Report on Session 3

Presentation 1: Tools and methods for assessing and reducing water resources vulnerability to climate change-Mr. Sergio Salinas-Rodrigues, WWF

There is common understanding that we are facing a serious set of problems. Water is a key issue in economical and human development and conservation (Food, Water and Energy Security). The water and conservation science communities hold a wealth of tools, data products and solutions. There is an opportunity to demonstrate a conservation based approach to development

- We don’t know what will happen to water resources-precipitation regimes vary
- Different changes projected, different tools and approaches required for adaptation
- Changes not really linear as generally perceived
- Prior allocation to environment—the reserve-will increase resilience, Reduce user water risk, Prevents over allocation, Reduce water resource vulnerability, Secure/increase adaptive capacity of both people and nature
- In Mexico-Water reserves part of the national water law
- Developed a standard for water allocation to the reserve that:
  - Balances water use and ecological importance
  - Regulates supply and demand
  - Integrates climate variability
  - Safeguards ecosystem resilience
  - Turns limiting into securing regulation
- Basin level assessments-HydroBat
  - Evaluates, analyse, visualise
  - Sowpack sensitivity analysis undertaken
- Flowing forward-Integrates ecological vulnerability and adaptive capacity
- Characteristics:
  - Framework approach
  - Combines climate and development scenarios
  - Combines participatory approaches with desk studies and scientific analyses
  - Looks at communities and the environment
- Appropriate Scale:
  - Landscape/Watershed
- Strengths:
  - Flexible
  - Integrated approach
  - Not restricted to data-heavy analysis

Need System based Adaptation- Water is the integrative element, Water resource vulnerability, Recognizes the needs of people and ecosystems, Adaptive IRBM – IRBM+
Presentation 2: Comparative assessment of the vulnerability and resilience for ten deltas, Mr. Cees Van De Guchte, The Netherlands

- Deltas valuable yet vulnerable.
- IPCC 4th assessment 2007, deltas at risk
- 10 deltas studied. Results:
  - Provide a first step towards a comprehensive overview of the current and future state of deltas
  - Integrate scientific, social and management knowledge
  - Provide framework for future data collection
- Used DPSIR+ Spartial layers approach
- Defined drivers and response measures with indicators grouped into 4 layers
- Deltas reported themselves on a score card
- Used scenarios downscaled to different deltas and how the deltas would score in future against vulnerability and resilience to climate change
- Overall, most deltas vulnerable: imbalance between demand and supply
- Aging infrastructure
- Inadequate governance
- Disruption of delta processes
- Framework helps Deltas communicate, promotes South- South Collaboration etc
- Different Deltas have varying levels of priorities
- Experiences shared through web based interface
  - For most of the deltas current resilience and sustainability is not satisfactory
  - Reasons differ per delta but some general mechanisms:
  - Imbalance between demands and supply with regard to land and water use;
  - Inadequate or ageing infrastructure in the delta;
  - Disruption of the natural delta processes;
  - Inadequate governance to address problems and implement solutions.
  - For a number of deltas the challenge is to define a comprehensive (multi-sectoral) delta plan
  - The combined DPSIR-layer approach has proven to be useful

Presentation 3: Vulnerability of water resources from a LDC-The case of Haiti, Jean fanfan Jourdain

A TWO-EXTREME PERSPECTIVE ON VULNERABILITY FROM DROUGHT TO FLOODS

1. First extreme-based on expert findings

   - Artifices and PRECIS for forecasting: All scenarios show a clear trend to a decrease in precipitation, however, that would be more important with the emission scenario of GES A2.
   - Changes will be between -8% and -19% for A2 versus -8% and -14% B1)
   - The climate scénarios drawn from PRECIS anticipate a warmer and dryer climate for the country.
   - For both emission scénarios will experience an increase that would vary between 0.7°C and 1.7°C during the horizons 2011-2040 and 2041-2070.
   - Precipitations: all the scénarios show a full decreasing pattern.
The predicted vulnerability of water resources to climate change is quite similar in trends to those expected for the agricultural sector.

In general terms, Gonaïves and Cap-Haïtien would experience an hydrological deficit that would translate into a higher pressure on the water reserves (Underground).

2. The Other Extremes—Water Excess and Floods

- Gonaïves: A landmark of Haiti’s vulnerability to StormsA flood-prone city victim of topography
- Situated in a valley, it’s is surrounded on 3 sides by hills and mountains; on the fourth side, the city abuts the Caribbean Sea.
- Water running out of the mountains is channelled to the city and into the neighboring Savane Desolee.
- This topography caused deadly flooding in both 2004 and 2008 from tropical storms in the North-East.
- In September 2008, a string of storms—Gustav, Hanna, and Ike—drenched Haiti:
  • as of September 15th, 423 people had been reported dead, 50 were missing, and more than 100,000 were in shelters, said the US Agency for International Development (USAID).
  • Gonaïves has been almost entirely cut off by Hanna’s floodwaters and virtual lakes have formed over every road.

Floods are the leading factor of vulnerability in Haiti. Visual communication and observations much more effective

Presentation 4: Assessment of climate change impacts on water resources and mountain systems, Mr. Rajan Kotru

- ICOMOD-Knowledge institution in South Asia, Nepal
- Ten Major rivers Basins-Ganjes, Yellow River, etc
- 1.3 Billion people depend on this for water livelihoods and energy

Impacts
- Glaciers melting 12,000 Km3
- 1956-2006-evidence of melting, lake outbursts
- Precipitation reducing in high areas and reducing in lower areas
- Winter and spring crucial—snow-precipitation is changing
- Loss of productive lands
- Springs drying up
- Forest fires

- Impact is location specific, communities confirm these changes
- 50 x 50 weather stations will not give us the required data

Interventions
- Himalaya Climate Adaptation Programme
- Snow pack monitoring
- Heterogeneous terrain, research undertaken in local areas
- Conceptual Framework for Climate Resilience in water shade management
- Customising Tools, GCMs, Community Vulnerability,, Policy etc
- HICAP Programme -Reduce uncertainty, KM and Capacity, Proposals for programmes
- Merging top down with Bottom up
Some Key Messages

- **Message 1:** Livelihood diversification emerges as a central adaptation strategy but support through networked institutions and integrated policy arena is needed for long term sustainability of “Water Availability”

- **Message 2:** Socio-cultural norms affect people’s adaptive behaviour; despite being deeply rooted, they can shift over time in response to the needs (customising traditions to change)

- **Message 3:** Good governance and integrated planning that takes into account climate risk, water-use efficiency, and infrastructure development contribute to enhancing water/food security, and disaster management

- **Message 4:** Adaptation requires striking an iterative balance between short-term priorities and long term gains, often that is a challenge (Convergence of R&D, Homogenization of data available, Sectoral coordination/Local Bodies)

- **Message 5:** Need improved tools/methodologies that capture climate induced ecosystem changes, gender and poor people’s adaptation needs and focus (Climate proofed watersheds)

- **Message 6:** Improved and multiple modeling and monitoring techniques should lead to data (integrate climate and community science) collection (with coverage), consolidation, interpretation and dissemination (e.g. RBM, TBL at Policy and Practice levels)
Question 1: How is climate change impacting on water resources and on related sectors and ecosystems? What are the multidimensional aspects of water affecting lives and livelihoods?

Water is the key mechanism through which we experience the impacts of climate change. Two types of impacts: slower impacts through interannual changes in precipitation and runoff, and more immediate and extreme events (floods, etc.).

Impacts on water resources are reflected on impacts on hydrological cycle such as the intensification of the water cycle, increased frequency and severity of floods and droughts and other extreme events, seasonal shifts and State-level shifts. Climate variability is impacting us right now, and possible future climate change impacts. Climate variability is not creating fresh vulnerability, but increasing existing vulnerability.

The impacts are reflected in changes in water resources quantity and quality and availability in time and space. The results are cascading effects on other sectors, ecosystems and livelihoods. The changes may be gradual or shifts to new state/regime that can completely change the viability of sectors, ecosystems, livelihoods. Existing tension over water resources is growing which could potentially lead to conflicts in the future. Stress on natural ecosystems is growing as a result of competing competition. It’s often the “user” that loses out in any competition.

Sectors depend on the quality and quantity, timing of hydrological services. Key sectors include agriculture, health, energy, transportation/navigation, tourism, etc.

Water is having an impact on food, energy, biodiversity and health security, exacerbating stress between competing needs, and at different levels, with its consequent economic aspects. Climate change is taking away our safety net and also impacting on migration and increasing urbanization. Some key changes include:

- Changes in long term mean climate rippling through ecosystems and economies. Disrupting how we think about things.
- Institutions that have worked for centuries, may not be adequate to cope with changes anymore.
- Population displacements
- Increased evaporation rates
- Decreased soil moisture with temperature increase
- Salinization of aquifers with sea level rise.
- Increases water scarcity situations.
- Aggravation of conflicts in transboundary waters
It is important to note that climate change can impact these sectors not only through the impacts on water resources, but also through other impacts, such as direct damage on infrastructure. Some examples of the impacts from around the world include:

- **Drought in Kazakhstan:** shortage of water; change in rainfall pattern? Changes in river flow; huge impacts on agriculture;
- **Maldives:** dry season becomes more dry; not enough rainfall; transport of water to other islands; very expensive – like desalinization plant; extreme rainfall in rain season; minor floods; impact on transportation;
- **Mexico:** drought and floods; water quality problems (health) agriculture, food security a problem;
- **Bolivia:** water quality; higher water temperature increases with temperature; nitrification; growth of algae;
- **Bangladesh:** groundwater, surface water, salinity intrusion; cyclones, floods; droughts in northern part; shorter return periods of floods (20 years are now 10 years); change in weather pattern – sometimes rain when we do not need it and vice versa; past rain pattern was easier to manage; salinity – health impact; erosion in the coastal zones; huge amounts of sediments are transported; displacement of people happens as adaptation measure; decrease in population in coastal zones; loss of livelihoods, shelter; rivers change their bed;
- **Zambia:** two zones: areas with more rain, and less rain; the latter are more vulnerable – drought and floods; people get displaced by floods; impact on agriculture – rain fed agriculture; in urban areas – water borne diseases (cholera); rain pattern is changing; effect on infrastructure (bridges, roads)

The adaptation approach thus needs to be holistic and address the socio-economic and ecological system as one whole in an integrated manner. IWRM can be helpful but has to be explicitly climate adaptive.

Ecosystem based approaches allows us to recognize and maintain ecosystem functions of watersheds, to store, clean, and transport water. This is often cheaper, and brings multiple co-benefits for biodiversity conservation, carbon storage, etc. A better understanding of ecosystem roles and functions is required in adapting to climate change to avoid making situations worse, or locking ourselves into solutions that are only short term. Therefore, when designing assessment tools of climate change impacts, we need to make sure to evaluate the status of these services in order to assure that they are maintained for future climate scenarios.

Adaptation will be more effective when it uses and builds on lessons from water resource management. Integrated Water Resource Management (IWRM) where ecosystems are considered as part of the solution provides a real opportunity for adaptation. Adaptation should not be considered a separate planning but part of water resource management. Water managers have always coped with uncertainty and change – that is hydrology,
therefore now they need to start better understand how the watersheds function to maintain the ecosystem functions. Some key points on adaptation to consider:

- water adaptation provides challenges and opportunities in almost every sector
- water impacts are different depending on local ecosystem so local context matters and there is no one size fits all approach
- water adaptation can bring us to use traditional and no-technological practices like water capture and ecosystem conservation/rehabilitation
- we need to develop water policies and better management practices even more so because of climate change
- understanding social dimensions if very important
- integrated water planning is important over the short and long-term and should be done across sectors
- governance is important – it is important to reinforce existing structures and consider creating new structures and build more connections
- water adaptation requires good spatial planning in both urban and rural areas, including good land use planning and wise infrastructure investments
- we should think about water impacts on diverse sectors including those like food security and energy that are often linked to water, as well as others like tourism, health, disaster risk reduction, and ecosystems
- Mechanisms need to be reconsidered, for example Irrigation requirements will need to be different in the future and the way we manage water resources will change.
- There is an Urgent need to formulate how climate change impacts on water resources within the UNFCCC

**Question 2. How could modern, indigenous and traditional knowledge with gender perspective inspire crosscutting tools for assessing climate change impact on water resources?**

Understanding communities’ perceptions of climate conditions and climate changes is important. These perceptions should be compared to observational data. Often, there will be a divergence between perceptions and observations, but this doesn’t mean perceptions should be disregarded. Need to recognize that perceptions are critical for creating political support for taking adaptation actions.

Traditional knowledge is often handed down from generation to generation. There is usually a significant amount of knowledge on how to adapt to historical events. This knowledge should be tapped to inform current tools and decision making early on.

There is a need to combine climate science and community science. Combining tools is important. Tools need to capture differences in gender perspectives. Mens’ and womens’ perceptions are often very different. Community assessment tools can build in a gender perspective by undertaking an institutional diagnosis. This means finding out who makes
which decisions. Based on this, user assessment tools can be designed and used to explicitly take into account a gender perspective.

One of the key issues to consider when integrating modern, indigenous traditional knowledge is scale (broader resolution of scientific information with identification of large scale patterns vs. traditional, indigenous knowledge which can often provide insights into what is happening at the local scale.

Another challenge is that indigenous traditional knowledge may not be systematized or written down. It needs to be captured through participatory processes. Indigenous and traditional knowledge is often about flexibility. Understanding impacts can inspire communities to do interventions at landscape scale to address degrading environment.

Integration can be very helpful as they can fill different gaps, as modern knowledge can provide information on trends and local knowledge can fill into specifics, often ground-truthing what is being observed at broad scales as well.

It is important to capture quantitative and qualitative knowledge and in that sense, traditional knowledge can provide very valuable inputs that can be captured by “modern tools.”

It is also important to capture Gender perspectives through explicit tools that reach out to and capture the voices of women in terms of impacts and solutions, whose ‘voice’ may not otherwise be heard.

From the outset, integration, collaboration and a bottom-up approach is required. In mountainous areas for example, it’s important not to underestimate the importance of local knowledge because the context change on shorter distances than in regular terrains. This should be valued to ensure a fair & effective participation from such communities.

We can learn from different sectors such as the health sector that has experience on how to incorporate traditional indigenous knowledge with science to inform public health policy. Examples of some actions that can be undertaken include:

- Catalogue and disseminate good practices based on local knowledge, and separated by all relevant sectors. Would be good to have a database on local knowledge solutions. Also differentiate by medium of capturing this information, and with specific language adapted to the target audience.
- Using this catalogue to feed decision-making which then has an impact on local practices. The challenge is to make sure that participation is truly taken into account.
- Develop partnership between modern prediction of climate outlook, forecasting tools, and traditional knowledge tools. Validate the two together. They supplement and enhance each other. Modern technology can help visualize.
- Raise awareness, improve preparedness
• Integrate traditional knowledge in early warning systems-Indigenous people have useful knowledge – but this may not be enough to cope with the increasing challenge
• Map and identify practices of indigenous people, and build capacity to disseminate the knowledge
• Improve new technologies: Freshwater lens: longer dry periods; agriculture – hydrophonics (use a pipe) technology, Plant trees to protect the local environment and change cropping patterns,
• Integrate gender perspectives- women have a central role and they are responsible to run the house hold and are the most vulnerable group of population
• Need to ensure balance from different perspectives:
  o Scientific knowledge should be calibrated by local/indigenous knowledge and vice-versa so that at the deliberation time no one comes out worst-off.
  o From a gender perspective, equity in the access to scientific education is important. This is important since scientific capacity can lead to better participation; therefore, we need to have enough women empowered scientifically.
  o Balance in terms of access (to)/delivery (of) information is important. In that way we need not to overlook any means of communication, from modern ITC tools to traditional ones. Ex: Push message from cell Phone (SMS) should go along with conch blowing, drums beating, even mobility means at the local community to transmit information door to door is important (ex. the use of bicycles) in order to dispatch the information/early warning alerts on the ground in a usable form.

**Question 3: what are the lessons learned, including good practices, gaps and needs?**

• Significant uncertainty in predicting climate changes-improved data is needed
• Data is often important but not adequately supported in adaptation processes
• Climate change is happening but not separate from other non-climatic drivers
• Sharing of best adaptation strategies is a good way to learn on what works
• Community participation is a good way to asses climate changes at local level
• Important to acknowledge power differences when engaging stakeholders and strategies to ensure and all ‘voices ‘are heard are needed
• Need to develop governance mechanisms to address climate change
• Need to develop more specific vulnerability assessments tools to asses changes in space and time
• Data gaps exist but can do a lot with what is available- Importance of both qualitative and quantitative data.
• Water and climate community need to communicate ‘outside the box’-beyond sectors
• Challenges not new and not product of climate change alone
• Climate change adaptation should make use of traditional knowledge in managing extreme events,
• Traditional knowledge does not take full consideration of climate change and should be complemented with climate science
• We may have significant uncertainty but we have information on how to deal with past hydrological changes and climate variability. We should build on this knowledge.
• Adapting to climate variability is a critical first step to adapting to future climate change.
• The strong desire to seek attribution to particular impacts to climate change is an obstacle to progress.
• Water change is climate change-UNFCCC seem far removed from this and need to consider that the impacts of climate change impact first and foremost. Appropriately addressing water and climate in the UNFCCC negotiations is a good step to address the problem.
• Need to fill the gap in vulnerability assessment of the poor communities.
• Technical knowledge alone is not enough to convince policy makers to take action-need to mobilise communities and civil society to help policy makers take action.
• Need to Integrate climate change in IWRM and linking that to sub-basin scales.
• Both top-down and bottom up approaches are essential for adaptation and should be a continuous process.
• Mountain ecosystems have many data gaps, e.g many scenarios for climate change are only available for low lying areas.
• Tools need to be sharpened when it comes to gender sensitivity and DRR forecasting.
• Private sector is key stakeholder in adaptation-investments in energy, infrastructure, tourism and other sectors can be at risk. There need to take private sector on board.