WATER ADAPTATION IN NAPAs

Freshwater in Climate Adaptation Planning and Climate Adaptation in Freshwater Planning

A UNDP Side publication to WWDR3

Contents

ACRONYMS AND ABBREVIATIONS

CBD	Convention on Biological Diversity
CCD	Convention to Combat Desertification
GEF	Global Environmental Facility
GHG	Green House Gas
GLOF	Glacier Lake Outburst Floods
ICIMOD	International Center for Integrated Mountain Development
IWRM	Integrated Water Resources Management
LDC	Least Developed Country
LDCF	Least Developed Countries' Fund
LEG	LDC Expert Group
MEA	Multilateral Environmental Agreement
NAPA	National Adaptation Programme for Action
NC	National Communication
NGO	Non-Governmental Organization
PRSP	Poverty Reduction Strategy Paper
SIDS	Small Island Developing State
SCCF	Special Climate Change Fund
UNDP	United Nation Development Program
UNDP WGF	UNDP Water Governance Facility at SIWI
UNEP	United Nation Environmental Program
UNFCCC	United Nation Framework Convention on Climate Change
UNITAR	United Nations Institute for Training and Research
WSSD	World Summit on Sustainable Development (Johannesburg 2002)

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1. Introduction

It has long been recognised that adaptation is critical to enable societies to deal with impacts of both natural and anthropogenic environmental change, especially in low-income countries. It was already discussed in the process leading up to the Rio Conference in 1992. Perhaps foremost among current challenges to development is the threat from anthropogenic climate change due to greenhouse gases. The Stern Review Report (2006) recognised that adaptation to climate change will in most cases provide local benefits, including economic benefits, realised without long lag times, in contrast to mitigation. Adaptation actions should be integrated into development policy and planning at every level, and as Stern emphasis "ignoring climate change is not a viable option – inaction will be far more costly than adaptation". In fact, much of adaptation work is an extension of sound governance and management structures, in particularly in the water and water-related sectors, although it implies an evolution in the way it is done. As the poorest countries will be hit earliest and hardest, adaptation efforts in developing countries must, according to Stern, be accelerated and supported by the international community. The UNDP Human Development Report 2007-2008 on Fighting climate change: Human solidarity in a divided world, draws similar conclusions. It states: "Successful adaptation coupled with stringent mitigation holds the key to human development prospects for the 21st Century and beyond." While many of the world's poor cannot adapt their way out of dangerous climate change, the impacts of global warming can be diminished through the implementation of effective policies and appropriate infrastructure development. Adaptation actions taken in advance can reduce the risks and limit the human development damage caused by climate change.

The Technical Paper on "Climate Change and Water, published by IPCC WG II in June 2008 (Bates et al, 2008) recognises that freshwater-related issues play an instrumental role among key regional and sectoral vulnerabilities. The Technical Paper states that "freshwater and its availability and quality will be the main pressures on, and issues for, societies and the environment under climate change; hence it is necessary to improve our understanding of the problems involved".

In a report for UNDP (July 2008) Schipper *et.al.* discusses the links between vulnerability to climate change and the development objectives that fall under the MDG. Such clear linkages at individual, group or society level are some of the reasons behind the efforts to mainstream adaptation that can be found in national development plans as in Bangladesh. Linked to that they identify as a difficulty that different approaches to adaptation, which might occur across sectors may result in difficulties to mainstream adaptation into physical and developmental planning.

At the COP 14 of the UNFCCC in Poznan in December 2008, adaptation was an important item on the agenda. During a Workshop on "Shared visions on long-term cooperative action" held during a session by the Ad Hoc Working Group on Long-Term Cooperative Action under the Convention (AWG-LCA) the delegate representing EU stated the following:
"Adaptation is the responsibility of all countries and should be implemented in partnership. To advance the implementation of effective adaptation, adaptation should be integrated into all relevant decision-making processes." The representative for the LDCs in his presentation included the following needs: "- Shifting the paradigm from the current fragmented approach to adaptation to one that is based on rigorous planning and predictable and adequate financing. - Sustainable long term implementation must be a pillar of the shared vision on

adaptation. - A shared vision on adaptation must also make provisions for the creation of effective, enabling environment for adaptation, nationally, regionally, and internationally with support of appropriate knowledge based institutional network."

It is evident that impacts of climate change will seriously affect the availability of water resources and that responses so far at best have been slow in most developing countries. The Report looks at water adaptation aspects in ongoing processes of formulating and implementing National Adaptation Programmes of Action – NAPAs. Adapting to climate change and increased variability will entail dynamic spatial and temporal adjustments at every level – from community-based to national and international. The range of practices that can be used to adapt to climate change is diverse, and includes changes in behavior, structural changes, policy based responses, technological responses and/or managerial responses, all of which could be related to the water sector as well as other sectors which water cuts across. The NAPA-process is an example of an internationally initiated process – under the United Nation's Framework Convention on Climate Change, UNFCCC, that targets national work for the least developed countries, LDCs. The Report is scrutinizing the water policy and NAPA interface and to what extent and in what ways water issues are made part of the NAPAs, and to what extent existing water sector plans and policies include adaptation as a strategic area.

1.1 The development of NAPAs

The National Adaptation Programmes of Action[1], the NAPAs, is an initiative agreed under the UN Framework Convention on Climate Change, UNFCCC, at its Conference of the Parties in 2001. It aims at building adaptive capacity in the most vulnerable countries, the LDCs. The NAPAs' main objective is "to serve as a direct channel where by the LDCs may communicate their urgent and immediate adaptation needs". The NAPA document shall further identify linkages to more long-term strategy frameworks, such as MEAs, PRSPs or applicable national agreements, such as Water Acts. But their agreed format implies that they are neither providing for a long-term strategy for adaptation to climate change, nor are they associated with any detailed plan for implementation of the identified activities. A very important aspect is that it is the process associated with producing the NAPA for a country that is the most important adaptation capacity building and awareness-raising outcome. The LDCs often lack institutional as well as human capacity to address their adaptation needs and the NAPA process as well as other supporting activities can be seen as activities to enable such capacity. An LDC Expert Group (LEG), developed under the UNFCCC, has provided guidance and advice on the preparation of the NAPAs.

The process of producing a NAPA is initiated by establishing the NAPA structure, including NAPA teams, steering committees and working groups as needed. It is important to ensure national ownership and support for the process by including the responsible ministries in the teams. The next step is the synthesis of available information of baseline vulnerability, including impact assessments, coping strategies, national development plans etc. A participatory assessment of vulnerability to current climate variability and extreme events and to climate change is done partly based on this background material. This consultation with stakeholders includes identification of regions and areas of specific vulnerability where severe adverse impacts of climate change will occur. The stakeholder consultations would further include identification of key adaptation projects, ranking them according to identified priorities and developing project profiles to address urgent and immediate adaptation needs.

The approach followed by the teams in the process of developing the different NAPAs is guided by some basic principles, including that the process 'should have a country-driven approach and be a participatory process involving multi-stakeholder consultation, reflecting a true bottom-up approach'. Further the process should involve a multidisciplinary group of experts and undertake comprehensive and integrated assessments but also recognise synergies with activities implemented under other multilateral environmental agreements.

Lessons learned in preparing NAPAs have been synthesised by Osman-Elasha and Downing (2007) based on the 14 NAPAs submitted to the UNFCCC by the 5th April 2007, half of which were from African LDCs. According to the analysis the main weaknesses experienced during the process of preparing the NAPAs were institutional barriers that hindered the free exchange of information including communication problems between central offices and states. The main strengths according to Osman-Elasha – Downing were the participatory approach and the consideration of both vulnerability and adaptation. The analysis built on interviews with members of NAPA teams, and the most important conclusion was the need to see the NAPA preparation as a process and not as an end product. Moreover, it is important to continue that process and not to lose momentum but to prepare specific projects for funding through for example the GEF, and to create synergies with ongoing planning processes.

Climate change and climate variabilities by definition imply long-term changes of mean temperature and of precipitation/evaporation due to GHG emissions as well as extremes as droughts and floods. The water sector and other sectors depending on access to water are invariably impacted. An important aspect of adaptation to climate change is therefore water related adaptation. Planning for adaptation should include water resources planning, as should water resources planning take into account the impacts of climate change on the water resources sector. Mainstreaming climate adaptation into national development planning would include integrating adaptation-related policy and activities including with water resources management planning. Very few of the LDCs, however, have developed and adopted any formal plans for the water resource sector, let alone any integrated water resources management, IWRM, plans, as agreed at the WSSD in Johannesburg 2002.

38 LDCs had completed the process leading to the NAPA document and presented it to the UNFCCC by October 2008[1], 24 of which have done that with support by UNDP, 12 with support by UNEP, and 2 supported by the World Bank. According to the Progress Report on the LDCF and the SCCF of October 21, 2008 (GEF/LDCF.SCCF.5/inf.3) 6 additional NAPAs are expected to be completed in early 2009.

Only 4 LDCs had reported to have IWRM plans in place and only 14 were preparing their IWRMs according to a survey undertaken by UN Water for the CSD 16 meeting (UN-Water 2008). At the UNFCCC meeting in Poznan December 2008 two more were in place.

At the UNFCCC COP 14 in Poznan "Enhanced action on adaptation" including planning and implementation, nature of adaptation plans including NAPAs, integration of adaptation into national policy etc" was also dealt with. The final document[2] includes the following recommendations:

[1] The following NAPAs were submitted by April 2008: In 2004 Mauretania, in 2005 Bangladesh and Samoa, in 2006 Bhutan, Comoros, Djibouti, Haiti, Madagascar, Malawi, Niger, DR Congo and Senegal, in January – June 2007 Burundi, Cambodia, Eritrea, Kiribati, Lesotho, Rwanda and Tuvalu, in July – December 2007 Burkina Faso, Cape Verde, Guinea, Mali, Sao Tome and Principe, Sudan, Tanzania, Uganda, Vanuatu and Zambia, in early 2008 Benin, Gambia, Guinea-Bissau and the Maldives, and by July 2008 Central African Republic, Ethiopia, Liberia, Mozambique and Sierra Leone.

[2] FCCC/AWGLCA/2008/16/Rev 1.

"National adaptation plans should go beyond the current NAPAs, and should be:

i Established as a formal process (AOSIS, MISC.5/Add.2; Gambia, adaptation workshop), prepared in all developing countries (China, MISC.5; AOSIS, adaptation workshop), integrated into all relevant decision-making processes (EC and its member States, shared vision workshop), and provided with support and guidance (United States, adaptation workshop), including support through capacity-building (China, risk workshop);

ii Living documents to reflect new and more detailed information and to reflect changes in domestic priorities (Australia, MISC.2/Add.1);

iii Based on environmental and economic vulnerability analysis, an identification of urgent, medium- and long-term action and their costs, and should establish and strengthen institutional capacity for adaptation and environmental education/awareness (Chile, MISC.5/Add.2);

iv Built on the lessons learned from existing mechanisms and processes, like NAPA process in the context of decision 1/CP.10, and prioritized with the assistance of support mechanisms and guidelines (AOSIS, MISC.2/Add.1);

v Nested in a national policy/programmatic and regulatory context (EC and its member States, MISC.5/Add.1; Canada, MISC.5/Add.2), and should take into account insurance-related actions and the application of measurement, reporting and verifying (Bangladesh, risk workshop)"

2. Water related vulnerability and potential adaptation needs identified during NAPA-preparation process.

2.1 Overall approach

Adaptation is by IPCC defined as:

"…adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities."

and by UNDP (2006) as "*Changing existing policies and practices and/or adopting new policies and practices so as to secure Millennium Development Goals in the face of climate change and its associated impacts"*.

Vulnerability is by the IPCC defined as:

"...the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity."

The countries involved in the NAPA-process are *(a)* to synthesize available information on adverse effects of climate change, *(b)* to, based on such information, assess vulnerability to current climate variability and extreme weather events, and *(c)* to assess whether climate change is causing increases in associated risks. This process should, according to the Annotated Guidelines for the preparation of NAPAs (2002), be undertaken in a participatory process, with a multidisciplinary approach and in a sustainable development perspective. The sustainable development approach, capturing the social, environmental and economic components, would imply a long-term perspective, while the instructions in the NAPA Guidelines to be "action-oriented" and "set clear priorities for urgent and immediate adaptation activities" implies a much shorter term perspective. The NAPAs are thus applying both to short-term and long-term strategies and actions. It is important that NAPAs not only take into account short-term projects but also recognize the need for a coherent long-term

adaptation strategy to which the implementation of the identified projects will contribute. A key aspect is to make the NAPA's implementable, which among others means that the financing requirements for vulnerabilities, risks and response measures in the water sector need to be assessed.

2.2 Sectoral and environmental vulnerabilities are recognised, as are concrete impacts

The NAPAs provide for broader views on the issue of how to approach adaptation. Most of the LDCs that today have completed their NAPAs or the process leading to the NAPA have identified sectoral vulnerability, sectoral climate change impacts, and adaptation needs per sector. As the agriculture sector to most of the LDC is the most important sector, mainly from the perspective of food security but also to some degree for income generation, the impacts of floods and droughts on the agricultural sector (food security) is considered important. This is the case for most of the countries that have completed their NAPAs. Nevertheless other flood impacts, such as the direct loss of life during extreme events, need also to be managed effectively.

The adverse impacts of climate extremes on water availability for household purposes are also considered particularly important to be addressed under an adaptation programme, as are the human health aspects. The vulnerabilities identified and which exacerbate the impacts are mainly sectoral or environmental vulnerabilities. One reason behind this may be that as for example for Bangladesh the working groups synthesising the collected background material and identifying the vulnerabilities, impacts and interventions to address this, are sectoral working groups.

Countries like Mauretania, Mali and Burkina Faso are all countries experiencing desertification which is emphasised by climate change and variation. Access to water is normally very restricted and land and water resources in large parts of the countries and for Mauretania also the coastal zone and the fishing sector, are considered vulnerable and the desert-close areas are also identified as vulnerable regions.

Water scarce countries sharing water whether they are sharing a river basin, such as Ethiopia and Sudan that are situated in the Nile River Basin, Guinea, Mali and Niger all part of the Niger River Basin, or Zambia and Mozambique situated in the Zambezi river basin are experiencing a situation where the water and climate vulnerability is exacerbated by a political vulnerability.

2.3 Framework for adaptation programmes

The NAPAs should identify urgent and immediate actions but the frameworks where the NAPA needs to fit should be existing development plans, including Poverty Reduction Strategies and economic development plans. But as was recognised in the UNDP Human Development Report 2007-2008, these processes are often completely separate[3]. With regard

[3] One example is that the findings of the Mauretanian 2004 NAPA were not included in it 2006 PRSP. UNDP HDR 2007-08, Box 4.7 "National Adaptation Programmes of Action (NAPAs) – a limited approach.

to ongoing water reform work in many LDCs there is thus a disconnection between already ongoing work to strengthen water resources management and water adaptation as set out in NAPAs. Implemented NAPAs should also "promote synergies with other plans of action" such as under the Convention on Biological Diversity, CBD, and the Convention to Combat Desertification, CCD. Hence, there needs to be more than just a sheer linkage between the different programmes. As the framework for adaptation programmes, NAPA framework, needs to adhere to policies and priorities that should be consistent with the social and economic policies and priorities already identified for the countries, most of the NAPAs merely briefly refer to that there is a connection to these. This sometimes makes the NAPA seem more of a list of immediate actions than a comprehensive *plan* for how to address the issues of adaptation. And very seldom the NAPA could be seen as *plan of consecutive* activities comprising short *and* long-term adaptation to climate change. This is particularly important from a water perspective as adaptation to several LDCs in Asia does not only imply a more short-term adaptation to extreme floods resulting from extreme glacier melting or glacier-lake outbursts. Long-term adaptation for some of the Asian LDCs might include strategies to adapt to a situation of less water access in all regions once the glaciers have melted away, and significant sea-level rise with flooded and eroded coast-lines and large groups of environmental refugees.

The NAPA framework shall also, where possible, identify potential barriers for implementation, not just financial barriers but also institutional and capacity issues generally being most significant. Issues on barriers including such linked to the governance system, was discussed at workshops during the NAPA process[4]. Such aspects, as well as lack of political will are, however, not identified as barriers for implementation of the NAPAs. Neither is there discussion in any of the NAPAs on how the barriers should be addressed to be overcome.

2.4 Adaptation project profiles

Based on the identified adaptation needs, countries identify climate change impacts on ecosystems or regions but more commonly specify the needs by sectors. Benin's NAPA identified **different adaptation needs for different regions of the country**, while Kiribati, being a more regional homogeneous SIDS identified its **shifting sectoral needs**. Cape Verde identified three objectives under its adaptation programme. The first objective is "promoting integrated water resources management in order to guarantee water for the people, for the production of food, for the ecosystems and for tourism industry". The sector-specific projects identified as response to the needs and objectives, fall to a large majority under the water, agriculture and health sectors, which could be expected for LDC countries.

The activities or projects are then to be prioritised according to the Guidelines for the preparation of NAPAs and the criteria for prioritisation should include: (a) level of degree of adverse effects of climate change; (b) poverty reduction to enhance adaptive capacity; (c) synergy with other multilateral agreements; and (d) cost-effectiveness. This process results in a list of priority projects, often specified in activities.

The projects identified are of different degree of detail, some are all-encompassing while others are very specific. Among the prioritised sector-specific projects are a wide range of

[4] UNITAR 2003-2004: National Adaptation Programmes of Action (NAPA). Selection of Examples and Exercises Drawn from Regional NAPA Workshops.

projects within water management and water harvesting, less on water quality and sanitation, and several projects of promotion of drought-resistant crop varieties and farming practices.

UNITAR presented in 2007 a document, which for each of the by then 21 presented NAPAs, analysed and categorized the project profiles according to their main topics, either sector or non-sector specific. Water management and rain water harvesting was ranked as the sector where adaptation measures was most needed by 6 out of 21 countries and ranked second by 3 countries. Water issues were thus considered important from an adaptation perspective. The suggested interventions varied from "Control of river dynamics of watercourses and torrents…" and "Increase the number of hydropower micro stations" to "Developing small dams, and other storage facilities, to mitigate floods, to harvest water and to initiate community based fish farming and breeding" (UNITAR, 2007). Sometimes water is also recognised as a prerequisite for agriculture and food production. The interventions are often identified as more comprehensive projects, implemented through several more detailed activities for which the country then seeks financial support from *inter alia* the GEF/UNDP. Some water and sanitation projects may focus primarily on achieving the MDGs, others may specifically building resilience to climate variability, but good projects integrate climate resilience into wider development work.

At the official webpage of UNFCCC the secretariat has created easy-to-use indices of the NAPA Priority Projects by country and by sector, detailed in the NAPAs received. (The http://unfccc.int/adaptation/napas/items/4583.php accessed December 4, 2008). 38 countries had presented their NAPAs and the majority of the activities presented, 89 projects, are identified as within the food security sector, 65 projects are identified as in terrestrial ecosystems and 64 projects in the water sector. Some of the Food security projects as well as some of the terrestrial ecosystem projects concern water for food production or for ecosystem production. 34 of the 38 countries having submitted their NAPA had clearly identified water as a key issue. 5 suggested 'water projects' are broad, all-encompassing projects, 20 concern water management, 18 water supply, mainly drinking water supply, 9 are technical type of projects such as dam-construction etc., 8 are projects on water for irrigation and only 4 of them concern water quality and water pollution.

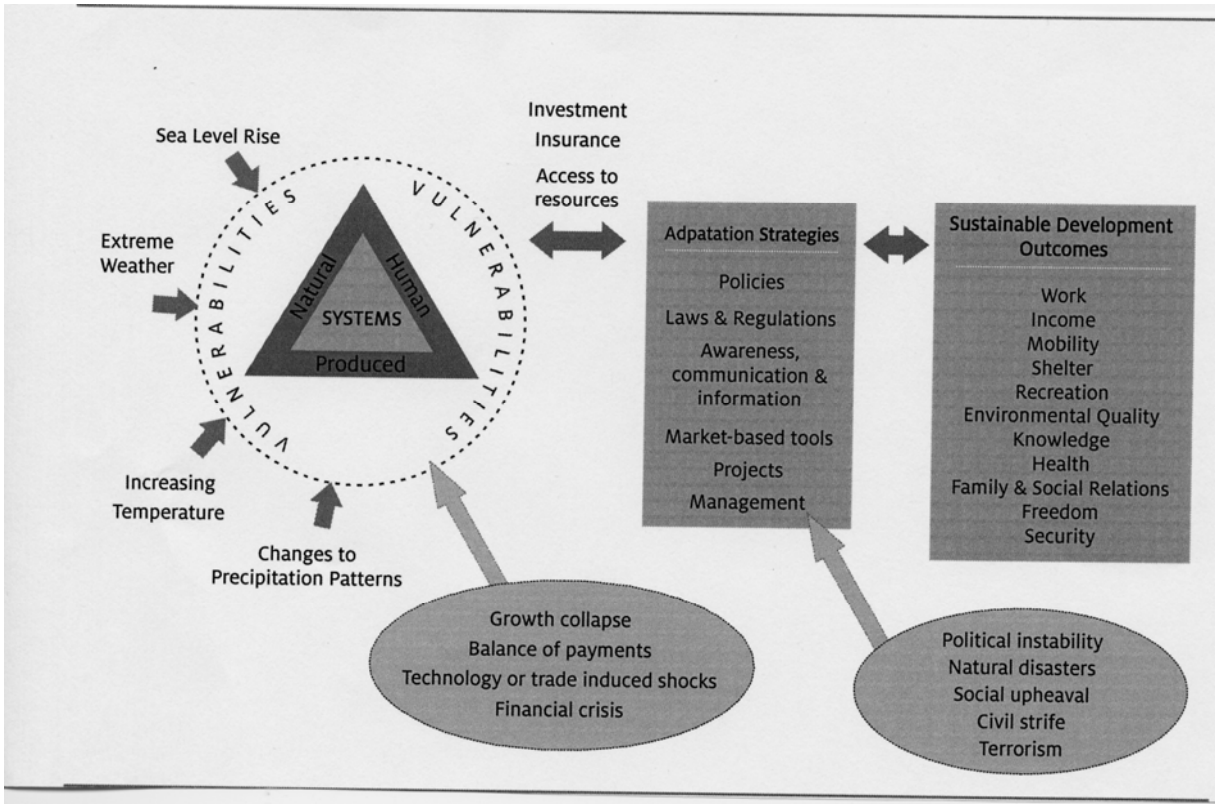

Figure 1: Conceptual framework of NAPA illustrating the complex relationship between sustainability and adaptation to climate change. From the 'National Adaptation Programme of Action – Maldives'. March 2008.)

Figure 1 describes the NAPA framework, including how the NAPA should be integrated in other ongoing planning procedures, as seen from a Maldivian perspective. It is regarded important to ensure a long-term sustainable outcome by the process of seeking synergies among Multilateral Environmental Agreements and relevant strategies such as the Poverty Reduction Strategies etc. Other ongoing planning procedures would also include planning for Integrated Water Resources Management, particularly as water access, use and management is recognised as crucial by almost all countries in their NAPAs.

Scope for NAPA improvements:

The main **weaknesses** in almost all of the NAPAs prepared are:

- the lack of clear linkages between what is in the content of the NAPA and what is in the content of the PRSPs, NDSs, IWRM plans, MEA Action programmes etc, it should not be just a link between the programmes;
- the lack of recognition of institutional barriers, including lack of political will to undertake the responsibility for implementing a comprehensive adaptation strategy; NAPAs could be further developed to identify specific responsibilities and build ownership;
- the lack of specificity as regards climate change impacts, adaptation measures and quantification of associated cost;
- the lack of discussion of a strategy to overcome existing barriers – and of how to implement such a strategy;

The latest submitted NAPAs are **better developed**, and both the NAPA for Mozambique and the one for Sierra Leone include:

- a more advanced discussion on the processes (physical and social) behind their vulnerabilities and the short term and long term impacts of climate change;
- a closer link between vulnerability – impact – adaptation and are thereby more process-oriented, where the process is not only a participatory process but also the adaptation strategy and its implementation. As a consequence the actions proposed are considered as response-options and part of the strategy;
- a more holistic approach to adaptation responses in the water sector and its development.

Generally, the NAPA process has its main advantages in that it is a participatory process where governmental representatives, NGOs and people concerned together are identifying and developing adaptation projects including developing adaptation capacity. The NAPA as a product, however, has been less successful to date. The Human Development Report 2007/2008 describes the NAPAs as "a limited approach" where the main shortcomings are identified as (1) inadequate financing; (2) underestimation of adaptation costs; (3) project-based bias; and (4) weak links to human development. All these aspects are of course very important and true. Integrating long-term water management in this structure would therefore be an ambitious but maybe difficult task. However, as the process of developing NAPAs for implementation is still relatively new and there is a tendency among the latest ones to include a more strategic approach, NAPAs may be developed into the strategic instrument needed. This tendency is clearly demonstrated in the NAPAs for Mozambique and for Sierra Leone.

A key challenge for adaptation is to build the technical, analytical, and institutional capacity needed for integrating climate change risks and opportunities into national development planning and decision-making. These are aspects that are sometimes missing in the NAPAs, in particularly the early ones. When countries outside the LDCs are developing adaptation strategies, for instance with a demand-driven support by the recently launched CC DARE[5] these capacity needs are the key elements.

Building Community Capacity in Climate Change Adaptation:

To reduce vulnerability of coastal communities to climate change impacts, UNDP is managing a GEF program in 'Community Based Adaptation to Climate Change through Coastal Afforestation' in four coastal sub-districts in Bangladesh - Barguna, Patuakhali, Bhola and Noakhali.

The project uses community based demonstration measures to protect ecosystems, ensure the sustainable use of climate-sensitive resources and diversify vulnerable livelihoods. These programs are help communities to adapt to climate change impacts.

3. Analysis of water linkages in the NAPAs and National Communications of from different categories of LDCs.

Climate change impacts on water resources pose different types of challenges to different regions of the world. Therefore interventions for the LDCs should be identified in their NAPAs – as well as in their National Water strategies, policies and plans. An adaptation

[5] Climate Change and Development – Adapting by Reducing Vulnerability, a UNEP/UNDP for Sub-Saharan Africa funded by the Danish Ministry of Foreign Affairs www.ccdare.org

strategy should be synchronized with existing environmental, health, social and economic plans, and lead to the implementation of adaptation actions.

In a report produced for UNDP primary and secondary impacts on freshwater resulting from climate change were presented for some Least Developed Countries that had completed their NAPAs.[6], namely Bhutan, Eritrea, Niger, Rwanda, Samoa, Sudan and Zambia (representing high-Himalayan, semi-arid and humid East and Central Africa, arid West Africa, a SIDS country, an Arab country and a South African country). The more detailed discussion is found in Annex 2. The table below reports on their vulnerable sectors and the foreseen adverse impact on the countries; and whether the countries have identified links to development strategies, water related strategies or institutional and governance system to implement the NAPAs; what kind of water related NAPA project the country has proposed; and if the country has developed any NAPA-project into an approved LDCF (Least Developed Country Fund) Adaptation Program.

Country	**Vulnerable sector/Impact**	**Link to strategies. Equipped for good Governance?**	**Identified Water related NAPA project(s)**	**Approved LDCF project**
Bhutan	Agriculture, hydropower. Important problem: Glacier Lake Outburst Floods, GLOFs.	Links to PRS. No detailed institutional structure	1. Rainwater harvesting	1. Reduced cc-risks and vulnerability from GLOFs in two regions.
Eritrea	Agriculture, livestock	Link to PRS. Governance capacity identified by National Capacity Self-Assessment.	1. Groundwater recharge for irrigation wells. 2. Increased agriculture prod. through spate irrigation…	1. Integrating cc risks into community based livestock management in one region.
Niger	Agriculture. Important problem: Extremely water scarce.	Link to PRS. No governance structure. No link to Niger River Basin Program.	1. Exploitation of surface and ground water.	1. Implementing NAPA priority interventions… of agriculture sector…. (PIF[7] approved)
Rwanda	Depending on agriculture. Important problem: heavy erratic rainfall periods shifting with droughts, land degradation	Link to PRS. Detailed discussion of IWRM as priority option to address cc. No governance structure. No link to the Nile Basin Initiative identified.	1. Development of irrigated areas by gravity water systems from perennial streams and rivers….	No project approved or in the pipeline.
Samoa	Water supply, tourism. Land, coral reef and coastline erosion and degradation	Link to National Development Strategies incl. water resource policy	1. Securing Community Water Resources.	1. Integrated CC adaptation in Samoa. (PIF approved)
Sudan	Agriculture, livestock, water resources and	Link to PRS. Lack of sector-specific	1. ..rangeland rehabilitation	1. Implementing NAPA priority

[6] The rational behind the selection of countries for a more detailed analysis was to find countries representing all different categories that are to present a NAPA among the ones having submitted their NAPA by early 2008.
[7] The Project Identification Form, PIF, needs to be approved as a first step towards a full project.

	hydropower. Northern parts water scarce, southern swampy.	coordination between affected sectors. No link to Nile Basin Initiative.	and water harvesting in one region 2. Improved water harvesting practices of southern Darfur State. 3. Strategies to adapt to drought-induced water shortages in Central Equatorial State	interventions to build resilience in the Agriculture and Water Sectors to the adverse impacts of cc.
Zambia	(Rain-fed) Agriculture, water and energy, natural resources/wildlife/forestry and human health.	Assess policies for agriculture, fishery, human health and natural resources but not water. Lack of inst. and individual capacity. No link to Zambezi RA	1. Maintenance and provision of water infrastructure to communities to reduce human-wildlife conflict.	1. Adaptation to the effects of drought and cc in two agro-ecological zones.

3.1 Analysing water as included in NAPA frameworks

A basic relationship between climate change and freshwater is the following: the main climate parameters are water and temperature and the warmer the air the more water can be evaporated and the less left as liquid water. Looking at the NAPAs submitted before May 2008, the following can be noted:

- Strategies to address impacts of climate change, would by necessity address issues related to water.
- Almost all the NAPAs studied under this work, both the ones studied broadly and the ones looked at more in detail attach importance to the need for adaptation to impacts on water for different uses.
- But the structure of a NAPA, as identified in the LEG guidelines[8], is more focussed on the political, participatory process by which priority actions and activities are to be identified then on the outcomes of implementing these actions and activities.
- This has made it very difficult to really find to what extent the NAPAs would result in real adaptation to climate change, or to any climatic hazards, or even to what extent an implemented activity might have a secondary beneficiary effect – or a sustainable primary benefit such as more sustainable access to water. Particularly as a key challenge for adaptation is to build the technical, analytical, and institutional capacity needed for integrating climate change risks and opportunities into national development planning and decision-making. The question is whether the NAPAs are paving the ground for that.

[8] UNFCCC: LEG, 2002: Annotated guidelines for the preparation of national adaptation programmes of action.

Developing resilience in the face of climate change:

ERITREA's NAPA in 2006 identified developing the resilience of drought-affected pastoral communities as one of the country's top 10 adaptation priorities. As a result GEF is funding a project 'Integrating Climate Change Risks into Community-based Livestock Management in the Northwest Lowlands of Eritrea.'

The project, funded by the LDCF, will support adaptation to changing climatic conditions of pastoral communities in the areas of livestock and management. It will enhance the technical capacity in climate change risk management of key stakeholders at the community and (sub-) national levels, implement priority demonstration risk management activities and provide support for the diversification towards less climate sensitive livelihood opportunities for rangeland communities.
Source: GEF Project ID 3406

The NAPA's main objective is "to serve as a direct channel whereby the LDCs may communicate their urgent and immediate needs", which by nature of course is urgent but which does not necessarily have to comply with more long-term needs. For instance the immediate need is often a need for urgent access to water for drinking water and food production for a growing population in a certain region to which a large community has migrated. But the necessary satisfaction of that need may, in a longer time perspective result in a much more pronounced migration and overpopulation to the region to which they have moved, which might result in increased famine, loss of drinking water, and maybe loss of income-generating, water-dependent activities. Hence, meeting the short-term need that might be identified under the NAPA may not by necessity result in a long-term sustainable solution, in particularly as the actions are not to be identified within any adaptation strategic framework.

The NAPA document shall, according to the guidelines, identify linkages to more long-term strategy frameworks, such as MEAs, PRSPs or applicable national agreements. As such long-term strategies could be strategic frameworks related to the UNFCCC or the CCD or could be national water agreements and strategies that could imply a more long-term sustainable strategy in satisfying water needs. The new PRSPs, in particular when linked to identification of how the country is advancing in meeting MDGs, are to a larger extent also including water-related priorities, but still very much on stand-alone project base. However, there are two problems: very few of the NAPAs have developed any detailed strategy including action programme for how to address the objectives under the Multilateral Environmental conventions. Their reporting under the convention concerns more often what is currently done; and the identification of the linkages is mostly an identification of the existence of such linkages, mainly as there currently is little else to report.

The countries in a participatory approach shall recognise sectoral and environmental vulnerabilities and concrete impacts. The vulnerability assessment shall be done mainly by using existing collected material. This should be a very important phase in the NAPA process, from a water perspective but also from other perspectives as this could be the phase where not only vulnerability, impacts and adaptation needs are recognised but also where there would be a possibility to clearly identify all sorts of cross-linkages based on this background material. This part of the process would need important support, from a sector perspective but also from a MEA-perspective etc.

Some of the very recently submitted NAPAs, the one for Mozambique and particularly the one for Sierra Leone, have more elaborated links to ongoing processes, both the physical ones resulting in climate extremes and severe impacts, and the multilateral processes under the MEAs. The latter is particularly true for Sierra Leone where one of the co-chairmen of IPCC WG III has been the consultative expert. Both these countries have profound experiences of climatic extremes and their impacts, including to water for life, for food, for drinking water supply and for income generation. They are more casual-chain oriented, both in terms of linking adequate response options to the impacts of climate change on water. But particularly Sierra Leone is also linking activities under the NAPA to activities under the action programmes for the other MEAS and other agreements, in particularly to obtain a synergistic effect.

When countries in their NAPAs identify adaptation project profiles, they define them either as different projects per sector or different projects per region. But the "profile" does not imply any necessary linkages between the projects that would relate to any specific strategy. But again the newer NAPAs show better linked profiles. The criteria chosen against which the projects are scored to come up with a list of prioritised projects should prioritise more long-term sustainable projects (see page 5) but are still less effective outside any strategic framework.

An aggravating circumstance in most countries is the gap in knowledge both as regards observation data and as regards the understanding of climate changes to the hydrological cycle at temporal and spatial scales relevant to decision making. As the IPCC WGII (Bates et al, 2008) pointed out "*Information about the water related impacts of climate change is inadequate – especially with respect to water quality, aquatic ecosystems and groundwater– including their socio-economic dimensions*." This is a relatively low cost activity that could ensure future development efforts are well target, and avoid maladaptation.

Another important and even more severe difficulty in implementing a water-related climate adaptation strategy is the lack of institutional and economic capacity and resources to implement such a strategy. The NAPAs do not require any institutional framework for sustainable implementation of the NAPA, nor for any governance that would provide for integration of climate adaptation action-programme with other country strategies. The only institutional structure that is to be identified within the NAPA is the one used to produce the NAPA, and ensuring a participatory process. As the guidelines specify the need for the NAPA process to include ministries as responsible organisations when producing the NAPA, there should be a possibility to identify a ministry to be accountable for the implementation of the plan, which is done for some NAPAs. But a governance structure needs also to be in-place. And most countries would need to build capacity and an enabling environment to implement the NAPA and to integrate an adaptation strategy into other relevant strategies, including integrated water resources management strategy.

4. Adaptation to climate change as part of National Water Strategies

The Annotated guidelines for the preparation of NAPAs produced under the Least Developed Countries Expert Group, LEG, in 2002, among its guiding elements included reference to; (i) a multidisciplinary approach; (ii) the need to build links between NAPAs; (iii) the Poverty Reduction Strategy Papers; and (iv) the national development planning process. It also

recognised the need to build on complementarities with existing plans and programmes including the Multilateral Environmental Agreements.

One of the sectors to which it is important to establish linkages is the Water Sector. Water sector policies are, when existing, mostly referred to in the NAPAs. To find out to what extent existing water sector programmes, strategies or plans include references to or integrate issues of adaptation to climate change, water-related programmes or plans of relevance were, when existing consulted for the same countries: Bhutan, Eritrea, Niger, Rwanda, Samoa, Sudan and Zambia (See Annex III). The most relevant plan for a country would have been one meeting the objectives of the Johannesburg Plan of Implementation, where governments were asked to:

"*Develop integrated water resources management and water efficiency plans by 2005, with support to developing countries, through actions at all levels to:*
(a)Develop and implement national/regional strategies, plans and programmes with regard to integrated river basin, watershed and groundwater management and introduce measures to improve the efficiency of water infrastructure to reduce losses and increase recycling of water;…"

The UN Water in its report to the Commission on Sustainable Development[9] presents the survey of progress on IWRM where Bhutan has not responded, for Eritrea plans are in preparation, Niger has responded but not indicated any work, Rwanda has just taken initial steps, for Samoa and Zambia the plans are in place, while for Sudan such a plan is in preparation.

The UN Water-report also contains some sub-regional comparisons that might be of interest for a broader, integrated management of water and that might be relevant when integrating climate change adaptation measures into water resources management. So are the groundwater, desertification and irrigation issues of more importance from a water resources management perspective to the arid parts in North Africa. The Caribbean countries rank assessment and basin studies high when it comes to water resources development, which might mirror their dependence on the decreasing water resources under climate change.

Strengthening Water Resource Management:

In *Ecuador*, which is a non-LDC developing country, a SCCF-supported project, which UNDP is implementing, aims to reduce the country's vulnerability to climate change through water resource management. The project aims to strengthen the policy environment and governance structure for effective water management through the integration of water-related risk management practices to withstand the effects of climate change. (Source: **GEF AGENCY PROJECT ID:** 3520)
http://www.gefweb.org/uploadedFiles/Focal_Areas/Climate_Change__(PDF_DOC)/SCCF1/Ecuador_Adaptation_to_CC_Water_Governance.pdf

[9] UN-Water (2008). *Status Report on IWRM/Water Efficiency Plans for CSD 16*

5. Opportunities to address and integrate climate change considerations into water resources management and decision making processes

Even though climate change has a fundamental role for water management, reforms in the water sector often have very weak links to climate. The water sector together with agriculture and food security are generally considered the most vulnerable sectors, and identification of needs for adaptation to climate change always include satisfying access to water. And access to water is generally considered fundamental to development processes. However, the water sector itself very seldom recognises consideration and adaptation to climate change in the water policies, plans or programmes. One important reason to that is of course that not all countries have a water policy, let-alone a comprehensive water policy. A severe water-scarce country such as Niger for instance has a water law that concerns water from a drinking water perspective but the law is very weak and the country has not initiated any steps towards a more comprehensive water policy that would provide for a framework under which water allocation to different sectors could be administrated. And even if Niger is part of the Niger River Basin it is a weak partner.

Bhutan, Eritrea, Rwanda, Samoa, Sudan and Zambia are developing (or have already developed) water resources policies and plans. All of them have, at the minimum, a National Water Policy although Rwanda's Policy only covers the water and sanitation sector; only initial steps have been taken towards any IWRM plan. Bhutan, Eritrea, Samoa, Sudan and Zambia are currently presenting more advanced water plans where the one for Eritrea is a draft IWRM and Water Efficiency Plan, and the one for the relatively small and homogeneous Samoa as well as the one for Zambia are already agreed IWRM/WE-plans. What is presented for Bhutan is mainly concentrated around their main water- and climate related problem of the glacier lake outburst floods, GLOF, in a comprehensive perspective. What is presented for the large and less homogenous Sudan still lacks the fully integrated approach. Only Bhutan has fully integrated adaptation to climate change into their national water policy and the countries that are members of the Nile Basin Initiative and the Zambezi River Authority have been discussing it within these river frameworks. Few NAPAs address water quality issues.

It is clear that dramatic (rapid onset) impacts generate much more attention than chronic impacts. For example, even Eritrea's detailed, integrated water policy recognises climate change as only a contributing factor. Adaptation to climate change is not well integrated. The long-term results of increasing gap between evapotranspiration and rainfall in Eritrea are difficult to detect and it is hard to pinpoint climate change as the clear cause of the country's recurrent droughts.

In contrast the Bhutan National Water Policy highlights adaptation to climate change. The reason is probably that the impacts of the GLOFs are recognisable immediately and are very visible The very pronounced emphasis on the GLOF-problematic within the Bhutan National Water Policy might also be a result of important research work and awareness-raising by the ICIMOD where the issue of GLOFs is an important research programme. Like any other natural disaster, it is important to respond according to objective criteria, and not be influenced by what is known as the 'CNN effect', whereby under-reported (but genuine) humanitarian needs get neglected.

NAPAs are only to be prepared by LDCs, but as is recognised by the IPCC and under the UNFCC adaptation strategies, are needed by all countries. The five year Nairobi Work

Programme shall assist all Parties to the Convention to "improve their understanding and assessment of impacts, vulnerability and adaptation to climate change; and make informed decisions on practical adaptation actions." As was recognized above the recently launched CCDARE is providing support in this endeavor, particularly to sub-Saharan countries, such as Uganda, Senegal and Tanzania.[10] And by the end of October, 2008, the Special Climate Change Fund (SCCF) had approved 15 projects under its Adaptation Program, of which 5 were addressing adaptation from an Integrated Water Resources Management perspective.[11]

The Nairobi Work Programme is not emphasizing any specific sector but partner countries such as for instance the EU countries are seeing water as an important aspect and link to adaptation to climate change. The EU Water Framework Directive, the agreed framework for integrated water management in a river basin perspective is seen as a vehicle for adaptation strategies by stakeholders in the EU member countries. The adaptation strategies for the different EU countries will of course also depend on degree of climate change and the implementation of the policy frameworks for water in each country. These policy frameworks generally include legal frameworks, national regional and local institutions, different guiding policies and role definitions to ensure accountabilities, management plans. The existence of these elements is to ensure proper governance and a holistic approach to integrate adaptation and water management strategies and their implementation in EU countries.

Impacts of climate change on water and environment is mainly a long-term process requiring long-term solutions. Even though lack of such awareness and knowledge are important barriers to integrating adaptation to climate change into the LDCs' national water policies, a low institutional capacity is the main impediment, of course together with lack of resources. Many of the LDCs have an insufficient institutional structure and capacity to be able to successfully and sustainably implement an integrated water resources management in a sufficiently long-term perspective to ensure aspects of adaptation to climate change are integrated. Yet, if that is not done urgently, there will be a need to actively plan for much more important remedies to adapt to climate change. "Ignoring climate change is not a viable option – inaction will be far more costly than adaptation" as is recognised in the Stern Report.

Action in the face of Climate Change risks - Disaster Risk Reduction in Bhutan:

A LDCF-supported project identified in the NAPA of *Bhutan* aims to enhance adaptive capacity to climate change-induced disaster impacts in the country, particularly vulnerable areas to glacial lake outburst floods: Punakha-Wangdi and Chamkar Valleys. The project, which UNDP is implementing, will strengthen the country's capacity for disaster risk management and prevention, implement the artificial lowering of Thortormi Lake waters, and install an early warning system for the Punakha-Wangdi valley—all with the purpose of preventing loss of life, homes and basic resources. (Source: G**EFSEC PROJECT ID:** 00053899)
http://www.gefweb.org/uploadedFiles/Bhutan_Reducing_Climate_Change_induced_Risks.pdf

6. Conclusions and Recommendations

The development of the National Adaptation Programmes of Action (NAPAs) is a relatively new initiative to build adaptive capacity in LDCs under the UNFCCC. The first NAPA was

[10] This was presented during a Side-event at UNFCCC in Poznan, December 2008.
[11] The IWRM-related adaptation projects were submitted to the SCCF by China, Egypt, Ecuador, Mexico and Tanzania.

prepared in 2004, but most of the 38 completed up to November 2008 have been developed from late 2006 onwards. Later NAPAs tend to be more strategic and this tendency is further pronounced in the implementation of the NAPA-projects with support from the LDCF (or to an even larger extent in the projects by the non-LDC developing countries, submitted for funding under the SCCF). The most valuable outcomes gained in the LDCs during the process of producing the NAPA are two:

- As the process of collecting and disseminating available data and background information should be a true participating process, led by a responsible ministry and with participation by stakeholders concerned, a structure that might be used as a basis for project implementation could be developed.
- Secondly, it is assumed the process will result in increased awareness, knowledge and capacity concerning the issue of adaptation to climate change.

Generally, however, the NAPAs have a project-based bias, and although they should have a linkage to MEA strategies, PRSPs etc., they are not very often integrating long-term development strategies to address water-related adaptation impacts. And to an even lesser extent do national water policies, plans and programmes integrate adaptation to impacts of climate change. This is the fact even as water-related processes are the main component within climate change. The main reasons behind this are:

- that the main climate adaptation needs are long-term even if what is singled out in the NAPA-projects are aspects that could be directly addressed (easier to define, to address and to cost-estimate);
- that long-term climate adaptation needs, including water-related needs should be addressed in an integrated framework. If such needs including their linkages become too multi-dimensional (as in reality!) they are too difficult to address both within the framework of the simpler NAPA and within IWRM related components of National Water Policies;
- that not only would complicated adaptation needs require a more detailed and comprehensive adaptation as well as water strategic framework, there is also a need for a effective governance system under which adaptation measures could be implemented across sectors. Such governance system should ensure coherency, equity, responsiveness and integration so that implementing different adaptation projects would ensure that they are becoming integral parts of the long-term objective – to find the most effective and efficient processes to adapt to climate change from a water perspective;
- that required capacity is ensured within the countries not only to establish a strategic structure for developing an integrated adaptation strategy but also to implement required actions.
- that for many countries current water management practices cannot adequately cope even with current climate variability. Therefore more immediate measures to improve information about current climate variability into water management would also assist adaptation to longer-term climate change impacts.

The difference in approach between the NAPAs/ National Water Policies that have been discussed above is not a difference between Asia and different parts of Africa, or between SIDS countries, Western African or Arab countries, and it is not between the poorest and less poor LDCs. The main difference seems to be between countries having an institutional structure and institutional and human capacity to undertake the process of developing a NAPA. Lack of such capacity leads not only to difficulties in finding suitable and sufficient background material but also to difficulties to structure, organise and govern the process. Such a process should result in increased adaptation capacity and a capacity to apply a more

long-term perspective, where immediate benefits can not always be recognised. A real long-term adaptation strategy for Bhutan and about 25% of all people on earth could include adapting to prolonged, seasonal water-scarcity– when the glaciers of the Himalaya-Hindukush region have melted.

6.1 Concluding remarks

- Although the NAPAs produced acknowledge links to national development strategies, PRSPs and MEAs, a link that is recognised in the text from the UNFCCC-meeting in Poznan[12], this link often holds very little content.
- The NAPAs studied do not describe any adaptation coalitions – but such regional coalitions appear in some of the pipeline projects, such as the SCCF-project on Community Adaptation to Climate Change in the Limpopo Basin[13].
- When discussing water aspects in the NAPAs it is almost always from a drinking water perspective and not from a river basin perspective. Maybe the EU approach, using the EU Water Framework Directive as a vehicle for adaptation strategies, could serve as a useful example, both from a regional and the river basin perspective.
- In general, links between water-related climate impacts and other development sectors are not well described. For example a lack of water may have significant industrial, employment and livelihoods impacts, and water conservation measures may be needed. Urban planning (for example siting developments outside flood or landslide prone areas, or more building more flood-resilient housing) is rarely mentioned.
- Significant impacts on the health sector (eg a rise in water-related diseases such as malaria and dengue fever in more humid climates; or scabies in areas of water shortages) are rarely mentioned.
- Another under-represented area is the adaptation needs for existing and future hydraulic infrastructure and the associated costs to climate proof these investments.
- Although NAPAs have been prepared in neighbouring countries, the NAPA-methodology allows for little regional synergy. This lack of a regional approach is particularly severe for regions were several countries share a river basin, such as for instance the Niger River basin (Niger River is not mentioned in the Niger NAPA!), the Nile River basin or the Zambezi River basin. - This river basin approach, may become better ensured in the future, under the SCCF funding such as the Limpopo-project but also an approved project on Mainstreaming Climate Change in IWRM in Pangani River Basin, Tanzania.
- Environmental education – raising awareness of climate change impacts and suitable adaptation measures – is rarely mentioned. Education is essential to ensuring better environmental management, at all levels.

It should be noted that many adaptation strategies are suitable initiatives for dealing with other environmental changes (such as urbanisation and desertification) and for natural climate variability. Improved resilience is beneficial to development, regardless of future climate change scenarios.

6.2 Policy recommendations

[12] "Noting the importance of the national adaptation programme of action process as a first step towards the scaling up of adaptation and integration of climate change into national development plan" FCCC/SBI/2008/L.21/Add.1 10 December 2008

[13] A suggested UNDP-implemented project in South Africa, Botswana, Mozambique and Zimbabwe.

Adaptation programmes and projects, identified in NAPAs as well as other projects, need to shift focus to also ensure sustainable development in adversely impacted countries, in particularly the LDCs. Therefore support should be redirected towards work that:

- *shift focus from identifying short-term single projects towards projects that are parts of a long-term strategy corresponding to long-term needs;*
- *identifying 'no regrets' adaptation policies and avoiding mal-adaptations;*
- *ensure that the long-term adaptation strategy for a country, when developed, also links to what is developed for the larger region as the impacts do not respect any political boundaries and transboundary cooperation is thus needed;*
- *build capacity, both institutional and human capacity to implement not only projects that are founded in a long-term adaptation strategy but the adaptation long-term strategy itself, including by make sure a proper governance system is in place; such a governance system is critical to deciding whether losses should be shared, avoided or accepted.*
- *ensure that water policies, strategies and plans properly integrate climate change adaptation policies, strategies and plans including when implemented, and vice versa;*
- *truly integrate measures for adaptation to climate change with Integrated Water Resources Management plans, physical land planning, infrastructure development, PRSPs and all other relevant development plans and programmes – including non-water sectors that may nevertheless be affected by water-related climate impacts – not only indicate the existence of links between them;*
- *follow up on recommendations made in completed NAPAs, managing appropriate adaptation activities;*
- *raise awareness and build capacity to address water and climate issues in LDCs and integrate climate change consideration into water resources management in a participatory perspective.*

It is further important that this shift towards a more integrated, long-term perspective that is demonstrated in the projects most recently submitted to *inter alia* the SCCF, is mirrored in all strategic adaptation work to ensure sustainable development also in poor countries with a vulnerable population and environment.

8. References

Bates, B.C., Z.W. Kundzewicz, S. Wu and J.P. Palutikof, Eds., 2008: Climate Change and Water. Technical Paper of the Intergovernmental Panel on Climate Change, IPCC Secretariat, Geneva, 210 pp. www.ipcc.ch/ipccreports/tp-climate-change-water.htm

Bridges, G: Key message on Samoa's National Water Strategy and Policies, conveyes by the Asian Development Bank at Stockholm World Water Week 2007.
www.adb.org/Documents/Books/AWDO/2007/cr10.pdf

Decisions at UNFCCC/COP-meetings, text from UNFCCC on NAPA-process.

European Environment Agency. Technical Report 2/2007: Climate Change and Water Adaptation Issues. http://reports.eea.europa.eu/technical_report_2007_2/en/eea_technical_report_2_2007.pdf

FCCC/AWGLCA/2008/16.Rev.1: "Ideas and proposals on paragraph 1 of the Bali Action Plan. Revised note by the Chair."

Osman-Elasha,B and TE Downing, 2007: Lessons Learned in Preparing National Adaptation Programmes of Action in Eastern and Southern Africa. European Capacity Building Initiative, ecbi, policy analysis report. www.eurocapacity.org.

Schipper, L.F., Paz Cigarán, M. and M. McKenzie Hedger: Adaptation to Climate Change: The new challenge for development in the developing world. UNDP July 2008. http://www.undp.org/climatechange/docs/English/UNDP_Adaptation_final.pdf

Stern Review, 2006: The Economics of Climate Change. www.hm-treasury.gov.uk/independent_reviews/stern_review_economics_climate_change.

UNDP Human Development Report 2007/2008. Fighting climate change: Human solidarity in a divided world.

UNFCCC: LEG, 2002: Annotated guidelines for the preparation of national adaptation programmes of action.

UNFCCC: Listing of NAPA Priority Projects by Sector (from all submitted NAPAs as downloadable files) Accessed 081204. http://unfccc.int/adaptation/napas/items/4583.php

UNITAR, 2007: Analysis of NAPA Project Profiles

UN-Water (2008). *Status Report on IWRM/Water Efficiency Plans for CSD 16*

Annex I: Status concerning NAPAs and IWRM-plans in LDCs

LDC	GEF-support by the following:	NAPA submitted	Status IWRM plans[14]	Link NAPA/water[15]
Afghanistan	UNEP	- In draft		
Angola	UNEP	- In preparation	Initial steps	
Bangladesh	UNDP	November 2005	In place	Yes
Benin	UNDP	January 2008	In preparation	
Bhutan	UNDP	May 2006		Yes
Burkina Faso	UNDP	December 2007	In place	Yes
Burundi	UNDP	February 2007	Initial steps	
Cambodia	UNDP	March 2007	Initial steps	
Cape Verde	UNDP	December 2007	Initial steps	
Central African Republic	UNEP	June 2008	Initial steps	Yes
Chad	UNDP	- In preparation	Initial steps	
Comoros	UNDP	November 2006		
DR of the Congo	UNDP	September 2006	Initial steps	
Djibouti	UNEP	October 2006	Initial steps	
Equatorial Guinea	UNEP	- Not started		
Eritrea	UNDP	May 2007	In preparation	Yes
Ethiopia	UNDP	June 2008	In place	Yes
Gambia	UNEP	January 2008		
Guinea	UNDP	July 2007		
Guinea-Bissau	UNDP	February 2008		
Haiti	UNEP	December 2006		
Kiribati	UNDP	January 2007	In preparation	
Lao PDR	UNDP	- In draft	In preparation	
Lesotho	UNEP	June 2007	Initial steps	
Liberia	UNEP	July 2008		
Madagascar	World Bank	December 2006		
Malawi	UNDP	March 2006	In preparation	Yes
Maldives	UNDP	March 2008		
Mali	UNDP	December 2007	In preparation	Yes
Mauretania	UNEP	November 2004	In preparation	
Mozambique	UNDP	June 2008	In preparation	Yes
Myanmar	UNEP	- In preparation	Initial steps	
Nepal	UNDP	- Initiated	In preparation	
Niger	UNDP	July 2006		
Rwanda	UNEP	May 2007	Initial steps	Yes
Samoa	UNDP	December 2005	In place	Yes
São Tomé and Principe	World Bank	November 2007		
Senegal	UNEP	November 2006	In preparation	Yes
Sierra Leone	UNDP	June 2008		Yes
Solomon Islands	UNDP	- In preparation		
Somalia	Not party to FCCC	-		
Sudan	UNDP	July 2007	In preparation	Yes
Timor-Lesté	UNDP	- Initiated		
Togo	UNDP	In preparation		
Tuvalu	UNDP	May 2007	Initial steps	
Uganda	UNEP	December 2007	In place	Yes
UR of Tanzania	UNEP	September 2007	In preparations	Yes
Vanuatu	UNDP	December 2007		
Yemen	UNDP	- Draft		
Zambia	UNDP	October 2007	In place	

[14] Data from UN-Water (2008). Status Report on IWRM/Water Efficiency Plans for CSD 16

[15] "Yes" only indicate that Water Management to some degree is dealt with in the NAPA but not how.

Annex II: Analysis of water linkages in the NAPAs and National Communications of Bhutan, Eritrea, Niger, Rwanda, Samoa, Sudan and Zambia.

For each of the following countries interventions to deal with the impacts reported are suggested. An analysis of whether the policy framework or institutional structure would at all allow for the adaptation strategy to be developed ends each country discussion. And for those countries where projects have been submitted for implementation under the LDC Fund these projects are mentioned although they are not yet being implemented.

Bhutan (NAPA submitted May 2006, 1st NC September 2000)

Bhutan is a mountainous country situated on the southern slopes of the eastern Himalayas. 72.5% of the area is forested and 7.8% is used for agriculture, mainly by smaller, subsistence farmers. The economy is highly depending on hydropower. As all the major rivers originate from glaciers and glacier lakes in the higher Himalayas and are discharging into Brahmaputra in India, the country and in particularly the valleys and the rivers are very vulnerable to climate change, both to temperature variations and change and to changes in precipitation pattern. Climate extremes are resulting in particularly in Glacier Lake Outburst Floods (GLOF) and devastating flooding of the valleys.

Identified vulnerability: The most vulnerable sectors identified are agriculture and hydropower as they do both depend on monsoon and temperature change pattern. And the most vulnerable communities are the rural poor depending directly on small scale farming and livestock.

Identified primary and secondary water impacts: Flash floods, resulting from extreme rainfall or extreme glacier-melting, result of course in severe impossibilities to run hydropower stations smoothly a problem that is rapidly increasing downstream. Flooding is also sometimes resulting in gully erosion, heavy landslides and sedimentation exacerbating the problem by causing not only water related problems but also destroying the farmlands and changing the morphology of rivers, lakes and dams. *Primary* sectoral impacts of climate change to Bhutan are, thus, to several water depending sectors, mainly to the agricultural sector and to the energy/hydropower sector but also the water sector including water for drinking water. Flooding and water-induced erosion or drought is also directly impacting the growing conditions for the forests and thus the forest sector.

Secondary water related effects are, thus, impacts to peoples' health as a consequence of decreasing water and food supply due to the impacts on access to drinking water and on water for agriculture. Other secondary effects are to income generating activities for the poor people due to less possibility to grow or to feed their livestock on the eroded lands, and to the economy of the country as a consequence of irregularities in hydropower production which is the main export product.

Identified adaptation framework, including links to relevant strategies etc. and governance means: In its NAPA Bhutan identified the National Visions, Strategies and Plans (including the PRSP, the National Environment Strategy, the ratification of the UNFCCC and the CBD, the participitation in UN-processes and the cooperation under the International Center for

Integrated Mountain Development (ICIMOD)) of relevance for the work on the objectives of the NAPA but without clearly identify the possible synergies. There is, however, no reference to the National Water Policy (under development). Further, under its NAPA Vision Bhutan identified as important to integrate climate change risks into the National Planning Process. But neither the NAPA nor the NC did identify any detailed institutional structure for implementing the NAPA. They identified the Information gaps such as regareding "Effects of climate change on water resources" and "Cumulative effects and indirect impacts of climate change effects". Capacity Building Needs are "Training on vulnerability to climate change in lower mountain valleys…", and "strengthening institutions such as NGOs as well as Government departments and ministries…" without specifying how they should be strengthened, which role they would play, any working structure and who should be accountable. These issues would need to be developed in a participatory approach, should Bhutan be able to develop any long term, forward-looking adaptation strategy within their own governance structure.

One project submitted for NAPA Implementation under the Least Development Countries' Fund: "Reduce CC-induced Risks and Vulnerabilities from Glacier Lake Oustbursts in the Punakha-Wangdi and Chamkar Valleys" UNDP.

Eritrea (NAPA submitted April 2007, 1st NC December 2001)

Eritrea with its central and north-western highland plateau and flat coastal plans along the Red Sea has a mostly arid climate although with extremely variable rainfall pattern between years and regions. Over 80% of the population is depending on traditional subsistence agriculture. Agriculture accounts for 21% of the country's GDP. One reason for the low figure is the erratic rainfalls with high variability, which also result in continuous soil degradation. The degree of poverty, about 66% of the population was below the poverty line in 2003 and concentrated to the arid rural highland areas, is partly a result of the political instability although one of Eritrea's immediate development priorities have been to meet the basic needs of the population.

Identified vulnerability: Agriculture is particularly susceptible to the changing rainfall pattern in a country which is modestly suited for rain-fed agriculture. The livestock on which the pastoralist in the eastern lowlands and north-western rangelands are depending is also particularly vulnerable to the lack of water. The poor fishing communities in the coastal zone as well as the coastal ecosystems are other vulnerable systems.

Identified primary and secondary water impacts: The changes in rainfall pattern, when the main rainy season starts later (if at all!) and finish earlier and is much more erratic and heavy has a strong *primary* impact to the agriculture sector, and results in gully erosion destroying the farm lands. The river system shows a seasonal flow pattern directly responding to the changing rainfall pattern. Villages and towns in the upstream areas are particularly experiencing scarce water supply as impacts of droughts.

Secondary impacts identified in the NAPA are to the coastal zones where people in a situation of surface water shortage are pumping and over-extracting groundwater, resulting in salt-water intrusion and an even more accenting freshwater shortage. Flooding in upstream areas has also an increased effect downstream as few of the rivers are regulated.

Another secondary impact identified is to peoples' health where the spreading of vector-borne diseases, such as malaria has increased, as has malnutrition, thus food insecurity.

Identified adaptation framework, including links to relevant strategies etc. and governance means: According to the NAPA, strong linkages were established with key national initiatives including with its interim PRSP presented in 2007 and of course to what was presented in the 1st National Communication, in 2001. The emphasis on agriculture and food security is evident in both documents but it is notable that although the National Communication was prepared under the Ministry of Land, Water and Environment, there is no reference to a need for any Water Policy. There is a strong possibility for synergy with the adaptation recommendations under NAPA and foci under the CBD and CCD including as there is an "overlap in participating institutions". As the Eritrean NAPA also identified the National Capacity Self-Assessment, NCSA, as a process that "helps identify key deficits in institutional capacity and institutional linkages and aids the process of creating synergies", the NCSA seems to be crucial in implementing the NAPA including its water-related needs. This would be a first step in identifying institutional capacity and structure needed for implementing an adaptation strategy.

One project has been submitted for NAPA implementation under the LDCF: "Integrating Climate Change Risks into Community Based Livestock Management in the Northwestern Lowlands of Eritrea", UNDP.

Niger (NAPA submitted July 2007, 1st NC November 2000)

Niger is a West-African arid landlocked country. Around 77% of the country, the Saharan desert zone in the northern part, has an annual precipitation of <150 mm and a very high rate of evaporation. It is the part where people are practicing small scale irrigated farming. The Sahara and Sahelian zone, south of Sahara, covering around 22% of the country, receives an average annual rainfall of 150 – 600 mm and is mainly suitable for livestock breeding. The remaining south western 1% of the country receives 600 – 800 mm annual rainfall and is suitable for agriculture and livestock production. The yearly potential evapotranspiration for the country is 1800 to 2200 mm. The main surface water source is the Niger River crossing the south-western parts. In the south-eastern corner is what up to 1980's used to be parts of Lake Chad, these parts are now dried. The majority of the people live in the south parts depending on agriculture and pastoral activities. 87% of the population is depending on activities within the rural areas while only 38% of the GDP is made up by agricultural production.

Identified vulnerability: As most of the country is water scarce the whole country is vulnerable to climate change. At the end of 1980's the agriculture could only cover 86% of the food needs and during drought periods there has been a considerable reduction in cattle. About 1% of the area is forestry area, a number that is decreasing. And as it is at the margins of several forestry species this area too is very vulnerable. In the regions without vegetation cover, large parts of the desert, wind erosion and water erosion during the rare erratic rainfalls is causing land degradation and transport of sediments. This is resulting in loss of soil fertility and ecosystem remnants, changes in river patterns and destructions of human habitats.

Identified Primary and secondary water impacts: The *primary* impacts as recounted in the NAPA for the water sector is to the rivers, which except the Niger River are wadis (only

occasionally or partially having any water). The less frequent and more erratic rainfall causes water erosion, decreasing of water for household use and for food production. Decreased fishing for living when water points are dried out or filled with water- or wind-borne sediments, is another primary impact. *Secondary* impacts are of course to the health sector mainly due to lack of water for food production, but also to the economy for the ones having fishing as an income-generating activity.

Identified adaptation framework, including links to relevant strategies etc. and governance means: The NAPA document specifically identifies the linkages and synergy between what are prioritised in the NAPA, the PRS and the Rural Development Strategy, SDR, for Niger. And the objectives of these strategies are much in line with each other although the PRS and SDR[16] are not referring to adaptation to climate change. The NAPA document also mentions that the adaptation measures identified by the NAPA framework are in synergy with the MEAs, but without specifying it. There is no specific mentioning of any water related policy.

The possibilities to implement the NAPA are very briefly discussed in the document. It identifies the "lack and/or shortages of material and financial means" as a main constrain. The document, otherwise, only describes the process of producing the NAPA. It mentions that "the priority activities of the NAPA will be under the responsibility of the decentralized services of the Ministries in charge of the sector", that they will be supported by the "Local Running Committee" and that they will "collaborate, if necessary, with other organisations". The governance structure is completely missing from the document and so is any discussion of needed capacity etc. This might depend on the real need for capacity enhancement. But this NAPA therefore is not able to identify institutional possibilities to implement an adaptation strategy in a long-term perspective and in a process owned by the country.

One project has been submitted for NAPA implementation under the LDCF: "Implementing NAPA Priorities to Build Resilience and Adaptation Capacity of the Agriculture Sector to Climate Change in Niger", UNDP.

Rwanda (NAPA submitted December 2006, 1st NC June 2005)

Rwanda is a small, mountainous, densely populated country just south of the equator. The terrain is fairly rough with ridges in the north/south direction as it is situated in the African Rift zone, with highest parts between 3000 to over 4500 in the north and west and lower parts in south-west around 900 m. The climate is modified by the high altitude to a temperate climate, thus with less evapotranspiration at higher altitudes and a varying degree of humidity. The rural population, around 83%, is dispersed with a concentration to the northern parts of the country but migrating towards south east and less populated areas. Heavy rains in the mountainous region with its important relief make regions with less stable vegetation cover susceptible to rainfall induced water erosion and land degradation. This in turn makes the lands less productive. Almost 90% of the population earns its incomes within the agriculture sector, which account for 43% of the GDP.

[16] "The SDR is currently being revised, and although adaptation per se is not mentioned, the development partners and government are very much mindful of the impacts of climate change and need to climate proof development under the SDR." Comment by Mirey Atallah.

Identified vulnerability: Rwanda's strong dependence on natural resources makes it vulnerable to climate changes and variations, in particularly to extremes. Floods and landslides may also cause disruptions in infrastructure, which is a particularly vulnerable sector in a country with this type of terrain. The NAPA is also recognising biophysical vulnerability which can be measured in relation to the extension of the periods of vegetation growths and the duration of periods of suitable weather conditions, a type of vulnerability that now increases.

Identified Primary and secondary water impacts: Increase of temperature, prolonged droughts and high evapotranspiration, in particularly in the swampy regions, may result in lower river flows and water levels of lakes and rivers. This therefore has *primary* impacts to the water sector as well as to ecosystems of rivers and lakes, and to food security by affecting water access for agriculture. Further, droughts as well as heavy rains, floods and associated landslides also result in primary impacts to the energy sector by reducing the hydropower production.

Changes in water quantity are also reported in the NAPA as resulting in *secondary* impacts to the health sector by increasing water-borne diseases, and to the economy by reducing production and GDP. Such changes are, thus, reducing rural population revenues, and resulting in migration by the population in search for food and income.

Identified adaptation framework, including links to relevant strategies etc. and governance means: The NAPA recognised the policies dealing with development, poverty and vulnerability such as the PRSP, and the integration of climate aspects into the Economic Development and Poverty Reduction Strategy of 2006. It further recognised policies and plans for the implementation of MEAs, the latter without identifying how climate adaptation was recognised in those plans.

The Rwanda NAPA is the only one of the NAPAs studied more in detail that discusses the Integrated Water Resources Management as a priority option to address climate adaptation. They see the target groups as rural communities, agro-animal husbandry and urban population. The NAPA also recognises that an adaptation strategy needs to be integrated with the Rwanda Vision 2020, the PRS and the National Strategy to Combat Desertification, as it has multi-sectoral cross-cutting aspects. The stakeholders to the process should include public sector, private sector, NGOs and local communities.

There is no discussion of the institutional and human capacity needed to implement the NAPA or of the adaptation framework. But the NAPA document includes a brief logical framework analysis for each suggested prioritised project under the NAPA, a LogFrame (briefly following the GEF LogFrame structure as a template) that also includes a discussion of risks and barriers. This LogFrame only recognises more technical risks without any suggestions for how any larger barriers should be overcome. Mainly these projects have appropriate ministries specified as suggested Implementing agencies, but without recognising one of them as the responsible one and without identifying executing agencies.

Samoa (NAPA submitted December 2005, 1st NC October 1999)

Samoa is a Small Island Developing State situated in the South Pacific. The two larger islands are built by volcanoes, the highest one more than 1850 m. They consist of easily eroded lava

plateaus and coastal lava areas and are surrounded by coral reefs. Some crater lakes exist with discharging rivers. The islands lie in the tropical climate region, in the south-east trade winds with tropical cyclones and heavy rainfalls during summer period and temperature around 25°C the whole year. About 70% of the population lives in the low-lying coastal areas and the main income-generating sector is the tourist sector and to some extent the fishing sector.

Identified vulnerability: The very shifting rainfall pattern as a result of climate change and the El Niño and the easily eroded land and coral reefs make the islands very vulnerable to impacts of climate change. The fact that the main infrastructure is in the low-lying coastal areas, together with the people living there makes this region very susceptible to climate extremes and climate change, both the more frequent storms and to the more slowly occurring sea-level rise.

Identified Primary and secondary water impacts: *Primary* impacts to the water sector recognised in the NAPA and the National Communication is the lack of water supply and the poor water quality. The lack of water supply is due to prolonged droughts or gully erosion resulting from flooding in higher areas. Flooding inundation of land is also destroying houses and villages. Plantation and livestock contribute to food security, together with fishing. Extreme weather events, in particularly storm surges, affect coastal plantation. Insufficient amount of safe water for household and for food security also increases health hazards as a *secondary* impact. Coastal erosion and destroying of coastal infrastructure, and insufficient amount of water is further impacting the tourist industry and hence the economy.

Identified adaptation framework, including links to relevant strategies etc. and governance means: The adaptation framework for Samoa builds, according to the NAPA on the national development goals, strategies and plans implemented by the government. The NAPA also identifies close linkages to the National Development Strategies, among which one is the national land use policy and another one is *the water resource policy*. Further, the NAPA recognises the synergy between Samoa's NAPA and its vision and the National Biodiversity Strategy and Action Plans, the Coastal Infrastructure Management Plans, etc and with the implementation of undertakings under the MEAs.

The NAPA document further discusses the risks and barriers for each proposed project profile under the adaptation framework But as under the other NAPAs there is no discussion on how to overcome these barriers.

Further, the Samoa NAPA as opposed to the other NAPAs studied in detail, formulises an Implementation Strategy for its NAPA within which they will build on the institutional framework, including stakeholder participation that was set up for the NAPA process. The Ministry of Natural Resources, Environment and Meteorology is to be designated with the responsibility to coordinate the process. However, there is no discussion of the needed capacity to successfully implement the full process, even though there is a good base for developing a well functioning governance structure.

One project has been submitted for NAPA implementation under the LDCF: "Integrated Climate Change Adaptation in Samoa", UNDP.

Sudan (NAPA submitted July 2007, 1st NC February 2003)

Sudan is one of two Arab LDCs. It is Africa's largest country. In more than 50% of the area of the country the ecosystems are arid and semiarid where the Northern parts are desert with practically no precipitation. Savannah ecosystems cover less than 10% of the country. Only the southern parts have an annual rainfall that might exceed 1000 mm. Most of this occurs during the rainy season March – October, but the high temperature results in high evaporation. Only about 1/6 of the country is actually cultivated, and about 2/5 consists of pasture and forested lands. The River Nile (including the Blue and the White Nile) traverses Sudan from Ethiopia and Uganda to Egypt and is Sudan's most important water source. About 35% of the population lives on or close to the River Nile flood plain. Large parts of the population in the Kordofan and Darfur, the Central and Northern region were severely suffering by the droughts of the 1970s and 1980s, which resulted in deaths and migrations. These displaced people are facing unemployment, water- and food insecurity as well as political insecurity due to that the situation has developed beyond what the country has capabilities to address. Agriculture, the main occupation is making up for less than 50% of Sudan's GDP although it covers almost 80% of its total export.

Identified vulnerability: The NAPA identifies the northern and western (N. Kordofan and Darfur) parts and central rain-fed areas as particularly vulnerable to the frequently occurring droughts. The regions within the River Nile Basin, in particularly the swampy southern parts and coastal areas are particularly vulnerable to frequent floods, while frequent dust storms and more rare heat waves, and wind storms make the central and northern parts particularly vulnerable. The erratic rainfall may also result in gully erosion which together with wind erosion may degrade land including its soil fertility, which makes agriculture sector, livestock as well as water resources very vulnerable over most of the country.

Identified Primary and secondary water impacts: *Primary* impacts of climate change to the water sector are of course decreased access to water for household use due to more frequent droughts. Droughts or floods also result in decline in water access or soil fertility and a loss of crops and livestock, thus severe food security degradation. The droughts are also resulting in decline in surface water which adversely impacts hydropower generated by the plants of the River Nile. The country is totally depending on its vulnerable energy resource also economically.

Frequent droughts and less surface water *secondary* also result in reduced groundwater recharge and an accentuated lack of access to water. The migrating and to some extent increasing population, which results in increased pressure on water, together with decreased or hazardous access to water, has secondary impacts on human as well as ecosystem health and on the health of crops and livestock. Less running water in the swampy areas increase the existence of insects and plant diseases as well as vector-borne diseases and may result in loss of lives. Secondary impacts of floods may also occur to the infrastructure.

Identified adaptation framework, including links to relevant strategies etc. and governance means: Sudan has according to the NAPA been actively seeking to mainstream adaptation in sectoral and development policies including in the 25-year National Strategy Outlines. The PRSP focuses on water resources, agriculture and health. In particularly, the NAPA recognises national water-related projects that should result in increased water access and increased capacity to cope with the impacts of climate variations and hazards. In the NC

Sudan further emphasis the need to link to ongoing work under the conventions, although the identification of the strategies is not detailed.

In the presentation of priority adaptation activities the NAPA recognises the needs to strengthen policies and strategies to guarantee food security for humans and animals. The adaptation strategies are further needed for utilization of natural resources and for targeting the increase of production. There is further a need to address the gaps in laws and legislations that regulate this work. The NAPA recognises the need for institutional strengthening to provide frameworks for integration of NAPA recommendations in the water resources and agriculture sectors. In particular it mentions the lack of sector-specific coordination between the affected sectors. A detailed structure for the NAPA preparation process is presented but without specifying the different actors including the responsible institution or its linkages to the government.

One project has been submitted for NAPA implementation under the LDCF: "Implementing NAPA priority interventions to build resilience in the agriculture and water sectors to the adverse impacts of climate change in Sudan", UNDP.

Zambia (NAPA submitted September 2007, 1st NC August 2004)

Zambia is situated at an altitude of 900 to about 1500 m with the Rift zone transversing the eastern parts. Main part of the country's water is discharged by tributaries to the Zambesi River, which runs along the boarder to Zimbabwe. The climate is tropical with a temperature between 15°C and 30°C but with extremes up to 38°C. The rainy season is November – April and the annual precipitation varies from around 1300 mm in the northern parts to around 600 mm in the south. Weather extremes have, however, increased considerably and between 2000 and 2007 there have been two drought years and two flood years, of which the 2006-07 flood had devastating effects. Only about 10% of the area is possible to utilize for agriculture but almost 70% of the population depends on income from the sector. The erratic rainfall combined with the countries dependence on rainfed agriculture has, however, drastically decreased the agriculture sector.

Identified vulnerability: The NAPA and the NC identify 5 vulnerable sectors in Zambia, the primer one is the agriculture sector, in particularly as the country still is completely devoted to rain-fed agriculture, although having access to a large part of the southern African water resources, mainly in the Zambezi River system but also to a minor extent in the north-western corner of the country, the Congo River system. The other vulnerable sectors are the Water and Energy sector, the Natural Resources/Wildlife/Forestry sector, and the Human health sector. All these sectors are very susceptible to rapidly shifting climatic extremes. Also the economic sector is very vulnerable to the extreme climate variations, which are thus resulting in increased poverty for the country.

Identified Primary and secondary water impacts: The recurrent droughts and floods are *primarily* resulting in crop failures, due to water logging and water erosion, or during drought years shortening of the growing season. The primary impact on the water sector is a non-reliable access to water for household or water for the animals. Disastrously decreased or increased river flows are also causing disruptions to the hydropower generation as well as to the generation of groundwater. *Secondary* impacts are malnutrition and diarrhoeal diseases

due to crop failure or decreased access to drinking water. Extreme cases may result in famine and loss of lives as well as productive assets.

Identified adaptation framework, including links to relevant strategies etc. and governance means: The NAPA recognises among key policies, strategies and programmes that are relevant to the NAPA process and where synergies should be sought, the National Policy on Environment 2007, the Water Act of 1948, the Irrigation Policy and Strategy of 2004, the National Water Policy of 1994, the National Policy on Wetlands Conservation 2002 and the linkages to the CBD and the CCD. Further the NAPA document discusses the level of relevance to NAPA, existing programmes that may integrate Climate Change Adaptation may have. The sectors assessed are: agriculture, fisheries, human health, and natural resources but not the water sector.

The NAPA also recognises potential barriers to implementation including: lack of financial resources; lack of clear and specific legal and policy framework; lack of institutional, system and individual capacity and inadequate public awareness. For the NAPA preparation process the key ministries and organisations involved, including the lead ministry, the Ministry of Tourism, Environment and Natural Resources are identified. But there is no structure or leading institution identified for the implementation phase of the programme, nor is there any discussion on how to overcome the barriers identified to achieve a successful implementation of the programme.

Annex III: Adaptation to climate change in water resources planning and part of National Water Strategies of Bhutan, Eritrea, Niger, Rwanda, Samoa, Sudan and Zambia.

Bhutan

Bhutan has developed a National Water Policy, currently in draft and not yet agreed. Although it is not developed as a formal Water Resources Plan it addresses water use interest including water allocation, water resources development and management, and the institutional capacity building for water resources development and management as well as human resources development. The policy also identifies the political structure including responsible ministries needed for the integrated management of the water resources.

Adaptation to climate change is integrated into the policy as the need to address the impacts of the glacier lake outburst floods, GLOF, resulting from glacier melting due to climate change, is specifically emphasised. This is the most important impact and addressed as a water-related impact of climate change within the NAPA, as well as in the water policy draft.

Eritrea

Eritrea did in 2007 present a draft Integrated Water Resources Management and Water Efficiency Plan (IWRM/WE), building *inter alia* on a Situation Analysis presented in July 2006[17]. The process in doing this is led by the Eritrean Government and executed by the Ministry of Land, Water and Environment. Global Water Partnership has been the facilitator of the process. The main emphasis of the process has been on

- establishment of political will for change and stakeholder participation in the planning process;
- improvement of the knowledge level of stakeholders on critical aspects in the development of IWRM;
- an IWRM strategy and plan of action own by the Eritrean government and with buy-in from key stakeholders;
- capacity development of staff in existing institutions;
- support to integration of water into PRSPs and all development plans in Eritrea.

Unfortunately the project document does not specify all the different aspects that should be integrated into such a strategy including whether adaptation to climate change and its impact to the water sector would be one.

The National Action Programme for Eritrea to combat desertification and mitigate the effects of droughts, the action programme under the CCD, includes Climate Variations and drought under drought-preparedness as a factor contributing to desertification. And the Actions part addresses the issues under the “Drought Preparedness and Mitigation Plan”.

[17] Situation Analysis: The State of Water Resources in Eritrea, July, 2006. The Ministry of Land, Water and Environment. Water Resources Department. Eritrea.

Niger

Niger has no Integrated Water Resources Plan, nor has the country indicated that any initial steps towards that have been taken. There is a water law on water regimes from 1993 but that does not regulate water from a broader perspective.

The National Action Plan to Combat Desertification for Niger deals with drought to a minor extent and is not discussing climate change related aspects, nor are water related issues prominent in that Plan.

Under the GEF/World Bank/UNDP-project "Reversing Land and Water Degradation Trends in the Niger River Basin" the participating countries, including Niger are developing a "Strategic Shared Vision and Sustainable Development Action Plan for the Niger River Basin". This includes integrated land and water strategies also for the western parts of the Niger country but not linkages to adaptation to climate change.

Rwanda

Rwanda has so far only taken initial steps towards any Integrated Water Resources Management Plan within the framework of their "Sectoral Policy on Water and Sanitation" that was presented 2004[18]. The policy document also presents a sector strategy which includes set up of "politic, regulatory and institutional framework favourable to rational water resources management". Although the policy under the specific objectives also relates to water for agriculture, for environmental protection and for energy production, it is not a fully developed integrated water resources strategy. And there is no reference to any integration of adaptation to climate change.

Rwanda is also a member of the Nile Basin Initiative, and the Sector Policy paper on water and sanitation refers to current activities of the Nile Basin Initiative strategic action plans and the African Ministerial Conference on Water as complement to the sector policy. Strategies to address impacts of climate change under the Initiative have been discussed. Further, Rwanda is a member of the Lake Victoria Basin Commission (LVBC), which is directly established and funded by the EAC and as such has a high level of influence on national policies and programming. The LVBC and its member countries have currently engaged in an assessment of climate change impacts on lake levels and are defining health and ecosystem indicators which may help track these impacts.
The Rusumo falls hydro-power plant, an joint investment between Rwanda and its neighbouring countries is currently at pre-feasibility phase, and considered to be highly vulnerable; while planned to provide rural and industrial electrification to a significant section of the populations in these countries, it may be compromised by the impacts of climate change.

[18] Republic of Rwanda, Ministry of Lands, Environment, Forests, Water and Natural Resources: Sectoral policy on water and sanitation, October 2004.

Samoa

Samoa's National Water Resources Policy was approved by the Cabinet in 1993. The policy is coupled with a short-term strategy, to strengthen the capacity to implement the policy, and a long-term strategy, "to establish a regulatory framework for the sustainable management of water resources". The strategy is to be further developed also to address key challenges, which may include "effects of climate change, weak and fragmented institutional and regulatory framework, need to appoint an independent water regulator, low tariffs and poor cost recovery due to low willingness to pay…, poor utility performance due to lack of institutional capacity and investments, increasing pollution of resources, need to increase sewerage collection and treat all raw sewage, connect the urban poor, technical performance and services are poor". The Asian Development Bank is supporting in this endeavour. (Bridges, 2007)

The South Pacific Applied Geoscience Commission (SOPAC) in 2003 held a session at the Pacific Dialogue on Water and Climate, particularly dealing with "Water in Small Island Countries. One of its key resulting messages was to "Change the paradigm for dealing with Island Vulnerability from disaster response to hazard assessment and risk management, particularly in Integrated Water Resource Management"[19]. This of course concerns Samoa as being one of these countries but is a message that is much more widely relevant.

Sudan

Southern Sudan's water policy was approved in 2007. It concerns rural water supply and sanitation and urban water supply and sanitation.

Sudan successfully produced a "National water Policy" document that was approved in the year 2000. The policy document includes several aspects of water resources management, utilization, and protection. It relates to various sectors including agriculture, industry, health, energy and transportation, although not a full sectoral policy.

The Water Resources Act was passed in 1995 and the National Water Resources Council was formed. The Act includes parts related to stakeholders, research, pricing, licensing brick making, river transport vessels and water abstraction. It failed, however, to relate to wetlands, erosion, drainage, standards, water harvesting, water related diseases, rain water as a resource, etc. and the integrated approach was missing. And neither the policies nor the Act refer to climate change.

Further, Sudan is a member of the Nile Basin Initiative, the policies and strategies of which is important to Sudan as the river traverse the country from South to North. The transboundary aspects are particularly relevant as Sudan is a downstream country to Ethiopia and Uganda but an upstream country to Egypt. Climate change related strategies are also included under the Nile Basin Initiative. (See Rwanda)

[19] http://www.sopac.org/Pacific+Resource+Centre+on+Water+and+Climate

Zambia

The Water Act of 1948 is the building block of Zambia's water legislation. The Water Policy of 1994 developed under the Ministry of Energy and Water Development was important as it did not only concern water supply but also water resources management, a Revised Water Policy was issued in 2007. The same year a Water Resources Management Bill was drafted.

The Integrated Water Resources Management and Water Efficiency Plan was prepared under the Ministry of Energy and Water Development in 2006. As IWRM is a process which "promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems" adaptation to climate change shall, as appropriate, be integrated to the plan.

Zambia is also a member of Zambezi River Authority as main parts of the country is within the Zambezi River Basin, which is developing an Integrated Water Resources Management Strategy for the Zambezi River Basin, legally regulated by the Zambezi River Authority Act 1987. The largest storage reservoir is the 185 km^3 Lake Kariba, on the border between Zambia and Zimbabwe that is generating 6400 GWh annually and thus very vulnerable to climate change including hazards.