

The United Nations World Water Assessment Programme

Dialogue Paper

Water Adaptation in National Adaptation Programmes for Action

Freshwater in Climate Adaptation Planning and Climate Adaptation in Freshwater Planning

Gunilla Björklund, Håkan Tropp, Joakim Harlin, Alastair Morrison and Andrew Hudson for UNDP

The United Nations Development Programme (UNDP)



United Nations
Educational, Scientific and
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The United Nations World Water Development Report 3

Water in a Changing World

Coordinated by the World Water Assessment Programme, the *United Nations World Water Development Report 3: Water in a Changing World* is a joint effort of the 26 United Nations agencies and entities that make up UN-Water, working in partnership with governments, international organizations, non-governmental organizations and other stakeholders.

The United Nations' flagship report on water, the WWDR offers a comprehensive review of the state of the world's freshwater resources and provides decision-makers with the tools to implement sustainable use of our water. The WWDR3 represents a mechanism for monitoring changes in the resource and its management and tracking progress towards achieving international development targets. Published every three years since 2003, it offers best practices as well as in-depth theoretical analyses to help stimulate ideas and actions for better stewardship in the water sector.

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Freshwater in Climate Adaptation Planning and Climate Adaptation in Freshwater Planning

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1. Introduction

It has long been recognized that adaptation is critical to enable societies to deal with the impacts of both natural and anthropogenic environmental change, especially in low-income countries. This need was recognized in the process leading up to the Rio Conference in 1992. Perhaps foremost among current challenges to development is the threat of anthropogenic climate change due to greenhouse gases (GHGs).

The Stern Review Report (2006) recognized that adaptation to climate change, in contrast to mitigation, will in most cases provide local benefits (including economic benefits), brought about without long delays. Adaptation actions should be integrated into development policy and planning at every level, and as Stern emphasizes 'ignoring climate change is not a viable option – inaction will be far more costly than adaptation (p.48)'. In fact, much of the work of adaptation is an extension of sound governance and management structures, particularly in the water and water-related sectors, although it implies an evolution in the way this 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 twenty-first century and beyond (p.198)'. 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 the Intergovernmental Panel on Climate Change (IPCC) Working Group II in June 2008 (Bates et al, 2008) recognizes that freshwater-related issues play an instrumental role among key regional and sectoral vulnerabilities. The paper states that 'water 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. (p.7)'



Steadily growing in population, the state of Tamil Nadu in India faces growing shortages of potable water. Photo: Håkan Tropp, SIWI

Acronyms and abbreviations

CBD	Convention on Biological Diversity
CCD	Convention to Combat Desertification
GEF	Global Environmental Facility
GHG	Greenhouse Gas
GLOF	Glacier Lake Outburst Floods
ICIMOD	International Centre 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
NDS	National Development Strategies
NGO	Non-Governmental Organization
PRSP	Poverty Reduction Strategy Paper
SCCF	Special Climate Change Fund
SIDS	Small Island Developing State
UNDP	United Nations Development Program
UNDP WGF	UNDP Water Governance Facility at SIWI
UNEP	United Nations Environmental Program
UNFCCC	United Nations 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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In a report for UNDP, Schipper et al (July 2008) discuss the links between vulnerability to climate change and the development objectives of the Millennium Development Goals (MDGs). Such clear links at individual, group and society level are some of the reasons behind the efforts to mainstream adaptation that can be found in national development plans; such as in the case of Bangladesh. The report identifies the difficulties that can derive from different approaches to adaptation, which might occur across sectors, and may result in difficulties in mainstream adaptation into physical and developmental planning.

At the UNFCCC Conference of the Parties in Poznan in December 2008 (COP 14), adaptation was an important item on the agenda. During a Workshop on 'Shared visions on long-term co-operative action' held during a session by the Ad Hoc Working Group on Long-Term Co-operative 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 Least Developed Countries in his presentation stressed that it was necessary to: '[Shift] the paradigm from the current fragmented approach to adaptation to one that is based on rigorous planning and predictable and adequate financing'. He also pointed out that, '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 an effective, enabling environment for adaptation, nationally, regionally, and internationally with the support of appropriate knowledge-based institutional networks'.

It is evident that the impacts of climate change will seriously affect the availability of water resources and that responses so far have, at best, been slow in most developing countries. This 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 – in communities, nationally and internationally. The range of practices that can be used to adapt to climate change is diverse, and includes changes in behaviour, structural changes, policy-based responses, technological responses and managerial responses, all of which could be related to the water sector as well as to other sectors which water cuts across. The NAPA process is an example of an internationally initiated process – under the United Nations Framework Convention on Climate Change (UNFCCC) – that targets national work for the least

developed countries (LDCs). The report scrutinizes the interface between national water policies and NAPAs and examines to what extent and in what ways water issues are made part of the NAPAs. It also looks at the extent to which existing water sector plans and policies include adaptation to the effects of climate change as a strategic area.

1.1 The development of NAPAs

NAPAs are an initiative agreed under the UN Framework Convention on Climate Change (UNFCCC), at its Conference of the Parties in 2001. They aim to build adaptive capacity in the most vulnerable countries, the LDCs. The main objective of the NAPAs is 'to serve as a direct channel whereby the LDCs may communicate their urgent and immediate adaptation needs'. The NAPA document should also identify links to more long-term strategy frameworks, such as Multilateral Environmental Agreements (MEAs), Poverty Reduction Strategy Papers (PRSPs) and 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 the 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 outcome in terms of raising awareness and building the capacity to adapt to a changing climate. The LDCs often lack the institutional as well as the human capacity to address their adaptation needs. The NAPA process as well as other supporting activities can be seen as activities that enable such capacity or capability. 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 carried out based partly on this background material. This consultation with stakeholders includes the identification of regions and areas of specific vulnerability where severe adverse impacts of climate change will occur. The stakeholder consultations should further include identification of key adaptation projects, ranking them according to identified priorities and developing project profiles to address urgent and immediate adaptation needs.



River Basin South Africa. Photo: Katarina Andrzejewska, SIWI

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'. In addition, the process should involve a multidisciplinary group of experts, and undertake comprehensive and integrated assessments and it should

Box 1

At the UNFCCC COP 14 in Poznan, the need for 'enhanced action on adaptation' was discussed, including the importance of planning and implementation, the nature of adaptation plans including NAPAs, and the integration of adaptation into national policy. The final document¹ includes the following recommendations:

'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)'

¹ FCCC/AWGLCA/2008/16/Rev.1.

also recognize 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 5 April 2007. Half of these first 14 NAPAs were from African LDCs. According to the analysis the main weaknesses experienced during the process of preparing the NAPAs were the presence of institutional barriers that hindered the free exchange of information, including communication problems between central offices and states. The main strengths according to Osman-Elasha and Downing were the participatory approach taken and the consideration of both vulnerability and adaptation. The Osman-Elasha and Downing analysis built on interviews with members of NAPA teams, and the most important conclusion reached 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 Global Environmental Facility (GEF), and to create synergies with ongoing planning processes.

Climate change and climate variability by definition imply long-term changes of mean temperature and of precipitation/evaporation due to GHG emissions as well as extremes such as droughts and floods. The water sector and other sectors that depend on access to water are invariably impacted. So an important aspect of adaptation to climate change is 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 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 World Summit on Sustainable Development in Johannesburg 2002.

By late 2008, 38 LDCs had completed the process leading to the NAPA document and presented it to the UNFCCC.¹ Twenty-four of the NAPA documents were produced with support of the United Nations Development Programme (UNDP), 12 with the support of the United Nations Environmental Programme (UNEP), and two NAPA documents were produced with the support of the World Bank. According to the progress report on the LDC Fund

¹ The following NAPAs were submitted by April 2008: In 2004 Mauritania, 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.

and the Special Climate Change Fund of 21 October 2008, (GEF/LDCF.SCCF.5/inf.3) six additional NAPAs are expected to be completed in early 2009.

Only 4 LDCs had reported having IWRM plans in place and only 14 were preparing their IWRMs according to a survey undertaken by UN-Water for the Commission on Sustainable Development meeting in New York in May 2008 (CSD 16; see UN-Water, 2008). By the UNFCCC meeting in Poznan in December 2008, two more were in place.

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

2.1 Overall approach

The countries involved in the NAPA process should (a) synthesize available information on the adverse effects of climate change, (b) based on such information, they should assess their country's vulnerability to current climate variability and extreme weather events, and (c) 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 with a sustainable development perspective. The sustainable development approach, capturing the social, environmental and economic components, implies 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 geared towards both 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 NAPAs implementable, which 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 recognized, 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 is the most important sector to most of the LDCs – mainly from the perspective of food security but also to some degree for income generation – the impact 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.

Box 2

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

Countries such as Mauritania, Mali and Burkina Faso are all experiencing desertification, which is emphasized by climate change and variation. Access to water is normally very restricted and land and water resources in large parts of the countries and in the instance of Mauritania 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 which share a water resource – such as Ethiopia and Sudan who share the Nile River basin, Guinea, Mali and Niger who share the Niger River basin, or Zambia and Mozambique situated in the Zambezi River basin – are all experiencing a situation where the water and climate vulnerability is exacerbated by 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 recognized in the UNDP Human Development Report 2007–2008, these processes are often completely separate.² With

2 One example is that the findings of the Mauritanian 2004 NAPA were not included in its 2006 PRSP. UNDP HDR 2007–08, Box 4.7

regard to ongoing water reform work, in many LDCs there is thus a disconnection between work already being carried out 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 mere link between the different programmes. As the framework for adaptation programmes, the 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 individual countries. Most of the NAPAs merely briefly refer to the fact that there *is* a connection to these. This sometimes makes NAPAs seem more like a list of immediate actions rather than a comprehensive *plan* for how to address the issues of adaptation to climate change. And very seldom could the NAPA 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 severe glacier melting or glacier lake outbursts. Long-term adaptation for some of the Asian LDCs might include strategies to adapt to a situation where there will be less access to water in all regions once the glaciers have melted away, as well as significant sea-level rise with flooded and eroded coastlines and large groups of environmental refugees.

The NAPA framework should also, where possible, identify potential barriers to implementation, not just financial barriers but also, more significantly, issues of institutional capability. The issue of barriers including those linked to the governance system, was discussed at workshops during the NAPA process.³ Such issues, as well as lack of political will are, however, not identified as barriers for the implementation of the NAPAs. Neither is there discussion in any of the NAPAs as to how the barriers should be addressed in order to be overcome.

2.4 Adaptation project profiles

While countries identify climate change *impacts* on ecosystems or regions, they 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 country (Small Island Developing State) identified its shifting sectoral needs. Cape Verde identified three objectives under its adaptation programme: 'promoting IWRM in order to guarantee water for the people, for the production of food, for the ecosystems and for the tourism industry'. The sector-specific projects identified as responses to the needs and objectives,

generally fall under the water, agriculture and health sectors, which is to be expected in the case of LDCs.

The activities or projects should then be prioritized according to the guidelines for the preparation of NAPAs and the criteria for prioritization should include: (a) the degree of the adverse effects of climate change; (b) a reduction in poverty to enhance the capacity to adapt; (c) synergy with other multi-lateral agreements; and (d) cost-effectiveness. This process results in a list of priority projects, often specified as activities.

The projects identified have different degrees of detail. Some are all-encompassing while others are very specific. Among the prioritized, sector-specific

Box 3

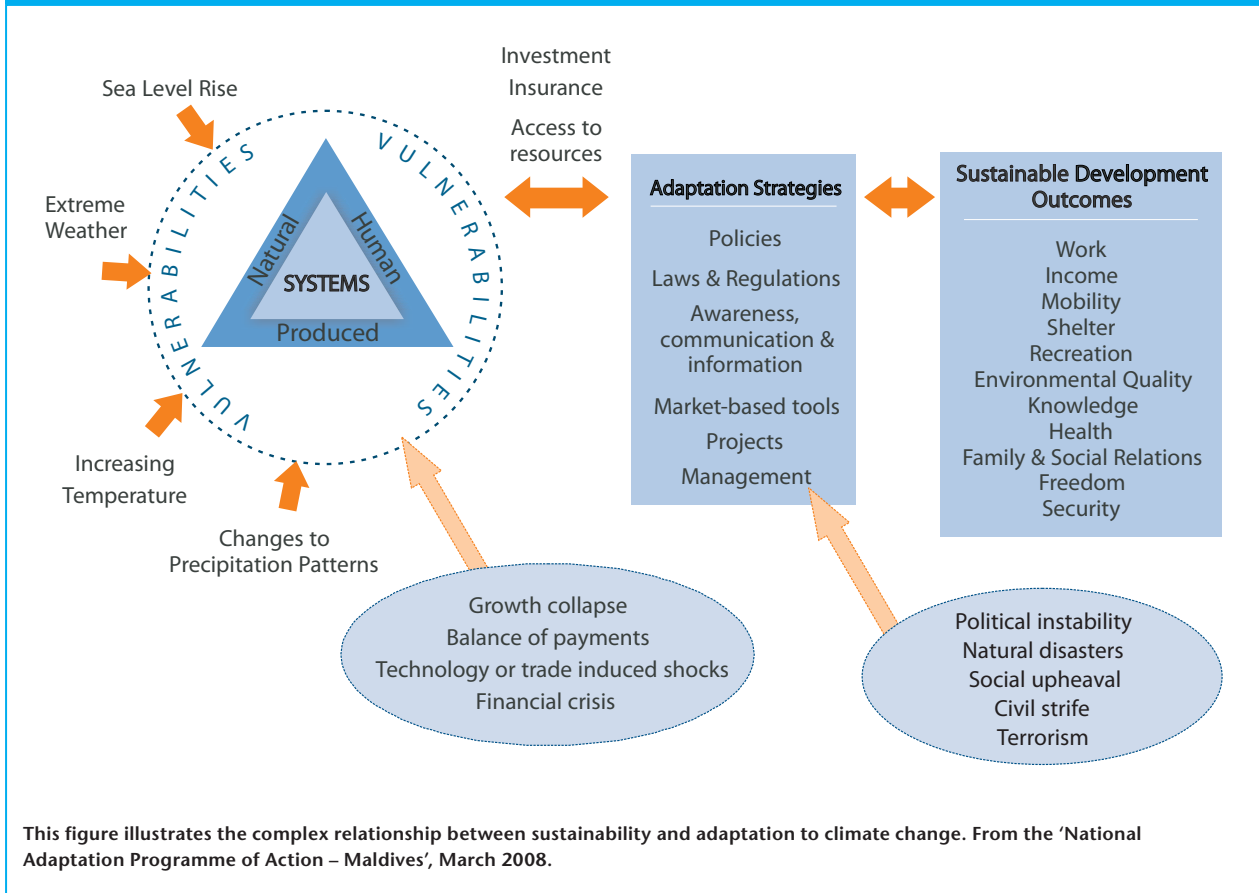
In 2007, The United Nations Institute for Training and Research (UNITAR) presented a document that analysed and categorized the project profiles according to their main topics, either sector or non-sector specific, for each of the 21 countries which had, at that time, presented a NAPA. Six out of the 21 countries ranked water management and rainwater harvesting as the sector where adaptation measures were most needed. A further three countries ranked this as the second most important sector. Water issues were thus considered important from an adaptation perspective. The suggested interventions varied from 'Control the river dynamics of watercourses and torrents...' and 'Increase the number of hydroelectric power microstations' to 'Develop 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 recognized 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 focus primarily on achieving the MDGs, others focus specifically on building resilience to climate variability, but good projects integrate climate resilience into wider development work.

On the official webpage of The United Nations Framework Convention on Climate Change (UNFCCC), the secretariat has created easy-to-use indices of the NAPA Priority Projects by country and by sector, based on the 38 NAPAs already received. (The <http://unfccc.int/adaptation/napas/items/4583.php> accessed December 4, 2008). Eighty-nine of the projects included in the NAPAs, and by far the largest group, deal with the food security sector; 65 projects are identified as being within the field of terrestrial ecosystems, and 64 projects fall within 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. All but four of the countries that submitted NAPAs have clearly identified water as a key issue. Five suggest that 'water projects' are broad, all-encompassing projects, 20 concern water management, 18 deal with water supply (mainly drinking water supply), nine are technical projects such as dam-construction, etc., eight are projects on water for irrigation and only four of them concern water quality and water pollution.

³National Adaptation Programmes of Action (NAPAs) – a limited approach.

3 UNITAR 2003–2004: National Adaptation Programmes of Action (NAPA). Selection of Examples and Exercises Drawn from Regional NAPA Workshops.

Figure 1 Conceptual framework of NAPA



projects are a wide range of projects within the field of water management and water harvesting, somewhat fewer fall into the categories of water quality and sanitation, and a number of projects deal with the promotion of drought-resistant crop varieties and farming practices.

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

Scope for NAPA improvements

The main weaknesses in almost all the NAPAs prepared are:

- the lack of clear links between what is in the content of the NAPA and what is in the content of the Poverty Reduction Strategy Papers (PRSPs), National Development Strategies (NDSs), IWRM plans, MEA action programmes, etc. – there should be more than just a link between the programmes;

- the lack of recognition of institutional barriers, including the lack of political will to take 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 more recently submitted NAPAs are better developed, and the NAPAs for both Mozambique and for Sierra Leone include:
- a more advanced discussion of 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 and adaptation, which makes the NAPA more process-oriented, where the process is not only a participatory process but also an adaptation strategy and an exploration of 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.

The main advantage of the NAPA process is that it is a participatory *process* where governmental representatives, NGOs and people concerned work together to identify and develop adaptation projects including the development of an adaptation capability. 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 and probably 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 that are 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, particularly in 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,⁴ technical, analytical and institutional capacity are the key elements.

Box 4 Building community capacity in climate change adaptation:

To reduce the vulnerability of coastal communities to the impacts of climate change, UNDP is managing a GEF programme 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 programmes help communities to adapt to climate change impacts.

⁴ 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

3. Analysis of water links in the NAPAs and national communications plans of different categories of LDCs

The impact of climate change on water resources poses different types of challenge 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 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 the UNDP, primary and secondary impacts on freshwater caused by climate change were presented for some LDCs that had completed their NAPAs.⁵ These countries were Bhutan, Eritrea, Niger, Rwanda, Samoa, Sudan and Zambia (representing a high-Himalayan country, countries in semi-arid and humid eastern and central Africa, arid West African countries, a SIDS country, an Arab country and a southern African country). A more detailed discussion is found in Annex II. Table 1 reports on their vulnerable sectors and the foreseen adverse impacts on the individual countries. It also states whether the countries have identified links to development strategies, water-related strategies, or institutional and governance systems to implement the NAPAs. Finally, it describes what kind of water-related NAPA project the country has proposed; and whether the country has developed any NAPA project into an approved LDC Fund Adaptation Program.

3.1 Analysing water as included in NAPA frameworks

There is a basic relationship between climate change and fresh water. 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 the impacts of climate change would, of 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.
- The structure of a NAPA, as identified in the LEG guidelines,⁶ is *more focussed on the political, participatory process* by which priority actions and activities are to be identified than on the outcomes of implementing these actions and activities.

⁵ The rationale behind the selection of these particular countries from the list of those who submitted their NAPAs before November 2008 for a more detailed analysis was to find sample countries that represented all the different categories of country that are expected to present NAPAs.

⁶ UNFCCC: LEG, 2002: Annotated guidelines for the preparation of national adaptation programmes of action.

Table 1

Country	Vulnerable sector/ Impact	Link to strategies. Equipped for good governance?	Identified water- related NAPA project(s)	Approved LDCF project
Bhutan	Agriculture, hydroelectric power. Important problem: Glacier Lake Outburst Floods (GLOFs).	Links to PRS. No detailed institutional structure	1. Rainwater harvesting	1. Reduced CC-risks and vulnerability to 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 agricultural production 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 water and ground water	1. Implementing NAPA priority interventions of agricultural sector. (PIF ¹ 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. Important problems: 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 hydropower. Important problems: northern parts water scarce, southern swampy.	Link to PRS. Lack of sector-specific co-ordination between affected sectors. No link to Nile Basin Initiative.	1. Rangeland rehabilitation 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	1. Implementing NAPA priority 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, fisheries, human health and natural resources but not water. Lack of institutional. and individual capacity. No link to Zambezi River Authority	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

¹ The Project Identification Form, PIF, needs to be approved as a first step towards a full project.

Box 5 Developing resilience in the face of climate change

ERITREA's NAPA in 2006 identified the development of 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 called, 'Integrating Climate Change Risks into Community-based Livestock Management in the Northwest Lowlands of Eritrea'.

The project, funded through 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 of key stakeholders at the community and sub-national levels to deal with climate change risk management, implement priority demonstration risk management activities, and provide support for the diversification towards less climate-sensitive livelihood opportunities for rangeland communities.

<http://www.gefweb.org>

Source: GEF Project Id: 3950

- It is very difficult to discover 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 beneficial effect, or a sustainable primary benefit such as more sustainable access to water. This is particularly so 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.

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 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 the long term, result in much more migration and overpopulation of the region to which they have moved. This might result in increased famine, the loss of drinking water, and maybe the loss of income-generating, water-dependent activities. So meeting the short-term need that might be identified under the NAPA may not necessarily result in a long-term sustainable solution, particularly when the actions are not identifiable within any adaptation strategic framework.

The NAPA document should, according to the guidelines, identify links to more long-term strategy frameworks, such as MEAs, PRSPs and 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, include, to a greater extent water-related priorities, but still very much on a stand-alone project base. However, there are two problems:

- very few of the NAPAs have developed any detailed strategy including action programmes outlining how to address the objectives under the Multilateral Environmental conventions – their reporting under the convention concerns more often what is currently done;
- the identification of the links is most often simply a statement that links exist – usually because there is little else to report.

The countries that take a participatory approach should recognize sectoral and environmental vulnerabilities and concrete impacts. The vulnerability assessment should be done mainly by using existing collected material. This is 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 recognized, but also where there would be the possibility of clearly identifying all sorts of cross-links based on this background material. This part of the process would need important support from a sector perspective and also from an MEA perspective, etc.

Some of the very recently submitted NAPAs – the one for Mozambique and particularly the one for Sierra Leone, for example – have more elaborate 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-chairs of IPCC WG III has been the consultative expert. Both these countries have profound experiences of climatic extremes and their impacts, including 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. Sierra Leone in particular also links activities under the NAPA to activities under the action programmes for the other MEAs and other agreements, specifically 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 links between the projects that would relate to any specific strategy. But again the newer NAPAs show better linked profiles. The chosen criteria, against which the projects are scored to come up with a list of prioritized projects, should prioritize more long-term sustainable projects but are still less effective outside any strategic framework.

An aggravating circumstance in most countries is the gap in knowledge: in relation to observation data as well as to understanding climate change and the hydrological cycle at temporal and spatial scales relevant to decision making. As the IPCC WG II (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 that future development efforts are well targeted, 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 programmes with other country strategies. The only institutional structure that is to be identified within the NAPA is the one used to produce it, and ensuring a participatory process. As the guidelines specify the need for the NAPA process to include ministries as responsible organizations when producing the NAPA, there should be the possibility of identifying a ministry to be accountable for the implementation of the plan. Some NAPAs do this. But a governance structure also needs 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 an IWRM strategy.

4. Adaptation to climate change as part of national water strategies

The Annotated guidelines for the preparation of NAPAs produced under the LDC Expert Group in 2002, has among its guiding elements a 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 recognizes the need to build on *complementarities* with existing plans and programmes including the MEAs.

One of the sectors to which it is important to establish links is the water sector. Water sector policies are, when they exist, usually referred to in the NAPAs. To find out to what extent existing water-sector programmes, strategies or plans include references to or integrate the issues of adaptation to

climate change, the water-related programmes and plans of relevance were examined for the 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, and to:
- 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.

UN-Water in its report to the Commission on Sustainable Development²⁰⁰⁸ presents the survey of progress on IWRM. Bhutan has not yet responded, for Eritrea and Sudan, plans are in preparation, Niger has responded but not indicated any work, Rwanda has just taken initial steps, and plans are in place for Samoa and Zambia.

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

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 the identification of needs for adaptation to climate change always includes satisfying access to water. Access to water is generally considered fundamental to development processes. However, the water sector itself very seldom recognizes the consideration of and adaptation to climate change in its policies, plans or programmes. One important reason for that is that not all countries have a water policy, let alone a comprehensive water policy. A severely water-scarce country such as Niger for instance has a water law that concerns water from a drinking-water perspective

Box 6 Strengthening water resource management

In Ecuador, which is a non-LDC developing country, a project supported by the Special Climate Change Fund (SCCF) and implemented under the UNDP 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.

<http://www.gefweb.org>

Source: GEF Project Id: 3520

but it is a very weak law 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 administered. And even though 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 (see Annexes). All of them have, at least, a national water policy (although Rwanda's policy covers only the water and sanitation sector); but only initial steps have been taken towards any IWRM plan. Bhutan, Eritrea, Samoa, Sudan and Zambia are currently presenting more advanced water plans. Eritrea's plan is a draft IWRM and water efficiency plan, and the plans from Zambia and the relatively small and homogeneous Samoa are already agreed IWRM/WE plans. Bhutan's plan is mainly concentrated around their main water- and climate-related problem of the glacier lake outburst floods (GLOFs) in a comprehensive perspective. The plan from the large and less homogenous Sudan still lacks the fully integrated approach. Only Bhutan has fully integrated adaptation to climate change into its 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 recognizes climate change as only a contributing factor. Adaptation to climate change is not well integrated. The long-term results of an 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 recognizable immediately and are very visible. The very pronounced emphasis on the GLOF problem within Bhutan's national water policy might also be

the result of important research work and awareness-raising by the International Centre for Integrated Mountain Development (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 designed with the LDCs in mind, but as is recognized by the IPCC and the UNFCCC, adaptation strategies are needed by all countries. The five-year Nairobi Work Programme will 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 CC DARE is providing support in this endeavor, particularly to sub-Saharan countries, such as Uganda, Senegal and Tanzania.⁷ And by the end of October, 2008, the Special Climate Change Fund (SCCF) had approved 15 projects under its adaptation program, of which five addressed adaptation from an IWRM perspective.⁸ The Nairobi Work Programme does not emphasize any specific sector, but partner countries such as for instance the EU countries, see 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 – 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 the 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 and management plans. The existence of these elements is to ensure proper governance and a holistic approach to integrating adaptation and water management strategies and their implementation in EU countries.

The impacts of climate change on water and the environment is generally 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 IWRM with a sufficiently long-term perspective to ensure that aspects of adaptation

⁷ This was presented during a side-event at UNFCCC in Poznan, December 2008.

⁸ The IWRM-related adaptation projects were submitted to the SCCF by China, Egypt, Ecuador, Mexico and Tanzania.

to climate change are integrated. Yet, if that is not done urgently, it will be necessary 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 recognized in the Stern Report.

6. Conclusions and recommendations

NAPAs are a relatively new initiative to build adaptive capacity in LDCs under the UNFCCC. The first NAPA was prepared in 2004, but most of the 38 completed up to November 2008 have been developed from late 2006 onwards. The more recent NAPAs tend to be more strategic, and this tendency is further pronounced in the implementation of their projects with support from the LDCF (or to an even greater extent in the case of 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:

- Firstly, as the process of collecting and disseminating available data and background information should be a truly participatory process, led by a responsible ministry and with participation by all stakeholders, 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 link to MEA strategies, PRSPs, etc. they very often don't integrate with 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 the 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 links, become too multidimensional they may become too complex to address both within the framework of the simpler NAPA and within the IWRM related components of national water policies;
- That not only would complicated adaptation needs require a more detailed and comprehensive

Box 7 Action in the face of climate change risks: disaster risk reduction in Bhutan

An LDCF-supported project identified in Bhutan's NAPA aims to enhance adaptive capacity to climate-change-induced disaster impacts in the country, particularly in areas such as the Punakha-Wangdi and Chamkar valleys, which are vulnerable to glacial lake outburst floods.

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.

<http://www.gefweb.org>

Source: GEF Project Id: 00053899

adaptation as well as water strategic framework, there is also a need for an *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 the effects of current climate variability into water management would also assist adaptation to longer-term climate change impacts.

The differences in approach between the NAPAs and 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 a comparison of the differences between the poorest and less poor LDCs. The main difference seems to be between countries that have an institutional structure and the institutional and human capacity to undertake the process of developing a NAPA. Lack of such a capacity leads not only to difficulties in finding suitable and sufficient background material but also to difficulties in structuring, organising and governing the process. Such a process should result in increased adaptation capacity and the capability to apply a more long-term perspective in which immediate benefits can not always be recognized. A real long-term adaptation strategy for Bhutan – as well as for down-stream countries like India, Pakistan and Bangladesh (depending on seasonal

melt water) – could include adapting to prolonged, seasonal water scarcity, due to rapid glacial melting in the Himalaya-Hindu Kush region.

6.1 Concluding remarks

- Although the NAPAs produced so far acknowledge links to national development strategies, PRSPs and MEAs (a link that is recognized in the text from the UNFCCC meeting in Poznan⁹), 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.¹⁰
- 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, water shortages may have significant impacts on industry, employment and people's livelihoods, and water conservation measures may be needed. Urban planning (for example locating housing developments outside flood- or landslide-prone areas, or building more flood-resilient housing) is rarely mentioned.
- Significant impacts on health (for example 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 where several countries share a river basin, such as for instance the Niger River basin (the 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 supported in the future under the SCCF funding, as has the Limpopo project and an approved project on Mainstreaming Climate Change in IWRM in the Pangani River basin in Tanzania.

⁹ '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

¹⁰ A suggested UNDP-implemented project in South Africa, Botswana, Mozambique and Zimbabwe.

- 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 initiatives that are suitable for dealing with other environmental changes (such as urbanization and desertification) and for natural climate variability. Improved resilience is beneficial to development, regardless of future climate-change scenarios.

6.2 Policy recommendations

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, particularly in the LDCs. Therefore support should be redirected towards work that:

- shifts focus from identifying short-term single projects towards projects that are parts of a long-term strategy corresponding to long-term needs
- identifies 'no regrets' adaptation policies and avoids mal-adaptations
- ensures that the long-term adaptation strategy for a country also links to what is developed for the larger region because the impacts do not respect any political boundaries and transboundary co-operation is thus needed
- builds capacity, both institutional and human capacity to implement not only projects that are founded in a long-term adaptation strategy but also to implement the long-term adaptation strategy itself, including ensuring that a proper governance system is in place; such a governance system is critical to deciding whether losses should be shared, prevented or accepted
- ensures that water policies, strategies and plans integrate properly with climate-change adaptation policies, strategies and plans including when they are implemented
- truly integrates measures for adaptation to climate change with IWRM plans, physical land planning, infrastructural development, PRSPs and all other relevant development plans and programmes – including non-water sectors that may nevertheless be affected by water-related climate impacts – and not only indicates the existence of links between them
- follows up on recommendations made in completed NAPAs, managing appropriate adaptation activities
- raises awareness and builds the capacity to address water and climate issues in LDCs and integrate climate change consideration into water resources management with a participatory perspective

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

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With most of Chennai, India being flat, floods can happen within six minutes from the start of a sustained burst of rain. Photo: Håkan Tropp, SIWI

Annex I Status of NAPAs and IWRM-plans in LDCs

LDC	GEF-support by the following	NAPA submitted	Status IWRM plans ¹	Link NAPA/ water ²
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		
Democratic Republic 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 People's Democratic Republic	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		

LDC	GEF-support by the following	NAPA submitted	Status IWRM plans ¹	Link NAPA/water ²
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 Príncipe	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
United Republic of Tanzania	UNEP	September 2007	In preparations	Yes
Vanuatu	UNDP	December 2007		
Yemen	UNDP	In draft		
Zambia	UNDP	October 2007	In place	

¹ Data from UN-Water (2008). Status Report on IWRM/Water Efficiency Plans for CSD 16

² 'Yes' only indicates 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 in any way 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 dependant on hydroelectric power. As all the major rivers originate from glaciers and glacier lakes in the higher Himalayas and discharge into Brahmaputra River in India, the country, particularly the valleys and rivers, are very vulnerable to climate change, both to temperature variations and change and to changes in precipitation patterns. Climate extremes are resulting particularly in GLOFs and devastating flooding of the valleys.

Identified vulnerability: The most vulnerable sectors identified are agriculture and hydroelectric power as they both depend on monsoons and temperature change patterns. 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 difficulties running hydroelectric power stations smoothly – a problem that is rapidly increasing downstream. Flooding also results sometimes in gully erosion, heavy landslides and sedimentation – all of which exacerbate the problem by causing not only water-related problems, but also destroying the farmlands and changing the morphology of rivers, lakes and dams.

The *Primary* impacts of climate change in Bhutan are felt by several water-dependent sectors, most notably the agricultural and hydroelectric power sectors but the drinking water sector is also affected. Flooding and water-induced erosion and drought also directly impact the growing conditions for forests.

Secondary water related effects are the impact on human health as a consequence of decreasing water and food supplies caused by difficulties accessing water for drinking and agriculture. Other secondary effects are the impact on income-generating activities in poorer areas because growing and feeding livestock on the eroded lands becomes more difficult. The economy of the whole country is affected by inconsistencies in the production of hydroelectric power – Bhutan's 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 of relevance for the work on the objectives of the NAPA, but without clearly identifying the possible synergies. There is, however, no reference to the national water policy (which is currently being developed). Further, under its NAPA vision, Bhutan identified that it was important to integrate climate change risks into the national planning process. But neither the NAPA nor the NC identified any detailed institutional structure for implementing the NAPA. They identified information gaps in areas such as the 'Effects of climate change on water resources' and the '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.

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

Eritrea with its central and north-western highland plateau and flat coastal plains along the Red Sea has a mostly arid climate although with an extremely variable rainfall pattern from year-to-year and between regions. Over 80% of the population depends on traditional subsistence agriculture. Agriculture accounts for 21% of the country's GDP. One reason for the low figure is the erratic rainfall with high variability, which also results in continuous soil degradation. The degree of poverty (about 66% of the population was below the poverty line in 2003 and concentrated in the arid rural highland areas) is partly a result of political instability although one of Eritrea's immediate development priorities has 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 moderately well suited for rain-fed agriculture. The livestock on which farmers in the eastern lowlands and north-western rangelands depend 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 sectors.

Identified primary and secondary water impacts: The changes in rainfall pattern, when the main rainy season starts late (if indeed it starts at all) and finishes early and is much more erratic and heavy has a strong *primary* impact on the agriculture sector, and results in gully erosion that destroys farmland. The river system shows a seasonal flow pattern in direct response to the changing rainfall pattern. Villages and towns in the upstream areas particularly experience scarce water supply caused by drought.

The *secondary* impacts identified in the NAPA are to the coastal zones where people with surface water shortages are pumping and over-extracting groundwater. This results in salt-water intrusion and an even more acute shortage of fresh water. Flooding in upstream areas also has an increased effect downstream as few of the rivers are regulated.

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

Identified adaptation framework, including links to relevant strategies etc. and governance means: According to the NAPA, strong links were established with key national initiatives including with its interim PRSP presented in 2007 and the initiative presented as part of the country's First 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 the 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 links 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 the 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 practising small-scale irrigated farming. The Sahara and Sahelian zone, south of the 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 1,800 to 2,200 mm. The main surface-water source is the Niger River crossing the south-western parts. In the south-eastern corner is what up to 1980s used to be parts of Lake Chad, these parts are now dried up. The majority of the people live in the southern parts and depend on agriculture and pastoral activities.

Some 87% of the population depends on activities within the rural areas while only 38% of the GDP is comes from agricultural production.

Identified vulnerability: As most of the country is water scarce, the whole country is vulnerable to climate change. At the end of 1980s, agriculture could cover only 86% of the country's food needs, and during drought periods there has always been a considerable reduction in cattle numbers. About 1% of the area is forestry, 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 the destructions of human habitats.

Identified Primary and secondary water impacts: The *primary* impact on the water sector as recounted in the NAPA is to the rivers, which except for the Niger River are wadis (only occasionally or partially having any water). The infrequent and erratic rainfall causes water erosion and a reduction in water for household use and for food production. Fewer people can survive when fishing for living when water points are dried out or filled with water- or wind-borne sediments. *Secondary* impacts are of course to the health sector and attributed mainly 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 links and synergy between what are prioritized 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 SDR¹¹ don't refer 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 mention of any water-related policy.

The possibilities of implement the NAPA are very briefly discussed in the document itself. It identifies the 'lack of and/or shortages of material and financial means' as a main constraint. The document, otherwise, only describes the process of producing the NAPA. It mentions that 'the priority activities of the NAPA will be 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 organizations'.

¹¹ 'The SDR is currently being revised, and although adaptation per se is not mentioned, the development partners and the government are very mindful of the impacts of climate change and need to climate-proof development under the SDR'. Comment by Mirey Atallah.

The governance structure is completely missing from the document and so is any discussion of needed capacity, etc. This might depend on a real need for capacity enhancement. But this NAPA therefore is not able to identify institutional possibilities for implementing an adaptation strategy with 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 a north-south direction as it is situated in the African Rift Zone. The highest peaks are in the north and west of the country and range between 3,000 and just over 4,500 metre and the lowest peaks are in south-west at around 900 metres above sea level. The climate is modified by the high altitude to a temperate climate, so it has less evapotranspiration at higher altitudes and a varying degree of humidity. The rural population, (around 83%), is dispersed with a concentration in the northern parts of the country but migrating towards the south-eastern and less populated areas. Heavy rains in the mountainous region with its important relief make the 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 income within the agricultural sector, which accounts for 43% of GDP.

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

Identified primary and secondary water impacts: Increase of temperature, prolonged droughts and high evapotranspiration, particularly in the swampy regions, may result in lower river flows and lower water levels in lakes and rivers. This therefore has *primary* impacts on the water sector as well as to the 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 production of hydroelectric power.

Changes in water quantity are also reported in the NAPA as resulting in *secondary* impacts to health by increasing water-borne diseases, and to the economy by reducing 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 recognized 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 recognized policies and plans for the implementation of MEAs, without identifying how climate adaptation was recognized in those plans.

Rwanda' NAPA is the only one of the NAPAs studied in detail that discusses IWRM as a priority option to address climate adaptation. They see the target groups as rural communities, agro-animal husbandry and the urban population. The NAPA also recognizes 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 multisectoral cross-cutting aspects. The stakeholders in the process should include the 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 prioritized project under the NAPA, a logical framework that also includes a discussion of risks and barriers. This framework only recognizes the more technical risks without any suggestions for how larger barriers should be overcome. Mainly these projects have appropriate ministries specified as suggested implementing agencies, but without recognizing any 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 (SIDS) situated in the South Pacific. The two larger islands were originally produced by volcanic eruptions. The highest point on the island rises more than 1,850 metres above sea level. The islands 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 a tropical climate region in the south-east trade winds with tropical cyclones and heavy rainfalls during summer period and year-round temperatures of about 25 °C. About 70% of the population lives in the low-lying coastal areas and the main income-generating sectors are the tourist sector and, to a lesser extent, the fishing sector.

Identified vulnerability: The very shifting rainfall pattern caused by climate change and the El Niño,

along with the easily eroded land and coral reefs make the islands very vulnerable to the 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 to the frequent storms and to the more slowly occurring sea-level rise.

Identified Primary and secondary water impacts: Primary impacts to the water sector recognized in the NAPA and the NC 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 of land is also destroying houses and villages. Plantation and livestock contribute to food security, together with fishing. Extreme weather events, particularly storm surges, affect coastal plantation. Insufficient amounts of safe water for household and for food security also increase health hazards as a *secondary* impact. Coastal erosion and the destruction of coastal infrastructure, and insufficient quantities 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 links to the National Development Strategies, among which one is the national land use policy and another is *the water resource policy*. Further, the NAPA recognizes 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 with 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, formulates 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 co-ordinate the process. However, there is no discussion of the needed capacity to successfully implement the full process, even though there is a good basis 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, Africa's largest country, is one of two Arab LDCs. In more than 50% of the country the ecosystems are arid and semi-arid and 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 1,000 mm. Most of this occurs during the rainy season between March and October, but the high temperatures result in high evaporation. Only about one-sixth of the country is actually cultivated, and about forty per cent consists of pasture and forested lands. The River Nile (including the Blue Nile 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 regions suffered severely as a result of the droughts of the 1970s and 1980s, which resulted in many deaths and migration. These displaced people are facing unemployment, water and food insecurity as well as political insecurity due to the fact that the situation has developed beyond what the country is capable of addressing. Agriculture, the main occupation accounts for less than 50% of Sudan's GDP although it covers almost 80% of its total exports.

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, 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 the land including having a detrimental effect on soil fertility, which makes the agriculture sector – livestock as well as water resources – very vulnerable over most of the country.

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

Frequent droughts and less surface water also result in reduced groundwater recharge and an accentuated lack of access to water. The migrating and to some extent increasing population, which causes yet more pressure on water resources, 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 life. 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 particular, the NAPA recognizes 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 emphasizes 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 recognizes the need to strengthen policies and strategies to guarantee food security for humans and animals. The adaptation strategies are further needed for the use 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 recognizes 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 co-ordination between the affected sectors. A detailed structure for the NAPA preparation process is presented but without specifying the different actors including the responsible institution and its links 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 between 900 metres and 1,500 metres with the African Rift Zone transversing the eastern parts. The 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 temperatures between 15 °C and 30 °C but with extremes of up to 38 °C. The rainy season is from November to April and the annual precipitation varies from around 1,300 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 2006–2007 flood had devastating effects. Only about 10% of the area is usable for agriculture but almost 70% of the population depends

on income from that 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 five vulnerable sectors in Zambia, the primary one is the agriculture sector because the country still is completely devoted to rain-fed agriculture – although it does have access to the Zambezi River system and, to a lesser extent, the Congo River system. The other vulnerable sectors are the water and energy sectors, the natural resources, wildlife and forestry sectors, and the human health sector. All these sectors are very susceptible to rapidly shifting climatic extremes. Also the economic sector is very vulnerable to extreme climate variations, which are causing increased poverty for the country.

Identified Primary and secondary water impacts: The recurrent droughts and floods *primarily* result in crop failures caused by water logging and water erosion, or during drought years by a shortening of the growing season. The primary impact on the water sector is non-reliable access to water for household and animals. Disastrously decreased or increased river flows are also causing disruptions to hydroelectric power generation as well as to the generation of groundwater. *Secondary* impacts are malnutrition and diarrhoeal diseases resulting from crop failure and decreased access to drinking water. Extreme cases may result in famine and loss of life 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 recognizes potential barriers to implementation including: lack of financial resources; lack of clear and specific legal and policy frameworks; lack of institutional, system and individual capacities and inadequate public awareness. For the NAPA preparation process, the key ministries and organizations 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 in the national water strategies of Bhutan, Eritrea, Niger, Rwanda, Samoa, Sudan and Zambia.

Bhutan

Bhutan is developing a national water policy that's currently in draft form 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 the 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 GLOFs resulting from glacier melting caused by climate change, is specifically emphasized. This is the most important impact and is addressed as a water-related impact of climate change within the NAPA, as well as in the water policy draft.

Eritrea

In 2007 Eritrea presented a draft IWRM and Water Efficiency Plan, building *inter alia* on a situation analysis presented in July 2006.¹² The process of doing this was 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 and the main emphasis has been on:

- the establishment of political will for change and stakeholder participation in the planning process
- the improvement of the knowledge level of stakeholders on critical aspects of the development of IWRM
- an IWRM strategy and plan of action owned by the Eritrean government and with buy-in from key stakeholders
- the capacity development of staff in existing institutions
- the 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 adaptation to climate change and its impact on the water sector.

The National Action Programme for Eritrea to combat desertification and mitigate the effects of drought, the action programme under the CCD, includes climate variations and drought

under-preparedness as a factor contributing to desertification. And the actions section addresses the issues under the 'Drought Preparedness and Mitigation Plan'.

Niger

Niger has no IWRM plan, nor has the country indicated that any initial steps towards that have been taken. There is a water law on water regimes dating back to 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 does not discuss 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 without links to climate change adaptation.

Rwanda

Rwanda has so far only taken initial steps towards any IWRM plan within the framework of their 'Sectoral Policy on Water and Sanitation' that was presented 2004.¹³ The policy document also presents a sector strategy which includes the setting up of a '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 East African Community (EAC) and as such has a high level of influence on national policies and programming. The LVBC and

¹² Situation Analysis: The State of Water Resources in Eritrea, July, 2006. The Ministry of Land, Water and Environment. Water Resources Department. Eritrea.

¹³ Republic of Rwanda, Ministry of Lands, Environment, Forests, Water and Natural Resources: Sectoral policy on water and sanitation, October 2004.

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 to track these impacts.

The Rusumo falls hydroelectric power plant, a joint investment between Rwanda and its neighbouring countries, is currently at the pre-feasibility phase, and considered to be highly vulnerable; while it was 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.

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 to address key challenges, which may include the 'effects of climate change, weak and fragmented institutional and regulatory frameworks, the 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, the increasing pollution of resources, the need to increase sewage collection and treat all raw sewage, the need to connect the urban poor, the need to improve poor technical performance and services. The Asian Development Bank is supporting this endeavour. (Bridges, 2007)

In 2003, the South Pacific Applied Geoscience Commission (SOPAC) 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 Resources Management'.¹⁴ 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

¹⁴ <http://www.sopac.org/Pacific+Resource+Centre+on+Water+and+Climate>

policy document includes several aspects of water resources management, use, and protection. It relates to various sectors including agriculture, industry, health, energy and transport, although it is 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 traverses 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)

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 and the same year a Water Resources Management Bill was drafted.

The IWRM/WE plan was prepared under the Ministry of Energy and Water Development in 2006. As IWRM is a process which 'promotes the co-ordinated 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 with the plan.

Zambia is also a member of Zambezi River Authority as the main part of the country is within the Zambezi River Basin, which is developing an IWRM strategy for the Zambezi River Basin, legally regulated by the Zambezi River Authority Act 1987. The largest storage reservoir is the 185-cubic-kilometre Lake Kariba, on the border between Zambia and Zimbabwe that is generating 6,400 GWh annually, so it is very vulnerable to climate change including hazards.

World Water Assessment Programme side publications, March 2009

During the consultation process for the third edition of the World Water Development Report, a general consensus emerged as to the need to make the forthcoming report more concise, while highlighting major future challenges associated with water availability in terms of quantity and quality.

This series of side publications has been developed to ensure that all issues and debates that might not benefit from sufficient coverage within the report would find space for publication.

The 17 side publications released on the occasion of the World Water Forum in Istanbul in March, 2009, in conjunction with *World Water Development Report 3: Water in a Changing World*, represent the first of what will become an ongoing series of scientific papers, insight reports and dialogue papers that will continue to provide more in-depth or focused information on water-related topics and issues.

Insights

IWRM Implementation in Basins, Sub-Basins and Aquifers: State of the Art Review

by *Keith Kennedy, Slobodan Simonovic, Alberto Tejada-Guibert, Miguel de França Doria and José Luis Martin for UNESCO-IHP*

Institutional Capacity Development in Transboundary Water Management

by *Ruth Vollmer, Reza Ardakanian, Matt Hare, Jan Leentvaar, Charlotte van der Schaaf and Lars Wirkus for UNW-DPC*

Global Trends in Water-Related Disasters: An Insight for Policymakers

by *Yoganath Adikari and Junichi Yoshitani at the Public Works Research Institute, Tsukuba, Japan, for the International Center for Water Hazard and Risk Management (ICHARM), under the auspices of UNESCO.*

Inland Waterborne Transport: Connecting Countries

by *Sobhanlal Bonnerjee, Anne Cann, Harald Koethe, David Lammie, Geerincq Lieven, Jasna Muskatirovic, Benjamin Ndala, Gernot Pauli and Ian White for PIANC/ICIWaRM*

Building a 2nd Generation of New World Water Scenarios

by *Joseph Alcamo and Gilberto Gallopin*

Seeing Traditional Technologies in a New Light: Using Traditional Approaches for Water Management in Drylands

by *Harriet Bigas, Zafar Adeel and Brigitte Schuster (eds), for the United Nations University International Network on Water, Environment and Health (UNU-INWEH)*

Dialogue Series

Water Adaptation in National Adaptation Programmes for Action Freshwater in Climate Adaptation Planning and Climate Adaptation in Freshwater Planning

by *Gunilla Björklund, Håkan Tropp, Joakim Harlin, Alastair Morrison and Andrew Hudson for UNDP*

Integrated Water Resources Management in Action

by *Jan Hassing, Niels Ipsen, Torkil-Jønch Clausen, Henrik Larsen and Palle Lindgaard-Jørgensen for DHI Water Policy and the UNEP-DHI Centre for Water and Environment*

Confronting the Challenges of Climate Variability and Change through an Integrated Strategy for the Sustainable Management of the La Plata River Basin

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