Towards a common framework for assessing adaptation outputs & outcomes

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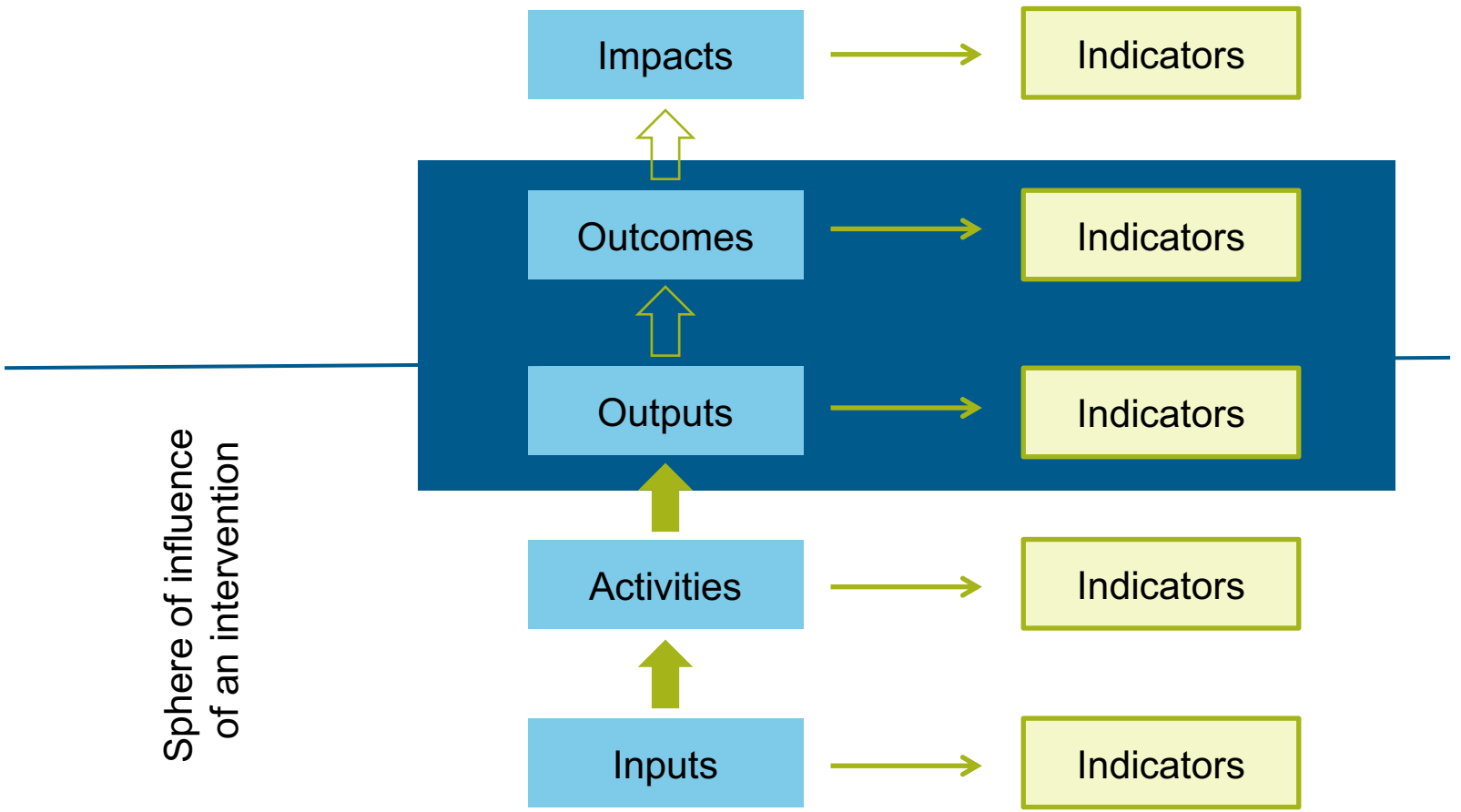
Int. Adaptation Conference
Benguerir, Morocco
26-27 Oct. 2018

Bank aus Verantwortung

KFW

OECD Results Chain



Who is interested in adaptation outputs/outcomes?

- **Beneficiaries of adaptation measures, e.g. to**
  - Establish adaptation targets (e.g. in NDCs),
  - Assess whether adaptation targets are met, and money is used efficiently,
  - Report on adaptation progress.

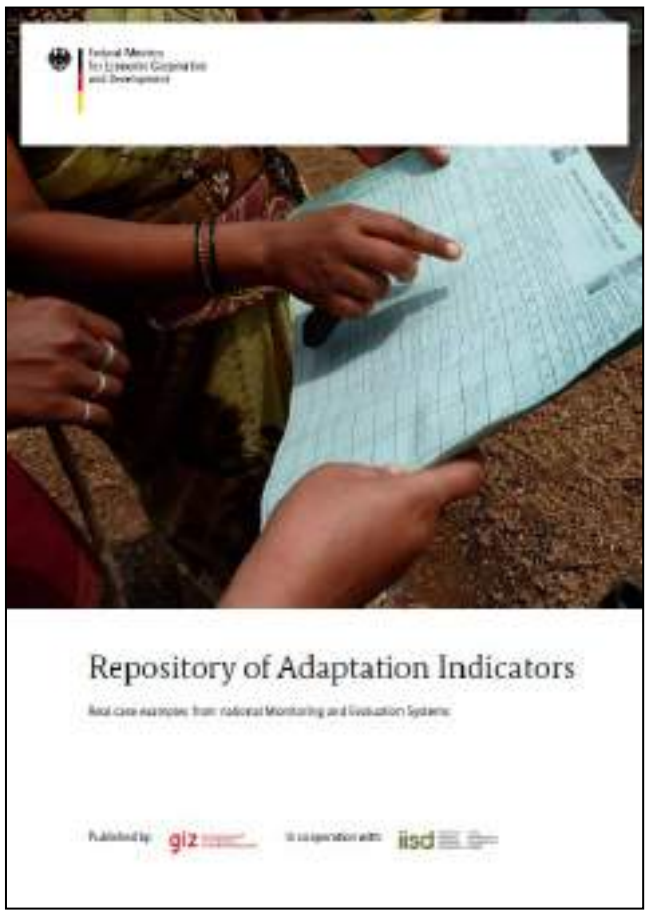
- **Financiers / Implementers of adaptation action, e.g. to**
  - Make sure that adaptation targets are met, and money is used efficiently,
  - Justify their support to taxpayers/shareholders

- **Others, e.g. to**
  - Make adaptation action transparent.

At which level are outputs/outcomes monitored?

- Global level („global goal on adaptation“)
- National level (e.g. NDCs / NAPs)
- Corporate / portfolio level
- Programme / project level

Existing guidance, e.g.



List of indicators for different focus areas:

- Climate parameters
- Climate impacts
- Adaptation action
- Adaptation results

For different sectors:

- Agriculture
- Biodiversity
- Building sector
- Coastal zones
- …

Provides Indicator Fact Sheets

Feedback from project developers

List of indicators is very useful, but

- Little guidance on outcomes / outputs
- Link between outcomes / outputs and indicators not always obvious

Their request

- Provide example outputs / outcomes for typical adaptation programmes / projects in relevant sectors
- Provide typical indicators for these outputs / outcomes

KfW-internal guidance introduced in 2016

KFW

Arbeitshilfe
Indikatoren für FZ-Vorhaben zu Anpassung an den Klimawandel

Version 1.0

Stand: 05.04.2016

KC Umwelt und Klima

To be updated in 2019

Why don´t we do that together??

Structure

Sector: A

Project type	Typical Outcomes	Outcome Indicators	Typical Outputs	Output Indicators
A	Outcome 1	Indicator 1 Indicator 2	Output 1 Output 2 Output 3	Indicator 1.1 Indicator 1.2 Indicator 2.1 Indicator 2.2 Indicator 3.1
	Outcome 2	Indicator 1 Indicator 2	Output 1	Indicator 1.1.

Example

Sector: Water supply and sanitation

Project type	Typical Outcomes	Outcome Indicators	Typical Outputs	Output Indicators
Improvement of drinking water availability	Reliable drinking water supply for target group during dry spells	• % households with sufficient drinking water during dry spells • Share of drinking water from sources less affected by drought (e.g. surface water infiltration/purification, desalinization, etc.) • …	• Reduced water losses from pipe leakages • Surface water purifi-cation system in place • Increased inter-mediate water storage capacity • Groundwater monitoring system in place	• % Leakage • Surface water purification capacity (e.g. in m^3/day) • Water storage capacity (m^3) • % of raw water from monitored wells
	Reliable drinking water supply during/after flood events	…	…	…

Possible advantages of a common framework

- Division of work saves time
- High quality through broad range of expertise
- Includes Financial and Technical Cooperation
- Wider acceptance of a concerted proposal
- Good basis for IT-based system
- Improved common understanding of adaptation results

Questions

- Does that make sense? What should be changed/included?
- Would you be interested in participating in developing the framework?
- Who could take over the co-ordination of the work?

Following the climate rationale: measuring and reporting on adaptation in the water sector

Robert Kranefeld

Sustainable Water Policy (GIZ)

Session II Water

BMZ Water Strategy

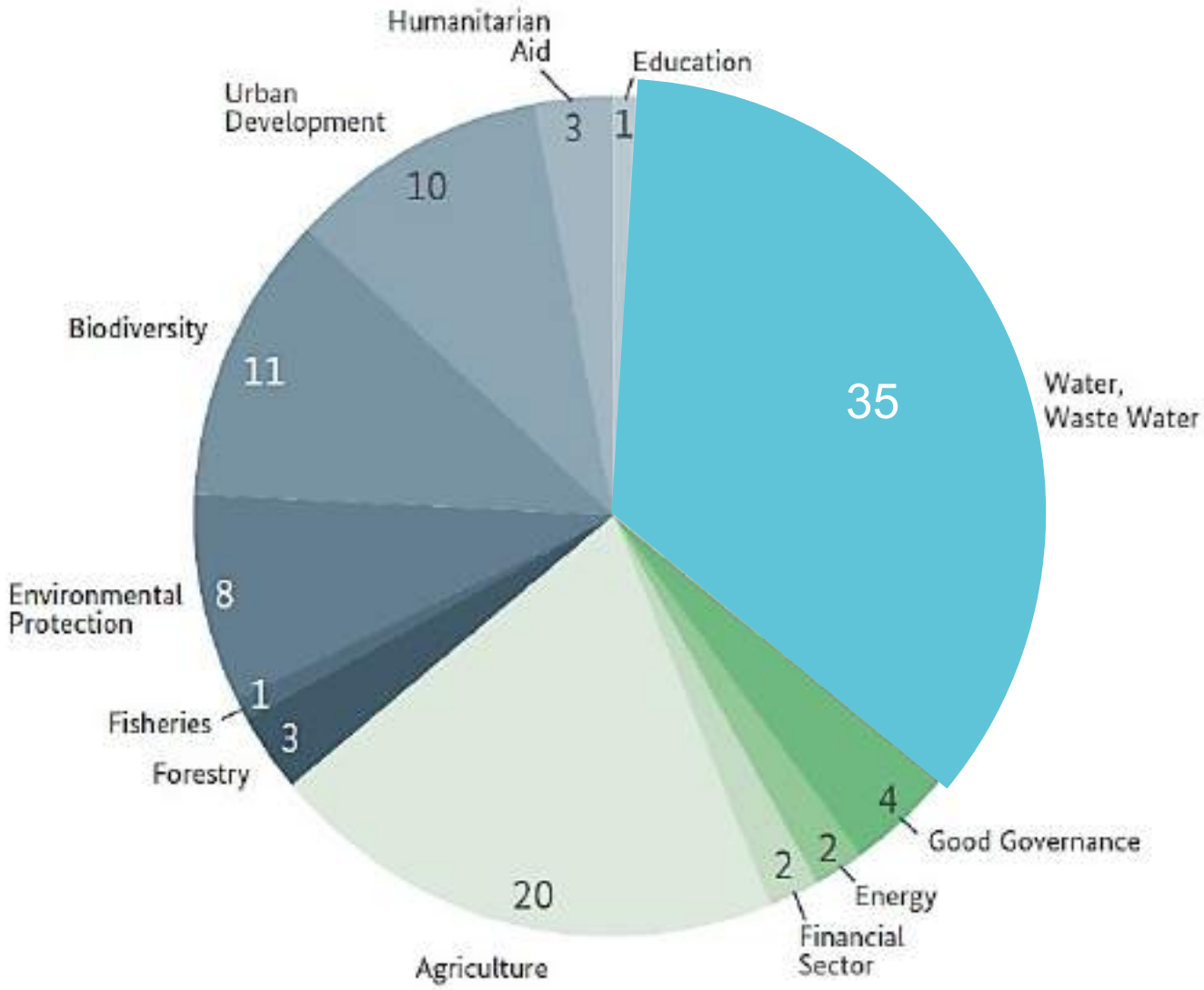
Integration of water in overarching strategies, in particular Agenda 2030 and Paris Agreement and Human Rights

Four main objectives:

- Access to Sanitation and Water
- Water Resources Security
- Climate Change Mitigation and Adaptation
- Water as a Resource for Peace

BMZ Adaptation Finance

FIGURE 4: : BMZ'S BILATERAL ADAPTATION FINANCE IN 2016 BY SECTOR (% OF TOTAL)



Source: BMZ (2017): Adaptation to Climate Change. Promising Ways to Tackle Climate Risks

International Climate Finance

GCF Portfolio – Approved Projects

1. **All climate sectors:**
   - 74 projects
   - $3.7 bn GCF finance, $12.6bn total
   - 75M direct and 217M indirect beneficiaries

Climate and water:

- 21 pr
- $737
- 10M

ADAPTATION FINANCE US$ 7,352 million

- 35% Water and wastewater systems **US$ 2,600 million**
- 26% Energy, transport and other built environment and infrastructure **US$ 1,938 million**
- 12% Other agricultural and ecological resources **US$ 871 million**
- 11% Crop and food production **US$ 798 million**
- 8% Institutional capacity support or technical assistance **US$ 598 million**
- 5% Cross-cutting sectors **US$ 357 million**
- 1% Coastal and riverine infrastructure **US$ 88 million**
- 1% Information and communications technology **US$ 53 million**
- 1% Financial services **US$ 43 million**
- 0.1% Industry, manufacturing and trade **US$ 6 million**

GCF Portfolio By Water Subsectors

Subsector	# Approved projects	Total value approved ($M)	# Pipeline projects
Coastal	5	141	9
Flood	3	153	7
Water supply	3	102	9
Drainage/sanitation/health	1	18	1
			5
			-
			2
			10

Source: GCF 2018, MDB Anuual Report 2017

Repository of water-related adaptation indicators

Climate parameters (Hazards)	Adaptation action (Output)	Adaptation results (Outcome)	Adaptation goals (Impact)
Climate impacts (Exposure)			
Climate impacts (Vulnerability)			

Repository of Adaptation Indicators
https://www.adaptationcommunity.net/?wpfb_dl=221

Range of impact uncertainty in the Niger basin

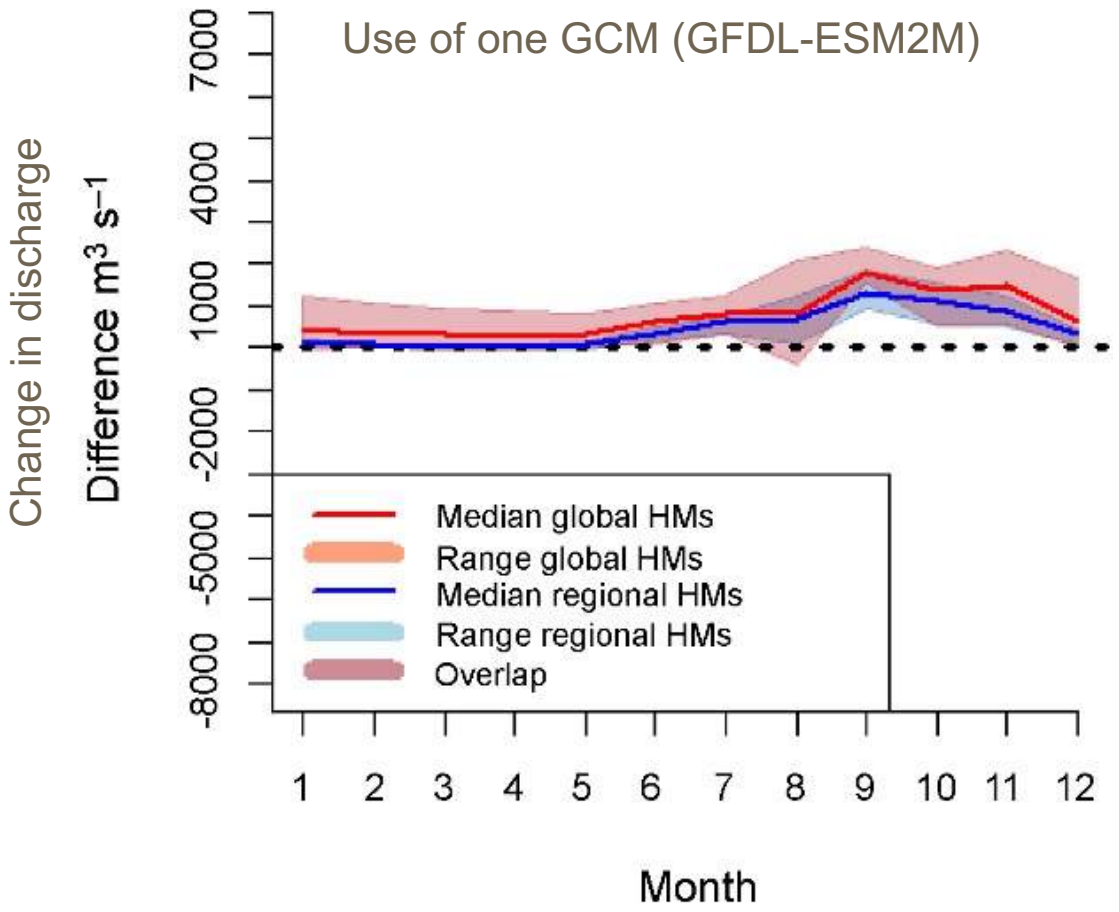


Figure 4 from Sources of uncertainty in hydrological climate impact assessment: a cross-scale study F F Hattermann et al 2018 Environ. Res. Lett. 13 015006

Dealing with uncertainty

Continuous
adaptation metrics
that monitor the effectiveness and appropriateness of adaptation activities

Report on national and global level

Transparency framework (PA § 13, APA item 5)

- NAP Process
- National Communications
- Adaptation Communications (APA item 4)
- NDCs
- … other national strategies

Monitoring, **E**valuation and **R**eporting builds the basis for long-term changes!

International Institute for Applied Systems Analysis
www.iiasa.ac.at

science for global insight

Metrics for assessing adaptation, risk and resilience

Reinhard Mechler, IIASA

Oktober 26, 2018

International Conference on

Adaptation Metrics for Agriculture, Water and Resilient Cities

Mohammed VI University, Benguerir, Morocco

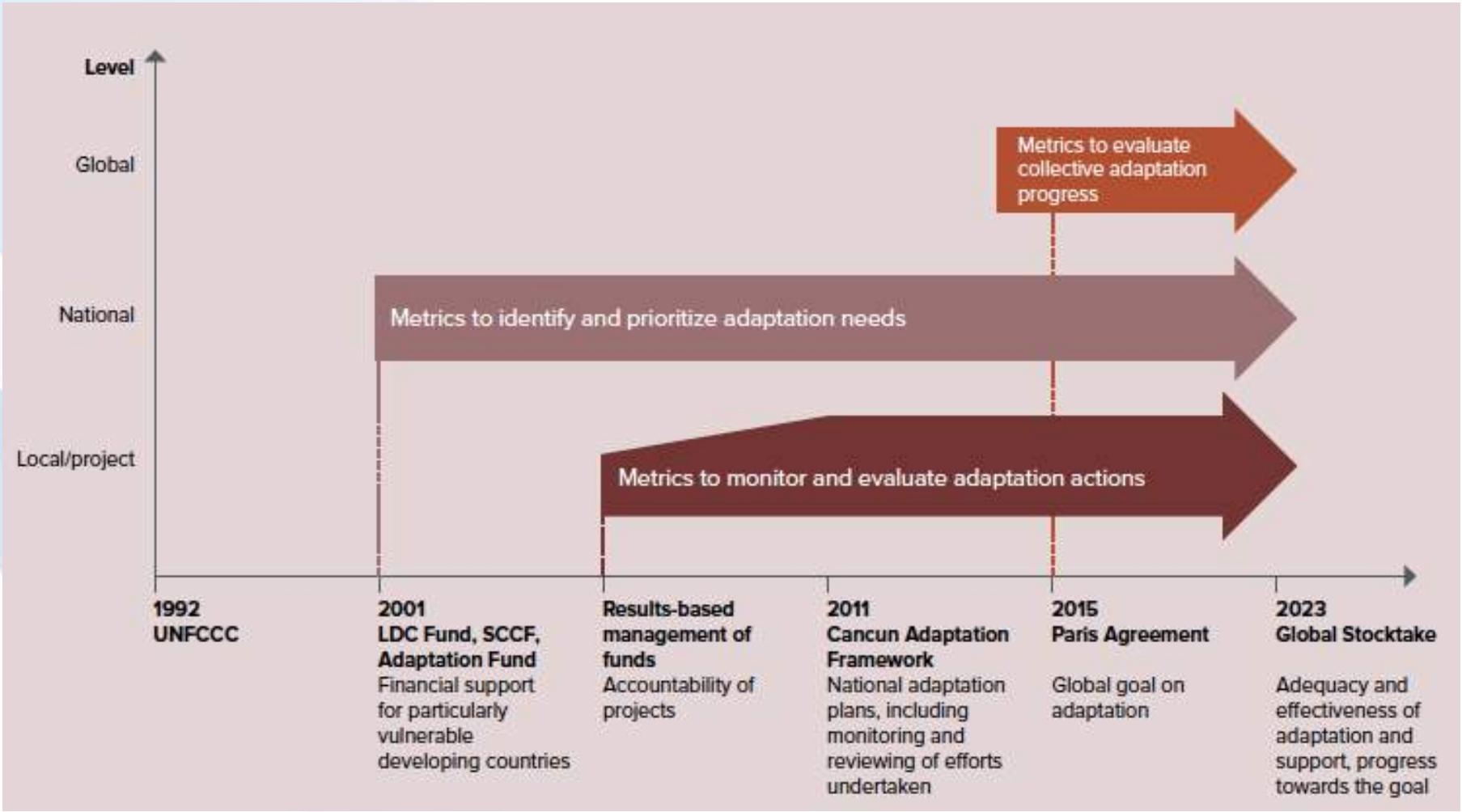
Adaptation metrics: what to measure?

- **Identifying need for adaptation: Vulnerability**
  Identify and compare **state** and needs: most vulnerable

- **Measuring and tracking inputs, output and process of implementing adaptive actions:**
  Input: e.g., spending on flood protection,
  Output: e.g., the number of early warning plans implemented,
  Process: running an inclusive risk management process

- **Measuring the effectiveness of adaptation - monitoring and evaluation: outcome**
  Measure progress and provide feedback on the effectiveness of actions, e.g. flood risk

Demand for adaptation metrics



Moehner, 2018

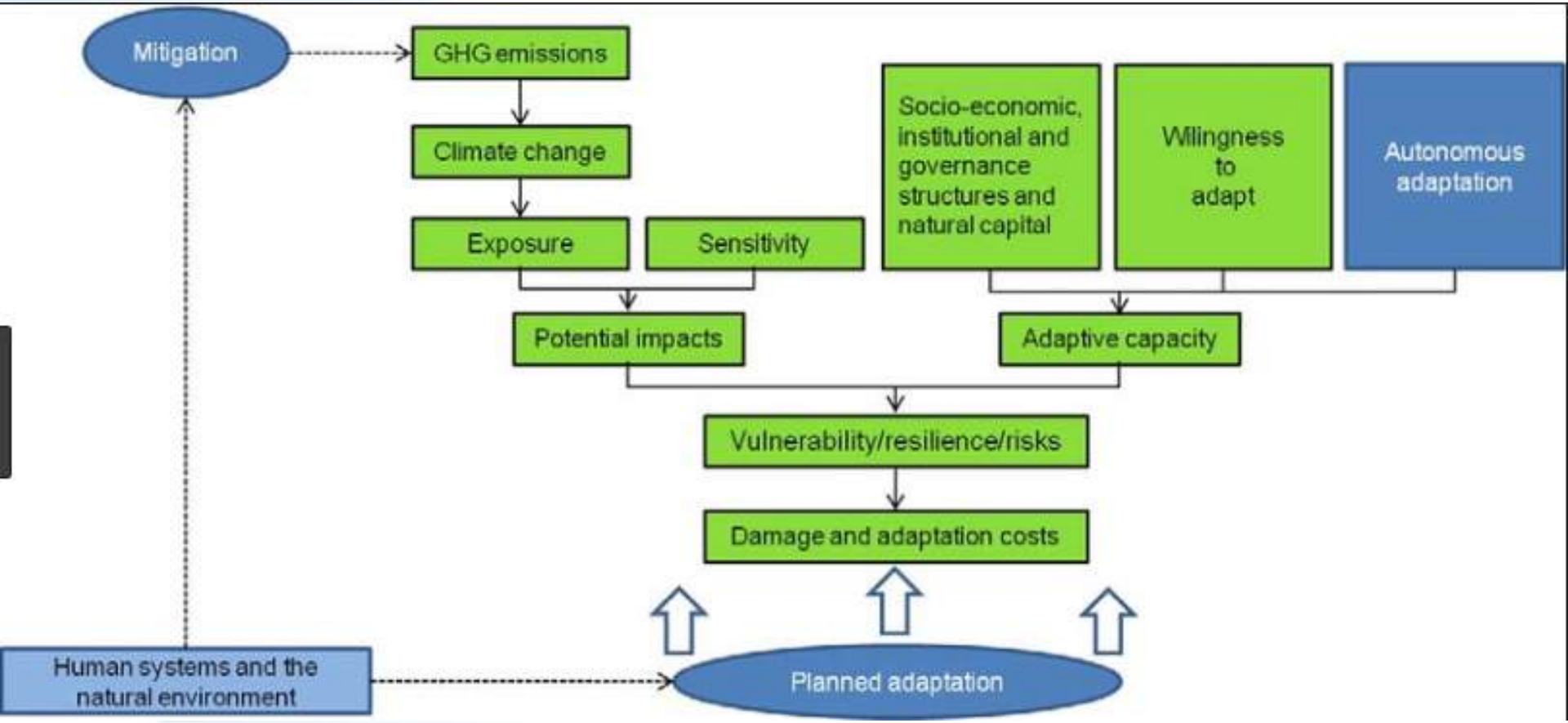
Uptake in NDCs

Table 2. Examples of quantitative targets and goals included in the adaptation component of the communicated intended nationally determined contributions (UNFCCC, 2016c p. 68).

Sector/area	National example
Water	• Ensure full access to drinking water by 2025 • Increase water storage capacity from 596 m^3 to 3,997 m^3 in 2015–2030 • Increase desalination capacity by 50% from 2015 by 2025
Agriculture	• Convert 1 million ha of grain fields into fruit plantations to protect against erosion • Increase the amount of irrigated land to 3.14 million ha • Reduce post-harvest crop losses to 1% through treatment and storage
Ecosystems and biodiversity	• Protect 20% of marine environments by 2020 • Regenerate 40% of degraded forests and rangelands • Establish 150,000 ha of protected marine areas
Forestry	• Increase forest coverage to 20% by 2025 • Maintain 27% forest coverage • Achieve 0% deforestation rate by 2030
Disaster risk reduction	• Ensure that all buildings are prepared for extreme events by 2030 • Reduce the number of the most vulnerable municipalities by at least 50% • Relocate 30,000 households
Energy	• Ensure that hydropower generation remains at the same level regardless of climate change impacts • Increase the proportion of renewable energy to 79–81% by 2030
Other	• Ensure that 100% of the national territory is covered by climate change adaptation plans by 2030 • Reduce moderate poverty to 13.4% by 2030 and eradicate extreme poverty by 2025

Moehner, 2018

1. Assessing climate vulnerability



EEA 2011

Assessing climate vulnerability for water resources

Table 2 Indicators used to represent *Global Impact Factors* for the CVI value for Mongolia

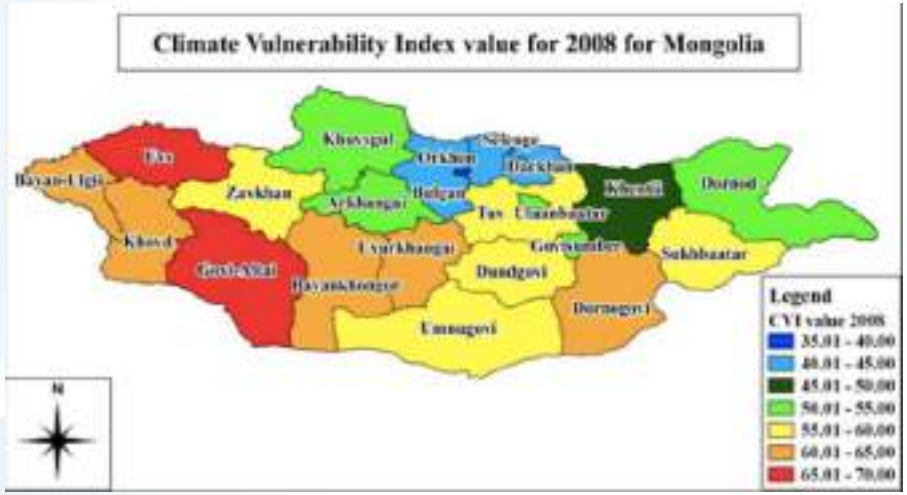
Global Impact Factors (GIFs)	Data used for each indicator	Source data
Geospatial variability (G)	• Isolation from the capital city (food sources) • Human population density • Range in altitude (slope)	• Dist from capital, Mong Rd Atlas 2004 • Statistical yearbook 2008 • Topog Map NASA SRTM 90m DEM data
Resource quantification (R)	• Ave annual precip (mm) * • Total water res per capita (M^3) *	• Statistical yearbook 2008 • Water census 2007, MNET /HDR, 2011
Accessibility and property rights (A)	• Useable water resource per capita (cubic metre) * • Domestic water use (litre per day) *	• Water census 2007, MNET cited in Mongolia HDR, 2011 • Stats yearbook 2008, Basandorj (2011)
Capacity of people and institutions (C)	• Under 5 mortality rate (per 1000 live births) • Tot sch children as % of school age cohort * • GDP per capita (1000 togrogs) *	• The MDGs Implementation, 2009 • National Statistical office, 2008 • Statistical yearbook 2008
Utilisation and econ efficiency (U)	• Econ return on ag water use (togrog) * • Econ return on ind water use (togrog) * • Econ return on mun water use (togrog) *	• Statistical yearbook 2008 • Statistical yearbook 2008 • Statistical yearbook 2008
Ecological integrity maintenance (E)	• Forest area (hectare) * • Pasture-damaged land (in percentages) • Livestock density • Road network (km)	• FAO (2007),Darkhan gov • MNET, 09 Mong HDR, 2011 • National Stats office, 2008 • Mongolian Road Atlas, 2004

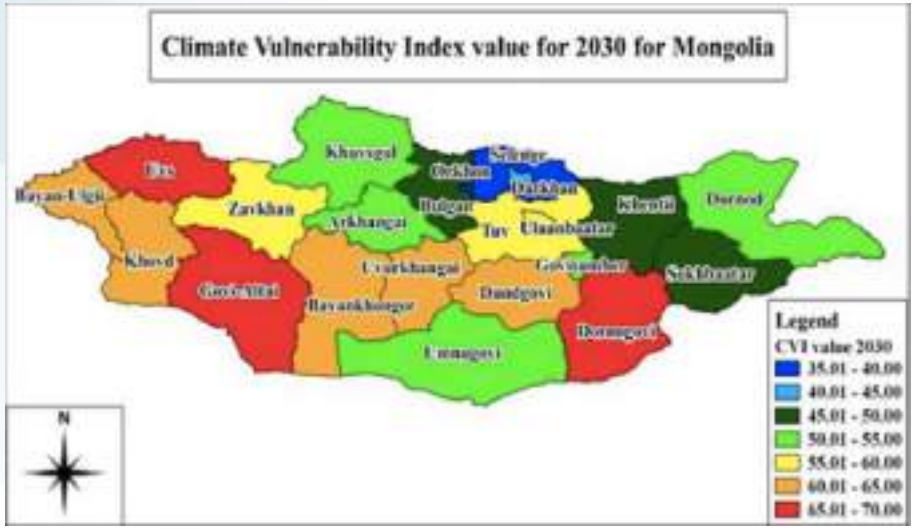
Note: Indicators marked with * must be inverted to reflect negative impacts. For example, high rainfall will reduce water vulnerability by increasing water resources and availability, but the high livestock density will increase vulnerability. This means the score for rainfall must be inverted to reflect its impact on the overall CVI score, since high CVI means high vulnerability.

Source: Byambaa, 2012

Sullivan and Byambaa, 2013

Measuring needs
Vulnerability assessment



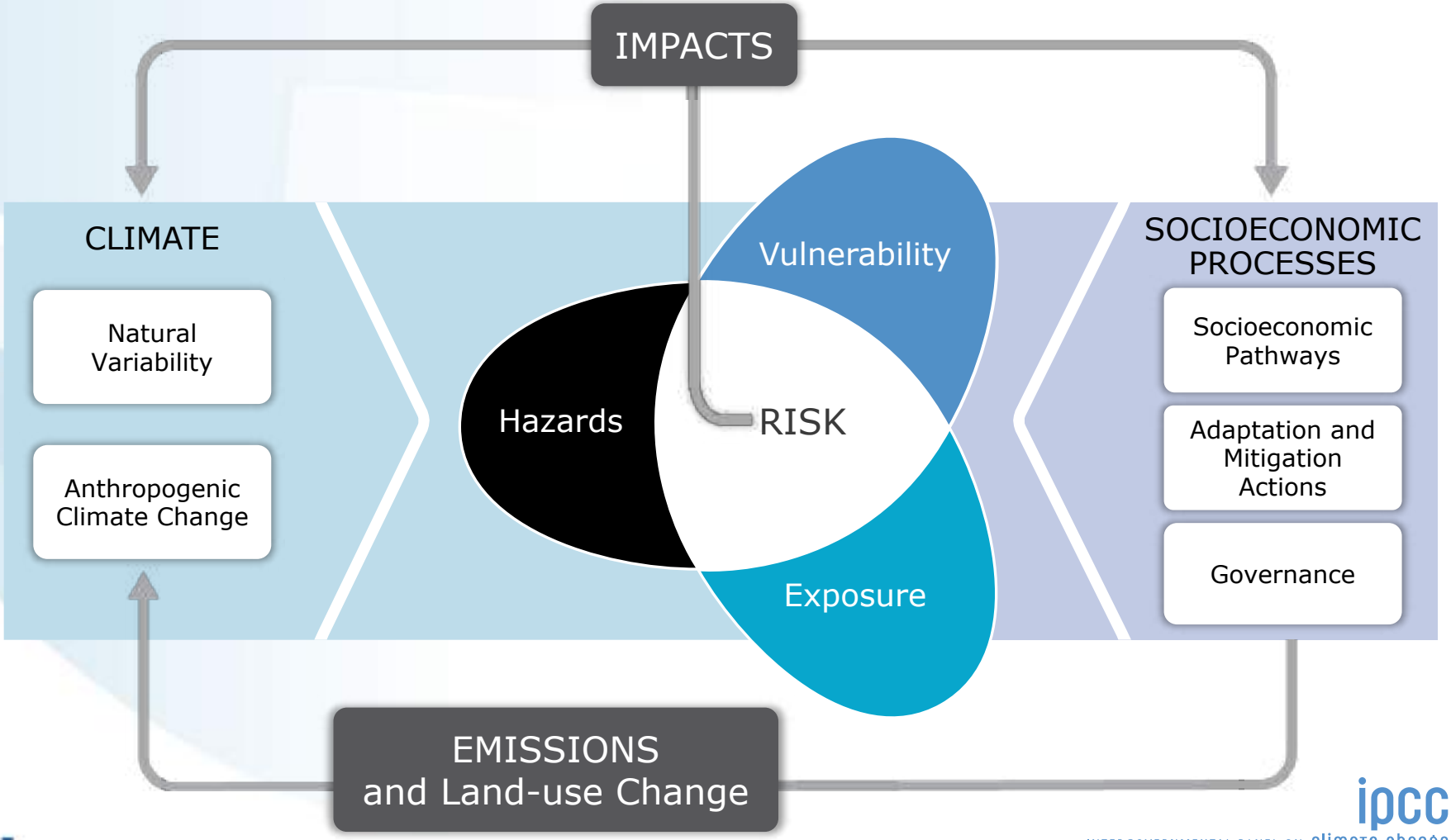


Sullivan and Byambaa, 2013

Status

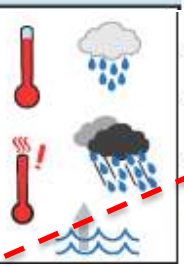
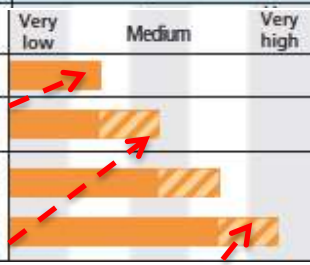
- Focussed on need, rather than outcome and impact
- Construction of V Index not straightforward
- Comparisons across regions and countries difficult

2. IPCC's Climate risk concept



IPCC AR5 climate risk management approach: outcome

Africa

Key risk	Adaptation issues & prospects	Climatic drivers	Timeframe	Risk & potential for adaptation
Compounded stress on water resources facing significant strain from overexploitation and degradation at present and increased demand in the future, with drought stress exacerbated in drought-prone regions of Africa (*high confidence*) [22.3-4]	• Reducing non-climate stressors on water resources • Strengthening institutional capacities for demand management, groundwater assessment, integrated water-wastewater planning, and integrated land and water governance • Sustainable urban development		Present Near term (2030 – 2040) Long term (2080 – 2100) 2°C 4°C	

Risk:
Potential impacts

Scope for risk management

Adaptation infeasible:
Limits

IPCC AR5 climate risk management approach: outcome

Africa

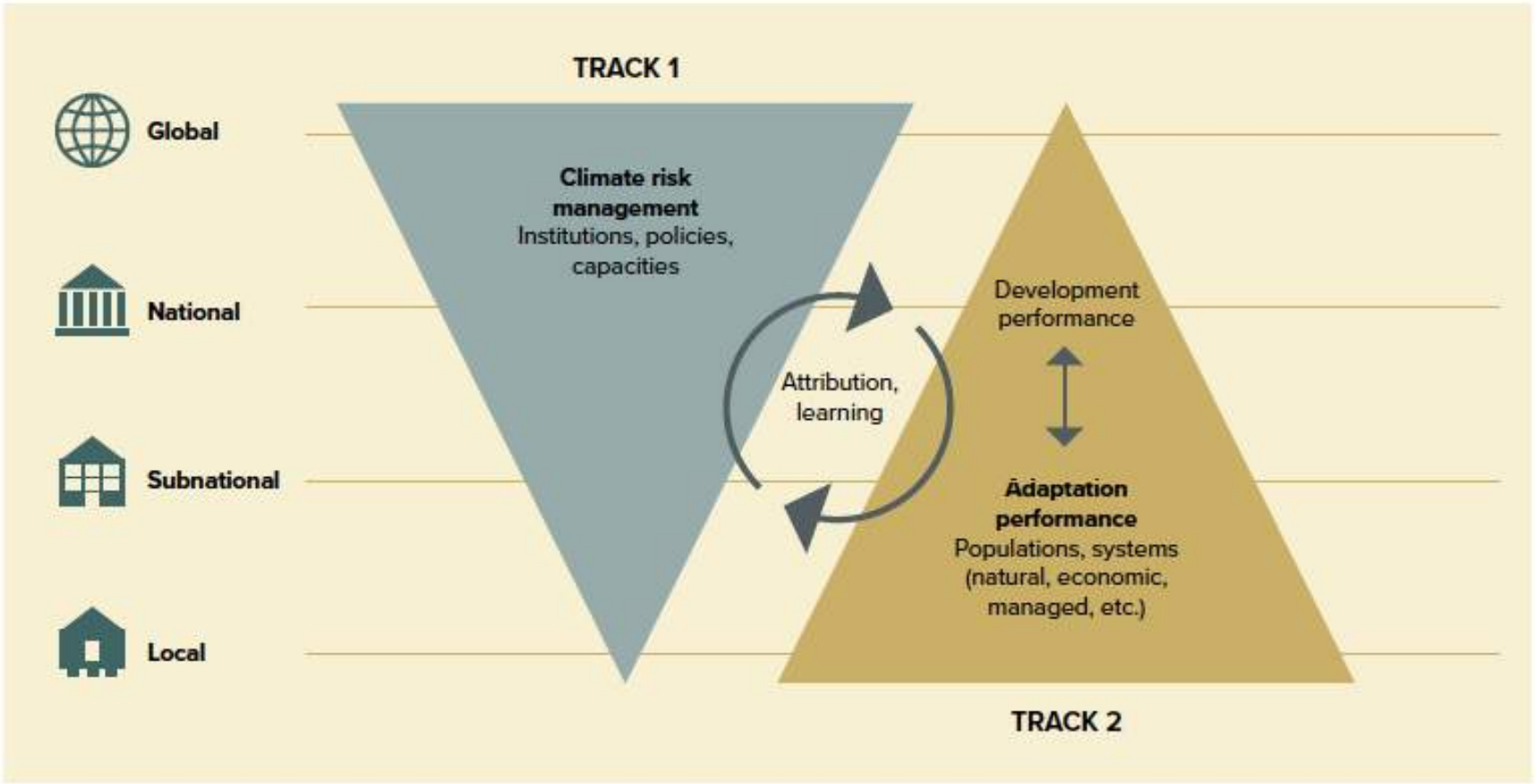
Key risk	Adaptation issues & prospects	Climatic drivers	Timeframe	Risk & potential for adaptation
Reduced crop productivity associated with heat and drought stress, with strong adverse effects on regional, national, and household livelihood and food security, also given increased pest and disease damage and flood impacts on food system infrastructure (*high confidence*) [22.3-4]	• Technological adaptation responses (e.g., stress-tolerant crop varieties, irrigation, enhanced observation systems) • Enhancing smallholder access to credit and other critical production resources; Diversifying livelihoods • Strengthening institutions at local, national, and regional levels to support agriculture (including early warning systems) and gender-oriented policy • Agronomic adaptation responses (e.g., agroforestry, conservation agriculture)		Present Near term (2030 – 2040) Long term (2080 – 2100) 2°C 4°C	Very low / Medium / Very high

Adaptation infeasible: Limits

Status

- Currently expert-based at regional scales
- Impact and risk analysis not yet brought together with scope for adaptation/risk management
- Tracing scope for risk management over time?
- Climate risk attribution difficult

3. Mixed approach: Process + output Learning across scales



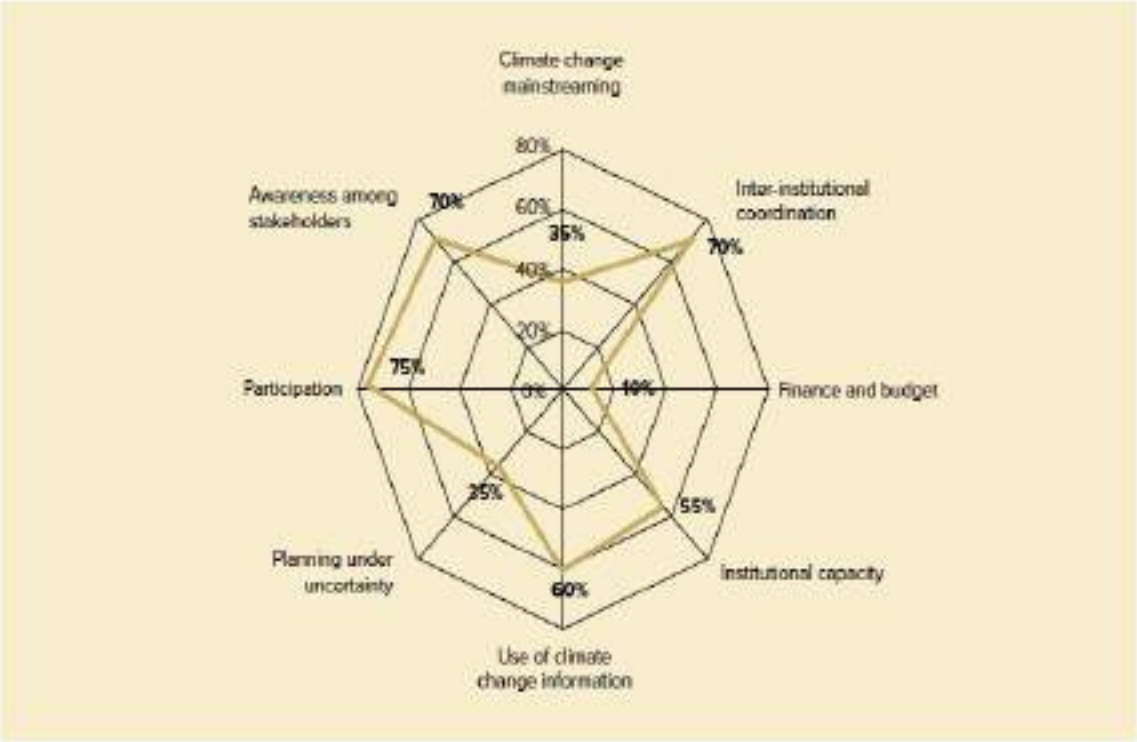
Tracking Adaptation Measuring Development (TAMD) framework

Brooks and Fisher, 2014

Process + output
Learning across scales

Institutional scorecard analysis

Figure 3. District of Guijá: institutional scorecard results (Artur et al., 2014, p. 33)



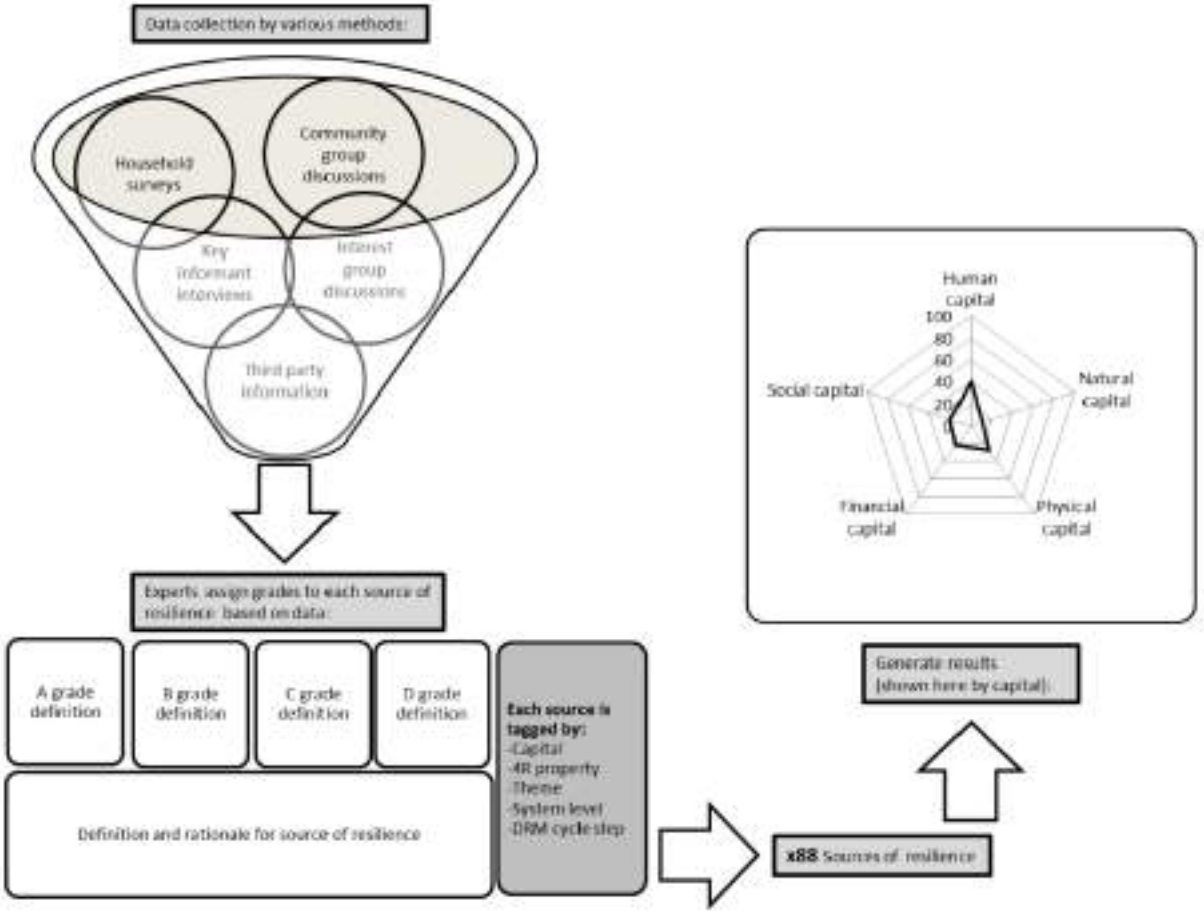
Source: Governo do Guijá (2014)

Table 1. Dimensions of climate risk management

Dimensions of climate risk management
Integration of climate into planning
Institutional coordination for integration
Budgeting and finance for climate integration
Institutional knowledge and capacity
Use of climate information
Planning under uncertainty using appropriate methodologies
Participation of relevant stakeholders in national planning
Awareness among stakeholders

Fisher and Anderson, 2018

Measuring capacity: The Flood Resilience Measurement Tool (Flood Resilience Alliance)



A: Best practice

B: Good standard, no immediate need for improvement

C: Deficiencies, room for visible improvement

D: Significantly below good standard, potential for imminent loss

Keating et al., 2017

Understanding Resilience
44 Sources evaluated with mixed methods approach

Household survey

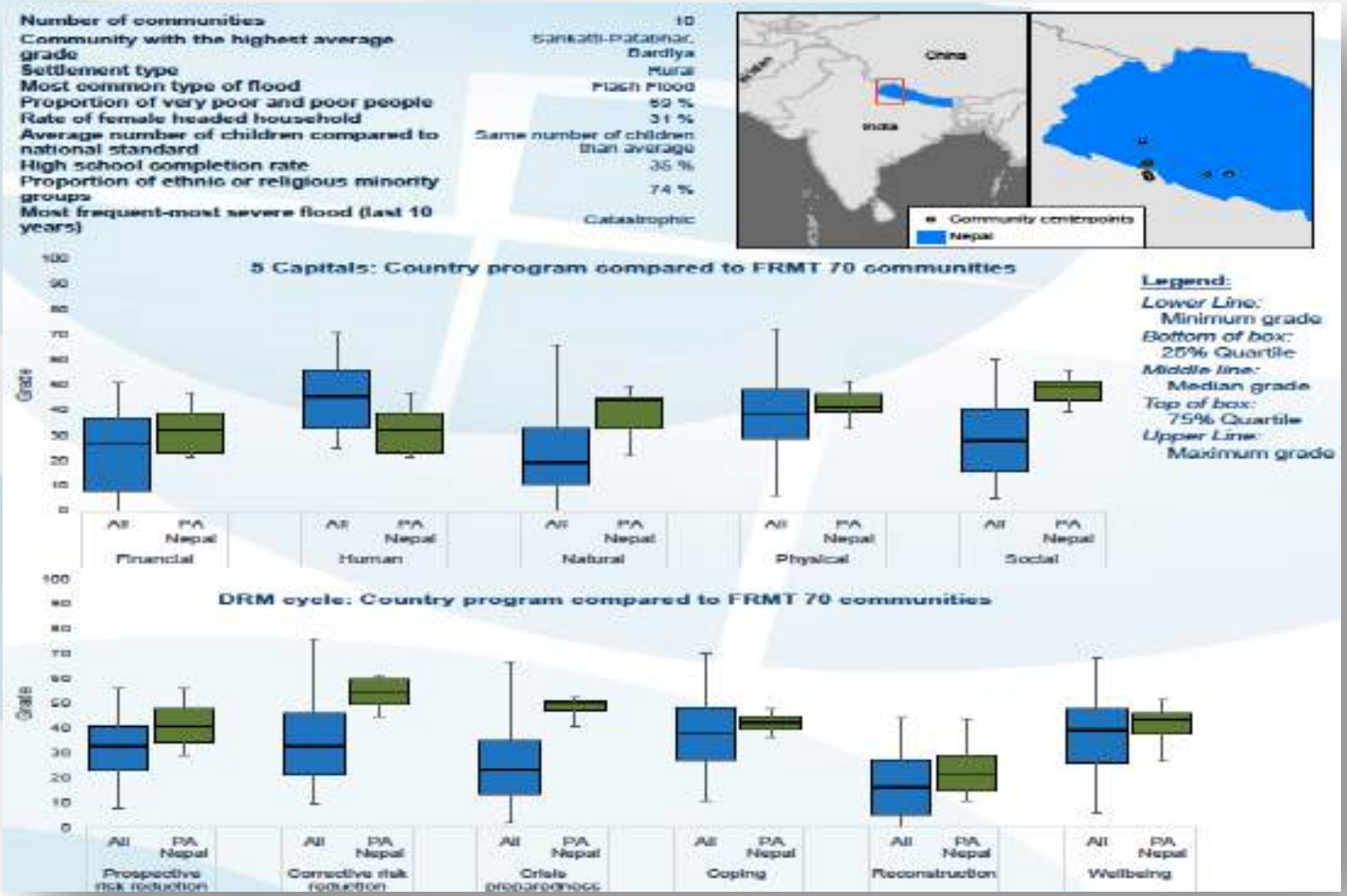
Community discussion

Key informant

3rd party source

Communal social safety net	Does the local government have money available to help those harmed by flood emergencies?	1 - Yes 2 - No 3 - I don't know emergencies 2 - The local government has a fund for flood emergencies but it is not yet solid (funding is uncertain) 3 - The local government has an flood emergency fund 4 - I don't know	Does the local government have money available to help those harmed by flood emergencies?	1 - Yes 2 - No 3 - I don't know flood emergency fund 4 - I don't know	Does the local government have money available to help those harmed by flood emergencies?	1 - Yes 2 - No 3 - I don't know there's fund for flood emergencies but it is not yet solids (funding is uncertain) 3 - The local government has an flood emergency fund	Does the local government have money available to help those harmed by flood emergencies?	1 - Yes 2 - No 3 - I don't know - The local government has a fund for flood emergencies but it is not yet solids (funding is uncertain) 3 - The local government has an flood emergency fund	Provide statistics on local social safety nets for flood emergencies.	Firm Form
	If a flood occurs, our household can get money or supplies from the local government (or community org)	1 - Yes 2 - No 3 - I don't know	If a flood occurs, the households can get money or supplies from the local government (or community org)	1 - Yes 2 - No 3 - I don't know	If a flood occurs, the households can get money or supplies from the local government (or community org)	1 - Yes 2 - No 3 - I don't know	If a flood occurs, the households can get money or supplies from the local government (or community org)	1 - Yes 2 - No 3 - I don't know		
	If a flood occurs, the community has a way to share resources to help those in need.	1 - Yes 2 - No 3 - I don't know	If a flood occurs, the community has a way to share resources to help those in need.	1 - Yes 2 - No 3 - I don't know	If a flood occurs, the community has a way to share resources to help those in need.	1 - Yes 2 - No 3 - I don't know	If a flood occurs, the community has a way to share resources to help those in need.	1 - Yes 2 - No 3 - I don't know		

Tracking progress



Status

- Strongly process-driven
- Quantitative-qualitative
- Focus on output rather than outcome

Final comments

- Water system (resources, flooding) strongly affected by climate change-directly and indirectly
- Adaptation occurring, but not well observed
- Measuring adaptation complex: work on metrics in flux
- Process-orientation important
- Climate risk management perspective promising combining qualitative and quantitative aspects

International Conference on Adaptation Metrics & Techniques for Water, Agriculture & Resilient Cities
October 26-27, 2018

Status of research on Adaptation (Water) in Africa: Approaches and Methodology

By
Ernest Mensah Abraham (PhD)
University of Professional Studies, Ghana

Outline

- Introduction
- The need for adaptation research
- Definitions
- Current approaches to adaptation in Africa
- Trends in thoughts on adaptation planning
- EU Funded research in Africa
- Technology application for adaptation
- Current approaches for adaptation
- Funding
- Conclusion
- recommendation

INTRODUCTION

Climate change already happening (Niang et al. 2014).

Projected temperature increase in the region by the end of 2100 is expected to be above 2°C, with impacts across the region

The food systems of Africa for instance are among the world's most vulnerable for various reasons

INRODUCTION CONT'D

Impacts of Climate change makes Sub-Saharan Africa most vulnerable in the word

INTRODUCTION CONT'D

In general, the warming in Africa is expected to be worse than other regions of the world (Collier, Conway, & Venables, 2008; Gemeda & Sima, 2015)

INTRODUCTION CONT'D: Demographic problems

Increased population: 1 billion in 2010; 3 billion by 2050

Poverty is still double the prevailing rates in developed countries

INTRODUCTION CONT'D

Farming is up to 98% rain fed in the sub-Saharan region, so crops and livestock rely on a on a dangerous situation (IPCC 2014).

Climate extreme events threaten agricultural production, and food security, health, water, and energy security, which as a result weakens Africa's capacity to grow and develop (Besada and Kewankambo, 2009)

INTRODUCTION CONT'D

Adaptation gaps in Africa are enormous. It is of utmost importance to mainstream it in all development plans and programmes

The outcomes of major COPS under the UNFCCC continue to provide capacity for Africa to adapt to climate change. However, since such outcomes do go at a pace that's higher than Africa's response, there is the need for more flexible African policies, investment on technology and scientific resources at national, regional and continental levels

The need for Adaptation Research

Africa's immediate adaptation requirements stem from the continents primary sensitivity and vulnerability to climate change, with minimal adaptive capacity (Ludi, Jones, and Levine, 2012)

The rich natural resources, the sophisticated social systems and networks, and traditional methods of managing vulnerability makes adaptation possible in Africa

The need for adaptation research

- The Africa Adaptation Initiative, championed by Africa Heads of States in 2015 recognizes the three important gaps in adaptation:
- Capacity: *Lack of strong policy and institutional Frameworks to support the development and implementation of adaptation action and approaches to address loss and damage*
- *Information: Lack of climate information services adequate in quality and quantity to support decision making*
- *Finance: Lack of resources to support the development and implementation of adaptation actions and approaches to address and damage*
- ***The presentation is aimed at sharing knowledge on the trends in approaches and methodologies, specifically on Africa.***

Definitions

Approach : *A complete framework that prescribes an entire process for the assessment of vulnerability and adaptation and offers a broad strategic approach. An approach may be built on the application of certain methods and tools. Example: The UNDP Adaptation Policy Framework (2004), which provides an overview of how adaptation should be approached, rather than a specific set of 'instructions'.*

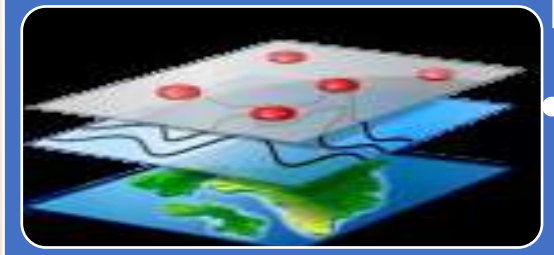
Method: A set or sequence of steps that should be followed in order to accomplish a specific task within a larger framework. Methods can be implemented through using a number of tools. Example: Vulnerability and capacity assessment is a method for which a number of tools can be used.

Tool : *A means or instrument by which a specific task is accomplished. Examples include: impact models, decision tools (cost-benefit analysis), stakeholder tools*

(CURRENT) APPROACHES TO ADAPTATION IN AFRICA

EXAMPLE OF PROJECT	TYPE OF APPROACH	SUMMARY
AfriCAN CLIMATE	developing a web-based knowledge platform – stakeholders can find knowledge on research in Africa.	This platform acts as a long-term mechanism for capacity building by facilitating knowledge sharing among key stakeholders and policy makers
AMMA, CLUVA	Capacity building including personnel able to operationalise adaptation knowledge	AMMA concludes that research and technical communities should be expanded in universities and environmental agencies, and that an investment in research and educational programmes, and their application in West Africa, will greatly increase the adaptation potential of the region.
EU FP6, AND FP 7	Capacity building	capacity building is an important medium- to long-term strategy that will help to operationalize what has been outlined by the research, and is also an effective tool for adaptation and mitigation

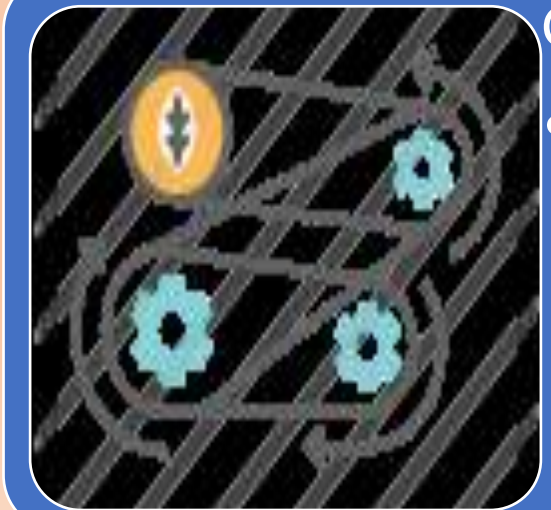
APPROACHES CONTINUED



REMOTE SENSING

- Explores various satellite imageries and GIS to communicate climate information

COMMUNITY BASED NRM: At the local level, organizations should be supported in planning their own adaptation processes – for example with community-based natural resource management plans for improved environmental security in a changing climate



GREEN ECONOMY

- The green economy provides a rational way of integrating adaptation and mitigation processes into overall development policies and programmes. This would sustain long-term wealth creation and quality of life in Africa and support existing development frameworks that constitute useful sub-mechanisms since they represent important multi-stakeholder and cross-sectoral interests

APPROACHES CONTINUED

DISASTER RISKS MANAGEMENT

INTEGRATED WATER RESOURCES MANAGMENT

- Including agriculture, fisheries, hydropower, flood and drought management

ECOSYSTEM SERVICES

APPROACHES CONTINUED

GOVERNANCE AND INSTITUTIONS

SUSTAINABILITY AND COST

WATERSHED MANAGEMENT BY FAO SINCE 1970

- Watershed Management is one of FAO's key approaches and is defined as a set of actions aimed at ensuring the sustainable use of natural resources in a watershed

APPROACHES CONT'D

LIVELIHOODS APPROACHES

TRENDS IN THOUGHTS ON ADAPTATION PLANNING

- Some recent approaches focus on adaptation planning in the context of uncertainty and recognise many social, economic and environmental changes besides climate change.

- By contrast, the early publications and tools emerging in the 1990s prioritized assessment of the risks associated with climate change

- This resonated with the contemporary view that adaptation implied relatively simple actions that would ‘cancel out’ the difference between business-as-usual and the scenarios of climate change impacts

TRENDS IN THOUGHTS ON ADAPTATION PLANNING

Uncertainty about the dynamics of climate change persists, although there is greater certainty about the overall phenomenon.

At the same time, it has become clear that adaptation is about adjusting development trajectories not only to deal with climate change, but also to cope with fluctuations in the many other, non-climatic factors that influence human well-being

TRENDS IN THOUGHTS ON ADAPTATION PLANNING

TRENDS IN THOUGHTS ON ADAPTATION PLANNING: The UNFCCC-led practice of adaptation planning

- *One of the documents to be developed on impact assessment was the SCOPE Report on Impact Assessments (Kates et al. 1985).*

- *Guidance documents that followed this, also emphasizing impact assessment, include: the IPCC Technical Guidelines for Assessing Climate Change Impacts and Adaptations (Carter et al. 1994);*

- ***the US Country Studies Program's Vulnerability and Adaptation Assessments: An International Guidebook (Benioff et al., 1996) and***

- ***-the Handbook on Methods for Climate Change Impact Assessment and Adaptation Strategies (Feenstra et al. 1998). The latter was primarily for assessing impacts by sector based on which adaptation strategies would be designed for each sector.***

TRENDS IN THOUGHTS ON ADAPTATION PLANNING: The UNFCCC-led practice of adaptation planning

The later Compendium of Decision Tools to Evaluate Strategies for Adaptation to Climate Change (UNFCCC 1999) focuses on decision-making, again taking a sectoral approach and looking at making decisions based on assessments of impacts.

Later publications reflect an understanding that there is more to adaptation than impacts and vulnerability assessments. The guide Climate Adaptation: Risk, Uncertainty and Decision-making (Willows and Connell 2003) emphasizes decision-making with uncertainty and the

Adaptation Policy Framework (UNDP 2004), offers an approach to formulating and implementing adaptation strategies, policies and measures on a project basis, which is interwoven with theoretical discussion on adaptation.

TRENDS IN THOUGHTS ON ADAPTATION PLANNING: The UNFCCC-led practice of adaptation planning

The UN Framework Convention on Climate Change (UNFCCC) also released an updated version of its 1999 compendium, entitled Compendium of Methods and Tools to Evaluate Impacts of, and Vulnerability and Adaptation to, Climate Change (UNFCCC 2004).

This moves away from focusing solely on impacts to recognizing the centrality of vulnerability

TRENDS IN THOUGHTS ON ADAPTATION PLANNING: The UNFCCC-led practice of adaptation planning

Importantly, these documents came at a time when adaptation theory had moved far faster than either policy or practice and, in many ways, they continued to contribute to the theory more than to the practice of adaptation, simply because there was still limited experience of trying to implement adaptation measures

During the 2000s, the types of actors involved in adaptation research, practice and policy expanded significantly, with wider involvement from development practitioners and a wider range of line ministries (i.e,

TRENDS IN THOUGHTS ON ADAPTATION PLANNING: The UNFCCC-led practice of adaptation planning

This meant less academic theory around adaptation and more case studies on vulnerability from real world.

It became obvious also that the UNFCCC and its related activities, previously seen as the main guiding process on adaptation, could not adequately address information gaps at national levels about how to actually get moving on adaptation.

More practical and specific guidance was sought for local-level decision-making bodies, who fall outside the immediate scope of the UNFCCC.

TRENDS IN THOUGHTS ON ADAPTATION PLANNING: The UNFCCC-led practice of adaptation planning

Emerging from a more practical perspective are guides such as Preparing for Climate Change: A Guidebook for Local, Regional and State Governments (ICLEI et al. 2007),

Climate Change Adaptation by Design (Shaw et al. 2007), and similar documents for particular cities (e.g Cape Town's Framework for Adaptation, Toronto's Ahead of the Storm) targeted at local governments. Sector-specific guides have also been developed, such as the Adapting to Coastal Climate Change: A Guidebook for Development Planners (USAID)

TRENDS IN THOUGHTS ON ADAPTATION PLANNING: The UNFCCC-led practice of adaptation planning

- While tools and methods, including approaches such as impact assessments, have been used throughout the last 20-25 years or so, they must be deployed in tandem with present thinking about adaptation planning.

- -Several collections of methods and tools, including the updated Compendium on Methods and Tools to Evaluate Impacts of, and Vulnerability and Adaptation to, Climate Change (UNFCCC 2008a), serve as comprehensive reference documents on adaptation methods and tools for the world and Africa.

TRENDS IN THOUGHTS ON ADAPTATION PLANNING: The UNFCCC-led practice of adaptation planning

- Most of this information does not explain how these approaches should be implemented. *This still remains a challenge for stakeholders and, therefore, additional steps for building knowledge of adaptation and enhancing adaptive capacity must be an integral aspect of the adaptation planning process especially for the Africa experience*

- Not surprisingly, the shift in emphasis in practitioner-focused documents, from impacts to vulnerability is also reflected in academic literature, where much of the ideas originated

TRENDS IN THOUGHTS ON ADAPTATION PLANNING: The UNFCCC-led practice of adaptation planning

- A recent study of extreme sea-level rise and public perception (Toth and Hizsnyik 2008) uses a participatory assessment approach, which reflects a recognition of the importance of social aspects for determining risk

- Similarly, Füssel and Klein (2006) point to an increasing degree of stakeholder participation in vulnerability assessments and Van Aalst et al. (2008) describe the application of the community risk assessment approach

- Adaptation planning continues to evolve, with authors pointing to the need to include explanations on use in the development of the plan

EU FUNDED RESEARCH IN AFRICA

- *Under the EU Sixth and Seventh Framework Programmes (FP), a total of €146 million was made available to 1241 participants for research projects in Africa. The budget allocated to Africa 2010 call for tender, for example, was 63 million. These* projects have explored the following climate change related research:

- mitigation and carbon sequestration potential;
- modelling climate change uncertainties and projected impacts;
- increasing knowledge base of climate change impacts;
- improved earth observation and monitoring; impacts on water availability;
- impacts of transport on climate change (and vice versa);
- the impact of climate change on agriculture and hence food security;
- impacts of climate change on health;
- impacts of climate change on natural resources and ecosystems; and work to quantify the cost of climate change impacts and response measures.

1. EU FUNDED RESEARCH IN AFRICA: Drought and water security

- Increased temperatures and a greater likelihood of extreme weather events resulting from climate change will no doubt increase the threat of drought and increased water scarcity in Africa.

- As a way to combat this, FP projects like CLIMB, CLICO and WASSERMED have looked at improved hydrological modelling in order to assess the risk of increasing water scarcity and the threat to human security.

- *The CLICO project looked at the risks of both drought and flooding in Sudan, noting the impact on food security, and their ability to exacerbate existing regional conflicts. Despite these challenges, the AIDA FP6 project indicated that agricultural innovation in drought-prone areas has the potential to improve crop yields*.

Cont'd

- The number of Direct Grant Research projects that have been undertaken to assess the range of climate change impacts throughout Africa, and the appropriate response measures, contributes to an enhancement of Africa's adaptive capacity.

- Carefully designed management systems are shown to be effective in responding to these impacts. For example, the WETwin project, in cooperation with the Twin2go project, has developed a methodology to quantify the adaptive and institutional capacity in the context of wetland and river basin management.

- *The methodology allows experts to evaluate the current state of the environment, the impact of solutions and to provide a monitoring strategy for these management policies.*

Cont’d

- The CIRCE project has explored the complexity of water management in the context of a changing climate.

- The NeWater project, promotes the “Adaptive Integrated Water Resources Management (AWM)” tool. Water scarcity and the implementation of adaptation measures are reviewed in the context of river basin management and the applicable socio-economic considerations among many project partners from Europe, Africa and Central Asia

EU FUNDED RESEARCH IN AFRICA : Information gathering and early warning system

- CLIMAFRICA project has worked on improving both the decadal and seasonal modelling for drought events (particularly in Sub-Saharan Africa) and for precipitation patterns more generally.

- DevCoCast increases access to environmental information by overcoming telecommunication limitations in developing countries. Both the AGRICAB (2011) and the DevCoCast projects served to enhance Africa's Adaptive capacity

Technology application for adaptation

- The use of adaptation technologies has been broadly defined as "*the application of technology in order to reduce the vulnerability, or enhance the resilience, of a natural or human system to the impacts of climate change*" (UNFCCC, 2005).

- *Support on technology include Technology Needs Assessments (TNAs), which identify, prioritise and highlight technology needs, and Technology Action Plans (TAPs), which are developed on the basis of TNAs to address specific barriers, and identify targets, budgets and responsible stakeholders for prioritised technologies (UNFCCC, 2014a).*

Cont’d

- Community-Based Adaptation (CBA) aims to achieve climate change adaptation in tandem with development goals, through employing bottom-up processes to enhance community capacity, while also ensuring contextual suitability and local acceptance of projects instigated

- -In South Africa, framework for screening for viable long term strategies that also meet local development goals have been deployed in Water Resources Strategies (2007).

METHODS: CURRENT RESEARCH FOCUS / AREA FOR INTERVENTION, WEST AFRICAN COUNTRIES	
COUNTRY	**ISSUES**
BURKINA FASO	•Implement protection measures to control pollution of waterways and water stores • Improve planning and management of Oursi Lake to reduce climate impacts on both the lake and the ecosystems and populations it supports • Stop siltation and accumulation of sediments in lakes and waterways • Develop scenarios that identify impacts and vulnerabilities and inform recommendations on actions to promote adaptation
GHANA	•Promote water preservation and conservation •Increase accessibility and availability of water for domestic, agricultural, industrial, and commercial use and energy production •Improve and sustain quality of water resources •Build capacity in water resource management
MALI	• Increase in water availability through improved catchment techniques and restoration of water sources • Increase groundwater usage
SENEGAL	•Establish infrastructure to decrease water losses into the sea •Ensure early treatment of polluted water and establish water purification systems •Improve education and raise awareness

METHODS: CURRENT RESEARCH FOCUS / AREA FOR INTERVENTION, SOUTHERN AFRICAN COUNTRIES	
COUNTRY	**ISSUES**
BOTSWANA	•• Implement water conservation measures, awareness campaigns • Develop national water conservation strategy • Assess water resources and scarcity • Develop programs to protect urban poor from price increases • Increase data availability/access and documentation • Diversify and increase water resources for rural areas • Adopt indigenous methods of water use • Implement integrated water resources management strategies
NAMIBIA	•Provide full support for integrated water resources management • Focus on reducing evaporation and improving the efficiency of water use • Improve water demand management, particularly at the local level and in the agricultural, industrial, mining, and tourism sectors •Monitor and control groundwater use more strictly

SOUTHERN AFRICA CONT'D

Various studies in the Africa region have identified gaps in the understanding of adaptation to climate change. One of these major knowledge gaps is the lack of understanding of adaptation strategies that have proven to be effective elsewhere and could be applied in the region (Myers et al. 2011).

Adopting such approaches would help the region to *quickly implement adaptation measures cost effectively*, without having to develop completely new measures whose efficacy has not been tested.

-***The region still lacks very basic understanding of locally relevant knowledge on climate change adaptation, because most of the climate change analysis thus far relies on global or regional datasets, whose application for implementing locally driven adaptation measures may be severely constrained.***

CONT'D

- This challenge has been recognised and initiatives such as the promotion of regional downscaling will help to close this gap (Ziervogel and Zermoglio 2009). Regional downscaling simulates global climate change using information from local meteorological stations in the region, to improve on the accuracy of climate change projects.

- -This would make it easier to develop adaptation measures that are driven by local knowledge since the projects are at a relatively fine scale compared to the global projections

METHODS: CURRENT RESEARCH FOCUS / AREA FOR INTERVENTION, EASTERN AFRICAN COUNTRIES	
COUNTRY	**ISSUES**
ETHIOPIA	•Manage water effectively to make it always available to humans, animals, and crops •Reduce the impacts of severe droughts by cloud seeding to induce rain
KENYA	•Prioritizing climate change into all water management plans and actions •Rehabilitating and restoring all water catchments •Expanding irrigation systems and improving drainage
TANZANIA	•Enhance protection and conservation of water catchments • Invest in and promote appropriate water management technologies •Invest in exploration and extraction of underground water resources • Improve water quality
UGANDA	• Integrate climate change considerations into national water management efforts • Increase access to and effective use and management of water resources

CONT'D

- Adaptation measures are considered either "soft" adaptation measures, where they involve natural capital or community control; or "hard" adaptation measures, where adapting a sector or a community requires the construction of new and capital-intensive infrastructure.

- The majority of the adaptation measures require an anticipatory and planned approach and large investments.

- The need for planned capital-intensive adaptation is greater at high than low warming levels

FUNDING ADAPTATION

- "*In many cases, we are not prepared for the climate-related risks that we already face. Investments can pay dividends both in the present and for the future*" Vicente Barros, Co-Chair of Working Group II, Intergovernmental Panel on Climate Change, March 2014

- Developed countries pledged to support developing countries through the Cancun agreement

Conclusion

- There is opportunity for more studies and publication on climate change adaptation and water in Africa
- Significant amount of knowledge is in forms that require downscaling to enable local use such as a number of GCM models
- Water is central to any climate change adaptation programme in most of sub-Saharan Africa
- Most water-related interventions are planned in the broader framework of watershed management.

Conclusion cont'd

- Adaptation research in Africa, has largely drawn from the global adaptation knowledge
- The approaches that have been deployed have largely been useful for knowledge generation and helping Africa built some adaptive capacity
- Africa can fast track adaptation processes by developing appropriate tools and techniques for understanding what has or is working in other regions
- Not much has also been published on future climate models in Africa, though following the work by IPCC, various works have been done

Recommendations

- Need to understand the future climate changes and the adaptation measures that will be needed
- Research needed to improve the capacity of institutions to make informed or evidence-based decisions regarding adaptation
- Improved knowledge of the spatial distribution of the impacts of climate change would provide decision makers with the necessary data for the implementation of potential adaptation measures.
- With respect to future climate events, there is a need to develop suitable response mechanisms by applying better modelling and facilitating the use of more sophisticated satellite imagery. This will improve African institutions' adaptive capacity.
- Mainstream adaptation into development programmes

Recommendations cont'd

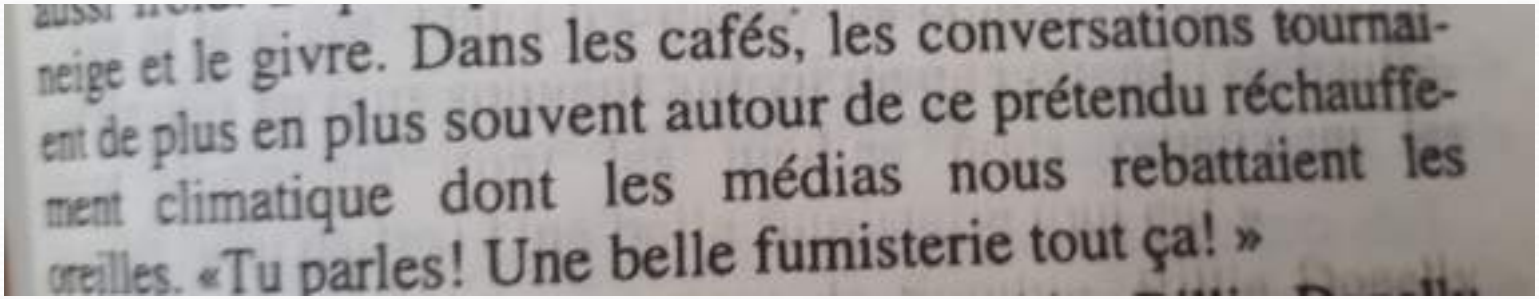
- Required local data and monitoring equipment for robust future climate predictions
- Local training and educational needs that will enable practitioners to better interpret climate data required
- Invest in water-related risk and climate management strategies, such as early warning systems, information networks, and data sharing;
- Consider both traditional and modern knowledge, such as water harvesting techniques, water conservation and storage, and improved recycling and re-use of water
- Strengthen capacity building related to surface and ground water management, irrigation, and water storage
- Re-inforce water research, including modelling and vulnerability assessment, to fully capture future multiple water usage and water stress
- Increase investment in research on adaptation –water in Africa
- Develop systematic ways to assess evidence on the ground

INTERNATIONAL CONFERENCE ON

ADAPTATION METRICS & TECHNIQUES
FOR WATER, AGRICULTURE & RESILIENT CITIES
UNIVERSITE MOHAMED VI
26-27 OCTOBRE 2018

ADAPTATION AUX CHANGEMENTS CLIMATIQUES DANS LE SECTEUR DE L'EAU

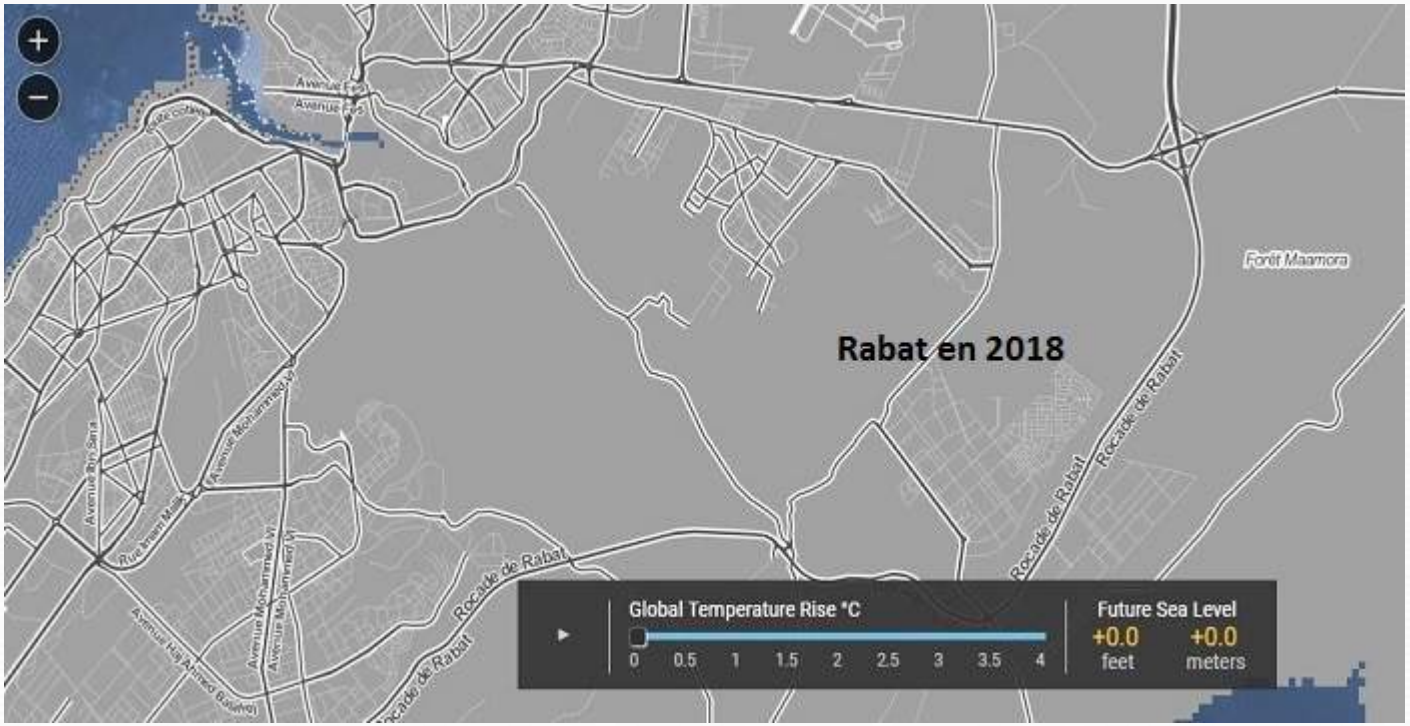
MOKHTAR BZIOUI

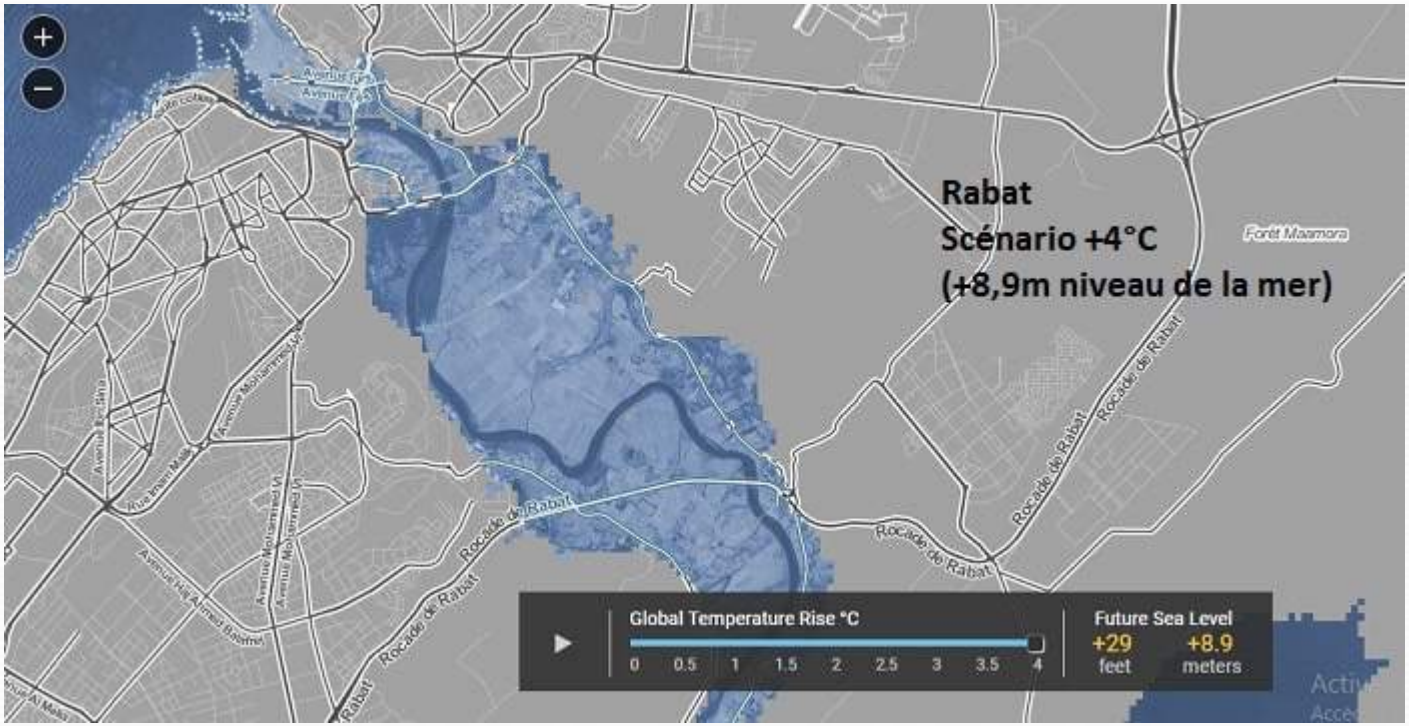

neige et le givre. Dans les cafés, les conversations tournai-
ent de plus en plus souvent autour de ce prétendu réchauffe-
ment climatique dont les médias nous rebattaient les
oreilles. «Tu parles! Une belle fumisterie tout ça! »

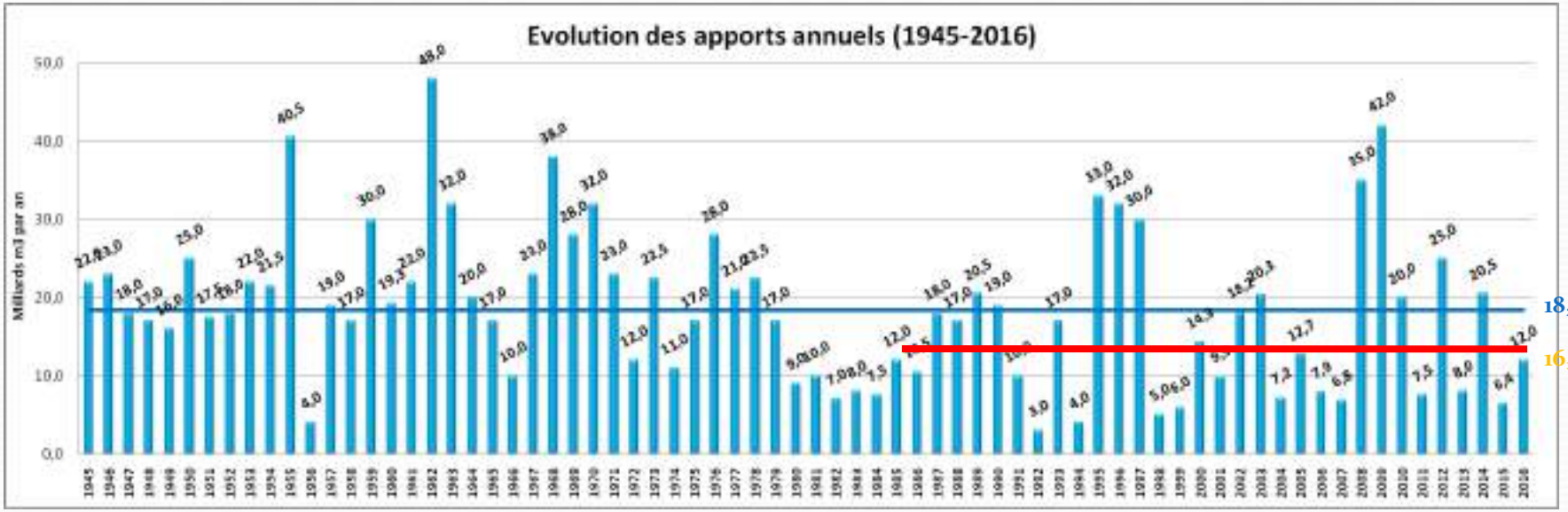
LA FILLE DE PAPIER

GUILLAUME MUSSO


PORT . BARQUES


Rabat en 2018
Forêt Maamora
Rocade de Rabat
Global Temperature Rise °C
0 0.5 1 1.5 2 2.5 3 3.5 4
Future Sea Level
+0.0 feet
+0.0 meters


Rabat
Scénario +4°C
(+8,9m niveau de la mer)
Forêt Maamora
Global Temperature Rise °C
0 0.5 1 1.5 2 2.5 3 3.5 4
Future Sea Level
+29 feet
+8.9 meters
Rocade de Rabat


Evolution des apports annuels (1945-2016)
Milliards m3 par an
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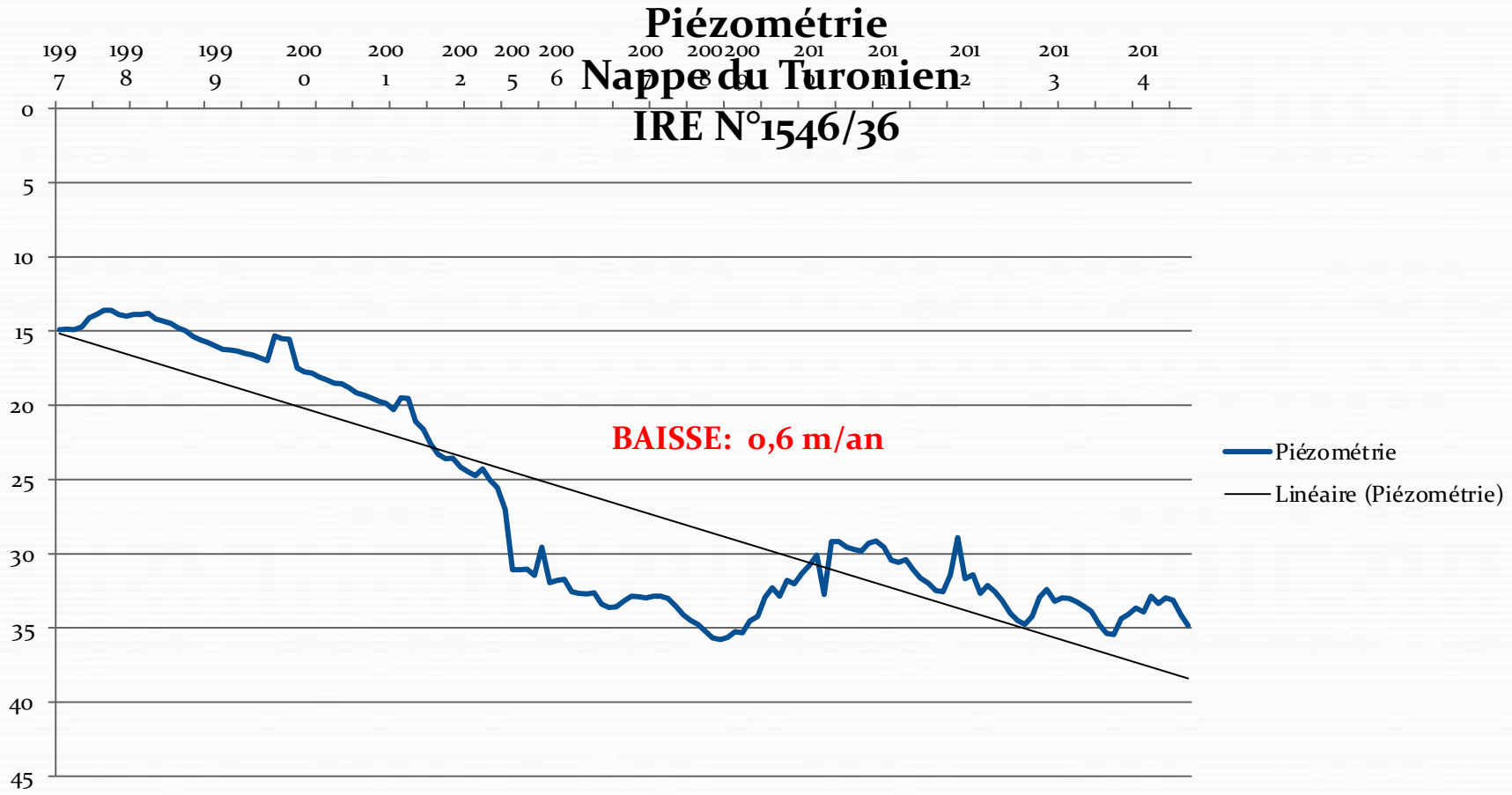
16,6


Piézométrie
Nappe du Turonien
IRE N°1546/36
1997
1998
1999
2000
2001
2002
2005
2006
2013
2014
0
5
10
15
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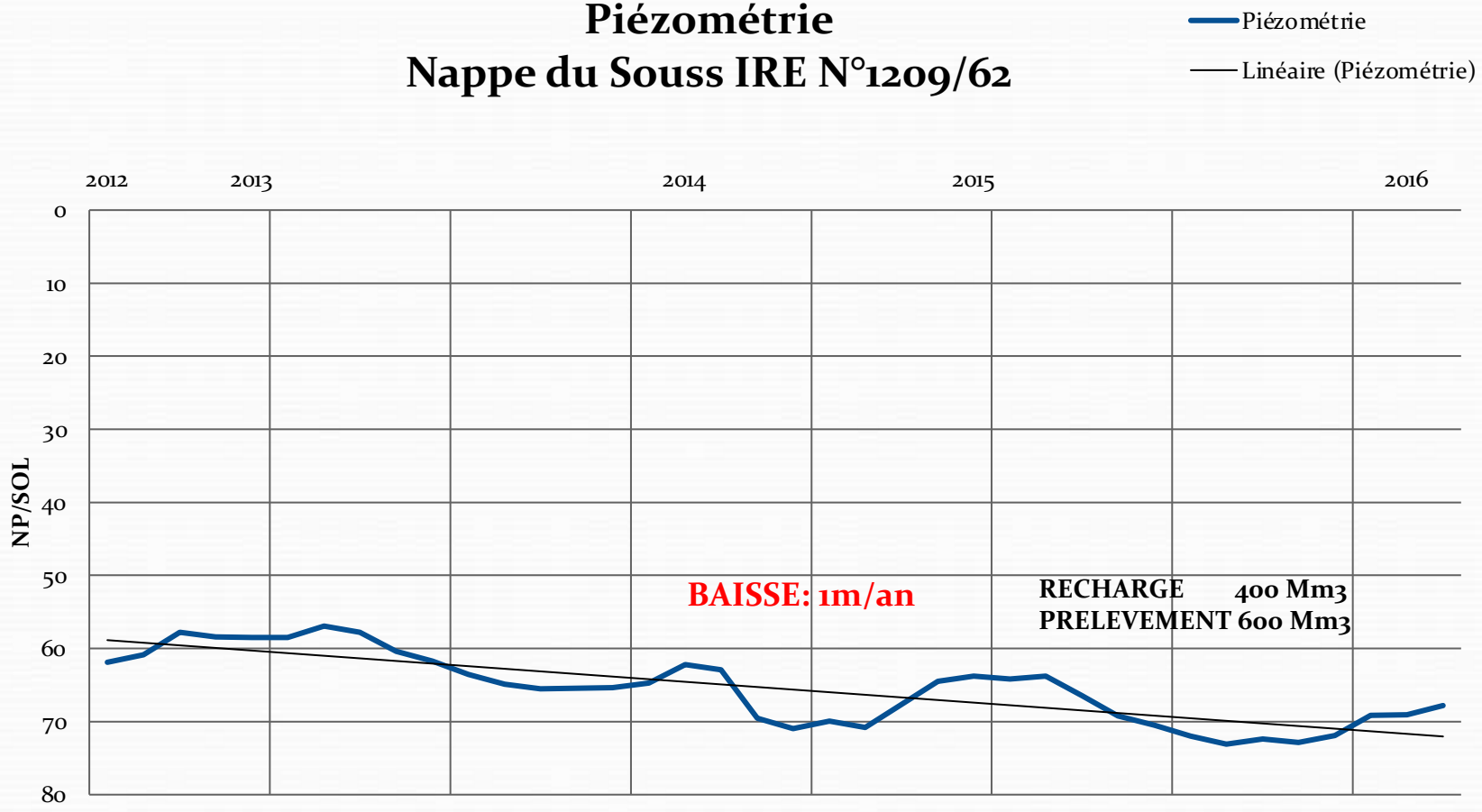
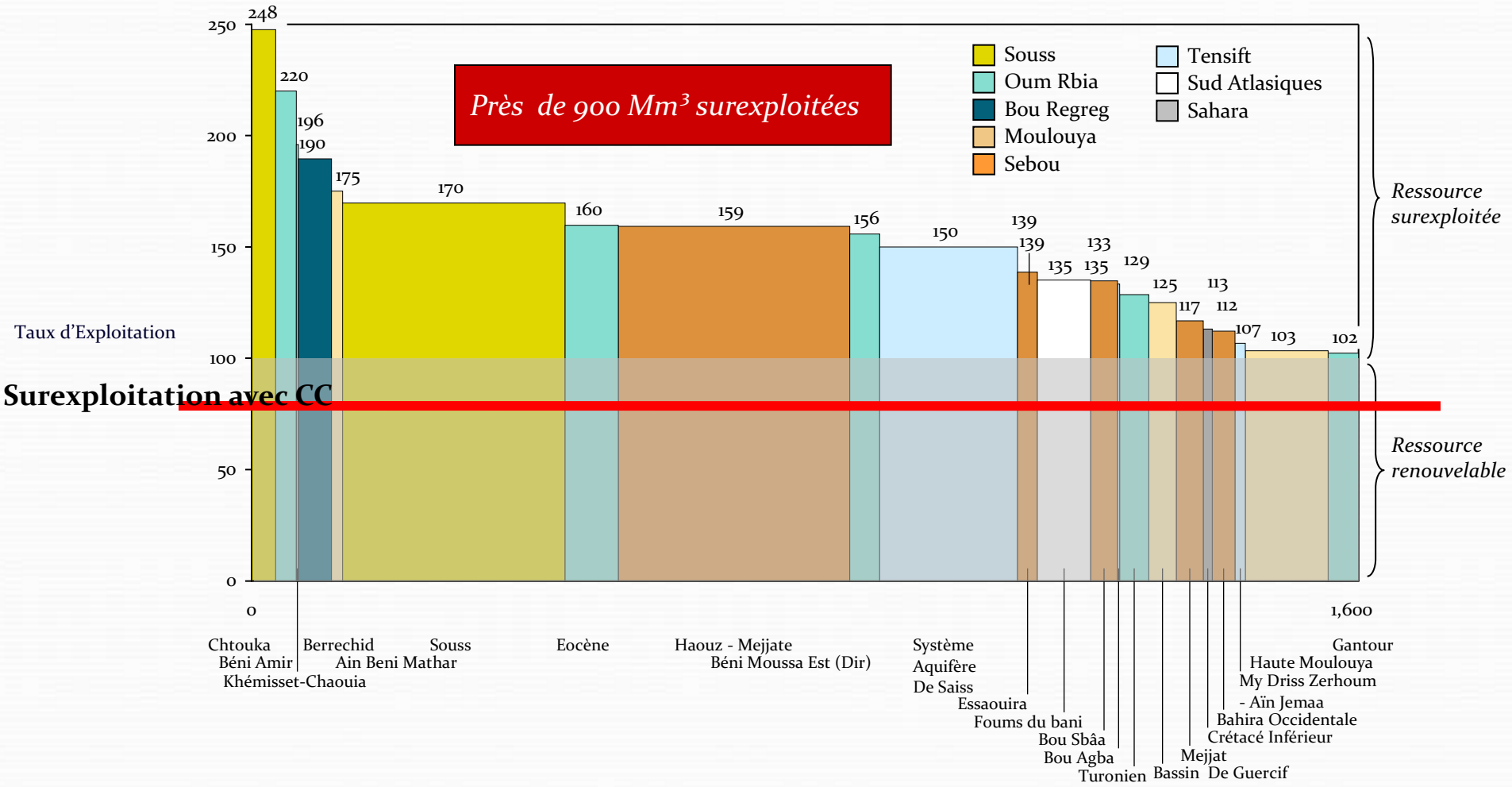
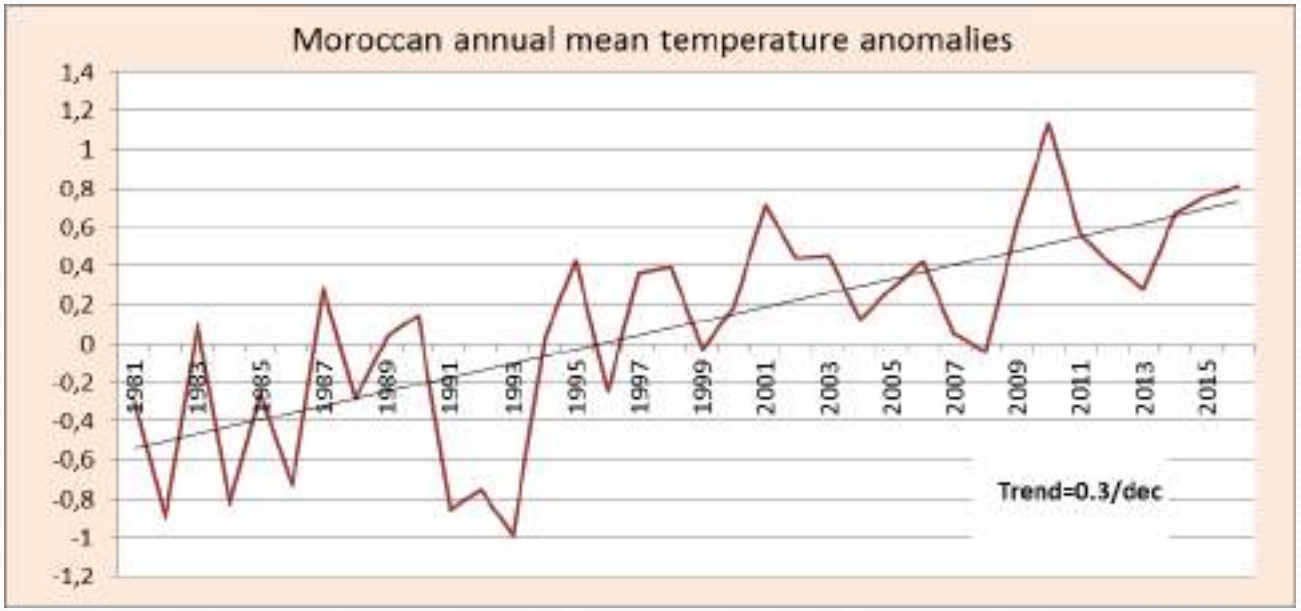
BAISSE: 0,6 m/an
Piézométrie
Linéaire (Piézométrie)

Piézométrie
Nappe du Souss IRE N°1209/62





Source : Monitor 2008


Moroccan annual mean temperature anomalies
1,4
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0,8
0,6
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0,2
0
-0,2
-0,4
-0,6
-0,8
-1
-1,2
1981
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2001
2003
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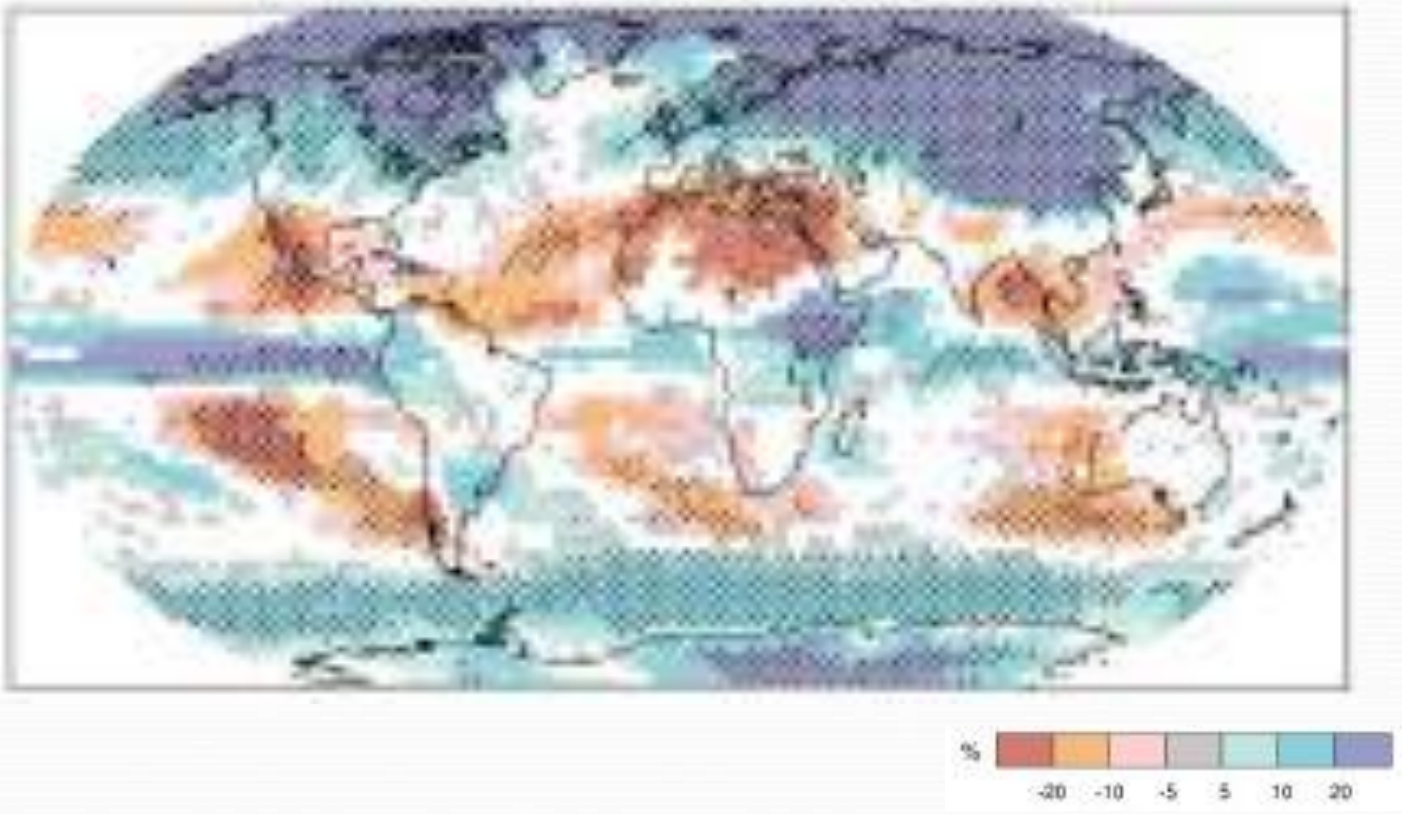
2007
2009
2011
2013
2015
Trend=0.3/dec

Projection du changement en taux de précipitation (en %) de 2090-2099 relatif aux précipitations moyennes de1980-1999



Source GIEC 2008

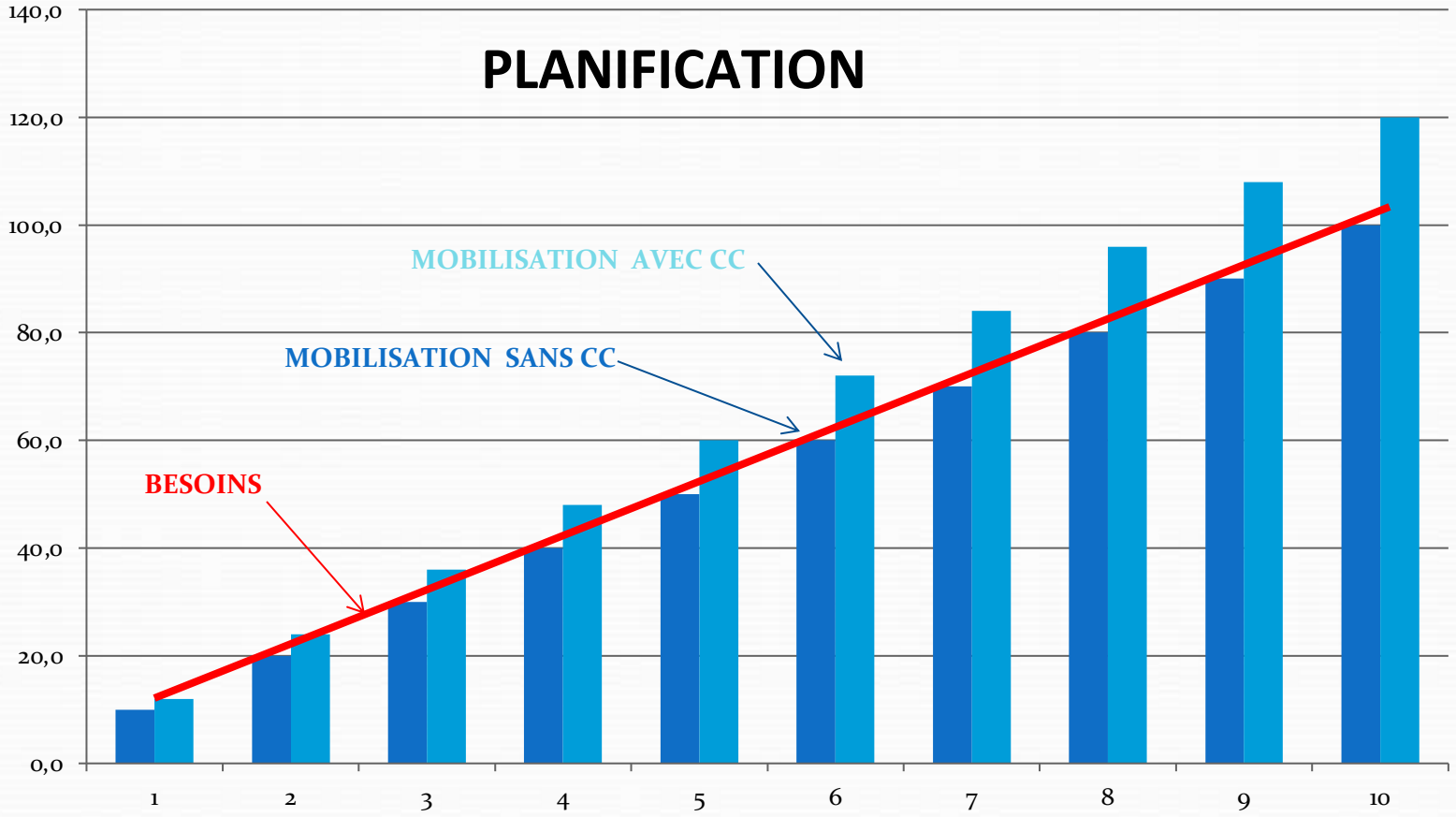
IMPACTS DES CHANGEMENTS CLIMATIQUES

- **REDUCTION DES APPORTS D'EAU DE SURFACE**
- **REDUCTION DES RECHARGES NATURELLES DES NAPPES**
- **SECHERESSES PLUS FREQUENTES**
- **FORTES PRECIPITATIONS LOCALISEES**

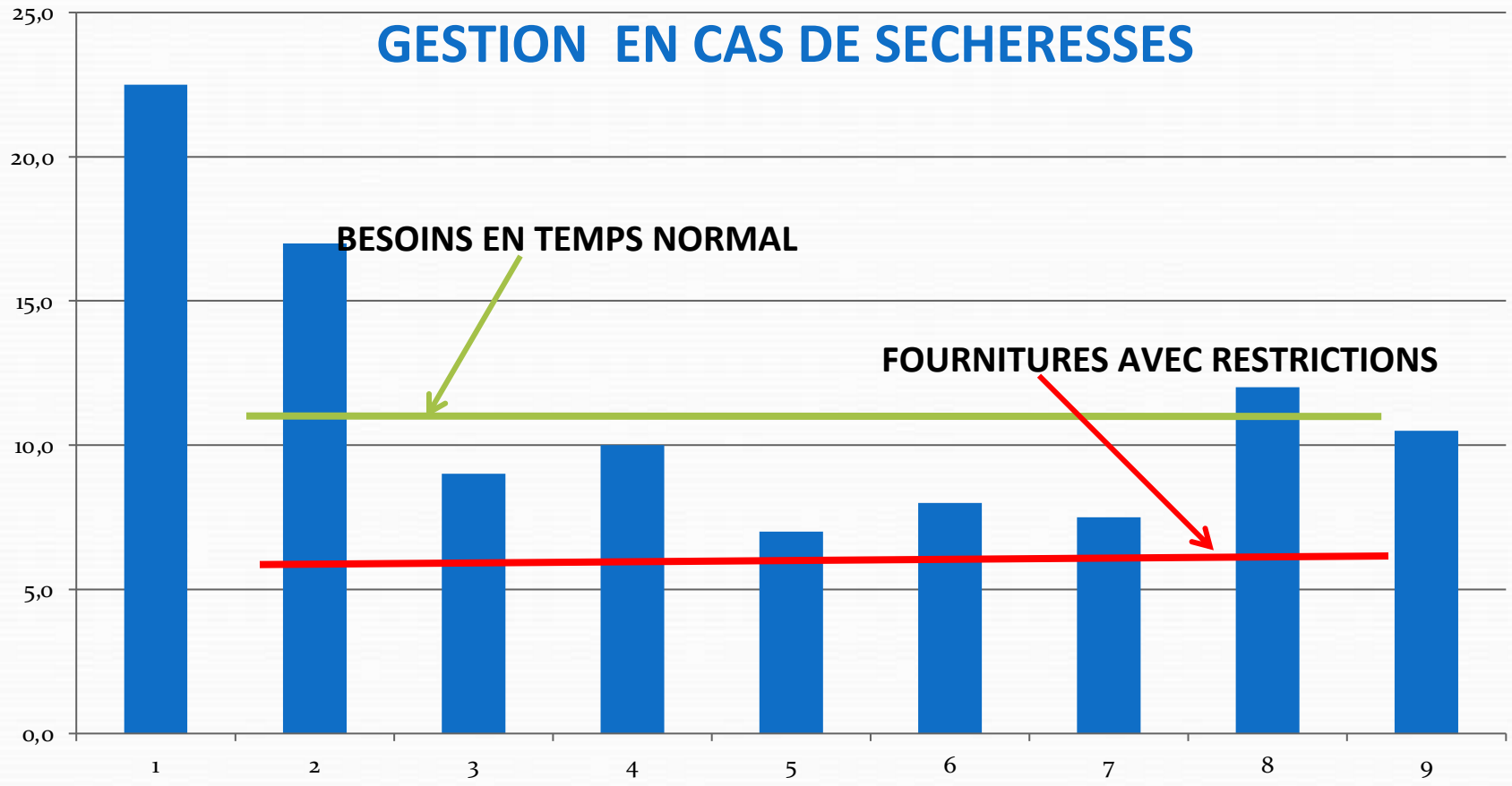
MESURES POUR L'ADAPTATION AUX CC

- **Renforcement de la mobilisation des ressources en eau**
- **Diversification des sources d'approvisionnement en eau :**
- **Gestion de la demande en eau**
- **Réduction de la vulnérabilité aux risques liés aux phénomènes extrêmes (crues et sècheresses)**
- **Préservation et protection des ressources en eau et des zones sensibles**

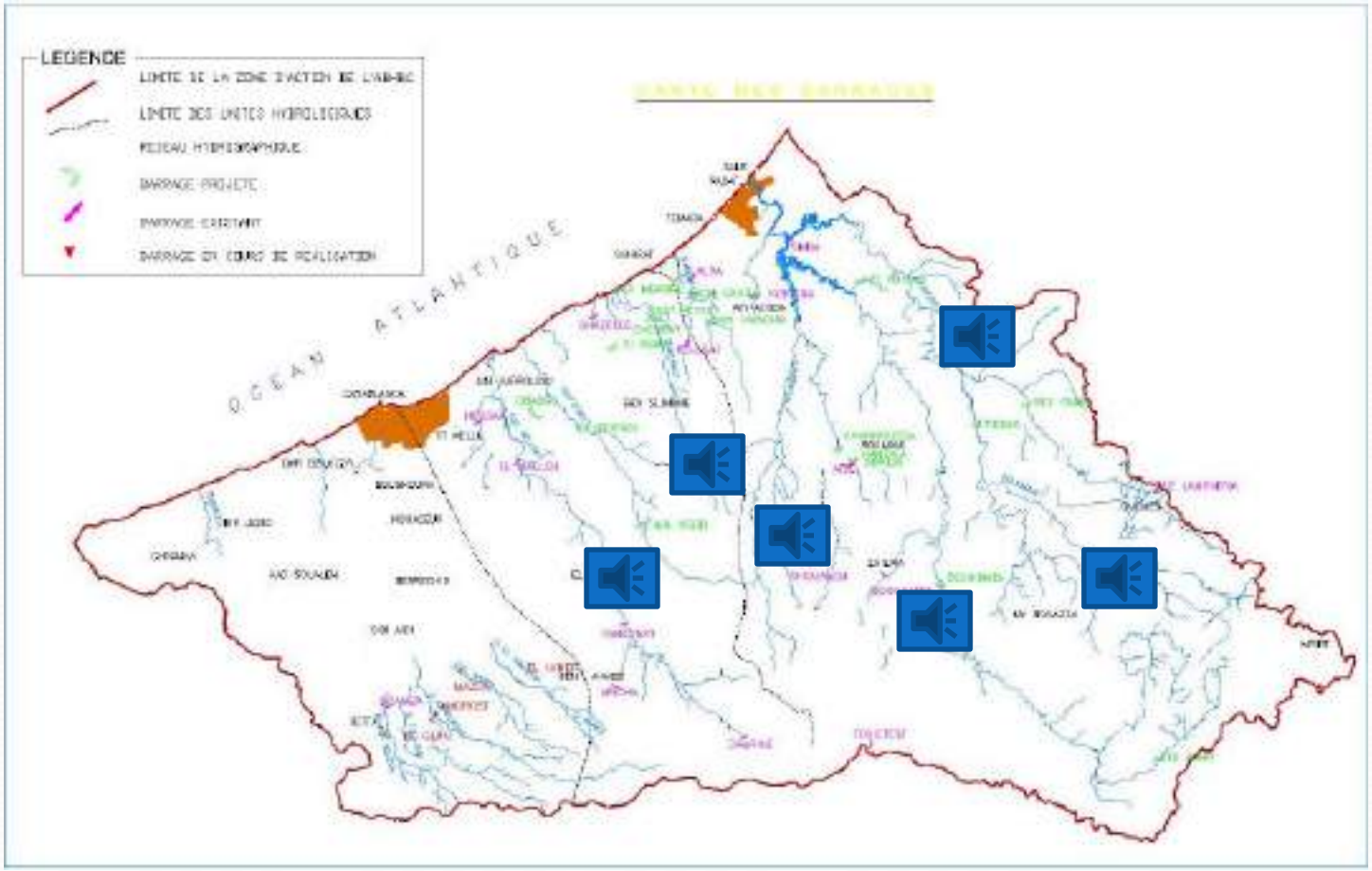
MESURES POUR L'ADAPTATION AUX CC



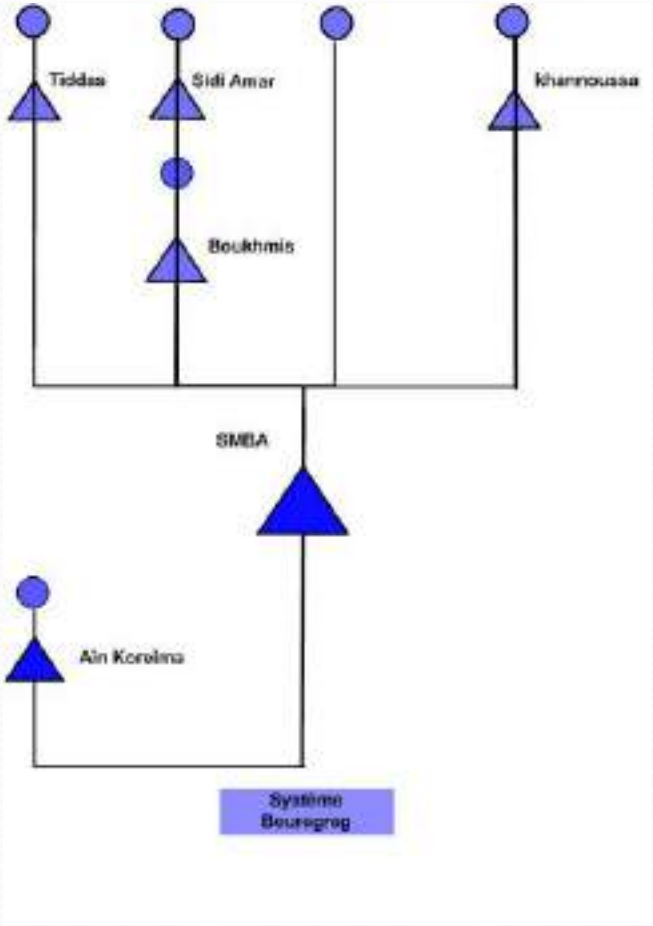
MESURES POUR L'ADAPTATION AUX CC



MESURES POUR L'ADAPTATION AUX CC
GESTION DES CRUES



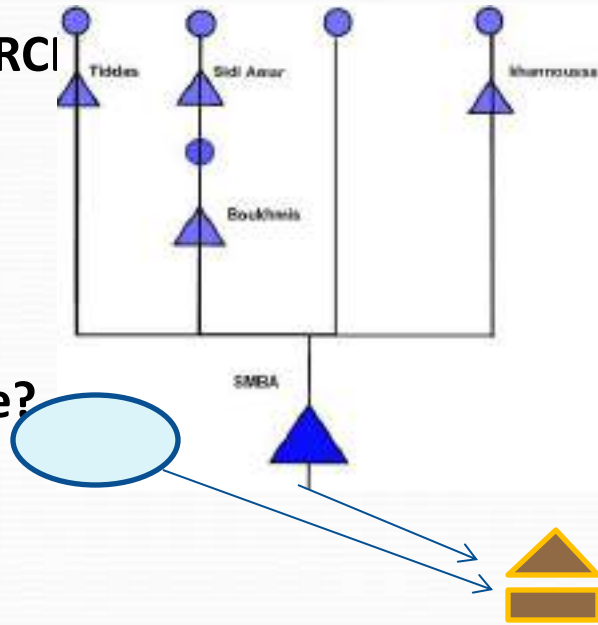
MESURES POUR L'ADAPTATION AUX CC
GESTION DES CRUES



MESURES POUR L'ADAPTATION AUX CC

- **DIVERSIFICATION DE LA MOBILISATION DES RESSOURCE**

  COUPLAGE EAU DE SURFACE /EAU SOUTERRAINE

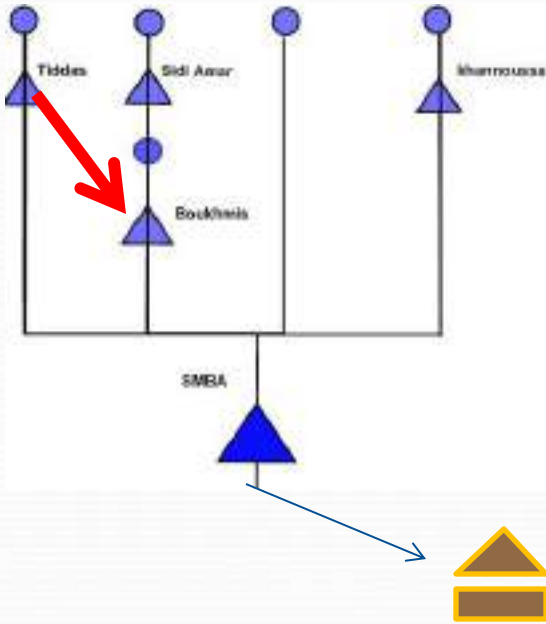


eaux souterraines pour les cas de pénurie?

AUTRES MESURES POUR L'ADAPTATION AUX CC

- **DIVERSIFICATION DE LA MOBILISATION DES RESSOURCES EN EAU**

CONNEXIONS ENTRE LES BARRAGES



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MESURES POUR L'ADAPTATION AUX CC

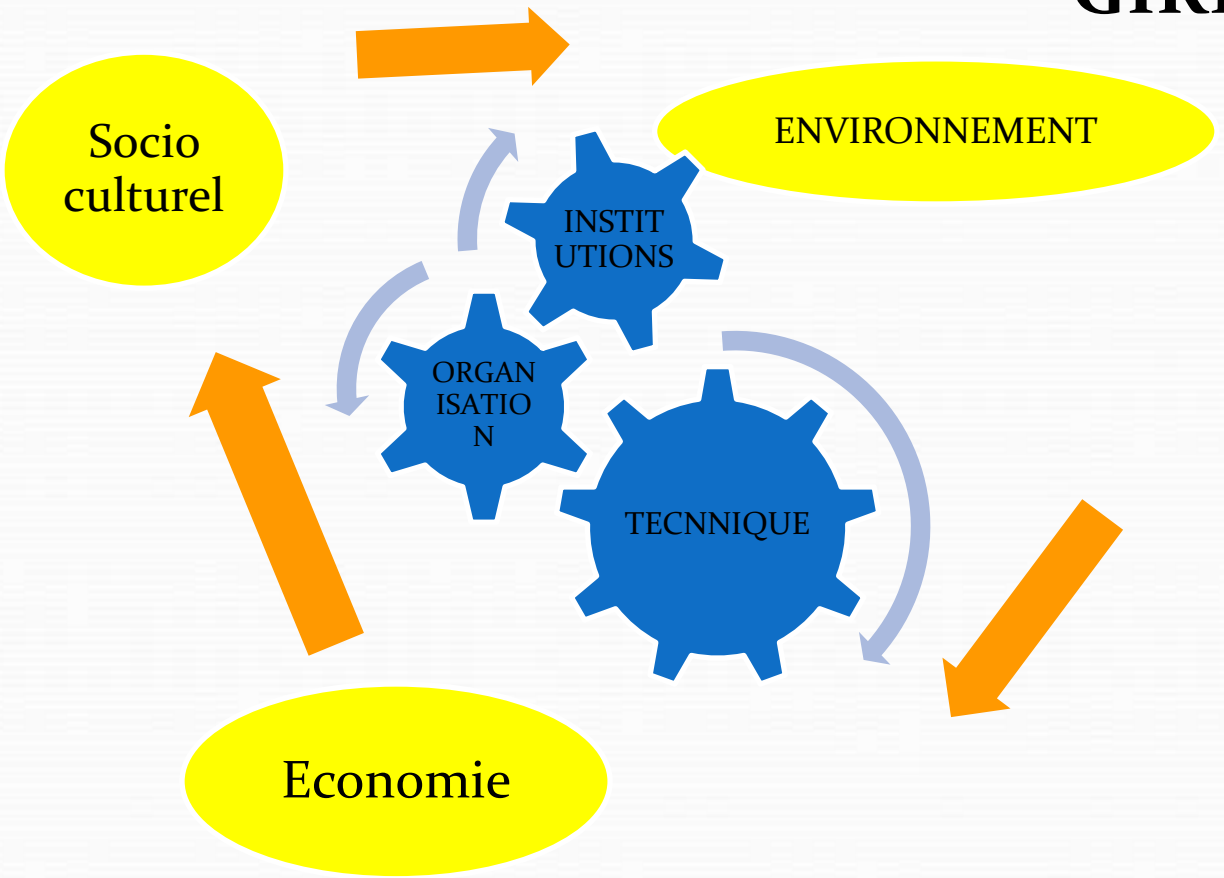
- **DIVERSIFICATION DE LA MOBILISATION DES RESSOURCES EN EAU**

➢ **RESSOURCES NON CONVENTIONNELLES(DESSALEMENT EAU DE MER, EAUX SAUMÂTRES, RÉUTILISATION EAUX USÉES)**

➢ **VALORISATION DE L'EAU PLUVIALE**

MESURES POUR L'ADAPTATION AUX CC

GIRE



MESURES POUR L'ADAPTATION AUX CC

TROIS PRIORITES:

- **Approfondir les connaissances,**
- **Définir les méthodologies de prise en compte de l'adaptation,**
- **Renforcer les dispositifs d'observation et d'alerte.**

MESURES POUR L'ADAPTATION AUX CC

CULTURE DU RISQUE

QUI ?

Etat, élus, experts, syndicats, associations et entreprises, sociétés d'assurance

A QUEL NIVEAU ?

Niveau national et régional, voire local

MESURES POUR L'ADAPTATION AUX CC

- **CULTURE DU RISQUE**

Partie intégrante de l'éducation à l'environnement et au développement durable, dans les programmes scolaires, les modules de formation continue, ainsi que dans le cadre de l'éducation non formelle (PNACC français).

MESURES POUR L'ADAPTATION AUX CC

- **INFORMATION**

- Mise à disposition des médias des indices et des outils visant à éclairer l'opinion sur les politiques publiques relatives à la problématique climatique formelle (PNACC français).
- Encourager la mobilisation de « vulgarisateurs » et de spécialistes des sciences humaines et sociales dans la mise en œuvre de ce changement (PNACC français).

المكتب الوطني للكهرباء و الماء الصالح للشرب
Office National de l'Electricité et de l'Eau Potable

المعهد الدولي للماء و الصرف الصحي
institut international eau & assainissement

Adaptation des Systèmes d'Alimentation Eau Potable aux changements climatiques

Mokhtar JAAIT
mjaait@onee.ma

UM6P, Benguerir 26-27 Octobre 2018

المكتب الوطني للكهرباء و الماء الصالح للشرب
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institut international eau & assainissement

Sommaire

- Contexte général
- Adaptation des SAEP aux changements climatiques
  - ✓Gestion de la demande
  - ✓Ressources en eau non conventionnelles
  - ✓R&D et KM
- Conclusion

المكتب الوطني للكهرباء و الماء الصالح للشرب
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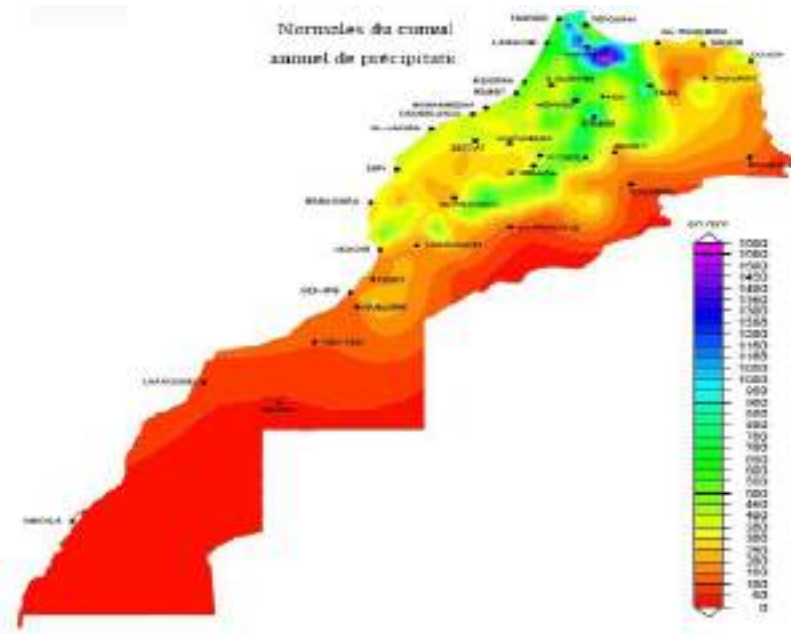
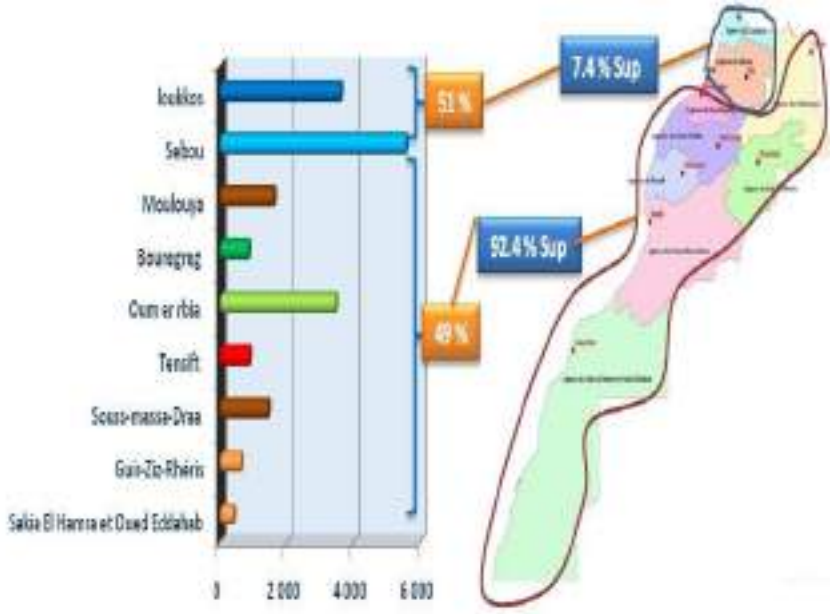
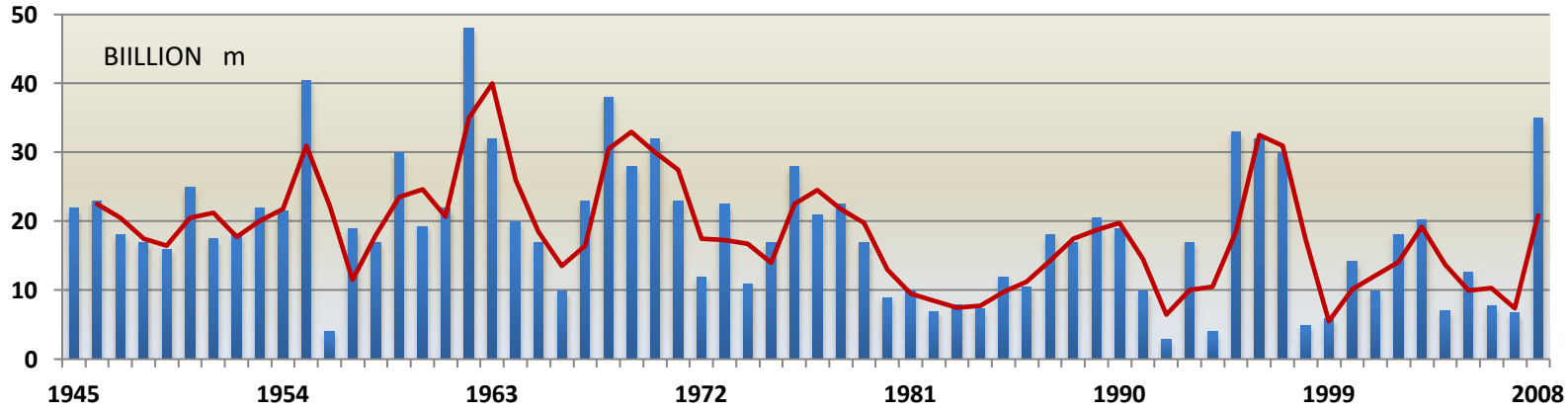
Contexte général







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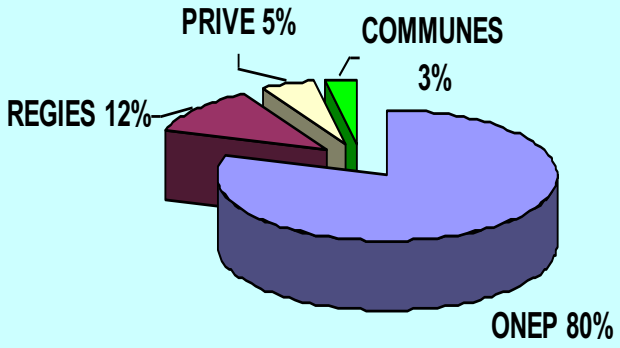
Contexte général

LE SECTEUR DE L'EAU POTABLE ET DE L'ASSAINISSEMENT

PRODUCTION



Volume d'eau Produite

- 1,2 Milliard de m3 par an

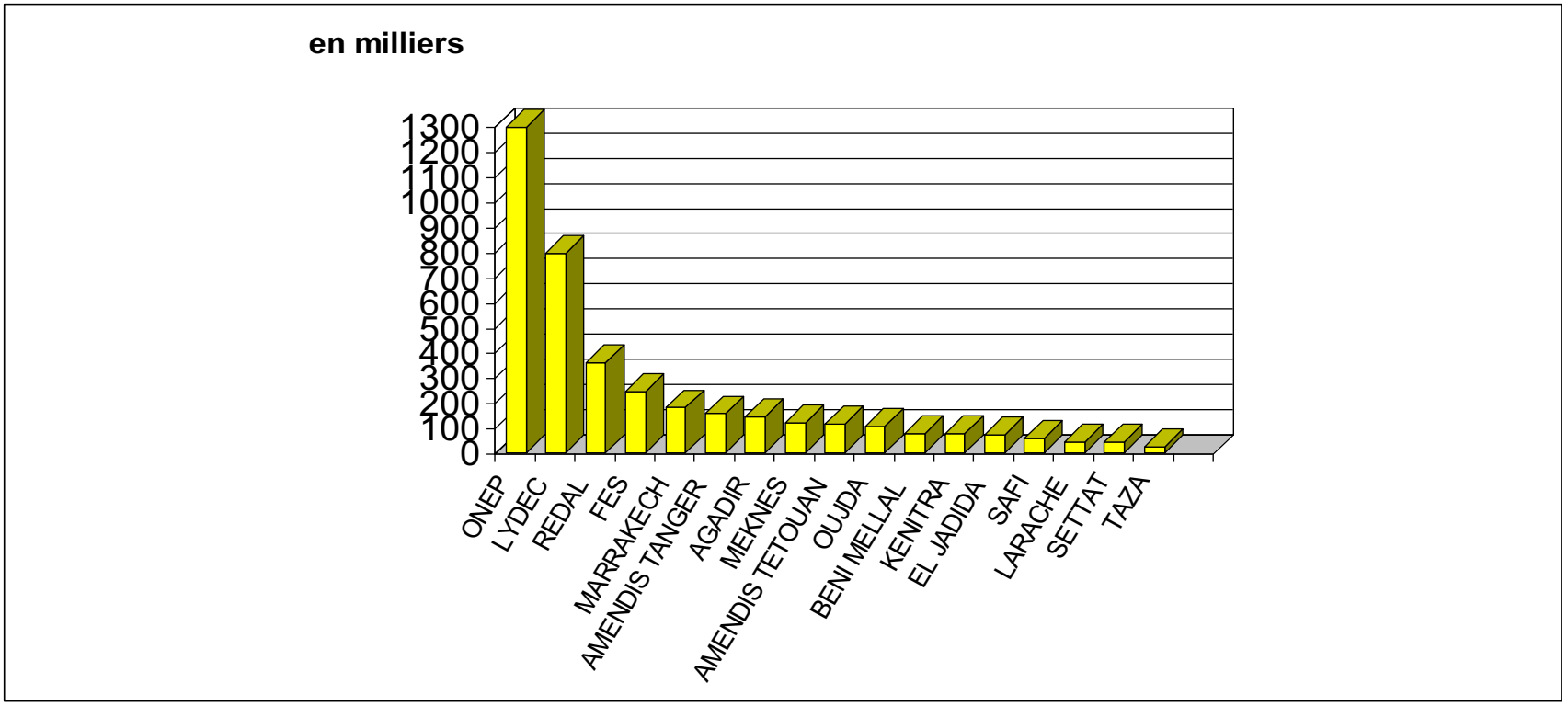
Taux d'accès à l'eau potable

- Milieu Urbain : 100 %
- Milieu Rural : 96 %

Contexte général

LE SECTEUR DE L'EAU POTABLE ET DE L'ASSAINISSEMENT

DISTRIBUTION



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Impact

- **Inondation**
- **Problèmes sociaux**

- ✓Gestion de la demande
- ✓Ressources en eau non conventionnelles
- ✓R&D et KM

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Gestion de la demande

- ✓ Gestion des eaux non comptabilisés.
- ✓ Maitrise de la consommation individuelle
  - ✓ Sensibilisation
  - ✓ Tarification

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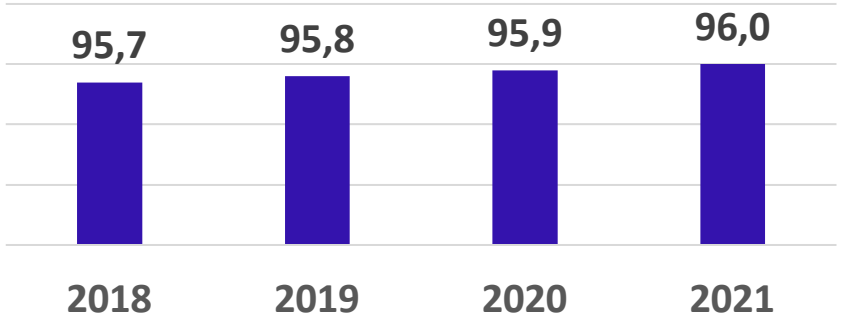
Gestion des eaux non comptabilisées

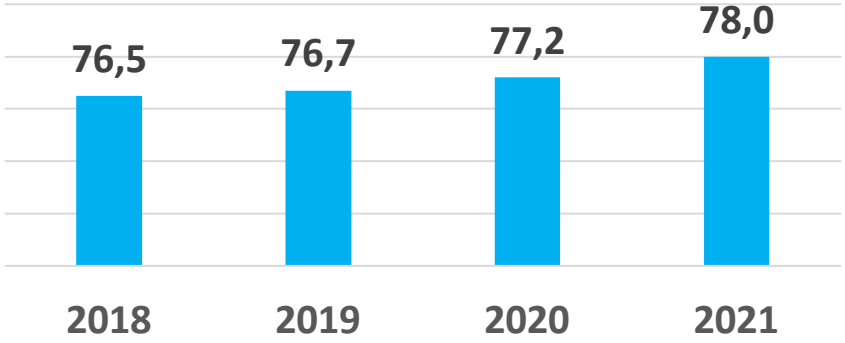
- ✓ Le renforcement et la réhabilitation des installations de production et de distribution;
- ✓ La détection et la réparation des fuites d'eau;
- ✓ L'amélioration du comptage hydraulique;
- ✓ La télégestion des systèmes production et de distribution.

Gestion des eaux non comptabilisées

Rendement des adductions (en %)

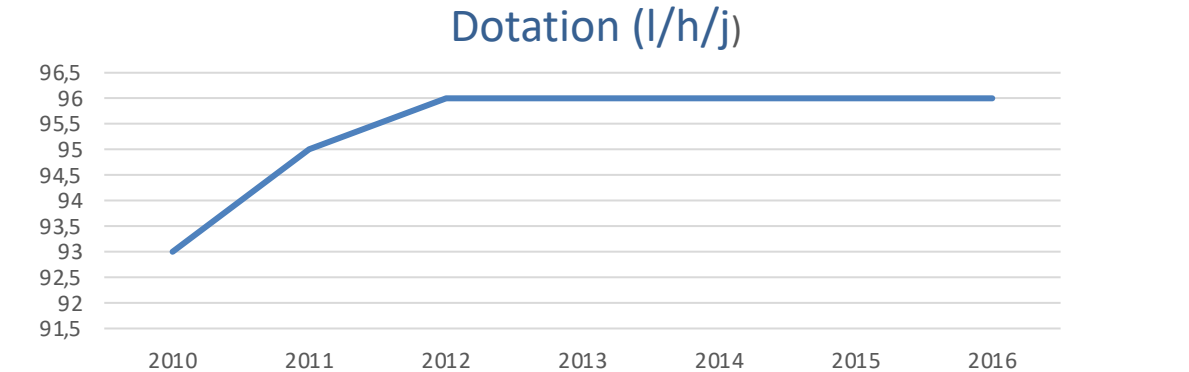


Rendement des réseaux de distribution (en %)



Maitrise de la consommation

- ✓ Sensibilisation
- ✓ Tarification



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Ressources non conventionnelles

- ✓ Recharge artificielle
- ✓ Dessalement d'eau de mer et d'eau saumâtre
- ✓ Réutilisation des eaux usées

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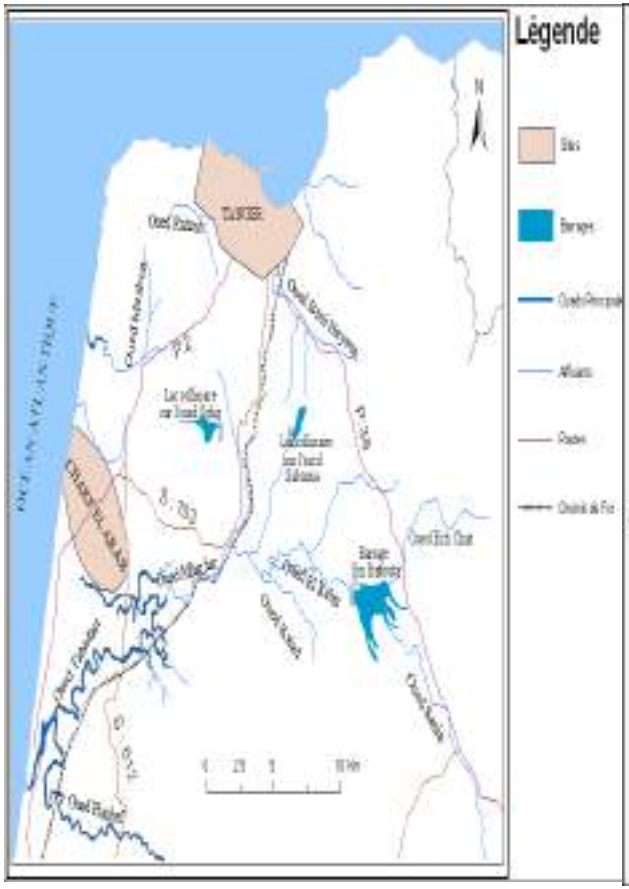
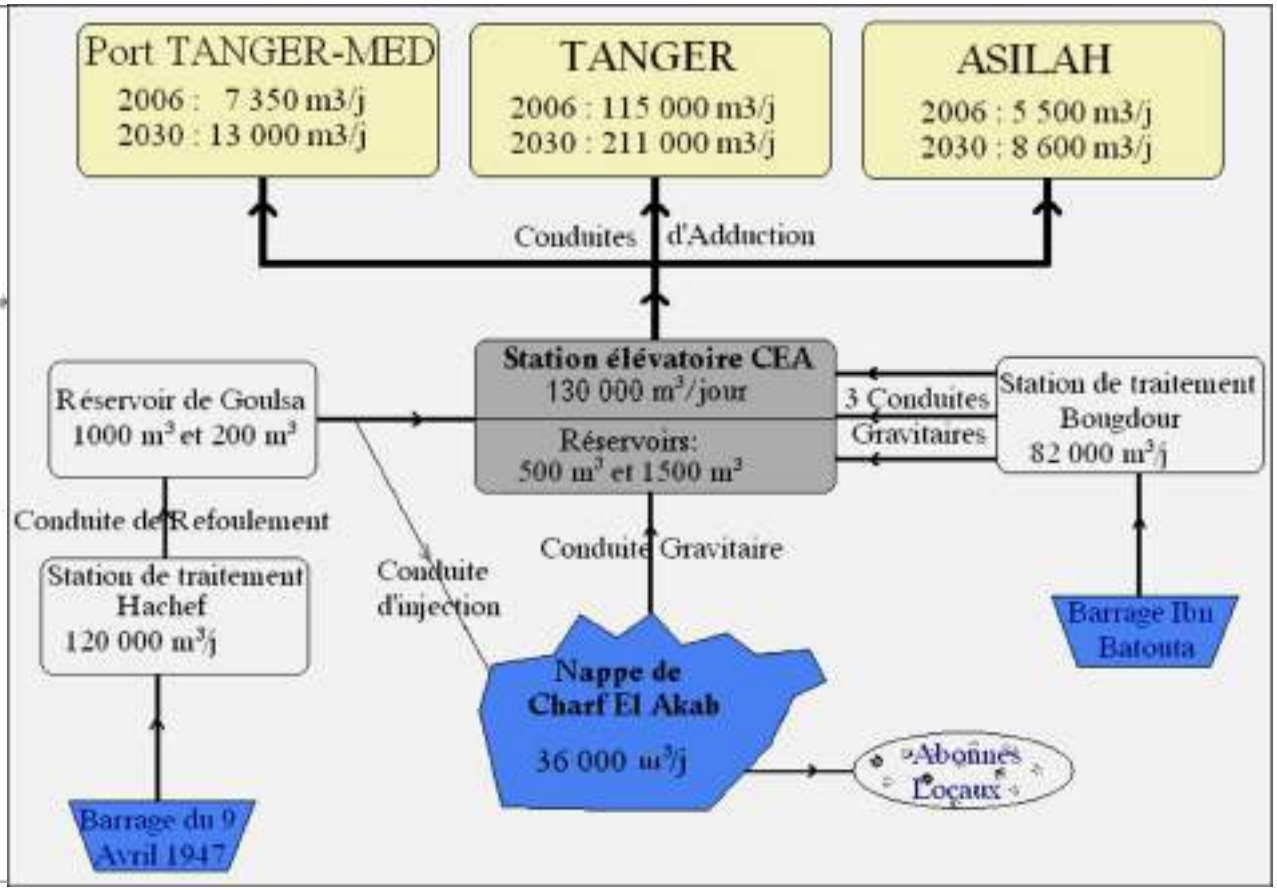
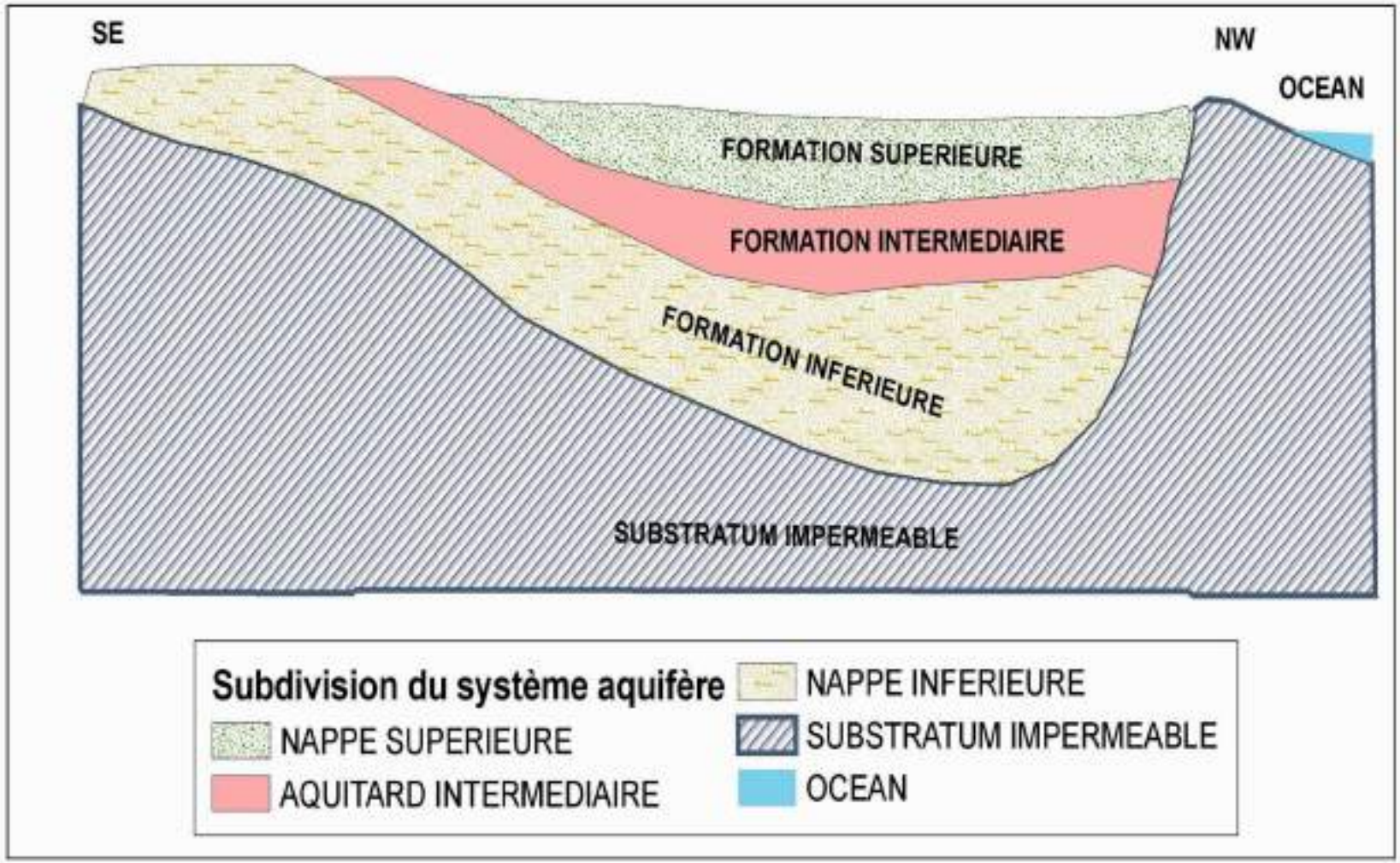
Recharge artificielle





Recharge artificielle



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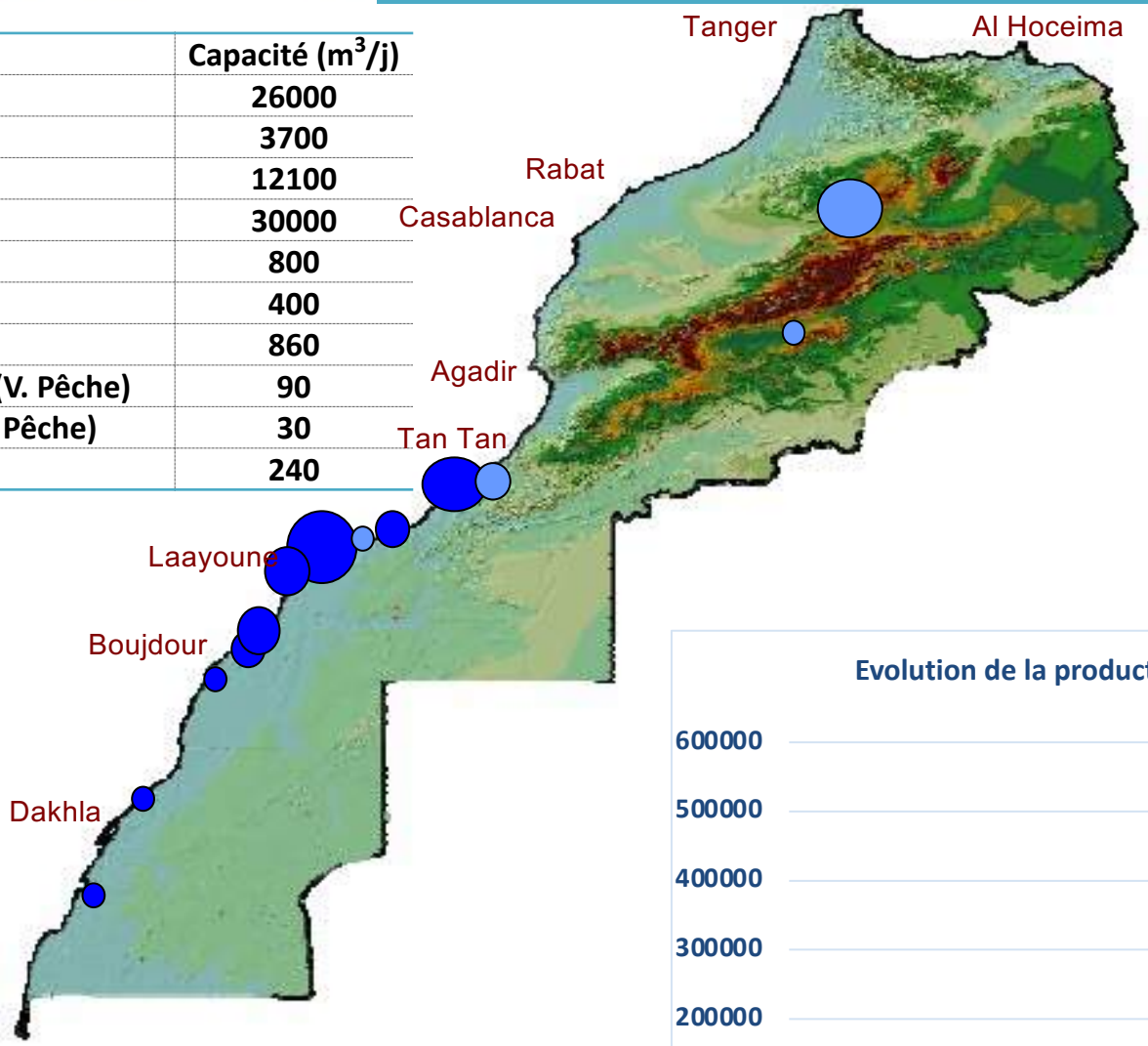
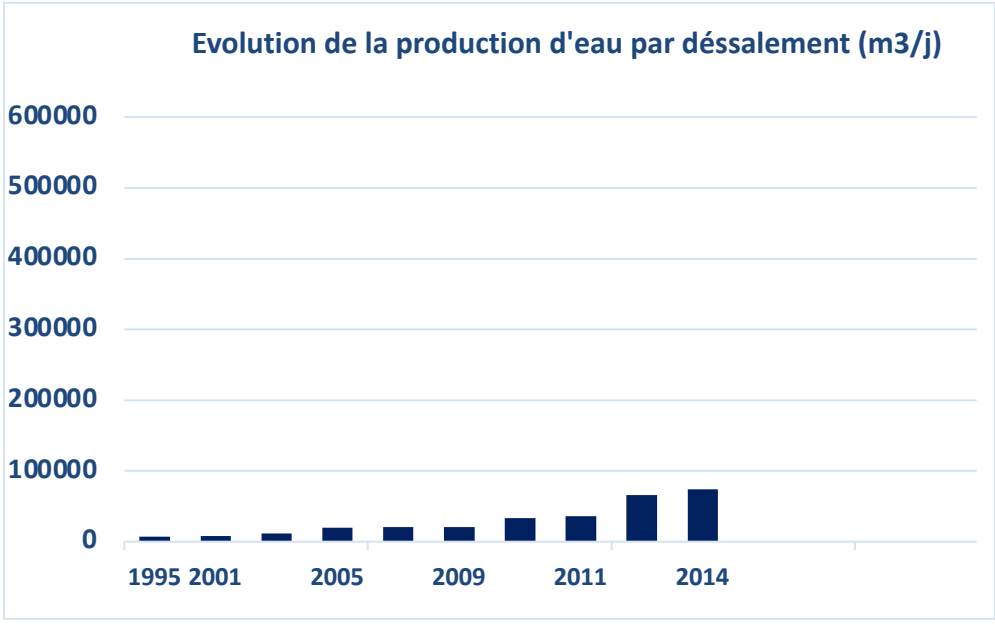
Recharge artificielle

Dessalement : Actuel

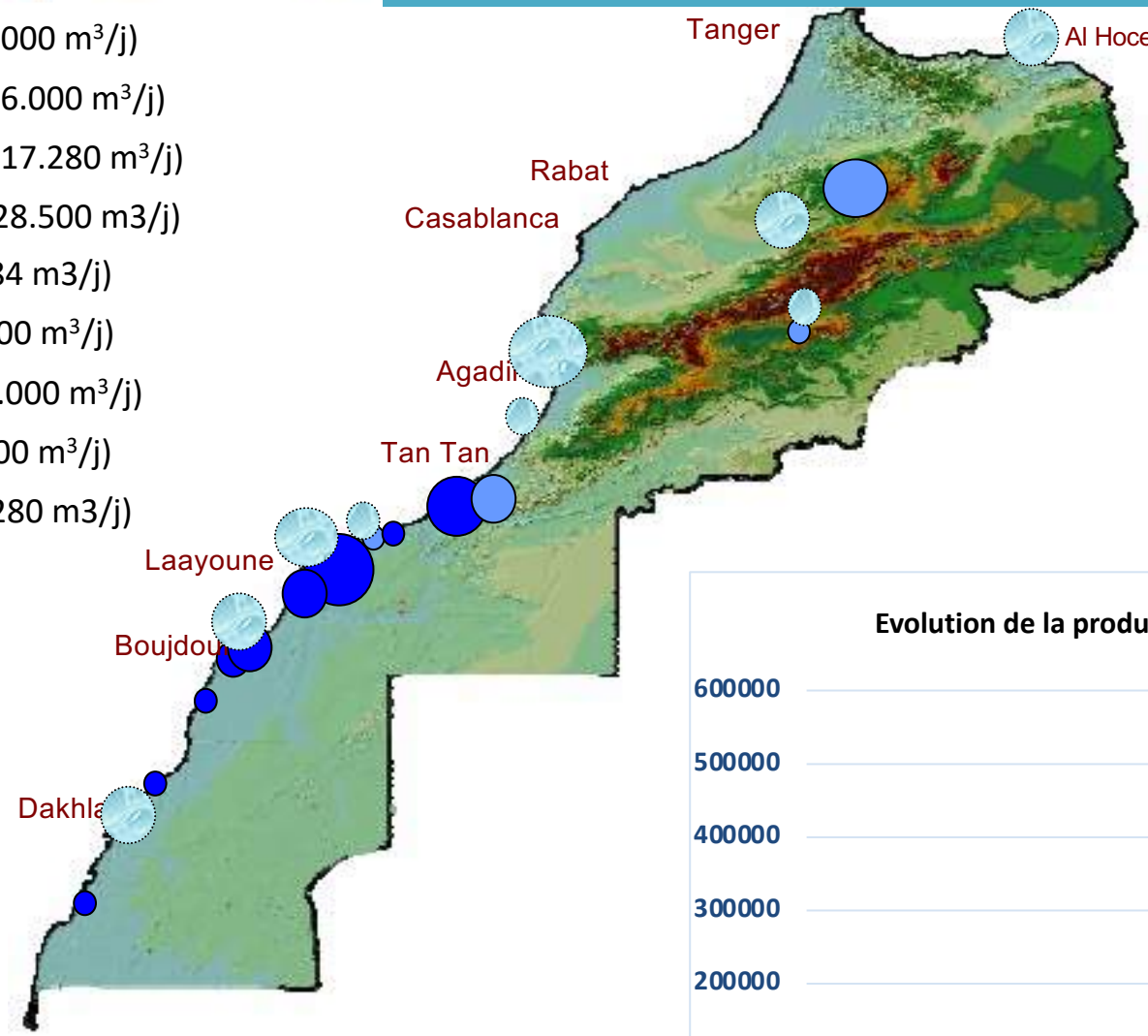
Ville	Capacité (m^3/j)
Laâyoune	26000
Boujdour	3700
Tan Tan	12100
Khénifra	30000
Tarfaya	800
Tagounite	400
Akhfénir	860
Sidi El Ghazi (V. Pêche)	90
Roc Chico (V. Pêche)	30
Daoura	240

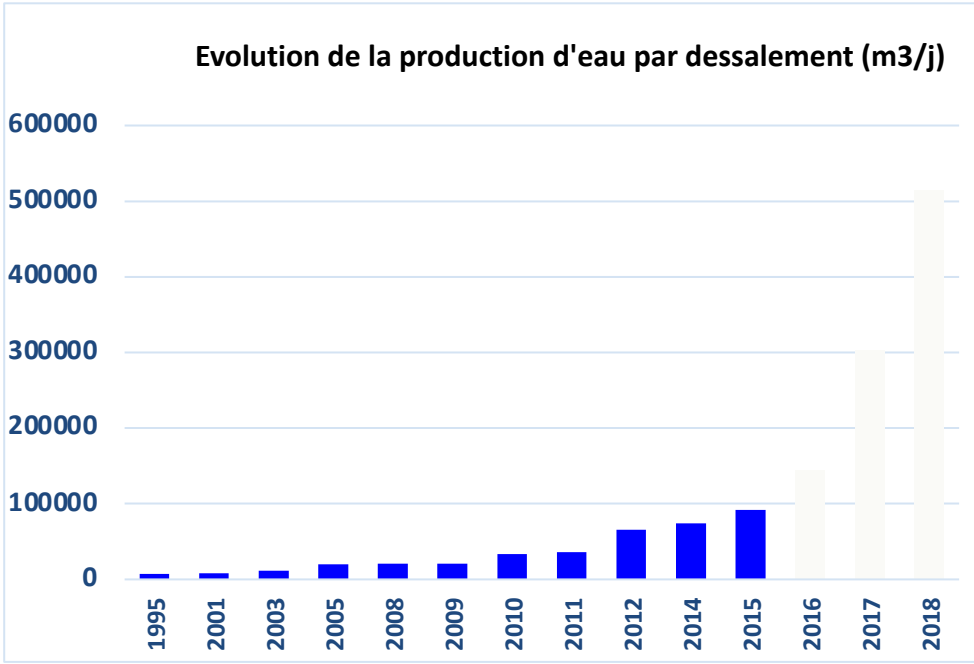




Dessalement : à moyen terme

- Agadir (100.000 m³/j)
- Laâyoune (26.000 m³/j)
- AlHoceima (17.280 m³/j)
- Khouribga (28.500 m3/j)
- Zagora (5.184 m3/j)
- Sidi Ifni (8.600 m³/j)
- Boujdour (7.000 m³/j)
- Tarfaya (1.300 m³/j)
- Dakhla (17.280 m3/j)





Réutilisation

Loi 15-36 : - Eaux usés font partie du domaine Hydraulique
- SDALs doivent tenir compte de la réutilisation

PD REUTI
PNREU
PNA
PNAR
PNAM

Taux de Réutilisation : 15 %

Arrosage des des golfs lavage des phosphates

et sera de 60 % en 2030 (350 Mm3/an)

R&D

- ✓ **Mécanismes du changement climatiques et du paléo-climat**
- ✓ **Système d'aide à la décision (sur GIS) pour l'optimisation et des solutions alternatives**

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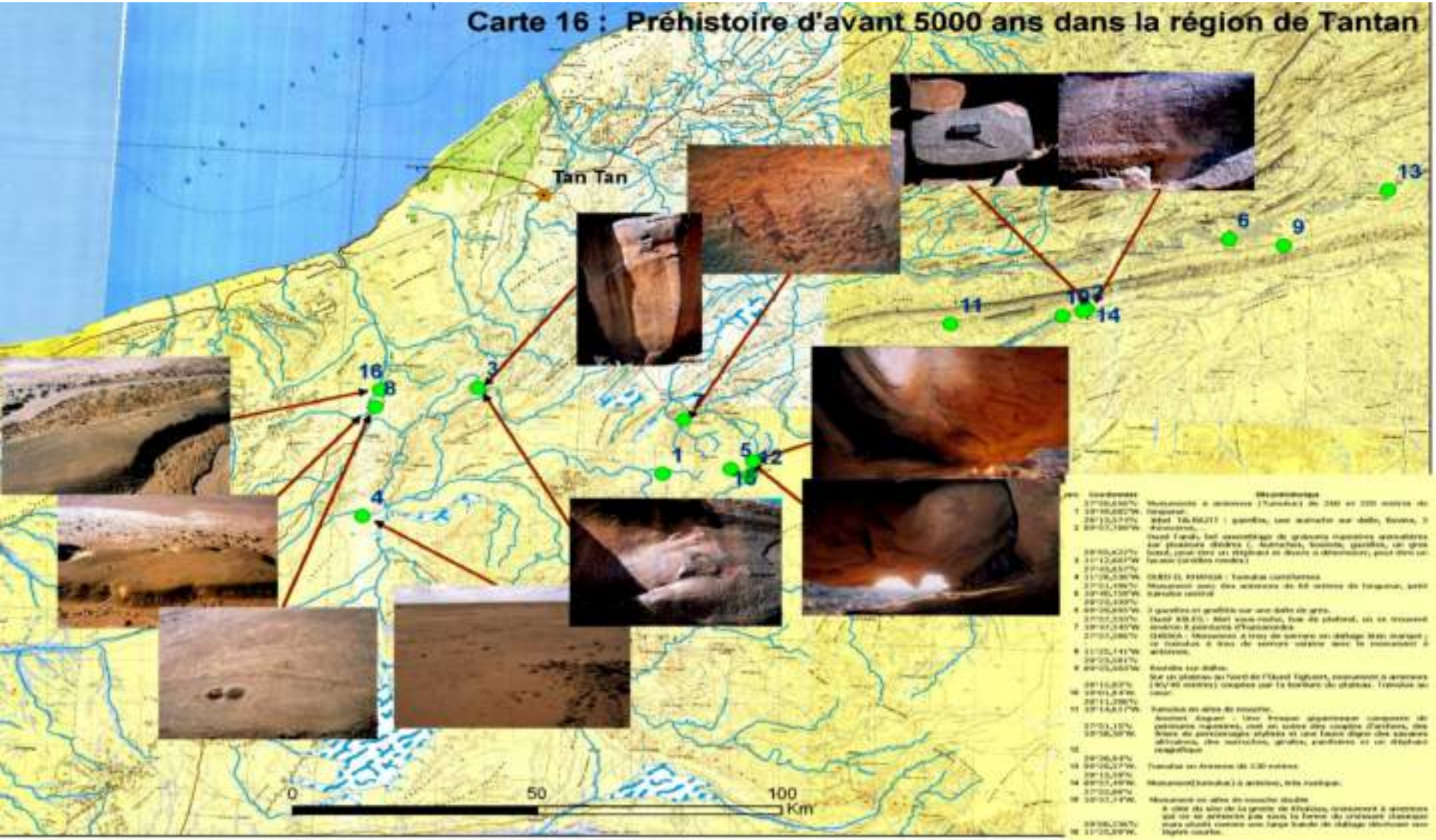
R&D



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R&D

University of Bangui

Comparison of community-based adaptation strategies for Droughts and Floods in Kenya & the CAR

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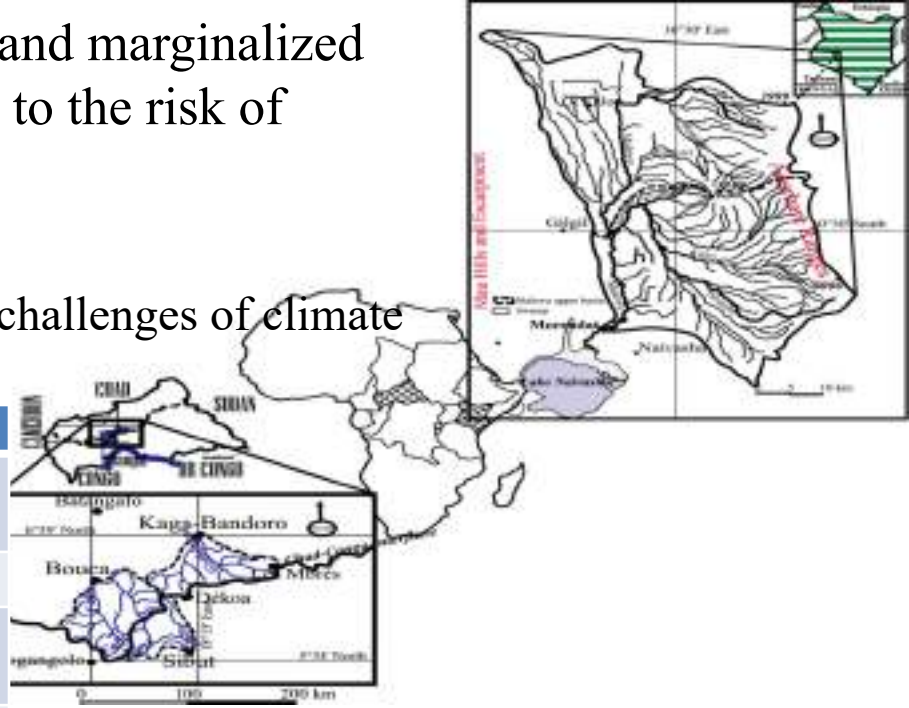
Introduction

- **Floods** and **droughts** form some of the potent **threats** to **human development**;
- As **extreme events** they imply the **effects of climate change** on **water resources**;
- Both phenomena linked to **lack** or **abundance of water** in basins-areas, mainly related to rainwater anywhere in Africa;
- This context integrates **water issues induced** in terms of **resource** (abundance) and **risk** (floods, severe low-water level, water scarcity) as well for established communities both in the slope/submerged areas and the floodplains where water access is difficult;
- **Droughts** & **Floods** require to People to **cope** or **adapt** due to their occurrence fashion over space and time
- **Challenges** are **societal constraints** for communities into these catchments.

- The **aim** is to analyze the **resilience** of poor and marginalized communities dependent on natural resources to the risk of **floods** and **droughts** through
  - adaptation capacities
  - Adaptation strategies in the areas to face the challenges of climate change;

	Malewa watershed, Kenya	*CAR watersheds*
Watersheds	1,700 km^2	12,440 km^2 for the whole, divided in Tomi: 2,380 km^2; Gribingui: 5,680 km^2; and Fafa: 4,380 km^2
Rivers	Rivers shallow but perennial	Perennial rivers that run dry occasionally
Climates	*Subtropical* in the South (750-) and *Semi-arid* in the North (250-), rainfall *bimodal* regime	Wet tropical climate Sudano-guinean variant (1,200-1,400 mm on an average), rainfall *monomodal* regime
Vegetation	Tussocky grassland with very few trees on Kinangop Plateau; many tussocky bogs in stream valleys	Semi-deciduous and dense forests; savanna types; gallery forest
Land use	Intensive cultivation of food crops and cash crops, poor land-use practices	Extensive cultivation of food crops and cash crops, settlement and activities in floodplains
Issues	Deforestation, siltation; excessive water abstraction for domestic and agricultural use, population pressure on natural resources, pollution, and water scarcity	Deforestation, drying-up of rivers during severe droughts, pollution due to fertilizers, climate change
Population	515,017 inhabitants (2009)	77,677 inhabitants (2009)



Study context and zones location

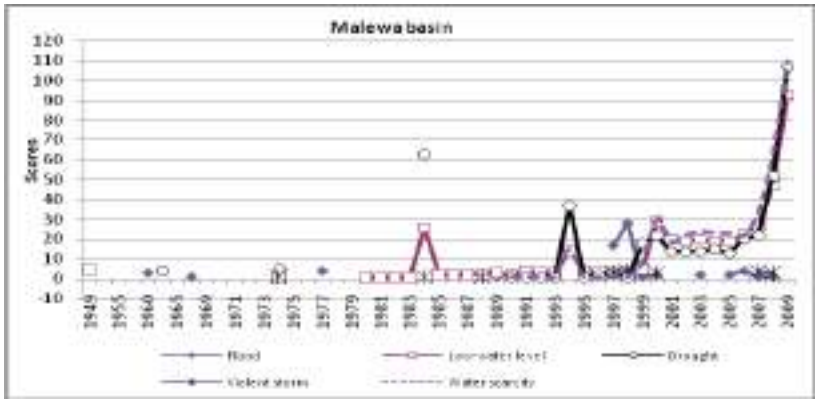
Methods

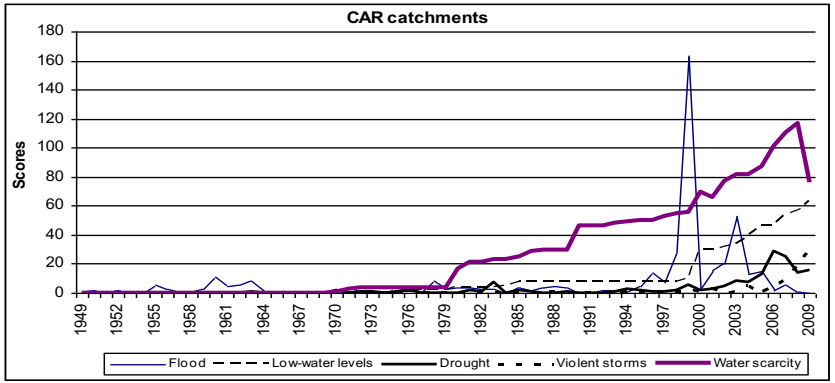
- Surveys (questionnaire and interview), mainly from people having 40-50 years and above and having resided a long time in the locality (20 to 30 years);
  - 227 questionnaires and 40 interviewees in Malewa basin, Kenya;
  - 330 questionnaires and 70 interviewees in CAR catchments
- To investigate the most current extreme events that affected the communities, their impacts in both sites, and the respective adaptation strategies adopted by communities;
- Survey information's treated statistically to establish climate variability/degradation effect through the hydrological extremes' violence and alternatives.

Perceptions of floods & droughts in both zones

- **Droughts** (rainfall shorten, shift in agricultural calendar, water scarcity impacting crops, livestock, or extra-agricultural activities, conflicts around of accees to resources)
- **Floods** (harmful water abundance destroying harvets or houses, or causing loss of life)

Obtained trends in areas…

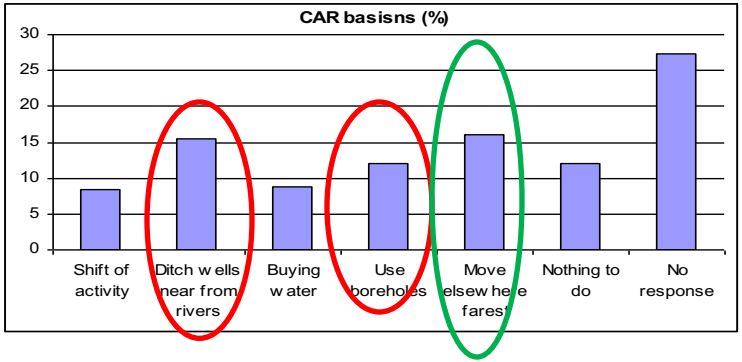


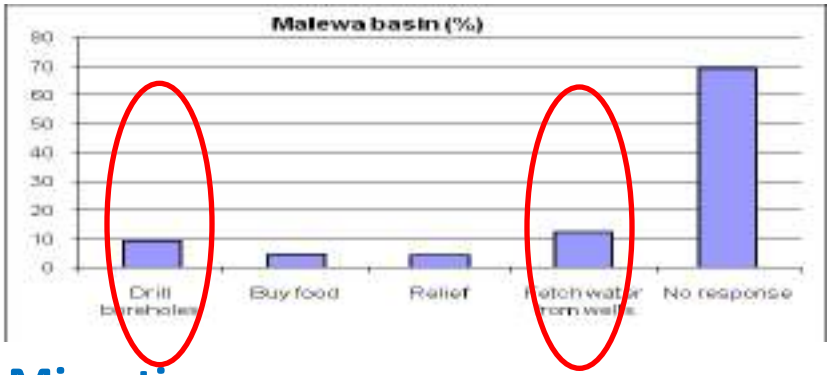


State of the extreme events faced by local communities

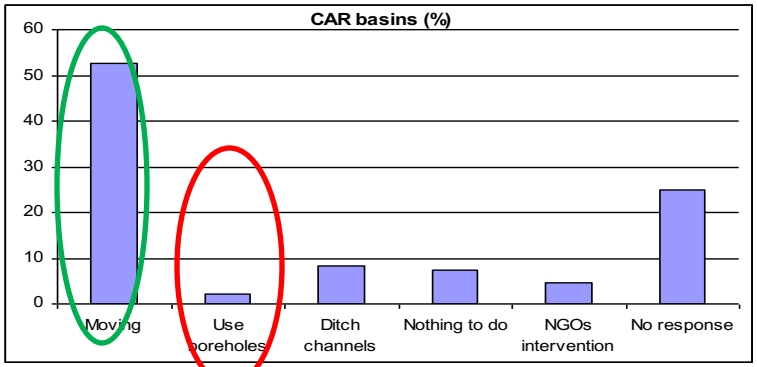
Communities' Adaptation Strategies

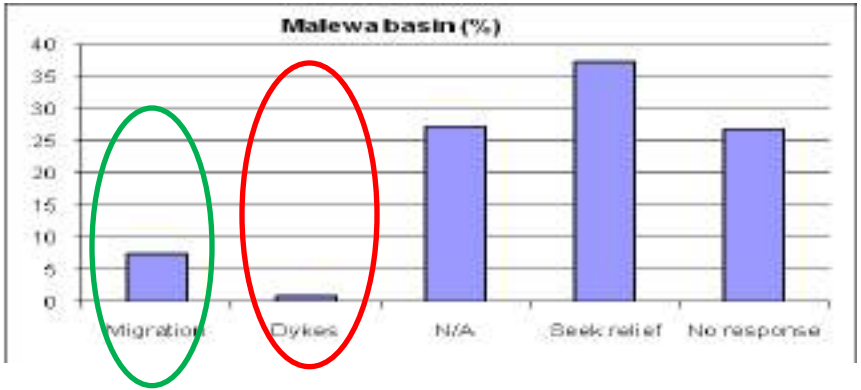
In case of Droughts… Changing livelihoods activities





In case of Floods… Temporary location or Migration

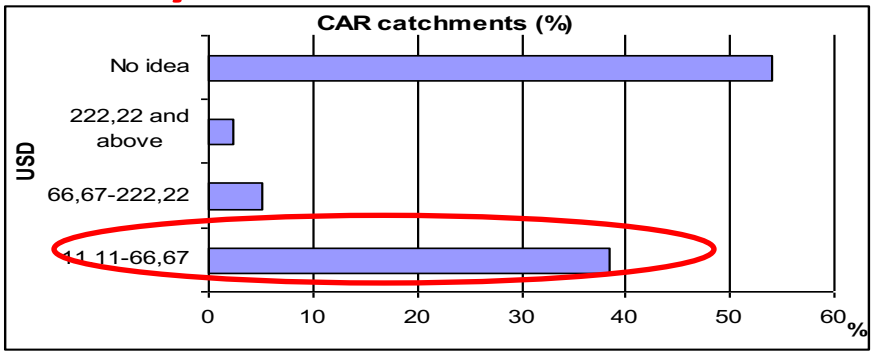


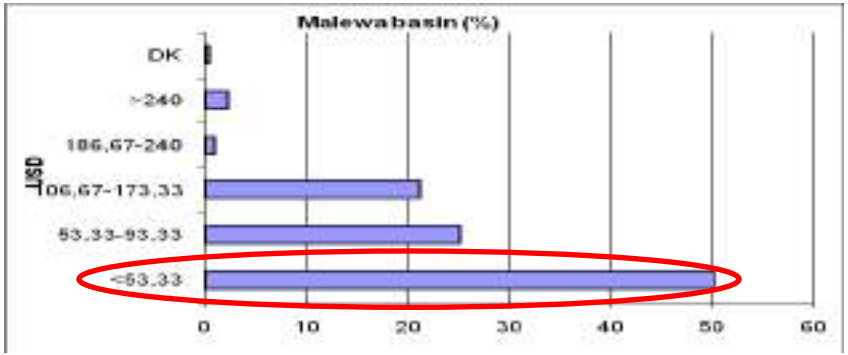


Communities' Adaptation Strategies

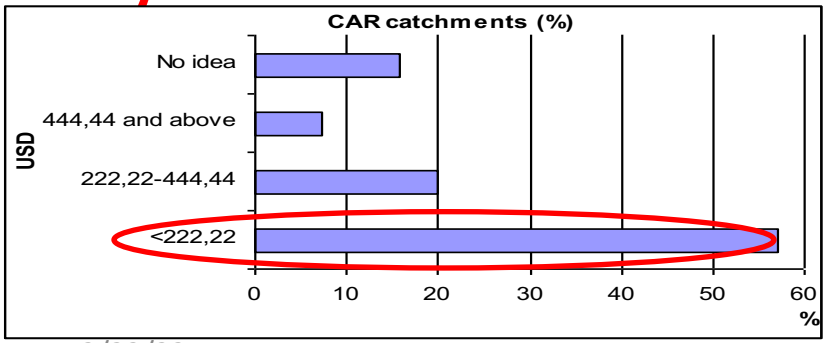
Which adaptation with lowest incomes?

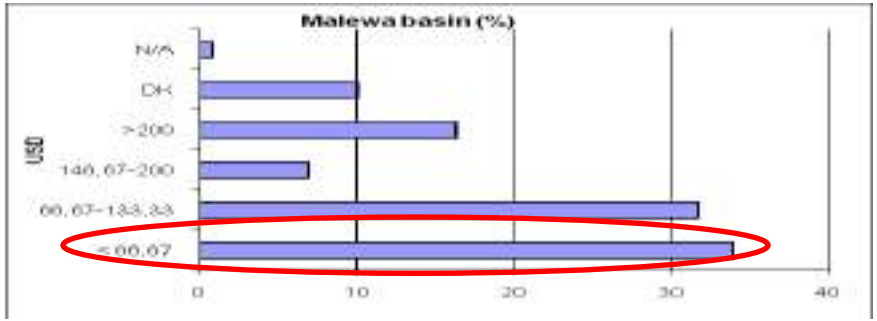
Monthly…





Yearly…

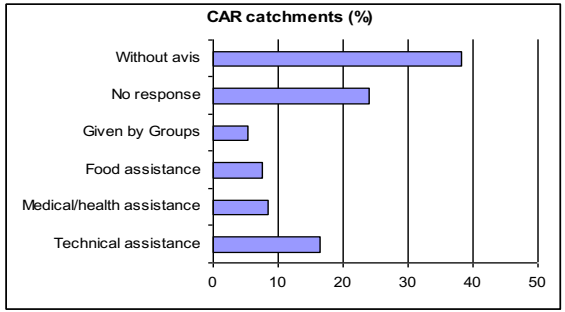


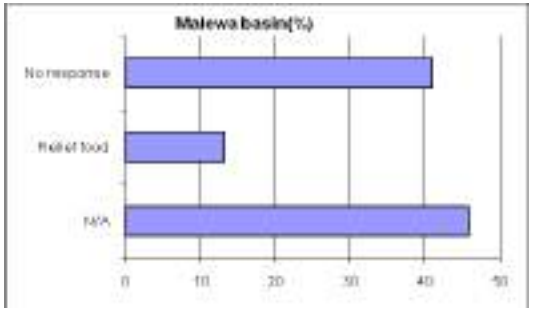


Constraints of Adaptation in Catchments

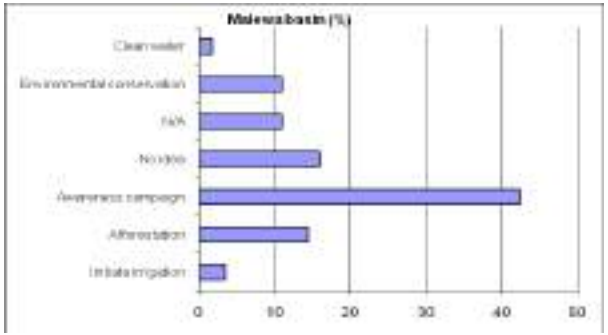
- ***Weakness of local Community-based Organizations/ Association;***
- ***Random policy facing Extreme Events Occurrence in basins-areas.***

Local Organizations interventions…

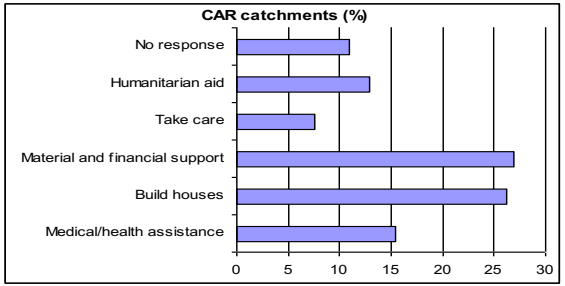


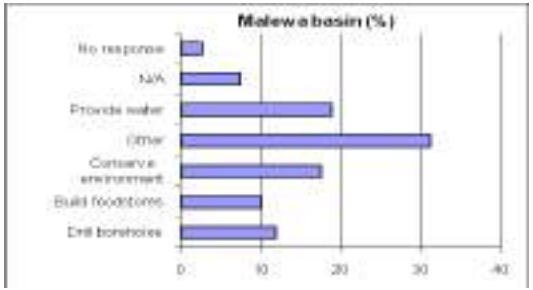


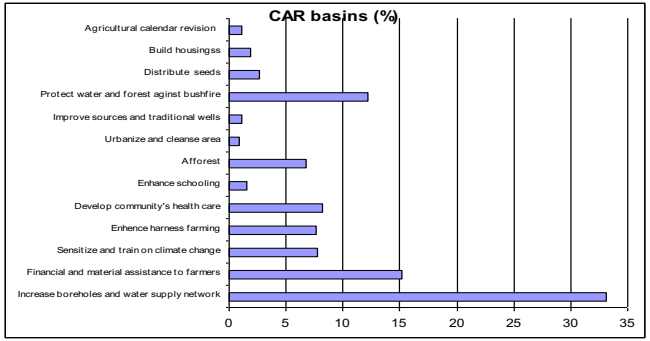
Surveys' Expected outputs from Communities…



Governments' interventions…







Over adaptation mechanisms of communities in both areas

How to enhance/improve these adaptation strategies?

- **Adaptation** is the *spontaneous response* of people facing an event;
- This response can be enhanced on time depending on the event duration, its magnitude and persistence in the area through **modern disaster risk reduction measures**;
  - **Protecting** (preparedness, mitigation, prediction and early warning;
  - **Recovering** (impact assessment, response, recovery and reconstruction);
- Training capacity building;
- Diversification of livelihoods;
- **Preparedness** (forecasting of extreme events, information on adaptation strategies, building human resilience);

➢ It supposes that in Africa, a part of the cost is absorbed by **households** and another by **public sector**

Conclusion

- ***Communities' exposure and vulnerability to droughts and floods as extreme events***;
- No preparedness to face devastating effects of these events due to the chronic lack of material means;
- Most strategies to adapt to CC in Africa are to reduce vulnerability and enhance the broad spectrum of communities' capacity in responding to environmental, resource and economic perturbations (Ringius et al., 1997);
- **Main strategies** for both (droughts & floods) have some similarities and differences:
  - **temporary relocation** or **migration**, **changing livelihoods activities**, **relief seeking**.
- **Measures** should include **communities' building capacity**, and **support to diversify livelihoods** and **develop coping mechanisms.**