ClimaSouth

Euro South Mediterranean Initiative:
Climate Resilient Societies
Supported by Low Carbon Economies

HANDBOOK N°2:
Seminar in Lecce, Italy
28-30 April 2014



Improving Climate Information

Project funded by the European Union

Project implemented by
AGRICONSULTING CONSORTIUM
Agriconsulting Agrer CMCC CIHEAM-IAM Bari
d'Appolonia Pescares Typsa Sviluppo Globale

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FOREWORD

The Mediterranean region has been identified as a climate change hotspot by the Intergovernmental Panel on Climate Change (IPCC). Most countries in the region are already experiencing rising temperature, increasing water scarcity, rising frequency of droughts and forest fires, as well as growing rates of desertification.

A common understanding is thus emerging in the region that fighting climate change is essential, by employing both mitigation and adaptation measures. These may also open new opportunities for further economic development, particularly those associated with low carbon options.

The EU-funded ClimaSouth project supports climate change mitigation and adaptation in 9 Southern Mediterranean partners: Algeria, Egypt, Israel, Jordan, Lebanon, Libya, Morocco, Palestine and Tunisia.

The project assists partner countries and their administrations in transition towards low carbon society while building climate resilience and promoting opportunities for sustainable economic growth and employment. The project also supports South-South cooperation and information sharing on climate change issues within the region as well as closer dialogue and partnership with the European Union.

As part of its efforts to enhance climate change strategic planning, the ClimaSouth project is producing a series of handbooks tailored to the needs of the South Mediterranean region. The key users targeted include relevant government departments at operational and policy levels, climate change units and committees, decision makers, meteorological services, members of local government, private sector and civil society.

The ClimaSouth handbooks are based on peer-to-peer seminars held by the project, which are designed to support national administrations in the development and implementation of climate change policy; they further help stakeholders in the region to engage more effectively in the global climate change framework.

Climate change information is gradually improving — but not yet enough. Data are available to some extent to guide strategic climate change response measures at the global and regional levels but their overall management and analysis needs to become much more effective.

This second handbook is reflecting the discussions held during a 'Climate Information Seminar' on network observation systems, data collection capabilities and experiences in the production of climate services.

We hope the handbook will contribute to improve the knowledge of policy-makers and technicians alike on those issues, and will assist in taking the right decisions.

We wish you an interesting reading.

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European Commission
Directorate General for
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CLIMASOUTH HANDBOOKS

Handbook N.1 : Building capacity & mainstreaming climate change policy

Handbook N.2 : Improving Climate Information

Handbook N.3 : Greenhouse Gas Inventory and MRV (forthcoming)

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LIST OF ACRONYMS

AR 5	IPCC Assessment Report 5
CC	Climate Change
CAF	Cancun Adaptation Framework
CLAC	Central Laboratory for Agricultural Climate
CMCC	Euro-Mediterranean Center on Climate Change
COP	Conference of the Parties (UNFCCC)
EC	European Commission
EEA	European Environment Agency
ENP	European Neighborhood Policy
ENPI	European Neigbourhood Policy Instrument
EU	European Union
AR5	Fifth Assessment Report
GFCS	Global Framework for Climate Services
GEF	Global Environment Facility
IPCC	Intergovernmental Panel on Climate Change
LARI	Lebanese Agriculture Research Institute
LDC	Least Developing Country
NAP	National Adaptation Plan
NMS	National Meteorological Service
SCCF	Special Climate Change Fund
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environnement Programme
UNFCCC	United Nations Framework Convention on Climate Change
WG I	Working Group I
WG II	Working Group II
WMO	World Meteorological Organization

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1. INTRODUCTION

ClimaSouth organized a three-day seminar in Lecce (Italy) in collaboration with the CMCC to assess climate change data availability as well as "climate information" and "climate service" related issues. This initiative was taken to implement Activity 3.1.1 of the ClimaSouth project defined as 'Adaptation data management and analysis - Enhance climate data management, use and sharing to properly assess vulnerability and improve resilience to climate change" with the view to achieve its 3rd Purpose "Strengthening institutional adaptation capacity". Three participants from each project beneficiary country were invited to present their network observations system, data collection capabilities and experiences in information and production of climate services. The seminar facilitated sharing and exchanging experiences between the project beneficiary countries in order to promoting the best experiences and retaining the best lessons/practices.

The ClimaSouth programme team is grateful to the speakers who contributed to this meeting to make it a success, in particular, Mr. André Jol, (Head of group on vulnerability and adaptation, EEA), Mr. Motsomi Maletjane (UNFCCC Secretariat, Adaptation Programme), Ms. Veronica Grasso (Global Framework for Climate Services (GFCS), WMO), Silvio Gualdi (CMCC), Mr. Andreas HAENSLER (Climate Service Center, Germany), Ms. Fatima DRIOUECH (Direction de la Météorologie Nationale, Morocco), Mr. Paolo Ruti (ENEA), Mr. Guido Rianna & Mr. Edoardo Bucchignani (CMCC), Mr. Abdelwaheb NMIRI, (Institut National de la Météorologie, Tunisia) as well as and all representatives of countries that made presentations on national circumstances.

2. STATE OF SCIENTIFIC KNOWLEDGE ABOUT CLIMATE CHANGE

The IPCC's reports are considered the most authoritative scientific assessments on climate change in the world and are produced through the involvement of thousands of scientists worldwide. The IPCC does not conduct its own research. Instead, scientists from universities, think tanks, businesses and nonprofit groups around the world assess and synthesize the most recent climate change-related science, on a volunteer basis. The IPCC's Fifth Assessment Report (AR5) is its first assessment report since 2007 (AR4), the year the IPCC won the Nobel Peace Prize.

The Fifth Assessment Report (AR5) provides a clear and up to date view of the current state of scientific knowledge relevant to climate change. It consists of three Working Group (WG) reports and a Synthesis Report (SYR) which integrates and synthesizes material in the WG reports for policymakers. The SYR will be finalized on 31 October 2014.

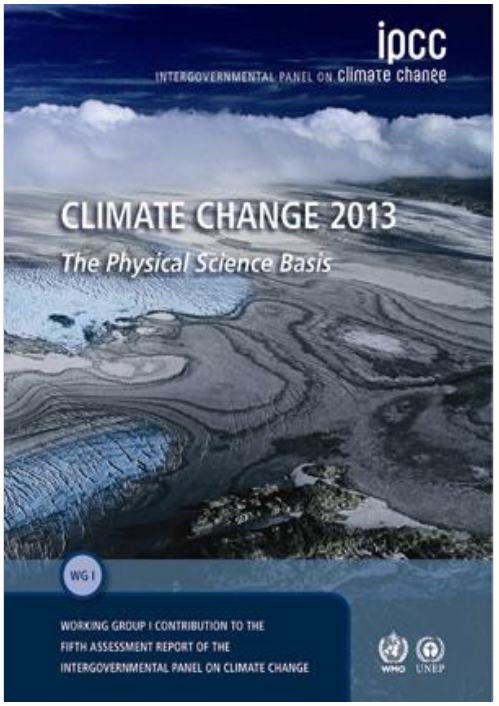
2.1 The AR5/WG I Report

The main findings of the IPCC AR5/ Working Group I were presented through a video entitled *"Climate Change: everything you need to know about the IPCC AR5/WGI: The Physical Science Basis"*. This video explores the contents of the Report narrated by:

- C. Carraro (ICCG/ FEEM/ CMCC), Vice-Chair of the Working Group III and Member of the Bureau of the IPCC
- Carlo Barbante (Institute for the Dynamics of Environmental Processes, CNR/University of Venice)
- Paolo Ruti (ENEA), Contributing Author AR5 WGI
- Antonio Navarra (CMCC)

What is the Working Group I report about?

The Working Group I contribution to the AR5 (WGI/AR5) has 14 chapters, a Technical Summary and a Summary for Policymakers. The report includes an assessment of observations of the climate system, with separate chapters covering changes in the atmosphere and surface, the ocean and the cryosphere, as well as information from paleo-climate archives. There are chapters covering the carbon cycle, the science of clouds and aerosols, radiative forcing and sea level change. Coverage of climate change projections is extended by assessing both near-term and long-term projections. Climate phenomena such as monsoon and El Niño and their relevance for future regional climate change are assessed. An innovative feature of the WGI/AR5 is the Atlas of Global and Regional Climate Projections (Annex I), which is intended to enhance accessibility for users and stakeholders.

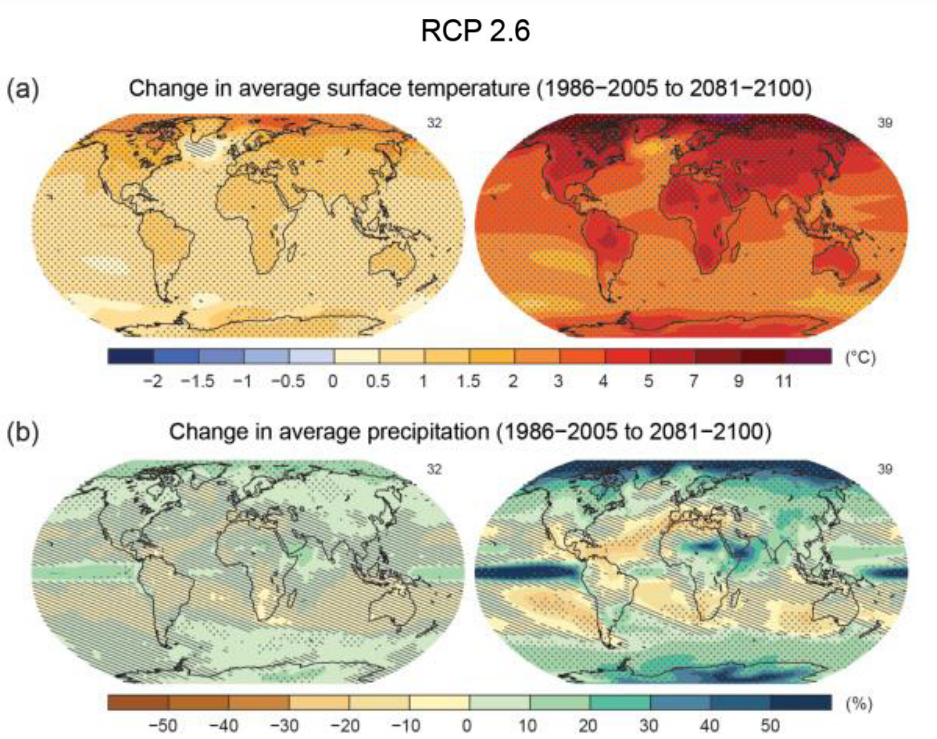


The WGI AR5 involved experts from around the world with expertise in the many different disciplines necessary to produce a comprehensive assessment of the physical science of climate change according to the approved chapter outlines. There were 209 Lead Authors and 50 Review Editors. More than 600 additional experts were invited by the Lead Authors of the report to be Contributing Authors and to provide additional specific knowledge or expertise in a given area.

Some findings highlighted by the video

Based on more data and papers published in the subject, AR5/WGI Report provides additional; solid and more precise information but there are no inherently new results.
The development of models is crucial for improving our understanding of CC and its impacts. However we know much better the sensitivity of climate to GHG emission and the probability that CC is induces by human activity is confirmed. He IPCC says with extreme certainty that "climate change is real, caused by human activity, and requires urgent action".

The report highlights that impacts of CC differ from one region to another. Some regions, such as the Arctic, are already widely affected while others will be impacted less quickly. Expectations for a decrease rainfall in the Southern Mediterranean region, particularly in the summer is confirmed. Through several climate simulations, significant progress has been made in quantifying this decrease of precipitation. The report also confirms that projections of climate change are not forecasts, they need to be used in different way, basically by estimated probability and assessing probability scenario for the future. More precise



Source: IPCC, AR5/WGI Summary for Policymakers

The Report states that:
Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases (GHG) have increased.

It also concluded that:
Human influence on the climate system is clear. This is evident from the increasing greenhouse gas concentrations in the atmosphere, positive radiative forcing, observed warming, and understanding of the climate system.

information about physical impacts of CC would be likely to enable better assessment of specific impacts by sector that is important for decision makers.

2.2 The AR5/WG II Report

The main findings of the IPCC AR5/ Working Group II were presented through a video entitled "Climate Change: everything you need to know about the IPCC AR5/ WGII: Impacts, Adaptation and Vulnerability". This video explores the contents of the Report narrated by:

- Sergio Castellari, CMCC - IPCC Focal Point for Italy
- Riccardo Valentini, CMCC - IPCC WG2 AR5 Coordinating Leading Author
- Francesco Bosello, CMCC - FEEM - IPCC WG2 AR5 Contributing Author

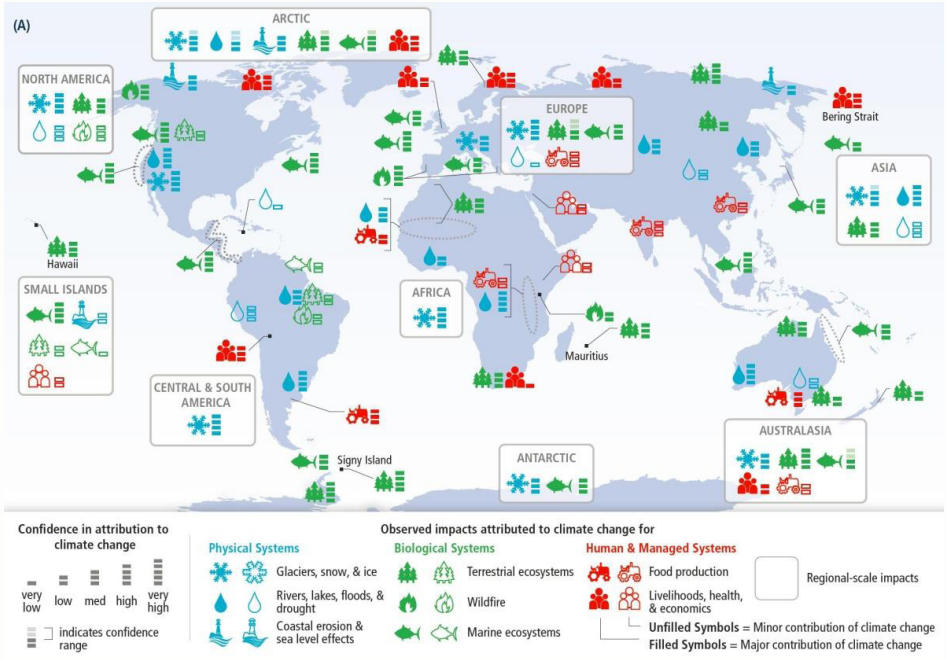
What is Working Group II report about?

The objective of the contribution of Working Group II to the AR5 (WGII AR5), Climate Change 2014: Impacts, Adaptation, and Vulnerability, is to consider the vulnerability and exposure of human and natural systems, the observed impacts and future risks of climate change, and the potential for and limits to adaptation. Also, the report assesses risks and opportunities for societies, economies, and ecosystems around the world. The first part focuses on global and sectoral aspects. It introduces the report with chapters that provide the context for the AR5, followed by those on natural and managed resources and systems; human settlements, industry, and infrastructure; and human health, well-being, and security. Also, it includes a set of four chapters on adaptation as well as synthesizes to provide multi-sector impacts, risks, vulnerabilities, and opportunities. The second part provides assessments on regions.

Findings

On the basis of a huge process of reading and compilation of twelve thousand scientific publications, the report notes that climate change has had in recent decades impacts "on all continents and oceans", mainly on natural systems but also on human activities. The main challenge is to what extent society and natural systems can adapt to these changes but also benefit from new opportunities.

"Recent changes in climate have caused impacts on natural and human systems on all continents and across the oceans", thus, for many natural systems on land and in the ocean, new or stronger evidence exists for substantial and wide-ranging climate change impacts. For human systems, effects of changing social and economic factors have often been larger than climate-change-related impacts, but despite this, some impacts in human systems have also been attributed to climate change.



A changing world - widespread observed impacts
Source: IPCC, AR5/WG II, Technical summary

Compared to the AR4, this report includes news topics related to a detailed assessment of literature on adaptation – including the needs, options, experience in planning and implementation, opportunities, constraints, limits, and economics of adaptation. Also, oceans have been more extensively covered in two new chapters. New chapters on livelihoods and poverty, human security, and urban and rural areas have been added to cover socioeconomic, cultural, and regional planning aspects that are important in understanding the implications of climate change.

A greater range of regional scale climate information: The report provides a global picture on the expected CC impacts over the world with zooming to have regional details. Indeed, there has been an evolution in the treatment of regional aspects of climate change from a patchwork of case examples in early assessments towards recent attempts at a more systematic coverage of regional issues. Thus, the Report provides a greater range of regional scale climate information which provides a more coherent picture of past and future regional changes with associated uncertainties.

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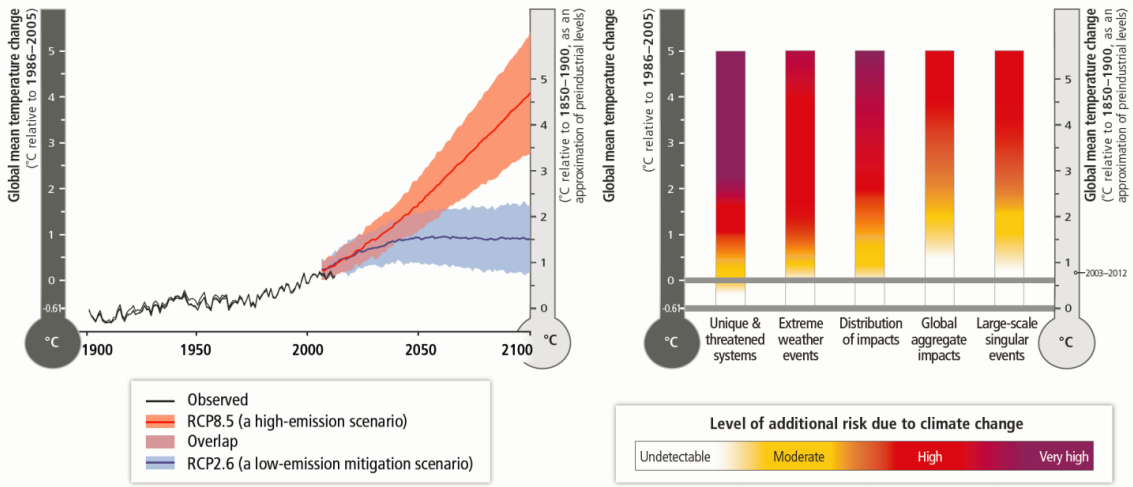


Source: IPCC, AR5, WG II, 2014

Advisable to act immediately:

With reference to extreme scenarios[1], the Report assesses to "high to very high" the risk in case of average temperature rise of 4°C above pre-industrial times with "substantial extinction of species" and "significant risks for food security". These risks are already "considerable" for a warming of only 1-2°C. The figure above shows the level of additional risk due to CC according to the temperature increase. A warming of about 2°C above preindustrial levels could cause a loss of between 0.2 and 2% of global annual revenues. It is strongly advisable to act immediately and decide what way we want to take. Referring to all scenarios, there will be changes requiring adaptation now in order to enhance the resilience of country.

[1] RCP 2.6: the optimistic scenario with a global warming of about 1.5 °C
RCP 8.5: the pessimistic scenario with a global warming of about 5° C

Adaptation to climate change is addressed in the perspective of climate risk:

It is part of a risk management process to reduce risk to human health and to ecosystems. Climate scenarios are used as a tool to assess the relationship between CC and the event, and to identify the impact thresholds to be analyzed for risk. Global, regional, and local socio-economic, environmental and governance trends indicate that vulnerability and exposure of communities or social-ecological systems to climatic hazards related to extreme events are dynamic and thus vary across temporal and spatial scales. The Special Report on Managing the Risks the SREX[2] (IPCC, 2012a) provides insights on the distribution of capacities to adapt to extreme events across countries, communities, and other groups, and the limitations on implementation of these capacities. It also emphasized the role of the socioeconomic setting and development pathway (expressed through exposure and vulnerability).

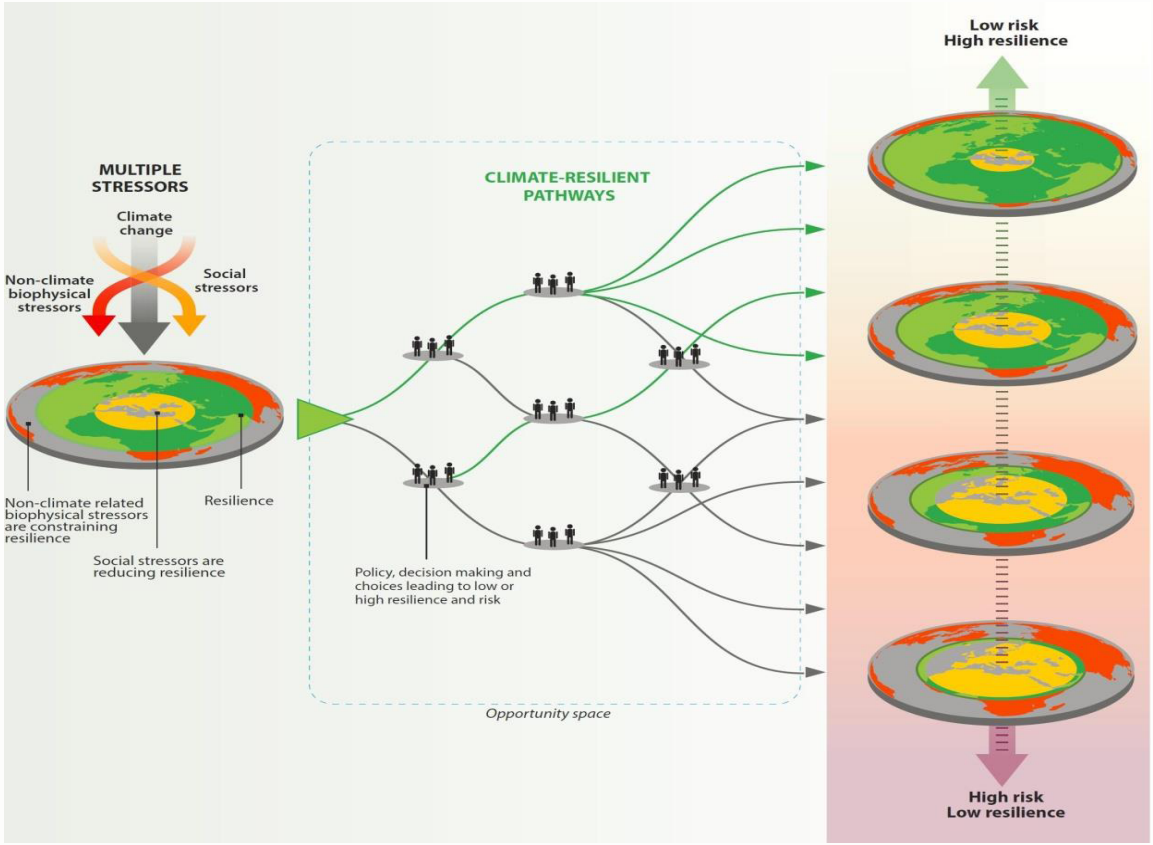
Climate-resilient pathways:

Climate change poses a moderate threat to current sustainable development and a severe threat to future sustainable development. Some climate-related impacts on development are already being observed (e.g, changes in agriculture, and increases in coastal vulnerability). Added to other stresses such as poverty, inequality, or diseases, the effects of climate change will make sustainable development objectives such as food and livelihood security, poverty reduction, health, and access to clean water more difficult to achieve for many locations, systems, and affect-

[2] The Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX), IPCC, 2012

ed populations. The following figure shows a design for Climate-resilient pathways to reduce climate change.

Climate-resilient pathways include strategies, choices and actions that reduce climate change and its impacts. They also include actions to assure that effective risk management and adaptation can be implemented and sustained. Adaptation and mitigation have the potential to both contribute to and impede sustainable development, and sustainable development strategies and choices have the potential to both contribute to and impede climate change responses. Both kinds of responses are needed, working together to reduce risks of disruptions from climate change. These actions, however, may introduce tradeoff.



Source: IPCC, AR5, WG II, 2014-05-14

Each country expressed their views on the work of the IPCC

Algeria:
A National Climate Plan has been developed and it is under approval by policymakers. Likewise the main needs requested by Algeria relate mainly to the technology transfer and capacity building. In this context, Algeria wishes to start, as soon as, it's national activities in order to meet these needs.

Palestine:
As part of a project with UNDP, it is planned to organize a workshop to raise awareness and disseminate IPCC/AR5 reports to a wide public. Similarly, we can consider using the new information included in these reports in the framework of the inception workshop of national activity

Lebanon:
The Ministry of Environment has recently created a National Committee on CC; it would be timely to present the summary of these reports to members of this Committee

Egypt:
Efforts are underway on down scaling of CC modeling in order to better assess the impacts of CC on Egypt and identify adaptation measures. These reports provide relevant information to move forward in this task.

Tunisia:
An interesting strategic reflection was conducted at national and sectoral level as well as some interesting initiatives on mainstreaming of CC in the development process. However, the governance of CC in Tunisia need to be reviewed and better structured.

Morocco:
Several initiatives are being undertaken to present the findings of these reports at the national level by emphasizing the fact that North Africa is particularly vulnerable to CC

To conclude, the IPCC findings are still relatively unknown in the region for the moment; these results are not used and as they could be. However, the information contained in these reports will be useful at different levels and significantly improve the management of climate change issues at national level. ClimaSouth could contribute improving the dissemination of these reports at the region through the development of products tailored to the needs of different users.

3. CLIMATE INFORMATION AT THE INTERNATIONAL LEVEL

3.1 Developments on adaptation issues under the UNFCCC

by Motsomi Maletjane, UNFCCC Secretariat Adaptation Programme,

Many important steps have been taken in the development of the adaptation regime under the United Nations Framework Convention on Climate Change (UNFCCC), as well as many activities mandated towards the implementation of the Convention. Four key milestones are indicated in the figure on the right.

Source: presented by Motsomi Maletjane, UNFCCC Secretariat Adaptation Programme

Within the UNFCCC framework, a National Adaptation Plan (NAP) is defined as follows:

The National Adaptation Plan (NAP) process was established under the Cancun Adaptation Framework (CAF, decision 1/CP.16, paragraphs 15 to 18). It enables Parties to formulate and implement national adaptation plans (NAPs) as a means of identifying medium and long-term adaptation needs and developing and implementing strategies and programmes to address those needs. It is a continuous, progressive and iterative process which follows a country-driven, gender-sensitive, participatory and fully transparent approach. (http://unfccc.int/adaptation/workstreams/national_adaptation_plans/items/6057.php)

Objectives of the NAP process (UNFCCC Decision 5/CP.17) are:

a) To reduce vulnerability to the impacts of climate change, by building adaptive capacity and resilience;

b) To facilitate the integration of climate change adaptation, in a coherent manner, into relevant new and existing policies, programmes and activities, in particular development planning processes and strategies, within all relevant sectors and at different levels, as appropriate.

Developing countries are invited to formulate NAP:

Indeed, through decision 1/CP.16, the Conference of party (COP) has invited non-LDC (Least Developing Country) Parties to employ the modalities formulated to support the national adaptation plans (NAPs). Developing country Parties are also invited to plan, prioritize and implement adaptation actions, including projects and programmes, and actions identified in national and sub national adaptation plans and strategies, national communications, technology needs assessments and other relevant national planning documents. In decision 5/CP.17, modalities of support and financial arrangements were decided upon, to further support the NAP process. Non-LDC developing country Parties are invited to use the modalities formulated to support the NAPs, including the guidelines for the NAPs. Information on progress made in the elaboration and operationalization of support for the NAP process can be found below and under the Guidelines.

Financial support:

The COP, in decision 12/CP.18, has requested the Global Environment Facility (GEF), through the Special Climate Change Fund (SCCF), to consider how to enable activities for the preparation of the NAP process for interested developing country Parties that are not LDC Parties. More information can be found in the Report of the GEF to the COP (document FCCC/CP/2013/3).

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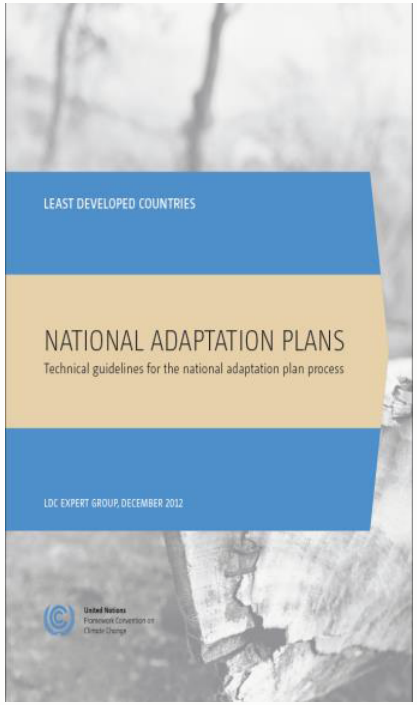
Part I. Introduction (pp. 10-19)	•Objectives of NAP process, key concepts, terms; •Guiding principles; •Differences to and lessons from NAPAs;
Part II. Elaboration of the elements of the NAP process (pp. 20-116)	•Steps; •Key questions; •Indicative activities;
Part III. A guide to using the technical guidelines (pp. 117-125)	•Sample flow of activities (workstreams); •Stakeholders; •Cycles of the NAP process;
Part IV. Annexes (pp. 126 -146)	•Additional material; •Approaches and methods enriched through; examples, case studies, and key references.



Guidelines:

COP guidelines [3] provide the basis for formulation and implementation of NAPs. We can distinguish four parts summarized in the following figure

[3] Initial guidelines are contained in decision 5/CP.17, annex.
Technical guidelines for the NAP process, developed by theLeast Developed Countries Expert Group (LEG)
re available at <http://unfccc.int/7279>, and on the NAP Central <http://unfccc.int/nap>.

The main guiding principles of the NAP process are:

- Continuous process at the national level with iterative updates and outputs
- Country-owned, country-driven
- Not prescriptive, but flexible and based on country needs
- Building on and not duplicating existing adaptation efforts
- Participatory and transparent
- Supported by comprehensive monitoring and review
- Considering vulnerable groups, communities and ecosystems
- Taking traditional and indigenous knowledge into consideration

The elements of the NAP process (described in the decision 5/CP.17)

1) Laying the groundwork and addressing gaps
   – Gap analysis
   – Institutional arrangements
   – National policies / programmes
2) Preparatory elements
   – Scenarios and assessments (e.g. V&A), etc…
   – Identification and prioritization of options
   – Develop overarching national strategy, etc…
3) Implementation strategies
   – Implement activities, policies, programmes
   – Build necessary capacities on an ongoing basis
   – Enhance knowledge base, etc…
4) Reporting, monitoring and review
   – Address inefficiencies, incorporate results of new assessments, etc..
   – Monitor and review efforts undertaken.

Among the **10 essential functions of the NAP process,** one focuses closely at the data and information "The collection, compilation, processing and dissemination of **data, information and knowledge** on climate change and relevant development aspects in support of adaptation planning and implementation"

3.2 EU adaptation strategy and Climate-ADAPT

by André Jol, Head of group vulnerability and adaptation (EEA)

The EU adaptation strategy is articulated around 3 priorities:

1) Promoting action by Member States
   – Action 1. Encourage MS to adopt Adaptation Strategies and action plans
   – Action 2. LIFE funding, including adaptation priority areas
   – Action 3. Promoting adaptation action by cities along the Covenant of Mayors initiative
2) Better informed decision-making
   – Action 4. Knowledge-gap strategy
   – Action 5. Climate-ADAPT
3) Key vulnerable sectors
   – Action 6. Climate proofing the Common Agricultural Policy, Cohesion Policy, and the Common Fisheries Policy
   – Action 7. Making infrastructure more resilient
   – Action 8. Promote products & services by insurance and finance markets

Funding:

Climate action including this EU adaptation strategy can be fully mainstreamed into the five European Structural and Investment Funds for the period 2014-2020.

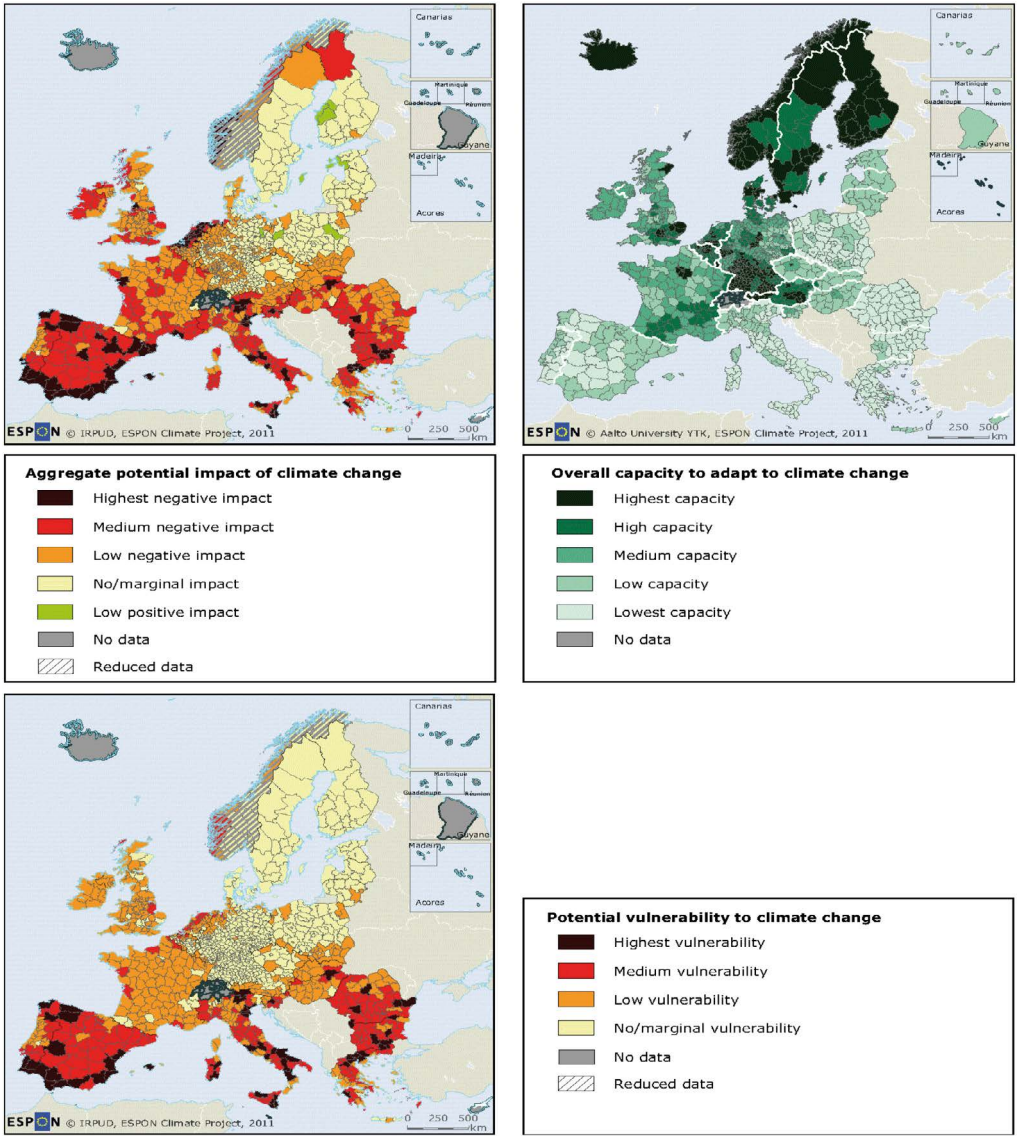
- European Regional Development Fund (ERDF)
- European Social Fund (ESF)
- Cohesion Fund (CF)
- European Agricultural Fund for Rural Development (EAFRD)
- European Maritime and Fisheries Fund (EMFF)

Assessment of the vulnerability:

As part of the process to implement this EU adaptation strategy, the main impacts and vulnerability about Europe is documented (the Climate change, impacts and vulnerability in Europe (EE indicator based report, Nov 2012).

An approach based on the combination of aggregate potential impact of CC with the overall capacity to adapt to CC leads to an assessment of the vulnerability. This exercise has highlighted some interesting lessons to be learned:

- Economic, technical, and institutional capacity to adapt to climate change differs across Europe.
- When impacts of climate change affect regions with low adaptive capacity, the consequences can be severe.
- Territorial cohesion may be negatively affected by deepening existing socio-economic imbalance.



Source: ESPON Climate

Climate-ADAPT:

CC data availability and sharing is crucial to improve the adaptive capacity for analysis and decision-making on vulnerability assessment and adaptation. In this context and as part of this strategy, EEA and DG CLIMA launched in 2012 the European Climate Adaptation Platform Climate-ADAPT (http://climate-adapt.eea.europa.eu/). This Platform Supports governmental policy and decision makers developing/implementing CC adaptation strategies, policies and actions. Climate-ADAPT includes background information (adaptation information, EU sector policies, database,.) as well as Information on/for country level including adaptation strategies. Referring to the EEA report [1] (Adaptation in Europe, April 2013), its findings and recommendations constitute lessons and guidance for a ClimaSouth Mediterranean approach to adaptation to CC.

EEA report findings and recommendations	lessons and guidance for a ClimaSouth (Mediterranean) approach
18 of the 33 EEA member countries have national adaptation strategies, and some have action plans (AT, BE, CH, DE, DK, ES, FI, FR, HU, IE, LT, MT, NL, NO, PL, PT, SE, UK)	The inception phase has identified the countries which have adaptation strategies, often at different stages of development. That said, we have also identified common challenges in the region (water, energy) and complementarities with the countries from the north shore of the Mediterranean on which we can start thinking in supporting the transition of Southern Mediterranean countries towards low carbon development and climate resilience
Some transnational regions (e.g. the Danube, the Baltic, the Alps and the Pyrenees) and cities have developed adaptation strategies	The Nile Delta, the semi-arid region common to several countries, transboundary aquifers, some trans boundary watershed (Jordan, Medjerda) need to be addressed through a regional approach
Actions taken include: 'grey' measures using technological and engineering approaches, 'green' ecosystem-based approaches using nature, and 'soft' measures such as policies to change governance approaches	'Soft' adaptation to CC measures including the institutional level (dealing with institutional barriers, carry out institutional arrangements.) as well as political changes in the governance approaches, are numerous, effective with immediate benefits and no/low cost
Challenges include the need for coherent, flexible and participatory approaches	Take advantage of political changes that occurred in the region including a civil society that contributes more to the decision.

[1] Assessment of adaptation policy processes in EEA member countries is in progress (report due in 2014)

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Responding to the question about the place of NAP with respect to the several levels of policy planning for adaptation to climate change, the response was that the NAP, as a federating process, should facilitate the integration of climate change adaptation into relevant new and existing policies, programmes and activities, in particular development planning processes and strategies, within all relevant sectors, as appropriate. Indeed, there is no substantive difference between the two concepts: adaptation rather focuses on resilience while losses and damages address the impacts of CC. So, the adaptation to the adverse effects of climate change is the most appropriate framework to address the issue of loss and damages. It has been recalled that NAPAs were conceived to address 'urgent and immediate LDCs' needs (UNFCCC COP Decision) whereas the NAPs are an extension of the concept of NAPA built on the experiences learned and geared towards all countries with a long term perspective.

The EU/DG CLIMA is funding several initiatives on data/information for adaptation such as

- Adaptation to climate change in the cities launched March 18, 2014
- CIRCLE-2 [1] (http://www.circle-era.eu/np4/home.html): Research and share knowledge on climate adaptation and the promotion of long-term cooperation among national and regional climate change programmes.

The support of the European Commission first targets member countries; there are also bilateral and multilateral programs for neighbouring countries. A particular interest has been given to the opportunity to support the National Meteorological Services (NMSs) to improve the availability, access and quality of data for adaptation to climate change. In this context, a program of the EU will start in 2015/2016 with funds available to the NMS.

CLIMATE-ADAPT provides a variety of tools and methods which are helpful for adaptation. This includes a CLIMATE-ADAPT toolset, additional Tools and Sectoral Tools (Health). The use of these tools require a basic scientific and technical knowledge as well as an understanding of their strengths and limitations. The interest for the ENPI countries to benefit from a similar platform is obvious. ClimaSouth must take initiatives in this respect. Answering the question about the involvement and commitment of the EU member countries with respect to the European strategy for adaptation to climate change, the response was that this strategy is a non-binding framework for collaboration and information sharing. Indeed, each country has the freedom to develop its own action plan for adaptation and implement it. The EEA is limited itself only for a qualitative assessment of the involvement of each country.

[1] CIRCLE-2: is a European Network of 34 institutions from 23 countries. The objective is to i) Establish a research funding network ii)Facilitate cooperation , iii) Promote a common strategic agenda, iv) Design and Fund joint initiatives and joint calls , v) Share knowledge , vi) Optimise national and European investments on CCIVA research

To conclude:

the nature of adaptation measures to CC as well as monitoring and evaluation are important aspects

- Adaptation actions can be technological, ecosystem-based or behavior changing; stakeholder involvement is important
- Indicators of climate change and impacts are required as well as further monitoring, research and climate change services are needed
- Monitoring and evaluation of adaptation actions is needed, unfortunately there is very little experience acquired in this field
- Information and knowledge platforms can help to find and share information and connect communities across Mediterranean countries

4. NATIONAL CIRCUMSTANCES

This session was dedicated to the review of national circumstances regarding data availability & access to it through the description of:

- Observation networks, the collection and processing of data, existing databases
- Deadlines/timing, access conditions and the cost of data.
- Supply and effective use for vulnerability and adaptation to climate change

The main specificities for each country are summarized in the the following pages.

Algeria

- The density of weather and climate observation network is satisfactory in the North of the country; however it is weak in the South.
- Several climate applications have enabled a definition of the Algerian climate and knowledge of climate evolution during recent decades as well as frequency of extreme event.
- The National Climatological Centre provided products and climate services to its users (Department of Agriculture, Energy, the National Highways Agency).
- The experience with the insurance sector is an interesting initiative (index insurance crop yields) that deserves to be shared in the region.
- The Algerian National Climate Plan, under approval, is a framework that will enable the Algerian Meteorological Service to further develop its contribution to cope with CC through the provision of appropriate climate services.

Egypt

- For his needs, the Central Laboratory for Agricultural Climate (CLAC) has its own network of agro-meteorological observation.
- This agro-meteorolgique network is composed by more than 50 stations and is completely automated.
- Behind this initiative is the cost of data sold by the Egyptian Meteorological Service.
- An Information System for Integrated Management Framework uses this data to provide an early warnings for agricultural activities.
- Agricultural activity in Egypt is vulnerable to CC. This Climate service (early warnings for agricultural activities)is a measure of adaptation of agriculture to CC.

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Israel

- The Israel Climate Change Information Center (ICCIC) was created in 2011 by the Ministry of Environmental Protection at the University of Haifa with collaboration of researchers from University
- The mission of the ICCIC is to prepare the national climate change policy and action plan that will include both mitigation and adaptation measures.
- The ICCIC was divided into seven topics, each leaded by a prominent scientist in the field and an advisory scientific committee.
- The main findings of the ICCIC were presented in three reports:
  - A survey of existing knowledge on the implications of climate change for Israel (published in May 2012);
  - Policy recommendations and preparation of a plan for international marketing of the products of the ICCIC (published in September 2012);
  - A guide on climate change adaptation by local authorities (published in August 2013).

Jordan

- The observation network was developed over the years to fulfill the national and international requirements, its density remains low in the arid regions.
- Some information / Classic climate services are provided free however other services are chargeable.
- Overall, the amount of services provided weather remains limited. In this context, some memorandum of understanding is signed with National Agencies and Departments users of climate information & services.
- Some on-going activities are likely to contribute to the rehabilitation of the network observation, enhancement of database as well as seasonal forecast and climate change modeling.
- The main needs expressed is to strengthen the existing national climate monitoring network as well as build capacity to meet climate services needs.

Lebanon

- The Lebanese Meteorological Department(LMD) network consists of 18 synoptic stations.
- As a complement, the Lebanese Agricultural Research Institute (LARI) has its own network of agro meteorological observations, composed by 50 agro-meteorological stations.
- Quality of the data collection; data management and analysis of the LMD and LARI do not comply with the WMO standards.
- LMD future plan:
  - Promote partnership at the national level
  - Develop its capacity to produce high quality climate services
- LARI's early warning system supports farmers to improve management of adverse impacts of climate variability on their agricultural activities, providing an agro meteorological support using SMS.

This experience is an interesting initiative that deserve to be shared in the region.

Morocco

- The Moroccan meteorological service (DMN) has an observation meteorological and climate network as well as other Networks related to: radars, radiation, lightning, air quality.
- Moroccan Climate Heritage includes: A computerized database, a paper climatological archives both for hourly and daily climate parameters, oldest Climatological document in paper format, and Metadata (Station history)
- To safeguard this heritage, the DMN has a data rescue programme
- The DMN has elaborated several climate change studies relate to:
  - Past changes in precipitation and temperature, in extremes, etc
  - Assessment of future climate change over Morocco,
  - Production of GCM downscaled time series for impact studies.
- The DMN has a commercial policy for the climate data. Nevertheless it shares needed data for specific purposes such as participating to national or international programme/project through memorandum of agreement

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Palestine

- Palestinian Meteorological Department has been working since 1994 after the Palestinian Authority took responsibilities in West Bank and Gaza strip.
- The network is composed by 11 automatic stations & 80 rain gauges.
- Historically, the responsibility for Network observation as well as management and database are went through several stages
  - From 1948-1967: Egypt and Jordan running meteorological network stations
  - From 1967-1994 Israel was running the meteorological stations.
- For archive and analysis of the climate data, an oracle-based system has been developed and starts used few months ago. Nevertheless, the main challenge is the retrieval historical data from Britain, Jordan and Egypt.
- Cooperation with Ministry of Agriculture for the implementation of an Early Drought Monitoring System.

Tunisia

- The Tunisian Meteorological Service (INM) is a Public Non Administrative Establishment (EPNA) since 16th of February 2009, certified (ISO 9001-2008) since 2010.
- The density of weather and climate observation network is satisfactory in the North and the Centre; however it is weak in the South West.
- Climate services are developed for some sectors.
- Low radar coverage (01 radar) does not allow to play an important role in the early warning of extreme climate events.
- A Twinning project with EU to develop a strategic plan hinged around four axes 1- Strengthen the technical capacity, 2- Improve the administrative and financial management, 3- Strengthen the capacity at Regional level, 4- Improve communication with partners.

On climate observation:

Meteorological services staff for observation tend to decrease. A general view in NMS was to place most importance on quality/training of staff. They also felt that the automation of the network is likely to improve data quality as well as providing solution to cope as the decline of staff. The Central Laboratory for Agricultural Climate (CLAC) from Egypt and the Lebanese Agriculture Research Institute (LARI) have their own agro meteorological network. This example is not unique, the inception missions showed that the Department of Agriculture, Water Resources and sometimes Energy (Jordan) have created their own networks for specific data but also for meteorological and climate data. This means that:

- NMSs are not the only providers of data related to climate change
- It makes finding the necessary arrangements in order to avoid duplication of effort.

Are sufficient data available?

In most countries, basic data to obtain climate information and carry out rapid analysis for national adaptation to climate change are available according to WMO standards. However, regarding vulnerability assessments and the formulation of adaptation measures at the local level, the data are available not at the required scale. They often lack high-resolution meteorological information coupled with socio-economic data. It is therefore necessary to differentiate between the data necessary to respond to specific climate change needs for a project/strategy at the local or regional level and the regular WMO climate monitoring.

What is the main bottle neck to data sharing?

Participants raised the cost of data as an important element to data exchange and sharing between partners. These costs are most of the time regulated by a legal framework. The user's perspective was that:

- Data and climate information have a cost;
- The NMSs have technical skills often unfamiliar to users;
- However, adaptation to climate change is a national priority therefore all national institutions should consider contributing to this issue.

Several questions revolved around the origin of the data circulating on the internet. The NMSs recalled that these data are often not corrected and validated; only NMSs are able to provide quality-assured data. Most industrialized countries have developed a pro-active approach to climate data and information management which is recognized a means to cope with climate change. In contrast, the current centralization of data and climate information in developing countries is not yet geared towards overall climate change analysis.

NMS participation to national activities on climate change:

NMSs Participation to the national activities on climate change varies considerably across countries to another. Most often, it remains limited and well below their potential capacity. This contribution is often limited to:

- Occasional participations in meetings;
- The provision of information or advice when requested by international bodies;
- Limited participation with little involvement in project on climate change.

This session is innovative in insofar as it enabled to expose and compare the vision of NMSs to the vision of users.

NMSs perspective	Users perspective
• This cost is regulated by legal framework which offers some flexibility. • NMSs have budgetary difficulties; they look to the provision of climate data to ensure a recipe. • Free data is not the best approach however NMSs must show more flexibility with their national partners	• users are aware that data and climate information has a cost • NMSs have very interesting technical skills often unfamiliar of users • Adaptation to climate change is a national priority and therefore the NMSs must contribute with all resources available to them.

- Observation capabilities: These capabilities vary from one country to another. In terms of spatial resolution, they are consistent with WMO standards with the exception of arid regions, mountainous areas with limited access, etc.
- Importance is given to the densification of the observation network; however, network management including its maintenance received less attention demonstrating a limited interest in the quality of data, an issue of equal importance.
- The need to share data and climate information is recognized by all, however, the approach to move forward in this area differs from NMSs to users perspectives. The amount of data and climate information available is interesting, it contrasts fundamentally with the small percentage shared with partners.

5. GLOBAL AND REGIONAL CLIMATE SERVICES INITIATIVES

5.1 The Global Framework for Climate Services (GFCS)

by Veronica Grasso, GFCS, WMO

Some highlights in the history of the emerging GFCS:

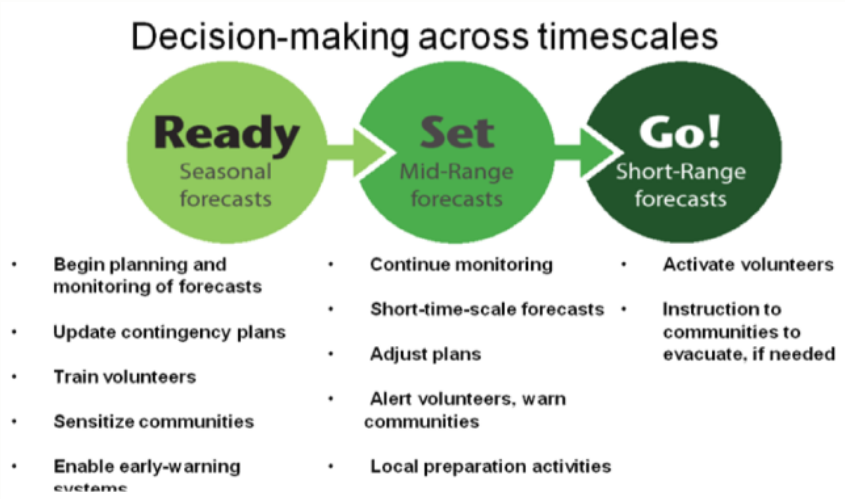
- Third World Climate Conference (2009): GFCS established as a UN-led initiative spearheaded by WMO.
- WMO Extraordinary Congress (2012): Intergovernmental Board on Climate Services (IBCS) was established and the GFCS implementation plan was adopted for subsequent consideration of the IBCS.
- IBCS-1: First Meeting of the Intergovernmental Board on Climate Services (July 2013).

The Goal of GFCS is to enable better management of the risks of climate variability and change and adaptation to climate change, through the development and incorporation of science-based climate information and prediction into planning, policy and practice on the global, regional and national scale.

What are climate services?

They draw on the accumulation of knowledge about the past, present and future of the climate system; they involve the development and delivery of a range of "products" and advice based on this knowledge about the past, present and future climate and its impacts on natural and human systems. They may include information from historical climate data sets (e.g., variability and trends), climate monitoring (e.g., drought monitoring, or more specific water deficit calculations to inform agriculture tactics), climate watches (e.g., alerts to heightened and imminent climate risks), Monthly/Seasonal/Decadal climate predictions and climate projections (through 21st Century). Thus, climate services draw on information across timescales. In some cases, short-term daily monitoring and weather forecasts might be included, as part of an integrated early warning system or strategic climate risk management package (such a flood warning system) (see figure, decision-making across timescales).

Enhancing such systems as depicted in the figure for real-time early warning / integrated climate risk management, can make contributions to adaptation in a changing climate, by increasing resilience to climate variability and extremes. Climate change projections represent a different type of information, that can inform adaptation actions on longer time-horizons (e.g. near-term, say 2021-2050 or longer-term, say 2051-2080). Such actions may involve strategic planning at national sector levels.



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Definition of Climate Services: Basic climate data (observations or model output) are typically not considered a climate service. User interaction and tailoring are needed. A climate service provides climate information in a way that assists decision making by individuals and organizations. A service requires appropriate engagement along with an effective access mechanism and must respond to user needs.

Examples of early GFCS implementation were presented, covering pilot projects on specific climate service development, and regional workshops for the most vulnerable countries. In addition, there are ongoing examples to institutionalize national frameworks for climate services.

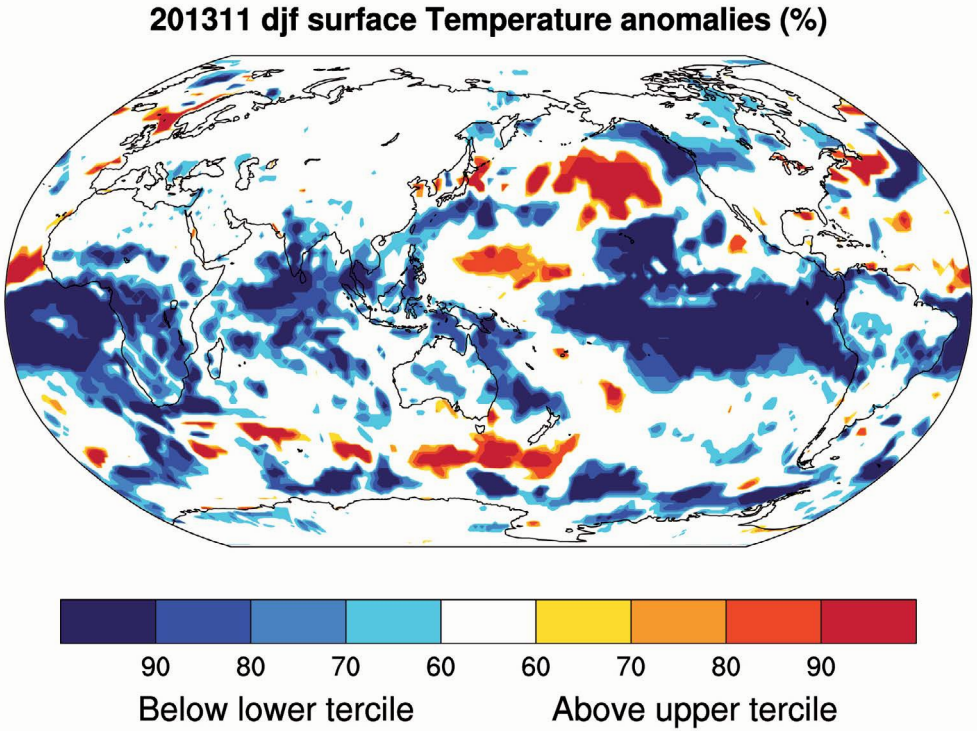
Lessons learned at regional scales include: the importance of research and science; the role of Regional Climate Outlook Forums (see examples in Sections 5.2 and 5.4), including the user engagement with translation of forecasts into impact variables such as food security risks; maximization of limited resources through regional approach; exploring gaps; capacity development and stakeholder engagement. Lessons learnt at national level include the importance of: systematic dialogue with users, understanding existing in-country capabilities (which can vary greatly, and may imply different paths forward), recognising data and observation requirements, building sector specific capacity and leveraging existing enabling factors.

Participants were encouraged to explore implementation of GFCS in their region/country (www.gfcs-climate.org). Other ways to contribute include through the Partnership Advisory Committee or GFCS Trust Fund. The seminar was also invited to consider possible synergy with the Mediterranean Climate Data Rescue (MEDARE), www.omm.urv.cat/MEDARE/.

5.2 The "Med Climate Outlook Forum"

by Silvio Gualdi, CMCC, Italy

One of the information components for climate services is seasonal forecasts (typically 1 to 6 months into the future). For example, see the seasonal forecast component ("Ready") of the Figure in Section 5.1. The Euro-Mediterranean Centre for Climate Change is an example of an institution using a Global Circulation Model (GCM) to make seasonal forecasts. For this "dynamical" approach, the global model is given the current observed state of the global ocean, atmosphere and land-surface (estimated in real-time, including from satellites, ships, buoys,



Seasonal forecasts, CMCC GCM

weather stations). The forecast consists of an ensemble of simulations performed with the GCM that mirrors the atmosphere and ocean dynamics. After starting the model with the observed initial state, computers generate a climate prediction for the future, typically out to about 6 months. Primarily through ocean surface temperature anomalies influencing the atmospheric evolution, the predicted average atmospheric climate anomalies (averages over months or seasons) can contain good skill, especially in the tropics. The initial conditions do not completely determine the outcome, so it is necessary to run an ensemble of integrations to sample the uncertainty in expected seasonal outcomes. Therefore, with a seasonal forecast, we predict the probability that a climate anomaly occurs in a given season. For example we may predict that next winter will likely be warmer than the reference period of the last 30 years.

The figure shows an example of a seasonal forecast using the CMCC GCM. Based on the range of possible outcomes estimated from the many ensemble members initialized in November 2013, the map shows the probability that the following December-February will fall among the coldest third of years on record (blue shading) or warmest third of years on record (red shading). When making a seasonal forecast, the global scale cannot be disregarded because the climate of a region may be strongly influenced by climate anomalies occurring in distant areas of the world. More and more often, stakeholders from different sectors (agriculture, tourism, energy) require regional focus on the mid and small scales. There is need for coordinated and agreed response from all involved centres to the increasing demand of seasonal climate forecast information.

Several seasonal forecast providers have developed their own tools to meet this demand with their own products. In addition to GCM forecasts, statistical methods (especially using sea-surface temperature predictors) may also be applied to make seasonal forecasts. The regional climate outlook forums (RCOFs) provide opportunity for forecast providers to meet and arrive at a consensus outlook at the regional scale, as well as providing a forum for interaction between providers and users of climate information. Hence, the RCOFs:

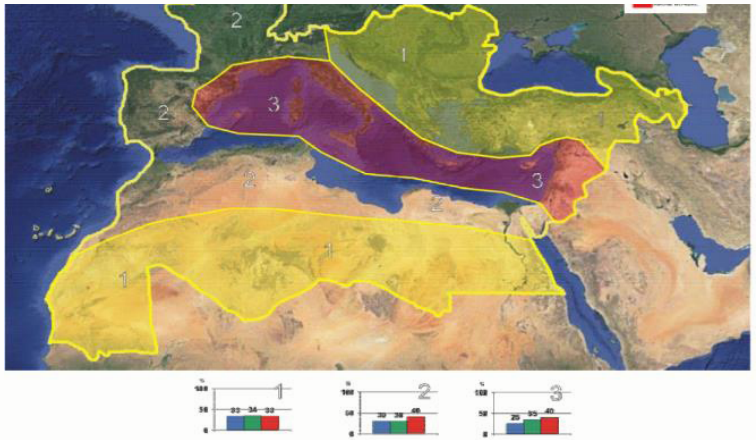
- Enhance cooperation for a task requiring resources which in many cases is beyond the capabilities of a single centre
- Facilitate the periodic organization of courses, workshops and other activities aiming to strength existing capabilities in seasonal forecasting and their applications.

The first RCOF was held in Southern Africa in 1997, and forums now meet regularly in several regions of the world www.wmo.int/pages/prog/wcp/wcasp/clips/outlooks/climate_forecasts.html.

For the Mediterranean, there have for some time, been forums on sub-regions, including North Africa (PRESANORD, see Section 5.4) and South-East Europe (SEECOF). Now, since June 2013, the MedCOF was initiated, overarching for the Mediterranean region, with coordination team: African Centre of Meteorological Application for Development (ACMAD), AEMET (Spain), CMCC (Italy), Egyptian Meteorological Authority (EMA, Egypt), MeteoFRANCE (France), Météorologie Nationale (Morocco), NHMS (Serbia), WMO. Two Annual meetings are envisioned: (a) in the second half of November (winter forecast) and (b) in the

second half of May (summer forecast). The MedCOF meetings are held in correspondence of the SEECOF and/or PRESANORD.

The figure below is an example of the product (surface temperature forecast for Dec 2013 – Feb 2014) from the first MedCOF (Belgrade, Nov 2013), based on all available seasonal forecast information and expert interpretation of those present, drawing on WMO Regional Climate Centres, Global Producing Centres (GCM forecasts), SE Europe Virtual Climate Change Centre and National Meteorological Services of the Mediterranean and other European, African and Middle East regions. The possibility was raised for whether MedCOF could be a partner in NAP processes. For more information, see: http://medcof.aemet.es/Medcof/events/events.html.

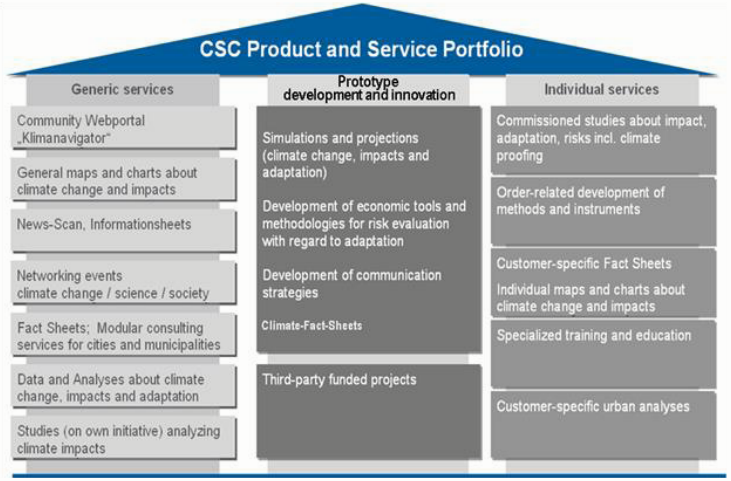


5.3 Successful experience of climate services: The German Climate Service Center (CSC)

by Andreas Haensler, CSC, Germany

The CSC was created as part of the High-tech-Strategy for protection against climate change of the German Federal Government. It was initially funded by the Federal Ministry of Education and Research (2009-till May2014) and will continue on a permanent basis in the Helmholtz Association. It represents the creation of a new institution specifically for Climate Services. There are very few cases of an institute created with such a direct mission of climate services and as such, its experiences can be useful in considering climate service development generally.

The mission is to offer products, advisory services and decision-relevant knowledge based on sound scientific knowledge in order to support government, administration and business in their efforts to adapt to climate change. The vision is for CSC to form a central node of a national network that provides and disseminates knowledge on climate change.



Generic products: e.g., CSC is developing short documents (20-30 pages) that translate IPCC results for different economic sectors. The first document focuses on "climate change and human health". The effort is led by a scientific communication specialist.

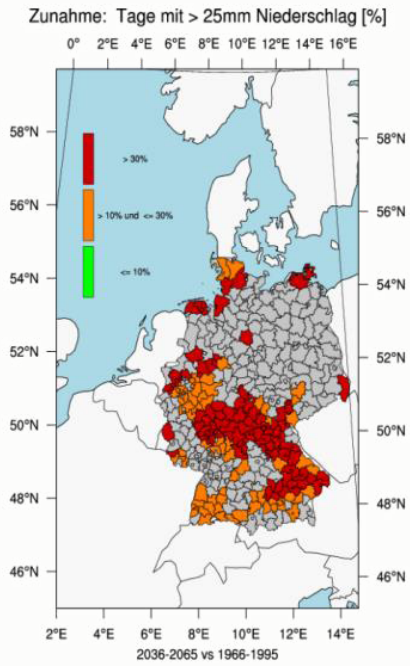
Prototype products: e.g., Climate signal maps (see illustrative figure) incorporating the assessment of robustness of projected regional climate changes (using ensembles, multiple simulations ~ 30).Three-level robustness test: (a) Agreement of projections, (b) Significance of projected changes, (c) Small sensitivity to minor shifts in the reference and projection time periods.

Lessons learnt include: the concept of climate service is new and largely unexplored; service needs science; the national and international landscapes are complex with different competing institutions at different levels; the scientific community is not yet sufficiently engaged; many customers do not yet know which services and products they need; co-production of products can be fruitful; the functions of CSC include aspects that clearly belong to a public service, while others are primarily market-oriented tasks, (although to date, fewer market-oriented opportunities have emerged than were anticipated. This latter issue may reflect a challenge of communication of the potential products to users, and inclusion of such knowledge transfer in the product portfolio. The presentation emphasised that there is still much room for innovation in the climate services field.

5.4 PRESANORD: the Regional Climate Outlook Forum for North Africa

by Fatima Driouech, DMN, Morocco

The forum has now met a total of six times (starting in Algeria April 2001, and then more regularly since January 2012, with each country (Algeria, Egypt, Libya, Morocco and Tunisia) hosting at least one time in that period. Each forum considers the recent climate conditions, the state and forecasted evolution of the main climate drivers for the region (SST, ELNINO, NAO etc), several available seasonal forecast information, including from the Global Producing Centers of Long-Range Forecasts. The forums include participation of meteorologists and users, such that advice and action options for sectors (water, tourism, agriculture etc) are also discussed and summarized. Each forum has



Example of Prototype product: 2036-2065, days with more than 25mm precipitation: All regions that failed at least one robustness test are coloured in grey.

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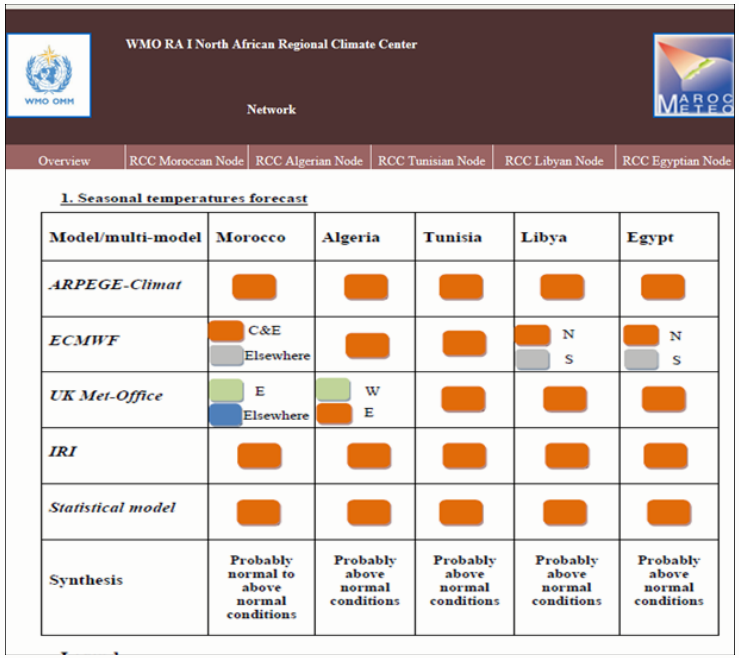
had a theme to focus producer-user interaction, including "Climate Services and seasonal forecasting for climate risk management & climate change adaptation" and "Seasonal forecast: Climate Service for Risk Management for Agriculture, Water and Health Sectors". A climate forecast for temperature and precipitation is produced for the domain of the WMO Regional Climate Network for North Africa (most recent example for temperature for March-May 2014 is shown). A summary of the forecast and implications / possible actions for users is also produced.

It is emphasised that the product is at regional scale, and users are encouraged to contact NMHSs for more precise / downscaled information. The presenter also provided the context of PRESANORD in relation to the WMO Regional Climate Network for North Africa, and regularly served seasonal forecast products for the NMHS member countries drawing on GCM and statistical products for the region, including ARPEGE-Climate Regional Climate Model (RCM) forecasts run by Morocco NMHS (an extract of the seasonal forecast product elaborated for the WMO Regional Climate Network for North Africa is shown on the right).



WMO RA I North African Regional Climate Center

Network

Overview | RCC Moroccan Node | RCC Algerian Node | RCC Tunisian Node | RCC Libyan Node | RCC Egyptian Node

1. Seasonal temperatures forecast

Model/multi-model	Morocco	Algeria	Tunisia	Libya	Egypt
ARPEGE-Climat					
ECMWF	C&E / Elsewhere			N / S	N / S
UK Met-Office	E / Elsewhere	W / E			
IRI					
Statistical model					
Synthesis	Probably normal to above normal conditions	Probably above normal conditions	Probably above normal conditions	Probably above normal conditions	Probably above normal conditions

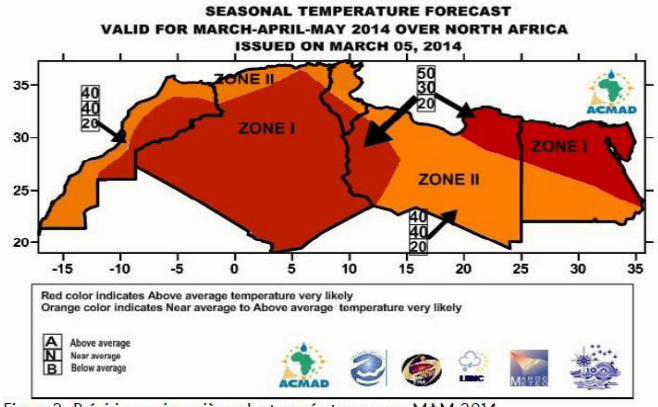


Figure 2: Prévisions saisonnières des températures pour MAM 2014

Ce produit est régional et doit être utilisé à cette échelle. Pour des applications nationales et locales, nous recommandons de consulter les Services Météorologiques et Hydrologiques Nationaux des pays de l'Afrique du Nord.

6. REGIONAL DOWNSCALING: WHAT CAN BE EXPECTED?

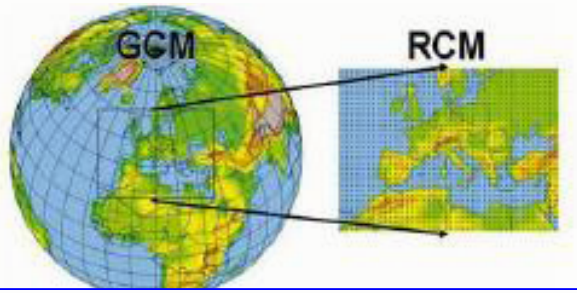
This Session focused primarily on creating high resolution climate change projections by downscaling global change scenarios under different assumptions about future atmospheric composition, i.e. primarily the response of global climate patterns to the change in global atmospheric composition. In Section 6.3 below, Morocco NMHS also present observed recent trends at high spatial resolution as an additional piece of high spatial resolution climate information related to climate change, and which can be drawn upon for climate-change-related climate services

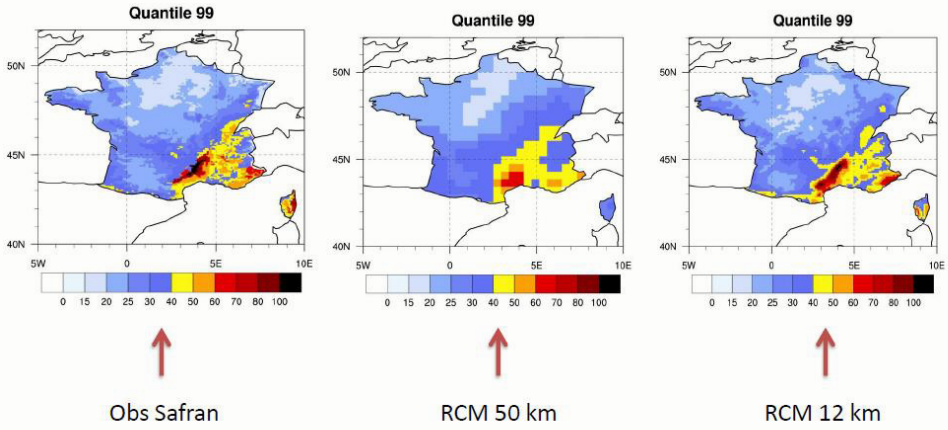
6.1 Med-CORDEX / CLIMRUN by Paolo Ruti, ENEA, Italy

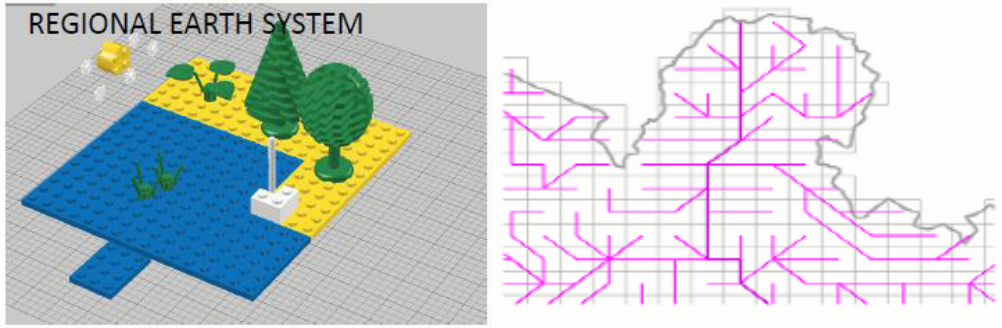
The presentation began by framing the demand for high resolution climate information. Emphasis was placed on evaluation of user needs, recognising stakeholders (policy-makers, industry etc) have relevant questions for climate science. Often this involves local and regional climate information, and in addition to global change scenarios, covers both present climate and the near future (6 months to 10 years).

The CLIMRUN project (www.climrun.eu) has been taking a bottom-up approach, undertaking case studies in provision of climate information and services for different locations and sectors across the Mediterranean. Climate services are "the last mile" and involve a huge communication challenge. In the case studies, needs are evaluated and modelling and downscaling tools are used to optimally respond to the specific demands. Case studies include tourism (Tunisia, France, Cyprus, Croatia), energy (Spain, Morocco, Cyprus, Croatia), Wild Fires (Greece) and an integrated case study for the North Adriatic.
Dynamical downscaling takes output from a Global Climate Model and finds the expression of the large-scale GCM information at the higher spatial and temporal resolution of a Regional Climate Model (RCM) (illustrated in the figure). Output of the RCM may also be used to drive even higher resolution RCMs (not shown).

The RCM permits better representation of high resolution climate processes, especially the impact of topography on detailed climate patterns. The result is better climate detail, both in space and time. The GCM output may be for the present day climate, in which case, the RCM provides estimates of the current climate details that can be validated with observations. The presentation highlighted improvement in representation of daily rainfall extremes, with further benefits shown when moving from 50km resolution to 12km resolution.







Schematics illustrating how Regional Climate Models must represent all relevant aspects of the regional earth system components and processes (left panel) including hydrology (right panel).

The comparison shown is only possible because of the existence of a high resolution gridded rainfall product for France. As RCM simulations become more common at this resolution, there is motivation to produce more widely such validation datasets. Positive validation of the RCM for current climate (as shown in the figure), then motivates repeating the dynamical downscaling using output from GCM scenarios (under different RCPs) for time-horizons through the 21st Century. The RCM now provides high resolution climate scenarios. Underlying uncertainties in the large-scale scenario are unchanged, but the RCM does provide a high resolution climate that is physically consistent with the lower-resolution GCM scenario, and which may now permit better assessment of societal implications and options for strategic planning at the national level.

CORDEX (Coordinated Regional Downscaling Experiment) is developing regional downscaling scenarios and it will increase the link with stakeholders and impact studies. Various domains for CORDEX downscaling experiments have been defined, and one for the Mediterranean has been incorporated for Med-CORDEX (www.medcordex.eu), which is being developed within the HyMex Framework. Many partners have already generated downscaled scenarios for the domain (currently there are runs from approximately 20 different models), and the data are served on the website. Med-CORDEX is intended to: build further understanding of the feedbacks between earth system components at the regional scale, characterize and analyse all components of the regional hydrological cycle and provide new sets of scenarios for the Mediterranean basin (AR5 simulations).

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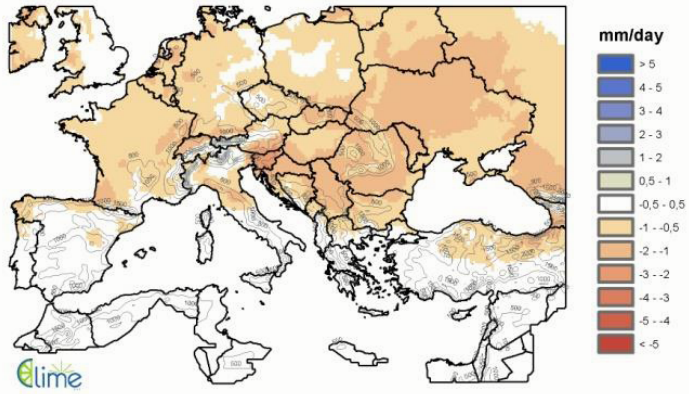
6.2 Climate Projections for the XXI century over the Mediterranean area

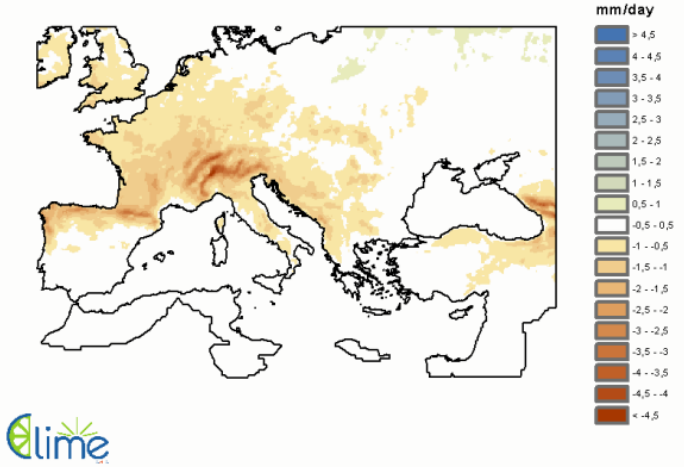
by Guido Rianna and Edoardo Bucchighani, CMCC, Italy

The presentation provided a detailed illustration of using low resolution GCM scenarios to drive a high resolution regional climate model (RCM) to achieve high resolution climate projections, and to assess the implications for specific climate impacts. The results were produced by different sections of the CMCC consortium in Italy. The RCM used is the COSMO-CLM, community developed (initially in Germany) and is now widely used by many modelling centres (more details, see http://www.clm-community.eu/). It is designed for simulations on time scales up to centuries and spatial resolutions down to 1 km.

Model validation: The RCM is driven by the CMCC GCM following the IPCC 20C3M protocol, for the period 1971-2005. Evaluation performed using E-OBS dataset (version 9) for temperature and precipitation (http://eca.knmi.nl/)

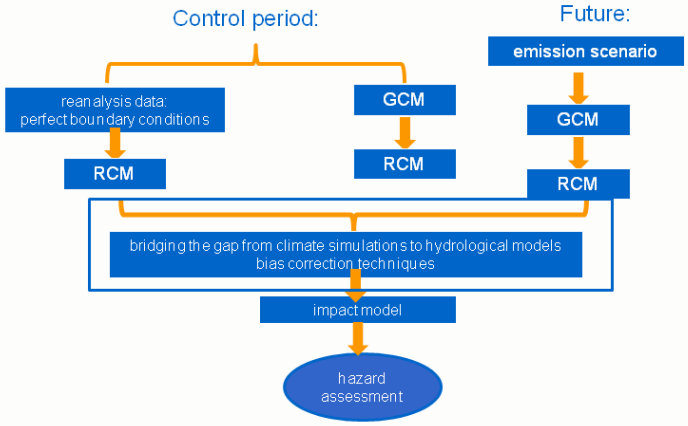


Illustrative validation of downscaled precipitation climatology in JJA (model minus observed), for 1971-2005. Model is at 14km spatial resolution.

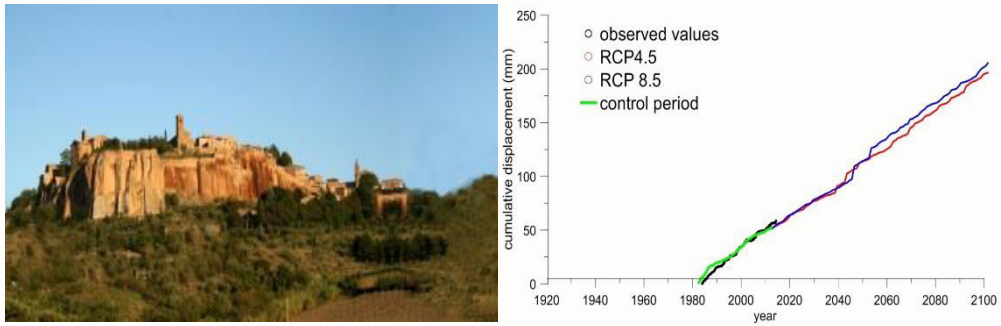


Illustrative downscaled projection for Precipitation in JJA under RCP8.5. The map shows projected rainfall for 2071-2100 (expressed relative to the 1971-2000 base period).

Model scenarios: The RCM is driven by the CMCC GCM for the period 2006-2100, under the IPCC RCP4.5 and RCP8.5 emission scenarios.
Scientific challenges in the translation of downscaled climate scenarios into risk assessments for geological hazards were introduced (see flow chart figure for step sequence).



Examples were given for flood risk assessment and slope instability / landslides. For example, model validation and projection was shown for the Orvieto hillside case study, showing cumulative displacement. This illustrates the translation of climate scenarios into an impact variable relevant for strategic planning.



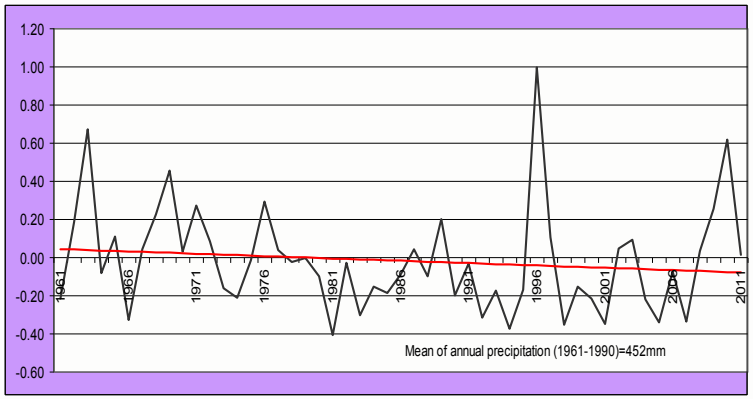
Orvieto Case Study, location (left) and the cumulative hillside displacement (right) as observed (black), modelled in the historical period (green) and under climate scenarios (red and blue).

6.3 Regional climate downscaling / information for Morocco

by Fatima Driouech, DMN, Morocco

Climate change information produced by the Morocco NMHS was categorised into:

(i) Observed climate evolutions and trends,
(ii) Climate scenarios: Dynamical and Statistical down-scaling,
(iii) Evaluation of future change (Climate indices, mean & extreme events).



Stations	Types de climat durant 1961-1980	Types de climat durant 1981-2008	Tendances sur 1961-2008 (mm/°C par an)
Tanger	Semi-humide	Semi-humide	-0,13
Oujda	Semi-aride	Aride	**-0,13**
Kenitra	Semi-humide	Semi-aride	**-0,12**
Rabat	Semi-humide	Semi-aride	**-0,11**
Fès	Semi-humide	Semi-aride	**-0,10**
Meknès	Semi-humide	Semi-aride	**-0,19**
Casablanca	Semi-aride	Semi-aride	**-0,10**
Ifrane	Humide	Humide	**-0,37**
Safi	Semi-aride	Semi-aride	-0,07
Midelt	Aride	Aride	**-0,09**
Essaouira	Aride	Semi-aride	0,01
Marrakech	Aride	Aride	-0,05
Agadir	Aride	Aride	-0,07
Ouarzazate	Hyperaride	Hyperaride	0,01

Climate types evolution using De Martonne Index.

Examples of each category are shown below.

(i) Recent trend analysis:

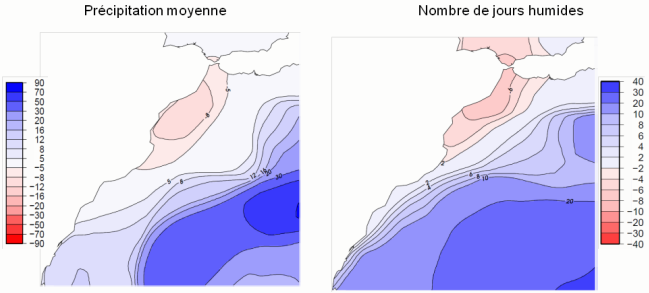
These results describe the recent trends in terms of meteorological parameter and implied change in climate types (shift from semi-arid to arid or semi-humid to semi-arid).

(ii) Dynamical/Statistical Downscaling of GCMs:

Examples were presented using AREPEGE-Climat (50-60km resolution) and Aladin-Climat (12km resolution). The following figure illustrates example of dynamical downscaling to average winter precipitation (left panel) and number of wet days (right panel). The future evolutions of Moroccan climate have also been evaluated under the Rcp scenarios using Cordex outputs and climate change simulations with Aladin-Climat (12km resolution) under Rcp scenarios are at the moment prepared by the DMN.

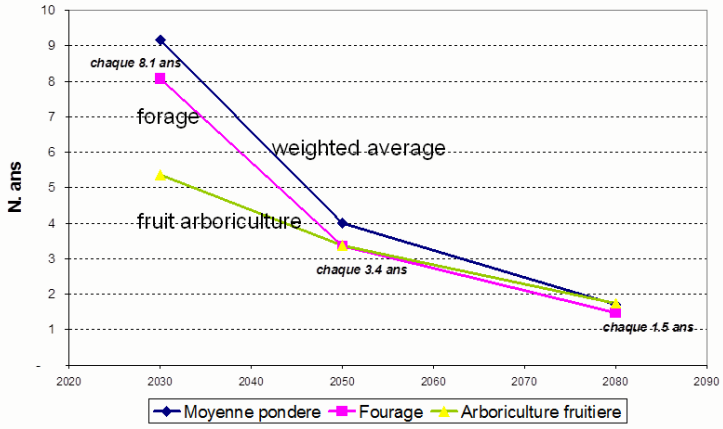
(iii) Estimated Impacts of Climate Change Scenarios:

Analyses presented included an assessment of the impact of climate change on water resources and on crops in Morocco. At current technology level, results show an increase of low yield frequency.



Changements (%) projetés par ARPEGE-Climat sous le scénario A1B pour l'hiver étendu (octobre à mars).
2021-2050 par rapport à 1971-2000.

Future return periods of yields with 10 years return period in the current climate



Avec remerciements à T. ElHairech

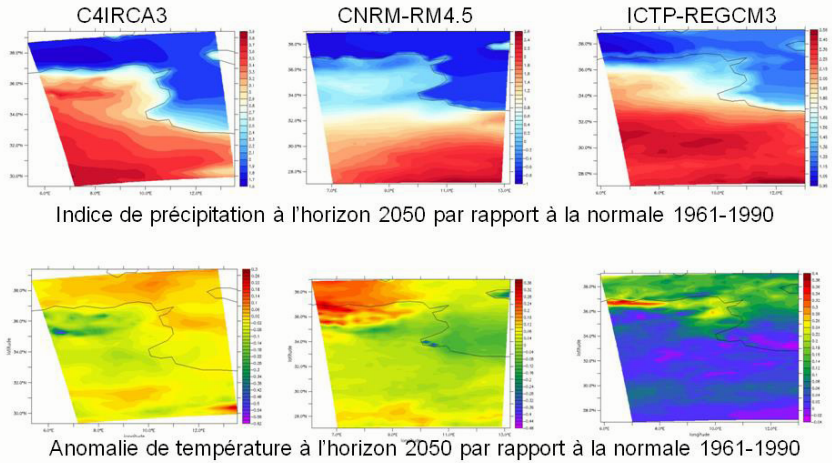
The Moroccan NMHS has been involved in different national and international projects focusing on climate change and climate change adaptation (i.e the World Bank project on evaluating climate change impacts on North African cities, World Bank project on climate change impacts on hydrology...). The presenter concluded by proposing the idea of implementing a RCM for dynamical downscaling extending across the North African domain (as an illustration, 18W-38E, 18N-38N, at a 25km resolution).

6.4 Regional climate downscaling / information for Tunisia

by Abdelwaheb Nmiri, INM, Tunisia

The presentation reported two initiatives involving regional downscaling that Tunisia NMHS has participated in.

(i) The first initiative used climate model output from the EU project ENSEMBLES. The domains of study were Mediterranean (10W-45E, 30N-52N) and Tunisia (7E-13E, 30N-40N). Results for selected models (from the 20 analysed) were presented, showing for seasonal means of rainfall and temperature, maps of 2021-2050 relative to 1961-1990. The figure shows an example of results for summer (JJA) over Tunisia.



Examples of downscaled change scenarios for JJA precipitation (top panels) and JJA surface temperature (bottom panels) for the Tunisia domain.

For 1980-2005, a validation of seasonal means over Tunisia was reported for the seven models that well represented the historical mean climate over Tunisia. The validation used 13 stations distributed across the country.

(ii) The Tunisia NMHS is a partner in the project "Improvement of water resources management and adaptation to climate change in Tunisia" (LDAS-TUNISIA). There are many partners, including World Bank, NASA, and the project coordinator, CRTEAN. Tunisia NMHS role is Climate Impact Analysis. To achieve this, statistical and dynamical downscaling of GCM global change scenarios is being implemented and Tunisia staff attended training workshop in March 2014. Statistical downscaling training included regression-based modelling and weather generators. Dynamical downscaling training is preparing to couple the WRF model (at 15km resolution) with GCM outputs of CMIP5. In subsequent discussion following the presentation, it also emerged that Tunisia NMHS is part of a consortium proposal across North African countries including climate change modelling that is under development to be submitted to the EU.

7. SWOT ANALYSIS ON CLIMATE SERVICES

The strategic field of activity targeted by the SWOT analysis was the "Information and climate service by national Meteorological Services: supply of its partners and refinement of the analysis of vulnerability and the implementation of adaptation action". The system studied is the 'National Meteorological Services". For the analysis, internal covers everything directly related to National Meteorological Services, while external covers everything related to national and regional/global initiatives and partners, who benefit from the climate information and services and in some cases contribute. The intention was to allow opportunity for everyone to have good opportunity to express their views, therefore the workshop divided into two working groups (each of about 10 persons). The working group participants were proposed to arrive at even balance of expertise in each group. Each group was asked to complete each cell in the table shown below, listing and prioritizing the key issues that emerge from the discussion in their group. To help the discussion to develop, the following questions were posed to each group:

Regarding National Meteorological Services (Internal)

(i) Which means and assets currently available national Meteorological Services to provide climate information and services of acceptable quality? (ii) What are the gaps / constraints faced by national Meteorological Services that hinder the provision of climate information and quality services?

Regarding regional/global initiatives and national partners (External)

(i) What are the opportunities that would promote demand and effective use of climate information and services?

(ii) Which threats are likely to reduce the interest in and the effective use of climate information and services?

(iii) Do regional/global initiatives/products meet your expectations, especially from the perspective of helping national /sub-national experts develop climate services? Please be specific on which ones?

(iv) What can be the contribution of your institution to enhance these types of regional products and initiatives?

	Positive aspects/advantages etc.	Gaps/constraints, etc.
In relation to national Met services	(S) Strengths Characteristics of the activity that give it an advantage over others.	(W) Weaknesses Characteristics that place the activity at disadvantage relative to others.
In relation to other partners	(O) Opportunities Elements that the project	(T) Threats Elements in the environment that could cause trouble to the activity

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Working Group 1: SWOT Summary Table

	Positive aspects/advantages etc.	Gaps/constraints, etc.
In relation to national Met services	(S) STRENGTHS • Holds expert personnel and essential techniques that are able to transfer information and data • Owning and having the databases/information services • Density (spatial) of the network is in accordance with WMO standards • Opportunity to create new divisions / specialties to comply with the end users requirements • Competition between met services and other providers/institutions created incentives for development and advancing the services • Able to use new/updated technologies	(W) WEAKNESSES • Cost of data is high • Lack of raising awareness about the existing of such services • Lack of coordination with end users (centres of research, universities, etc); messages also might not be understood by the end users. • Data liability and quality and availability of long time series of data • Lack of well distribution of networks (might be dense in one place and not in another (desert)) • Private sector providers do not comply with standards • Climate modelling either absent or require further development
In relation to other partners	(O) OPPORTUNITIES • Sustainable development is an opportunity to develop the services • Ability to provide forecasting information/climate services about extreme events • Raising awareness can create new opportunities • Able to integrate new sectors • The international initiatives are beneficial for the met services at national level	(T) THREATS • Data quality reduces data use opportunities • Maintaining weather stations • Defining met services institutions in all countries is different • Rules and legislation might hinder development of climate service and data direct sharing • Legal responsibility issues often unclear when weather information is disseminated (is the situation different for probabilistic vs deterministic information?)

Working Group 2: SWOT Summary Table

	Positive aspects/advantages etc.	Gaps/constraints, etc.
In relation to national Met services	(S) STRENGTHS • Good observational networks (long time series, good coverage) • Good technical capacity • Countries have regulatory frameworks for the dissemination of data and provision of climate services • Existing databases for data archiving and management • International linkages	(W) WEAKNESSES • Lack of financial resources • Weak technology (soft and hard) • Human resources (numbers) • Bureaucratic administration systems (management, coordination, etc.) • Lack of collaboration/coordination with users/stakeholders • Ageing infrastructure • High costs of data • Data availability over long time periods and quality • Private sector providers do not comply with standards at times • Climate modelling needs improvement
In relation to other partners	(O) OPPORTUNITIES • Capture user needs to improve products (high demand by national entities) • Regional participation including benefits to staff • Raising awareness can create new opportunities • Sustainable development is an opportunity to develop services • International collaboration enhances climate services • Information communication technology can improve climate services • International initiatives like the GFCS provide opportunities to improve services • Ability to provide forecasting information and climate services on extreme events	(T) THREATS • Data threat if free of charge (need for careful data policies) • Administrative bureaucracies (ownership, buy-in, responsibilities) • Defining roles of met service institutions differs per country • Rules and regulations might hinder development of climate data and information services • Budget cuts at the national levels • Some important international initiatives do not have funding (e.g. CORDEX), which might imply lack of potential support to countries • Lack of clarity on the authority on climate data and information • Data quality reduces data use opportunities • Deterioration of climate stations due to lack of maintenance

One theme in subsequent discussion was the differing national circumstances (as also introduced in the GFCS presentation, Section 5.1). Therefore the balance of the points in the SWOT analysis may vary in each country. Nonetheless, the discussion generally appreciated the SWOT exercise and noted the many positive dimensions of the existing situation for NMHSs, as well as outstanding technical and policy issues that required attention in order for the NMHSs and partners to function more effectively in the provision of climate information and services. The exercise provided a natural segue into the following session that focused more broadly on actions to address gaps in the provision of climate information and services.

8. BRIDGING THE GAPS BETWEEN INFORMATION PROVIDERS AND USERS

Two working groups were formed to address the gaps issue, WG1: Emerging Sectors for Climate Services and WG2: Agriculture and Water Resources. Taking into account the results of the SWOT analysis, each working group was invited to assess:

(a) What are the most important gaps?

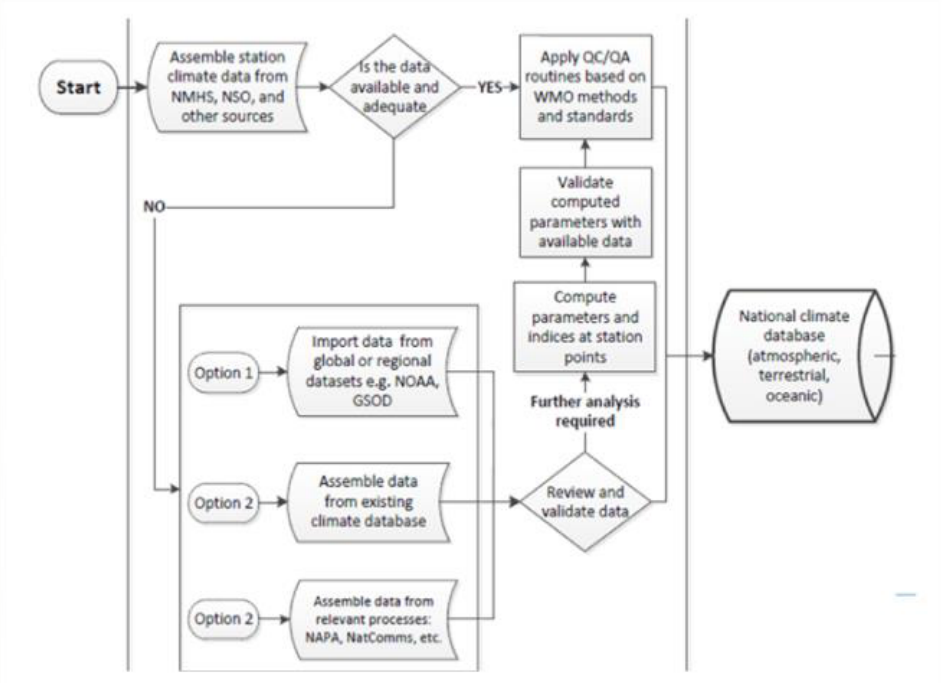
(b) For each gap, what actions may improve the situation?

The gaps identified could be at different levels in the chain, e.g., data to product; product to user; science to product provider; missing product design. Some cross-cutting issues proposed for each group to address were: (a) Gaps in producer-user interaction (by addressing this gap, to what extent, and in what ways, can this be expected to help?), and (b) Gaps associated with data to underpin climate services (gaps in data existence, gaps in data provision, gaps due to lack of analysis of merging/interpolating data etc).

To further inform and motivate the discussions, two short presentations were made (1) focusing on data in the NAP process, to help participants reflect on data gaps, and (2) an example of translation of global change projections that are downscaled and then transformed into impacts on selected key crops through relevant national partnerships, this example to stimulate thoughts about gaps in the process of translating downscaled meteorological information into adaptation action at the national level.

Example 1: Working with climate data in the NAP process presented by Motsomi Maletjane

The NAP process is an umbrella process for coordinating work on adaptation at the national level. Major processes in working with climate data in the NAP process include: Climate data collection and compilation (see flow chart below); use of a central database to manage the data; analysis and visualization of the data to generate end user products; application of the data and products under different work streams of the NAP process. For climate data collection and compilation, the process was summarized in the flow chart.



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This was shown to stimulate participants to consider potential gaps in arriving at national climate data bases. The presentation continued with flow charts for (i) analysis and visualization of the data to generate end user products and (ii) application of the data and products under different work-streams of the NAP process.

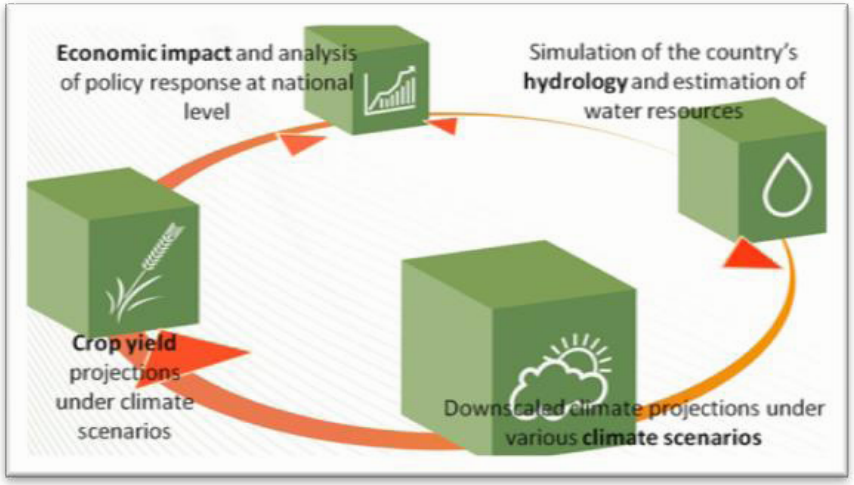
Example 2: Testing the 'MOSAICC' model in Morocco presented by Rachid Sebarri

The Modeling System for Agricultural Impacts of Climate Change (MOSAICC) is an integrated package of models for assessing the impact of climate change on agriculture. MOSAICC has been developed by the FAO in the Framework of the EC/FAO Programme on "Linking information and decision making to improve food security".

Morocco is the first pilot experience in the world. It has been implemented through successful synergy between stakeholders (Climate, Water, Soil, Agriculture and Economy). Evaluation phase is just completed, results appear positive and next steps are being considered, including potential for implementation in other countries. The four components of the system are (see the figure):

- CLIMATE: Supports the preparation of downscaled climate data and their interpolation;
- HYDROLOGY: Estimates water resources under future climate projections;
- CROPS: Simulates crop yields under future climate projections and technological progress scenarios;
- ECONOMY: Evaluates the economic impacts of future crop yields and water resources projection.

MOSAICC therefore leads to an integrated impact assessment on crop yields, from climate data handling to economic assessment. It provides information to support decision-making at national level. The system is delivered to national institutions with training.



From: Tarik El Hairech, Crop Monitoring as an E-agriculture Tool for Developing Countries – Dissemination Event on: The Operational Crop Monitoring and Forecasting in Morocco, 6 March 2014, Rabat, Morocco

Results of the Gaps Analysis
Working Group 1: Emerging Climate Services

Gaps	Responses / actions
1. Lack of communication between providers and users of information to adequately understand the needs (8/8)	• Awareness raising through workshops, seminars, mass media, integrating climate in education curricular , etc • Identification on needs • Capacity-building • Outreach/marketing to users on available climate services/information
2. Lack of tailored services for the different users, or inability to respond to all the requests (6/8)	• Better communication and interaction between providers and users of climate information • Build the capacity to develop tailor made products to meet the needs of the emerging sectors • Identify the climate information needs of the new users • Capacity-building
3. Inadequate institutional and regulatory frameworks (6/8)	
4. Lack of awareness among users and the broad public on the application of climate information (5/8)	• Outreach and awareness to the users and the general public on the importance on climate change information service • Outreach and awareness to all stakeholders on how climate change will impact their operations

The numbers in parenthesis in the above table indicate the fraction of working group participants emphasising each gap topic. An unresolved issue concerned the role of the private sector in relation to NMHSs and new product development. This represents an important policy issue to be addressed in appropriate forum. It is part of the needed clearer definition of roles for each stakeholder, which can then be expected to lead to more effective development of climate services.

Results of the Gaps Analysis
Working Group 2: Agriculture, Water

Gaps	Responses / actions
Real-time information/services (especially with seasonal forecast in mind)	
Low technical capacity to create forecast	Capacity building for providers
Information is not suited to farmers	More collaboration between providers and agriculture community
Poor dissemination	Use new information technology
Low accuracy of forecasting and missing temporal information	More research
Climate Services drawing on Global Change Projections	
IPCC projections are too broad	Downscaling
Lack of technical capacity for downscaling	Capacity building
Lack of software and hardware for downscaling	New infrastructure
Lack of connection to user	Downscale to impact variable Collaboration among national institutions Capacity building
Low collaboration between national institutions	MOUs
Unable to manage uncertainties in the projections	Capacity in managing risk and uncertainties

For water, the gaps sequence for global change information was considered similar in character to above. Some specific consideration was given to recharge information and flood risk information. Here, certain gaps were considered more serious because extreme events are important for flood (e.g. amplifying gaps in data and science).

Working Group 2: Agriculture, Water

Discussion mainly focused on agriculture, given the expertise present in the group. Discussion recognised that some gaps related to provision of real-time information, such as seasonal forecast, may be of a different nature compared to gaps related to global change scenario / trend information. Hence results were presented separately.

Working group 2, having considered the situation in an area where climate services already have a long history, has more issues of a concrete nature, reflecting the greater on-the-ground experience of trying to enhance services. The group also discussed the extent to which the data requirements for the MOSAICC system were likely to represent a gap for some countries. The general view amongst the working group was that in most and probably all countries, sufficient data could be accessed (through collaboration across relevant national institutions) to enable the system to be implemented and generate information that could be expected to be helpful at the level of national strategic planning. In plenary, discussion also noted that for some applications in some countries, available data may not be of sufficient spatial resolution, and therefore expectations should be managed according to national situation and anticipated application.

9. CLOSING ROUND TABLE

The discussion began with some initial observations from seminar resource persons on two topics, intended to stimulate discussion and feedback by seminar participants on the needs of ClimaSouth countries together with next steps and future plans.

9.1 Strengthening institutional adaptation capacity & synergies with international initiatives

By Paolo Ruti and Neil Ward

It was suggested that maintaining a strong connection to science, to encourage continued relevant scientific advances, and to participate in those to the extent possible, were all essential ingredients for a strong adaptive capacity in the region. One dimension of the above is to maintain connection to the IPCC process, especially relevant for the NMHSs who have limited technical capacity, yet the extremely complex climate science problem is central to their domain. Downscaling continues to be a central theme for technical advancement of relevant information. Benefits can be achieved by addressing this in a collaborative way, as illustrated by Med-CORDEX. The project may consider how to ensure adequate collaboration on downscaling moving forward, recognising there is also a desire for in-country capacity as well. However, for example, validation of existing Med-CORDEX experiments (and other existing regional downscaling experiments) may be a fruitful activity leading to best-informed climate-change-related climate services. Collaboration on generation of high resolution validation datasets could also lead to collective benefits.

The challenge of building capacity such that downscaling initiatives have maximum relevance to information for adaptation was emphasised. In this regard, capacity to transform global change scenarios into actionable indicators and impacts was considered achievable, connecting to ongoing initiatives where possible. The ongoing initiative of FAO with MOSAICC was noted as one very promising example that contained the relevant technical multi-disciplinary coupled models/systems, and that also naturally stimulated the needed national partnerships for the most effective creation of actionable information.

9.2 Regional training programme on downscaling climate modelling, some thoughts.

By Yadh Labbene

Existing downscaling climate modelling capabilities are limited and vary substantially across the countries in the project. Only some countries have capacities to handle GCM data and apply downscaling techniques (statistical and/or dynamical). Yet, stakeholders have expressed the need to be informed about the expected climate change about their country in order to explore and test the robustness of adaptation responses/policies. This is despite the uncertainties in the climate change information.

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A project initiative on training in this area should ensure all countries are able to start their own downscaling. The program may include empowering a national institution to: produce downscaled projections of CC for the country; share these generated CC scenarios with national partners; initiate translation into a sector-relevant variable (e.g. Crop production), in collaboration with a sector partner, and consider a possible adaptation measure. Outcomes should ensure that institutions have good technical capacity to understand the scientific basis, potential and limitations of climate modelling and regional downscaling, as well as knowledge of relevant initiatives (regional, international) in modelling/downscaling.

Some guiding principles in crafting a training program include:

(i) always being aware of the highly technical nature of the content,

(ii) taking advantage to the extent possible of international initiatives (such as Med-CORDEX, GFCS) in the field,

(iii) always being clear on what science can provide and ensure expectations of partners are realistic.

Discussion on the needs of ClimaSouth countries: Next steps for future plans and Feedback from participants.

A strong endorsement on the need for enhanced downscaling capacity became clear in the discussion. Downscaling is a route to information at appropriate scales to inform adaptation strategies and actions, even at the level of planning for cities (urban building).Various ideas for structuring the training emerged through the feedback from participants. This partly reflects the challenge of the varying capacity present across the region.

Some of the questions that emerged were:

(i) the extent to which training should be tailored to individual countries (or sets of countries), versus the training should be primarily structured for the whole region, and build a regional collaboration;

(ii) the training may explore a sectoral applications platform (such as MOSAICC, endorsed by a number of participants, with a caveat to ensure it is sufficiently mature to adopt), the platform providing a general linkage into a set of impact variables and national partners;

(iii) agriculture impacts represent one focus, another could be vulnerability to extreme events e.g. flooding;

(iv) the balance of dynamical versus statistical downscaling and the data issue for both (data to validate dynamical downscaling and data to construct statistical downscaling models; is dynamical downscaling more practical from data availability perspective? But would it benefit from collaborative effort to generate regional high resolution validation datasets?);

(v) downscaling should not solely focus on global change scenarios, but also, high resolution climate information for early warning systems (monitoring, seasonal forecast);

(vi) in the training, partnerships may be fostered between NMHSs and universities;

(vii) the training should include data management issues.

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Other more general feedbacks included: the workshop has dealt with integrated issues in a good way; the project may promote uncovering financial opportunities for related concrete proposals, especially in relation to National Adaptation Plans; UNEP will produce an IPCC Mediterranean report that should be relevant for downscaling in the project; downscaling initiatives should be conscious of their added value. The response to the discussion on training was for the meeting to agree that a menu of training options should be constructed and circulated to project countries for their discussion (including amongst national partners) and feedback on preferred option(s). Essentially the document that will be constructed for circulation will attempt to lay out the needs for downscaling and training as emerged at the seminar, and practical options to fulfil those needs, again building on the discussion at the seminar.


ClimaSouth