TRAINING MODULES ON EFFECTIVE COMMUNICATION OF CLIMATE SCIENCE

For policy makers, Scientists and practitioners

Prepared by

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ACRONYMES

VIPP: Visualization in Participatory Programs

AfDB: African Development Bank

CC: Climate change

CILSS: Comité Permanent Inter-Etats de Lutte contre la Sécheresse dans le Sahel

CNRM-CM3: National Meteorological Research Center–Climate Model 3

CRA: Centre Regional AGRHYMET

CSIRO: Climate model developed at the Australia Commonwealth Scientific and Industrial Research Organization

ECHAM 5: Fifth-generation climate model developed at the Max Planck Institute for Meteorology

GCCA : Global Climate Change Aliance

GCM : General circulation model;

GDP : Gross domestic product

GHGs : Greenhouse gases

GIEC : Groupe d'experts intergouvernemental sur l'évolution du climat

MDG : Millennium Development Goals

MIROC : Model for Interdisciplinary Research on Climate, developed at the University of Tokyo Center for Climate System Research

NGOs : Non-governmental organizations

OCDE : Organisation de Coopération et de Développement Économiques

SDG : Sustainable Development Goals

UNFCCC: The United Nations Framework Convention on Climate Change

INTRODUCTION TO THE TRAINING MODULE

The focus of the module is on building the capacity of decision-makers, scientists and practitioners to understand the concept and all the implications of climate change. At the end, this module aims is a better understanding of climate change, it's impacts end also to prepare these actors to adopt the best adaptation strategies in order to maximize opportunities and minimize negative impacts. In total, the training module has five units, as follows:

- Unit 1: Understanding the climate and its links to development
- Unit 2: Current and Future Climate Trends at global and local levels
- Unit 3: Climate Services
- Unit 4: Dissemination of climate information
- Unit 5: Integrate climate into monitoring and evaluation systems

TRAINING MODULE OBJECTIVES

This Module ***on Effective Communication of Climate Science For policy makers, Scientists and practitioners*** has the following general objectives:

- Equipping policy makers, scientists and practitioners with knowledge and skills of effectively communicating climate science for decision making.
- Equipping policy makers, scientists and practitioners with content and skills to train others on climate science communication.
- Motivating policy makers, scientists and practitioners to appreciate the value and importance of timely communication.
- Providing instruction and skills on how to interpret and present data for policy makers, scientists and practitioners.

These objectives should be written on a manila card, white board, newsprint, or chalkboard or use a transparency and overhead projector or any other appropriate material to share them with your colleagues and trainees.

Some Assumptions

This training module has been designed with several assumptions in mind, including the following:

- Policy makers, scientists and practitioners can make well-informed decisions when they have complete, accurate, and unbiased information
- Policy makers, scientists and practitioners have opportunities to gain the appropriate information and skills about collecting, analysing, synthesising, and maintaining evidence-based data for decision making.
- Experiential learning, including role-playing, games, and songs, is an excellent way to learn.

One of the most crucial assumptions that this module makes is about the facilitator. The facilitator is the key to the success of this intervention. The facilitator should have the following traits:

- Be social and enjoys interacting with people from different backgrounds
- Be knowledgeable about climate change, policies and climate information and services
- Be respectful of others and their opinions
- Be enthusiastic about facilitating this module
- Have good communication and group facilitation skills
- Be non-judgmental
- Be proficient at using a variety of participatory and experiential programme techniques

Facilitators are free to add questions to exercises or alter the sessions in other appropriate ways to make the content more relevant to the participants.

If you are training people who have little experience with this subject matter, facilitators are advised to present the training in its entirety. If trainees have had some exposure to this type of information, conduct a needs assessment to determine what information they have and what gaps exist. Then, select the topics that best fulfil their training needs.

FACILITATION APPROACHES AND TECHNIQUES

Experiential Education

Experiential activities in this module are designed to help trainees gain information, examine attitudes, and practise skills. There are structured exercises in which the trainees do something and then process the experience together, generalising about what they learned and, ideally, attempting to see how the information would apply to their work. Experiential learning is participant-centred. Although the role of the facilitator is crucial, creating the learning experience is ultimately a group responsibility.

One way to make this training successful is to involve the trainees in their own education. Here are some tips for conducting experiential activities:

- Review the unit and activities thoroughly until you feel comfortable with the steps
- If possible, do a 'dry-run' before introducing a new activity to the group
- Consider the learning points of the activity and prepare questions to trigger discussion
- Keep an eye on the clock so there is sufficient time for group sharing and discussion
- Remember that although doing the activity is fun, it is in processing the experience that learning takes place

Specific Techniques

The training module employs a variety of techniques, some of which you may be more comfortable with than others. Do not be afraid to try new techniques. There are many different kinds of activities, including role-plays, games, values clarification and voting, brainstorming, small group work, problem-solving scenarios, and presentations by guest speakers. Here is a brief description of some training techniques.

***Visualisation in Participatory Programmes (VIPP)*:** VIPP involves the use of different shapes of coloured cards so that everything that is done during a session, either individually or collectively, can be visualised, processed, synthesised, and shared. VIPP encourages everyone to participate and is based on well-founded theories of adult learning.

***Lecturette*:** A lecturette is a short (10 to 15 minutes), structured, and orderly presentation of information delivered by a facilitator. A lecturette can be used to impart knowledge or introduce skills. A lecturette that allows for an exchange between the speaker and the trainees is usually more effective.

***Discussions*:** Discussions are useful in both large and small groups. Small groups may offer shy or less-verbal learners more of an opportunity to speak. During group discussions, the facilitator should try to control the flow of conversation, if necessary.

***Role-plays*:** Role-plays are short dramas in which learners can experience how someone might feel in a situation, try out new skills, and learn from each other. Role-playing in small groups or pairs is usually less threatening for learners and allows more people a chance to participate. Ask for volunteers, because many people are embarrassed or uncomfortable acting in front of a large group. After the role-play, be sure to declare the role-play over and ask questions about it.

***Case studies/scenarios*:** Case studies are stories, either fictional or true, that put information into context by describing a problem and discussing how it might be or was resolved. Feel free to adapt any scenarios in the module to better suit your trainees. Asking the trainees to come up with case studies or scenarios, sometimes as an assignment, is a good way to ensure realistic situations and language.

***Brainstorming*:** Brainstorming is a free-flowing exchange of ideas on a given topic. You ask a question, pose a problem, or raise an issue, and learners suggest answers or ideas. Write all suggestions down for the group to see. No editorial comment or criticism is allowed. When the brainstorming is finished, the group evaluates the ideas together, perhaps to identify those they consider most useful or to categorise them in some helpful way.

***Guest speakers*:** Guest speakers can bring a topic alive by discussing personal experiences and sharing their feelings. Identify guest speakers and invite them in early enough to ensure they can participate in the workshop. Make sure they are dynamic, knowledgeable about the topic, and comfortable speaking in front of an audience. Prepare the trainees for the speaker‘s presentation so that they know what to expect, are ready with questions, and act respectfully. Prepare the speaker with information about the group and a clear understanding of your expectations.

***Games and exercises*:** Games and exercises are very much a part of this training. They include such things as introductions, energisers, and warm-ups. These games and exercises enhance the amount and the quality of interaction in the group. Energisers and warm-ups can be done just before the start of a session, immediately before or after a break, or just before the end of the day‘s sessions. You can use the ones that are described here or substitute others.

EVALUATION OF TRAINING SESSIONS

Training will be evaluated in several ways.
Moodmeter: At the beginning of the topic, prepare a chart called “The Moodmeter”. The moodmeter is an instrument for the subjective measurement of the mood and atmosphere of the group. It is not directly related to the content of the workshop.

Prepare a chart on newsprint with the total number of days or sessions written in a horizontal line. In a column, draw at least three different mood symbols: for example, faces showing happiness, indifference, sadness, frustration, or anger. Alternatively, temperature indicators such as 15 F/25 F/35 F can be used. Ask the trainees to place an X or a dot in line with the emotion they are feeling at the end of the day or the session. You can draw a line through the dots or Xs that reflect the group feeling or the ups and downs of the group. This could be used to discuss the energy level of the group or possible success or dissatisfaction.

Flash: Stand in a circle with the participants. Ask a direct question to the group: for example, "Tell me how you feel about the workshop today?" or "What two new things did you learn today?" Ask each person to give a personal opinion in a very short statement, going round the circle. It is called "flash" because of the speed in which opinions are given. It should not take more than 30 seconds for each person. No discussion is allowed while the flash is going on.

Your role is always to ask the opinions of the trainees and permit a variety of ideas to be stated. However, you should remind the group to be constructive in their criticisms and to look for ways to improve the training.

HOW TO USE THE TRAINING MODULE

This module is primarily intended for use by trainers and scientists. However, it can also be used to train policy makers and service providers. It has been written specifically for various uses. You may need to adapt it to suit the needs of the trainees or learners according to their field.

In total, the training module has five units, as follows:

- Unit 1: Understanding the climate and its links to development
- Unit 2: Current and Future Climate Trends at global and local levels
- Unit 3: Climate Services
- Unit 4: Dissemination of climate information
- Unit 5: Integrate climate into monitoring and evaluation systems

Each unit is broken into sessions. All the sessions have experiential activities that address the topic's objectives in a variety of interesting ways. Each unit specifies the purpose, the materials needed, the approximate time required, and the steps to follow. All the units specify the preparation that must be done before the session. Some sessions have handouts for the trainees.

To design and conduct a programme tailored to the needs of learners, you need to do the following:

- Familiarise yourself with the entire training module. In particular, note that each unit may have several sessions.
- The time allocated to each session is only a guide. Adjust the time according to the needs of the trainees.
- Prepare handouts or other materials that may be needed before the session begins. If guest speakers are required, make sure they are invited well ahead of time and have been properly briefed about what you expect of them.

Introduce each unit by presenting the unit's objectives.

UNIT ONE: UNDERSTANDING THE CLIMATE AND ITS LINKS TO DEVELOPMENT

Unit 1: *Understanding the climate and its links to development*	
Content:	*This Unit will describe:* • *Some concepts use: climate, weather, climatology, meteorology, climate system and scenario, climate variability and change, Adaptation, Mitigation, Vulnerability, Resilience.* • *Links between climate and development* • *Indigenous Knowledge as climate science*
Objectives:	At the end of this unit, it is expected that participants will: ▪ *Improve understanding of key climate concepts* ▪ *Improve understanding of the links between climate and development* ▪ *Use of indigenous Knowledge as climate science*
Target Participants:	*Scientists, decisions makers, practionners such fields workers (NGOs, etc)*
Method of training:	Participatory training/facilitation methodologies, lectures, group discussions, case studies, Quiz, etc.
Training material	Flip charts, notebooks and pens, marker pens, white board, white board markers, PowerPoint projection
Exercises	*Quiz*
Classroom setup:	This will depend on the facilitator and the methodology adopted
Duration:	60 mins
Evaluation:	The facilitator to decide the most appropriate evaluation method
Reference Material	CILSS (2014). *Module d'intégration du changement climatique dans les politiques de développement National*. Projet GCCA CILSS/CRA (2010). *Le Sahel face au Changement Climatique. Enjeux pour un développement durable*. Niamey (Niger) 42. GIEC (2001). "Climate Change 2001: Synthesis Report. Question 3. http://www.grida.no/publications/other/ipcc%5Ftar/?src=/climate/ipcc_tar/vol4/french/index.htm." GTI TRE Section 11.5.1. GIEC (2007). "Bilan 2007 des changements climatiques : Rapport de synthèse "*www.ipcc.ch*. GIEC (2007). *Climate Change 2007. Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, M.L. Parry, O.F. Canziani, J.P.*

	Palutikof, P.J. van der Linden and C.E. Hanson, Eds.,. Cambridge University Press, Cambridge, UK 976 GIEC (2014). *Changements climatiques 2014 : Impacts, vulnérabilité et adaptation. Résumé à l'intention des décideurs.* www.developpement-durable.gouv.fr/giec Gèneve 42

Description of facilitation methods

Before starting the training, the facilitator is required to go through the facilitation notes and the facilitation methodology for each session. Additional materials for the unit are provided in the links available in the sessions and in the facilitation notes. The facilitator can make reference to local knowledge to explain events.

Notes for the facilitator

Section 1: QUIZ

The Objective*: is to assess the climate knowledge of the audience in order to better guide the communication for an effective transmission of climate sciences*

Methodology: (i) Train X groups, (ii) choose a reporter from each group, (iii) each group answers the different questions and the answer is given by the leader of the group (iv) finally the leader gives the correct answers

- **Africa has the climate below?:**
    1. The equatorial Climate
    2. The monsoon climate
    3. The tropical climate
    4. The desert climate
    5. The altitude climate

- **What is the name of the desert below Sahara?**
    1. The Sahara
    2. The south-Sahara
    3. The Sahel

- **What is the definition of climate?**
    1. The interaction of the three main factors: the air conditioner, mountains and crops.
    2. The climate is the average weather conditions (temperature, precipitation, sunshine, humidity, wind speed, etc.) that prevail over a given area over a long period of time. For the **World Meteorological Organization**, it must be at least 30 years old.
    3. The climate corresponds to the problems between the USA and the rest of the world on the management of industrial waste

- **The Paris Agreement aims to limit global warming to?:**

1. + 2 ° Celsius maximum by the end of the 21st century.
2. + 1.5 ° Celsius maximum by the end of the 21st century.
3. + 2 ° Celsius maximum by the end of the XXVth century.

- **Question A : Africa emits about 4% of global greenhouse gas emissions**
  1) True
  2) False

- **Question B : CO2 is the main natural greenhouse gas**
  1) True
  2) False

- **Question C : Identify in the list below the climate-related risks**
  1) Drought
  2) Coastal erosion
  3) floods
  4) Shortening of the rainy season

- **The IPCC is:**
  1) Inter-State Group of Companies on Copper,
  2) Intergovernmental Panel on Climate Change,
  3) Group of Electro Cardiac Nurses.

Adaptation, mitigation or resilience?

1.  → 

2.  → 

3.  → 

Section 2: Definitions of some concepts

What is weather?

Weather: state of the atmosphere, describing for example the degree to which it is hot or cold, wet or dry, calm or stormy, clear or cloudy etc.

Weather is known as the condition of the atmosphere over a period of time. It refers to day-to-day temperature and precipitation activity.

What is climate?

The climate is the average weather conditions (temperature, precipitation, sunshine, air humidity, wind speed, etc.) that prevail over a given area over a long period of time.

For the World Meteorological Organization, it must be at least 30 years.

Climate: averages, but also extremes. Since it is translated into averages, the climate is also characterized by extremes and variations. It results from the interaction of the three main reservoirs: the ocean, the atmosphere and the continental surfaces (including the polar ice caps).

What is climatology and meteorology?

Climatology: known as climate science is the study of climate, scientifically defined as weather conditions averaged over a period of time. Given the wide scientific and societal significance of climate and its study, the origins of the terms climate and climatology are of interest. They are traced from their earliest usages in English. The early references are in general scientific works but later climatology evolves as a science in its own right.

Meteorology: the scientific study of the atmosphere that focuses on weather processes and forecasting. Meteorological phenomena are observable weather events which illuminate and are explained by the science of meteorology. Those events are bound by the variables that exist in Earth's atmosphere.

What is climate system and scenarios?

Climate system: The term "**climate system**" refers to an ensemble that includes the atmosphere, the hydrosphere, the biosphere and the geosphere, as well as their interactions.

Climate scenarios: Climate scenarios are long-term visions of future climate change (i.e.: climatic parameters) as well as the main socio-economic parameters in a given locality. They make it possible to estimate the vulnerability of the country and to anticipate with adaptation measures.

What is climate variability?

Climate variability : is defined as long-term averages and variations in weather measured over a period of several decades. Evidence for changes in the climate system abounds, from the top of the atmosphere to the depths of the oceans. Climate, sometimes understood as

the "average weather," is defined as the measurement of the mean and variability of relevant quantities of certain variables (such as temperature, precipitation or wind) over a period of time, ranging from months to thousands or millions of years.

What is Adaptation, Mitigation and Vulnerability?

- **Adaptation:** is the set of responses (solutions) to the harmful or positive effects of climate change. It can be done naturally, or by a spontaneous reaction (for example in the face of a climatic disaster) or be anticipated as part of a planning.
- **Mitigation**: is concrete measure to limit global warming.
- **Vulnerability**: is the level at which a system can be degraded or damaged by climate change. It depends on both physical and socio-economic factors.

What is resilience?

Resilience: A concept **derived from physics**, resilience refers to the ability of a material to recover its original shape after deformation.

In **sociology and psychology**, resilience is the ability of an individual or group to rebuild after trauma.

In **ecology**, resilience is defined as the ability of an ecosystem to recover its functions after major disturbances, whether natural (fire, flood, storm ...) or related to human activities (hunting, agricultural practices, pesticides ...) . For example, the resilience of a forest ecosystem after a fire describes its ability to recover from the regrowth of resistant trees, seeds in the soil, wind-blown seeds, animals, etc.

Another illustration: agroforestry is a set of agricultural techniques favorable to the resilience of agriculture in the face of climate change, thanks to the protection of crops against climatic excesses (wind, cold, storms, floods ...), the limitation of runoff and evaporation, to the diversification of the sources of income

What is climate change?

According to the United Nations Framework Convention on Climate Change (UNFCCC) CCs are all changes directly or indirectly attributable to human activities that affect the composition of atmospheric air and add to the natural variability of climate.

The natural variability of the climate expresses the variations of the average state of the climatic variables: ex. a year it rains a lot, the following year is dry; one year, the start of the rainy season is early and then late another.

- **Causes of climate change**

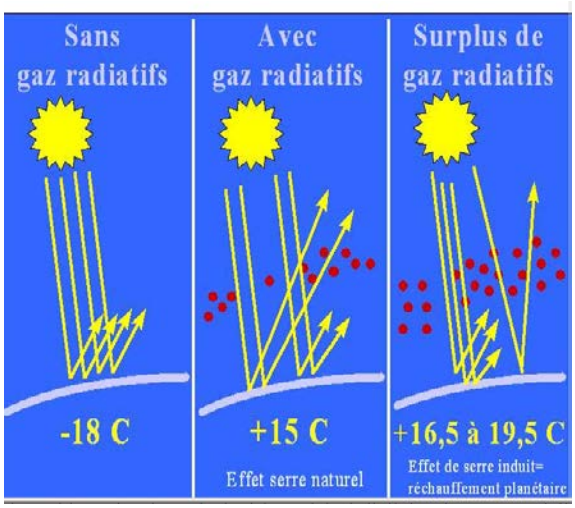
  - **Natural causes**
    - Changes in atmospheric composition of greenhouse gases (GHGs) of natural origin
    - Variations in solar activity
    - Accidental influence: massive volcanic dust discharges,

  - **Human causes**
    - The massive release of GHGs into the atmosphere due to human activities (energy supply, industry, transport, deforestation, agriculture)

What is Greenhouse effect and GHG?

The greenhouse effect is the trapping in the lower layers of the atmosphere of the radiation emitted by the earth to the atmosphere.

1) Without a natural greenhouse effect (without water vapor in the atmosphere) the average temperature on Earth would drop first to -18 ° C.
2) However, observations on the temperature show an average temperature of the earth of the order of + 15 ° C. This difference in temperature is due to the natural greenhouse effect.
3) With the observed increase in greenhouse gases, global mean temperature is expected to be + 16.5 ° C and 19.5 ° C



Energy supply, industry, forestry (deforestation), agriculture (release of nitrates, land clearing, biomass decomposition, etc.) transport (use of fossil fuels such as oil) are the most emitting sectors of GHGs.

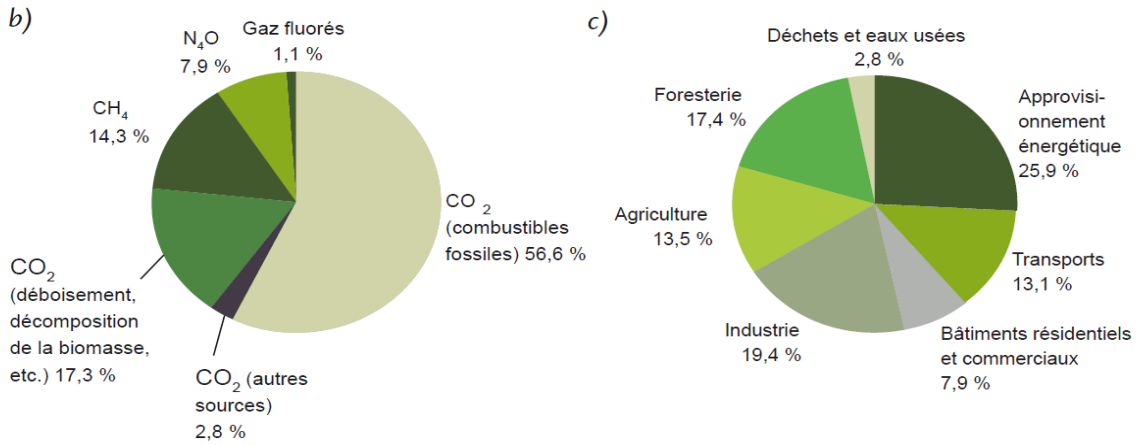
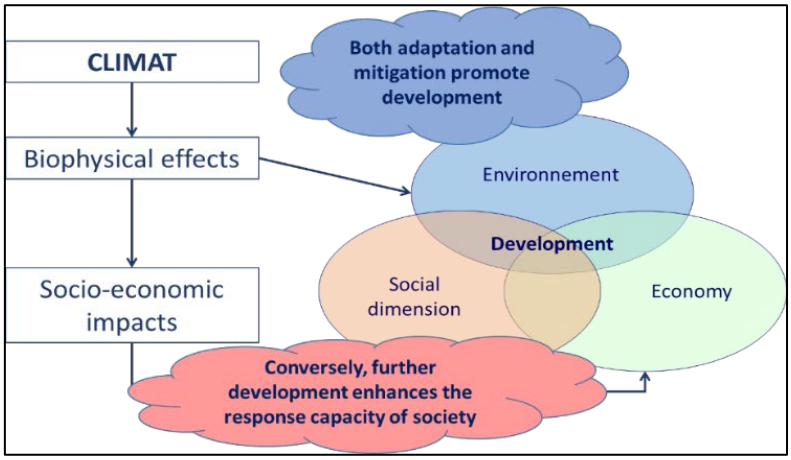


Figure 1 : Emissions mondiales de GES d'origine anthropique (source : GIEC[2])

Section 3: Links between climate and development



1) Climate and Sustainable Development Goals (SDGs)

From the Millennium Development Goals (MDGs) to the Sustainable Development Goals (SDGs). The 2030 Agenda for Sustainable Development, a real roadmap for sustainable development for the next 15 years, is formally adopted in New York, the United Nations 2015 Summit for Sustainable Development (New York, 25-27 September 2015).

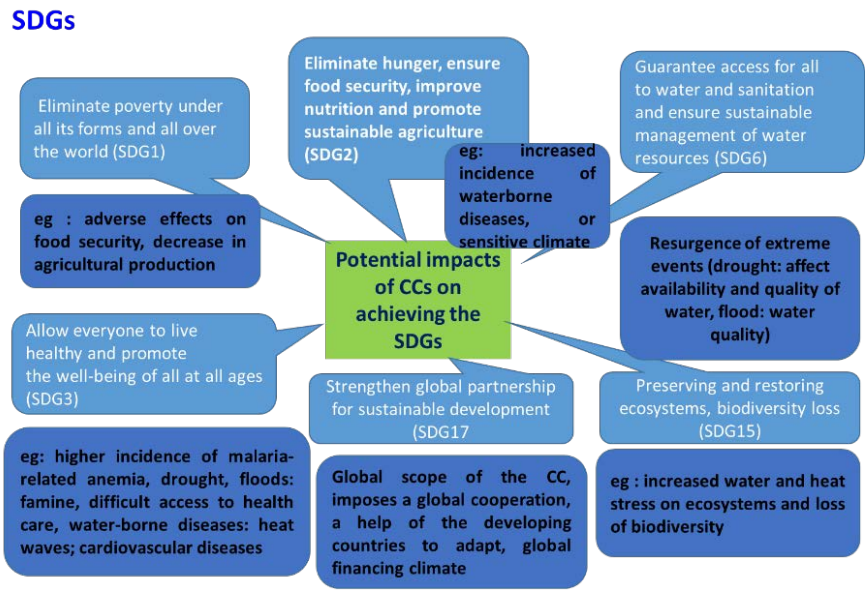
The Sustainable Development Goals (SDGs) are applicable to both developing and developed countries and cover the three pillars of sustainable development (economic, social and environmental).

The SDGs number 17 and are themselves broken down into 169 targets or sub-objectives.

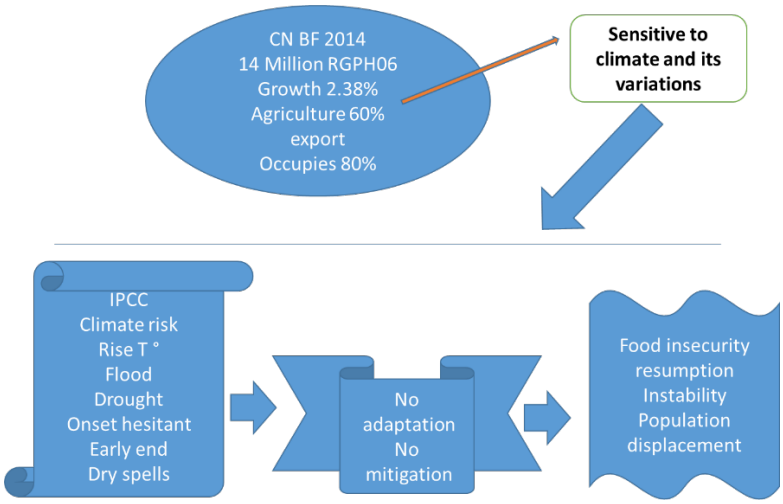
Climate issues and changes are reflected in a specific SDG (SDG13), and in various other SDGs that reflect the vulnerability of the poor to extreme weather events: SDGs for combating poverty, hunger, health, water resources, land degradation and loss of biodiversity

SDG 13: Take urgent action to tackle climate change and its impacts

2) Sustainable Development Goals (SDGs)

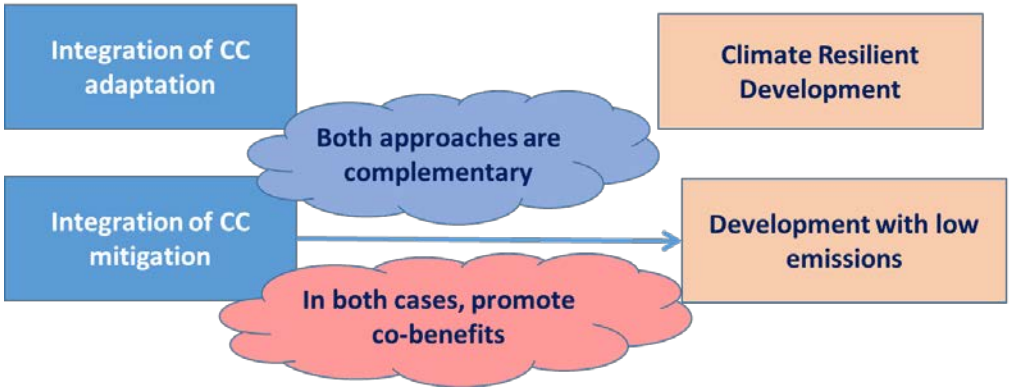


3) Climate change and Sustainable Development Goals

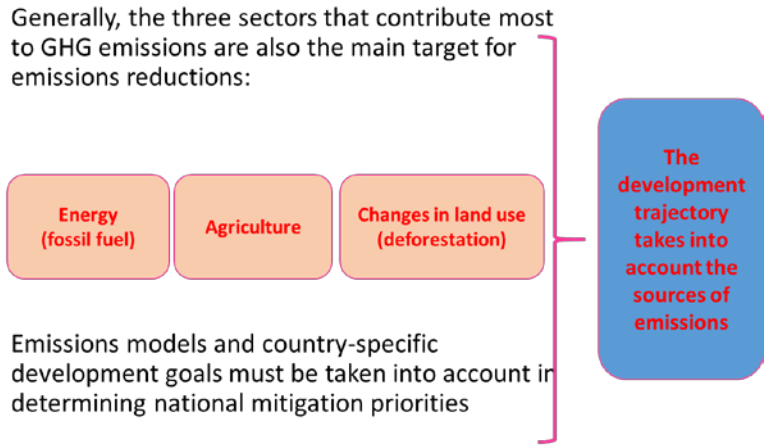


4) Climate resilient development

It is the integration of CC into Local Policy and Planning processes that can lead to climate-compatible development.



➢ ***A development with a low carbon emission***



- In general, the greatest potential for containing greenhouse gas emissions is in:
- Improved energy efficiency (across all uses / sectors)
- Use of low emission technologies to produce heat and electricity
- Use of more sustainable modes of transport
- Reduced deforestation (and cessation of desertification)
- Change in agricultural practices, for example.
    - More efficient use of nitrogen-based fertilizers
    - improved manure management

Section 4: Local/indigenous climate science

Rely on local understanding of the relationship between temperature and rainfall to explain the technical aspects of scientific predictions of rainfall based on sea surface temperatures (SST).

Peasant interpretations of wind movements also recognize the sea as the origin of the rains. During the dry season, farmers expect the winds to blow westward, that is, to take water from the ocean, and then return by blowing eastward to beginning of the winter season. Farmers predicted and explained the drought from the absence of such winds (Carla, 2001).

Beyond our study area, different communities use baseline indicators to decide what to do and monitor food production. These indicators include:

- The period, intensity and duration of cool temperatures in the dry season;
- The production of flowers and fruits by certain plant species;
- Animal behaviors such as insects, birds, frogs ...;
- The movements of constellations;
- The circulation of the winds;
- The succession of seasons...

A publication in the journal of the Union of Chemical Industries (UIC) of CHAMPAGNE-ARDENNE clearly shows us that at the base of a traditional interpretation on the indicators is a scientific explanation:

In Peru and Bolivia, at the end of June (often during the St. John's Day, winter solstice for this hemisphere), farmers, who grow potatoes in the Andean highlands, gather in small groups in the middle of the night to climb the mountains. Once at the summit, they watch for the appearance, just before dawn, of the Pleiades (group of stars located in the constellation Taurus in the direction of the North-East) at the level of the skyline. If the Pleiades are brilliant and numerous, it means that the year will be rainy and the harvests good. On the other hand, when they are pale and in small numbers, the year will be dry, with poor harvests.

Later, studies have shown that the appearance of El Niño results in less abundant rainfall. Statistics from the International Potato Center in Lima indicate a strong correlation in this region between rainfall and yields. In a normal year, summer high winds blow from east to west into the highlands and raise moist air from the Amazon Basin, and then follow the mountain ranges south. In years when El Niño is present, high winds blow from west to east and reduce the moisture supply to crops. El Niño initiates the formation of a thin layer of clouds that veils the sky, which helps to make the Pleiades paler and less numerous because the less luminous are masked, as is well observed by the farmers.

1) Biophysical Indicators of season characteristics

- **Astral Indicators**

- **The Grand Chariot (Constellation of the Big Dipper)**

It consists of four feet or four legs, two posterior and two anterior. These four stars, feet or paws of the camel, form the chariot of the Big Dipper. The four legs are connected to the three neck stars composed of three cervical vertebrae. If the three cervical vertebrae are easily identifiable, the head is a problem: it is probably Arcturus (Edmond, 1989) which punctuates, far enough from the previous three, the end of the constellation

- When the Grand Chariot appears to the North after the sunset between May and June, with the shape of a camel sitting looking towards the East: This is the beginning of the rainy season. The farmers know that it is time to sow even if the rain does not fall, some give themselves to dry sowing knowing that it is still time for this activity.

- When the Grand Chariot appears to the northwest after the sunset between September and October, with the shape of a camel standing this time, the head looking to the west: the peasants know that this is the end of the rainy season.

- **The Pleiades (Constellation of the bull)**

The Pleiades are a cluster of stars at first sight, but their observation can distinguish six or seven of these stars (Zan Diarra, 1988). It is a most spectacular stellar open cluster, clearly visible to the naked eye in the form of a small cauldron, formed by the 7 main stars

- When the Pleiades disappear in the West after the sunset: it is the beginning of season of rains. This is the period from April to May during which we can record a few times the first rains. But the peasants say that they do not always sow at the end of these rains. The peasants speak of 7th and 8th month which would correspond to the traditional period of observation;

- When between May and June, the Pleiades reappear in the East towards dawn, that is to say around 4 to 5 am in the morning: it is the beginning of sowing;

- When at dawn always we observe the Pleiades in the middle of the sky towards 4-5 in the morning, it is the end of sowing and the actual installation of rains; and this corresponds to the 9th month of their traditional agricultural calendar which is roughly equivalent to July-August.

Usual name	***Latin name***	***Behavior***	***Period***	***Expected Result***
Grand chariot	*Ursa Major*	*Appearing northward after sunset, Form of camel sitting looking towards East*	*May-June*	*Beginning of rainy season (Beginning of sowing)*
Grand chariot	*Ursa Major*	*Appearance to the northwest after sunset, Camel shape while standing head looking West*	*Sept-Oct*	*End of rainy season*
Pleiades		*Disappearance of Pleiades in the West after the sunset*	*April-May*	*Rainy season start / Fall of first rains in ten days*
Pleiades		*reappear in the east around 4-5 in the morning*	*May-June*	*Beginning of sowing*
Pleiades		*Arrival of Pleiades in the middle of the sky towards 4-5 of morning*	*July-August*	*End of sowing and Actual installation of rains*

- **Plant indicators**

In West Africa, through years of observation, farmers have developed traditional ways to predict the characteristics of all seasons of the year. To the order of these means known as basic knowledge, or traditional knowledge, or indigenous knowledge, they use indicators such as plants whose observation of the phenological phases of some of them, allows to monitor and to predict the start, end and quality of the rainy season.
We have inventoried with the farmers a great diversity of plants considered as indicators that fall within the framework of the tools they use to forecast the rainy season.

Usual name	*Nom latin*	**Behavior of the indicator**	Period	Expects Resultat
Prune tree	*Sclerocarya birrea*	Maturing fruit	May-June	Beginning of the rainy season (Falling from the first rains in about ten days)
Annone tree	*Annona senegalensis*	Maturing fruit	End of May-beginning of June	Beginning of the rainy season / beginning of sowing
Baobab tree	*Adansonia digitata*		April May	Beginning of the rainy season
Bauhinia	*Bauhinia rufescens*	Regeneration of leaves	Mai-Juin	Beginning of the rainy season
Cassia	*Cassia sieberiana*	Flowering	April May	Early rainy season (dry sowing) Beginning of the rainy season)
Combretum	*Combretum micranthum*	Regeneration of leaves		Beginning of the rainy season
Combretum	*Combretum*	Leafing, flowering	May June	Beginning of the rainy season

	glutinosum			
Doumier	*Hyphaene thebaica*	When its dry leaves are not breakable	May June	Beginning of the rainy season
Doumier	*Hyphaene thebaica*	When nuts are well formed	May June	Beginning of the rainy season
Ebénier of West Africa	*Diospyros mespiliformis*	foliation	April May	Beginning of the rainy season

- **Animal Indicators**

Birds are also among the most important categories of basic indicators in this West African zone that concerns us. Their arrival and activity informs farmers about agricultural activities and even sometimes the strategies to implement in order to maintain household food security. In this area, the best-known birds in the forecast setting of the winter season are the stork and the little red-billed hornbill. These are two well-known migratory birds in West Africa that arrive early in the winter and return with the end of the winter season.

- The arrival of the storks or Ciconia nigra indicates to the farmers the start of the rainy season. These birds usually arrive between May and June, when the monsoon begins to blow. Like the plants, we must also say that, the early season indicator birds do not predict the day of the first rain, but rather, they show the farmers that it is the right time to prepare the fields for cultures. “The elders inform us that the stork does not come at once to settle, she made a first arrival in the village in April, after nesting, she returns to return in 1 month: it is the start then of the wintering, and some farmers can sow dry. About the stork, in some areass it is the arrival of these birds which counts, but elswere the number of the birds is very important for the forecast. Thus in this last zone, it is thought that the arrival of a small number of Ciconia nigra predicts a good rainfall and therefore the season will be favorable. On the other hand, the arrival of a large number of these birds in the village indicates a bad winter season”.

- The arrival also of Red-billed Hornbill or Tockus erythrorhynchus also show the farmers the beginning of the rainy season. It is a migratory bird, and farmers usually observe its migration from South to North between April and May. It passes in large group towards the North. Although they are found in the area during wintering. It is clear that the birds continue to the north, and it is at the end of the winter season precisely during the harvest in September-October that we also observe its migration from North to South.

- **Insects and worms**

Insects also start their arrival or appearance and especially their activities, are part of the indicators that inform farmers about the characteristics of the rainy season. Most of its insects are mostly used for short-term forecasting. They insect concerned are bees, Cicada, Locust, locust, Ants, Stinging winged ants, Red insect, scarab, termites, winged termites, flying termites, earthworms, etc.

- **Fish, reptiles, amphibians and others**

Fish, reptiles and amphibians are also involved in traditional seasonal forecasting in West Africa.

The wind seems to be the best-known and best used indicator by farmers in all the villages we surveyed. What is more important with this indicator is that the interpretation of its behavior does not suffer from contradiction even small nuances as is the case for other indicators. What is followed by his behavior is speed, direction, and direction. It is therefore observed very ready to know the beginning and the end of the season, as well as the quality of the rainy season.

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UNIT TWO: CURRENT AND FUTURE CLIMATE TRENDS AT GLOBAL AND LOCAL LEVELS

Unit 2: Current and Future Climate Trends at global and local levels	
Content:	This unit describes: ▪ *the evolution of the current and future climate* ▪ *the impacts of Climate Change on natural and human systems*
Objective:	The objective of the unit at end is to: ▪ *Improve knowledge on the evolution of the current and future climate* ▪ *Improve understanding of the impacts of CC on natural and human systems*
Participants:	*Scientists, reporters, decisions makers, practionners such fields workers (NGOs, etc)*
Method of training:	Participatory training/facilitation methodologies, lectures, group discussions, case studies, PowerPoint presentation, etc.
Training material	Flip charts, notebooks and pens, marker pens, white board, white board markers, projector
Exercises	
Duration:	40 mins
Evaluation:	To be decided by the facilitator
Reference Material	Thornton, and Heinke (2009): Crop Physiological Response to Climate Change (Peanut, Senegal OCDE(2009) Adaptation au changement climatique et coopération pour le développement: document d'orientation. Editions OCDE, Paris Stern N. (2007) The Economics of Climate Change: Stern Review. Cambridge University Press: Cambridge. M. Ly et al. (2013), Evolution of some observed climate extremes in the West African Sahel, Weather and Climate Extremes 1 19–25 GIEC 2007 et 2013, degré de confiance élevé à très élevé ; BAD, 2013 Thornton, and Heinke (2009): Crop Physiological Response to Climate Change (Peanut, Senegal) Ali, A. and T. Lebel (2008). "The sahelian standardized rainfall index revisited." International Journal of climatology 10(1002/joc.1832

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Description of facilitation methods

Before starting the training, the facilitator is required to go through the facilitation notes and the facilitation methodology for each session. Additional materials for the unit are provided in the links available in the sessions and in the facilitation notes.

Notes for the facilitator

Section 1: Climate trends

1) Global temperature trends

The IPCC (2007) concludes with a very high degree of confidence (probability> 90%) that human activities since 1750 have the net effect of warming the global climate.

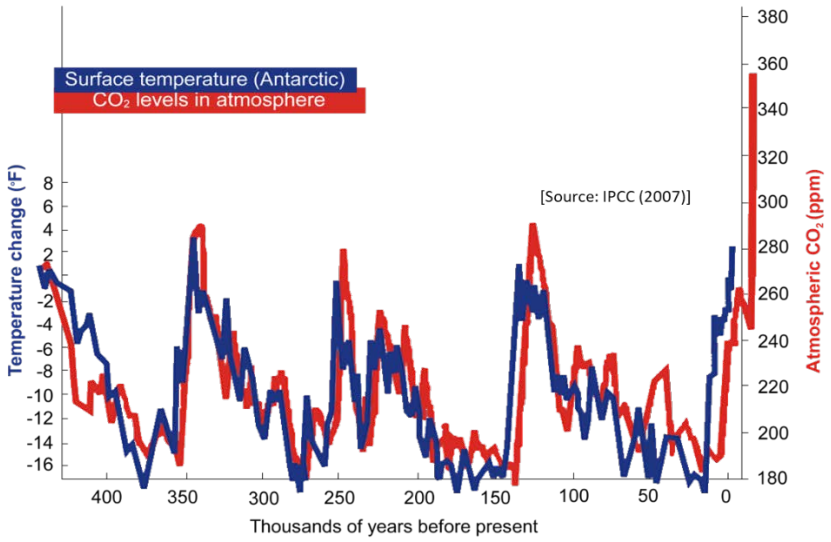


Figure: *Correlation between atmospheric CO2 and the air temperature (Source IPCC 2007)*

From 1906 to 2012, the average temperature on the surface of the earth increased by 0.80°C (IPCC, 2013)

During the period 1901 -2010, the mean sea level rose by 0.19 m

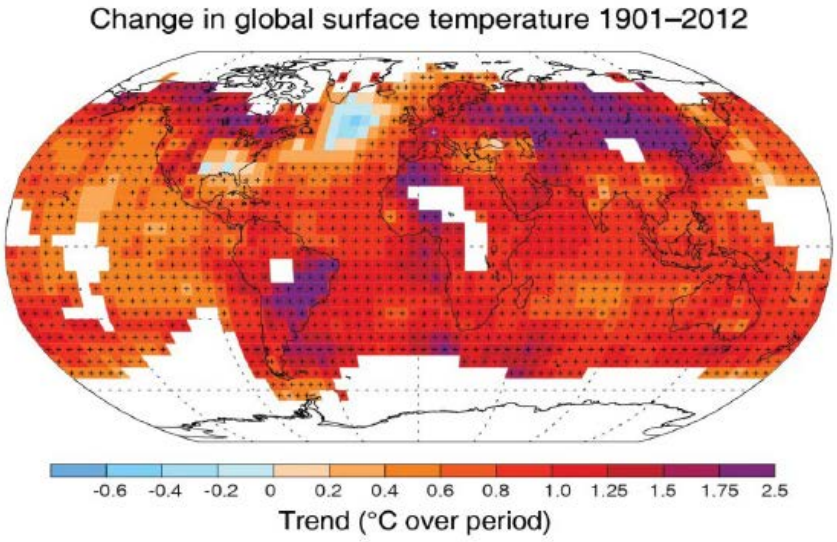
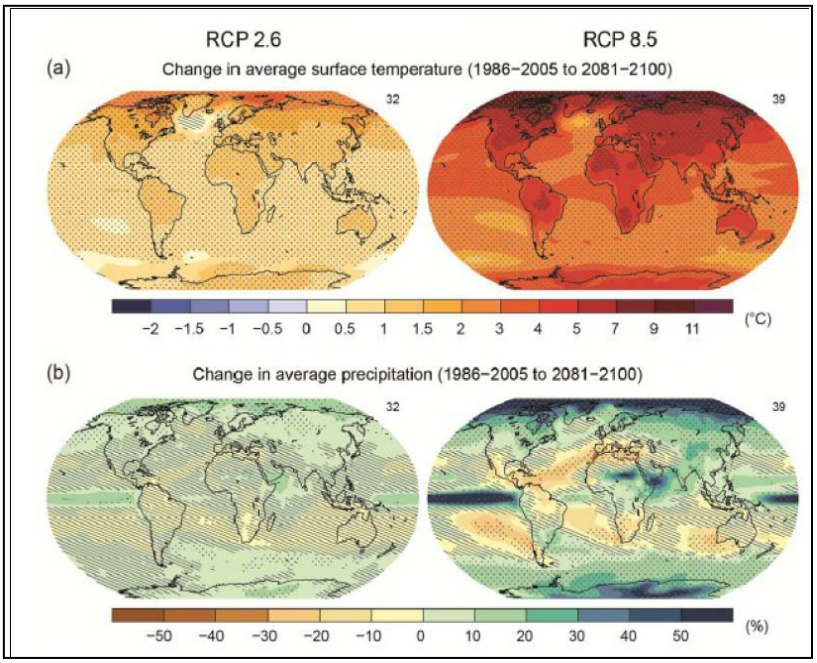


Figure: Change in global surface temperature 1901-2012 (Source: IPCC 2013)

➢ **Global current and future trends in climate: temperature and precipitation**

✓ Increased temperatures at the end of the 21st century by 2°C for the optimistic scenario (mitigation policy) and at + 4°C for the pessimist scenario.

✓ For future rainfall, few significant variations in West Africa. However, there are still many differences between models and many uncertainties.



(GIEC, 2013)

2) Current climate trends in the Sahel precipitation

➢ 50s wet and 70s, 80s dry

➢ Since the 1990s and 2000, greater interannual rainfall variability

➢ This variability of rains is associated with an upsurge of heavy rains and floods in several places in West Africa

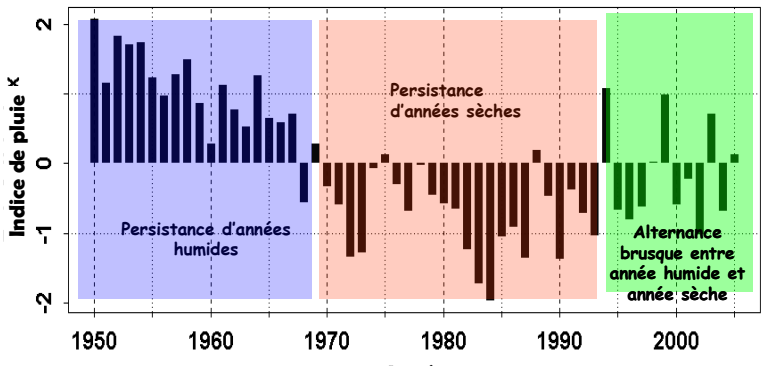


Figure: Evolution of the rainfall index in the Sahel from 1950 to 2005, Source: Agrhymet

3) Evolution of some observed climate extremes in the West African Sahel

- Decrease of cold nights
- Increase of warm days
- Increase of warm spells
- Decrease of Diurnal temperature range

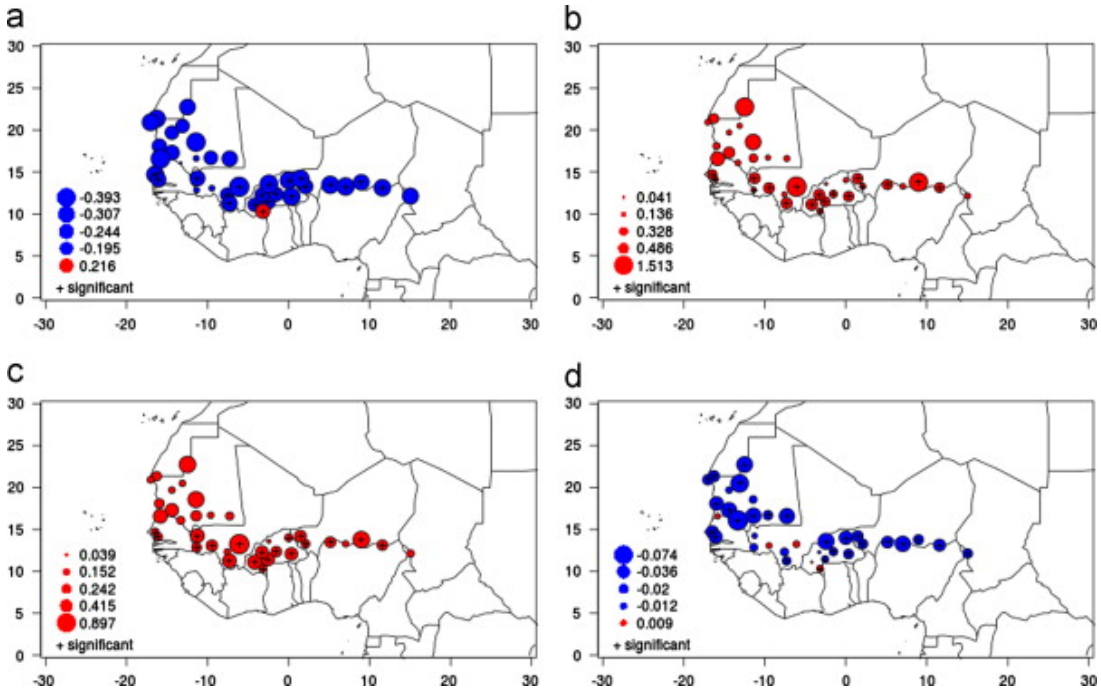


Figure: Observed trends in some temperature indices in West Africa from 1960 to 2010. (a) Cool nights (Tn10p), (b), Warm days (Tx90p), (c) Warm Spells (WSDI), and (d) Diurnal temperature range (DTR).

- Decrease of total annual precipitation
- Increase of cumulated rainfall of extremely wet days
- Decrease of Maximum Consecutive Wet days

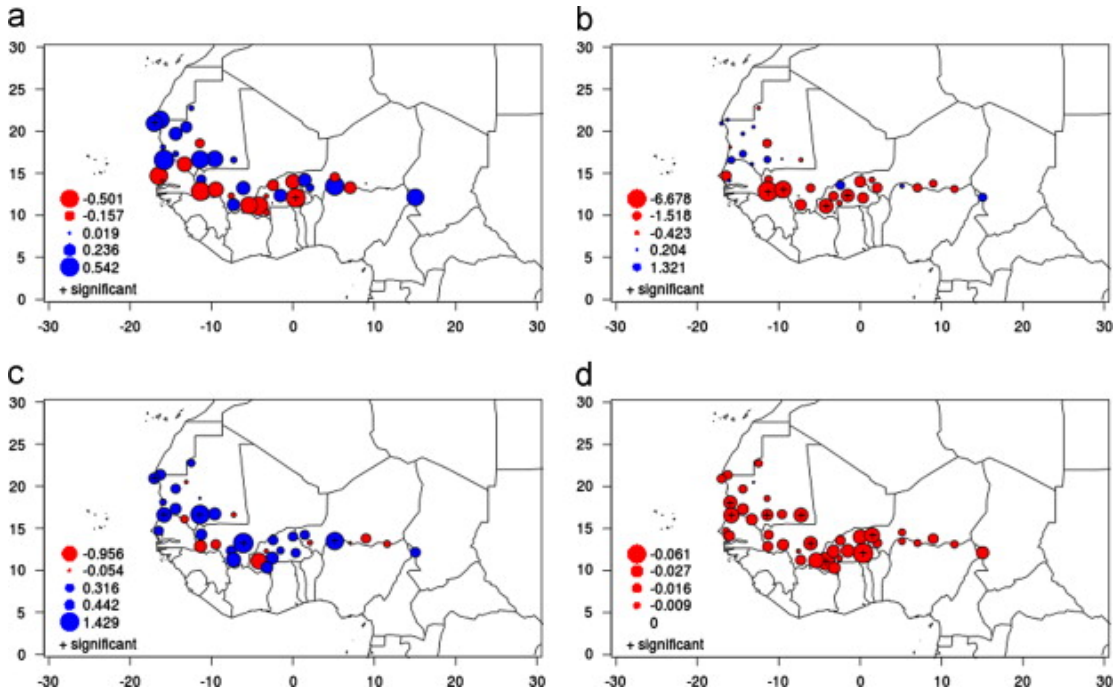


Figure: Observed trends in some rainfall indices in West Africa from 1960 to 2010. (a) 5-day cumulative rainfall, (b) Total annual precipitation, (c) Cumulated rainfall of extremely wet days, and (d) Maximum Consecutive Wet days. M. Ly et al. / Weather and Climate Extremes 1 (2013)

Section 2: Climate impacts

1) Main consequences of CC

Biophysical impacts

- Changes in (i) rainfall patterns (ii) water quality and availability (iii) ecosystems (iv) disease cycles, pests
- Malfunction of the seasons
- High frequency or intensity of floods, droughts,
- Erosion,
- Desertification
- Loss of biodiversity, ...

→

Socio-economic impacts

- Damage and destruction of infrastructures
- Decrease in crop production, food security and malnutrition
- Economic and social disorders,
- Loss of livelihood,
- Increase in mortality and morbidity,
- Decrease in hydropower generation capacity,
- Conflicts, population, displacements, human migration, ...

Climate impacts?

2) Future climate impacts

➢ Crop Physiological Response to Climate Change (Peanut, Senegal):

All models simulate a drop in peanut yield of 5 to 25% between 2000 and 2050

Notes: A1B = greenhouse gas emissions scenario that assumes fast economic growth, a population that peaks midcentury, and the development of new and efficient technologies, along with a balanced use of energy sources; CNRM-CM3 = National Meteorological Research Center–Climate Model 3; CSIRO = climate model developed at the Australia Commonwealth Scientific and Industrial Research Organization; ECHAM 5 = fifth-generation climate model developed at the Max Planck Institute for Meteorology (Hamburg); GCM = general circulation model; MIROC = Model for Interdisciplinary Research on Climate, developed at the University of Tokyo Center for Climate System Research.

Source: Authors' estimates based on Jones, Thornton, and Heinke (2009)

➢ Future impacts

In the rest of the report, GIEC experts set out the effects of these changes:

- Beyond 2 to 3 degrees more than in 1990, warming will have negative impacts on all regions of the globe.
- Above 1.5 to 2.5 ° C more, 20 to 30% of animal and plant species may disappear.
- The number of flood victims could increase by two to seven million people each year.
- By 2080, droughts, soil degradation and salinization will lead 3.2 billion people to run out of water and 600 million to starvation.
- The consequences of these floods will be more severe where population pressure is increasing and in the large deltas of West Africa, Asia or Mississippi.
- "Poor people, even in prosperous societies, are the most vulnerable to climate change," the experts added during the press conference.
- Political Chipotage

➢ Regional impacts in Africa

By 2020, 75 to 250 million people are expected to suffer from a lack of water accentuated by climate change.

- Increased risk of climate-sensitive infectious diseases (vector-borne, waterborne and respiratory diseases) of cardiovascular diseases during heatwaves; increased victims of disasters such as floods,
- By 2020, in some countries, the yield of rain fed agriculture could fall by 50%, with serious consequences for food security and malnutrition, i.e. agricultural losses of 2-4% of the countries' GDP. 75% of the African population could be exposed to hunger

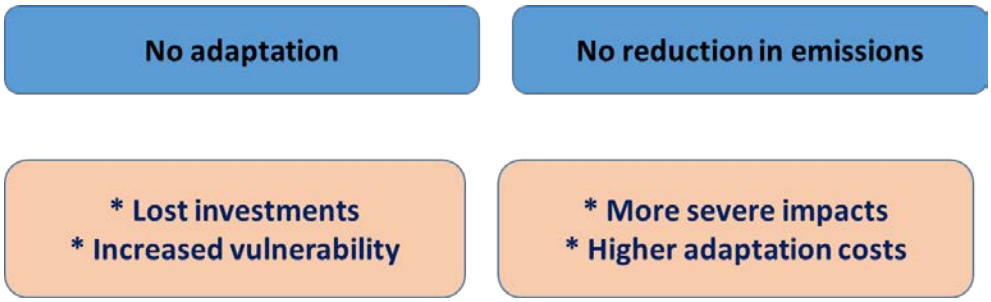
- By 2100, the anticipated rise in sea level will affect the densely populated coastal lowlands (coastal erosion, floods, salinization, etc.) The cost of adaptation will be 5 to 10% of the GDP of the coastal countries.
- By 2080, according to several climate scenarios, the area of arid and semi-arid lands could increase by 5 to 8%.

Intensification of migration, conflicts (due to the sharing of scarce resources)

Source: IPCC 2007 and 2013, high to very high confidence; AfDB, 2013

➢ **Adaptation and inaction in the face of climate change**

- Uncertainties related to climate change should not justify inaction
- However, in a medium and long term perspective, inaction today may be more costly:



See N. Stern 2006 report on the economics of climate change: current costs of adaptation would be 17 to 187 billion US dollars, costs could reach 100 billion US dollars in 2050 according to the World Bank (2010). In all the bags these costs are lower than the costs of inaction

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UNIT THREE: CLIMATE SERVICES

Unit 2: Climate Services	
Content:	This unit describes: ▪ *climate services* ▪ *climate information needs* ▪ *Information Technology that meets the needs of users*
Objective:	The objective of the unit at end is to improve the: ▪ *knowledge on climate services* ▪ *knowledge on identifying climate information needs* ▪ *synthesis of Information Technology that meets the needs of users*
Participants:	*Scientists, reporters, decisions makers, practionners such fields workers (NGOs, etc)*
Method of training:	Participatory training/facilitation methodologies, lectures, group discussions, case studies, PowerPoint presentation, etc.
Training material	Flip charts, notebooks and pens, marker pens, white board, white board markers, projector
Exercises	
Duration:	30 mins
Evaluation:	To be decided by the facilitator
Reference Material	Sénégal (2016). Plan d'actions du Sénégal (2006-2020) pour la mise en place du cadre national pour les services climatologiques (cnsc). 77 pages VINCENT LIDSKY et al (2017). Les outils de gestion des risques en agriculture. 57 pages https://ideas4development.org/services-climatiques-levier-developpement/

Description of facilitation methods

Before starting the training, the facilitator is required to go through the facilitation notes and the facilitation methodology for each session. Additional materials for the unit are provided in the links available in the sessions and in the facilitation notes.

Notes for the facilitator

Section 1: climate services

What is climate services?

- *Climate services are the production and contextualization of information and knowledge derived from climate research, which aims to support decision-making at all levels of society*
- *These services can be divided into three categories:*
  - ✓ ***long-term climate projections*** *that study the evolution of rainfall, winds, sunshine, etc. in the future ;*
  - ✓ ***short- and medium-term forecasts*** *(day, month or season) that allow all players to optimize their choices;*
  - ✓ *and finally, these same* ***short-term forecasts****, but used to reduce the risk of disasters such as drought, flood, etc. alerts.*

Purpose and role of climate services

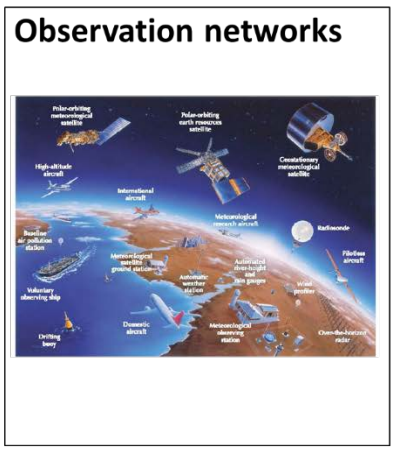
- A climate service aims to provide a range of resources (data, products, decision support, ...) directly usable by the actors involved in the actions induced by climate change (impact, adaptation, mitigation)
- It plays a role of interface and coordination between the needs (sphere of the users) and the available resources (sphere of the research)

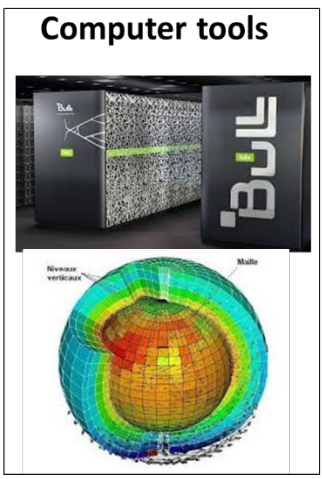
Users of climate services

Everyone, at all levels, uses climate services to manage their hobbies or professional activity: from the individual who checks the weather to take a walk to the local authorities who receive "heavy rain" warning bulletins, including the project manager who needs to know the evolution of future rains to correctly size his wastewater treatment.

Section 2: Basics needs of Climate Information Services

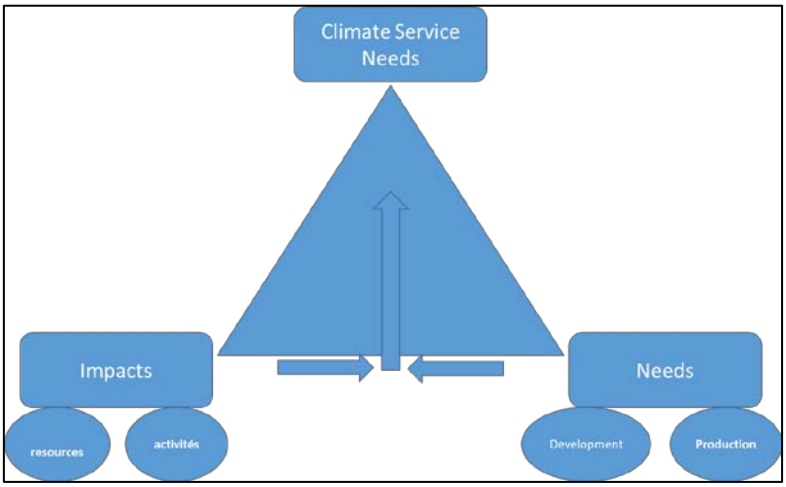
- ➢ Observation networks
- ➢ Powerful computers
- ➢ Qualified Human resources

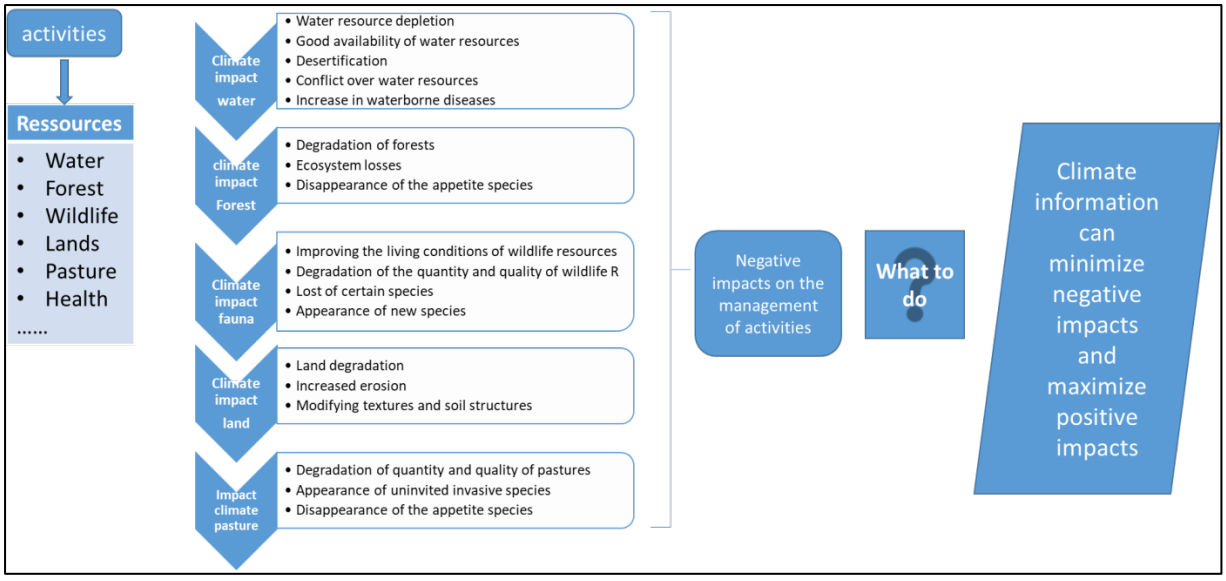




Section 3: Constraints on the applicability of climate and weather information

- Quality of information products,
- Availability of data at appropriate scales
- Difficulties in communication
- Difficulties in interpreting the information produced.





For any activity, there is a need to define:

- Basic resources of the activity
- Major climate risks on resources
- Sub-activities that contribute to the achievement of the activity
- Information requirements (operational / strategic) to:
  - minimize negative impacts
  - maximize positive impacts
- The best channels to transmit information:
  - operational
  - strategic
- The ability of climate services to transmit this information

The challenge of climate services is:

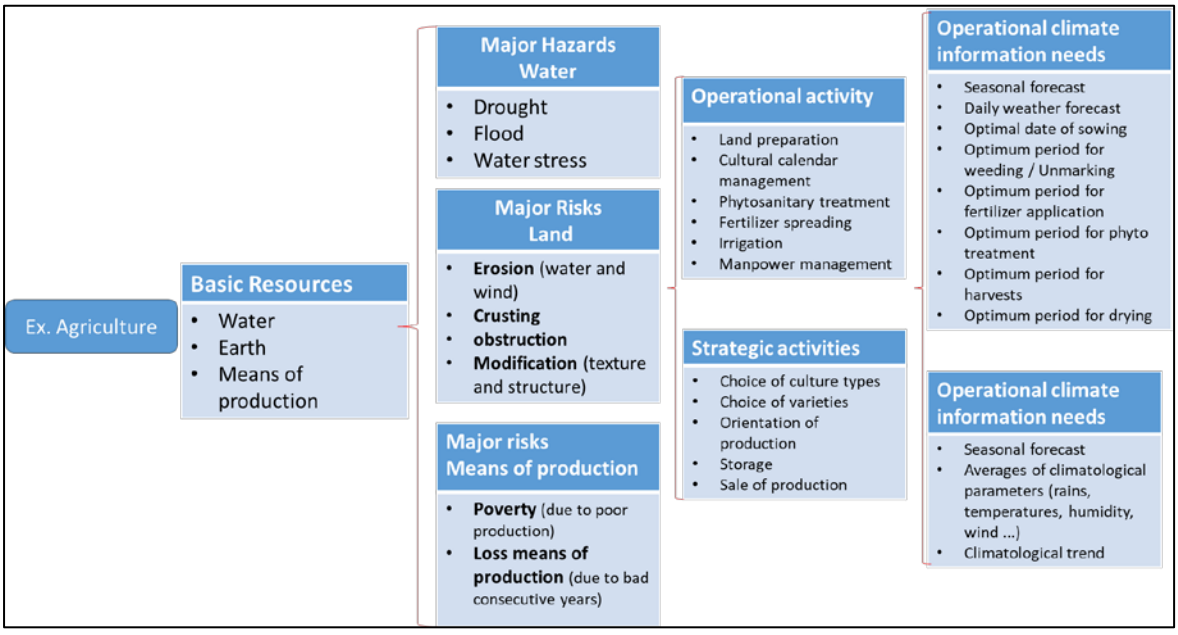
- User needs analysis
- dissemination of information

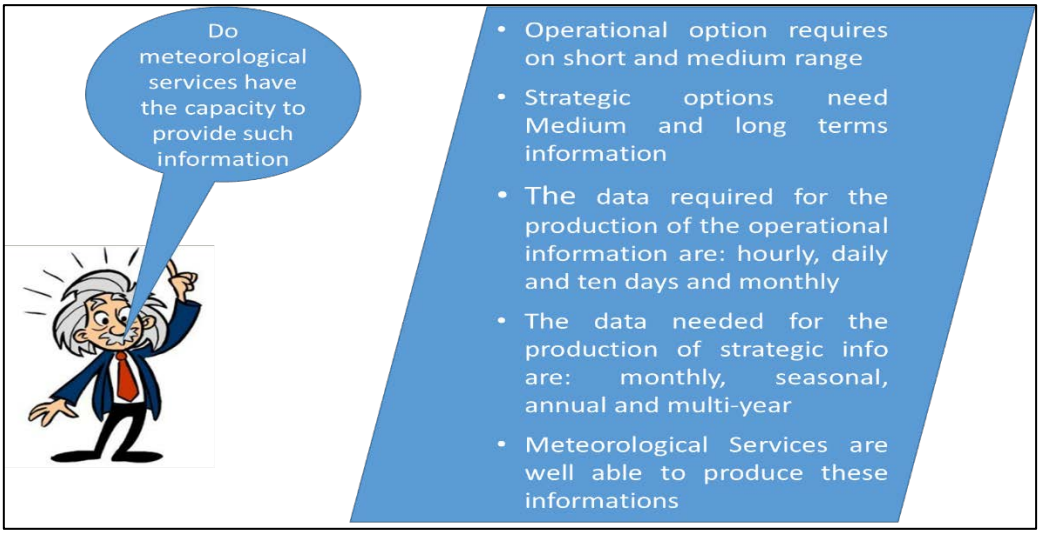
The difficulty in analyzing user needs lies in the fact that:

- The users are numerous and each one has specific needs.
- In Africa the major activities are agropastoral

So the main users of climate information are:

- Farmer
- Breeder
- Sinner
- Carrier
- Buildings and Public Works





Are Southern countries well equipped for this?

- Some have good information production capacity at the meteorological agency level, but the diffusion is insufficient.
- Information production, dissemination and needs analysis are three areas of climate services in which much can be done in the South.
- A better knowledge of users is fundamental.
- It must also be admitted that meteorological stations and radars are aging, in West Africa for example.
- Investments in these infrastructures are therefore necessary, but the information does exist and is reliable.
- The whole issue of climate services is the dissemination of information, whatever the means of transmission: SMS, radio bulletin or voice server ...

References

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Site : https://ideas4development.org/services-climatiques-levier-developpement/

UNIT FOR: DISSEMINATION OF CLIMATE INFORMATION

Unit 2: Dissemination of climate information	
Content:	This unit describes: ▪ *climate services to be more comprehensible for users* ▪ *mean of transmitting climatic information to users* ▪ *Importance of regularity and the need to find the best time slots to meet the needs of users* ▪ *Use of indigenous Knowledge in communication of the climate information.*
Objective:	The objective of the unit at end is to: ▪ *Make the contents of climate services more comprehensible for users* ▪ *Improve mean of transmitting climatic information to users* ▪ *Highlight the importance of regularity and the need to find the best time slots to meet the needs of users* ▪ *Combine local with modern climate science in the commuinication.*
Participants:	*Scientists, reporters, decisions makers, practionners such fields workers (NGOs, etc.)*
Method of training:	Participatory training/facilitation methodologies, lectures, group discussions, case studies, PowerPoint presentation, etc.
Training material	Flip charts, notebooks and pens, marker pens, white board, white board markers, projector
Exercises	
Duration:	30 mins
Evaluation:	To be decided by the facilitator
Reference Material	CILSS (2014). *Module d'intégration du changement climatique dans les politiques de développement National*. Projet GCCA CILSS/CRA (2010). *Le Sahel face au Changement Climatique. Enjeux pour un développement durable*. Niamey (Niger) 42. GIEC (2001). "Climate Change 2001: Synthesis Report. Question 3. http://www.grida.no/publications/other/ipcc%5Ftar/?src=/climate/ipcc_tar/vol4/french/index.htm." GTI TRE Section 11.5.1. GIEC (2007). "Bilan 2007 des changements climatiques : Rapport de synthèse "*www.ipcc.ch*.

	GIEC (2007). *Climate Change 2007. Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds.,*. Cambridge University Press, Cambridge, UK 976 GIEC (2014). *Changements climatiques 2014 : Impacts, vulnérabilité et adaptation. Résumé à l'intention des décideurs.* *www.developpement-durable.gouv.fr/giec* Gèneve 42

Description of facilitation methods

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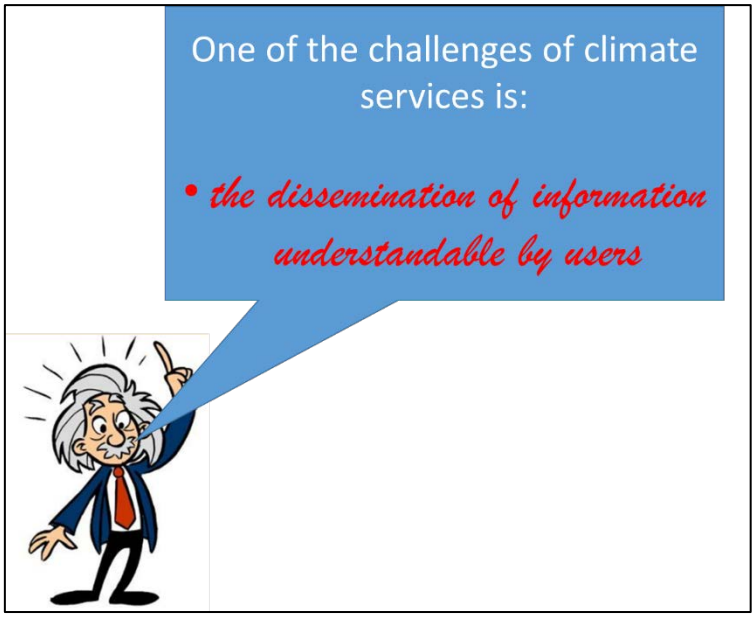
Notes for the facilitator

Section 1: Some challenges faced by climate information community

1) End-users challenges of climate information

- quality of information products,
- Availability of data at appropriate scales
- Difficulties in communication
- Difficulty in interpreting the information produced.



2) Translation of technical terms

- Information from meteorological agencies is often contaminated by technical terms that are not digestible by users
- Before any attempt for translation, it is imperative to find a consensus on the essentials of the terms in at least three of the most used languages in the locality and the historical references to better situate events (drought, record year of production ...)

English	Hausa	Lingala	Fulfulde
Rainfall			
Violent showers			
Wind			
Strong wind			
Sand storm			
Temperature			
Dew			
Thunderstorm			
Lightning			
Heat			
Cold			
Drought			
Water stress			
Flood			
Fog			
Dry season			
Rainy season			
Climate change			
desertification			
biodiversity			

3) Quality of the message

- Differentiate according to user groups: farmers, decision makers, water resources managers, etc.
- Relevant,
- accurate,
- recent,
- comparable
- complete

4) Availability of data at appropriate scales

➢ According to the agro-ecological zone, the climatic information must be adapted



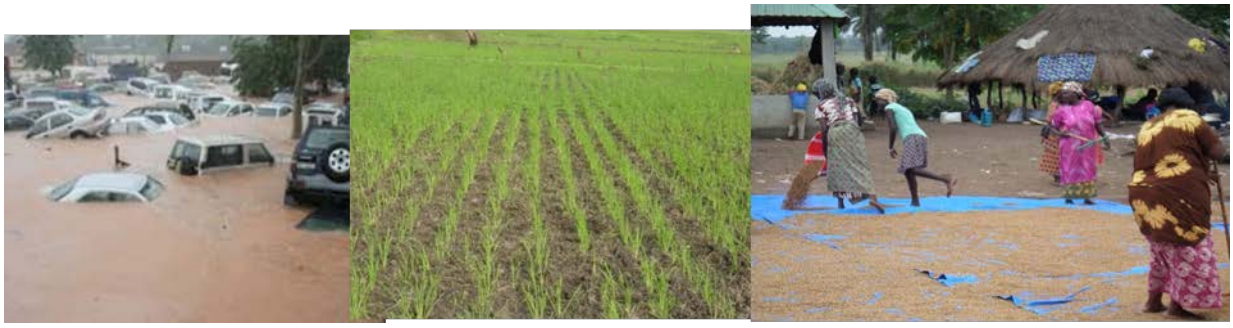


- Depending on the type of farm, climate information needs to be adapted

- Depending on the level of education, climate information needs to be adapted
- Depending on use climate information must be adapted



- Depending on the time scales (Short term)
  - Disaster Management
  - Operational decisions (sowing, phytosanitary treatment, fertilizers, irrigation, field trips ...



- Depending on the time scales (Medium term and Long term)
  - Strategic decision-making (choice of culture, types and number of animals, cultivation area ...

Section 2: Communication means and needs

- **Supports to communication**
  - Level of education
  - Social organization of the user community
  - Users calendar

- **Communication media**
  - Written newsletter (bulletins)
  - Radio

- Television
- Telephone
- Social networks (Twitter, WhatsApp ....)
- Forum
- Releases after prayers

➢ **Communication of information**

- Roving workshops on the use of climate information
- Field schools
- Cross-visits for exchange of experience of operators



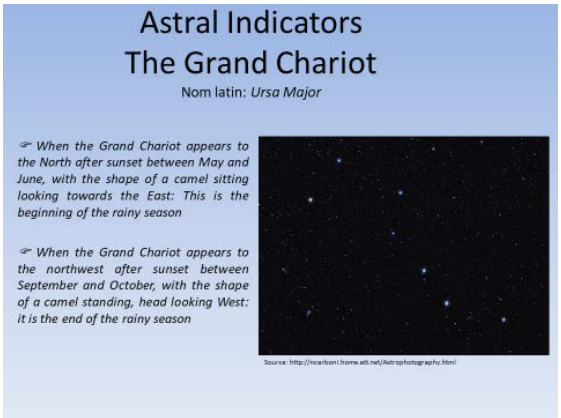
➢ **Regularity and ideal moment of transmission of information**

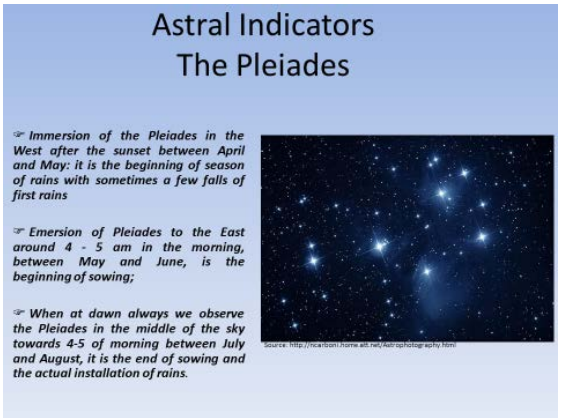
- When information is crucial for conducting activities and the management of resources it creates in users:
  - The addiction
  - Requirement and precision
- Hence, the producer of the information need :
  - To choose the best times of transmission of the information
  - the regularity in the production and transmission of the information

Use of indigenous knowledges and sciences

Nature of the indicators

➢ Astral Indicators
  - constellations
  - Pleiades





- Biotic Indicators
-
  - Plants

Usual Name	Nom latin	Behavior	Period	Prediction
plum tree	*Sclerocarya birrea*	*fruit maturity*	*May June*	*first rains in about ten days*
Cassia	*Cassia sieberiana*	*Flowering*	*April May*	*early season (dry sowing)*
Baobab	*Adansonia digitata*	*Regeneration of leaves*	*April May*	*early season*
shea	*Butyrospermum parkii*	*High fruit production*	*May June*	*Good rainfall*
Nere	*Parkia biglobosa*	*High fruit production*	*April May*	*Good rainfall*
Monkey Raisin	*Lannea acida*	*High fruit production*	*April May*	*Good rainfall*
Kapokier with flowers	*Bombax costatum*	*Flowering*	*October-November*	*"The rain does not fall on its flowers"*
Faidherbia	*Acacia albida*	*Regeneration of leaves*	*September October*	*End of the rainy season*

  - Birds

- Physical Indicators
  - wind
  - seasons
  - The weather

Indicator	Behavior	Prediction
Hot dry season	**When it lasts and with a lot of heat (T ° high)**	**Many rains during the next campaign**
	Short duration	**Less rains during the next campaign**
	Early start	**Early start of the rainy season**
Cold dry season	**Long duration**	**Late start of the rainy season**
	(until the end of March of times)	**Early start of the rainy season**
	Short season	**Low rainfall / Bad season**
Wind	**When the cold season lasts with a lot of cold**	**Beginning of the rainy season**
	West-East direction of movement: May and June	**(End of the rainy season)**
	(Direction of travel East-West: Sept-Oct)	**Pocket of drought during the rainy season.**

References

CILSS (2014). *Module d'intégration du changement climatique dans les politiques de développement National*. Projet GCCA

CILSS/CRA (2010). *Le Sahel face au Changement Climatique. Enjeux pour un développement durable*. Niamey (Niger) 42.

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UNIT FIVE: INTEGRATE CLIMATE INTO MONITORING AND EVALUATION SYSTEMS

Unit 2: ***(Title of Topic)***	
Content:	This unit describes: ▪ *how to integrate climate indicators into existing national monitoring and evaluation systems;* ▪ *why the monitoring system needs to integrate climate indicators into the process of mainstreaming climate change*
Objective:	The objective of the unit at end is to: ▪ *Understand how to integrate climate indicators into existing national monitoring and evaluation systems;* ▪ *Understand why the monitoring system needs to integrate climate indicators into the process of mainstreaming climate change*
Participants:	*Scientists, reporters, decisions makers, practionners such fields workers (NGOs, etc.)*
Method of training:	Participatory training/facilitation methodologies, lectures, group discussions, case studies, PowerPoint presentation, etc.
Training material	Flip charts, notebooks and pens, marker pens, white board, white board markers, projector
Exercises	
Duration:	30 mins
Evaluation:	To be decided by the facilitator
Reference Material	CILSS (2014). *Module d'intégration du changement climatique dans les politiques de développement National*. Projet GCCA CILSS/CRA (2010). *Le Sahel face au Changement Climatique. Enjeux pour un développement durable*. Niamey (Niger) 42. GIEC (2014). *Changements climatiques 2014 : Impacts, vulnérabilité et adaptation. Résumé à l'intention des décideurs.* www.developpement-durable.gouv.fr/giec Gèneve 42

Description of facilitation methods

Before starting the training, the facilitator is required to go through the facilitation notes and the facilitation methodology for each session. Additional materials for the unit are provided in the links available in the sessions and in the facilitation notes.

Notes for the facilitator

Section 1: Key concepts of monitoring and evaluation

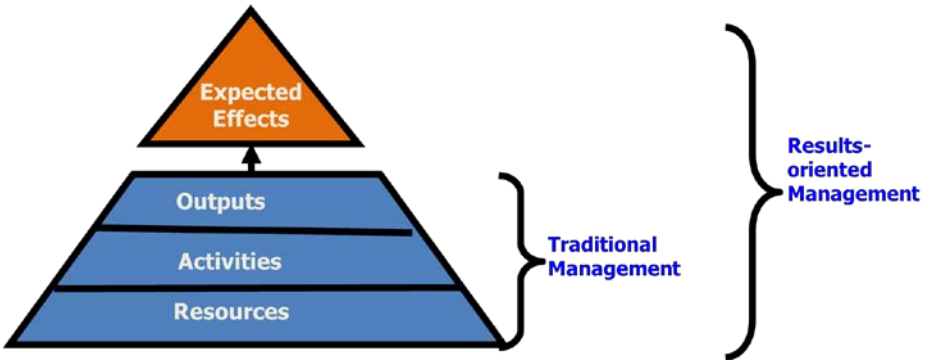
MONITORING is a continuous process of collecting, processing and analyzing data and information for the proper functioning of a structure. It is an internal activity that is an integral part of daily management.

EVALUATION is a time-limited, more comprehensive and in-depth exercise that aims to critically examine RELEVANCE, EFFECTIVENESS, EFFICIENCY, EFFECTS AND IMPACT. From this point of view, the evaluation appears as a photo, a diagnosis, an appreciation at a given moment.

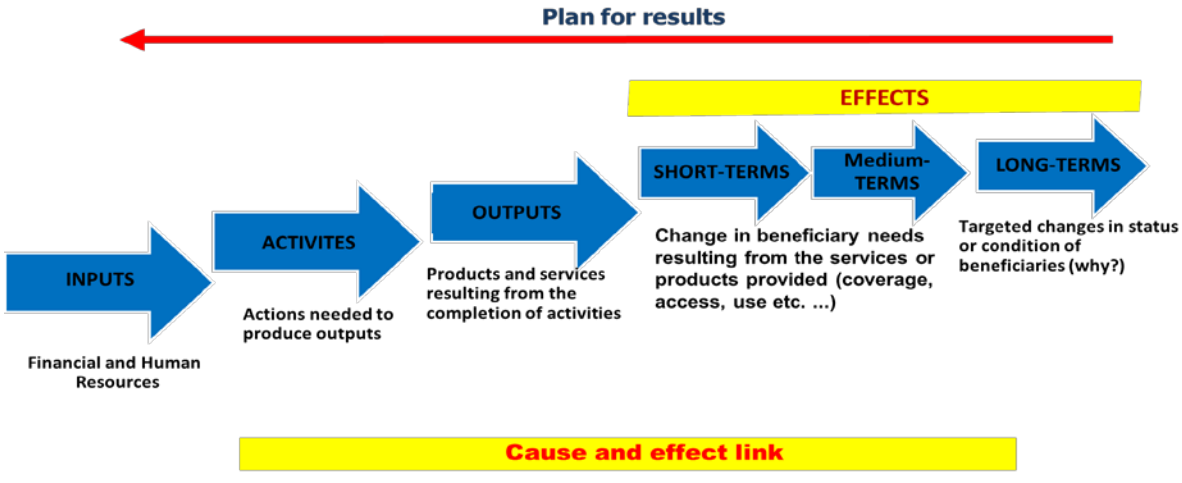
RESULTS are qualitative and quantitative changes produced by an action. The results are directly related to the objectives of the action.

Section 2: Traditional Management / Results-Based Management

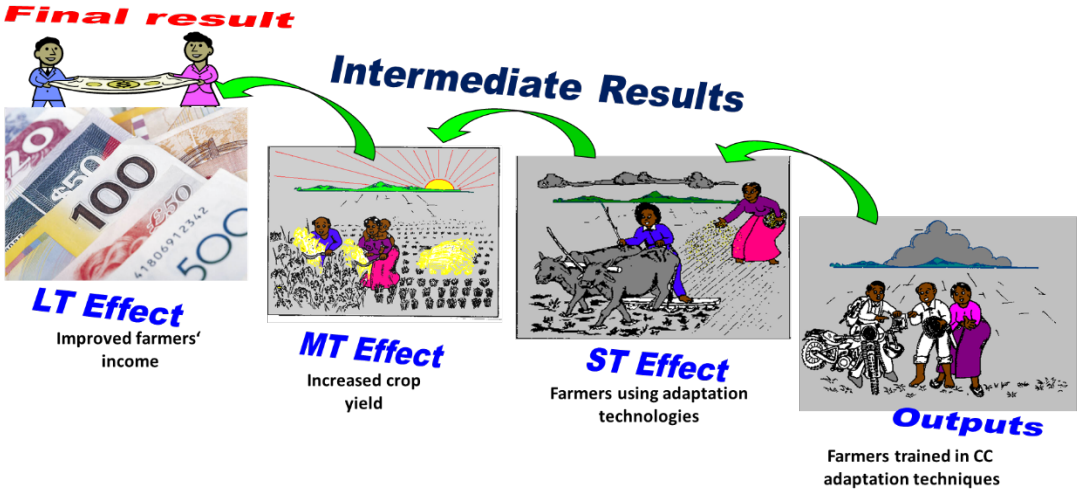
Operations that provide only outputs without achieving the desired effects are only a waste of public resources



1) **Results Chain**



2) **Example of the results chain**



3) **Typology of ME level indicators in the result chain**

- **Product Indicators**: Ensures that project-driven activities have delivered expected benefits as planned. These are the first levels of outcome indicators.
  Example: Number of farmers using improved varieties as a result of project interventions.

- **Outcome indicators**: demonstrate the evidence of the expected effects of using the products made available by the project.
  Ex. Number of communities that were food insecure and are no longer in this situation
- **Impact Indicators**: Evaluates the contribution of the project in achieving objectives and expected results
  Ex. Number of long-term adaptation measures implemented that increase productivity agriculture and food security

Section 3: Including the monitoring and evaluation of Climate Change actions

How to include the monitoring and evaluation of Climate Change actions?

Is there a monitoring and evaluation system?
Yes ⟹ What to do? **Integrate the monitoring of CC in the system**

Check whether the system foresees a mechanism, tools (logical framework, results, planning matrix, monitoring, etc.), adapted indicators, baseline situation, resources for monitoring CC actions and take actions to correct

Is there a monitoring and evaluation system?

No → What to do? **Set up a system**

- Construct a logical framework or results framework,
- Provide a data collection mechanism;
- Identify follow-up managers
- identify monitoring indicators;
- Choose monitoring tools (monitoring plan, dashboards, etc.),
- Provide resources,

Some examples of Climate Change indicators

- **climate hazards and indicators of vulnerability**
  - Frequency and intensity of natural disasters related to climate;
  - Proportion of agricultural land exposed to floods or drought;
  - Proportion of the population living in low coastal areas;
  - Population exposed to various types of extreme weather events.

- **indicators for monitoring political and institutional changes at local level**
  - Number of communal and sectoral documents reviewed and updated in light of climate change adaptation and mitigation considerations;
  - Proportion of resources allocated to adaptation and / or mitigation measures in the municipal budget;
  - Number of people / Proportion of staff trained in the specific or generic skills needed to integrate climate change adaptation and / or mitigation into their work

- **indicators for monitoring the implementation of local policies on cc**

- Number of ongoing and completed projects focused on adaptation and / or mitigation of climate change
- Number of regulations adopted to promote adaptation (eg, codes related to communal land development, construction)
- Number / Proportion of farmers trained in climate change adaptation and climate risk management
- Proportion of private dwellings, public buildings, industrial facilities and other infrastructure constructed or upgraded to meet building standards that provide good protection against climate risks;

- **indicators for monitoring local policy results**
- Deaths and injuries due to climate-related disasters;
- Economic losses and damage from climate-related disasters (annual total, as a percentage of GDP);
- Proportion and productivity of farmland harvested using seed varieties, technologies and / or farming practices selected to better cope with climate variability and extreme weather events;
- Carbon dioxide and other GHG emissions (annual total, per capita, percentage change from baseline) by source (deforestation, agriculture, ...);

References

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Annexes

Annex 1: Glossary

Weather: the state of the atmosphere, describing for example the degree to which it is hot or cold, wet or dry, calm or stormy, clear or cloudy etc. it is known as the condition of the atmosphere over a period of time. It refers to day-to-day temperature and precipitation activity.

Climate: the average weather conditions (temperature, precipitation, sunshine, air humidity, wind speed, etc.) that prevail over a given area over a long period of time. Averages, but also extremes.

Climatology: science that study the climate. It is defined as weather conditions averaged over a period of time.

Meteorology: the scientific study of the atmosphere that focuses on weather processes and forecasting.

Climate system: The term "climate system" refers to an ensemble that includes the atmosphere, the hydrosphere, the biosphere and the geosphere, as well as their interactions.

Climate scenarios: Climate scenarios are long-term visions of future climate change (i.e.: climatic parameters) as well as the main socio-economic parameters in a given locality.

Climate variability: is defined as long-term averages and variations in weather measured over a period of several decades. Evidence for changes in the climate system abounds, from the top of the atmosphere to the depths of the oceans. Climate, sometimes understood as the "average weather," is defined as the measurement of the mean and variability of relevant quantities of certain variables (such as temperature, precipitation or wind) over a period of time, ranging from months to thousands or millions of years.

Adaptation: is the set of responses (solutions) to the harmful or positive effects of climate change. It can be done naturally, or by a spontaneous reaction (for example in the face of a climatic disaster) or be anticipated as part of a planning.

Mitigation: is concrete measure to limit global warming.

Vulnerability: is the level at which a system can be degraded or damaged by climate change. It depends on both physical and socio-economic factors.

Resilience: A concept derived from physics, resilience refers to the ability of a material to recover its original shape after deformation.

> In sociology and psychology, resilience is the ability of an individual or group to rebuild after trauma.
>
> In ecology, resilience is defined as the ability of an ecosystem to recover its functions after major disturbances, whether natural (fire, flood, storm ...) or related to human activities (hunting, agricultural practices, pesticides ...) . For example, the resilience of

a forest ecosystem after a fire describes its ability to recover from the regrowth of resistant trees, seeds in the soil, wind-blown seeds, animals, etc.

In agroforestry is a set of agricultural techniques favorable to the resilience of agriculture in the face of climate change, thanks to the protection of crops against climatic excesses (wind, cold, storms, floods ...), the limitation of runoff and evaporation, to the diversification of the sources of income

Climate change: According to the United Nations Framework Convention on Climate Change (UNFCCC) CCs are all changes directly or indirectly attributable to human activities that affect the composition of atmospheric air and add to the natural variability of climate.

Greenhouse effect : The greenhouse effect is the trapping in the lower layers of the atmosphere of the radiation emitted by the earth to the atmosphere.

Sustainable Development Goals: a real roadmap for sustainable development for the next 15 years, formally adopted in New York, the United Nations 2015 Summit for Sustainable Development (New York, 25-27 September 2015).

Climate services *: the production and contextualization of information and knowledge derived from climate research, which aims to support decision-making at all levels of society*

Monitoring: continuous process of collecting, processing and analyzing data and information for the proper functioning of a structure. It is an internal activity that is an integral part of daily management.

Evaluation: time-limited, more comprehensive and in-depth exercise that aims to critically examine RELEVANCE, EFFECTIVENESS, EFFICIENCY, EFFECTS AND IMPACT. From this point of view, the evaluation appears as a photo, a diagnosis, an appreciation at a given moment.

Results: qualitative and quantitative changes produced by an action. The results are directly related to the objectives of the action.

Annex 2: Evaluation sheets

Biography
Name: _____

Institution: _____

Profession: _____

Length of Experienced: _____

Training Needs

How are you currently applying climate information?:

What do you expect to archive from the training?:

Please describe the top two topics you would like to learn about from the training:

_____
__

Preferred level: [a]. Introductory [b]. Intermediate [c]. Advanced

Preferred format: [a]. Seminar/workshop (how many days?_____)
[b]. Self-study materials
[c]. Interactive distance learning (i.e., Web-based)
[d].Other:_____

Training Evaluation Form

Your feedback is critical to ensure we are meeting your educational needs. We would appreciate if you could take a few minutes to share your opinions with us so we can serve you better. Please return this form to the instructor or organizer. Thank you.

Training title: _____

Date:_____ Instructor:_____

		Strongly agree				Strongly disagree
1.	The content was as described in publicity materials	1	2	3	4	5
2.	The workshop was applicable to my job	1	2	3	4	5
3.	I will recommend this training to other conservators	1	2	3	4	5
4.	The program was well paced within the allotted time	1	2	3	4	5
5.	The instructor was a good communicator	1	2	3	4	5
6.	The material was presented in an organized manner	1	2	3	4	5
7.	The instructor was knowledgeable on the topic	1	2	3	4	5
8.	I would be interested in attending a follow-up, more advanced workshop on this same subject	1	2	3	4	5

9. Given the topic, was this workshop: [a] Too short [b]. Right length [c]. Too long

10. In your opinion, was this workshop: [a]. Introductory [b]. Intermediate [c]. Advanced

11. Kindly rate the following presentation tools:

		Excellent	Very Good	Good	Fair	Poor
a.	Visuals	[ ]	[ ]	[ ]	[ ]	[ ]
b.	Acoustics	[ ]	[ ]	[ ]	[ ]	[ ]
c.	Meeting space	[ ]	[ ]	[ ]	[ ]	[ ]
d.	Handouts	[ ]	[ ]	[ ]	[ ]	[ ]
e.	The program overall	[ ]	[ ]	[ ]	[ ]	[ ]

12. What did you most appreciate/enjoy/think was best about the course? Any suggestions for improvement?

_____
__

How will you apply the information obtained from this training..