behalf of the Cambodian NA, upon both Asia and Europe parliaments to work hand in hand to implement the EU Green Deal and all EU commitments. She also highlighted the Cambodian Parliament's' concerns for the environment as well as CC, highlighting Cambodia's progress in implementing the 2015 Paris Accord. In addition, at the COP27 in Egypt in 2022, one of the members of parliament, H.E. Sorn Sarana was also invited to attend in the event.

The role of parliamentarians with voters

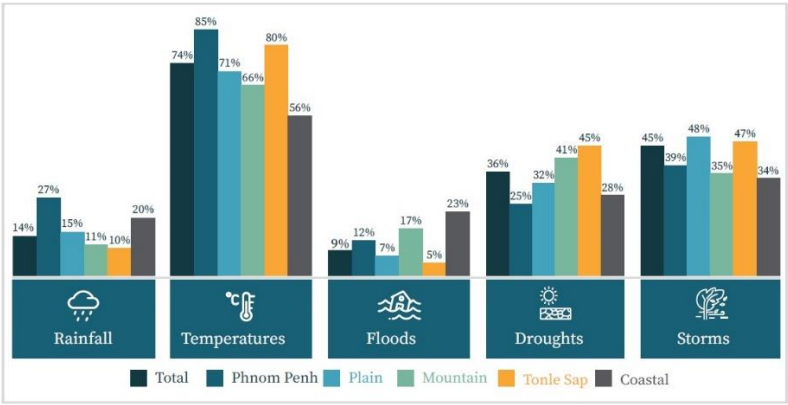
Studies have been conducted to understand people's knowledge, attitudes and practices towards CC, in particular by MoE, in 2010, 2015 and 2020[25]. The latest study concluded that while 725 of people had heard about the term "climate change" only 33% understood it, and many people, particularly in rural areas, were not familiar with the term or did not understand it. This may indicate their limited understanding and vulnerability to CC because they are not prepared to cope with it. MPs' understanding of CC would help bringing up people's understanding, when MPs visited local people and discussed the issue the message would be

[25] NCSD/MoE. (2020). *A Third Study on Understanding Public Perceptions of Climate Change in Cambodia: Knowledge, Attitudes, and Practices*. Phnom Penh, Cambodia: the National Council for Sustainable Development / Ministry of Environment.

carried along and echoed by local people in their local development deliberation from their basic knowledge.

In terms of people's attitudes towards CC, the study reported that about 84% of the respondents understand that CC impacts are felt in Cambodia, i.e., change in temperature, wind storms, irregular rainfall, more frequent and severe floods and droughts (Figure 5.6). Respondents also observed an increase in pest infestations such as mosquitoes and flies relative to 10 years ago.

Figure 5.6 Perception of regional climate change (increase in % only)



On CC response, most responses show that some actions had been taken, for example buying more jars to store more water or consuming water more efficiently, reducing food waste and cultivating alternative crops, i.e., switching to more climate resilient crops such as watermelon, cucumber or beans. However, with their current understanding and response measures they will not be able to cope with long term CC, so MPs may help them by raising awareness with

local authorities, encourage local and sub-national authorities to develop CC response plans, in particular emergency preparedness. MPs can also convey people's concerns of CC impact to relevant ministries and NGOs active in CC. They also can monitor the expenditure of the national budget on CC through the National Council for Sustainable Development website[26].

Aside from the public in general, religion also plays an important role in ensuring that people are knowledgeable about CC. It is observed that the forest is part of Buddhism and some pagodas are always enriched with trees, so MPs can encourage all pagodas across the country to plant more trees to mitigate CC and set an example in Environmental protection. This handbook can also be an educational material (in addition to educational materials in all general education levels produced by the MoE and the Ministry of Education, Youth and Sports) for monks and abbots to gain knowledge and disseminate to people on various festivals. Monks and abbots should inspire people to plant trees as much as possible, especially on the National Arber (Tree Planting) Day on July 9 every year and take the opportunity to educate Buddhists about CC. This way, we connected ourselves to the Buddha's enlightenment, promote biodiversity and mitigate CC.

[26] https://ncsd.moe.gov.kh/node/12800

Parliamentary role with the private sector

Parliamentarians have a similar role with the private sector. Private sector also needs to be involved in reducing GHGs, for example through the use of agricultural machinery, and in adapting to CC, for example, use of technology in farming. MPs have always had the same relationship with the private sector as the general public, and if private sector is involved, it will be easier to mobilize them to address CC. Parliaments may sometimes propose legislation to help address CC, such as reducing taxes on agricultural machinery or incentives for private sector to help people adapt to CC.

5.5 Legal Framework and International Conventions

The Conference of the Parties (CoP) is the supreme body of the United Nations Framework Convention on Climate Change (UNFCCC), in which voting member states approve or ratify it. 197 participating countries and territories, called parties, signed the framework convention. CoP meets every year since 1995, and the most important achievement was in CoP 21 in Paris in 2015, when the first international climate deal was reached. Other legal instruments include:

1. United Nations Framework Convention on Climate Change 1992 (UNFCCC): The Convention was drafted on May 9, 1992 in New York City and signed by more than 150 parties and the European Union at the World Summit on June 4, 1992 in Rio de Janeiro, and entered into force on March 21, 1994. The main purpose of the Convention is to "stabilize the concentration of greenhouse gases in

the atmosphere to a level that can prevent dangerous disturbances from human activities on the climate system."

2. Kyoto Protocol 1997: This protocol defines GHG emissions from human activities over time among countries in Annex B of the protocol. For example, from 2008 to 2012, the EU had to reduce GHG emissions by at least 5 percent compared to 1990.
3. Paris Climate Accord 2015: The Accord encourages all signatories to address CC through sustainable low-carbon investment in the future. It is based on the core principles of the UNFCCC, which urges all parties to fulfill their obligations to address CC and adapt to the effects of CC.

Of all events related to CC, CoP is an important event that the Parliament should monitor and participate in as much as possible. Below is a schedule of all the major CoP meetings.

Table 5.1 Chronological order of all major CoPs events

CoP	City	Year	Key outcomes
1	Berlin	1995	World and country leaders have agreed to meet every year.
2	Kyoto	1997	Implement the Kyoto Protocol, in which industrialized nations pledge to reduce GHGs. This CoP also created a carbon market.
13	Bali	2007	The Kyoto Protocol was replaced by the Pali Roadmap, which includes all countries to reduce GHG emissions, including the REDD+ initiative.
15	Copenhagen	2009	It is officially recognized to keep the increased temperature below 2 degrees Celsius. Rich countries have pledged to provide long-term financing to developing countries, including $ 1 billion a year from 2020 to 2025.
16	Cancun	2010	The Cancun Agreement was formally signed in Copenhagen and also established the "Green Climate Fund".
17	Durban	2011	All countries agree to reduce GHG emissions, including US, Brazil, China, India and South Africa
18	Doha	2012	Kyoto Protocol extends to 2020. Another aspect of CC included is loss and damage.

CoP	City	Year	Key outcomes
20	Lima	2014	This is the first time that all countries have agreed to establish and share their commitment to reducing GHG emissions.
21	Paris	2015	Approved the Paris Accord, keeping global temperatures below 2 degrees Celsius and targeting 1.5 degrees Celsius
22	Marrakesh	2016	The CoP created three key documents following the Paris Agreement: the Marrakesh Declaration of Action and the Marrakesh Partnership.
23	Bonn	2017	There is progress on how to work to implement the Paris Accord. This includes the inclusion of gender issues in CC.
24	Katowice	2018	The IPCC published a report ahead of CoP24 that showed what happened when temperatures reached 1.5 degrees Celsius and that reducing GHG emissions was even more urgent.
26	Glasgow	2021	All countries have placed NDCs, but it has been found that the amount of GHG emissions is not in line with the plan to keep the
27	Sharm El-Sheikh	2022	temperature below 2 degrees Celsius. All countries have agreed to re-impose CoP27 to ensure that they abide by the Paris Accord. Loss and Damage Fund

CHAPTER 6. CLIMATE FINANCE

6.1 Economic Analysis in the Context of Climate Change

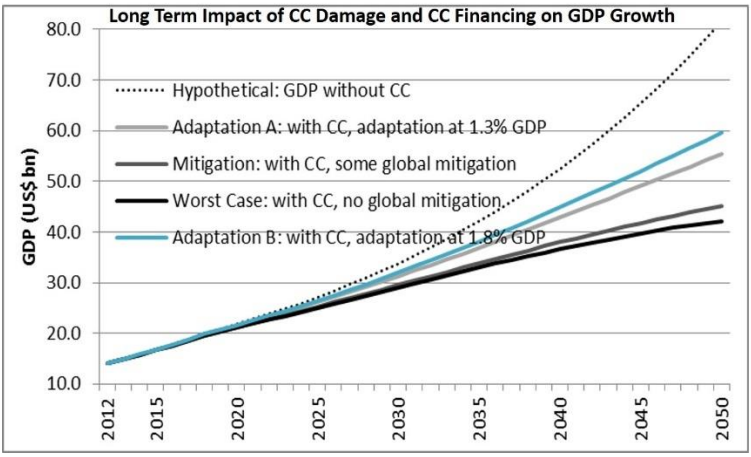
Even if GHG emission could be stopped now CC effects will still be felt due to the emissions that were made since the Industrial Revolution. That is why the UNFCCC requires developed countries to provide new and additional financing so that developing countries can compensate the damages and carry out adaptation actions. This chapter presents an analysis of the economic damage in Cambodia caused by CC and the funding sources to address them.

In Cambodian economy, CC is a threat to the development of all sectors, agriculture in particular, as it relies on rainfall for its production. Although the contribution from agriculture is somewhat similar to the industry and services, more than 50 percent of the country's population remains dependent on the sector. Every year, farmers face floods or droughts, and both for some years. In the third national communication, at least 966 people were killed between 2000 and 2013 and more than 1 billion US dollars in property damage was reported between 2005 and 2013.

As indicated by the IPCC, CC will continue to rise and the economic implications will be even greater if appropriate actions to prevent and respond in a timely manner are not

taken. A study by the RGC on "Addressing the CC Impacts on Cambodia's Growth in 2019" reports that without disruption from CC, Cambodia's GDP would grow at about 6.9 percent between 2017 and 2050 and the country would graduate to a high-middle-income country by 2035, however the NSDP 2019-2023 projects by 2030. With moderate CC disruptions and current level of adaptation plan by Cambodia, the GDP would be impacted by 2.5 percent by 2030. As shown in Figure 6.1, disruption from CC slows down the country's economic growth and it is also directly linked to global GHG reduction. In a worst-case scenario, Cambodia's GDP would fall by more than half below the baseline by 2050. However, with effort to adapt, by spending about 1.8 percent of its GDP, the GDP losses could be partially avoided. So far, about 1 percent of GDP has been spent by Cambodia from 2009 to 2014 and almost 2 percent in subsequent years. The Ministry of Economy and Finance has incorporated CC into the country's financial system, as reflected in the National Budget Circulars. This plays an important role in mobilizing and managing both external and internal resources to respond to CC.

Figure 6.1 Impacts of climate change on GDP



Source: Analysis and Recommendations for Cambodia Climate Change Financing Framework

According to the third national communication in 2022, Cambodia needs about $865.47 million for CC, in particular for adaptation. Cambodia's capacity to meet this need is limited, or in other words, Cambodia needs about $ 800 million from development partners, donors and other funding sources, especially UNFCCC umbrella funds such as the Global Environment Facility (GEF), the Green Climate Fund (GCF), the Special Climate Change Fund (SCCF), the Least Developed Countries Fund (LDCF) and the Adaptation Fund (AF).. The funds come from countries that have pledged to help developing countries fight CC. At CoP15 in Copenhagen, developed countries have pledged $100 billion a year from 2020 to 2025, however this goal has not yet been met .The mechanism for receiving these funds is complex, i.e., it differs from one fund to another, requiring the ministry

/agency or the direct recipient units to follow each fund guideline.

6.2 GLOBAL FINANCIAL MECHANISM

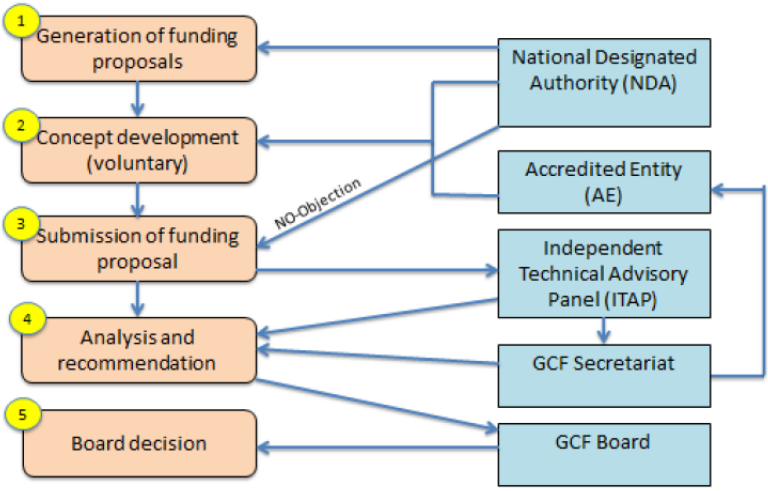
In the report on the "Financial Framework for the Implementation of the National Adaptation Plan", Cambodia lists 171 projects in all areas: water resources, agriculture, energy, health, rural development and the environment. In the initial shortlisting process, only 148 were set a priority . The MoE's NCSD and the Green Climate Fund studied the "Cambodia Program for the Green Climate Fund". According to the study, 15 of the 24 Cambodia priority projects will receive funding to implement through this fund, amounting to about 257.6 million US dollars. In order to receive money, Cambodia must comply with the workflow as shown in Figure .6.2

The financing needs of Cambodia are also reflected in the updated NDC (USD 865.5 million to implement 171 actions as indicated in the National Adaptation Plan) and in the Long-term Strategy for Carbon Neutrality.

As an example, for the Green Climate Fund, in Figure 6.2, the left column shows activities the project proponent has to complete and on the right is the project quality control party. In general, ministries / agencies proposing projects for CC adaptation or mitigation must go through a five-step process, from the submission of financial proposals to the decision of whether or not to approve by the fund's board of directors. The MoE, the National Designated Authority (NDA), acts as the endorsement body on behalf of other party (the accredited entity) to issue approval. Accredited Entity may vary from

project to project, for example for local resilient livelihoods and social land concession infrastructure projects the National Committee for Sub-National Democratic Development of the Ministry of Interior is accredited and could be the implementing party. For other projects international agencies could play the role. A list of accredited entities is available on the GCF website. The other three parties on the right in Figure 6.2 are assigned by the Green Climate Fund.

Figure 6.2 Steps in the CC project planning process



Source: Cambodia's Country Programme for Green Climate Fund

6.3 NATIONAL BUDGET FOR CLIMATE ACTIONS

The Royal Government of Cambodia has identified CC as a challenge to national economic development. In addition to raising funds to support CC actions from donor countries, Cambodia has developed climate public expenditure reviews since 2009 and has regularly made them public on the

Ministry of Environment website[27]. The year-on-year increase in the national budget and the transparent reporting by the Ministry of Economy and Finance shows that Cambodia is leading the way among developing countries on CC. The nation CC budgeting mechanism is also carried out through other projects, i.e., the budget could be raised by relevant ministries / institutions in accordance with the annual budgeting guideline by the MEF as per the proposed investments submitted. According to the Budget Strategic Plan 2023-2025, MEF encourages national and sub-national agencies to prioritize CC actions and ensure sustainable development. Similarly, the sub-national administrations may also incorporate CC in their projects to ensure that all developments are climate resilient.

6.4 Climate Change Development Partners

In addition to funding under the UNFCCC, Cambodia has received financial support from development partners, particularly the $ 120 million Strategic Program for Climate Change Resilience from the Climate Investment Fund for adaptation in climate resilient agriculture, roads and other rural infrastructure, in order to adapt to droughts and floods in many provinces. MoE's NCSD has the Cambodia Climate Change Alliance (CCCA) program for implementing CC projects in collaboration with other departments. CCCA funding comes from development partners such as the United Nations Development Program and developed countries such as Sweden or the European Union. So far, CCCA has implemented two phases of the project and is implementing the third phase. From one stage to another, the CCCA

[27] https://ncsd.moe.gov.kh/node/12800

provides support for a wide range of activities, from climate change research studies to adaptation or mitigation activities.

Other major donors on climate change include China, the US, World Bank, ADB, France, Japan, and Australia. A full overview of external finance on climate change is available on the NCSD website and on the CDC/CRDB ODA database.

BIBLIOGRAPHY

IPCC. 2021. *Climate Change 2021: The Physical Science Basis*. Cambridge: Cambridge University Press.

IPCC. 2022. *Climate Change 2022: Impacts, Adaptation and Vulnerability*. Cambridge: Cambridge University Press.

IPCC. 2022. *Climate Change 2022: Mitigation to Climate Change*. Cambridge: Cambridge University Press.

Ministry of Environment. 2001. National Greenhouse Gas Inventory for 1994. Phnom Penh: Ministry of Environment.

Ministry of Environment. 2001. Vulnerability and Adaptation Assessment to Climate Change in Cambodia. edited by Cambodia Climate Change Office. Phnom Penh: Ministry of Environment.

Ministry of Environment. 2002. Cambodia's Initial National Communication. Phnom Penh: Ministry of Environment.

Ministry of Environment. 2006. National Adaptation Programme of Action to Climate Change. edited by Department of Climate Change. Phnom Penh: Ministry of Environment.

Ministry of Environment. 2013. Cambodia Climate Change Strategic Plan. Phnom Penh: Ministry of Environment.

Ministry of Environment. 2015. Cambodia's Intended Nationally Determined Contribution. Phnom Penh: Ministry of Environment.

Ministry of Environment. 2015. Cambodia's Second National Communication. Phnom Penh: Ministry of Environment.

Ministry of Environment. 2016. Cambodia Climate Change Action Plan. Phnom Penh: Ministry of Environment.

Ministry of Environment. 2017. Cambodia National Adaptation Plan Financing Framework and Implementation Plan. Phnom Penh: Ministry of Environment.

Ministry of Environment. 2017. National Adaptation Plan Process in Cambodia: Climate Finance Readiness Programme. Phnom Penh: Ministry of Environment.

Ministry of Environment. 2017. National Environment and Strategy and Action Plan 2016-2023. Phnom Penh: Ministry of Environment.

Ministry of Environment. 2019. National GHG Emission Inventory Phnom Penh: GSSD.

Ministry of Environment. 2020. Cambodia's Updated Nationally Determined Contribution. Phnom Penh: Ministry of Environment.

Ministry of Environment. 2020. First Biennial Update Report of the Kingdom of Cambodia. Phnom Penh: Ministry of Environment.

Ministry of Environment. 2021. Initiative for Climate Action Transparency - ICAT. Phnom Penh: Ministry of Plan.

Ministry of Environment. 2022. Cambodia's Third National Communication. Phnom Penh: Ministry of Environment.

Ministry of Industry and Handicraft. 2015. Climate Change Action Plan for Industry and Handicraft Sectors 2015-2018. Phnom Penh: Cambodia.

Royal Government of Cambodia. 2010. National Strategic Development Plan Update 2009-2013. Phnom Penh: Ministry of Planning.

Royal Government of Cambodia. 2014. National Strategic Development Plan 2014-2018. Phnom Penh: Ministry of Plan.

Royal Government of Cambodia. 2017. National REDD+ Strategy. Cambodia: Ministry of Agriculture, Forestry and Fisheries.

Royal Government of Cambodia. 2021. Long-Term Strategy for Carbon Neutrality. Phnom Penh: Ministry of Plan.

Royal Government of the Kingdom of Cambodia, RGC. 2019. National Strategic Development Plan (NSDP) 2019-2023. Cambodia: Ministry of Planning.

United Nations. 1992. "United Nations Framework Convention on Climate Change." United Nations.

United Nations. 1997. "Kyoto Protocol to the UNFCCC." United Nations.

United Nations. 2015. "Paris Agreement." United Nations.

United Nations Climate Change. 2021. Annual Report 2021. Bonn: United Nations Climate Change.

ANNEX: Timeline of Conference of Parties and its Major Achievements

CoP	City/Country	Year	Major Achievements
1	Berlin, Germany	1995	The COP meets annually to review the Convention's implementation and make decisions on strengthening the global response to climate change.
2	Geneva, Switzerland	1996	There was a recommendation to amend the United Nations Framework Convention on Climate Change (UNFCCC) to make it a legally binding treaty.
3	Kyoto, Japan	1997	Executed the Kyoto Protocol meaning that industrial countries must reduce their greenhouse gas. This CoP established Carbon Market.
4	Buenos Aires, Argentina	1998	Discussed technological transfer and providing services to developing countries.
5	Bonn, Germany	1999	Encouraged all of the delegates to consider in detail on Kyoto Protocol
6	The Hague, Netherlands	2000	There was a discussion on the flexibility of greenhouse gas mitigation.
7	Marrakesh, Morocco	2001	Marrakesh Agreement was developed, and Climate Change Special Fund for Adaptation was established.

CoP	City/Country	Year	Major Achievements
8	New Delhi, India	2002	Russia was convinced to fulfill the Kyoto Protocol criteria, but the United States and Australia did not ratify the agreement.
9	Milan, Italy	2003	Some additional criteria were added to the Special Climate Fund (SCF) and the Climate Fund for Least Development Countries (LDCF)
10	Buenos Aires, Argentina	2004	Developed Buenos Aires Action Plan, and Russia and Canada ratified the Kyoto Protocol.
11	Montreal, Canada	2005	Kyoto Protocol came into force, and there was an agreement on Joint Implementation and Clean Development Mechanism.
12	Nairobi, Kenya	2006	There was a discussion on Clean Development Mechanism that can be implemented with higher flexibility.
13	Bali, Indonesia	2007	Kyoto Protocol is replaced by the Bali Road Map, in which all countries/states must reduce greenhouse gas emissions. In Bali Road Map, REDD+ initiatives were introduced.
14	Pozanri Turkey	2008	CoP delegates agreed on the principles of the Adaptation Fund and agreed to use this Fund for forest protection.

CoP	City/Country	Year	Major Achievements
15	Copenhagen, Denmark	2009	It is officially recognized to keep the temperature below 2 degrees Celsius. Developed countries have pledged long-term financing to developing countries, including $ 100 billion annually from 2020 to 2025.
16	Cancun Mexico	2010	Cancun Agreement was to officialize Copenhagen and agreed to establish the "Green Climate Fund."
17	Durban South Africa	2011	All countries/states agreed to reduce greenhouse gas emissions, including the United States, Brazil, China, India, and South Africa.
18	Doha Qatar	2012	Kyoto Protocol is extended until 2020. Loss and Damage (L&D) related to climate change was introduced in this CoP.
19	Warsaw Poland	2013	UNFCCC required the signature country/state to prepare INDCS before CoP21.
20	Lima Peru	2014	This is the first time every country/state has agreed to develop and share technology with others and commit to reducing greenhouse gas emissions.
21	Paris French	2015	Adopting the Paris Agreement by keeping global temperatures below 2 degrees Celsius, preferably at 1.5 degrees Celsius

CoP	City/Country	Year	Major Achievements
22	Marrakech Morocco	2016	This CoP produced three major documents after the Paris Agreement, including Marrakech Action Agenda, Marrakesh Partnership for Climate and Development, and Marrakech Climate Fund,
23	Bonn Germany	2017	There is good progress on how to implement the Paris Agreement. Also, gender issues are integrated into climate change activities.
24	Katowice Poland	2018	IPCC released its Climate Change Assessment Report during CoP 24. It illustrated what the world would be if the global temperature increased up to 1.5 Decree Celsius and urged to reduce Greenhouse Gas emissions urgently.
25	Madrid Spain	2019	The Paris Agreement's rulebook is ready for it to take effect.
26	Glasgow England	2021	All countries have submitted their NCD, but it has been found that the amount of greenhouse gas emissions reduction shown in the NCD, is well below emission targets to keep temperatures below 2 degrees Celsius. All countries have agreed to resubmit CoP27 to ensure

CoP	City/Country	Year	Major Achievements
			they abide by the Paris Agreement.
27	Sharm El-Sheikh, Egypt	2022	CoP delegates unanimously agreed upon establishing the Loss and Damage (L&D) Fund. The L&D Fund is for climate change-vulnerable countries.

គាំទ្រថវិកាដោយ

CAMBODIA CLIMATE CHANGE ALLIANCE

Implemented by:

Funded by:

Sverige

GOVERNANCE OF
CLIMATE CHANGE FINANCE
TO ENHANCE GENDER EQUALITY
IN ASIA PACIFIC
www.CFADE.org