Food and Agriculture Organization of the United Nations

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Lecture Notes of the Massive Open Online Course

National Adaptation Plans: Building Climate Resilience in Agriculture

Module 3: Identifying and assessing climate change impacts and risks

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National Adaptation Plans: Building Climate Resilience in Agriculture

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Food and Agriculture Organization of the United Nations

Rome, 2018

WEEK 3

Contents

Foreword

This document presents a lecture note prepared for the National Adaptation Plans: Building Climate Resilience into Agriculture Massive Open Online Course (MOOC) which is one of the deliverables of the National Adaptation Plans (NAP-Ag) Programme.

The NAP-Ag Programme is a joint effort led by the United Nations Development Programme (UNDP) and the Food and Agriculture Organization of the United Nations (FAO) to support a set of developing countries to identify and integrate climate change adaptation measures in the agricultural sectors into relevant national planning and budgeting processes. Under this programme, UNITAR supported UNDP and FAO in developing a MOOC to raise awareness and increase the capacities of a wide range of interested stakeholders in climate change adaptation planning, specifically for the agriculture sectors.

This MOOC is structured around 6 thematic modules:

1. Introduction to climate change adaptation, agriculture and food security
2. International Frameworks and National Adaptation Planning
3. Identifying and assessing climate change impacts and risks
4. Identifying and prioritizing climate adaptation options
5. Governance, coordination and finance
6. Communications, monitoring and evaluation

The lecture notes include links to complementary lecture videos and additional resources.

The Module 3 focuses on the importance of using the latest available information and enhancing a strong knowledge base in adaptation planning. It discusses different types and sources of information available for conducting vulnerability and climate risk assessments, and the importance of integrating different types of knowledge. This Module also introduces interactive tools and approaches for modelling climate change impact on agriculture, measuring impact and mainstreaming gender into adaptation planning. Examples for these will be drawn from the Programme on Climate Information for Resilient Development in Africa (CIRDA), Modelling System for Agricultural Impacts of Climate Change (MOSAICC), Agriculture Stress Index System (ASIS), along with gender analysis approaches.

Learning Objectives

(1) Identify types and sources of knowledge and information needed for adaptation planning;
(2) Reflect on the importance of informed decision-making in adaptation planning;
(3) Identify tools for modelling climate change impacts and mainstreaming gender in adaptation planning.

Acknowledgements

This course and the programme were made possible by the generous funding of the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) through its International Climate Initiative (IKI).

Part I

3.1.1 Types and sources of information needed for adaptation planning

Expert: Rohini Kohli

Key messages

1) The NAP builds on the latest available science and a strong knowledge base composed of a variety of types of information including strategic, policy, planning and legal documents, climate information, risks and vulnerability assessments, socio-economic analyses, capacity assessments, climate change financing and interventions. This knowledge base can often be accessed online, or through experts and institutions.

2) The NAP builds on, but can also strengthen the knowledge base through the enhancement of data collection, analysis, dissemination and use, and the production of additional analyses, as well as through capacity development of key stakeholders.

3) Taking stock of, building on, and strengthening existing information ensures that the NAP is rooted in and contributes to countries' planning systems.

Medium and long-term adaptation planning requires that decision makers and planners at all levels have access to and understand climate information. They should be able to use it by triangulating it with socio-economic analyses and other research, and ultimately be able to make decisions on prioritization of adaptation interventions on this basis. The NAP therefore both relies on and supports strong knowledge base and the latest information and science. One of the first steps of the formulation of a NAP is taking stock of available information on climate risks and impacts, vulnerabilities and adaptation and developing needs and then identifying specific knowledge gaps in addressing adaptation strategies. Once established, NAPs processes continue with prioritizing adaptation options, building implementation strategies, and facilitating improved reporting, monitoring and review. Relevant information and knowledge needs to be fed throughout the full, iterative cycle of adaptation planning.

Types of information that can contribute to the NAP process:

- **Strategic, policy, planning and legal documents** pertain to institutional arrangements, development in general, including specific sectors and subsectors, as well as climate change. These documents provide the background against which adaptation priorities are set. They can also include institutional coordination agreements relevant for adaptation planning.
    - Such documents are for example: National Development Plans and Sustainable Development Strategies, National Agriculture Investment Frameworks and agricultural, fisheries and forestry policies, National Climate Change Policy, Nationally Determined Contributions, National Adaptation Programme of Actions.
- **Climate information**[1] describes past, current and future climate conditions and provides information on hazards and exposure. Climate information is necessary to know and manage climate risk, and is particularly useful when defining the different climate scenarios

[1] For more information see section 3.1.4 Climate Information for Resilient Development, p. 10

to inform the appraisal and prioritization of adaptation actions. Low adaptive capacity in many developing countries is often exacerbated by the lack of or limited availability and quality of climate information, on which to base adaptive solutions.

    - Climate-related information may include, for example: National Communications, Biennal Update Reports, downscaled and non-downscaled climate projections, seasonal forecasts and agriculture reports, climate information databases, localized weather station monitoring data, weather and climate information packaged and distributed to create advisories, or as part of early warning systems to lower risk.

- **Risk and vulnerability assessments** allow decision makers to determine how and to what extent a certain country, population, sector or ecosystem is vulnerable to climate impacts, as well as how likely it is to be impacted.
    - Risk and vulnerability assessments can be found in Assessment Report 5 – Working Group 2 of the IPCC, National Communications, and often as part of baseline assessments for different projects and programmes.
- **Socio-economic analyses** are produced within the framework of broader development strategies and are often relevant to climate change adaptation planning. The information they contain regarding income, food security, access to basic services, economic forecasts, etc. is essential to the NAP process as it helps identifying potential risks and benefits of adaptation options in terms of economic impact and how climate change and adaptation interventions might impact different social groups.
    - These can be found in, for instance, National Human Development Reports, sectoral/targeted population vulnerability assessments (e.g. FAO vulnerability assessments), household vulnerability surveys, and gender analyses.
- **Cost-benefit and multi-criteria analyses**[2] are economic tools can help prioritise adaptation options.
- **Capacity assessments** are a fundamental part of building adaptive capacity and enhancing resilience, which enable long-term comprehensive capacity development programmes to become an integral part of NAPs, addressing priority gaps and needs.
    - Examples of capacity assessments are National Self Capacity Assessments and Technology Needs Assessments.
- **Information on climate change finance and past or ongoing interventions.** The NAP builds on past and existing initiatives and attempts to scale-up adaptation. A database of projects and programmes can therefore be examined, so that the range of projects and programmes can be appraised in the course of NAP implementation and the most effective options can be prioritised. Any existing information or tracking of climate finance can also help inform adaptation budgeting.
- **Reporting, monitoring and evaluation (M&E)**[3]**.** As NAPs are put into place, reporting, monitoring and evaluation of the NAP is essential for reporting to UNFCCC, and for adjusting adaptation approaches based on evidence-driven frameworks.

Collecting information for the NAP:

As a first step of the NAP process, it is important to define the geographical, temporal and sectoral areas of interest so that the information search can be as focused as possible. The information

[2] These are discussed in more detail in Week 4.

[3] For more information see section 3.1.6 Measuring Impact, p. 14

needed can be collected, for example, through desk-based literature review, interviews with key stakeholders and by working with climate change experts or institutions.

Accessing information for the NAP:

A second step would be to access information for the NAPs process, for which some of the sources are:

- Online data:
    - http://www.ipcc-data.org - provides climate, socio-economic and environmental data, both from the past and from scenarios projected into the future);
    - http://unfccc.int/2860.php - provides information on the climate change negotiations process, including all Parties' reports);
    - National climate information databases – these seldom exist but are a useful tool when they do. Often, if the information does exist, it is not shared openly with coordinating ministries, creating siloed information that challenges the creation of effective NAPs;
    - Databases on the economics of climate change adaptation (http://adaptation-undp.org/resources/datasets/capacity-building-programme-economics-climate-change-adaptation-ecca) – these are rare but combine climate information with relevant economic information to create an effective analysis that can drive decision-making, adaptation planning and future investment strategies;
    - Websites of donors and technical partners - many adaptation and development initiatives are funded by external donors and their websites can also provide much information on existing adaptation initiatives and lessons learned from adaptation processes – e.g. Green Climate Fund, Global Environment Facility, UNDP, World Bank, International Climate Initiative of BMUB.
- Climate change expertise and institutions:
    - UNFCCC focal points, authors of National Communications;
    - Relevant ministries and government agencies;
    - National Hydro-Meteorological Services (NHMS) and institutes, including agricultural agencies;
    - Universities, research institutes and think tanks (such as http://www.wri.org/, http://iri.columbia.edu/);
    - Donor agencies, scientific or development NGOs.

This information will need to be linked to and used in the analyses conducted through NAP process, such as the prioritisation and appraisal of adaptation options (cost-benefit analysis, impact evaluation, gender analyses). It is essential for the NAP to have a strong evidence and knowledge base to ensure that the plans emerging from the process fully address climate change adaptation and development challenges.

NAPs require enabling policies and political support. To ensure the sustainability of results, information derived through M&E of the NAP process should be repackaged and shared on subnational, national and international levels to ensure accountability to investors.

Key Definitions

Climate Information - is the collection and interpretation of weather and climate data that is credible, relevant and usable.

Climate Scenario - is a plausible and sometimes simplified representation of the future climate that has been constructed for explicit use in investigating the potential consequences of anthropogenic climate change.

National Hydro-Meteorological Services (NHMS) - are mandated to continuously generate and disseminate weather and climate data from across a country's territory and develop and issue forecasts and warnings.

Resources for further learning

http://www.climatefundsupdate.org/resources/initiatives-tracking-climate-finance
http://www.ipcc-data.org/
http://unfccc.int/2860.php

UNDP 2017. Data philanthropy will drive climate resilient development. http://adaptation-undp.org/data-philanthropy-will-drive-climate-resilient-development

3.1.2 Knowledge Tank

Experts: Maryline Darmaun, Maria Nuutinen

Key Messages

1) FAO's search engine allows all stakeholders to find relevant tools and resources to address knowledge gaps.
2) Reliable and up-to-date sources of information are uploaded to the NAP-Ag Knowledge Tank regularly.
3) A user-friendly, categorized search, providing a detailed description of each resource and explaining how it relates to the NAP process.

The NAP-Ag Knowledge Tank is the first holistic and categorized search engine of key tools and resources for adaptation planning integrating the agriculture sectors. It serves as a knowledge support and guide for the formulation, planning, budgeting, implementation, monitoring and reporting of NAPs. The Knowledge Tank has been developed by the "Integrating Agriculture in the National Adaptation Plans" Programme" (NAP-Ag). It helps countries in implementing their Nationally Determined Contributions (NDCs) to the UNFCCC with targeted knowledge resources.

The Knowledge Tank is featured as a search engine compiling a wide range of knowledge materials on adaptation planning in the agriculture sectors, from FAO and other international agencies as well as research and development programmes (such as UNDP, GIZ, World Bank, IFAD, WFP and CCAFS). It aims at answering the information and technical needs of national planners, development officers and decision makers, as well as other stakeholders dealing with climate change adaptation, resilience and disaster risk reduction in agriculture sectors, especially in developing countries.

It complements the *Addressing agriculture, forestry and fisheries in National Adaptation Plans – Supplementary guidelines* ('NAP-Ag Guidelines') to the NAP technical guidelines, as well as other databases and platforms, such as TECA platform, the NAP Global Network, AdaptationCommunity.net, UN CC: Learn, etc.

Abbreviations

GIZ – The Deutsche Gesellschaft für Internationale Zusammenarbeit
IFAD – The International Fund for Agricultural Development
WFP – The World Food Programme
CCAFS – The CGIAR Research Program on Climate Change, Agriculture and Food Security

Resources for Further Learning

www.fao.org/in-action/naps/knowledge-tank
www.fao.org/climate-change
http://www4.unfccc.int/nap/Guidelines/Pages/Supplements.aspx

3.1.3 Integrating traditional knowledge into adaptation planning
Expert: Yon Fernandez

Key Messages

1) Indigenous Food Systems have a unique capacity to generate food from the environment without depleting the resource base. Indigenous peoples have already developed and tested today's answers to many of tomorrow's challenges. Their knowledge is more important than it has ever been, in answering the question of how to feed nine billion humans amid climate change.
2) Indigenous peoples' territories encompass around 20% of the word's land surface, which holds 80% of the world's biodiversity. As such, their role is of importance in the sustainable management of resources as well as environmental and biodiversity conservation, which are essential for combating climate change.
3) Identification of effective climate adaptation solutions requires investment of time and resources to better understand and document many of the indigenous traditional practices.

Indigenous peoples estimated at more than 370 million, belonging to 5000 different groups[4] and living in more than 90 countries in the seven socio cultural regions of the world[5] constitute 5% of the world's population but 15% of the world's poor (FAO; UNDESA, 2009).

This financial poverty contrasts sharply with the richness of their culture: out of the 7000 languages spoken in the world more than 4000 are indigenous languages spoken from the savannahs to the artic; and from the tropical forests to the tundras. FAO does not consider Indigenous peoples as vulnerable. Across the world and over millennia, they have come up with ways of living that have not only provided food; shelter; and rich cultural heritage but have done so while preserving the environment and ecosystem in which they live.

Indigenous peoples have developed a series of indigenous food systems and livelihoods that preserve the environment better than other peoples (FAO-CINE, 2013). This becomes evident if we compare a map of biodiversity pockets with a map of indigenous peoples territories. We will see a clear overlap and coincidence between the two (IUCN, 2016). This overlap is relevant given the increased attention being paid to adaptation in the climate change policy debate, and the uneven distribution of impacts and vulnerability between regions and peoples (adapted from UNFCCC, 2013). As such, factors such as livelihood assets, sources of income, class, social status, race, ethnicity, indigenous identity, gender and poverty are defining both vulnerability and capacities to adapt to climate change (UNFCCC, 2013).

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[4] FAO Policy on Indigenous Peoples, FAO 2010, abide by the following criteria when considering indigenous peoples: (1) Priority in time, with respect to occupation and use of a specific territory; (2) The voluntary perpetuation of cultural distinctiveness, which may include aspects of language, social organization, religion and spiritual values, modes of production, laws and institutions; (3) Self-identification, as well as recognition by other groups, or by State authorities, as a distinct collectively; and (4) An experience of subjugation, marginalization, dispossession, exclusion or discrimination, whether or not these conditions persist. FAO 2010 Policy on Indigenous Peoples

[5] The UN Permanent Forum of Indigenous Peoples (UNPFII) divides the world into seven socio cultural regions with indigenous populations.

Indigenous Food Systems are attractive, because they involve practices such as the use of both cultivated crops and gathered wild plants, synergies with the natural environment and biodiversity, close adaptation to local conditions, a high level of diversification, a light carbon footprint, fewer "negative externalities" and reduced use of external inputs (FAO, 2017a). In a way, indigenous peoples have already developed and tested today's answers to many of tomorrow's challenges.

An experience from the Andean region illustrates the argument. In this part of the world, the *waru-warus* or *sukakollos* have been dug by generations of Aymaras and Quechas peoples to both irrigate and protect from freezing the crops planted in elevated beds (FAO, 2011). Similarly, in certain valleys of Peru, the Qechua peoples plant a variety of potato that does not yield, but stops the surrounding high yielding potatoes from freezing (FAO 2008). Owing to the adaptive nature of their livelihoods, their ability to read the natural cycles and their traditional knowledge, they are striving to come up with climate change adaptation strategies.

Climate change besides the rising of temperatures has brought about climatic variability affecting the available windows of climate patterns and bringing unexpected droughts, floods, or freeze in times when animals and plants are not expecting them[6]. This has become more obvious in areas with extreme weather conditions such as artic regions, mountains or dry lands.

The Paris Agreement in Article 7, paragraph 5 "acknowledges that adaptation action should be based on and guided by the best available science and, as appropriate, traditional knowledge, knowledge of indigenous peoples and local knowledge systems, with a view to integrating adaptation into relevant socioeconomic and environmental policies and actions, where appropriate." (UNFCCC, 2015).

Still, the vast array of adapted solutions continually displayed by indigenous peoples are not sufficiently regarded by science and development agencies.

Uganda's national adaptation programme

Some countries have already included indigenous knowledge in their NAPA and NAPs. For example, in Uganda's national adaptation programme of action one of the projects proposed was the Indigenous Knowledge (IK) and Natural Resources Management project. Uganda felt that the project was necessary in order to document and understand IK so as to exploit its potential for adaptation. The NAPA mentions that a "lack of frameworks…coupled with total disregard of IK due to misconception and disrespect of cultural values" had resulted in a lack of research in the area. During the NAPA consultation process, indigenous practices were discussed, including the use of water harvesting and seeds to purify water in times of water scarcity and the need to understand traditional food preservation techniques to increase food security. Source: Uganda. 2007. Uganda National Adaptation Programmes of Action. (UNFCCC, 2013, p.19)

Another issue is that traditional indigenous knowledge valid for climate change adaptation is threatened by the rapid modernization and the migration of the youth to urban centers. For instance, in the valleys of Caylloma in Arequipa, new agricultural techniques of intercropping were introduced by combining traditional knowledge with new techniques of mulching and intercropping (beans and potatoes). These practices have already been abandoned by the new generations of indigenous peoples in the area (FAO, 2008). If we are to identify effective climate adaptation

solutions, it is important to invest time and resources in better understanding and documenting many of the indigenous traditional practices.

A valid approach is the establishment of "community ran climate change adaptation laboratories" where new techniques combined with indigenous traditional ones are tested (FAO, 2008). This will enable us to come up with techniques which are the best of both worlds, and identify new varieties of indigenous and neglected crops, better adapted to the emerging climate change scenarios. This is particularly important since certain very powerful foods and crops such as *Quiguicha* and *Cañygua* have witnessed a decrease in seed availability.

Finally, despite their resilience and traditional knowledge, in recent times indigenous peoples are being progressively pushed into situations of increased vulnerability at an incredible rate across the world. This vulnerability emanates from a combination of lack of respect for their access to land and natural resources, pressure from extractive industries and the challenge of finding revised models of what it means to be indigenous in a globalized world. While not being responsible for climate change indigenous peoples suffer their consequences.

If this trend is not reversed, the answers that indigenous food systems can provide for climate challenges will vanish, along with the communities that developed them.

Key Definitions

Biodiversity - The variability among living organisms from terrestrial, marine and other ecosystems. Biodiversity includes variability at the genetic, species and ecosystem levels.

Ecosystem - An ecosystem is a functional unit consisting of living organisms, their non-living environment and the interactions within and between them. The components included in a given ecosystem and its spatial boundaries depend on the purpose for which the ecosystem is defined.

Externalities - Externalities arise from a human activity when agents responsible for the activity do not take full account of the activity's impacts on others' production and consumption possibilities, and no compensation exists for such impacts.

Food System - A food system includes the suite of activities and actors in the food chain (i.e., producing, processing and packaging, storing and transporting, trading and retailing, and preparing and consuming food); and the outcome of these activities relating to the three components underpinning food security (i.e., access to food, utilization of food, and food availability), all of which need to be stable over time.

Intercropping - growing two or more crops at the same time.

Resources for further learning

FAO portal on indigenous people: http://www.fao.org/indigenous-peoples/en/
FAO infographic: Indigenous Peoples can feed the world. Available at http://www.fao.org/resources/infographics/infographics-details/en/c/445251/
UNFCCC, 2013. Best practices and available tools for the use of indigenous and traditional knowledge and practices for adaptation, and the application of gender-sensitive approaches and tools for understanding and assessing impacts, vulnerability and adaptation to climate change. FCCC/TP/2013/11, 62 pp.
NFCCC, 2013. Available at http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/SC/pdf/UNFCCC-TP-2013-11.pdf

3.1.4 Mainstreaming gender into adaptation planning: Gender analysis

Expert: Catherine Hill, Sibyl Nelson

Key Messages

1) Gender analysis is a useful tool in adaptation planning and can be used for assessing climate impacts and vulnerability as well as identifying adaptation options.
2) Climate change adaptation implies a process of institutional and behavioural change, which is only possible when underlying social and gender issues are analyzed and addressed.
3) Gender analysis and gender mainstreaming are the key approaches for understanding and addressing gender issues and ensuring a gender-responsive adaptation process.

There is growing commitment to take a gender-responsive approach to adaptation. This is in recognition of the fact that adaptation practices, plans and policies must accurately reflect existing socio-economic conditions and promote equality to achieve the necessary institutional and behavioural changes for long-term adaptation to climate change. The process of mainstreaming gender into adaptation planning is used to ensure that men's and women's needs are addressed, and that the implications of any planned action on different groups are considered.

Gender mainstreaming is often built upon gender analysis, which examines how differences in gender and power relations, gender roles, activities, needs, opportunities and rights affect men, women, girls and boys in certain situations or contexts.

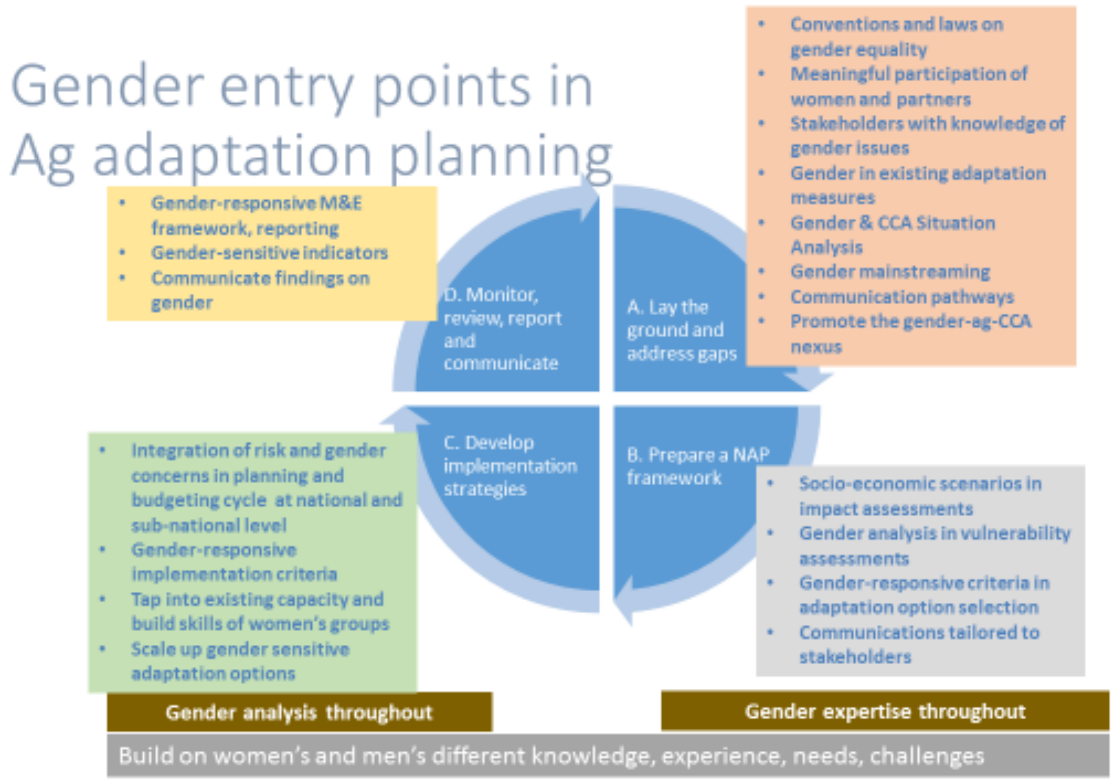

Figure 4. Gender Entry Points into Agriculture Adaptation Planning

What is Gender Analysis?

- Systematic identification of key gender and social issues that contribute to poor development outcomes.
- Exploration of social relations and institutions that lead to discrimination.
- Consideration of factors (e.g. class, ethnicity, age, caste, disability, sexuality, etc.)

Gender analysis is a useful tool in adaptation planning and can be used for the following:

- Assessing climate impacts and vulnerability -
    - Ways in which climate change impacts (and brings about changes in) gender relations and roles;
    - Influence of inter-connected factors on vulnerability;
    - Ways in which social/gender norms, relations, and institutions can shape the adaptive capacity of women and men;
    - Spaces for changing relations and transforming institutions to strengthen adaptation capacity.
- Identifying adaptation options, with attention to -
    - Shifts in labour or time use from proposed practice or technology in the adaptation option;
    - Shifts in access to resources (i.e. certain groups may lose access to land, water, etc.);
    - Constraints to access to and control over productive resources, inputs and services;
    - Decisions impacted by social/gender norms and institutions (including local, customary practices, legislation, etc.), by understanding who decides appropriate options.

The result of gender mainstreaming informed by gender analysis is gender-responsive policies and plans.

Gender-responsive adaptation has multiple characteristics -

- Based on comprehensive, participatory, gender-sensitive analysis of climate change vulnerability (i.e. social, economic, political determinants);
- Recognizes differential vulnerability within countries, communities, households and targets adaptation strategies accordingly;
- Builds on existing knowledge and capacities of men, women, boys, girls;
- Aims to empower vulnerable women and girls to build their adaptive capacity, and promotes gender equality as a long-term goal;
- Incorporates participation of both women, men, and most vulnerable in the community, in planning and implementation;

- Promotes adaptation policies, programs at local, national, and international levels that meet the specific needs of poor women and men;

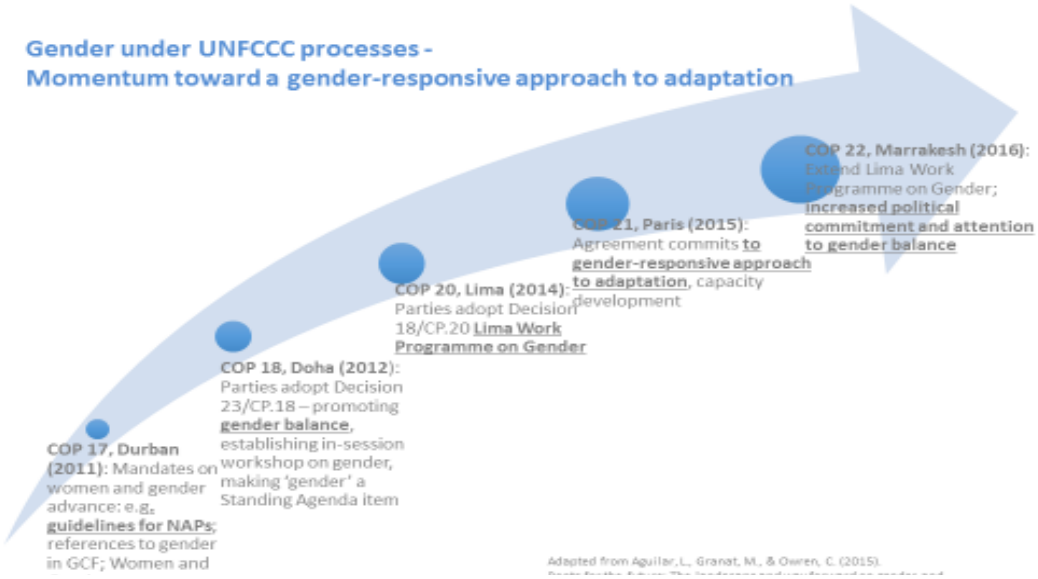

Figure 5. Example of a Gender-Responsive Approach: UNFCCC Processes

- Supports men and women to access the resources, rights and opportunities they need to adapt to changing environment.

Gender-responsive plans and projects have multiple benefits -

- Ensure equal participation of men and women in decision-making processes and implementation of adaptation activities;
- Prevent adaptation planning processes and activities from exacerbating gender inequalities;
- Increase likelihood of better adaptation and more resilient communities.

Key stakeholders in gender in building gender-responsive approaches to adaptation are policy-makers; government planners at central, sub-national, district levels; the private sector; non-governmental organizations; and researchers.

Key definitions

Gender analysis - is central to designing adaptation plans that are effective and meet the different needs of women and men across socio-economic, age, ability, geography and other lines. Gender analysis provides a critical examination of how differences in gender/power relations, gender roles, activities, needs, opportunities and rights/entitlements affect men, women, girls and boys in certain situations or contexts. Other important analysis factors that should be considered along with gender include age, poverty levels, ethnicity, race and culture (Adapted from UNDP, 2015 Gender-responsive national communications toolkit).

Gender mainstreaming - is the globally recognized strategy for achieving gender equality and is the process of assessing the implications for women and men of any planned action in all areas and at all levels. Gender mainstreaming has also been criticized for integrating gender into existing agendas, resulting in making the issues invisible. It is important that all staff and stakeholders (as opposed to

gender coordinators and gender focal points) take responsibility for addressing gender and social inclusion concerns in adaptation planning to mitigate against this concern.

Gender-responsive - refers to identifying, reflecting on and implementing interventions needed to address gender gaps and overcome historical gender biases in policies and interventions. Its use contributes to the advancement of gender equality with an idea to 'do better' (LDC Expert Group, 2015).

Gender-transformative - approaches to planning that seek to make real lasting change by strengthening adaptation planning through application of approaches that build the capacity of women and men, lead to more equitable gender and social relations and power dynamics, and transform discriminatory structures (social norms, legislation/policy, customary practices, etc.).

Resources for further learning

NAP-Ag Webinar - Mainstreaming gender in climate change adaptation planning for the agriculture sectors (Recording). Available here: http://www.fao.org/in-action/naps/resources/webinars/gender-mainstreaming/en/

Gender analysis for climate change adaptation in agriculture (PowerPoint)

LDC Expert Group, 2015. Strengthening gender considerations in adaptation planning and implementation in the least developed countries. UNFCCC. Available at http://bit.ly/28UZxuM
Nelson, G., 2015a. Gender-responsive national communications toolkit. UNDP. Available at http://bit.ly/2avRxzE
UNDP, 2016. Filling buckets, fueling change: Ensuring gender-responsive climate change adaptation. Available at http://bit.ly/2eBrqLO
UNFCCC, 2016. Guidelines or other tools for integrating gender considerations into climate change related activities under the Convention. UN Framework Convention on Climate Change. Available at http://unfccc.int/resource/docs/2016/tp/02.pdf.

Part II

3.2.1 Climate Information for Resilient Development: CIRDA Project

Experts: Bonizella Biagini, Montserrat Xilotl

Key Messages

1) Climate Information (Data, Products, Services) is necessary to know and manage climate risk and is fundamental to the integration adaptation into policies and actions.
2) Effective climate information systems need to focus on end-users first in order to identify what information they need and for what purposes.
3) Procurement of climate hardware is insufficient without the analytical capability and communications capacity to reach the last mile.
4) Engaging with the private sector and civil society provides a new opportunity to reduce costs and develop climate services and products that are needed to empower vulnerable populations, particularly small farmers whose livelihoods are threatened by the onset of climate change.
5) There is a continued need to support national hydro-meteorological services (NHMS) to provide climate information as a public good. particularly to the poorest and most vulnerable. This requires supporting national efforts in enhancing their capacities and helping them be part of a wider discussion in the national development process.

On a macro-economic and global policy level, a failure to accurately provide warnings on fast-acting storms and other extreme climate events not only takes lives, it also affects production levels and hinders economic development. The IPCC has identified Africa as the continent most vulnerable to climate change, with projected reductions in agricultural yield as much as 50% and net crop revenues dropping by up to 90 % by 2100. Providing accurate, reliable, and timely weather and climate information is central to building resilience to climate change, empowering nations, saving lives and strengthening livelihoods across Africa's most vulnerable communities.

Investing in weather and climate services is a smart investment. The World Bank has estimated that upgrading all hydro-meteorological information production and early-warning capacity in developing countries would save an average of 23,000 lives annually and could provide between US$3 billion and US$30 billion per year as an additional economic benefit related to disaster reduction. Currently, least developed countries find themselves with limited capacity to enhance their resilience and adapt to climate change due to a lack of climate information, products and services. This is often due to the lack of technical expertise and experience together with minimal budgets that limit their capacity to invest in or maintain technological solutions for weather and climate services. Many of the challenges arise from attempts to utilize weather monitoring systems that are costly, difficult to maintain, and ill-suited for the tropical or arid environments in many less developed countries, particularly those in Sub Saharan Africa.

A solution can be found in relatively recent innovations in weather and climate monitoring, analysis and forecasting technologies. Parallel advances in computing and cellular telecommunication services have also proven to be cost effective and reliable in providing information for climate adaptation and early warning purposes. In addition, designing climate and weather monitoring

networks in a way that puts end users first ensures that observation networks provide actionable information with real impacts in saving lives and livelihoods.

In the case of agriculture, this means providing vulnerable farmers and communities with improved climate and weather services with the potential to increase farm production and reduce climate risk. With better information on impending weather events and likely characteristics of the upcoming season, together with actionable information on what to do, farmers can protect property and human lives. They can access risk-management mechanisms like index-based insurance, and create long-term plans for a future that will be highly dependent on rainfall patterns, droughts, floods and other natural disasters.

Programmes like UNDP's Climate Information for Resilient Development in Africa Programme (CIRDA), which is currently working with 11 African LDC's, provide best practices on how to build end-to-end systems suited for adaptation and development purposes with an overall vision for long-term system sustainability.

It is engaging with new actors such as the private sector and leveraging existing networks to reduce costs and provide resources to national hydro meteorological services through the development of useful climate and weather services.

An approach being promoted in the UNDP's CIRDA Programme is the use of cellular networks and modern computers to exploit these devices' capabilities to provide sustainable local observing networks. This approach is being currently developed in Liberia and Sierra Leone, helping them rebuild their national hydro-meteorological capacities that were virtually eliminated as a result of ebola and civil war.

In addition, by engaging with civil society and software engineers through a Climate Action Hackathon, the program has demonstrated that once information is available and accessible, it can spur the development of innovative and flexible climate and weather services that can be adapted to various needs and populations. This shows that non-traditional approaches and technologies have potential to support the development and sustainability of weather observing networks and respond to development and adaptation needs of the population.

Abbreviations

CIRDA - Climate Information for Resilient Development in Africa

Resources for further learning

http://www.adaptation-undp.org/resources/communications-products/new-vision-weather-and-climate-services-africa
http://www.adaptation-undp.org/resources/knowledge-products/climate-and-weather-services-market-assessment-revenue-generating
http://undp-cirda.blogspot.com/search/label/Insurance

3.2.2 Using climate data to assess agricultural risk in support of NAP in agriculture

Experts: Dr. Mark Tadross, Dr. Peter Johnston, Dr. Olivier Crespo

Key Messages

1) Small changes or trends in climate may lead to significant increase in risks and can be important for crop production in marginal productions areas.
2) Different techniques and sources for producing seasonal forecasts and future climate scenarios can alter the derived climate change impacts. Only robust changes across a range of models and techniques are suitable for decision making.
3) Identifying climatic thresholds that define threats to crop production can be useful to determine the future vulnerability of crops.
4) Weather station data is often difficult to source, and often may not be available for relevant locations, periods or variables.
5) Indigenous knowledge can provide a rich source of local information, and relevant alternative responses.

Using climate data to assess agricultural risk involves the following three elements.

i) Assessing potential impacts on crop management decisions;

While processing data and identifying relevant variables, there is a need to consider not only monthly or seasonal averages, but also characteristics which are linked to particular decisions. For example, identifying, estimating, or predicting the start and end of the rainfall season directly relates to farmers' decisions of when to plant and which plant varieties (or cultivars). The frequency of dry spells (e.g. defined as the number of days with less than 1 mm of rainfall), especially during crop flowering stages, relates to farmers decisions of which crop varietals to plant, for example whether to go for drought tolerant or other varieties. Key learnings will include how to access historical climate information, link it to specific events and interrogate the associated impacts and responses that took place, and whether they were appropriate. Beyond weather data, indigenous knowledge can be highly relevant and useful in the communication of climate information to agricultural experts, including farmers.

ii) Identifying trends in climate data that may affect agriculture; and

Trends where climate conditions approach critical thresholds, e.g. maximum temperatures or rainfall seasonal duration, affect the choice of crops and cultivar and their long-term sustainability in a particular location. It is helpful to ask questions such as: Have yields been changing consistently to the detriment of the farmer? How often can a farmer afford to have a significant percentage of crop fail? What are acceptable levels of risk in the climate? Is it possible to identify thresholds and quantify the costs, damage, consequences that would result from the breaching of these thresholds? Other considerations are whether any previous responses from farmers have managed to counteract the impacts.

iii) Using climate datasets to run crop models.

Whilst thresholds of climate variables can be useful to assess first order impacts and relate to decision making, these simple approaches are unable to assess the combined impacts of several climate variables which may either work in tandem or in opposition. For example, the water balance (rainfall – evaporation) available for crop growth is dependent on a range of variables, including rainfall, winds and humidity. Additional impacts of temperature on crop phenology[7] are also important for understanding the impacts of climate change. The complexity required of a crop model is dependent on the availability of weather and climate data[8] and the crop responses to climate which are being evaluated. If advisories are to be developed based on seasonal forecasts[9] and climate change projections,[10] it is essential they are based on robust projected changes in climate. This is a key consideration as some important climate attributes are sub-seasonally varying characteristics, dependent on climate variations on shorter timescales, and which are typically harder to robustly forecast.

The key stakeholders in climate change risk and vulnerability assessments include: National Hydro-Meteorological Services (NHMS), Ministries of agriculture and water, particularly when supplemental irrigation is being used, universities undertaking agrometeorological research, UN organizations e.g. FAO, WFP, input providers, such as seed, fertilizer and pesticide companies.

Resources for further learning

NAP-Ag Webinar Session Recordings: The Role of Climate Information Services in Adaptation Planning for Agriculture. Available at http://adaptation-undp.org/nap-ag-webinar-session-recordings-role-climate-information-services-adaptation-planning-agriculture

NAP-Ag Webinar Session Recordings: The Role of Climate Information Services in Adaptation Planning for Agriculture. Available at http://adaptation-undp.org/nap-ag-webinar-session-recordings-role-climate-information-services-adaptation-planning-agriculture

CGIAR Participatory Integrated Climate Services for Agriculture (PICSA): https://ccafs.cgiar.org/participatory-integrated-climate-services-agriculture-picsa#.Wfl9DnZx2M8

CGIAR CCAFS Regional Agricultural Forecasting Tool (CRAFT): https://ccafs.cgiar.org/ccafs-regional-agricultural-forecasting-tool-craft#.Wfl9NXZx2M8

[7] Phenology is a branch of science dealing with the relations between climate and periodic biological phenomena (such as bird migration or plant flowering). Source: Merriam-Webster Dictionary
[8] For example, which variables, daily or monthly resolution.
[9] These are usually around managing short term crop and water management decisions.
[10] These are typically longer-term adaptation decisions on land use and crop suitability.

3.2.3 Tools for modelling climate change impacts: MOSAICC

Expert: Dr. Hideki Kanamaru

Key Messages

1) Modelling System for Agricultural Impacts of Climate Change (MOSAICC) is a tool to fill information and capacity gaps by providing and building capacity for robust evidence and information.
2) The outputs from MOSAICC can inform policy makers and enable medium to long-term climate change adaptation
3) The interdisciplinary nature of the challenge of climate change and agriculture calls for an integrated approach for better understanding the issue.
4) MOSAICC helps address the need for an improved science-policy link, where information and research studies must be designed in a way that responds to the needs of policy makers.

Climate change adaptation is a long-term iterative process from the farm to the national level and it requires robust knowledge and evidence base to inform the design investments and interventions. Yet, information and capacity gaps still exist.

Modelling System for Agricultural Impacts of Climate Change (MOSAICC) is an integrated system of tools and models to evaluate climate change impacts on the agriculture sector. Using the tool, countries will be able to better understand an essential climate change-related question: "What do we need to adapt to?". The question can be answered by understanding what the relationship between climate and agriculture has been in the past and then simulating future potential impacts under climate change scenarios.

The challenge of climate change and food security requires an interdisciplinary approach. Our methodology and software facilitate a collaborative integrated research from different sub-sectors – climate, crops, water resources, forests, and economy.

Capacity development and stakeholders' participation are another focus of the MOSAICC approach. National scientists are trained to use their country's own data to run impact models and produce information which responds to the stakeholders' needs. This would contribute to a more sustainable institutional capacity of countries to periodically revise climate change information, reflecting new scientific findings and evidence. Policy makers will then be equipped with fundamental information to guide national adaptation and food security policies, e.g. Climate-Smart Agriculture, National Adaptation Plans, etc.

Abbreviations

MOSAICC – Modelling System for Agricultural Impacts of Climate Change

Resources for further learning

CSA Sourcebook (2013 version, module 18) http://www.fao.org/docrep/018/i3325e/i3325e00.htm
Incorporating Climate Change Considerations into Agricultural Investment Programmes. A Guidance Document http://www.fao.org/policy-support/resources/resources-details/en/c/433905/
MOSAICC web page (to be upgraded to a new look soon)
http://www.fao.org/climatechange/mosaicc
MOSAICC - a Capacity Development Tool for Assessments of Climate Change Impacts on Agriculture (Powerpoint) https://www.slideshare.net/FAOoftheUN/mosaicc-a-capacity-development-tool-for-assessments-of-climate-change-impacts-on-agriculture?next_slideshow=1

3.2.4 Agricultural drought monitoring with ASIS

Experts: Dr. Oscar Rojas

Key Messages

1) The greater frequency of dry spells and droughts is one of the most significant climate change impacts for agriculture and food security.
2) Easily available, simple and free of charge data is crucial for effective agricultural drought monitoring.
3) The Agriculture Stress Index System (ASIS) developed by Global Information and Early Warning System (GIEWS) and Climate and Environment Division (CBC) of FAO can detect agricultural areas with a high likelihood of drought and support the vegetation monitoring activities of FAO-GIEWS.

The Food and Agriculture Organization of United Nations (FAO) on the frame of the EU/FAO Improved Global Governance for Hunger Reduction Programme, developed a system based on Earth Observations for detecting agricultural areas with a high likelihood of water stress (drought) at global level: The Agriculture Stress Index System (ASIS). Following the successful completion of the global system http://www.fao.org/giews/earthobservation/asis/index_1.jsp?lang=en, the team is now concentrating on the calibration of a standalone ASIS to support regional and national early warning systems.

The idea behind ASIS is to mimic the analysis that a remote sensing expert will do and simplify the results that reach the final users. ASIS is based on a 10-day (dekadal) satellite data of vegetation and land surface temperature from a MetOP-AVHRR[11] sensor at 1 km resolution from 1984-2017.

This index can detect drought conditions at any time of the year. ASIS will provide a map, which will be updated every 10 days in which the Global Information and Early Warning System (GIEWS) officers will detect "hot spots" around the globe where crops may be affected by drought during the growth season. The officers should verify the "hot spots" with auxiliary information by contacting the Ministry of Agriculture of the affected country, and monitoring prices of the commodities (See Figure 1).

[11] The Meteorological Operational satellite programme (MetOp) is a European undertaking providing weather data services to monitor the climate and improve weather forecasts. The programme was jointly established by ESA and the European Organisation for the Exploitation of Meteorological Satellites (Eumetsat), forming the space segment of Eumetsat's Polar System (EPS).

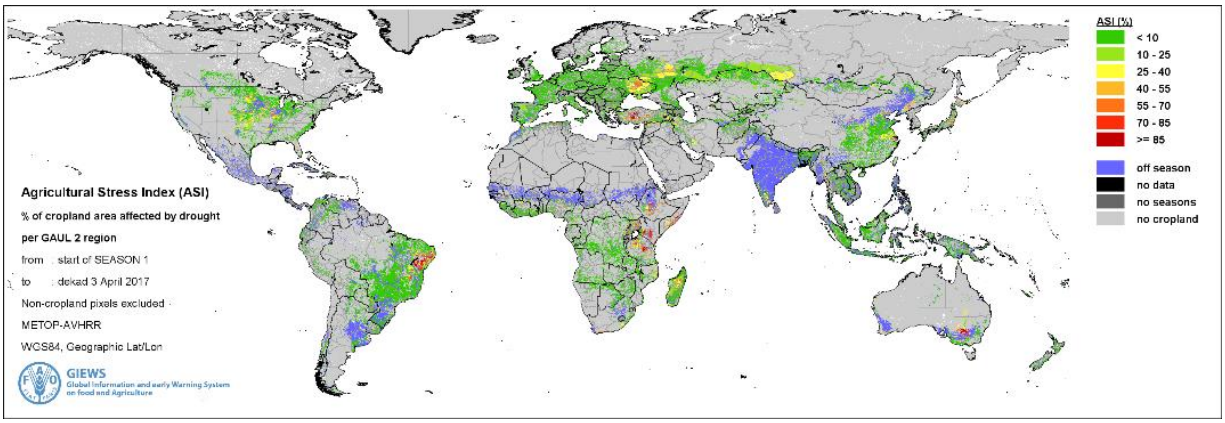

Figure 1. Agricultural drought situation at global level for the third dekad of April 2017.

For agriculture, FAO is interested in the most sensitive period for crop growth, so the analysis is performed only between the start and end of the crop season and restricted to crop areas. ASIS assesses the severity (intensity, duration and spatial extent) of the agricultural drought and express the final results at the administrative level, given the possibility to compare it with the agricultural statistics of the country. Figure 2 presents the steps involved in the monitoring activities carried out using ASIS.

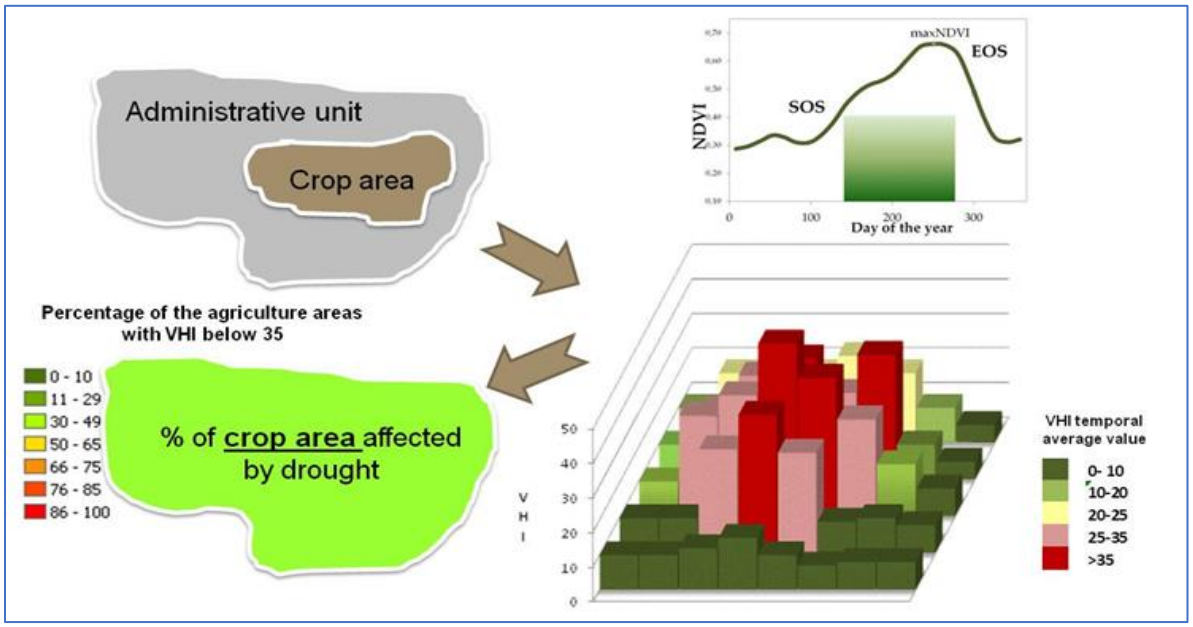

Figure 2. The first step on ASIS is to have a temporal average of the VHI assessing the intensity and duration of the dry period(s) occurred during the crop cycle at pixel level. The second step would be the calculation of the percentage of agricultural area affected by drought (pixels with VHI<35) on this way assessing the extent of the drought. Finally, the whole administrative area will be classified using an arbitrary color scale.

Following the successful completion of the monitoring activities of GIEWS, the FAO team is now concentrating on the calibration of a standalone ASIS to support regional and national early warning systems. In the standalone version, adapting analysis parameters to each region or country´s specific agricultural conditions will yield more accurate results. **The final index could be used as a trigger for activating drought mitigation activities in countries, or for the implementation of index-based crop insurance.**

Key Definitions

Remote sensing – is the acquisition of information about an object or phenomenon without making physical contact with the object and thus in contrast to on-site observation.

Spatial interpolation techniques – involve using of the surrounding observations to estimate a new data point. This can be done using weighted mean (inverse distance weighted interpolation), by fitting a mathematical function through the existing points (splines), or a combination of both (kriging with external drift).

(Normalized) Difference Vegetation Index (NDVI) – a simple graphical indicator that can be used to analyze remote sensing measurements, typically but not necessarily from a space platform, and assess whether the target being observed contains live green vegetation or not.

Abbreviations

ASIS - Agriculture Stress Index System
CBC - Climate and Environment Division
GIEWS - The Global Information and Early Warning System
NDVI - Normalized Difference Vegetation Index
NOAA – National Oceanic and Atmospheric Administration
AVHRR – Advanced Very High Resolution Radiometer
VHI - Vegetation Health Index
VITO - Flemish Institute for Technological Research

Resources for further learning

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MOOC videos

Week 3 Part 1 - Information Requirements for National Adaptation Plans. Watch here: https://www.youtube.com/watch?v=2BoFkirDT48&list=PLyBRsrYRs7YfwMYIxKbV41CPwMgeC1e-h&index=5

Week 3 Part 2 - Climate Information Services. Watch here: https://www.youtube.com/watch?v=hoQVWNkn1Vo&index=6&list=PLyBRsrYRs7YfwMYIxKbV41CPwMgeC1e-h