Mainstreaming Climate Change
in International Water Projects
Implementation Workshop

Workshop Proceedings

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Mainstreaming Climate Change in International Water Projects Implementation Workshop

Workshop Proceedings

By
Jean-marc Mwenge Kahinda and Jean Ruhiza Boroto

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EXECUTIVE SUMMARY

A workshop on mainstreaming Climate Change Adaptation into International Water Projects was held at Kevin Kroons Estate in Pretoria, South Africa, from 3 to 5 March 2009. It brought together Project Managers and Executive Secretaries of the following five UNDP/GEF funded projects:

- Lake Tanganyika
- Okavango River
- Orange-Senqu River
- Pangani River
- Botswana IWRM

With the exception of the Botswana IWRM projects, these projects are transboundary water projects in Eastern and Southern Africa. The workshop was organised jointly with InWEnt Capacity Building International Germany, as part of their River Basin Dialogue program and project implementing agency for the GEF-UNDP African Water Governance MSP project.

The objectives of the workshop were to assist Project Managers and Executive Secretaries of shared river and lake basin institutions:

1) To come up with concrete ways to incorporate climate change considerations into the strategic planning of the transboundary water resources management (Strategic Action Programme and/or IWRM planning processes), and;
2) To develop indicators that help measuring the adaptation benefits to be realised through the project implementation.

The workshop benefited from the inputs of several experts who provided to the participants sufficient information that assisted in developing a concise and implementable methodology while sharing best practices on mainstreaming climate change in their projects. The intent was to avoid an emphasis on theory and focus on practical strategies and on the exchange of experience. In this respect, all the sessions were highly interactive.

Most of the expected outcomes of the workshop were met, these include:

- Enhanced capacity amongst both project managers and executive secretaries of the invited basins to meaningfully prepare for and manage the mainstreaming of climate change adaptation considerations;
- Experiences and best practices shared/exchanged re: climate change adaptation processes/practices;
- A clear and concise strategy to mainstream climate change into the strategic planning processes promoted by GEF projects, namely, TDA/SAP processes and IWRM planning processes;
- A set of indicators agreed that track the progress of mainstreaming climate change adaptation into strategic planning both at the project/basin level as well as at the portfolio/regional level;

- Revised project log frame, which includes a set of indicators that measure the progress in adaptation capacity building targets, to be tabled at the next project steering committee meeting for approval. To enhance the understanding of and enable strategic planning for mainstreaming climate change adaptation;
- A compendium of useful resource material;
- A roster of useful resource personnel/experts (in the region);
- A roster of funding opportunities;
- A report submitted to the governments, UNDP and IW:LEARN documenting outputs and benefits of the technical cooperation;
- A joint presentation at the 5th Biennial GEF International Waters Conference as well as at the SADC River Basin Dialogue on the outcomes of this learning exchange, and;
- An agreed plan for continuous learning and information exchange mechanisms among the participants to further advance their knowledge and experience in mainstreaming climate change adaptation into strategic planning of the transboundary water resources management.

While the projects could not finalise their revised log frames during the workshop, they were sufficiently equipped with a methodology that would assist them to do so once back home.

Additional spin off from the workshop include:

- The methodology that was developed to analytically identify adaptation measures to Climate Change projects,
- Opportunities for funding some CCA activities which were offered, including by InWent and Cap-Net, especially for the capacity building needs for each project.
- The good interaction that took place between the project teams which met for the first time for information sharing and devising together towards adapting to CC
- For project where both the Project team and the Executive Secretary were present, they had the opportunity to collaborate practically on the CC challenges
- Building on the mix of participants and experts, which made it possible to establish a good network for further interaction.

The overall evaluation of the workshop by the participants is that it was good (57%) or excellent (43%) and that it was an excellent learning opportunity.

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1 INTRODUCTION

1.1 Background

The United Nations Development Programme (UNDP) is currently supporting 15 countries in Eastern and Southern Africa (including DR Congo) through 7 regional projects addressing transboundary water governance issues. UNDP/GEF International Waters projects assist countries and their decision makers to agree on strategic priorities for the sustainable and equitable management of shared transboundary resources using the Transboundary Diagnostic Analysis (TDA)/Strategic Action Programmes (SAP) process or IWRM Planning process. They are designed to promote effective and efficient water governance and assist decision/policy makers to make decisions towards sustainable development, based on sound scientific information.

Decision makers at all levels in the sub-Saharan African region are oversaturated with climate change (both mitigation and adaptation) seminars these days, where they are consistently exposed to the message that the Sub-Saharan Africa region is the hardest hit by Climate Change. Climate change introduces an increased level of uncertainty. Decision makers need to manage uncertainty, including those caused or enhanced by the climate change. Awareness level among the decision makers about the climate change uncertainties has been rising, however without a parallel increase in their knowledge on what they can incorporate the increased uncertainties into their practices on the ground.

Through the promotion of effective water governance, the UNDP/GEF IW projects have been assisting governments either directly or indirectly to build adaptive capacity to climate change, or make transboundary basins more resilient against possible adverse impacts of climate change. However, how exactly this can be done in more explicit manner during the project implementation, how effectively this can be done and how to measure its effectiveness are not clearly known to the project managers.

GEF IW projects in Southern and Eastern Africa are at various stages of implementation. Whereas some projects actively factor climate change in the development of diagnostic analyses and integrate adaptive actions in the SAP some consider it a peripheral concern. There is a lack of consensus on: a. the importance of mainstreaming Climate Change b. a methodology or strategy to integrate climate change in project execution and outputs c. the availability of resources personnel in the region, and d. the best practices to develop awareness among project partners on the importance of this issue.

Increased uncertainties due to climate change may undermine the effectiveness of the development results that the project outcomes are designed to achieve. Incorporating climate change considerations explicitly into GEF international waters projects can ensure robust and sustainable outcomes.

1.2 A workshop focusing on 'implementation'

Against this background, a workshop on mainstreaming climate change adaptation into international water projects was held from 03 to 05 March 2009 at Kievits Kroon Country Lodge in Pretoria, South Africa bringing together five UNDP/GEF funded projects:

- Lake Tanganyika
- Okavango River
- Orange-Senqu River
- Pangani River
- Botswana IWRM

The workshop was organised jointly with InWEnt Capacity Building International Germany, as part of their River Basin Dialogue program and project implementing agency for the GEF-UNDP African Water Governance MSP project. InWEnt was the co-convener - jointly with ANBO, UNEP, GEF IW:LEARN, GWP-EA and the NBI - of the pan-African seminar: "Building Adaptive Capacity - mainstreaming adaptation strategies to climate change in rive basin organizations" that took place in August 2008 in Entebbe, Uganda.

The workshop built on the experience and recommendations (*The Entebbe Declaration*) of the Entebbe seminar and is part of the follow up initiatives with regional workshops that focus on operational aspects in river basin management: how to enhance adaptive capacity and what actions need to be taken?

The workshop focused on the practical, project implementation level. The working session concept targeted a small group consisting exclusively of project managers, Executive Secretaries of River Basin Organizations that UNDP/GEF projects support, and associated experts working together to develop a concise and implementable methodology and to share best practices on mainstreaming climate change in GEF IW projects in the region. The intent was to avoid an emphasis on theory and focus on practical strategies and on the exchange of experience.

1.3 Workshop Objectives

The objectives of the workshop were therefore to assist Project Managers and Executive Secretaries of shared river and lake basin institutions:

1) To come up with concrete ways to incorporate climate change considerations into the strategic planning of the transboundary water resources management (Strategic Action Programme and/or IWRM planning processes), and;
2) To develop indicators that help measuring the adaptation benefits to be realised through the project implementation.

1.4 Expected Outputs/Outcomes

The expected outcomes of the workshop were:

- Enhanced capacity amongst both project managers and executive secretaries of the invited basins to meaningfully prepare for and manage the mainstreaming of climate change adaptation considerations;
- Experiences and best practices shared/exchanged re: climate change adaptation processes/practices;
- A clear and concise strategy to mainstream climate change into the strategic planning processes promoted by GEF projects, namely, TDA/SAP processes and IWRM planning processes;
- A set of indicators agreed that track the progress of mainstreaming climate change adaptation into strategic planning both at the project/basin level as well as at the portfolio/regional level;
- Revised project log frame, which includes a set of indicators that measure the progress in adaptation capacity building targets, to be tabled at the next project steering committee meeting for approval. To enhance the understanding of and enable strategic planning for mainstreaming climate change adaptation;
- A compendium of useful resource material;
- A roster of useful resource personnel/experts (in the region);
- A roster of funding opportunities;
- A report submitted to the governments, UNDP and IW:LEARN documenting outputs and benefits of the technical cooperation;
- A joint presentation at the 5th Biennial GEF International Waters Conference as well as at the SADC River Basin Dialogue on the outcomes of this learning exchange, and;
- An agreed plan for continuous learning and information exchange mechanisms among the participants to further advance their knowledge and experience in mainstreaming climate change adaptation into strategic planning of the transboundary water resources management.

1.5 Workshop Participants

Participants at the workshop were:

- Project Managers and Executive Secretaries of shared river and lake basin institutions supported by UNDP/GEF International Waters projects, and;
- A roster of resource personnel and experts in the region.

The list of participants is shown in Appendix 1.

2 WORKSHOP SESSIONS

The workshop was organised in an interactive manner to facilitate discussion and learning from the experience of all the participants and resource persons. The workshop was originally organised as follows (See full workshop programme attached in Appendix 2):
Day 1:

- Session 1: Opening session where the workshop objectives and the expected outputs were presented;
- Session 2: Setting the scene: presentations by experts
- Session 3: Climate change challenges in projects;
- Session 4: Possible Adaptation Measures with the Okavango as a case study with inputs from experts

Day 2

- Session 5: Adaptation Indicators
- Session 6: Update of LFAs and workplans

Day 3:

- Session 6 (continued), updates of LFAs and presentation
- Session 7: Closing

In practice, the following changes happened to the programme:

- Session 2 took longer than planned on Day 1
- Session 3 (climate change challenges in projects) eventually took place on Day 2 after Session 5 on the Adaptation Indicators.
- Session 4 still took place on Day 1 to take advantage of the experts who were only there for Day 1.

These proceedings therefore follow the sequential order in which the sessions took place:
Day 1

- Session 1: Opening session
- Session 2: Setting the scene
- Session 4: Possible adaptation measures using the Okavango case study

Day 2:

- Session 5: Presentation on Adaptation Indicators
- Session 3: Presentation by Projects
- Session 6: Update of LFAs

Day 3

- Session 6: Update of LFAs and presentation by projects
- Session 7: Closing

2.1 Session 1: Opening

The workshop was officially opened by Dr. Akiko Yamamoto, UNDP/EEG Regional Technical Advisor for International Waters, who welcomed the participants and gave a brief background of the workshop. She stressed that the workshop arose from the need to operationalise the concept of Climate Change and as such, its emphasis was on the **implementation** of Climate changes adaptation into Transboundary Diagnostic Analysis (TDAs) and/or Strategic Action Programmes (SAPs) of UNDP/GEF IW freshwater funded projects in Southern and Eastern Africa. Dr. Thomas Petermann also welcomed the participants on behalf of InWEnt (Capacity Building International Germany).
Mr. Jean Boroto, the workshop facilitator invited the participant to introduce themselves and give their expectations. Some expectations voiced by the workshop participants are:

- How to best mainstream CC in project activities and incorporate it in the IWRM plan. Make projects CC sensitive and as a result increase the water resources resilience to CC.
- Move from theory to practice. Not a "talkshop" but a workshop.
- To share the CC issues faced by the Southern Africa community in the general and different UNDP/GEF IW freshwater funded projects in Southern and Eastern Africa in particular;
- To create a framework that assists in assessing the impact of CC on water resources and to learn how to select appropriate adaptation measures.
- To use IWRM as a value added tool to deal with CC
- Learn what can be incorporated in strategic action programme in order to address the issue of CC
- Create precedence to the world about what can be done to adapt to climate change

2.2 Session 2: Setting the Scene

The session consisted of six presentations that informed the participants about:

- The general knowledge on CC issues in the region;
- The incorporation of CC into the planning process
- Tool used for seasonal forecasting
- The use of IWRM as a tool for adaptation to CC

2.2.1 UNDP CC Strategy and Water Governance

By Akiko Yamamoto (UNDP)

According to this year's Human Development Report "Fighting climate change: Human solidarity in a divided world", climate change will have grave consequences for the world's most vulnerable people. Hence, Climate change is a direct threat to the achievement of the Millennium Development Goals (MDGs) as it reduces food and water security. The UNDP's Mission is to assist in developing national capacity in countries to secure MDGs in face of climate change impacts by:

- modify existing policies and practices
- adopt new policies and practices

The four pillars of the UNDP CC Strategy are:

- Support the design of integrated Climate Change Policies, Strategies and Quantified Actions Plans;
- Promote early adaptation actions and long-term adaptive capacity of developing countries in a programmatic manner;
- Attract and drive direct private and public investment towards lower carbon technologies and sustainable land use practices, and;
- Integrate climate change into UN and UNDP development assistance at the global, regional and national levels.

Several adaptation projects are undertaken by UNDP through GEF funds. A very large part deals with how to deal with climate change effects posed on water resources.

2.2.2 IWRM as a Tool for Adaptation to Climate Change

By Kees Leendertse (Cap-Net)

Adaptation to climate change can be incorporated in water resources management at all levels through Integrated Water resources Management (IWRM). IWRM helps to adapt to climate change by providing:

- a policy and decision making framework for water resource management actions;
- the planning framework for water, and;
- a system for stakeholder consultation and interaction.

To be effective, Adaptation measures should be promoted at the appropriate level:

- Transboundary level (Treaties and agreements);
- National enabling environment (Water Laws and institutions);
- National planning (IWRM Plans policies and strategies), and;
- Basin water management (Functions of water management).

Adaptation means action, how and who to mobilise for action. What is needed is:

- The right message for decision makers;
- The right message for communities;
- Focus on what we can do now.

2.2.3 Capacity building in IWRM as a tool for Adaptation to Climate Change

By Kees Leendertse (Cap-Net)

Cap-Net, an international network for capacity building in IWRM developed a capacity building programme: “Capacity Building in IWRM as a tool for Adaptation to Climate Change”. The course is part of a collaborative programme between Cap-Net/UNDP and APFM/WMO to capacitate water professionals, capacity builders, local authorities and other stakeholders to adapt to changing climatic conditions. The focus of that programme is on

how sustainable water management can be instrumental in dealing with extreme climate variations in vulnerable areas.

2.2.4 Addressing possible impacts of Climate Change on Water Resources Management

By Mark Summerton (Umgeni Water)

The Mgeni catchment cover 0.33% of the total surface are of South Africa, is home to 15% of the country total population and contributes 20% of the national GDP. The current water demand increases by 2-5% per annum. Recognising the potential risk associated with climate change on water resources, Umgeni Water has attempted to quantify the possible impacts of a changing climate on its business (Figure 2.2.1).

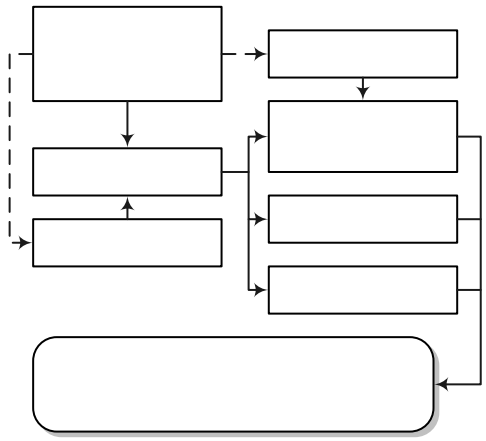


Figure 2.2.1. Summary of the process currently being followed to analyse the impacts of Climate Change on Umgeni Water

The results indicate several runoff trends which will be compared to those obtained from further simulations using other General Circulation Model GCMs. By using these runoff sequences to represent the hydrology, together with water demands, in specialised water resources planning and yield models, it will be possible to determine the potential impact that climate change will have on the utility's current and future ability to supply bulk potable water at the required level of assurance. These results will then be incorporated into the review of the utility's water resource development plans and system operating rules.

2.2.5 Ameliorating the impacts associated with Climate Change - Water Resource Management Adaptation Mechanisms

By Jason Hallowes(Clear Pure Water)

The impacts of CC are already visible. The temperature and the rainfall variability have increased over the last decades. Since there is uncertainty about the impacts associated with climate change, the focus should be to adopt adaptation approaches that reduce **uncertainties** and improve the knowledge of **variability** in the system. The application of forecasting in IWRM is one such adaptation mechanism used by Clear Pure Water. Hence, three near real time Operating Systems have been developed by Clear Pure Water for the:

- Crocodile East River System, to assist stakeholders and water managers to use Simulation Models;
- Lower Orange System, to assist DWAF in establishing the optimal releases from the Vanderkloof Dam on a day-to-day basis;

- Mhlathuze River System, to improve weekly and daily releases from Goedertrouw dam and ensure risks associated with the operating policy are maintained at acceptable levels.

2.2.6 Using climate change projections to model changes in agriculture and water resources in Mozambique

By Mark Tadross (University of Cape Town)

To generate scenarios, 27 stations around Mozambique, of at least 10 years of credible observations, were selected. Using the statistical downscaling method of Hewitson and Crane (2006) 7 Global Climate Models (GCMs) were downscaled for the 2046-2065 period. Results indicate:

- Increases in rainfall – more towards the coast and less inland
- Increases in temperature – more inland and less towards the coast
- Highest increases in temperature during SON (as much as 2.5-3.0°C). Particularly in the Limpopo and Zambezi valleys
- Increases in potential evapotranspiration (PET) by 0.5mm day-1
- Increases in PET greater than rainfall during winter and early summer, especially in central regions
- Frequency of hot days increases by 7%

The impacts of these results, as changes in Median River Flow as well as changes in Magnitude of Flood Peaks, on the operations of the Mozambican Ministry of Disaster Risk Management was then assessed and mapped.

2.2.7 Some emerging issues

From the presentations and the discussions, the following points were raised:

- There is uncertainty about the predicted impacts of CC on Water resources. Nevertheless, being able to get a “what if” scenario is already an important adaptation measure. Despite the fact that there is uncertainty in Population forecast, it is still done and used in the planning process.
- Different climate model predict different impacts, it is therefore necessary to use a number of models and generate many scenarios.
- To reduce the level of uncertainty, models need good quality data, at different scales, that most countries lack. In countries where observed data is not available, satellite data can be used to fill the gap;
- Water practitioners must keep in mind that CC is not the only stressor that must be incorporated into their scenarios and risks based approaches, other stressors such as population growth have to be considered. When incorporating climate change, the basin’s priorities have to be kept in mind
- Water practitioners should assess the additional resources required for the incorporation of CC in their projects
- Before being presented to decision makers, results of CC predictions have to be properly packaged to avoid contradictions and misunderstanding.

- Climate Change should not be run in parallel with, but as part of, the IWRM process

2.2.8 Pungwe River Basin

By Rikard Lidén

The Pungwe river basin is an international river basin (Figure 2.2.2 and Table 2.2.1) shared by Zimbabwe and Mozambique. Two IWRM projects took place in the Pungwe river basin. The Pungwe Project (2001-2006) had for objective to develop a joint integrated water resources management strategy for the Pungue basin and to build capacity for its implementation and upgrading. While the Climate change project (2006) had for objective to assess the possible consequences of future trends in water resources and to identify possible adaptation needs.

Figure 2.2.2. The Pungwe River Basin

Results of the forecasted changes of the climate until 2050 are:

- 10% less rain over a year;
- A warmer air temperature;
- More water lost through evaporation from dams and from the ground;
- Delay in the start of the rainy season;
- Shorter rainfall season;
- Decreased river flow;
- Possibly will the very high floods not occur so often;
- Higher sea level

Table 2.2.1. Pungwe River Basin Characteristics

Basin Area (km^2)	31,151
MAR (Mm^3)	3,783
River length (km)	400
Population in basin (million)	1.2
Riparian countries	Mozambique and Zimbabwe

Although the projects were undertaken separately, many projects defined under the Pungwe project are directly linked to adaptation measures

2.3 Session 4: Possible adaptation measures using the Okavango case study

The session consisted of two presentations. The first presentation was the Okavango case river basin while the second presentation informed participants about funds available for CCA projects. Although CC experts made some inputs/comments, the draft CCA strategy was not developed.

2.3.1 Okavango River Basin

By Chaminda Rajapakse

The Okavango River Basin, is shared by three countries: Angola, Namibia and Botswana (Figure 2.3.1 and Table 2.3.1). The Okavango River is the fourth-longest river system in southern Africa, running southeastward. The OKACOM Agreement established the Permanent Okavango River Basin Water Commission (OKACOM) who acts as technical advisor to the Contracting Parties (the Governments of the three states) on water use, development and environmental issues of common interest.

Figure 2.3.1. The Okavango River System

The Environmental Protection and Sustainable Management of the Okavango (EPSMO) Project is an OKACOM initiative, jointly funded the Global Environment Facility (GEF) and the three national governments.

Table 2.3.1. Okavango Basin Characteristics

Basin Area (km^2)	429,400
Annual flow (km^3)	10
River length (km)	1,100
Population in basin (million)	1
Riparian countries	Angola, Botswana and Namibia

There are opportunities to incorporate climate change adaptation into EPSOM, since the TDA and the SAP are yet to be developed. Consequently, an understanding of Climate Change impacts in the basin can be developed by the TDA while Adaptation measures with clear indicators can be integrated into the Strategic Action Program.

OKACOM points the following possible Climate Change Related Challenges:

- High vulnerability and low resilience of communities especially in Angola;
- Water Security: Communities living in Angola due to direct dependence on river water, Botswana and Namibia are water scarce countries;
- Marginal agricultural productivity / returns on investment / further mining of groundwater;
- Increased incidence and/or severity of floods due to changes in rainfall and/or land-use change (i.e. conversion of floodplains);
- Impacts on the delta;

- Impacts on food security in all areas due to changes in viability of farming and livestock and/or wild products (i.e. fish);
- Reduced returns on Hydro Electric Power investments, and;
- Increased cross-boundary tension due to above and other issues and challenges to benefit sharing arrangements.

2.3.2 Financial mechanisms for Climate Change Adaptation

By Thomas Petermann

Funds are available for projects addressing the adverse impact of climate change by building adaptive capacity. GEF manages 5 categories of adaptation funds:

- Enabling Activities: National Communications;
- Strategic Priority on Adaptation (Exhausted);
- Least Developed Country Fund (LDCF). The LDCF supports (a) preparation of National Adaptation Programmes of Actions (NAPA), for identifying urgent and immediate needs; (b) implementation of NAPA;
- Special Climate Change Fund (SCCF). The SCCF supports projects in water, land management, agriculture, health, infrastructure development, fragile ecosystems, coastal zone management, disaster preparedness (prevention not mitigation);
- Adaptation Funds *(not yet operational)*

2.4 Session 5: Adaptation Indicators

The session consisted of:

- Three presentations about adaptive management, adaptation measures and indicators;

2.4.1 Indicators. Implementing Integrated Water Resources Management at River Basin Level

Presented on behalf of Cap-Net by Jean Boroto (Workshop Facilitator)

Cap-Net has been working with river basin organisations at national and sub-national levels to assist in their development as effective managers of water. As part of a programme of capacity building support, indicators have been developed that are based on the implementation of the integrated approach to the sustainable management of water resources. The indicators are presented as a minimum set and therefore do not comprehensively measure the objectives described for good water resources management.

Assumptions:

1. Managers of water resources primarily have a regulatory function but this is further elaborated with functions considered essential for effective management of the water resources in a river basin.

2. The water resource management functions may not all be managed by one agency and may to some extent be decentralised within the basin.
3. All of the information associated with the above functions, used in an integrated fashion, is essential for effective water resources management within the basin.

Application:

4. The indicators are grouped by water management function.
5. The indicators may be used to:
    a. Measure progress with integrated water resources management;
    b. Identify weak areas of: regulation; institutional arrangements; management systems (financial and operational); capacity and authority and therefore to guide corrective action by the water management agency; and
    c. Report on an annual basis to management and to stakeholders.

2.4.2 Climate change adaptation - Strategies of the German water sector

By Thomas Petermann

Germany is allocating a fair share of its water budget to climate change adaptation. In order to adapt to climate change, the following action are considered:

- Preparedness for changes in water supply and demand management
- Increase in water consumption in some sectors, e.g. irrigation demand; summer season drinking water supply
- Increase seasonal storage capacity (reservoirs)
- Dealing with insecurity (in weather predictions)
- Models and WM-planning for different landscape systems (regions)
- Actors must cooperate and be coordinated beyond administrative boundaries; the planning unit is a river basin
- New administrative structures, procedures and regulations need to be developed
- CCA requires mainstreaming across-sector policies
- CCA requires new instruments for benefit sharing and risk management

2.4.3 Adaptation indicators: IWRM

By Jessica Troni (UNDP)

The objective of climate change adaptation programming is to improve the adaptive capacity and/or reduce the vulnerability of human populations and the natural and economic systems on which they depend to climate change and its impacts. In practice, vulnerability reduction and building adaptive capacity will seek to minimize the costs and damages associated with climate change, and enable people to prepare for climate change and exploit in a sustainable manner any development opportunities that climate change may generate.

Box 1. Key adaptation questions we are trying to track

- What are we adapting to?
- What are our adaptation options?
- How much will they cost and who will pay?

Monitoring portfolio and project effectiveness will be achieved through the tracking of indicators at three levels: the **portfolio objective level**, and the **project outcome and output levels**, as illustrated in Table 1. Output indicators are not addressed in this framework, as they are likely to be largely process-oriented.

Table 2.4.1. Illustrative matrix mapping a single Thematic Area Portfolio level goal, objective and indicators to Project level outcomes, indicators and outputs

Portfolio Level			Project Level			
Goal	**Objective**	**Portfolio √ Indicators**	**Outcomes**	**Outcome √ Indicators**	**Outputs**	**Output √ Indicators**
Improved development benefits in relation to climate change stressors	Vulnerability reduction/ Adaptive capacity enhanced	Coverage Impact Sustainability Replicability	Outcome 1 Outcome 2 . Outcome x	Coverage Impact Sustainability Replicability	Strategies	…
					Policies	…
					Measures	…

Four types of indicators will be used to measure the success of projects and portfolios:

I. **Coverage:** the extent to which projects reach vulnerable stakeholders (individuals, households, businesses, government agencies, policymakers, etc.)

II. **Impact:** the extent to which projects reduce vulnerability and/or enhance adaptive capacity (through bringing about changes in adaptation processes: policymaking/planning, capacity building/awareness raising, information management, etc.)

III. **Sustainability:** the ability of stakeholders to continue the adaptation processes beyond project lifetimes, thereby sustaining development benefits

IV. **Replicability:** the extent to which projects generate and disseminate results and lessons of value in other, comparable contexts

2.5 Session 3: Climate Change challenges in projects

In this session, the workshop participants gave an overview of their respective river/lake basin project and identify possible entry points for CCA measures.

2.5.1 Lake Tanganyika Basin

By Laurent Nathuga, Henry Mwima, Mnyanga Vitalis and Simbotwe Mwiya

Lake Tanganyika (LT) is a large lake in central Africa (Figure 2.5.1). The lake is divided between four countries (Burundi, Democratic Republic of the Congo (DRC), Tanzania and Zambia). It is estimated to be the third largest freshwater lake in the world by volume, and the second deepest, after Lake Baikal in Siberia. The Partnership interventions for the implementation of the Strategic Action Programme for Lake Tanganyika have a

Transboundary Diagnostic Analysis (TDA) and a Strategic Action Programme (SAP) that are completed and endorsed.

The following outcomes are expected from the project:

Figure 2.5.1. Lake Tanganyika

- regional and national institutions established & implementing LT/SAP;

Table 2.5.1. Tanganyka Basin Characteristics

Catchment area (km^2)	231,000
Max. length (km)	673
Max. width (km)	72
Surface area (km^2)	32,900
Average depth (m)	570
Max. depth (m)	1,470
Water volume (km^3)	18,900
Shore length (km)	1,828
Surface elevation (m)	773
Population in basin (million)	10

- wastewater interventions in Bujumbura & Kigoma;
- catchment management & livelihood improvement;
- LT monitoring system for LT management established.

The project lists the following CC Issues / Considerations:

- Current situation
  - Evident CC impacts: since Pleistocene & Holocene periods, rainfall & temperature increase, severe droughts;
- Socio-economic aspects
  - Land use practices: deforestation, land degradation, soil erosion, etc.
  - Unsustainable fisheries
  - Important population growth in LT hydrologic basin
- Policy level
  - Influencing policy & decision makers to include CCA in national development planning
- Land farming
  - Improved agriculture, land cover conservation,
  - UNDP/GEF Project: catchments management
- Fisheries
  - CB of Fisheries communities
  - Alternative activities to generate incomes
  - Co-Finance (AfDB): address over-fishing issue, fisheries monitoring

2.5.2 Pangani River Basin

By Sylvand M. Kamugisha and Hamza Sadiki

The Pangani River Basin (Figure 2.5.2 and Table 2.5.2) extends from the northern highlands to the north-eastern coast of Tanzania. The hydrology of the Pangani is highly influenced by rivers rising from the mountains and highlands (Kilimanjaro, Meru and Pare Mountains).

Table 2.5.2. Pangani River Basin Characteristics

Basin Area (km^2)	56,300
Average flow (m^3/s)	< 40
River length (km)	500
Population in basin (million)	3.7
Riparian countries	Kenya and Tanzania

Pangani River Basin Management Project aim to mainstream climate change into Integrated Water Resources Management in the Pangani Basin

Two main institutions administer the water resources of the Pangani River Basin. In Tanzania, it is the Pangani Basin Water Office (PBWO), while in Kenya it is the Water Resources Management Authority (WRMA).

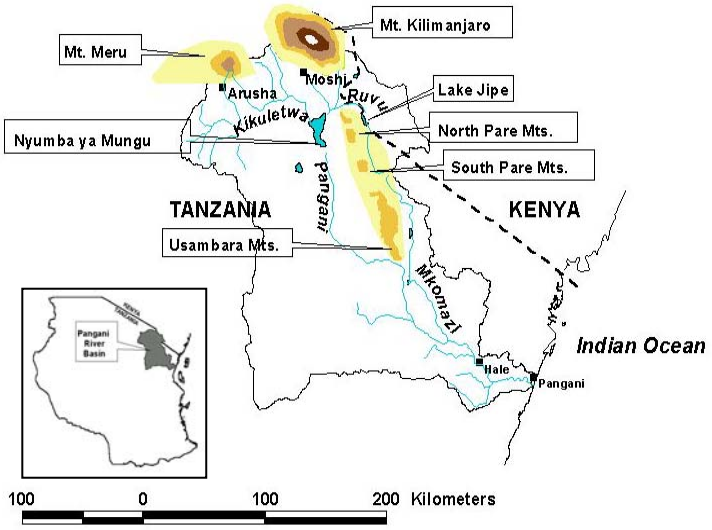


Figure 2.5.2. The Pangani River Basin

The project lists the following CC Issues / Considerations:

- Decreasing glacial ice cap on Mt. Kilimanjaro
- Water stressed basin - <1,200 m^3/p/yr
- Initial National Communication to UNFCCC predicated 6-10% decrease in the annual flow
- 4th IPCC report indicate a general (strong) wetting trend in central-east Africa
- Need to undertake detailed studies on CC to contribute in the basin management
- There is evidence of Climate variability in the basin – adaptation could not be avoided
- Conduct CC vulnerability assessment and identification of appropriate strategies using CC adaptation tools – CRiSTAL
- How to increase water availability in a water stressed basin

2.5.3 Orange-Senqu River Basin

By Thamae Lenka

The Orange-Senqu is an international river system (Figure 2.5.3 and Table 2.5.3) shared by Lesotho, Namibia and South Africa. The Orange-Senqu River Commission (ORASECOM)

established in 2000 between Botswana, Lesotho, Namibia and South Africa provides technical advise to parties. The ORASECOM – UNDP GEF TDA/SAP Project developed in 2008 a Preliminary TDA and recently compiled and submitted TDA

Table 2.5.3. Orange Senqu Basin Characteristics

Basin Area (km^2)	973,000
Average Annual flow (Mm^3)	12,000
River length (km)	2,200
Population in basin (million)	14.3
Riparian countries	Lesotho, Namibia and South Africa

The preliminary TDA list the following as expected Climate Change related Challenges:

- Increases in potential evaporation;
- Failure to secure adequate food security and restricted industrial development;
- Fewer but more intense rainfall events (droughts and floods);
- Unreliable energy resources (combined hydropower and other sources);
- Variation in distribution of streamflow;
- Change in distribution of vector borne diseases, and;
- Failure to maintain ecological requirements.

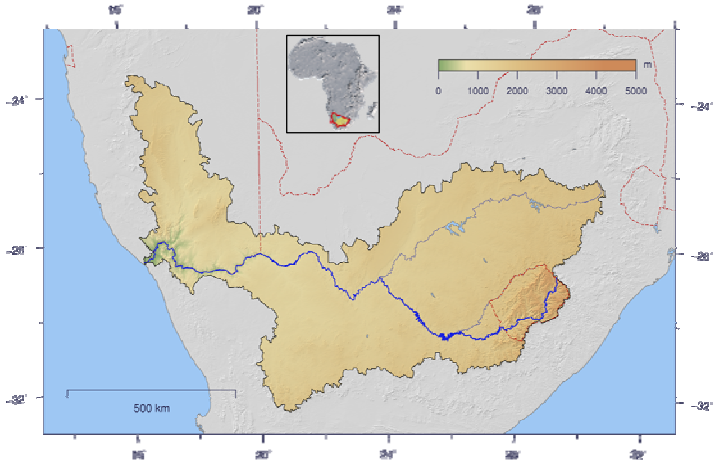


Figure 2.5.3. The Orange Senqu River Basin showing the three riparian states

Identified possible entry points to mainstream CCA are:

A. Data verification and collection, including advise on optimal monitoring network;
B. Further adapting and localising (downscaling) global and regional GCMs and application over the basin;
C. Assessing major adaptation needs for communities and economic sectors (risk assessment);
D. Promoting mainstreaming of holistic water resources risk management among local government (/community authorities), and national government through disaster management authorities and catchment management agencies;
E. Reviewing existing and planned infrastructure w.r.t. addressing climate change vulnerability and resilience, and advise on e.g. transboundary/basin scale interventions;
F. Mainstreaming CCA in basin wide IWRM plan.

2.5.4 Botswana IWRM

By Bogadi Mathangwane

The IWRM/WE project aims to facilitate national processes and development of institutional mechanisms, supported by and contributing to regional knowledge management processes, for efficient and equitable IWRM planning in Botswana.

The roles and responsibilities of key actors are:

- Government-Owner of the process/ national executor;
- UNDP- Implementer;
- Botswana Water Partnership-Facilitator;
- Host Institution/ KCS- management.

The project lists the following CC Issues / Considerations:

- Water Scarcity / Security
- Water Quality deterioration
- Floods
- Competition amongst S/H - Economic recession
- WC &WDM implementation
- Role clarity amongst stakeholders

While identified possible entry points to mainstream CCA are:

- Strong links with National Committee on CC and related activities of the on-going GEF/UNDP 2nd National Communication Project (SNC);
- Effective Policy dialogue which can be driven by the SNC- Use existing platforms to integrate into national development. Address community concerns;
- More practical approach – Demonstration project does that;
- Marketing the strategies/plans – Translating the scientific climate language into 'language of target sector' and communicating it efficiently.

2.6 Session 6: Updating LFAs and WORKPLANS

From the different presentations given on CCA and through facilitation, Bio chemical and Physical CC related issues were grouped into four thematic areas (Table 2.6.1).

A process ensued of developing a methodology for identifying indicators associated with each issue as presented in Figure 6.2.1 and in Table 6.2.2 which served as the basis for the group work.
It was agreed that the following three steps were important in identifying the relevant cc adapation measures and indicators.

Table 2.6.1 CCA thematic areas

Theme	Possible Bio chemical and Physical Issues
Ecology	Changes in biodiversity (flora and fauna), Changes aquatic habitats, Changes in terrestrial habitats
Water quality	Changes in water quality, Pollution Oxygen depletion Changes in Groundwater salinity Changes in estuarine salinity
Water quantity	Changes in water quantity Changes in precipitation (intensity, variability) Changes in evapotranspiration Floods Droughts Changes in Groundwater level Changes in lake levels
Geomorphology	Sedimentation
	Changes in river/lake morphology

1. Know the baseline condition

It is necessary to have a good understanding of the baseline conditions (the hydrology and the water resources of the basin). When the baseline condition is not well established, valuable data can be gather from independent studies that took place or are a taking place within the hydrological and/or political boundaries. The first step will be to make a comprehensive list of such studies and analyse the data they generated. Since it might still happen that there is insufficient data, the second step will be to implement a data collection programme and/or to rely on satellite data.

2. Assess the impact of climate change

Adaptation measures can only be as good as the Vulnerability Assessment for Climate Change Impacts. It is therefore necessary to assess the hydrological, environmental, social and economic impacts of climate change. Such an assessment will require that the future climate be predicted using existing GCM downscaled at regional level.

3. Choose adaptation measures and indicators

The Vulnerability Assessment for Climate Change Impacts will assist in highlighting key issues that necessitate adaptation measures. This answers the key question “What are we adapting to”. After considering the available adaptation options, the suitable adaptation measures are identified together with their indicators.

Following the above described process, the participants were requested to fill the climate change adaptation matrix (Table 2.6.2) for their respective projects. The filled matrixes were presented and received input from both the participants and the experts. The projects matrixes are presented in Appendix 3.

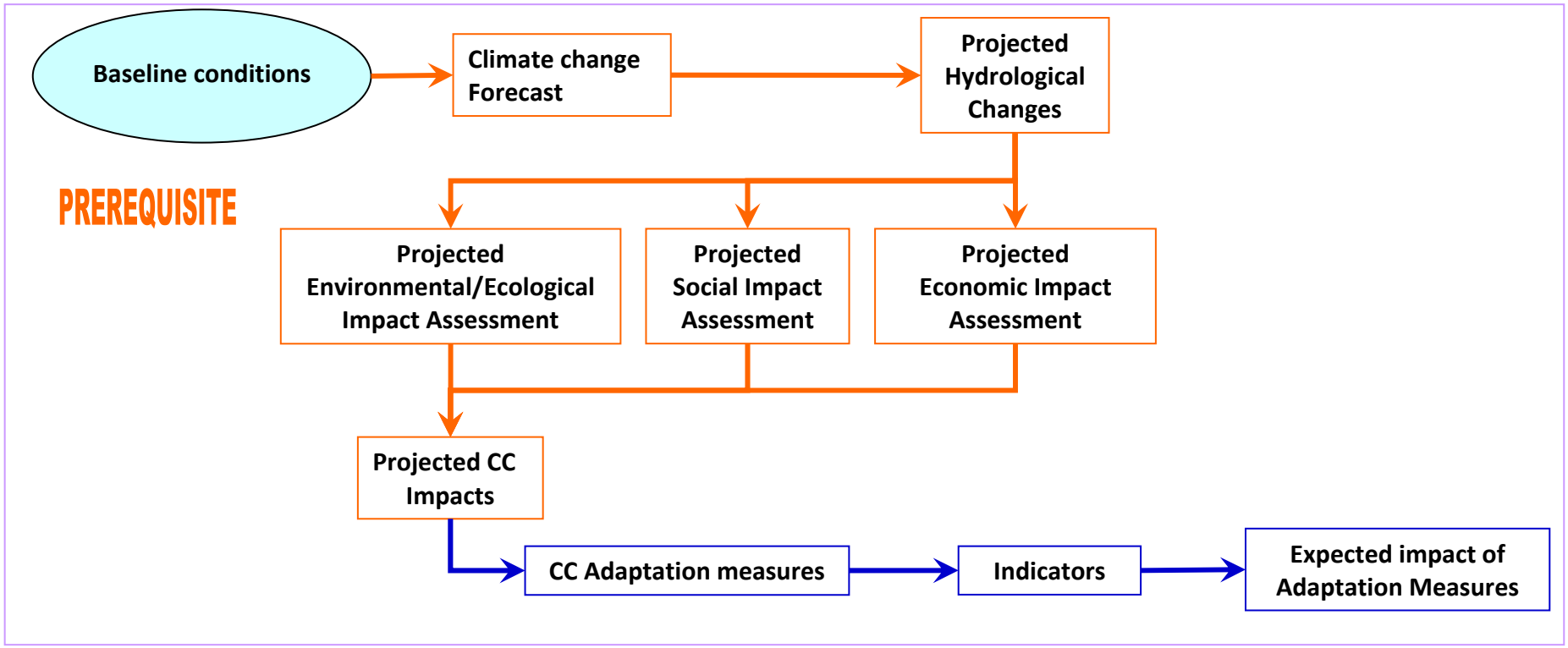


Figure 2.6.1. Process to follow in order to include CCA into water projects

Table 2.6.2. Climate change adaptation matrix

	Possible Bio chemical & Physical CC issues	Root cause	Relevance to the basin	Current status based on Available knowledge	Impact (Socio economic & ecological	Adaptation Measure? (Existing & Possible new one)	Indicator	Expected Impact of Adaptive measure
Ecological								
Quantity								
Quality								
Geomorphological								

Although LFAs and workplans were not updated, the following was agreed:

- Participants will identify in their LFAs and workplans activities that are listed as adaptation measures and assess the accrued cost brought by CC;
- Participants will add as activities the remaining adaptation measures and assess their cost.

2.7 Session 7: Closing

During this session, Mr. Jean Boroto (the workshop facilitator) summarised the workshop output and asked the participants to use the developed matrix to mainstream CC in their respective projects and update their LFAs accordingly.

Dr. Akiko Yamamoto informed the participants that she will explore the opportunity to present the outcomes of this learning exchange as a joint presentation at the 5th Biennial GEF International Waters Conference as well as at the SADC River Basin Dialogue

A workshop evaluation form was handed to the participants who filled it.

3 SUMMARY OF WORKSHOP OUTCOMES

3.1 Overview of the workshop outcomes

Considering the initial objectives of the workshop and its intended outcomes, it can be stated that:

- Though the initial programme changed, most of the objectives were achieved, even if the outcomes of Session 4 (a draft CCA strategy for the Okavango) could not be achieved and each project could not finalise its updated LFA (as anticipated in Session 6)
- Beyond the objectives, of the workshop, additional spin-offs include:
    a. A methodology was developed to analytically identify adaptation measures to Climate Change projects, the participants were equipped with sufficient insight to finalise their LFAs after the workshop;
    b. Opportunities for funding some CCA activities were offered, including by InWent and Cap-Net, especially for capacity building needs for each project.
    c. A good interaction took place between the project teams which met for the first time for information sharing and devising together towards adapting to CC
    d. Project were both the Project team and the Executive Secretary was present, had the opportunity to collaborate practically on the CC challenges
    e. Building on the mix of participants and experts, a good network for further interaction was established.

3.2 Evaluation by participants

The workshop evaluation is divided into three sections:

i. Evaluation of the sessions;
ii. Evaluation of the course, and;
iii. Evaluation of the facilitator.

The evaluation indicates that:

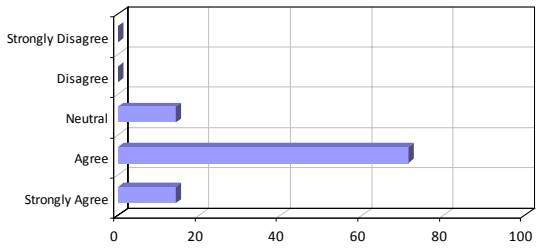
- 57 per cent of the participants rate the workshop as Good and 43 per cent as excellent
- Time was the main constraint in the attainment of some outcomes
- Valuable insight was gained about mainstreaming CCA in water projects

3.2.1 Evaluation of the sessions

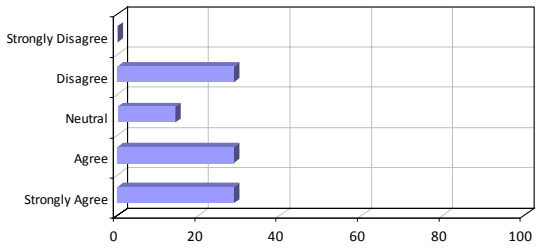
The following graphs summarise the evaluation of the seven sessions of the workshop. Strengths and weaknesses of the sessions and the overall workshop are presented in Appendix 4.

Session 1. OPENING

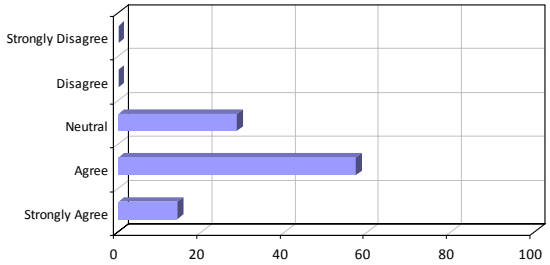
The session expected outputs were clear



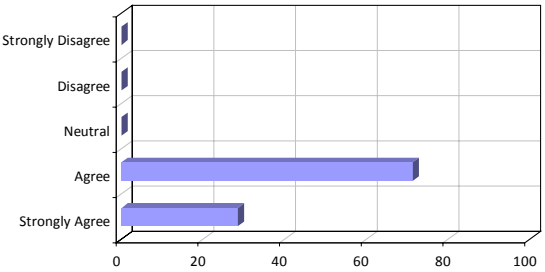
The time allocated to the session was adequate



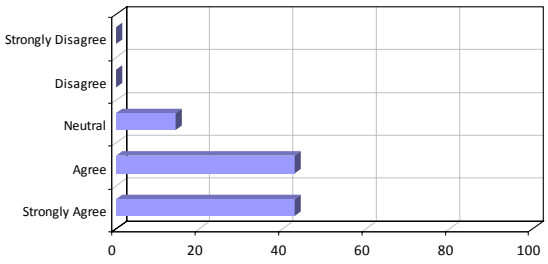
The amount of information provided was appropriate



Did you gain some useful, practical knowledge

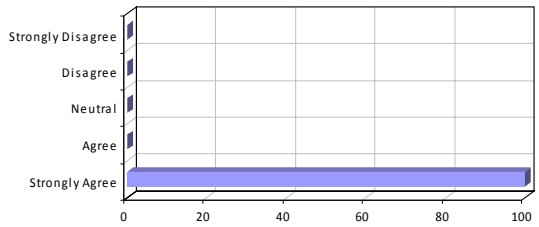


In your opinion, did the session achieve its expected outputs?

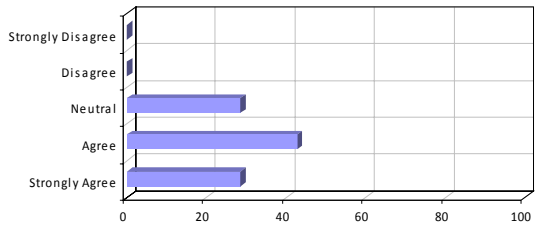


Session 2. SETTING THE SCENE (Presentations by experts)

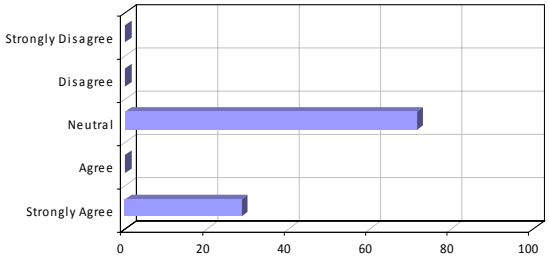
The session expected outputs were clear



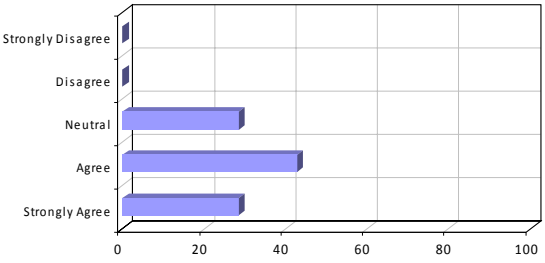
The time allocated to the session was adequate

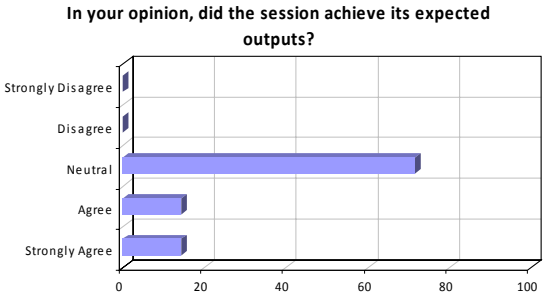


The amount of information provided was appropriate

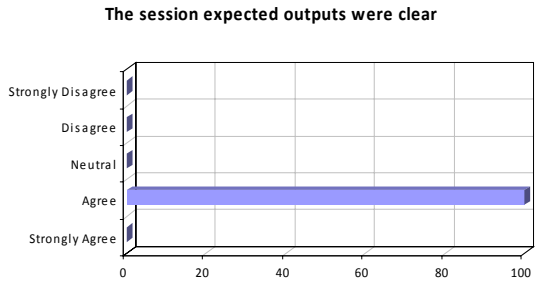


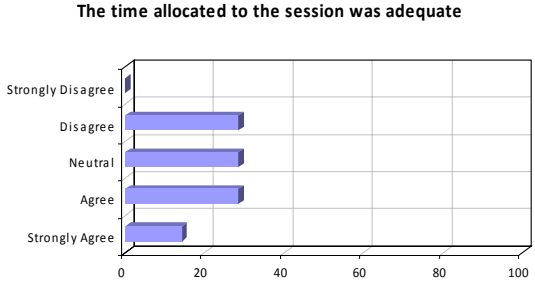
Did you gain some useful, practical knowledge

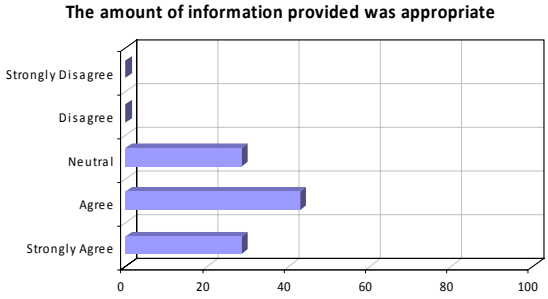


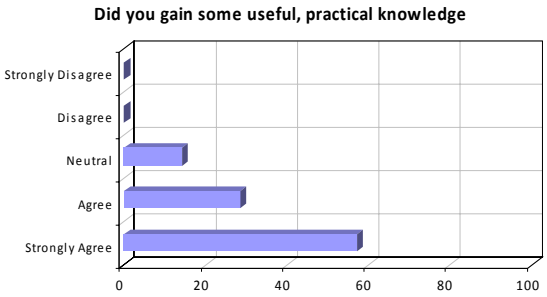


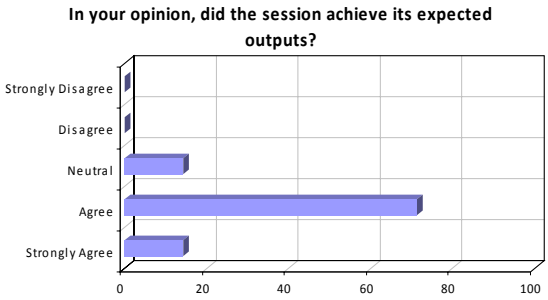
Session 3. CLIMATE CHANGE CHALLENGES IN PROJECTS



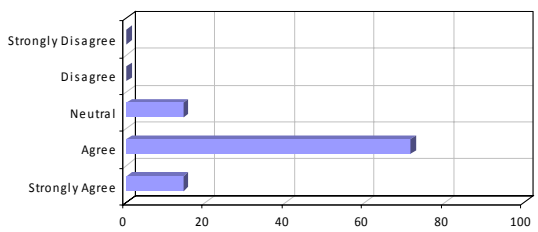


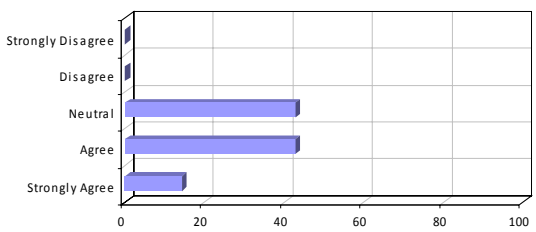


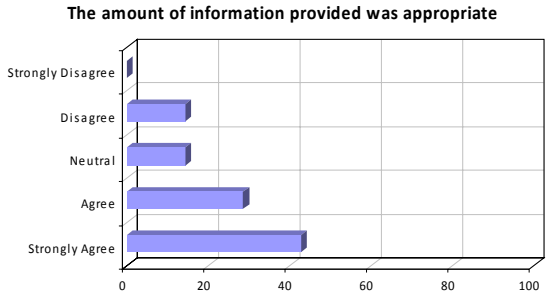


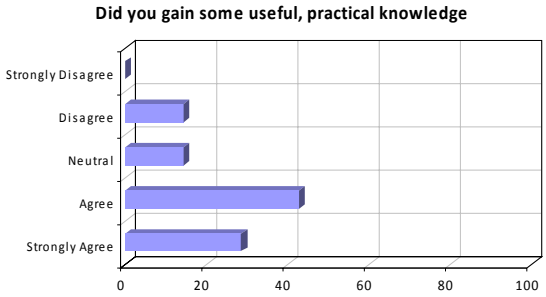


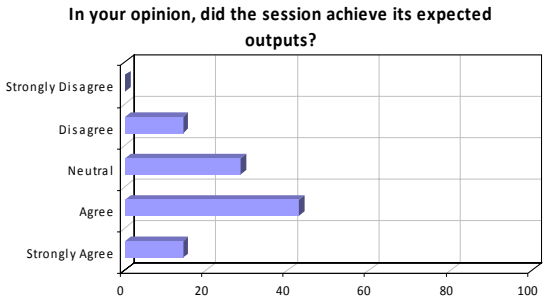
Session 4 POSSIBLE ADAPTATION MEASURES



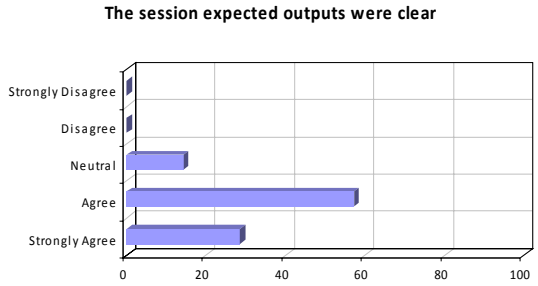


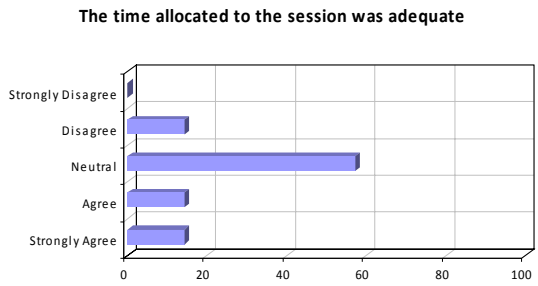


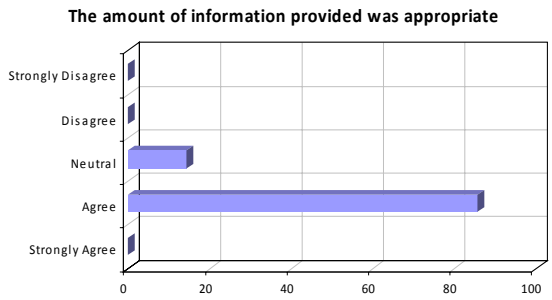


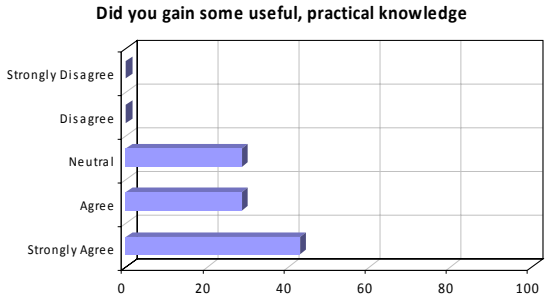


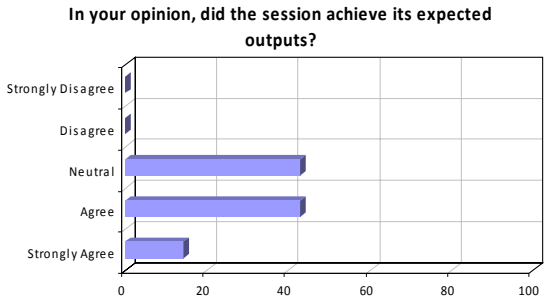
Session 5 ADAPTATION INDICATORS





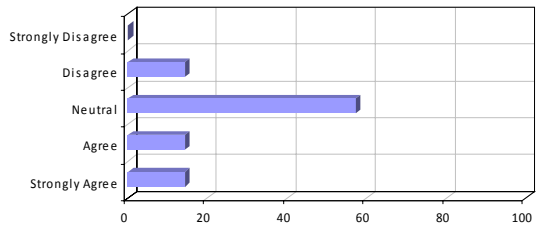




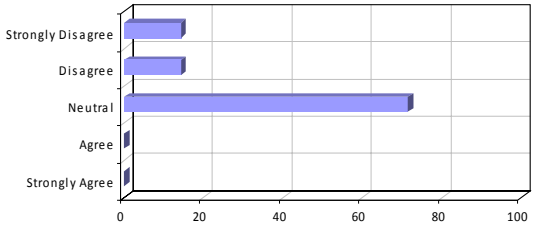


Session 6 UPDATING LFAs AND WORKPLANS

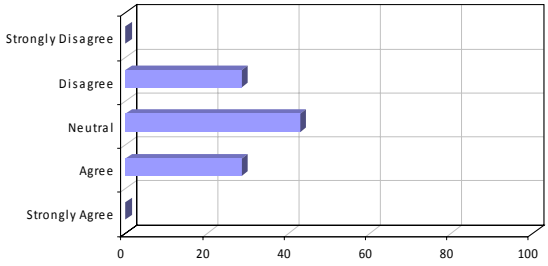
The session expected outputs were clear



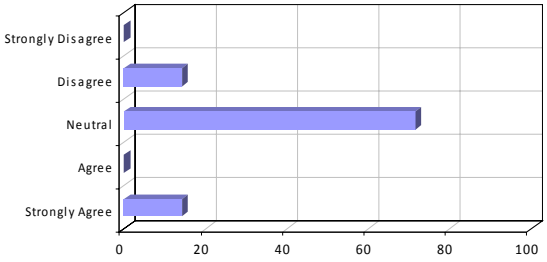
The time allocated to the session was adequate



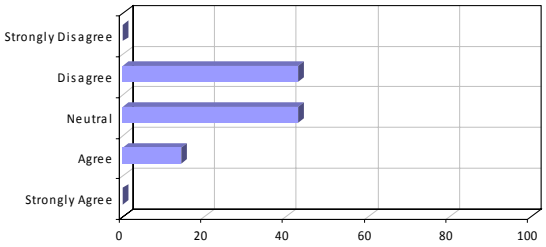
The amount of information provided was appropriate



Did you gain some useful, practical knowledge

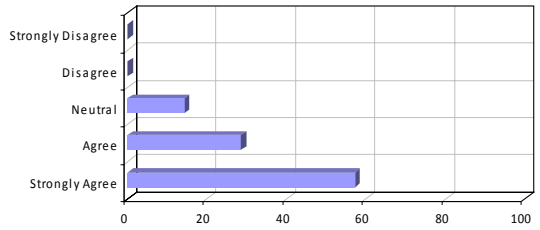


In your opinion, did the session achieve its expected outputs?



SESSION 7: CLOSING

The session expected outputs were clear



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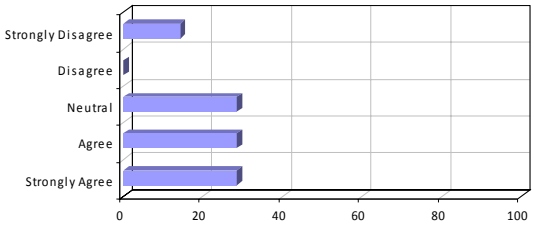

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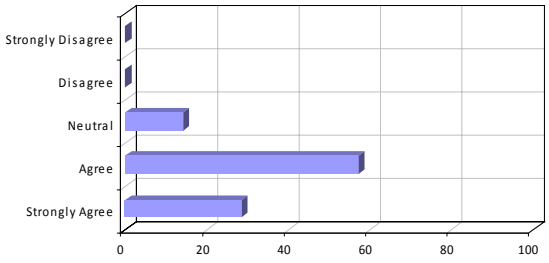
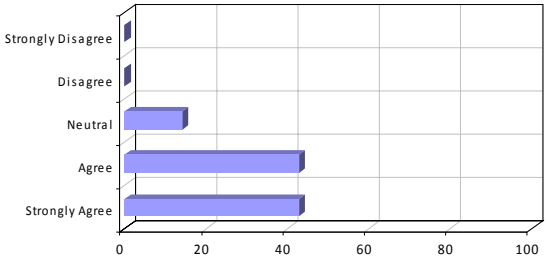
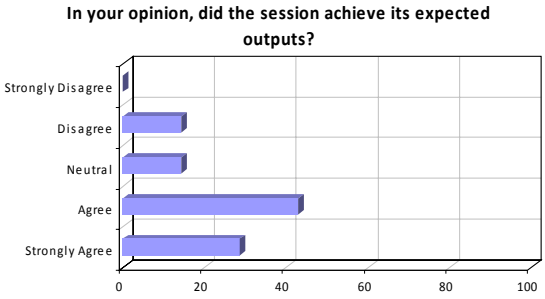
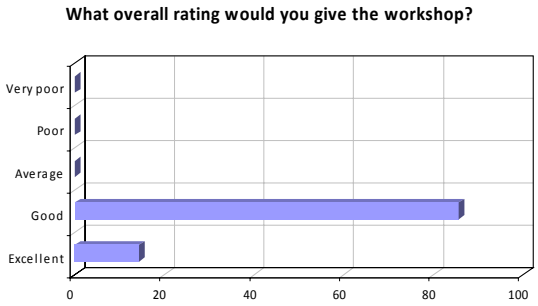


Did you gain some useful, practical knowledge

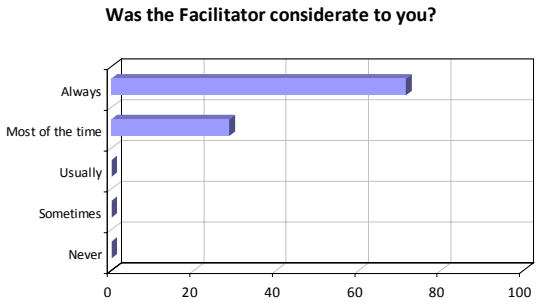


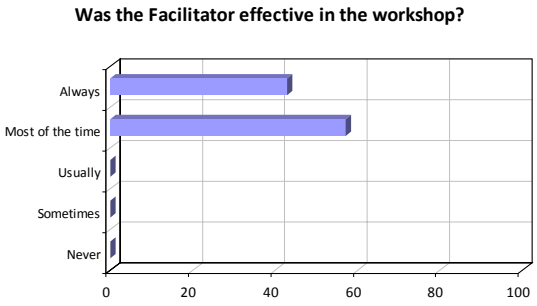


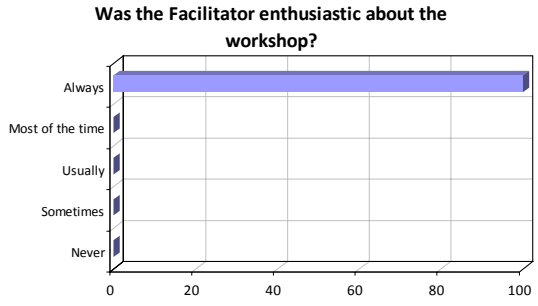
3.2.2 General Evaluation of the workshop

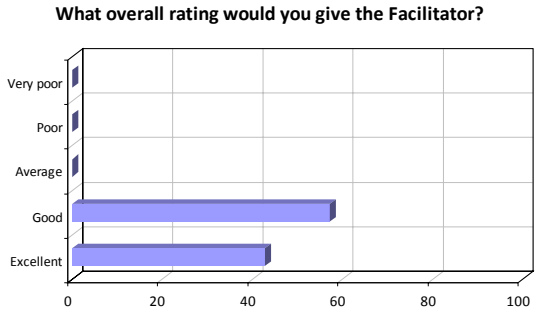


3.2.3 General Evaluation of the Facilitator









APPENDICES

Appendix 1. List of participants

	Project Personnel		
	Name	Organisation/Project	Email address
1	Bogadi Mathangwane	Botswana IWRM	bmathangwane@gov.bw
2	Chaminda Rajapakse	EPSOM	chaminda.rajapakse@fao.org
3	Ebenizario M.W. Chonguica	EPSOM	ebenc@okacom.org
4	Sylvand M. Kamugisha	Pangani	smkamugisha@panganibasin.com
5	Hamza Sadiki	Pangani	hamzasadiki@yahoo.com
6	Laurent Ntahuga	Lake Tanganyika	LaurentN@unops.org
7	Henry Mwima	Lake Tanganyika	henry.mwima@yahoo.com
8	Mnyanga Vitalis	Lake Tanganyika	mnyangavitalis@yahoo.com
9	Simbotwe Mwiya	Lake Tanganyika	abcconsult@zamnet.zm
10	Lenka Thamae	ORASECOM	ThamaeL@dwaf.gov.za
11	Barney Karuomba	Africa water governance	bkaruuombe@sadcpf.org
12	Rikard Lidén	Pungwe/ SWECO	Rikard.liden@sweco.se
	Boorn Almstrom	SWECO	boorn.almstrom@sweco.se
	Organisers/Facilitators		
	Name	Organisation/Project	Email address
13	Akiko Yamamoto	UNDP	
14	Jessica Troni	UNDP	jessica.troni@undp.org
15	Samuel Chadema	UNDP	samuel.chademana@undp.org
16	Thomas Petermann	InWent	thomas.petermann@inwent.org
17	Rebecca Binns	InWent	rebecca.binns@gtz.de
18	Jean Boroto	SSF	jboroto@wol.co.za
19	Jean-marc Mwenge Kahinda	SSF	jeanmarcmk@yahoo.co.uk
	Resource Persons/Observers		
	Name	Organisation/Project	Email address
20	Ruth Beukman	GWP-SA	R.Beukman@cgiar.org
21	Constantine Von de Heyden	GWP-SA	constantin@pegasys-international.com
22	Kees Leendertse	Cap-Net	kees.leendertse@cap-net.org
23	Jason Hallowes	CPH_20	Jason@cphwater.com
24	Mark Summerton	Umgeni Water	Mark.Summerton@umgeni.co.za
25	Mark Tadross	UCT	mtadross@csag.uct.ac.za

Appendix 2. Workshop Programme

Venue: Kievits Kroon Country Estate, in Pretoria

TIME	ACTIVITY	WHO
	DAY 0: 02 MARCH 2009	
Afternoon	Delegates arrives at venue	All
Evening	Early registration	
	DAY 1: 03 MARCH 2009	
	SESSION 1: OPENING Expected outputs of the Session 1: • Workshop objectives clearly understood • Expected outputs from the workshop discussed and agreed • Participants introduced	
08:30-08:35	Objectives of the workshop (10min)	UNDP
08:35-08:40	Welcome	INWENT
08:40-09:00	Introduction of the delegates and expectations (15min)	All
	SESSION 2: SETTING THE SCENE Expected outputs of the Session 2: • General knowledge on the CC issues and concerns in the region shared • General processes to incorporate CCA into a (development) planning process (Risk and vulnerability assessment, climate forecasting, etc.) shared • General processes to incorporate CCA into a project management/implementation cycle shared • Example of CCA measures in water sector shared (Umgeni Water) • Example of a tool used for a seasonal forecasting shared (Clear Pure Water)	
09:00-09:30	Climate change: what is it? What to do about it? (20 min presentation+10 min questions)	UCT
09:30-10:00	Adaptation and water reform	UNDP
10:00-10:30	IWRM as a tool for adaptation to climate change	Cap-Net
10:30-10:45	TEA/COFFEE BREAK	
10:45-11:00	Coping with climate change: Umgeni Water case (20 min presentation+10 min questions)	Umgeni Water
11:00-11:30	Climate change forecasting (20 min presentation+10 min questions)	Clear Pure Water
	SESSION 3: CLIMATE CHANGE CHALLENGES IN PROJECTS Expected outputs of the Session 3: • Project overview for each project shared with all participants, including resource people • Potential entry points for the CCA measures/mainstreaming identified for each project through discussions	
11:30-13:00	Sharing of experience per project What are the CC challenges that we face? (10 min pres+ 5 min discussion). • Okavango River basin • Lake Tanganyika (Regional, Burundi, DRC) • Lake Tanganyika (Tanzania) • Lake Tanganyika (Zambia) • Orange-Senque River basin • Pangani River basin • Pungwe River Basin	Project Managers
13:00-14:00	LUNCH BREAK	
14:00-14:30	• Botswana IWRM • Pungwe River Basin	
	SESSION 4: POSSIBLE ADAPTATION MEASURES Expected outputs of the Session 4: • A draft CCA strategy for a transboundary river basin developed using the Okavango River basin as a case study	
14:30-14:45	Okavango Case Study: • Mainstreaming CC in the TDA and SAP (15 min presentation)	Okavango Project
14:45 -15:45	Inputs from experts (GWP, Umgeni Water, Clear Pure Water):	Experts and

	• Responses to challenges • What is CC adaptation and what is not? • Experiences from elsewhere • Focus on transboundary challenges and CC (Using Okavango as a case study)	participants
15:45 -16:00	Agree on the way forward for the Okavango CCA Strategy (a draft proposal to OKACOM)	Experts and participants
16:00-16:15	TEA/COFFEE BREAK	
16:15-17:00	Brainstorming: identifying *practical* adaptation measures applicable to all.	All
16:00-17:30	Closure of Day 1: Summary of Day 1 Outline of Day 2	
	DAY 2: 04 MARCH 2009	
	SESSION 5: ADAPTATION INDICATORS Expected outputs of the Session 5: • A sample list of indicators to measure the progress in building adaptive capacity to climate change risks and reducing climate vulnerability shared • A set of indicators to monitor the CCA progress at each basin proposed	
08:30-09:15	Mainstreaming Climate Change	
	Presentation on Adaptation Indicators	UNDP
09:15-10:15	Group work: Selection of appropriate Indicators for projects	All
10:15-10:30	TEA BREAK	
10:30-11:00	Group work (continued) and preparation of report backs	
11:30-12:30	Plenary: report backs	All
12:30-13:30	LUNCH BREAK	
13:30 -14:30	Report back (continued) and consensus on Indicators	All
	SESSION 6: UPDATING LFAs AND WORKPLANS Expected outputs of the Session 6: • A list of CCA activities proposed for each basin and funding sources and/or funding gap identified. • LFA of each project revised to incorporate CCA activities (which can be funded by the current project fund) and proposed CCA indicators to be tabled at the next respective PSCs for consideration. • Workplan and budget revised according to the revised LFA.	
14:30 -15:30	Project specific discussions: from your LFAs and work plans: • Summarise your own CC activities, funded or unfunded • What can be improved in your current LFAs • Propose LFA indicators	
15:30-15:45	TEA BREAK	
15:45 -	Updating of the LFAs / Presentation of updated LFAs	All
	DAY 3: 05 MARCH 2009	
08:30 -10:15	Presentation of updated LFAs	All
10:15-10:30	TEA BREAK	
	SESSION 7: CLOSING Expected outputs of the Session 7: • Workshop outputs summarized • Follow-up activities & Way Forward Agreed • Lessons learned for this portfolio-level learning exercise summarized, including workshop evaluation	
10:30 -11:00	Review of Workshop Outputs (Expected vs. Achieved)	
11:00-12:00	Follow up activities & Way Forward • IWC2009 in October • SADC RBO Dialogue • …	UNDP
12:00-12:30	Summary of Lessons Learnt	UNDP
12:30-13:00	Evaluation of the workshop (evaluation forms to be filled in) Closure	All
13:00 -	LUNCH Delegates depart	

Appendix 3. Projects' Adaptation measures and Indicators

Okavango

Adaptation measure:-Develop longer-term forecasts products, on timescales relevant to agricultural and water-sector planners. Capacity and systems to asses long-term trends and anticipate extreme events enhanced (through EFA)

Indicators: system in place, number of people trained, geographic coverage,

Adaptation measure:-Exchange of information and coordinated action (early warning systems): A developed transboundary institutional cooperation framework to enhance flow of hydrological and meteorological information for real time decision making in the agriculture, water management and disaster management sectors.

Indicators: system in place, coverage (area, people), people trained, number and relevancy of national agencies associated with the system, number of national decisions made on the basis of information received through the system.

Adaptation measure:- A joint management system for the river basin: a system that incorporates dam operation rules, water utilization plans, to minimize scarcity and impacts of extreme events

Indicators: system in place, reduced incidence (number, intensity) of floods and droughts

Adaptation measure:- Coordinated disaster response systems

Indicators: losses resulting from disasters (loss of life, economic impact, productivity) decreased, efficiency, cost of disaster response costs and time lag reduced

Adaptation measure:- Coordinated flood haphazard mapping and Coordinated Land use planning policy: A coordinated effort to identify likely areas of inundation and flood return periods. Guide landuse planning regulations on the three countries that are sensitive to climate change related impacts (designation of conservation areas such as flood plains etc). This could include appropriate farming systems (i.e. conservation agriculture, crop selection etc).

Indicators: Changes in policy, legislative, and regulatory frameworks, changes in investment decisions

Tanganyka

	Possible Bio chemical & Physical CC issues	Root cause	Relevance to the basin	Current status based on Available knowledge	Impact (Socio economic & ecological	Adaptation Measure? (Existing & Possible new one)	Indicator	Expected Impact of Adaptive measure
Ecological	Changes in biodiversity (flora and fauna)	Water quality and Land Degradation	5	Aquatic studies undertaken and less terrestrial(both need up-dating)	Income reduction Disturbance of natural cycles Change in the species composition	Diversification of livelihood options	Number of livelihood options	Enhanced livelihoods
					Loss of fish species (Ec)	Sedimentation Control Reforestation and afforestation Alternative energy sources	Turbidity Extent of reforestation/afforestation area Number of people adopting alternative sources	Fish Habitat restoration Reduction of Siltation Reduced pressure on wood biomass
					Reduction of fish trade(SE)	Diversification of livelihood options	Number of livelihood options	Enhanced livelihoods
	Changes aquatic habitats	Pollution	5 5	Fair amount of information on aquatic habitats	Habitat degradation	Pollution control	Chemical and physical	Decreased pollution
	Changes in terrestrial habitats	Land cover destruction	5 5	Very little information on the terrestrial habitat	Habitat degradation	Control land cover conversion	Physiognomy of land cover	Land cover diversity maintenance or improvement
Quality	Changes in water quality Pollution Oxygen depletion	Pollution	5	Available but needs up-dating	Not usable for domestic use Habitat quality disturbance	Pollution control	Biological, Chemical and physical	Decreased pollution

	Possible Bio chemical & Physical CC issues	Root cause	Relevance to the basin	Current status based on Available knowledge	Impact (Socio economic & ecological	Adaptation Measure? (Existing & Possible new one)	Indicator	Expected Impact of Adaptive measure
					Impair fish reproduction and health			
	Changes in Groundwater salinity							
	Changes in estuarine salinity							
Quantity	Changes in water quantity	Rainfall and temperature Variation	4	poor	Water vessel docking problems Encroachment leading to habitat modification	Afforestation and reforestation	Water volume measurements	reduction in water volume variation
	Changes in precipitation (intensity, variability)							
	Changes in evapotranspiration							
	Floods							
	Droughts							
	Changes in Groundwater level							
	Changes in lake levels							
Geomorphology	Sedimentation							
	Changes in river/lake morphology							

Orange-Senqu

	Possible Bio chemical & Physical CC issues	Root cause	Relevance to the basin	Current status based on Available knowledge	Impact (Socio economic & ecological	Adaptation Measure? (Existing & Possible new one)	Indicator	Expected Impact of Adaptive measure
Ecological	Alteration of rainfall and evaporation rates	Increase in temperature	5	Prelim.TDA: Research results, IPCC (2001)	Failure to maintain faunal, floral resources and ecological reserve of wetlands	Advise on Rangeland management	Area under Improved rangeland management	
	Change in rainfall distribution	Shift in climatic zones	5	Prelim TDA:	Failure to sustain food security, water supply and restricted industrial development	Review of existing and planned infrastructure towards promoting resilience	Adoption of results of review by parties	
Quality	Pollution of stretches of river system	Increase in potential evaporation	5	Prelim TDA: Schulze (2005)	High cost of water treatment, variation in spread of vector borne diseases	Review and advise on waste water treatment facilities.	Number of municipalities/local government adopting guidelies on ww treatment.	
Quantity	Frequent droughts and reduced runoff	Change in precipitation and evaporation	5	Prelim TDA	Unreliable energy resources	Reviewing infrastructure adequacy and further pursuit of regional cooperation joint power generation	Advise on sustainable energy development adopted by parties.	
	Changes in precipitation (intensity, variability)							
	Changes in evapotranspiration							
	Floods							
	Changes in Groundwater level							
	Changes in lake levels							
Geomorphology	Sedimentation							
	Changes in river/lake morphology							

Pangani

	Possible Bio chemical & Physical CC issues	Root cause	Relevance to the basin	Current status based on Available knowledge	Impact (Socio economic & ecological	Adaptation Measure? (Existing & Possible new one)	Indicator	Expected Impact of Adaptive measure
Quantity	Changes in water quantity	Rainfall variability	5	Reduced flows	Loss in household and natural incomes (SE)	Allocation	Water user permits reviewed; % of time the desired flow is maintained is maintained Cooperative framework	Improved in water availability
						Diversification of livelihood strategy	Available options	Improved livelihood
						Storage facilities	Potential sites identified	Improved water availability
					Loss of ecosystem functions and services (Ec)	Allocation Provision of information	% of time desired flow is maintained in river system Water Managers use the EFA information to plan for water allocations; Board decision made based on provided information	
	Changes in precipitation (intensity, variability)	Land slides Long dry periods	4	No data on intensity Change in on set periods	Food security (SE)	Rainwater harvesting	Water harvesting infrastructure in place and used	
						Diversification of livelihood strategy	Available options	
	Changes in evapotranspiration	Decline in rainfall Water table fluctuations	3	Uncertain	Food security (SE)	Watershed management	Watershed/IWRM plans	
	Floods	Rainfall	3	Moderate	Food security (Se)	Management option	Reduced number; Number of impacted	Reduced hazards

	Possible Bio chemical & Physical CC issues	Root cause	Relevance to the basin	Current status based on Available knowledge	Impact (Socio economic & ecological	Adaptation Measure? (Existing & Possible new one)	Indicator	Expected Impact of Adaptive measure
					Loss of ecosystem functions and services		people	
	Droughts	Prolonged shortage rainfall	5	To be ascertained	Food security (SE)	Storage facilities Resistant crop varieties	Availability of infrastructures	
						Allocation	Water user permits reviewed; % of time the desired flow is maintained is maintained	
					Domestic water supply (Se) Loss of ecosystem functions (Ec)			
	Changes in Groundwater level	Decrease in yields	4	Study needed	Domestic water supply (Se)	Monitoring and enforcement of abstractions Control development		
	Changes in lake levels	Decline of water levels	4		Loss of fish species (Ec) Loss of ecosystem functions (Ec)	Diversification of livelihood strategy		

Botswana

	Possible Bio chemical & Physical CC issues	Root cause	Relevance to the basin	Current status based on Available knowledge	Impact (Socio economic & ecological	Adaptation Measure? (Existing & Possible new one)	Indicator	Expected Impact of Adaptive measure
Quality	Frequency and intensity of drought	Shift in climatic zones	5	2006 Research on RWH and utilization study	Waterborne diseases	Securing alternative and dependable sources of Water supply	Amount of water stored of acceptable quality	improved water quality
	Changes in water quality			2006 BNWMP review	Dilapidation Infrastructure	No reservoirs in compliance to set standard	Amount of Water harvested	Improved water quality
		Changes in rainfall distribution		s	Technical skills / capacity			
					Failure to secure food security			Food security
Quantity	Changes in precipitation (intensity, variability)		4	2006 BNWMP review	Frequency and intensity of rainfall	Storage capacity (infrastructure)	Amount of water harvested per rainy season. Amount of money saved	
					Availability of tanks			
					Innovative and smart technology			
					Air pollutants			

Appendix 4. Workshop Evaluation

I. Evaluation of the sessions

Session 1. OPENING

Strengths	Weaknesses
• Understanding the purpose • Bringing together project managers and basins CEOs for mainstreaming CCA in project activities • Clarity with respect to objectives • A lot of useful information on CC was made available to us • Networking, information sharing • Clarification on CCA in specific projects • Practical CCA issues have been covered • Introduction of the participants were done in the appropriate manner • The Session was participatory with strong backstopping of the Facilitator	• Background on CCA varies • Some presentations were not very useful. Some interventions were not very useful and delayed the agenda • Time allocated for practical aspects of mainstreaming CCA • The experts must plan to spend more time with the participants • Opening statements were not prepared but rather conversations

Session 2. SETTING THE SCENE (Presentations by experts)

Strengths	Weaknesses
• A lot of technical information • Good case studies • Opportunity to interact with each other • New science in field • The setting was flexible and comfortable • Knowledge sharing	• Time was short • The experts input was minimal, especially during the discussions after Project presentation • Few practical examples (Umgeni) • Lack of timeliness: the speakers didn't respect the time allocations and the chair didn't anything about that

Session 3. CLIMATE CHANGE CHALLENGES IN PROJECTS

Strengths	Weaknesses
• Networking • It was clear how to mainstream CCA in the projects • The presence of Projects senior staff • Practical issues have been covered • Information sharing on each of the concerned projects	• Not enough time to present details • Not enough time allocated • Linkages of measures to CCA was not always very distinct • Came at end and therefore quite very exhausted participants with very few resource persons • Experts spent little time with the participants Non respect of the established agenda

Session 4 POSSIBLE ADAPTATION MEASURES

Strengths	Weaknesses
• Good • Need for strong information sharing among riparian country • Formulation of indicators for climate change • The session had a clear presentation • The selection of project to showcase the needs in CCAs	• Still a lot to be done • Do not see how to choose indicators for a basin in pristine conditions • Time was limited and packed • The interaction with experts, especially for more advise on project implementation strategy • Very little has been done to use this as a case study for the intended objective • Time allocated quit limited • Time for the session was a constraint • Non respect of established agenda

Session 5 ADAPTATION INDICATORS

Strengths	Weaknesses
• Questions to ask yourself • Knowledge on indicator generation was clear • The monitoring aspect, which influences the intended results outcomes • Lin between indicators and adaptation measures were explained • Formulation of indicators for climate change • Clear presentation Good focus on topics to be handled	• Time was short for concentration • Not enough time • This perhaps was the most important session to ensure that LFAs contained something practical • Time allocated quit limited • Time constraint • Not all was said on CCAs: success stories in sampled cases could have been useful

Session 6 UPDATING LFAs AND WORKPLANS

Strengths	Weaknesses
• N/A • Makes the case for CCA mainstreaming is the project • The idea of going step by step until inclusion of CCA activities in our respective LFAs	• N/A • No time for this session • It would have been ideal to allocate more time to this session since it influences the outcome of our project • Time constraint • LFAs and Budgets were not handled at all because time has been mismanaged or not reasonably planned

II. General Evaluation of the workshop

Strengths	Weaknesses
• Networking, the participation of projects secretaries and implementers is the best way for ownership • Has opened light for CCA in our projects • The interactions between project managers, giving more insight information • Broadened the scope of CCA mainstreaming • Well organized • Important participants • Networking between scientist and practitioners • Presentation of practical knowledge • Level of expertise outsourced and made available to the participants • Level of knowledge of the participants themselves and their will to cooperate • Food was simply excellent	• Not enough time to formulate indicators • Time allocation to different sessions should be more looked into & more time allocated to discussion • Insufficient expert inputs • Time plans for each of the topics • Constraints linked to time, availability of experts • Workshop location, seating arrangements in the tiny hall

III. General Evaluation of the Facilitator

Recommendation to the facilitator to improve performance
• Probing expert to give out more information especially with clear examples and presentation to be communicating to all participants as there was different background • Should call people by their names-not only the few that he probably knows. Otherwise, he was a great facilitator. • Engage with organizers quite intensively every day (regular) to update programme (and output) where necessary • He must limit the contribution of some of the contributors • Less democratic and rigorous in time keeping