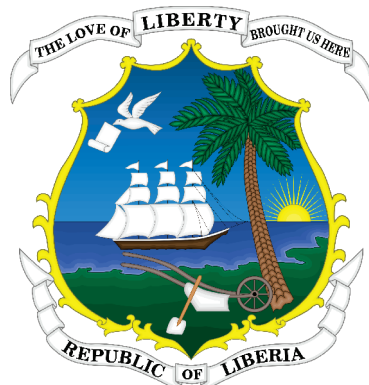


IMPLEMENTATION OF THE NATIONALLY DETERMINED CONTRIBUTION (NDC) IN LIBERIA



TRAINING MANUAL



CONSERVATION
INTERNATIONAL



Foreword

The perennial impacts of climate change are ubiquitous and latently weakening the ability of Liberians to cope. Whilst it is undeniable that Liberia's emissions profile, compared to the global emission mix, positions the country as a global carbon sink, the need to continuously engage in meaningful and responsible environmental behaviors towards addressing climate change cannot be underplayed.

In preparation for the Paris Climate Change talks, the Government and People of Liberia made a bold commitment to become carbon neutral by 2050 as espoused in the Nationally Determined Contributions (NDC). This ambitious target is achievable but only with the adequate financial, technical and political support. If the country does not take actions to address climate change, the situation may worsen with calamitous results, beyond the capacity of the national system.

A major step towards addressing climate change and reducing emissions nationally is to build core capacity of those expected to be involved in the messaging, engagement with stakeholders, and implementation of the targeted interventions in the Nationally Determined Contributions for Liberia. This is why the training manual, a first of this kind, is extremely important. Understanding the risk, vulnerability, impacts, and adaptive capacity of the country is a priority. Likewise, having an appreciable knowledge about the different sectors and activities that could generate carbon emission is significant. The manual brings all these critical information into once place that can be accessed and used by everyone irrespective of the educational qualification.

I appreciate Conservation International for supporting this work through the Global Environment Facility (GEF) under the Capacity Building Initiative for Transparency (CBIT) project. It is my hope that this manual will be used to improve knowledge on the NDC and climate change in general.

Dr. Nathaniel T. Blama
Executive Director/CEO
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Implementing NDC in Liberia: A Training Manual for building core capacity and understanding on climate change, emissions reduction and the implementation of the Nationally Determined Contribution (NDC) for Liberia provides climate change trainers and learners with a wealth of knowledge, and a process to assess, analyze, and plan for focused climate change emissions reduction initiatives across the country. The manual is sectioned into three training modules, setting a common understanding around climate change concepts, vocabulary and the greenhouse gas effects, then moving to more integrated knowledge regarding national determine contributions and the United Nations Framework Convention on Climate Change (UNFCCC) processes. The last module presents a detailed description of the Liberia NDC along with the attending interventions and aspirations based on the five (5) key sectors.

Each module is comprised of learning sessions, complete with participatory exercises. All trainers and learners to follow the module process, particularly ensuring that vocabulary in learned as a starting point, and appropriate focus and time be given to competing exercises.

The manual is quite intensive and since each person learns in a different way, the content of this module is delivered using a range of training methodologies. These include:

- Audio-visual presentations and lectures by the facilitator
- Small group work and discussions
- Questioning techniques
- Brainstorming
- Engaging participants' creativity
- Participatory Exercises

The facilitator is advice to make use of **Icebreakers** and **Energizers** to encourage rapid relationship building and stimulate participants at points in the workshop where their energy has dropped.

I. Module 1: Understanding Climate Change

Module Overview

This module is designed to introduce the concept of climate change and the causes. Participants are exposed to the basic concepts used in climate change discussion including those related to mitigation and adaptation and resilience. It is also designed to share information regarding the impacts of climate change on human population, biodiversity, and the general ecosystem. The design of the module takes the participant through a process of awareness building as to why climate change exists, and why different sectors of society are vulnerable to climate change.

Objective

To develop common understanding of climate change amongst key stakeholders within Liberia and how this is related to socio-economic development under the framework of the nationally determined contributions (NDC).

Section 1: What is Climate Change?

Section 2: What are the causes of climate change?

- Human Causes
- Natural Causes

Section 3: The Impacts of Climate Change

Session 1: What is Climate Change?

Objective

This section presents a general understanding and definition of climate change; its processes, key terminologies used in climate change discussion, and the need to address it.

Weather and Climate Change

It is important to understand the difference between weather and climate. Weather events are short-term (minutes to months) changes in the atmosphere, e.g. temperature, rain, cloudiness, to wind etc. Climate is the average of weather over time and space, i.e. climate is what you expect, weather is what you get.

Climate change

Climate change refers to a significant variation in either the average state of climate or in its variability, persisting for an extended period (typically decades or longer). Natural processes may cause climate change or be caused by external – human related - events that

cause long term changes in the composition of the atmosphere or in land use. Note that the United Nations Framework Convention on Climate Change (UNFCCC), in its Article 1, defines “climate change” as: “*a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.*” The UNFCCC thus makes a distinction between “climate change” attributable to human activities natural causes.

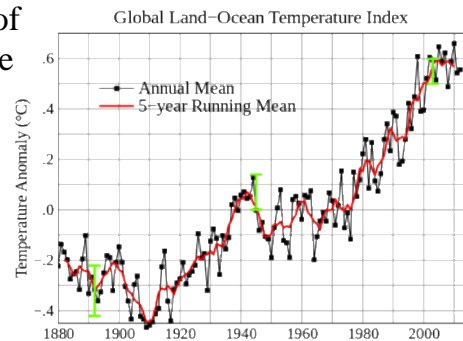
Climate change has affected the seasonal pattern (rainy and dry season) with cascading impacts on human livelihoods, agriculture, infrastructure, biodiversity, etc. The change the timing of the raining season along with the increase in rainfall can all be as a result of climate change. Climate change is responsible for extreme weathers, whether hot or cold or rainy. As other parts of the earth is extremely hot, other parts are extremely cold while some areas experience massive rainfall. These are all as the result of climate change which will be discuss subsequently.

GLOBAL WARMING

Global warming is a term that describes the rise in the average temperature of Earth's atmosphere and oceans since the late 19th century. Since the early 20th century, Earth's average surface temperature has increased by about 0.8 °C, with about two-thirds of the increase occurring since 1980. Scientists are more than 90% certain that global warming is caused by increasing concentrations of greenhouse gases produced by human activities such as the burning of fossil fuels and deforestation.

GREENHOUSE EFFECT and GASSES

The Earth gets energy from the sun in the form of sunlight. As a result, the Earth's surface absorbs some of this energy and heats up. The Earth cools down by giving off a different form of energy, called infrared radiation. But before all this radiation can escape to outer space, greenhouse gases in the atmosphere absorb and reflect some of this infrared radiation energy back to earth, making the atmosphere and the Earth warmer. This process is called the greenhouse effect. Water vapor (H₂O), carbon dioxide (CO₂), nitrous oxide (N₂O), methane (CH₄), and ozone (O₃) are the primary greenhouse gases in the Earth's atmosphere.



CARBON and CARBON DIOXIDE

Carbon is an element that's found all over the world and in every living thing. Oxygen is another element that is in the air we breathe. When carbon and oxygen bond together, they form a gas called carbon dioxide, which is a heat-trapping greenhouse gas. Whenever we burn fossil fuels such as coal, oil, and natural gas—whether it is to drive a car, use electricity, or make products, we are producing carbon dioxide. Forests are also very important because they keep CO₂ in a solid form, thus helping mitigate global warming. But, when they are cut down and burned, they add CO₂ to the atmosphere. As a common reference in climate talks, the term 'carbon dioxide equivalent' is used to reflect how much global warming a type and amount of greenhouse gas may cause.

CLIMATE VULNERABILITY

Vulnerability is considered as the degree to which physical structures, people, or natural and economic assets are exposed to loss, injury or damage caused by the impact of a hazard. This is similar to 'climate vulnerability', but is broken down into three constituents in direct relation to climate hazards, 1) the degree of exposure to climate related hazards, 2) the degree of capacity available to deal with climate related hazards, and 3) the degree of sensitivity to the given climate related hazard.

CLIMATE CHANGE MITIGATION

Climate change mitigation should be thought of as human actions to reduce the intensity or severity of climate change. Actions are to result in the decrease of radiative forcing via decreasing the amount of greenhouse gasses in the atmosphere to reduce the effects of global warming. Most often this is done by reducing sources of greenhouse gas emissions, or by increasing sinks – a natural or artificial reservoir that accumulates and stores 'carbon' for an indefinite period. Examples of reducing a 'source' would include using fossil fuels more efficiently for industrial processes or electricity generation, or switching to renewable energy such as solar energy or wind power. Replanting forest or creating new ones is a good example of increasing carbon sinks, i.e. sequester greater amounts of carbon dioxide (CO₂).

CLIMATE CHANGE ADAPTATION

Climate change adaptation is understood as the things we do, planned or not planned (autonomous), that result in adjustments to climate induced hazards. Adaptations are considered as adjustment in natural or human systems in response to actual or expected

effects of climate change. These adjustments are intended either to reduce the harm caused by these effects or to take advantage of opportunities that climate change may present, e.g. adaptation funding.! Adaptation activities can be proactive (before the effects of climate change are felt) or reactive (after the effects). They can also be planned and implemented, by public and private actors, or happen autonomously.

RESILIENCE

Resilience refers to the capacity of a system, community or society potentially exposed to hazards to adapt via either resisting or changing in order to reach and maintain an acceptable level of function and structure. This is often determined by the degree to which the social system is capable of organizing itself to increase its capacity for learning from past disasters to improve risk reduction measures.

ADAPTATION and RESILIENCE BUILDING

The simplest way to understand the difference between adaptation and resilience building is to look at ‘adaptation’ as the ‘what to do’ to lower vulnerability to climate change, e.g. increasing household water storage capacity. Resilience building can be looked at as the ‘how to’ design and or deliver the adaptation to bring forward development value in the context of systems, community, and or society, e.g. establishing a community managed emergency water storage facility. There are six (6) key characteristic to the ‘how to’ to consider: 1) scale, 2) robustness, 3) rapidity, 4) redundancy, 5) flexibility, and 6) self organization.

Session 2: Causes of Climate Change

Objective

The objective of this session is to describe the causes of climate change including natural and human-induced. It gives participants a good understanding of the major causes of climate change globally with a focus on those causes attached to the national circumstance.

Causes of Climate Change

Generally, climate change causes are categorized into two major groups-natural and human-induced causes. The principal cause of climate change is as a result of a phenomenon scientifically known as the green gas effect.

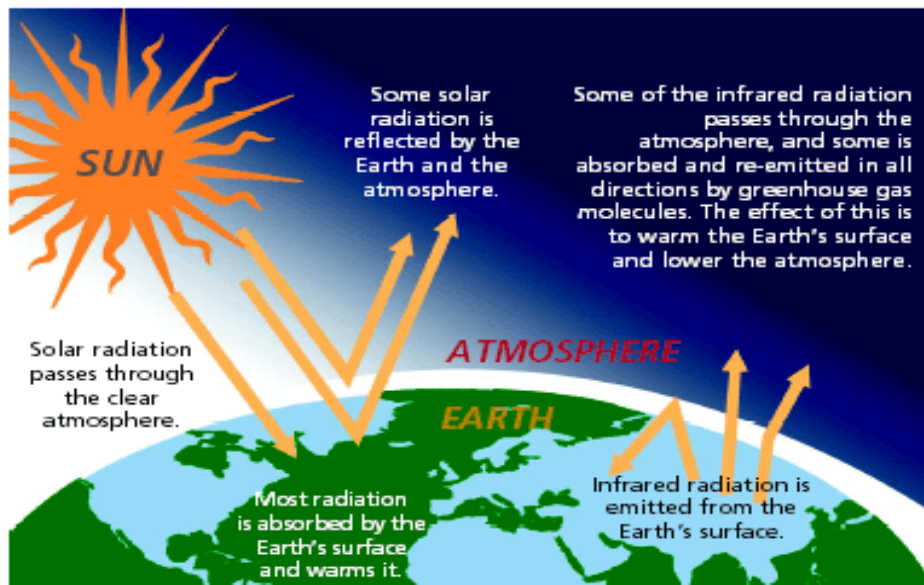
The Green House Gases Effect

Is the greenhouse effect a good thing, or bad thing? Life on Earth depends on energy coming from the sun. About half the light reaching Earth's atmosphere passes through the air and clouds to the surface, where it is absorbed and then radiated upward in the form of infrared heat. About 90 percent of this heat is then absorbed by the greenhouse gases and radiated back toward the surface, which is warmed to a life- supporting average of 15 to 17 degrees Celsius.

The greenhouse effect is a good thing. But, too big of a greenhouse effect can cause the temperature of the earth to increase and affect life as we know it. For example, on the planet Venus, greenhouse gases are abundant, and the average temperature at the surface is more than 457 °C.

People often talk about the greenhouse effect as if it is a bad thing. This is because people are concerned that the Earth is warming up very rapidly. This is happening because ‘we’ are currently adding more and more greenhouse gases to the atmosphere, e.g. water - H₂O, Carbon Dioxide - CO₂, Nitrous Oxide - N₂O, and Methane - CH₄. This increases the ‘greenhouse effect’ and causes unwanted changes to our planet and our lives.

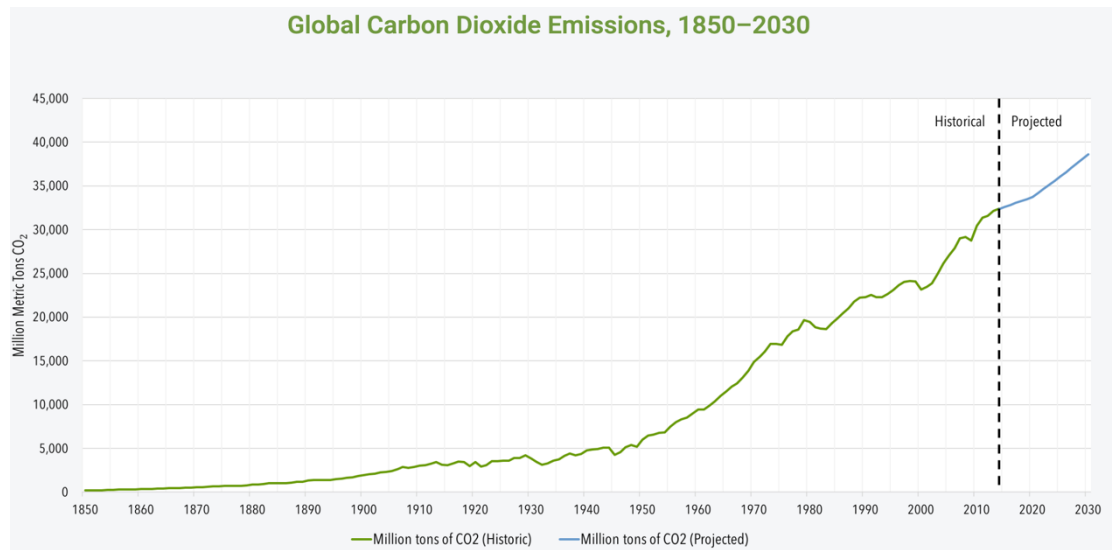
Gases that contribute to the greenhouse effect



Water vapor (H₂O): Water vapor is the most abundant greenhouse gas. Water vapor increases as the Earth's atmosphere warms, but so does the possibility of clouds and precipitation, making this one of the most important feedback mechanisms to balance the greenhouse effect.

Carbon dioxide (CO₂): A minor but very important component of the atmosphere, carbon dioxide is released through natural processes such as respiration, volcanic eruptions, and

through human activities such as deforestation, land use changes, and the burning of fossil fuels. Humans have increased atmospheric CO₂ concentration by a third since the industrial revolution began. It is the most important of the all GHGs in the atmosphere.



Methane (CH₄): A hydrocarbon gas produced both through natural sources and human activities, including the decomposition of wastes in landfills, all forms of agriculture – especially rice cultivation, and livestock. On a molecule-for-molecule basis, methane is a far more active greenhouse gas than carbon dioxide, but also one that is much less abundant in the atmosphere.

Nitrous oxide (N₂O): A powerful greenhouse gas produced by soil cultivation practices, especially the use of commercial and organic fertilizers, fossil fuel combustion, nitric acid production, and biomass burning.

Chlorofluorocarbons (CFCs): CFCs are human made compounds used in a number of applications. On a good note, these compounds are regulated from their production phase to their release into the atmosphere by international agreements because they have the ability to contribute to the destruction of the Earth's ozone layer. They are also greenhouse gases.

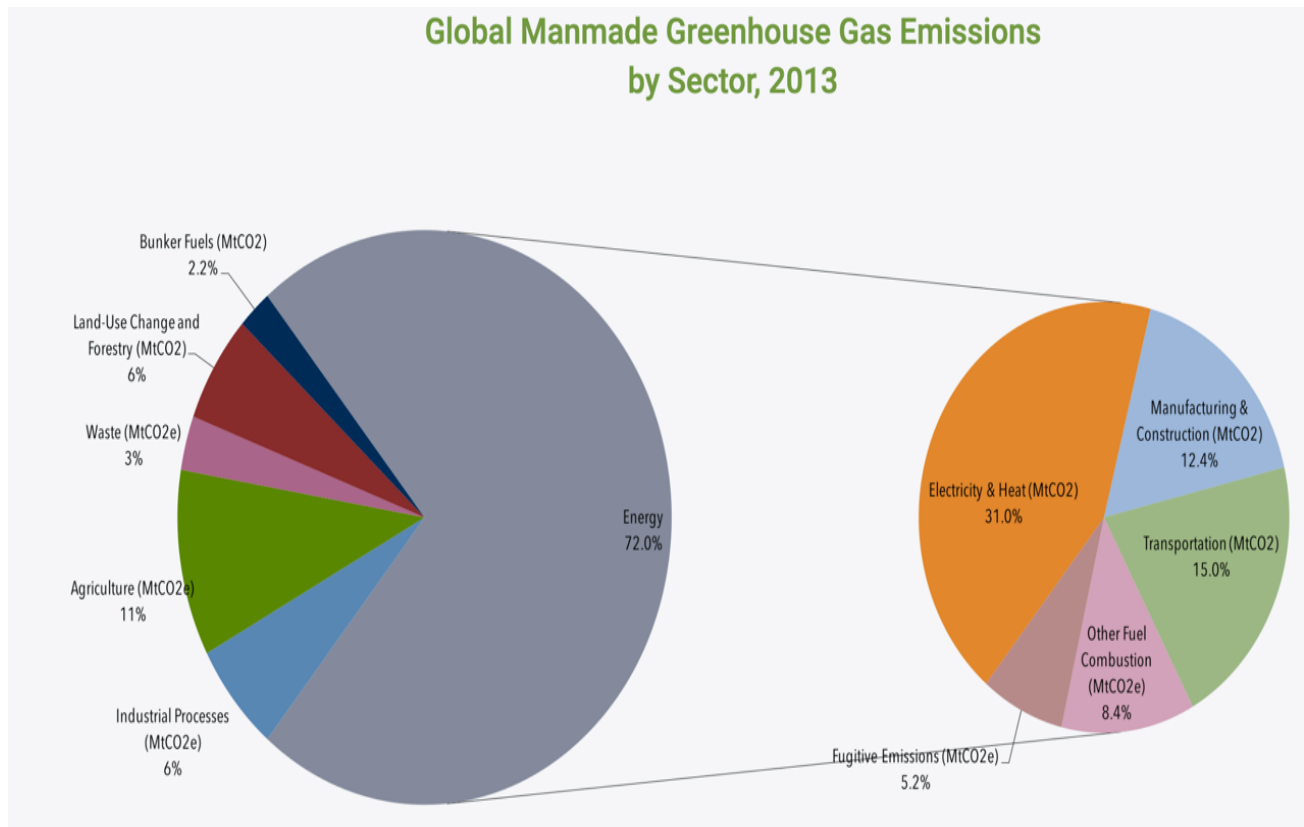
Human (Anthropogenic) Causes

The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), a group of 1,300 independent scientific experts working through the support of the United Nations, concluded there's a 90%+ probability that human activities over the past 250 years have warmed our planet. Industrial activities that our modern civilization depends upon have raised atmospheric CO₂ levels from 280 parts per million to 379 parts per million in the last 150 years. The panel also concluded there's a better than 90% probability that human-produced greenhouse gases such as CO₂, CH₄ and N₂O have caused much of the

observed increase in Earth's temperatures over the past 50 years.

Global anthropogenic GHG emissions by gas and sector

Globally, the primary sources of greenhouse gas emissions are energy (72%), agriculture (11%), industrial processes (6%) and land-use change and forestry (6%). Waste and Bunker Fuels contribute 3% and 2.2% respectively.¹ Within the energy sector, electricity and heat contribute the highest amount (31%) followed by transportation (15%).



Natural Causes

The earth has gone through warm and cool phases in the past, and long before humans were around. Natural forces that contribute to climate change include the sun's intensity, volcanic eruptions, and changes in naturally occurring greenhouse gas concentrations. Global climate has changed because of variations in sunlight. Tiny wobbles in Earth's orbit altered when and where sunlight falls on Earth's surface. Variations in the Sun itself have alternately increased and decreased the amount of solar energy reaching Earth. When there is volcanic eruption, tonnes of GHGs are released into the

¹World Resources Institute CAIT, 2017

atmosphere relating the greenhouse effect as discussed earlier. Volcanic eruptions have generated particles that reflect sunlight, brightening the planet and cooling the climate. Also, natural wildfires, may increase the concentration of GHGs in the atmosphere.

But records indicate that today's climatic warming—particularly the warming since the mid-20th century—is occurring much faster than ever before and cannot be explained by natural causes alone. But the United States National Aeronautics and Space Administration has noted² that “these natural causes are still in play today, but their influence is too small or they occur too slowly to explain the rapid warming seen in recent decades.”

Session 3: Impacts of Climate Change

Objective

This session exposes the participants to the impacts of climate change globally and confirmed common impacts within Liberia. It is intended to create understand on how climate change has ravaged human population and ecosystem and the need for common action in addressing these impacts.

Impact

Climate change has many impacts; some are felt on regional and national scales, some specific to an economic or development sector, some at the community level, and others amongst different members of a family. In general, climate change impact is described by the IPCC as the effects of climate change on natural and human systems. For example, loss in biodiversity or ecosystem function, to losses incurred to peoples livelihoods or to their health. Thus, often climate change impacts are described as ‘losses’, and in some cases ‘gains’.

Climate change is responsible for sea-level rise and the cascading impact of loss to human settlements around the coast; lack of rain and increase in drought affecting faunal and flora; change in seasonal patterns and impact to agriculture development and food security; increase rain and flooding; reduction in water resources and the resulting impacts to humans and other aquatic species; increase in ocean acidification and impact to marine species; air pollution resulting into respiratory tract infection; increase in pest and other pathogen carrying insects; damage to critical ecosystem, etc.

Common Impacts of Climate Change in Liberia

²<https://earthobservatory.nasa.gov/features/GlobalWarming/page4.php>

Climate change has impacted Liberia in many ways ranging from impact to coastal communities due to sea level rise, flooding due to increase rainfall, reducing in agriculture yield due to changes in seasonal patterns, spread of new diseases, etc. Below are some of the local impacts of climate change in Liberia.

Threatened Coastal System

As the earth warms, glacier within Antarctica and other parts of the world continue to melt and pour huge amount of water into the ocean. This causes the sea level to rise. A rise in sea water level along the coast in Liberia could cause saltwater intrusion into freshwater areas. Settlements in coastal lowlands of Liberia are especially vulnerable to risks resulting from climate change, yet these lowlands are densely settled and growing rapidly. For example, it is projected that about 95 km² of land in the coastal zone of Liberia will be inundated as a result of one-meter sea level rise, with about 50% (48 km²) of the total land loss due to inundation been the sheltered coast, with Inundation followed by shoreline retreat yet the population of Monrovia continues to grow³. The potential rise in sea levels could add to existing trends of coastal erosion in areas like Buchanan and Monrovia, with a loss in infrastructure and land of around \$250 million apart from the social and psychological stress on the population⁴. Because of sea level rise, areas like West Point, New Kru Town, Greenville, and Buchanan are severely impacted.

Flooding

Climate change increases the amount of rainfall experienced per year. When it is dry season, the sun is extremely hotter than previous years, while during the rainy season pours uncontrollably. The increase in rainfall pattern creates flooding in may communities in Liberia. Relying on the fact that mostcommunities are located near mangroves and swamp lands, flooding is easily experienced during the raining season leading to displacement and loss of lives and properties. Flooding is an obvious and immediate threat to economic growth, energy supply, roads and transport, food and agriculture, education, health, water and sanitation and social protection.

Impact on Forest and Wildlife

Of the total land area of Liberia (9.58 million hectares), forests cover about 4.30 million hectares or 45 percent of the land area. In recent years, the forest area has decreased somewhat, largely due to uncontrolled logging and an expansion of land used for agriculture. The average annual rate of deforestation since 2001 and over a reference period of 2005 to 2014 is 0.46%⁵. Despite Liberia's small size, it contains a significant amount

³National Climate Change Policy of Liberia, 2018

⁴National Climate Change Policy of Liberia, 2018

⁵Forest Development Authority. (2006). National Forestry Policy and Implementation Strategy. Liberia, Monrovia.

of biodiversity (flora and fauna), including: over 2,900 different vascular plants (including 225 tree species); 600 bird species; 150 mammal species; and 75 reptile species.

A changing climate influences the structure and function of forest ecosystems and plays an essential role in forest health. It may worsen many of the threats to forests, such as pest outbreaks, fires, human development, and drought. Evidence also suggests that climate-induced changes on the ability of forest ecosystem to provide basic goods and services will impact negatively the economic and social well-being of forest-dependent communities. This might include limiting the ability of communities to meet their basic requirements for food due to a reduction in the amount of productive land and pest infestation of crops, access to clean water, medicinal products, wildlife products, and fuel wood among other things, which they get from the forest. In fact, increased temperature as a result of climate change has started to expand the ranges and enhance the survival rates of forest pests; such as the case of the armyworm caterpillars outbreak which occurred in rural Liberia in 2009. The FAO speculated the abnormal behaviour of the Armyworms to reach in the foliage of the tall Dahoma trees where they tend to congregate due to climate change.

Agriculture

Rice, cassava and vegetables production accounts for about 87% of cultivated land, the output of the staple foods remains below national requirements. Agriculture related imported products, of which food and life animals account for over a third amounted to well over half (50%) of total imports in the post war period, second only to petroleum products⁶.

The production system of agriculture in Liberia is nature dependent as the production activity that transforms inputs into agricultural outputs involves direct use of weather inputs (precipitation, temperature, and solar radiation available to the plant.), with various studies of the impacts of climate change on agriculture reporting substantial differences in outcomes such as prices and production. The increasing tendency of temperature and the high variability but increasing tendency for rainfall pattern shows that climate change continuous to exert significant pressure on agriculture sector.

Without adaptation, climate change is generally problematic for agricultural production and for agricultural economies and communities, although vulnerability can be reduced with adaptation-related activities. In Liberia, where more than 70% of the population engage in agriculture as their main livelihood activity, with rice, which is, the nation's staple covering a majority of the area under production (rubber and cassava coming in at second and third place respectively), The disruption to the agricultural system resulting from climate change will seemingly have direct consequences for the country.

⁶Ministry of Agriculture (MoA). (2015) Food and Agricultural Policy and Strategy, Monrovia.

Impact on Health

The Climate Change and Gender Action Plan of Liberia notes that average temperature across the country has been rising and will continue to do so, creating incidence of pests. It also notes that with low health standards the correlation between temperature and waterborne disease, and the spread of malaria are issues for concern. The population of disease-carrying mosquitoes will be boosted and result in increased malaria epidemics, which already accounts for more than 30% of Liberian deaths⁷.

Climate change could alter or disrupt natural systems, making it possible for diseases to spread, including both those caused by water-borne pathogens (such as cholera) as well as those caused by vector-borne diseases (such as malaria, onchocerciasis and schistosomiasis). In addition, vector-borne diseases have aquatic phases and the changes in the pattern of rainfall - and subsequent habitat change - will therefore also affect their epidemiology. Other climate-sensitive diseases of concern to the country include respiratory disease (such as tuberculosis) and disease associated with, or exacerbated by, malnutrition (such as HIV/AIDS).

Exercise 1.0

Without reference to the material, participants should be asked to name at least one greenhouse gas and its human source. The second part of the exercise should involve placing participants in a group of 4 requiring each group to name at least 3 impacts of climate change within their community.

II. Module 2: Nationally Determined Contributions (NDC)

Module Overview

The module presents a historical perspective and background on the introduction of the nationally

⁷UNICEF. (2013), https://www.unicef.org/wcaro/wcaro_liberia_fact_CP_malaria, Accessed 20/01/17

determined contributions (NDC) as a mechanism for demonstrating developing countries commitment to reduce emissions and create sink for carbon sequestration. The model also describes the global climate change framework process focusing on the Paris Agreement with the general aspiration and mandate for parties to pursue domestic mitigation measures, with the aim of achieving the objectives of such contributions.

Objective

The objective of this module is to introduce the NDC as the newest international framework for mitigation and adaptation; it defines what the NDC is and state its objectives as an outcome of the Paris Agreement and the key sectors targeted for mitigation.

Session 4: International Framework for Climate Change Mitigation and Adaptation

Objective

This section gives a background on the global framework for climate change by introducing the United Nations Framework Convention on Climate Change (UNFCCC) and its processes. The section later introduces the most recent international instrument for climate mitigation and adaptation known as the Paris agreement. Participants will understand the Katowice Climate Package, which in essence provides a road map, essential procedures and mechanisms that will make the Paris Agreement operational.

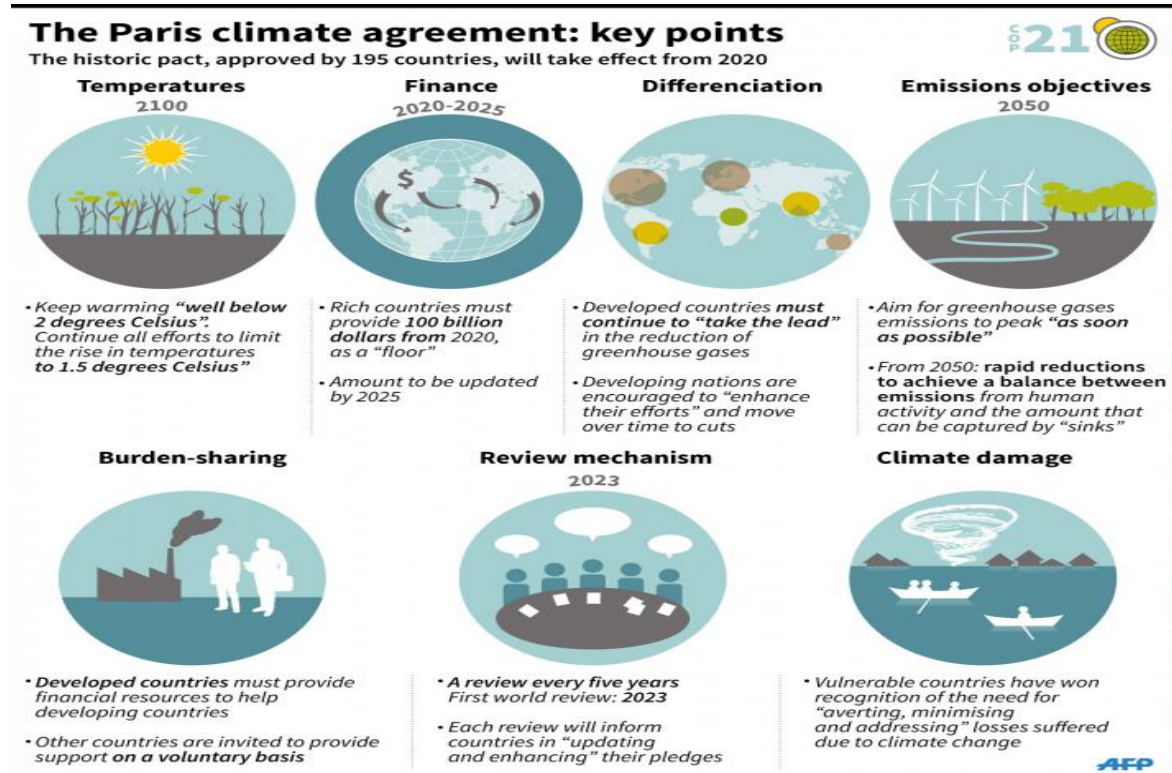
UNFCCC

The United Nations Framework Convention on Climate Change (UNFCCC) is an international environmental treaty adopted on 9 May 1992 and opened for signature at the Earth Summit in Rio de Janeiro from 3 to 14 June 1992. It then entered into force on 21 March 1994. The UNFCCC objective is to "stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. The framework outlines how specific international treaties (called "protocols" or "Agreements") may be negotiated to specify further action towards the objective of the UNFCCC.

The convention enjoys broad legitimacy, largely due to its nearly universal membership. The parties to the convention have met annually from 1995 in Conferences of the Parties (COP) to assess progress in dealing with climate change. In 1997, the Kyoto Protocol was concluded and established legally binding obligations for developed countries to reduce their greenhouse gas emissions in the period 2008–2012. The Protocol was amended in 2012 to encompass the period 2013–2020 in the Doha Amendment, which as of December 2015 had not entered into force. In 2015 the Paris Agreement was adopted, governing emission reductions from 2020 on through commitments of countries in Nationally Determined Contributions (NDCs), lowering the target to 1.5 °C. The Paris Agreement entered into force on 4 November 2016.

"UNFCCC" is also the name of the United Nations Secretariat charged with supporting the operation of the Convention, with offices in Bonn, Germany. The Secretariat, augmented through the parallel efforts of the Intergovernmental Panel on Climate Change (IPCC), aims to gain consensus through meetings and the discussion of various strategies.

Paris Climate Agreement (Paris Agreement)



At

COP 21 in Paris, on 12 December 2015, Parties to the UNFCCC reached a landmark agreement to combat climate change and to accelerate and intensify the actions and investments needed for a sustainable low carbon future. The Paris Agreement was launched and builds upon the Convention and – for the first time – brings all nations into a common cause to undertake ambitious efforts to combat climate change and adapt to its effects, with enhanced support to assist developing countries to do so. As such, it charts a new course in the global climate effort.

The Paris Agreement sets the ambitious goal of limiting global warming to well below 2°C while pursuing efforts to limit the increase to 1.5°C. According to the Intergovernmental Panel on Climate Change, if we are to limit warming to 1.5°C we will need to lower our CO₂ emissions by about 45% by 2030 (compared to 2010 levels). Even limiting global warming to 2°C will require nothing less than transitioning to a carbon-neutral economy by the middle of this century – only several decades from now.

The Paris Agreement’s central aim is to strengthen the global response to the threat of climate change by keeping a global temperature rise this century well below 2 degrees Celsius above pre-

industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius. Additionally, the agreement aims to increase the ability of countries to deal with the impacts of climate change, and at making finance flows consistent with a low GHG emissions and climate-resilient pathway. To reach these ambitious goals, appropriate mobilization and provision of financial resources, a new technology framework and enhanced capacity-building is to be put in place, thus supporting action by developing countries and the most vulnerable countries, in line with their own national objectives. The Agreement also provides for an enhanced transparency framework for action and support.

The Paris Agreement requires all Parties to put forward their best efforts through “nationally determined contributions” (NDCs) and to strengthen these efforts in the years ahead. This includes requirements that all Parties report regularly on their emissions and on their implementation efforts. There will also be a global stock take every 5 years to assess the collective progress towards achieving the purpose of the agreement and to inform further individual actions by Parties.

Session 5: [What is NDC](#)

Objective

The objective of this section is to guide participants through the story behind the NDCs, its purpose and how it strengthens the Paris Agreement in committing both developing and developed countries to setting agreed targets that are not only compatible with their national development agendas but promotes it.

Overview of NDC

Nationally determined contributions (NDCs) are at the heart of the Paris Agreement and the achievement of these long-term goals. NDCs embody efforts by each country to reduce national emissions and adapt to the impacts of climate change. Nationally Determined Contributions (NDCs) or (Intended) National Determined Contributions (INDC) are therefore (intended) reductions in greenhouse gas emissions under the United Nations Framework Convention on Climate Change (UNFCCC).

In 2013, Liberia as a signatory to the UNFCCC elected to join the community of nations to submit to the United Nations Framework Convention on Climate Change (UNFCCC) an Intended National Determined Contribution (INDC) to reduce greenhouse gases in key sectors of the economy. The INDC was intended as a compromise between "quantified emissions limitation and reduction objective" (QUELROs) and "nationally appropriate mitigation actions" (NAMAs) that the Kyoto Protocol used to describe the different legal obligations of developed and developing countries. It took a long time to arrive at this compromise that would commit countries in both these blocks to an INDC due to division among countries over the issue of historical responsibility. The NDC under the Paris Agreement achieved that feat and is widely regarded as the best hope of a global action against

climate change.

The NDC commits countries to 30% emission reduction by 2030 relative to Business as Usual (BAU); in line with its sustainable development agenda.

All countries that signed the UNFCCC were asked to publish their INDCs at the 2013 United Nations Climate Change Conference held in Warsaw, Poland, in November 2013. Under the Paris Agreement, adopted in December 2015, the INDC will become the first Nationally Determined Contribution (NDC) when a country ratifies the agreement unless it decides to submit a new NDC at the same time. Once the Paris Agreement is ratified, the NDC will become the first greenhouse gas targets under the UNFCCC that applied equally to both developed and developing countries.

The INDCs combine the top-down system of a United Nations climate agreement with bottom-up system-in elements through which countries put forward their agreements in the context of their own national circumstances, capabilities and priorities, within the ambition to reduce global greenhouse gas emissions enough to keep global temperature rise to 2 degrees Celsius.

NDC Key Sectors

The NDC key sectors are Energy, Transport, Waste, Forestry and Agriculture

Exercise 2.0

1. Divide participants up by sectors or interests to make a list of sources of emissions from each sector
2. Draw up a second list of specific action that can be taken to reduce emissions
3. In a larger group (possibly in plenary) compile both list in a matrix, have a column for enablers/reasons for why the trend in emissions and another column on barriers to the mitigation measures in number 2 above.

III. Module 3: NDC Key Sectors

Module Overview

This module introduces you to key sectors mentioned in the National Determined Contribution targets as spelled out in the INDC. The module will discuss each sector separately beginning with the priority sectors, state their current contribution to national GHG emissions relative to the year 2000 estimates and list NDC targeted interventions for each of those sectors.

Objective

The objective of this section is to discuss the NDC sectors, their contribution to national GHG emissions and what actions the NDC intervention will be in reducing emissions from these sectors. The sectors are discussed in details in the following section:

Section 6: Transport

Section 7: Waste

Section 8: Energy

Section 9: Agriculture

Section 10: Forestry

Liberia NDC

Liberia has committed to reporting and mitigating greenhouse gas concentration in five key sectors of the economy. Without Land Use, Land-Use Change and Forestry (LULUCF), Liberia's total national GHG emissions for the year 2000 is estimated to be 8,022 Gg of equivalent CO₂. Of the four non-LULUCF sectors responsible for the Country's sources of GHGs, the Energy Sector is the most significant, accounting for about 67.5% of the national total. This is trailed closely by the agriculture sector's contribution of about 31.9%. The waste sector accounts for 0.6%. The long-term strategy of Liberia is to achieve carbon neutrality by 2050. The strategic options for mitigation considered under the INDC are the energy sector (electricity, transport) and the waste sector. Data for Agriculture and Forestry Sectors are therefore scanty in the INDC since they are not priority Sectors.

The GHGs of concern in Liberia from the three mentioned sectors are mainly Methane (CH₄), contributing 51.6%; Carbon dioxide (CO₂), contributing 44.5%; Nitrous oxide (N₂O) contributing 3.9%. Other important gases for consideration include Hydrofluorocarbons (HFCs), per fluorocarbons (PFCs), and sulfur hexafluoride (SF₆). Each of these GHGs are associated with one sector or more of the sectors mentioned below, therefore emission reduction actions must be deliberate and specific to these sectors

Session 6: [Transport](#)

Objective:

The Transport Sector is not a stand-alone sector, but a major subsector under the Energy Sector, therefore mitigation actions in this sector will greatly reduce national total emissions. Using Mitigation Scenario 3: 5% bio-fuel use in the Transport Sector to reduce emissions in the Transport Sector by 4,821,000 tCO₂ equivalent.

This section also lists some adaptation measures to strengthen the sector climate resilience, particularly in infrastructure which has continued to suffer breakdown and degradation as climate change becomes a reality, coupled with reduced national earnings and budget to the sector.

Total Emission Contribution from Transport Sector

This sub-sector's contribution of emission to the Energy Sector is about 327.30 Gg tCO₂ e. This translate to 27.1% of the national total and 40.1% contribution to the sector. However, this may increase to about 32,000 Gg by 2038 for this sub sector if mitigation measures are not implemented.

Targeted NDC interventions

Mitigation interventions

1. Mainstream climate change into existing transport management plan to strengthen emission control.
2. Strengthen institutional capacity for developing strategies for integrated transport services; developing technical and safety standards and the enforcement of policies including emission control.
3. Improve the quality and reliability of transport infrastructure and services.
4. Develop emission reduction and tracking system of pollutants from vehicles.
5. Blend up to 5% of palm oil biodiesel with both gasoline and diesel by 2030 for vehicles.

Transport/Infrastructure (Adaptation)

1. Implement and reinforce design standards and planning codes for roads and other infrastructure to cope with flooding, sea level rise and windstorm.
2. Strengthen early warning systems and evacuation planning for intense rainfall events and floods.
3. Install signs high above the ground that can alert pedestrians and motorists of unsafe zones, such as low-lying areas.
4. Maintain and upgrade roads with appropriate drainage systems to cope with flooding. □
Improve and enhance public transport services

Session 7: [Waste](#)

Objective:

This section highlights the waste sector and important contributor to methane emissions. For the waste-management sector, three waste management systems recognized in Liberia are solid waste disposal on land, industrial and domestic wastewater handling, and incineration. Estimated waste production for the Monrovia municipality is about 724 metric tons and is projected to increase by 2.5% every year, producing 153,009 tons/day in 2012 and about 321,000 tons/day in 2020. With this

waste-generation rate for the Monrovia municipality, suggested mitigation measures are recycling, composting, incineration, and methane recovery. The later is the focus of the NDC, captured in what some people view as a semblance of a waste to wealth strategy, in that methane gas is capture and used in a wide ranch of application. Methane is a potent GHG, but it is possible to reduce that potency by capturing and burning some of the methane to convert it to CO₂ (called flaring). The heat from flaring can be used to generate electricity or supply local heating needs.

Total Emission Contribution from Waste Sector

Emissions from this sector by the year 2000 was 46 Gg tCO₂ e.

Targeted NDC interventions

1. Strengthen institutional and individual capacity for waste management.
2. Develop waste management infrastructure.
3. Implement and strengthen policy that promotes private investment in waste management.
4. Capture methane gas emitted from landfills and used for fueling vehicles, cooking at home or generation of power.

Session 8: [Energy](#)

Objective:

This section breakdown several subsectors considered under the energy sector, it highlights the sector contribution to national emissions total, different energy sources and what intervention the NDC has proposed to mitigate emissions from this sector.

Total Emission Contribution from Energy Sector

The energy sector is by far the biggest contributor to GHG emissions in Liberia with about 5,454.96 Gg of CO₂e according to year 2000 estimates. The rate of growth in energy-sector emissions in the past decade is a measure of the economic growth of Liberia. Emissions growth in the future can, however, be slowed considerably if Liberian hydropower generation is brought back on stream as part of the country's climate change mitigation response.

Targeted NDC interventions

1. Strengthen implementation and coordination mechanisms to improve climate change mitigation actions.
2. Implement quantitative and qualitative research and improve systematic priority sequencing between National Energy Policy, Low Carbon Economy, and National Vision 2030 developmental goals.
3. Strengthen institutional and individual capacity in renewable energy technology and management.
4. Implement and strengthen policy that promotes private investment in renewable energy (hydro, biomass and solar etc.).
5. Rehabilitate existing hydro-power plants and build new hydro-power plants to increase hydro-power production capacity.
6. Produce and distribute 280,543 energy saving cook stoves that use fuel wood and 308,004 energy saving cook stoves that use charcoal by 2030.
7. Implement large scale biomass projects to generate about 30 MW by 2030.

Session 9: [Agriculture](#)

Objective

Various climate change scenarios have placed agriculture sector to suffer disproportionate impacts from climate change. According to the Liberia's Initial National Communication, 2013, the agriculture system of Liberia is 80% subsistence involving shifting cultivation, shifting cultivation is characterized by conversion of land away from forestland, thereby leading to deforestation. However, the INDC does not consider it as a priority sector for mitigation while the Liberia Initial National Communication (2013) considers the sector only for adaptation. The aim of this section is to consider the sector's contribution to GHG emissions. However, Liberia being an agrarian nation with about 70 percent of the population engaged in mainly subsistence farming, which is climate dependent and low input based, this section will also look at different measures that would not only promote climate smart agriculture but one that is resilient and ensures food security.

Total Emission Contribution from Agriculture Sector

The Sector contribution to 2,562 Gg CO₂ e.

Targeted NDC interventions

1. Develop and promote drought-resistant, flood-tolerant and early maturing crop species.
2. Intercropping, irrigation and the optimization of lowland/swamp farming.
3. Pest control including fencing of farms against rodents, bird scarecrows, regular weeding, and the use of high echoing bells.
4. Develop climate resilient crop/agroforestry diversification and livestock production systems.

5. Create a platform for knowledge and experience sharing on best adaptation practices.
6. Develop and implement agriculture and hydrological technology models and scenarios for planning.
7. Establishment of a gene bank of climate resilient varieties of indigenous food crops.

Session 10: Forestry

Objective

Liberia with 43.4 % of land in forest from 96, 000 sq. km of land area, has huge mitigation potential from all types of its forests, if left intact and carbon sinks enhanced. Conversely, deforestation and land cover conversion can release stored CO₂ and reverse Liberia's status as a net sink of GHG. This section aims to create understanding of interventions from the NDC and INC that would lead to sustainable management of Liberia's forests for the provision of ecosystem and life support services as well as important tangible benefits that does not compromise conservation and developmental objectives.

Total Emission Contribution from Forest Sector

N/A (Liberia's massive forests makes the sector a sink for CO₂). GHG sequestration from LULUCF is -96,811 Gg.

Targeted NDC interventions

1. Increase awareness and strengthen participation of local dwellers in forest conservation.
2. Protection of forest and biodiversity rich forest zones.
3. Increase the amount of forested land through reforestation of degraded lands.

Exercise 3.1

1. Discuss why Liberia prioritized only 3 sectors for mitigation in the NDC
2. Why the choice of some other sectors for adaptation?
3. What could have been decided differently? Why do you think so?