



Mexico 2006 4th World Water Forum

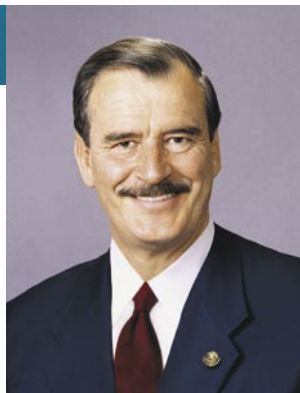
AFRICA



Regional
Document

Local
Actions for
a Global
Challenge





VICENTE FOX QUESADA
PRESIDENT OF MEXICO

People, organizations and nations are more interested in sharing their own experiences and in knowing how effective solutions have been implemented to solve different challenges regarding water issues.

We know that waste and scarcity of this resource might affect social welfare and limit the development.

Therefore, World Water Fora have become one of the most important events at the international level.

The 4th World Water Forum was organized by the National Water Commission of Mexico and the World Water Council. This important event was held in Mexico City on March, 2006.

With the purpose of facilitating the organization of the Forum, the world was divided into the following five regions:

- Africa.
- Americas.
- Asia-Pacific.
- Europe.
- Middle-East and North Africa.

Each Region was organized in a specific way and as part of its important work, they produced a document that shows the main water related problems in the region, that explains the progress made so far in their solution and that evaluates the future perspectives.

These documents are a very important source of knowledge and I am sure that they will become a key reference in the future.

Finally, I would like to reiterate my recognition to the superb job performed by the different specialists, institutions and organizations involved in the regional process. Their professionalism, enthusiasm and commitment have been outstanding.

AFRICAN REGIONAL DOCUMENT

Water Resources Development in Africa

TABLE OF CONTENTS

FOREWORD	9
ACKNOWLEDGEMENT	11
EXECUTIVE SUMMARY	13
ACRONYMS	16
1. INTRODUCTION	18
1.1 Genesis and Evolution of Water Issues Affecting the African Continent	18
1.2 The 4th World Water Forum	20
1.3 Preparation for African Participation in the 4th World Water Forum	21
1.4 The Regional Report for the 4th World Water Forum	22
1.5 Structure of the Regional Report	22
2. REGIONAL SETTING	23
2.1 Socio-Economic Characteristics	23
2.2 Climate and Water Resources	24
2.2.1 Climate	24
2.2.2 Surface Water Resources	24
2.2.3 Groundwater Resources	25
2.3 Transboundary Water Basins	26
3. ISSUES AND CHALLENGES	27
3.1 Water Resources Development Opportunities and Issues	27
3.2 State of Water Resources	27
3.2.1 Growing Water Scarcity	27
3.2.2 Climate Variability	28
3.2.3 Natural Risks	30

3.2.4	Human Impacts on Freshwater Resources	30
3.3	The Development Environment	31
3.3.1	Overarching Issues	31
3.3.2	Opportunities for Water Development	31
3.3.3	Water Policies and Strategies	32
3.3.4	Political Situation and Conflict Resolutions	32
3.4	Water Security	32
3.4.1	Meeting Basic Water and Sanitation Needs	32
3.4.2	Development of Water for Food Security	33
3.4.3	Development of Water for Energy Security	33
3.5	Water Governance	34
3.5.1	Institutional Arrangements and Water Governance	34
3.5.2	Human Resource Capacity	35
3.5.3	Threats to Environmental Sustainability	35
3.5.4	Sedimentation of Reservoirs	36
3.5.5	Information and Knowledge	36
3.5.6	Monitoring and Evaluation	37
3.5.7	Gender Mainstreaming	37
3.6	Investment Requirement	38
4.	AFRICAN RESPONSES TO WATER DEVELOPMENT CHALLENGES	39
4.1	Emerging Political and Policy Frameworks	39
4.1.1	Political Support and Commitments	39
4.1.2	African Ministers' Council on Water (AMCOW)	39
4.1.3	Adoption of the African Water Vision (AWV)	40
4.1.4	Adoption of IWRM	40
4.2	Water for Growth and Development	40
4.2.1	Regional Efforts	40
4.2.2	NEPAD: Water and Sanitation Infrastructure Programme (WSIP)	42
4.2.3	The African Water Facility (AWF)	42
4.2.4	World Bank	42
4.2.5	UN-Water/Africa	42
4.2.6	The EU Water Initiative (EUWI)	43
4.2.7	The Africa Partnership Forum (APF)	43
4.2.8	The Infrastructure Consortium for Africa (ICA)	44
4.2.9	Canada's Water Initiative	44
4.2.10	Local Actions in the Area of Water for Growth and Development	44
4.3	Implementation of IWRM	45
4.3.1	IWRM Principles and Practices	45
4.3.2	Regional Cooperation and Transboundary Water Basin Organizations (TWBO)	45
4.3.3	Establishment of Regional Water Partnerships in Africa	46
4.3.4	Establishment of the African Network of Basin Organisations (ANBO)	46
4.3.5	The Africa Civil Society Network on Water (ANEW)	46
4.3.6	The Africa Water Journalists' Network	47
4.3.7	G8 Africa Action Plan and Transboundary Water Management	47
4.3.8	The TIGER Initiative	47
4.3.9	Local Actions on Implementation of IWRM Principles and Practices	48

4.4	Water Supply and Sanitation for All	49
4.4.1	Efforts Towards Meeting Water Supply and Sanitation Provisions	49
4.4.2	AfDB Rural Water Supply and Sanitation Initiative	50
4.4.3	Water and Sanitation Programme for Africa Region (WSP-AF)	50
4.4.4	UN-HABITAT, Water and Sanitation Trust Fund (WSTF)	51
4.4.5	The African Water Association (AfWA)	51
4.4.6	Water Utility Partnership	51
4.4.7	The United States Water for the Poor Initiative	51
4.4.8	The West Africa Water Initiative (WAWI)	52
4.4.9	Local Actions on Water Supply and Sanitation for All	52
4.5	Water Management for Food and the Environment	53
4.5.1	Africa's Commitment to Achieve Food Security	53
4.5.2	NEPAD-CAADP	54
4.5.3	Collaborative Programme of the AfDB, FAO, IFAD, IWMI and the World Bank	54
4.5.4	Local Actions for Water Management for Food and the Environment	54
4.6	Risk Management	55
4.6.1	Development of Disaster Risk Reduction; Strategies for the Region	55
4.6.2	Promotion of Science and Technology	56
4.6.3	Data Collection and Transmission	56
4.6.4	Local Actions Exhibiting Innovative Risk Management	57
4.6.5	Pace of Meeting the Challenges	57
5.	CONCLUSIONS AND THE WAY FORWARD	58
5.1	Conclusions	58
5.1.1	Underdevelopment of Water Resources	58
5.1.2	Water for Growth and Development	58
5.1.3	Implementing IWRM	59
5.1.4	Water Supply for All	61
5.1.5	Water Development for Food and the Environment	61
5.1.6	Risk Management	62
5.2	The Way Forward	62
5.2.1	Attaining Growth and Development	62
5.2.2	Implementation of IWRM	62
5.2.3	Meeting the MDG Target for Water Supply and Sanitation	63
5.2.4	Achieving Food Security	63
5.2.5	Managing Risk	63

LIST OF ANNEXES		
ANNEX 1:	LIST OF REFERENCES	65
ANNEX 2:	HUMAN POVERTY INDEX (HPI-1) RANK, 2000	67
ANNEX 3:	PROGRESS TOWARDS ACHIEVING THE MILLENIUM DEVELOPMENT GOALS	68
ANNEX 4:	INTERNATIONAL WATER BASINS DRAINING MORE THAN 30,000 KM²	70
ANNEX 5:	BASIC INFORMATION ON ARRANGEMENTS FOR THE MANAGEMENT OF SOME WBOs	71
ANNEX 6:	LOCAL ACTIONS	72
1.	Introduction	72
2.	Theme I: Water for Growth and Development	72
2.1	Regional Solar to Improve Access to Water in the Rural Sahel	72
2.2	Performance Contracting Applied to Water in South Africa	72
2.3	Community-based Water Leaks Project	72
2.4	Food Security and Natural Resources Management in the Baidiam District - Mauritania	73 74
2.5	NEPAD Water and Sanitation Infrastructure Programme (WSIP)	74
2.6	South African Multi-stakeholder Initiative on the WCD	74
2.7	MDG capacity-strengthening project for Africa	74
3.	Theme II: Implementing IWRM	74
3.1	AQUIFER: Tunisia Exploiting Space for Transboundary Aquifer Management – NWSAS (SASS)	74
3.2	IWRM in the Nakanbe Basin in Burkina Faso.	75
3.3	Decentralization of WRM in Uganda	75
3.4	May Zegzeg Integrated Watershed Management Project	75
3.5	Pioneering Actions in Managing the Transboundary Nubian Sandstone Groundwater Aquifer	75
3.6	One Basin, Nine Countries – A Shared Vision	76
3.7	Promoting IWRM in the Mara Basin of East Africa	76
3.8	Strengthening River Basin Organisations in the SADC Region	77
3.9	The NWSAS Project as a Local Action for Joint Management of Shared Aquifers	77
3.10	OMVS: Water for Sustainable and Solidarity-based Development.	78
3.11	Establishment of Stakeholder Forum for Lake Guiers in Senegal	78
4.	Theme III: Water Supply and Sanitation for All	79
4.1	Siraro Water Supply	79
4.2	Oxidation Pond with Kaolin Bed for Sewage Treatment	79

4.3	Private Sector Management of Simplified Water Supply Systems	80
4.4	Assessing Prepay Water Metering in Informal Settlements in Windhoek	80
4.5	The Kazusabori Technology Transfer and Sustainable Community Water Development	81
4.6	Rural Water Supply and Sanitation Initiative (RWSSI)	81
4.7	Sanitation for a Rural Girls' School in Uganda	81
4.8	Pioneering the Use of Strategic Communication Approaches in Kenya's Water Sector Reform Process	82
4.9	Project to Rehabilitate 50 Simplified Water Supply Systems in the Maradi, Tahoua and Zinder Regions	82
4.10	Evolution of Water and Sanitation in Disaster Mitigation	83
4.11	Local Action for Better Water Service Provision	83
4.12	Kiambu Water and Environmental Sanitation – KIWESA Project in Nairobi	83
5.	Theme IV: Water Management for Food and the Environment	84
5.1	Integrated Watershed Management through Progressive Terracing Techniques	84
5.2	Nile Dialogue: Nile Basin Society	84
5.3	Community Participation as a Tool for Gender Conflict Management and Peace-Building	85
5.4	River to River Project	85
5.5	Umm Bronga Water Harvesting and Spreading Dam	85
5.6	Integrated Water Resources Management: Koga Irrigation Project	86
5.7	The Gory Experience	86
5.8	Treated Sewage Water Irrigation Project in Tunisia	86
6.	Theme V – Risk Management	87
6.1	Risk Management in the Lullemeden Aquifer	87
6.2	Contribution to Flood Monitoring and Adaptation Strategies in Zimbabwe	87
6.3	Kenya Sand Dams	87
6.4	Flood Forecasting System for Integrated Natural Resources Management in the Niger Inner Delta in Mali	88
6.5	Protection against Flooding in Great Tunis	88

FOREWORD

Africa's share of global freshwater resources is about 9 percent or 4 050 km³/yr. These freshwater resources are distributed unevenly across Africa, with western Africa and central Africa having significantly greater than the rest of Africa. By 2025, with Africa's population is expected to grow to approximately 1,345 million people, it is evident that the available renewable freshwater in Africa will not be enough to sustain that population. By 2025, it is expected that 25 African countries will be subject to water scarcity or water stress and Northern Africa is facing the worst prospects.

Problems with freshwater availability in Africa are further complicated by highly variable levels of rainfall. This extreme variability has greatly affected African countries as both floods and droughts take a big toll on the countries economies because of inadequate infrastructure to mitigate these episodes. The solution to this extreme climatic variability is increasing water storage capacity and regulation of flows. Currently the average storage capacity in Africa is about 200 m³/person/year while in North America it is about 5,961 m³/person/year. The storage capacity gap is ample evidence that Africa faces serious water security challenges.

Statistics show that agricultural production has not kept pace with population growth in the Region. As a result, the nutrition position of the region is now worse than it was 30 years ago. One of the reasons contributing to this is the heavy dependence of African economies on

rain-fed agriculture with the attendant risks of droughts and floods. Hence the region is faced with a challenge to expeditiously develop the huge potential of irrigated agriculture as a strategy for eradication of absolute poverty and hunger.

Access to electricity in most African countries is less than 200 KWh/person/year and in some countries it is less than 30 KWh/person/year. In comparison access to electricity in America is over 12,000 KWh/person/year. The technically feasible hydropower potential of the region is estimated to be about 1.4 million GWh/year and so far only about 3% has been developed. As matter of fact the potential is so high that its development could be beneficial to Europe and the Middle East.

In Africa about 300 million people lack access to adequate water supply and about 313 million people lack access to adequate sanitation. Low access to sanitation and water supply are the root causes of many diseases that affect Africa. People with HIV/AIDS who are victims of opportunistic diseases are also affected by the situation.

Water plays a pivotal role in society; it is critical for economic development; for human health and social welfare, especially for the poor; and for environmental sustainability. The Millennium Summit and the World Summit on Sustainable Development have set clear; time bound goals targets. Water poses a number of challenges for Africa in its efforts to meet the MDGs.



As expressed by the Head of States and Governments in the Sirte Declaration on 27th February 2004 the Region requires significant investments in infrastructure, such as storage dams, water harvesting, irrigation and hydropower structures, as a priority. In order to guarantee the sustainability and increase investment in the sector the Region requires complementary policy actions and institutions. Africa should collectively promote hydropower and irrigation development and transboundary cooperation on shared water courses to address the immediate development needs of the continent. This should be supported by realization of legal and institutional frameworks for cooperation, management and beneficial use of the transboundary water resources.

African countries and their development partners have responded to the challenges by launching several regional programs and by participating in global initiatives. The Africa Water Vision, which was presented at the 2nd World Water Forum in The Hague in 2000, represents Africa's response to its water crises. Since then, the Vision has inspired other major initiatives, including the NEPAD, RWSSI (Rural Water Supply and Sanitation Initiative), the African Water Facility and others. The NEPAD Water and Sanitation Infrastructural Program and the CAADP provide blueprints for Africa's future water resources development. The programs focus on enhancing financial flows towards investment in infrastructure, and development of skills and knowledge towards the installation, operation and maintenance of infrastructure. In this respect the technical

and financial assistances made so far by the World Bank, European Union, the African Development Bank and other bilateral and multilateral donors are highly appreciated. Africa has also secured pelages from the G8 and other partners for its development.

AMCOW considers that while the challenge before Africa is enormous, it is certainly not beyond the collective means of Africans. In this respect AMCOW strives to strengthen the global partnership with a common framework of action to achieve the Millennium Development Goals in Africa. AMCOW calls on African countries to give the priority that these goals deserve and also calls the international donor community to provide the required resources so that this worthy endeavour becomes a reality.

Hon. Maria Mutagamba,
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Minister of State for Water
Ministry of Water, Lands and Environment,
Uganda

ACKNOWLEDGEMENT

The Africa Regional Report for the 4th World Water Forum entitled "Water Resources Development in Africa: Challenges Response and Prospective" is prepared with support obtained from the African Development Bank under the Bank Netherlands Water Partnership Programme.



The Bank, designated by AMCOW as the Regional Beacon coordinated and facilitated the preparation of the report under the guidance of Mr. Kodje Bedoumra, Director of the African Water Facility and was supervised by Mr. Tefera Woudeneh Chief Water Operations Officer at the African Water Facility. The Report was prepared by consultants, Mr. Amhayesus Metaferia with the support of Mr. Kometsi Khotle.

Background documents used in the preparation of the report are indicated in the Annex. The Regional Report was discussed and reviewed during the first 4th World Water Forum Regional Technical Committee meeting in Tunis on 28th-29th September 2005 and the Second Regional Steering and Technical Committee meeting on 7th-9th December 2005 in Windhoek, Namibia. The draft final report was further reviewed by the Bank as well as regional stakeholders including NEPAD, UN Agencies, RBOs and other regional and international organizations who contributed their comments and suggestions by email.

AMCOW extends its sincere thanks for all those who have contributed in one form or other for the successful completion of the Report.

EXECUTIVE SUMMARY

The African Convention on the Conservation of Nature and Natural Resources, adopted by the Organisation of African Unity (OAU) in 1968, was the first collective action on water in Africa. Since then, several conventions and conferences have been held, leading to the 4th World Water Conference in March 2006 in Mexico. Some of the most important milestones in this process were the adoption of the African Water Vision and the Framework for Action in The Hague in 2000, and the adoption of the outcomes and recommendations of the Pan-African Implementation and Partnership Conference on Water in 2003 in Addis Ababa.

The main theme of the 4th World Water Forum is: **"Local Actions for a Global Challenge"**. The objective of this report is to present the main challenges and opportunities of water development in Africa, the major actions needed to boost water services and resource management, and exemplary local actions that should be promoted, scaled up or replicated for enhanced development and achievement of sustainability.

Africa is characterised by high population growth, rapid spread of HIV/AIDS and high indebtedness. The Population of Africa in 2005 is estimated at about 905 million and is expected to grow to 1,936 million by 2050. Currently, 39.7% of the population is urban and this is expected to rise to 53% in the next 25 years.

In 2003, the African economy grew by 3.7% and aid to African countries has been increasing in the last few years. The New Partnership for Africa's Development (NEPAD), the Monterrey Concession on financing for development in 2002, and the implementation of the Heavily Indebted Poor Countries (HIPC) Initiative have all played an important role in making Africa the focus of development aid. However, despite all these efforts, 46.4% of the population (313 million people) lived on less than US\$ 1 per day in 2001 and the absolute number of malnourished people in Africa has increased substantially from around 88 million in 1970 to over 200 million in 1999–2001. Consequently, most African countries are slipping back or lagging behind in their attempts to reach the MDGs.

Africa's annual renewable water resources are estimated at about 5,400 billion m³ per year, of which roughly 15% is groundwater. Africa receives an average annual rainfall of 673.1 mm, which varies at the subregional level from 1,700 mm per year in the island



countries to 71.4 mm in North African countries. The region also experiences rainfall fluctuations of varying frequencies and magnitude, resulting in droughts and floods.

The region has 24 major surface water basins and 38 major transboundary groundwater aquifers. However, unlike rivers, little is known about these freshwater resources, which are distributed unevenly across Africa and are characterised by extreme temporal and spatial variation.

Africa has developed only three percent of its technically feasible hydropower potential and only six percent of its cultivated land is irrigated. In total, only

3.8% of water resources are developed for water supply, irrigation and hydropower use.

This calls for an enormous amount of investment in irrigated agriculture, water supply and sanitation, and decentralization of water supply and sanitation services to appropriate administrative levels. Transparent, open, accountable, gender-responsive, communicative and effective water governance at all levels of water management is also needed.

This can happen if appropriate policy changes are implemented at the regional and national levels to facilitate good governance, promote good water resources management practices, attract investment in agriculture and negotiate better access to markets.

IWRM principles and policies are considered an essential prerequisite for water resources development. All African countries were supposed to have taken steps to prepare and adopt national IWRM plans, or at least begin preparing them by June 2005. While some have complied

with this commitment, many have not yet done so. Also, some of the existing policies need to be scaled up or adapted.

Although encouraging measures are being taken to establish and strengthen Water Basin Organizations (WBOs), most of these lack the human and financial resources required to fulfil their mandate. Except for the South African Development Community (SADC) WBOs and the Senegal River Development Organization (OMVS), most other transboundary WBOs are performing in environments that lack basin-wide agreements on water basin management. Efforts should be therefore be directed towards building the human and institutional capacity of the WBOs and developing and adopting legal instruments governing water use at the basin and regional levels. Mechanisms are also needed to enable the WBOs to generate their own financial resources.

Many African countries face water stress, but this is most pronounced in North Africa. Inter-basin transfers of water resources and desalination are the two possible



solutions. Awareness of desalination technology in the region is minimal, but some countries have started to use it recently. There is need to promote its use for large-scale supply systems and at the household and community levels, as the unit cost of technology continues to decline.

The development of transboundary water basins could also involve inter-basin transfers of water resources. The region has so far undertaken two successful inter-basin transfers and the potential for further similar projects has been identified. However, such projects are complex and should be preceded by in-depth studies, which requires confidence-building and mutually beneficial mechanisms.

Soil erosion is another important factor when developing large water infrastructures. On average rate, one percent of reservoir volume is lost each year in Africa due to sedimentation. Controlling sedimentation would require applying appropriate catchment management techniques to control soil erosion.

The scarcity of data on water resources is a key constraint to the planning and monitoring of development activities at the national, subregional and continental levels in Africa. A monitoring and evaluation mechanism should be established to provide strategic assistance for developing the necessary information and knowledge required for development activities. This should also be accompanied by new ways of disseminating information and sharing knowledge.

Currently about 300 million people in Africa do not have access to safe water, about 313 million have no access to sanitation and over 88 million people are malnourished. This takes a heavy toll on the social and economic progress of African countries.

An annual investment outlay of US\$ 4.7 billion is required to achieve food security in Africa. The financial investment required to meet the 2025 African Water Vision (AWV) has been estimated at about US\$ 20 billion per year. The volume of financial and technical support pledged so far falls far short of what is required and most of it is still in the form of pledges yet to be honoured. High priority should be given to designing appropriate instruments to attract investment from bilateral international partners and the private sector in order to meet urgent and critical needs in water resources development.

To date, African countries have not achieved water security because they have engaged in small projects

to address short-term needs and have not invested sufficiently in water infrastructure and institutions. They should make water a high priority in their Poverty Reduction Strategy Papers (PRSPs) and, in their policies, strategies and programs, include commitments to invest in water infrastructure. This is a key to achieving water security and attaining sustainable growth.

The scarce investment made in the water sector limited to infrastructure. However, for investment in water infrastructure to yield the expected returns, it is important to invest in water institutions and the capacities required to run them. Perhaps even more important is the need to develop social capacity through education, information and the strengthening of local knowledge in communities and community-based organizations.

Growth is also more likely when a vibrant private sector is heavily involved in the development of the sector. A level playing field with optimal sector and micro-economic policies are essential pre-requisites. Certain local actions have shown that even modest efforts to involve the local small business sector has made a difference in the provision of public utilities. However, private sector involvement should be accompanied by appropriate regulatory frameworks and institutions.

To move forward, African countries need to streamline their efforts to promote good water governance, secure the promised financing for development, and invest in water infrastructure, human resources and institutions for proper management of the continent's resources. Most importantly the countries should support water infrastructure projects to exploit the potential and mitigate the adverse effects of the water resources. Projects with subregional or regional dimensions, such as hydropower developments, should also be emphasized as a way of enhancing regional integration.

International donors, meanwhile, should recognize the efforts being made by African countries and increase their assistance to develop water infrastructure and institutions. Such assistance should support regional initiatives and programs such as the NEPAD Short-Term Action Plan for Infrastructure (NEPAD – STAP), the Comprehensive African Agricultural Development Programme (CAADP), the Rural Water Supply and Sanitation Initiative (RWSSI), the African Water Forum (AWF), and Water for African Cities, among others.

ACRONYMS

ABN (NBA)	Niger Basin Authority
AfDB	African Development Bank
AfDF	African Development Fund
AfWA	African Water Association
AMCOW	African Ministers' Council on Water
ANBO	African Network of Basin Organisation
ANEW	African Civil Society Network on Water
APF	African Partnership Forum
AU	African Union
AWF	African Water Forum (also African Water Facility)
AWTF	African Water Task Force
AWV	African Water Vision
BOOT	Build Own Operate Train and Transfer
CAADP	Comprehensive African Agricultural Development Programme
CBOs	Community-Based Organizations
CSOs	Civil Society Organisations
ECA	Economic Commission for Africa
EUWI	European Union Water Initiative
FAO	Food and Agricultural Organization of the United Nations
FFA	Framework for Action of the African Water Vision
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GIS	Geographic Information System
GNI	Gross National Income
GTZ	Gesellschaft für Technische Zusammenarbeit
GWP	Global Water Partnership
HIV/AIDS	Human Immunodeficiency Virus /Acquired Immunodeficiency Syndrome
HSGIC	Heads of States and Government Implementation Committee
HYCOS	Hydrological Cycle Observing Systems
IFPRI	International Food Policy Research Institute
IMF	International Monetary Fund
IWMI	International Water Management Institute
IWRM	Integrated Water Resources Management
MDG	Millennium Development Goals
MDP	Municipal Development Partnership
MLTSF	Medium to Long Term Strategic Framework in the NEPAD Infrastructure
NEPAD	New Partnership for Africa's Development
NFFA	National Framework for Action
NGOs	Non-Governmental Organizations
NSAS	Nubian Sandstone Aquifer System
OAU	Organization of African Unity
ODA	Official Development Assistance
OECD	Organization of European Community Development
ORASECOM	Orange Senqu Basin Commission

ACRONYMS (cont.)

PANAFCON	Pan-African Implementation and Partnership Conference on Water
PPLB.3	Partnership and Cooperation Division
PRSP	Poverty Reduction Strategy Paper
REC	Regional Economic Commission
RMC	Regional Member Country
RWSSI	Rural Water Supply and Sanitation Initiative
SADC	Southern African Development Community
STAP	NEPAD Short-Term Action Plan for Infrastructure
UNEP	United Nations Environment Programme
UN-HABITAT	United Nations Human Settlements Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Emergency Fund
WAWI	West African Water Initiative
WB	World Bank
WBOs	Water Basin Organisations
WCD	World Commission on Dams
WMO	World Meteorological Organization
WSSD	World Summit on Sustainable Development
NEPAD – STAP	NEPAD – Short Term Action Plan for Infrastructure
WSP-AF	Water Sector Programme (Africa)
WUP	Water Utility Partnership
WWAP	World Water Assessment Programme
WWC	World Water Council

1. INTRODUCTION

1.1 Genesis and Evolution of Water Issues Affecting the African Continent

The first collective action on water in Africa dates back to September 1968, where the **African Convention on the Conservation of Nature and Natural Resources** was adopted at Algiers by the Organization of African Unity. The Convention gives considerable prominence to water resources. Article II of the Convention declares that the Contracting States "undertake to adopt the measures to ensure conservation, utilisation and development of soil, water, flora, and fauna resources in accordance with scientific principles and with due regard to the interests of the people."

The **UN Conference on the Human Environment** in Stockholm in 1972 resulted in the creation of the United Nations Environment Programme (UNEP). The conference declared that most of the environmental problems in developing countries –including those in Africa– are caused by under-development and recommended that developing countries bear in mind the need to safeguard and improve the environment as they pursue development. The 1977 **UN Conference on Water** in Mar del Plata (Argentina) provided a platform to discuss water issues and outlined an action plan which was the first internationally coordinated approach to IWRM. The conference recommended that 1981 to 1990 be declared International Drinking Water Supply and Sanitation Decade.

The aim of the Water Decade was for countries to provide safe drinking water and adequate sanitation for everyone by 1990. The **New Delhi Statement** on the Global Consultation on Safe Water Supply for the 1990s (September 14, 1990) emphasized that the goal had not been achieved. However, the Water Decade contributed considerably to defining the problem for future interventions.

The **Dublin Principles** (January 1992) influenced current thoughts about IWRM. This meeting was followed by Agenda 21, which arose from the proceedings of the **UN Conference on Environment and Development**

(UNCED Earth Summit), held in Rio de Janeiro. In response to the Dublin meeting and Rio Conference, the World Water Council (WWC) was established as an international think-tank for water issues and the Global Water Partnership (GWP) was formed to promote and operationalize the Dublin Principles, using the Integrated Water Resources Management (IWRM) approach.

In 1997, the **1st World Water Forum** was organized on African soil in Marrakech (Morocco). The Marrakech Declaration reiterated the importance of recognizing the basic human need for access to clean water and sanitation, effective mechanisms for management of shared waters, support and preservation of ecosystems, and efficient use of water. The WWC was also given the mandate to develop a vision for Water, Life and the Environment in the 21st Century.

The Declaration of The Hague was adopted at the Ministerial Conference held during the **2nd World Water Forum** in March 2000 in the Netherlands. It identified seven major challenges: meeting basic needs, securing the food supply, protecting ecosystems, sharing water resources, managing risks, valuing water and governing water wisely. The Forum also formulated a World Water Vision for 2025. Africa participated in the Forum and developed the Africa Water Vision (AWV) for 2025, along with a Framework for Action (FFA). The AWV was endorsed during the African Caucus meeting at the 2nd World Water Forum and obtained wide support among African countries and their development partners.

Following this, the **55th UN General Assembly** in 2000 adopted eight Millennium Development Goals (MDGs). The MDGs help crystallize global commitments to create, at the national and global levels, an environment conducive to development and the elimination of poverty. Among other goals, the MDGs aim to reduce the proportion of people without access to safe drinking water by half by 2015. Water-related MDGs also have direct and indirect effects on the other seven MDGs.

In September 2001, the **African Water Task Force** was established to help African water stakeholders focus

the world's attention on African water issues at the World Summit on Sustainable Development (WSSD) and the 3rd World Water Forum.

In December 2001, at the **International Conference on Fresh Water** in Bonn, 45 African ministers responsible for water recommended the establishment of the African Ministers' Council on Water (AMCOW), which was formally launched in Abuja, Nigeria, in April 2002 with the Abuja Declaration.

Also in April 2002, the African Water Task Force (AWTF), with the support of the AfDB, organized a **Stakeholders' Conference on Water and Sustainable Development** in Accra, Ghana. One of the results of the Accra conference was to recommend the creation of an African Water Facility (AWF) to be housed within the African Development Bank.

In 2002, the **World Summit on Sustainable Development** in Johannesburg reaffirmed the Millennium Development Goals and brought prominence to sanitation by agreeing to include a target for it among the MDGs. The WSSD agreed on the Johannesburg Plan of Implementation, which included an engagement to "launch a programme of actions, with financial and technical assistance, to achieve the millennium development goal on safe drinking water," and to "develop integrated water resources management and water efficiency plans by 2005, with support from developing countries, through actions at all levels"¹.

As a side event to the WSSD, a week-long Water Forum was organized at the Water Dome to promote water use as a key to sustainable development and to increase awareness about African water issues and challenges. The first formal meeting of AMCOW was held at the Water Dome. Among other decisions, the meeting endorsed the recommendation to create the African Water Facility (AWF). At the same time, the new Incomaputo Regional Water Sharing Agreement was signed by South Africa,

Swaziland and Mozambique, and the EU-Africa Water Initiative was launched.

The **3rd World Water Forum** took place in Kyoto in March 2003. Discussions focused on balancing, on one hand, the increasing need for adequate water supplies and improved health and sanitation, and on the other, requirements related to food production, transportation, energy and the environment. The forum also considered the issues of effective governance, enhanced capacity, and adequate financing. The Ministerial Declaration at the Forum reaffirmed global resolve to achieve the water-related Millennium Development Goals and WSSD commitments. Africa Day was organised at the Forum by the AWTF to ensure African participation and promote African water issues and challenges.

The **Pan-African Conference on Water (PANAFCON)** was organised in December 2003 in Addis Ababa under the auspices of the African Ministers' Council on Water to review commitments previously made by governments, donors and other institutions and to establish or strengthen partnerships to facilitate the implementation of the action programs.

PANAFCON made proposals for concrete actions in nine key areas: meeting basic needs; water, sanitation and human settlements; water for food security; protecting ecosystems and livelihoods; managing risks; water and climate; financing water infrastructure; integrated water resources management / shared water resources; valuing and allocating water; ensuring water wisdom; and governing water wisely.

The ministers agreed to establish a National Task Force on Water and Sanitation in each individual country to prepare national plans with service delivery targets for achieving water and sanitation goals by 2015. They also signed a joint declaration with the European Commission on the implementation of the African-European Union Strategic Partnership on Water Affairs and Sanitation.

¹ WSSD Plan of Implementation

During the conference, the ministers launched a number of initiatives, including: the African Water Facility with targeted funding of over US\$ 600 million for medium-term projects on water and sanitation; the African Water Journal as a channel to disseminate knowledge; the Water and Sanitation for African Cities Programme (Phase II); the Rural Water Supply and Sanitation Initiative; and the G8 Action Plan on Water for Africa.

The 1st AfDB Water Week took place in Tunis, July 1-3, 2004, and was attended by 422 participants from 60 countries, including 17 African ministers responsible for water. The conference sessions focused on: MDG Challenges and Responses, Water Security Challenges and Responses – The NEPAD Framework, Water Supply and Sanitation, Financing Water Initiatives, and Water Resources Development in Africa.

The **4th World Water Forum**, which this report deals with, will take place in March 2006 in Mexico. The Forum's focus is described in the following section.

Over the last 40 years, the water movement has gone through various stages, starting with raising awareness and consultations, then moving on to the development of ideas and concepts, and the formulation of targets and goals. This was followed by outlining concrete actions plans and strategies, and mobilizing funds to implement them. Funding pledges were then secured, one of the most significant being the G8 commitment.

The aim of the Africa agenda for the 4th World Water Forum is to contribute to the dialogue on water

development. This is an opportunity to continue the effort to mobilize resources from the donor community, secure the commitments made in previous forums and invest in water infrastructure, putting into practise available tools and instruments to achieve the MDGs.

1.2 The 4th World Water Forum

The 4th World Water Forum will focus on “**Local Actions for a Global Challenge**” and will seek to harness the practical, intellectual, financial and political means to increase the scale of local actions for global impact. In order to facilitate dialogue and deliberation at the Forum, the main water issues and challenges are laid out under two main headings: Thematic Process and Regional Processes. The thematic content brings together and describes some of the most important challenges and problems faced by global water under five thematic areas and five cross-cutting themes:

Box 1. Thematic Areas and Cross-Cutting Themes

Thematic Areas

- 1) Water for Growth and Development;
- 2) Implementing Integrated Water Resource Management (IWRM);
- 3) Water Supply and Sanitation for All;
- 4) Water Management for Food and the Environment; and
- 5) Risk Management.

Cross-Cutting Perspectives:

- 1) New Models for Financing Local Water Initiatives;
- 2) Institutional Development and Political Processes;
- 3) Capacity Building and Social Learning;
- 4) Application of Science, Technology and Knowledge; and
- 5) Targeting, Monitoring and Implementation Assessment.

Regional Process

The aim of the Regional Process is to enable dialogue and networking among stakeholders in the region. For each region, a Regional Beacon is assigned to coordinate: (i) the



identification of local actions that should be promoted, scaled up or duplicated; (ii) the preparation of a regional report on the difficulties and major actions needed to boost action on the ground for better water services and resource management; (iii) the drafting of a brief paper on the region to be incorporated as an annex in the Forum's Ministerial Declaration.

1.3 Preparation for African Participation in the 4th World Water Forum

Preparation for Africa's participation in the 4th World Water Forum started on June 26, 2005 at a meeting convened by the World Water Council (WWC) in cooperation with AMCOW. The meeting established: a) steering committee chaired by an AMCOW executive committee²; and b) a technical committee co-chaired by AMCOW-TAC and AfDB³. AfDB was designated as a Regional Beacon, with responsibility for coordinating the preparatory process and acting as a secretariat.

The African Development Bank established a task force to assist the regional preparation and the first meeting of the technical committee was held in Tunis on September 28-29, 2005. A second meeting of the steering committee and the technical committee took place in Windhoek, Namibia on December 8-9, 2005.

Through the regional process, the region has selected six topics plus the regional report for presentation at the sessions to be held at the Forum.

2 Composed of AMCOW EXCO and representatives of the AU, AfDB, UN WATER, ECA and NEPAD;

3 Composed of representatives from the GWP, AMCOW, AfDB, UN Water, ANEW, WWC, MDP, AWTF, IWMI, FAO, UNEP, UN Habitat, WUP, ANBO and WBOs, among others.

Box 2. Overview of Regional Sessions

1. Regional Report Presentation: The African Regional Report on Water, prepared by the Bank on behalf of AMCOW, will be presented before high-ranking officials. The report highlights the state of development, the main challenges and issues, and the future strategic direction for water resources development in Africa. A ministerial declaration will be released by AMCOW.

2. Multi-Stakeholder Response to the Report: National, regional and international partners and stakeholders will join the session to discuss key water issues and the way forward, based on the regional water report and the ministerial declaration

3. Transboundary Water Resources Management in Africa: The session is aimed at discussing concrete, ongoing experiences in the management of transboundary water basins in Africa and how dialogue and cooperation lead to regional integration, social improvement and economic growth.

4. Financing Mechanisms for Local Water Initiatives: The session will showcase a range of viable and affordable financing options and mechanisms for reinforcing local water development initiatives.

5. Enhancing Investments for Water Management in African Agriculture: The session will highlight and discuss opportunities for innovative, cost-effective investment in agricultural water management, fostering high agricultural growth and a rapid reduction in the scarcity of agricultural water.

6. Water Supply and Sanitation for All: The purpose of this session is to discuss and exchange experiences among key stakeholders on actions undertaken to improve the water supply and sanitation situation in terms of the MDG targets.

7. Groundwater Resources Management and Protection in Africa: The session will create awareness among key stakeholders at all levels regarding its role of groundwater in development, its hydrological and ecological functions, its vulnerability to human impacts, and approaches to using it in a sustainable way.

8. Water for Growth and Development in Africa: The aim is to present actions in the African water sector aimed at ensuring growth and development in the areas of: water and energy, water and industry, risk management and valuing water.

1.4 The Regional Report for the 4th World Water Forum

The objective of the Regional Report is to present: the main challenges and opportunities of water development in Africa; the major actions needed to boost water services and resource management; and exemplary local actions that should be promoted, scaled up or replicated for enhanced development and the achievement of sustainability.

The Regional Report is prepared by the Regional Secretariat and was discussed and commented on at the first and second preparatory meetings of the technical committee for the 4th Forum, and at the AMCOW technical executive advisory committee meeting. The report was also presented to the steering committee for the 4th Forum and was distributed by e-mail to the major stakeholders in the region, including UN agencies and other international organizations. The final report takes into consideration all comments, suggestions and information received from the various stakeholders.

1.5 Structure of the Regional Report

The African Regional Report has five chapters. Following this introduction, Chapter 2 presents the key socio-economic and hydrological characteristics of the region, while Chapter 3 presents the main water-related challenges facing Africa. Chapter 4 focuses on the region's response to the challenges and includes examples of local actions. Finally, the conclusions and the way forward are summarized in Chapter 5.



2. REGIONAL SETTING

2.1 Socio-Economic Characteristics

Population

The population of Africa in 2005 is estimated at about 905 million and is expected to grow to 1.115 billion by 2015, 1.345 billion by 2025 and 1.936 billion by 2050. Hence, in addition to having to replace existing infrastructure, it will be necessary to provide a water supply and sanitation to an additional 21 million people each year, on average. Currently, 39.7% of population is urban, but by 2025 more than half of the African population will be urban, and during the next quarter century the urban population will grow almost twice as much as the overall population. By 2020, Africa will have 11 mega-cities with five million or more inhabitants and almost 720 cities with populations of more than 100,000⁴. This implies a gradual shift in the focus of water supply and sanitation from the rural areas to the urban areas.

HIV/AIDS

Africa also bears the brunt of the world's HIV/AIDS pandemic. Though Africa has about 14% of the world's population, it is home to more than 60% of all people living with HIV/AIDS. To date, 13 million men, women and children have died of HIV/AIDS and 26 million are now living with the virus. In 2005, an estimated 3.2 million people in the region became newly infected, while 2.4 million adults and children died of AIDS. In many African countries HIV/AIDS is erasing decades of progress in extending life expectancy. It is also bringing additional pressure to bear on the health sector and is affecting essential human resources capacity. In total, HIV/AIDS is seriously hindering socio-economic growth and development.

Progress towards MDGs

Assessment of progress towards the MDGs for 2015, based on linear interpolation of trends in the 1990s, shows that among 173 countries, 26 African countries are classified as exhibiting low human development⁵. This indicates that most African countries are slipping back or lagging

in the attainment of the MDGs. The Human Development Index (HDI) rankings and the progress of African countries toward the MDGs is shown in Annexes 2 and 3.

The available statistics on MDG achievements are diverse with several countries making remarkable progress, some stagnating and others lagging seriously behind. For example, in Sierra Leone, in 2003, 175 children died before the age of five per 1,000 births, compared to only 16 per 1,000 births in Mauritius; Zimbabwe's illiteracy rate is around 9%, while Niger's is 82%; 22% of the population of Ethiopia have access to safe sources of water, compared to 99 percent in Mauritius. GNI in Ethiopia and Burundi is US\$100 while in Seychelles it is US\$ 7,050⁶.

Governance

The launching of the NEPAD initiative in 2001 and the establishment of the AU in 2002 offer exciting prospects. These two historic events show that Africa is taking leadership in its own development process. The AU and the Regional Economic Commissions (RECs) are playing pivotal roles in bringing peace and stability to countries affected by conflicts. Democracy has started to take root in a number of African countries and good investment environments have been created. NEPAD is playing a key role in promoting good governance through its African Peer Review Mechanism and countries are submitting voluntarily to peer review. The challenge is to maintain the momentum for good governance in the region.

Economic Growth

Annual GDP growth in the region rose to 5.1% in 2004, up from 4.4% in 2003, resulting in per capita GDP growth of 2.8%. This is the highest GDP growth rate for the continent since 1996⁷. In addition, inflation has reached historic lows, despite increasing oil prices⁸. Several factors, both external and internal, contributed to this strong overall economic performance.

The flow of aid to African countries has increased in the last few years. The launching of NEPAD, the Monterrey Consensus on financing for development in 2002, and the

⁴ Population Division of the Department of Economic and Social Affairs of the United Nations, December 2005

⁵ Human Development Report 2002, UNDP

⁶ African Development Report 2004,

⁷ African Development Report 2004, African Development Bank, 2004

⁸ African Economic Outlook 2004/2005, OECD, African Development Bank, 2005

implementation of the Heavily Indebted Poor Countries (HIPC) Initiative have all played an important role in making Africa the focus of development aid. Nevertheless, the commitments made and the funds actually disbursed are below the levels seen in other forums, for example the commitment to devote 0.07% of GDP to aid.

Despite all the efforts mentioned above, Africa remains the only continent where poverty has increased in the last decade and its share of world trade fell to half between 1980 and 2002. In 2001, 46.4% of the population (313 million people) lived on less than one US\$ per day.

Furthermore, the region's total external debt rose to US\$ 218 billion in 2003, compared to US\$ 204 billion in 2002, even though 23 countries obtained total debt service relief worth about US\$ 43 billion. In addition, of a total US\$ 135 billion in foreign direct investments (FDI) in 2003, net FDI flows to Africa dropped to US\$ 9 billion in 2003⁹ –less than half the 2001 figure.

2.2 Climate and Water Resources

2.2.1 Climate

Africa is a large continent comprising 53 countries, with a wide range of hydrological characteristics. The region represents 22.4% of the world's land area and 13 percent of the world's population, but has only nine percent of its fresh water.

Most of Africa is composed of hard Precambrian rocks forming a platform with some mountainous areas, mainly on the fringes of the continent and where the rift valley crosses East Africa. Its climate is much more varied than its physical relief. The continent has the hottest of deserts and the most humid of jungles –and the amount and distribution of precipitation is the key factor. Annual totals vary from 20 mm a year over much of the vast Sahara region to 5,000 mm near the mouth of the Niger. With large amounts of solar radiation and high temperatures, African evaporation rates are high. The deserts that cover about one third of the continent in the north and south have little surface water but large volumes of groundwater.

Average annual rainfall is about 20,211 cubic kilometres per year or 673.1 mm per year. However, distribution is varied at the sub-regional level. The highest rainfall occurs in the island countries (1,700 mm per year), central African countries (1,430 mm), and in the Gulf of Guinea (1,407 mm). By contrast, the lowest rainfall occurs in the northern countries, where the annual average is only 71.4 mm.

⁹ African Development Indicator (ADI) 2005

The continent has a long history of rainfall fluctuations of varying frequencies and intensities, leading to drought and floods. The variability of rainfall is very pronounced in the drier parts of the region. The worst droughts were those of the 1910s, which affected both East and West Africa. They were generally followed by increasing rainfall amounts, but negative trends were observed again from 1950 onwards¹⁰. Historical data also indicate that the rainfall in the Sahel region during 1961–1990 was 30% percent lower than it was during 1931–1960.

According to the International Panel on Climate Change (IPCC), the African continent is the most vulnerable to climate change. Runoff and water availability are expected to decline in the northern and southern regions of the continent, while the frequency of floods and droughts will increase. This, combined with population growth and higher demand, means that 25 African countries are expected to experience water scarcity and or water stress over the next 20–30 years. These situations demand increased awareness regarding the utilisation and management of fragile water resources and the creation of storage capacities to overcome fluctuations in water availability.

2.2.2 Surface Water Resources

Africa is estimated to have annual renewable surface water resources of about 4,590 billion m³ per year. The region is divided into 24 major hydrological units or basin groups: eight major river basins draining to the sea (Senegal, Niger, Nile, Shebelli-Juba, Congo, Zambezi, Limpopo and Orange/Sengu rivers); nine coastal regions with several small rivers also draining to the sea; and five regions grouping several endorheic drainage basins (Lake Chad, Rift Valley, Okavango, South Interior and North Interior), with significantly greater precipitation than northern Africa, the Horn of Africa and southern Africa.

The region's average per capita water resources are estimated at about 4,979 m³/inhabitant/year¹¹. Figure 2.1¹² shows the distribution of water resource potential in the sub-regions of Africa, together with the distribution of the population (1994 estimates) in the same sub-regions. The per capita potential supplies in the sub-regions are also shown. These freshwater resources are distributed unevenly across Africa, with western Africa and central

¹⁰ Rainfall variability and drought in sub-Saharan Africa since 1960, FAO 1996

¹¹ Review of Water Resources by Country, Water Reports 23; FAO UN Rome, 2003

¹² Water for People...Water for Life, UNESCO 2003

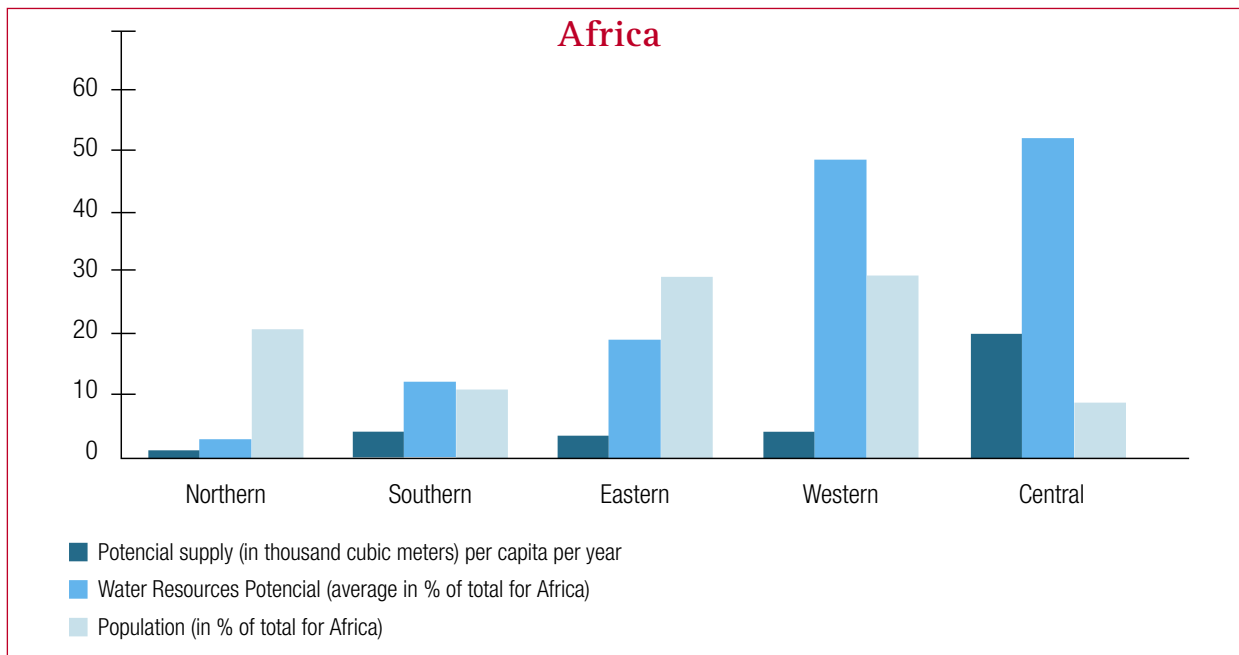


Figure 2.1 Per Capita Water Availability

Africa getting most of them. The Democratic Republic of Congo is the wettest country in the region and Mauritania is the driest, contributing 25% and 0.001% to Africa's total water resources, respectively.¹³

This situation calls for regional planning for an equitable use of water resources to benefit resource-rich countries and countries facing water stress.

2.2.3 Groundwater Resources

Groundwater resources account for about 15% of Africa's renewable water resources, amounting to about 810 billion m³ per year. These resources are crucial for many African countries and peoples, particularly during the dry season and in the major arid zones. Because of the low level of rainfall in some countries, large numbers of people are dependent on groundwater as their primary source of fresh water. Groundwater accounts for 60% of water use in Algeria (UNEP 2002), 80% in Botswana, (Government of Botswana 1993) 40% in Namibia (Heyns 1993) and 95% in Libya (UNEP 2002).

Like rivers, aquifers cross national borders and can be shared by two or more countries. Unlike Africa's rivers, little is known about the continent's more than 38 shared or transboundary groundwater aquifers. The Nubian Sandstone Aquifer System (NSAS) is a huge groundwater resource shared among four countries within the eastern Sahara in north-east Africa (Chad, Egypt, Libya and Sudan). The NSAS underlies an area of more than 2.5 million km².

It occupies a portion of the great arid zone belt of North Africa, extending northward into the Mediterranean Steppe and merging on its southern side into the subtropics. Groundwater studies in general have been greatly lacking, since substantial investment and scientific expertise is required just to identify or map the boundaries of an aquifer before beginning to accurately assess the quantity and quality of water it contains.



¹³African Environment Outlook, UNEP 2002

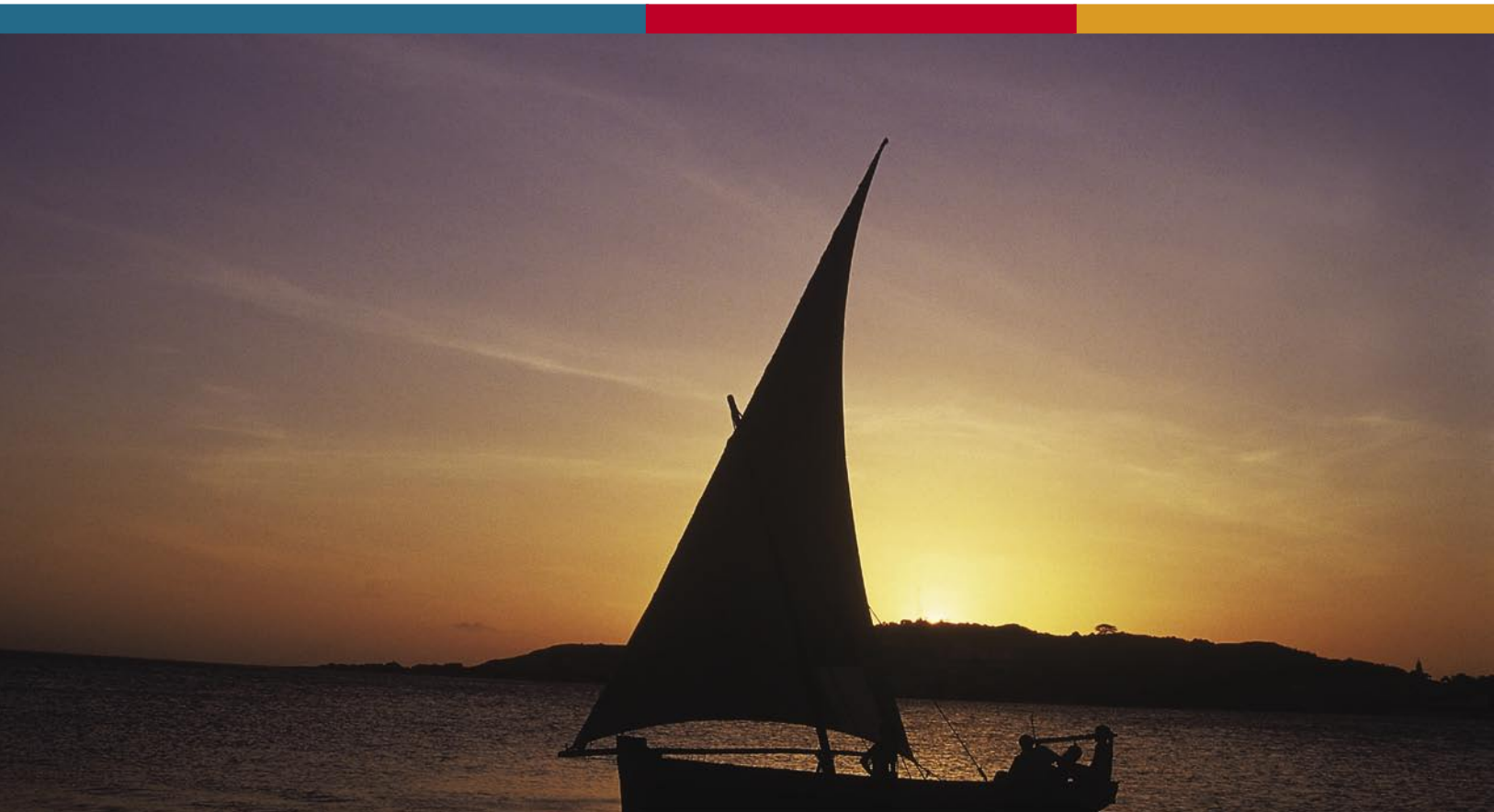
2.3 Transboundary Water Basins

African water resources are characterised by the great number of transboundary water basins. Africa has about one third of the world's major international water basins, about 80 international rivers and lake basins, and over 38 transboundary groundwater aquifer basins. Most countries share many water basins and most of the basins in the region are shared. For example, the Nile basin is shared by ten countries and Guinea shares twelve river basins with other countries. The list of international water basins draining more than 30,000 km² is given in Annex 4. Water inter-dependence in the region is very high. For example, almost 100% of Egypt's flows originate from outside its borders and for Mauritania and Botswana the figures are, respectively, 95% and 94%. Despite this, very few shared waters are jointly managed at present and, in many respects, the issues of water rights and ownership of international waters remain unresolved, resulting in national interests prevailing over shared interests.

The African continent's many international rivers and lakes that could provide great opportunity for cooperative development and serve as an instrument for regional integration. Partnerships and cooperation between countries sharing a common water basin would also enable the use of water basins as a unit for water resources management. Cooperative frameworks and institutions must be established to ensure mutually

beneficial development of transboundary water resources. In the past, African governments, with the assistance of regional and international partners, have developed models for cooperative frameworks that have led to the establishment of river basin organizations (RBOs). The list of existing RBOs and a brief description of their mandates and activities is given in Annex 5.

Three main types of models for developing institutional frameworks have emerged from cooperation on transboundary water resources management in Africa. With the first type, riparian countries reach an agreement on a legal framework that leads to the establishment of river basin organization with full development mandate. The OMVS, NBA and LCBC have been established following this approach. The second type of cooperative arrangement follows the SADC model, where a comprehensive protocol on shared watercourses is agreed at the REC level, providing the legal basis for forming river basin organizations. Under the third model, riparian countries embark on confidence-building measures through the development and implementation of shared vision programmes, before establishing the legal institutional framework. The NBI is a transitional arrangement established under this approach. For effective water management at the basin level, there is a strong need to build confidence among riparian countries and to build the capacity of the WBOs.



3. ISSUES AND CHALLENGES

3.1 Water Resources Development Opportunities and Issues

Although a great deal of effort has gone towards meeting the internationally agreed goals and targets relating to water, results have been far below expectations. Water development has failed to meet the challenges facing it for various reasons. The Pan-African Implementation and Partnership Conference on Water (PANAFCON) has identified these key issues influencing water sector development:

- Multiple transboundary waters;
- High spatial and temporal variability of rainfall;
- Increasing water scarcity;
- Inadequate institutional and financing arrangements;
- Inadequate data and human capacity;
- Inadequate development of water resources;
- Depletion of water resources through human actions;
- Lack of access to safe and adequate water supply and sanitation services;
- Lack of water for food security;
- Inefficiency and waste in water use;
- Threats to environmental sustainability.

Since the PANAFCON, several meetings and discussions have taken place both in and outside the region on the opportunities and the issues surrounding African water development. In light of these latest developments, water issues and opportunities are classified and discussed under the following five main headings:

- State of Water Resources,
- The Development Environment,
- Ensuring Water Security – Developmental Needs,
- Governing Water Wisely,
- Financing Water Resources Development.

3.2 State of Water Resources

3.2.1 Growing Water Scarcity

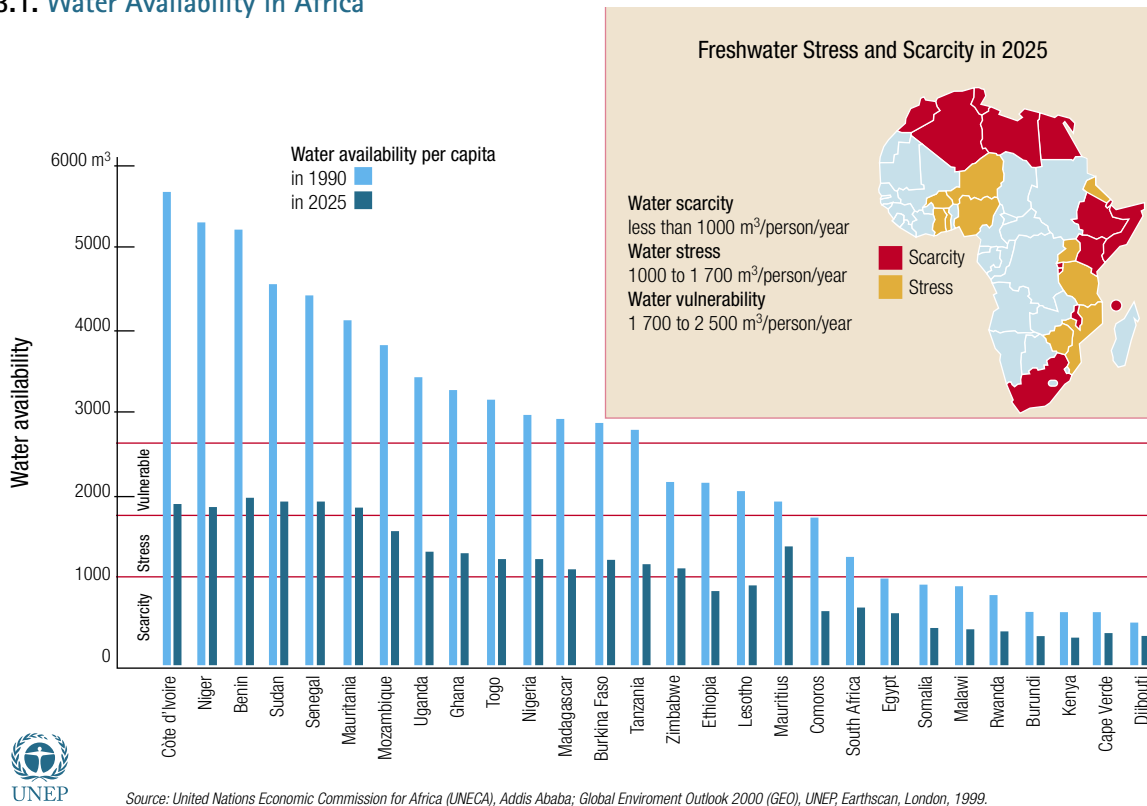
While Africa uses only about 4% of its renewable freshwater resources (WRI, UNEP, UNDP and WB, 1998), water is becoming one of the most critical natural resource issues. Availability of water in Africa is highly variable. Only the humid tropical zones in central and west Africa have abundant water. Many others are approaching or already facing water stress (1,700 m³ or less per person annually) or scarcity (1,000 m³ or less per person annually). Currently, fourteen countries in Africa are subject to water stress or water scarcity, with those in northern Africa facing the worst prospects. Figure 3.1 shows water availability in the region.

This situation is worsening as a result of rapid population growth, expanding urbanization, and increased economic development. A report by the Global Environment Outlook (GEO) predicts that by 2025, "25 African countries will be subject to water scarcity or water stress" and points out that northern Africa will be facing the worst prospects.

The North African annual average per capita water availability has dropped from 2,285 m³ in 1955 to 958 m³ in 1990 and is expected to reach 602 m³ by the year 2025¹⁴. To meet its present and future water demands, the sub-region's options are limited to either long distance water transfers from the southern aquifers to the coastal areas or else large-scale seawater desalination projects. There is great potential for future use of desalination in the region. However, there are great challenges involved in developing and selecting the appropriate technology, and in developing the human and institutional capacity to operate and manage the systems. Box 3 shows the state of desalination technology in selected locations in the region.

¹⁴ Water transfer versus desalination in North Africa: sustainability and cost comparison Saad A. Alghariani, Alfateh University, Tripoli, Libya, March 2003

Figure 3.1. Water Availability in Africa



Box 3. Desalination Technology in the Region

Desalination technology in the region has been clouded by poor understanding and scarce information on the sophistication of the technology and its cost. While transferring water is clearly becoming more costly, the unit cost of desalinating seawater has dropped over the last two decades, consequently raising its profile. The Algerian Hamma Membrane Desalination plant, with a capacity of 200,000 m³/day and a cost of about US\$ 250 million¹⁵, was commissioned in July 2005. This national programme involves the construction of eleven plants along the Algerian coast for a global production of 1.2 million cubic meters in 2009. The first plant (80,000 m³/day) is already operational. This and other undertakings demonstrate the future of desalination in the region.

Desalination for household and small community water supply is also under development. A pilot plant constructed by South Africa using a reverse osmosis unit powered by solar energy was capable of producing potable water from brackish borehole water for rural communities. In the remote community of Cite Patate in Mauritius, locally-constructed solar water desalination units have provide households with improved access to drinking water.

3.2.2 Climate Variability

The extreme spatial and temporal variability of climate and rainfall in Africa is one of the significant features of the continent's water resources, with far-reaching consequences for water resources management. Africa's climate is governed indirectly by monsoon circulations that extend across large parts of the Atlantic and Indian Oceans. In addition, extra-tropical influences are felt from both hemispheres. Year-to-year fluctuations in rainfall over Africa are determined by circulation regimes that alter the preferred location of tropical convection and the Inter-tropical Convergence Zone (ITCZ)¹⁶. The apparent disappearance of Lake Chad in West Africa illustrates the influence of climate change in Africa. The lake has shrunk in area by over 95% – from 25,000 km² to 1,200 km² – in just the last three decades¹⁷. The white cap of Kilimanjaro varies in size depending on the season of the year and may grow and shrink at intervals, depending on solar influx, precipitation and other factors; but since 1912 there is clear evidence that the glaciers have shrunk consistently and dramatically. Satellite images confirm the findings measured on

¹⁵ Press Release/GE Infrastructure, Water & Process Technologies/June 25, 2005

¹⁶ African Climate Variability (G4), Harrison, MSJ, 1986

¹⁷ Centre for Sustainability and the Global Environment Nelson Institute for Environmental Studies University of Wisconsin-Madison.

the ground¹⁸. One example of temporal variability of climate is the fluctuation of the level of Lake Malawi, as described in Box 4.

Temporal and spatial variability, compounded by unpredictability and climate change, are at the heart of resource insecurity, resulting in vulnerability and a strong impact on economic growth. The baseline document for Water for Growth and Development for the 4th Forum states: "The economic cost of hydrological variability in Ethiopia is estimated at over one-third of the nation's average annual growth potential. Economy-wide models that incorporate hydrological variability in Ethiopia show that projections of average annual GDP growth rates

drop by as much as 38 percent as a consequence of this variability²⁰. Mozambique offers another example of the impact of variability: as a result of the flood in 2000, the projected annual GDP growth rate dropped by 23% after the flood and projected inflation increased by 44%.

To mitigate the temporal and spatial variability of the African climate, the challenge is to create an environment that attracts investment in water infrastructure to contain floods, create water storage capacity for flow regulation and make water available for productive use. The impacts of climate variability also reveal whether countries are prepared to mitigate this phenomenon.

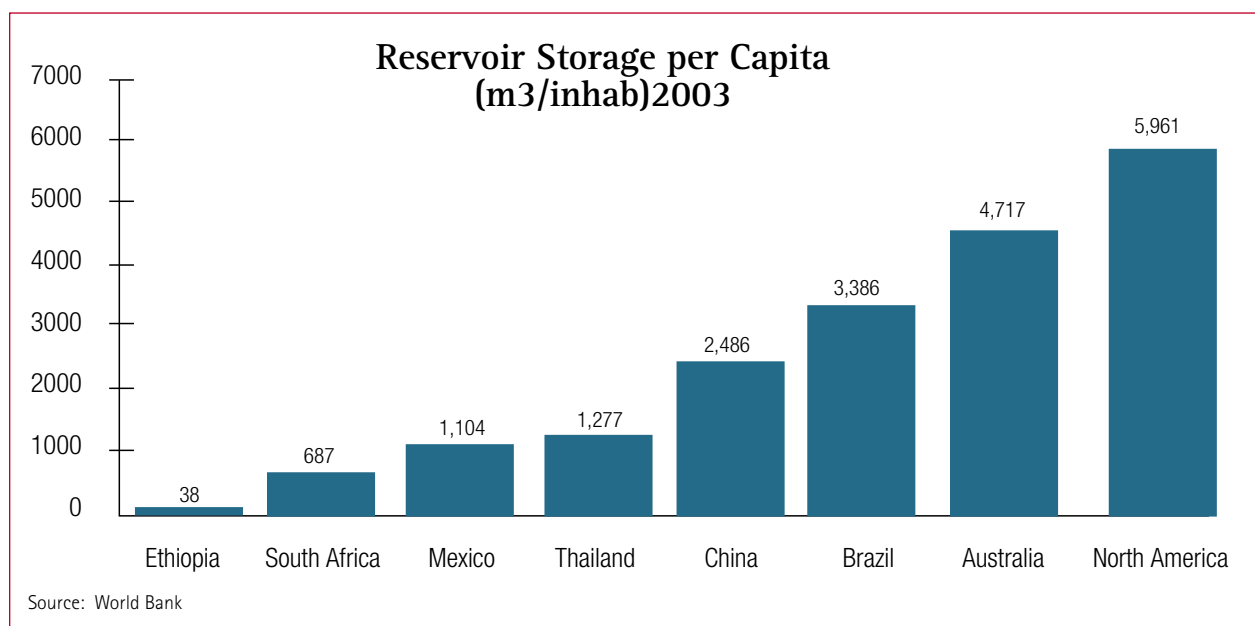


Figure 3.2: Per Capita Reservoir Storage

Box 4. Fluctuation of the Lake Malawi water level

Water levels in Lake Malawi have shown considerable variations since regular records were first taken in 1896. From 1915 to 1935, the lake was so low that outflow ceased in 1915, due to low rainfall in the catchment basin in preceding years. The droughts of 1949 and 1992 have had similar effects on lake levels, with rises during the rainy season of only 0.08 and 0.32 meters, respectively. However, from 1935 to 1937, and from 1979 to 1984, high lake levels were observed. During the wet season of 1978-79, a rise of 1.83 m was registered¹⁹.

Figure 3.2²¹ compares the per capita volume of stored water in both developed and developing countries. This also indirectly shows the relationship between development levels and vulnerability to climate variability. Reusing recycled water is one method of optimising the use of available water resources and averting water stress. However, recycled water is currently being reused only in a few specific areas in the northern, western and southern African countries. Concentrically useful water is being

¹⁸ Vital Climate Graphics Africa, UNEP/GRID-Arendal

¹⁹ Naturalization of Lake Malawi Levels and Shire River Flows, Challenges of Water Resources Research and Sustainable Utilisation of the Lake Malawi-Shire River System, Osborne N. Shela, Interconsult, Lilongwe, Malawi

²⁰ Water for Growth and Development: A Framework for Analysis, The World Bank, 2005.

²¹ Water for Growth and Development: A Framework for Analysis, the World Bank, 2005.

wasted, but as more African countries face water scarcity, the importance of reusing recycled water will grow.

3.2.3 Natural Risks

The most common natural disasters in Africa are drought, flooding, cyclones, food shortage, and pest infestations. Droughts are endemic in both southern Africa and the Sahelian region of western and northern Africa. Drought is the most deadly natural disaster, accounting for over three-quarters of those affected and 98% of mortality under this heading. During the past ten years, three-quarters of the droughts in the world have occurred in Africa. Drought is a condition of life for many residents of Africa, especially those of the Greater Horn region. The African countries most affected by drought are Ethiopia, Chad, Botswana, Burkina Faso, Kenya, Mozambique and Mauritania.

Much of Africa is vulnerable to flooding. Flooding is the most prevalent disaster in northern Africa, the second most common in eastern, southern and central Africa, and the third most common in western Africa. Flooding accounted for 26% of all disaster incidents in Africa from 1971 to 2001.

Early warning systems are useful in determining the likelihood and duration of occurrence of floods, as well as the extent and location of damage. Public awareness also has to be raised regarding disaster preparedness and the benefits of floods. Sub-regional systems for early flood warnings exist in the SADC and Sahel sub-regions and are being developed in other regions. However, water resource variability, river flow and hydrological models to enable

Box 5. Examples of Impact of Flood in Africa

The 2001 flood in northern Algeria resulted in about 800 deaths and an economic loss of about \$US 400 million. In Kenya, the El Niño-related flood in 1997-98 destroyed infrastructure and property worth about \$US 1.8 billion. In Mozambique, the 2000 flood, (worsened by two cyclones) reduced annual economic growth from 10% to 4%, caused 800 deaths, affected almost two million people (of which about one million needed food), displaced 329,000 people and destroyed productive agricultural land. The worst episodes of flooding in Africa killed 2,311 people in Somalia in 1997 and affected 1.8 million people in Sudan in 1999.

Box 6. Desertification in Africa

Desertification affects about 46% of Africa. Only about 11% of the land mass is humid and, by definition, is excluded from desertification processes. About 14% of Africa is at low risk, 16 % at moderate risk and 11% at high risk, particularly regions bordering on deserts. The Sahara is said to have been moving at the rate of one kilometre per year for the past 300 years. Climate, humans and livestock are the main causes of spreading deserts in Africa. Prolonged drought, in particular, leaves land dry and infertile, resulting in the destruction of forest, farmland and rangeland, and ultimately to economic decline²².

the development of comprehensive flood early warning systems are at various stages of development at the national and subregional levels throughout Africa.

The most obvious way of managing flood and water scarcity is to develop physical infrastructures to increase water storage capacity in the region. However, due to the high level of investment required, the development of these structures has been grossly inadequate. Per capita water storage capacity in North America is about 6,150 m³ while in Africa it ranges from 746 m³ in South Africa to 34 m³ in Ethiopia. It is obvious that if Africa wants to manage natural risks, eradicate poverty and attain sustainable growth it must invest adequately in water infrastructure. One important impact of climate variability is desertification. Box 6 presents the desertification situation in Africa.

3.2.4 Human Impacts on Freshwater Resources

Anthropogenic impacts on freshwater resources in Africa are mainly derived from population growth that outstrips economic growth, fast-growing urban areas, and industrial and urban waste disposal problems. If this situation is allowed to continue uncontrolled, it will reduce both the quality and quantity of fresh water resources. Examples of deteriorating quality are eutrophication and the proliferation of invasive aquatic plants. The water hyacinth has already seriously affected most water bodies in Africa, including Lake Victoria and Lake Chivero.

The problem of wastewater disposal is equally important as that of water supply. The disposal of

²² Land Resource Stresses and Desertification in Africa, P.F. Reich, S.T. NumbeM, R.A. Almaraz and H. Eswaran, 2001.

wastewater and other refuse without adequate treatment from urban centres and industrial plants has a negative impact on a wide range of ecosystems. The Homa Bay wastewater treatment plant and its impact on Lake Victoria is discussed briefly in Box 7.

Aquatic ecosystems have impacts on water supply. The deterioration of water quality may be accompanied by waterborne diseases that affect people using the water sources, increases in the cost of water resources development and increased water insecurity.

Box 7.: Homa Bay Sewage Treatment Works

In Homa Bay, Kenya, the sewage treatment plant, constructed in 1982, has a design capacity of 750 m³/day, but the current daily raw wastewater flow is in excess of 2,000 m³/day. The final effluent is therefore of very poor quality and is discharged directly into Lake Victoria. Only 22% of the town's population is connected to the sewerage network²³.

On average, about 50% of water in urban water supplies is not accounted for; and as much as 70% of the water used for irrigation is lost and not used by plants. These high levels of water wastage may be attributed to perverse incentives or to the use of inefficient technologies. In the case of water supply, a major contributing factor is poor maintenance through neglect of installed equipment. In many African countries, limited resources and poor water management has made renovations a form of delayed maintenance at water facilities.

3.3 The Development Environment

3.3.1 Overarching Issues

The overarching objective of water resources development is to achieve economic development and attain the goals of poverty reduction in the region. The non-availability of basic services is a primary measure of poverty, while poverty is the primary obstacle to the provision of basic services. Poverty is the single most influential factor related to the sustainable provision of basic water and sanitation services and food and energy security. Of the 173 countries included in the Human Poverty Index published by UNDP in 2002, there were 48 African countries among the lowest-ranked 73, and the last 28

countries were all in Africa²⁴. The region's progress towards achieving the MDG for the eradication of extreme poverty and hunger is not promising. Of 53 African countries, eight are slightly behind, eight are far behind, 16 are slipping back and six have reported no data²⁵.

Poverty affects basic water supply and sanitation in a number of ways, and if pervasive, it can challenge the application of even the very best practices incorporating all the lessons learned. Poverty is not confined to individuals and families alone, but extends to the institutions responsible for ensuring that services are provided at all levels. At the same time, the provision of services forms part of the poverty reduction agenda.

The foremost challenge here is to eradicate extreme poverty and chronic hunger. The MDG target is to "halve, between 1990 and 2015, the proportion of people whose income is less than one dollar a day". Meeting the targeted increase in income will greatly increase the likelihood that people will have the resources to meet other basic needs that are encompassed in the MDGs

3.3.2 Opportunities for Water Development

Access to and utilisation of water resources in Africa is generally very low – only about three percent of the total amount is used. The region's large areas of irrigable land, its huge, untapped hydropower potential, its unmet demands for water supply and sanitation, and for energy, make this an attractive sector for investment. The key challenge for the region is to create an enabling environment for both the public and private sectors to invest in water infrastructures that will make use of this potential.



²³ UN-HABITAT

²⁴ Human Development Report 2002, UNDP

²⁵ Human Development Report 2004, UNDP

3.3.3 Water Policies and Strategies

An assessment conducted by AfDB in 2005 for 34 countries in Africa indicates that only 14 of them have a water resources policy and strategy, and that only 16 countries prioritize water in their PRSPs. Water regulation mechanisms exist in very few countries: according to an informal stakeholder baseline survey undertaken by the GWP in 2004 on the status of national efforts to use an IWRM approach, only six of Africa's 45 countries had made good progress, while 17 had taken some steps and 22 were at the initial stages of the process²⁶.

According to commitments made at the international level at the WSSD and reiterated in the PANAFCON, African countries should have undertaken steps to prepare and adopt national IWRM plans by June 2005.

The challenge here is to promote the prioritization of water in national PRSPs, upgrade existing water management policies to embrace IWRM principles and practices according to national specificities, and develop or strengthen country water strategies.

3.3.4 Political Situation and Conflict Resolutions

Situations of instability and conflict are being corrected in most African countries. The political conflicts in Mozambique, Angola, Sudan and Liberia have been resolved and Congo is expecting a breakthrough through

political dialogue and conflict resolution mechanisms established by the AU. However, new conflicts are emerging and others are rekindling in some parts of the region. Instability and conflict create displacement of people and weaken economies. This shifts the focus from the development agenda to conflict resolution and discourages investment. Consequently, the water sector remains underdeveloped. A key challenge facing African countries is to ensure that stability and democracy prevail in the region by devising and implementing conflict avoidance strategies and strengthening existing conflict resolution mechanisms.

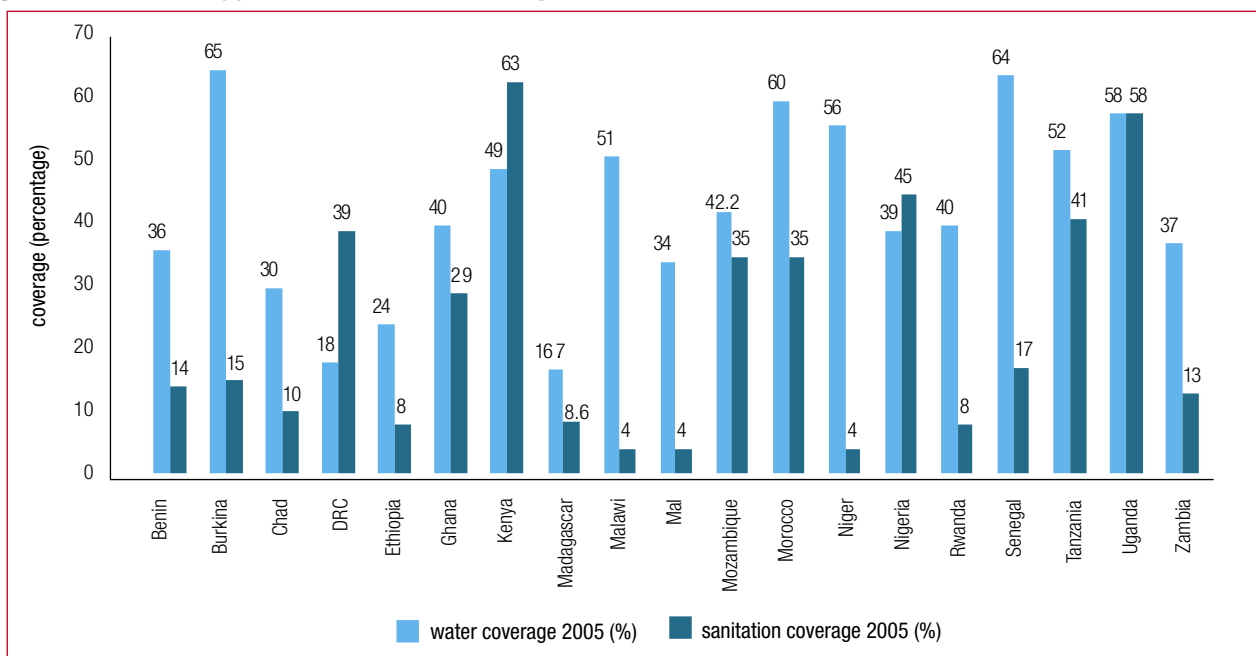
3.4 Water Security

3.4.1 Meeting Basic Water and Sanitation Needs

Africa has the lowest total water supply coverage of any region in the world. About 300 million people in Africa lack access to a safe water supply and about 313 million lack access to adequate sanitation. Figure 3.3 compares water supply and sanitation coverage in some African countries. While some have already achieved the MDGs, most are lagging behind.

Low access to a safe water supply and adequate sanitation is the root cause of many diseases that affect Africa and contributes to the high infant and maternal mortality in many countries. The World Health

Figure 3.3 Water Supply and Sanitation Coverage in 2005²⁷



²⁶ Current Status of National Efforts to Move Towards Sustainable Water Management Using an IWRM Approach, Informal Stakeholder Baseline Survey Global Water Partnership VERSION 1, April 2004

²⁷ Water Supply and Sanitation Assessment, AfDB, September 2005,

Organization (WHO) has reported that approximately 50 percent of all Africans suffer from one of six major water-related diseases.

HIV/AIDS is often linked to a lack of access to water supply and sanitation provisions. Women and children are particularly exposed to the disease when fetching water and taking care of HIV/AIDS victims. Hence, a gender-sensitive water supply and sanitation programme can help them cope better with the effects of HIV/AIDS.

In order to meet these targets, the region will have to devise innovative and efficient approaches to accelerate delivery of services and ensure the reliability of these services. This will be best achieved if there are adequate incentives for investment and if cost recovery is feasible.

3.4.2 Development of Water for Food Security

During the past three decades, agricultural production in the region has increased by no more than two percent per year, while population has risen at about three percent. Agricultural productivity per capita in sub-Saharan Africa has not kept pace with population increase and the region is now in a worse position in terms of nutrition than it was 30 years ago. In much of West Africa, the average food supply (2,430 kcal/day/person) is below what is regarded as the optimum level (2,700 kcal/day/person). In eastern and southern Africa, the number of people lacking food security almost doubled from 22 million in the early 1980s to 39 million in the early 1990s.

Cereal imports are expected to rise from the current ten million metric tons per year to 30 million metric tons 25 years from now. It has been estimated that a 3.3% increase in annual agricultural output is needed to achieve the continent's food security objectives²⁸.

In the past, additional food in Africa came from increases in the amount of land cultivated, but as good land becomes less available, the region will be forced to increase yields per hectare. Both rain-fed and irrigated agriculture will need to be intensified. While rain-fed agriculture would benefit from technology inputs on moisture management, it is irrigated agriculture that has a higher potential for intensification.

Currently, about 12.6 million ha²⁹ is under managed water and land development, equivalent to only about eight percent of total arable land. Only seven percent of arable land is now irrigated. Ten countries control more than 80% of the irrigated areas while

28 countries, covering more than 30% of Africa, share a mere five percent of the irrigated areas³⁰. Over the last 30 years, on average, irrigation in Africa has increased at a rate of 1.2% per year. However, this rate began to fall in the mid-1980s and is now below one percent per year, though varying widely from country to country. These numbers demonstrate that there is a very wide scope for the expansion of irrigated areas in the region by increasing the proportion of cultivated land under irrigation. In line with this, a recent FAO projection assumes that in sub-Saharan Africa, 73% of the growth expected by 2030 will come from the intensification of cultivated land³¹. New research from the International Food Policy Research Institute (IFPRI) shows that policy choices and investments made now could either substantially improve or else further worsen the prospects of food security in Africa. In what IFPRI calls a vision scenario, in which national governments and international donors increase investments in education, HIV/AIDS prevention and treatment, water harvesting technology, female schooling and clean water access, the available kcals/person would increase markedly in Africa by 2015, while the number of malnourished children in sub-Saharan Africa would decrease by 23.3 million, from 32.7 million in 1997 to 9.4 million in 2025³².

3.4.3 Development of Water for Energy Security

The gross theoretical hydropower potential of the region is estimated to be over 4.0 million GWh/year, while the technically feasible hydropower potential is estimated to be about 1.4 million GWh/year, of which less than three percent is utilised. According to the 2004 survey by the World Energy Council, at the end of 2002, Africa's installed hydropower capacity was 20,989 MW, generating 84,874 GWh/year (about three percent of the world total). Small-scale hydropower potential for rural energy supply is hardly exploited. However, the real figures (in particular the economically exploitable potential) are likely to be somewhat larger as data on hydropower potential is limited or not available for almost half the countries on the continent³³.

²⁸ African Water Development Report, UN-ECA, 2003

²⁹ FAO. 2000. Agriculture Towards 2015/30 estimates.

³⁰ African Water Development Report, UN-ECA, 2003

³¹ Irrigation in Africa south of the Sahara, FAO, Investment Centre Technical Paper 5 Rome

³² IFPRI, Looking Ahead: Long-Term Prospects for Africa's Agricultural Development and Food Security, August 2005

³³ World Energy Council, 2004 Survey of Energy Resources

The Democratic Republic of Congo alone is reported to have the potential to provide three times as much power as all of Africa presently consumes. The INGA hydropower scheme has the potential to be developed to provide power to southern, western and north-western African countries (with possible supply to Europe through Morocco) and northern African countries (with possible supply to the Middle East and Europe through Egypt). One study projects an installed hydro capacity of about 43 GW at Inga, to be developed as a run of the facility on the Congo River.

There are several other potential hydropower developments which could supply power to one or several countries. These include: the Kunene River that could supply Namibia, Angola and South African grids; the Kafue Gorge Lower (KGL) hydroelectric facility in Zambia to provide power to Zimbabwe, Botswana and DRC; the Bui Hydro plant, with capacity to provide power to Burkina Faso, Togo and Cote d'Ivoire, and several power plants on the Nile and other rivers in Ethiopia to supply power to North and East African countries.

Sixty-seven percent of total energy consumption is supplied by hydrocarbon-based power plants, while only



32% is covered by hydropower. The current distribution of hydropower is 23% in North Africa, 25 percent in West Africa and the remaining 51% in South/Central and East Africa. Africa's electrical consumption is expected to grow at a rate of 3.4% per year until 2020. Power shortages and irregularities have forced many countries to look to their neighbours to supplement their own supplies, resulting in regional networks and power pools.

The development of Africa's emerging power sector is a prerequisite for growth in other industries. A regular, consistent power supply will do much to attract investment. The continent's demand for energy supply and its hydropower potential, coupled with the currently very high price of oil, makes hydropower a more rewarding investment sector than ever before.

3.5 Water Governance

3.5.1 Institutional Arrangements and Water Governance

Institutions are defined broadly to include governance, capacity, organizations and policies. Water governance refers to the range of political, social, economic and administrative systems that are in place to regulate the development and management of water resources and the provision of water services at different levels of society. The assessment conducted by AfDB in 2005 for 34 countries in Africa indicates that only 18 of them have undertaken institutional reform at national level, while 13 have extended this to the district level. In order to achieve the MDGs, sound and effective water governance is required. On the other hand, the institutional evolution in the water sector in many African countries has not kept pace with the requirements. Consequently, resolving the challenges in this area must be a key priority if we are to achieve sustainable water resources development and management.

The ongoing institutional reforms must be strengthened to provide more scope for:

- involvement of civil society, youth, the private sector and local populations in the process of water resource planning and the reorganization of public water utilities;
- implementation of a rational legal framework for the settlement of disputes, protection of waters from pollution, and private sector regulation;
- economic valuation of water without neglecting the social dimension.

The river basin organizations operate under various arrangements. Some have a well-formulated legal and institutional framework, such as the SADC Protocol for Shared Watercourses; some have temporary arrangements for co-operation, such as the Nile Basin Initiative; and there are transboundary river basins like the Congo River basin without any form of regional cooperation arrangement. The existing river basin organizations also differ in terms of the degree to which they have developed their human resources and institutional capacity.

Box 8 presents the Senegal River Development Organization (OMVS) as an example of how shared water use can be a strong catalyst for regional cooperation.

The challenge here is for the countries and the region to address these issues at the appropriate level for each and every water basin. It is necessary to establish new organizations, and to rationalize and strengthen existing ones with financial, human and institutional capacities, and also to create frameworks for regional cooperation and harmonization of water policies and legislation.

Box 8. International Cooperation on Transboundary Basins

The Senegal River Development Organization (OMVS) is a unique case in Africa, in which three riparian states have established common infrastructure for the coordinated management of a river basin's water resources. Three conventions define the institutional and juridical framework for cooperation among the three countries: the convention of March 11, 1972, establishing the OMVS and defining the status of the river; the convention of December 21, 1978, on the status of shared infrastructure, and the convention of May 12, 1982, on the modalities of financing shared infrastructure. In 2002, the OMVS was given a charter governing the waters of the Senegal River. This stipulates that all water distribution is to be made on the basis of resource availability, regional cooperation, and integrated water resource management.

3.5.2 Human Resource Capacity

Over US\$600 billion has been invested in water infrastructure around the world in the last thirty years, but very little corresponding investment has been made in the capacity to manage such infrastructure. Current

capacity-building efforts are limited in both content and reach. For IWRM to be effective, it is important that capacity-building efforts should reach the different level of professionals ranging from the village artisan to the top-level designer. As demonstrated in Box 9, this situation is exacerbated by the brain drain process.

The region is facing two major challenges with respect to capacity building: launching an IWRM-focused capacity-building programme targeted at all levels of water professionals; and decreasing or reversing the brain drain, or else creating instruments to gain value from the African diaspora, wherever it is located.

Box 9. Brain Drain in Africa

According to the International Organization for Migration (IOM), Africa has already lost one third of its human capital and is continuing to lose its skilled workers at an increasing rate. An estimated 20,000 doctors, university lecturers, engineers and other professionals have been leaving the continent annually since 1990. There are currently over 300,000 highly qualified Africans in the diaspora, 30,000 of which have PhDs. At the same time, Africa spends US\$4 billion per year (equivalent to 35% of total official development aid to the continent) to employ some 100,000 Western experts performing functions generically described as "technical assistance". For example, 90% of private firms in Gabon are managed by expatriates. The problem of brain drain has reached disturbing proportions in certain African countries, with Ethiopia ranked first in the continent in terms of rate of loss of human capital, followed by Nigeria and Ghana³⁴.

3.5.3 Threats to Environmental Sustainability

Sustainable development depends on three key factors: environmental protection, social development, and economic growth and development. Of these, the critical and limiting factor is environmental protection. Africa's life-supporting environmental resources include its soils, land, forests, wetlands, aquatic and terrestrial ecosystems, coastal waters and biodiversity.

³⁴ Semantics Aside: The Role of the African Diaspora in Africa's Capacity-Building Efforts., Brain Drain in Africa, Facts and Figures, The Association for Higher Education and Development (AHEAD)

The challenge is to determine how much water needs to be left in the environment to meet the minimum needs of environmental sustainability. The water quantity and quality requirements of ecosystems are not normally taken into account in the overall allocation of available water resources in much of Africa, nor are they considered in the calculation of production and distribution costs. As a result, the environment is increasingly being endangered by pollution, encroachment, poor cultivation and deforestation. The important role played by the environment must be better recognized and reflected in national water policies.

When water developments are implemented with an eye to environmental concerns, these developments often help keep ecosystems in balance. For example, it is estimated that about 130 million people in Africa live in areas where fuel wood consumption outpaces the natural regenerative capacity of the forest. In such circumstances, degradation is compounded by greater reliance on energy sources such as dung or unused plant material, which play an important role in maintaining soil fertility and structure for future production. Development of rural electrification using hydropower would help reduce this problem.

3.5.4 Sedimentation of Reservoirs

Africa's lakes have a total volume of 30,567 km³, covering a surface area of 165,581 km². All the major lakes in Africa, except Lake Tana in Ethiopia, are shared by more than two states. These lakes contain more aquatic biodiversity than any other lakes in the world.



Africa has 2.4% of the world's large reservoirs (more than 15 m). Half of the continent's reservoirs are in South Africa. These multipurpose reservoirs were mainly designed for hydropower generation, although many are used for water supply, irrigation, industry and domestic purposes.

The average world rate of loss of reservoir volume due to sedimentation is between 0.5% and 1% per year³⁵. Sedimentation rates in temperate areas are low, while the sedimentation rate in Africa is very high, mainly due to soil erosion in the river's catchment area. For example, the loss of reservoir volume due to sedimentation in Lake Gelila at Koka dam (Ethiopia) is about 1.35% per year (25 million m³ per year³⁶). In addition to the storage loss, the finer sediment deposition can block diversion and abstraction facilities, and damage turbines

Reservoir sedimentation remains a serious problem in Africa. The situation has been exacerbated by the intensification of agricultural production and the encroachment upon marginal lands by settlements as a result of population pressure. This in turn has led to accelerated rates of soil erosion with subsequent siltation of river channels and reservoirs. The sedimentation of reservoirs seriously affects their economics and useful lifetime. The number of sites where dams can be built is strictly limited. If reservoirs are abandoned due to sedimentation, it will become increasingly difficult to find sites for new dams.

In order to achieve water security and undertake water development, major water infrastructure will have to be constructed in the coming years. For this to be successful, it is imperative to have accurate predictions of erosion in the catchment area (under varying conditions) and of the eventual deposition of these mobilized sediments in reservoirs and water channels. Such information is valuable in the implementation of sustainable catchment area management for water resources.

3.5.5 Information and Knowledge

Water Information and Knowledge consists of several steps: generation and collection of basic data, data validation and storage, data analysis and dissemination, and utilisation of data for development planning, implementation and overall sector management. Following these steps efficiently and regularly ensures a robust national information and knowledge system. Though very

³⁵ Flushing of Sediments from Reservoirs, Dr W. Rodney White, HR, Wallingford, UK

³⁶ Bird Life IBA, Fact Sheet, ET039Koka Dam and Lake Gelila

essential data is being generated every day, most African countries do not have the capacity and the capability to collect, compile and disseminate information to stakeholders. The effect is that the status of the sector is unknown at the country level, with enormous implications for planning and development in the sector.

It will be a great challenge to establish and maintain the data collection and evaluation network that is needed to provide strategic assistance for development activities. This should also be accompanied by new ways of disseminating information and sharing knowledge.

3.5.6 Monitoring and Evaluation

Monitoring and evaluation enhance the effectiveness of development activities by establishing clear links between past, present and future interventions and results. Monitoring and evaluation can help to extract relevant information that can subsequently be used as the basis for fine-tuning, reorienting and planning programs. A key factor constraining the planning and monitoring of development activities at the national, subregional and continental levels in Africa is the scarcity of data on water resources as well as a lack of:

- human and financial resources;
- appreciation of the importance of monitoring;
- understanding of the economic value of hydrological data and services;
- properly developed indicators;
- infrastructure and systems for collection, aggregation and dissemination of available data and information.

Without monitoring and evaluation, it would be impossible to judge if work was going in the right direction, whether progress and success could be claimed, and how future efforts might be improved. Monitoring and evaluation mechanisms are key to attaining the MDGs and these mechanisms must include the appropriate indicators in order to measure outcomes and outputs.

3.5.7 Gender Mainstreaming

During the International Drinking Water and Sanitation Decade of the 1980s there was very strong emphasis on involving women in water and sanitation programs. During the 1990s, however, the emphasis shifted from 'Women in Development' to 'Gender Mainstreaming'. In the process of this transition, many of the programs targeted for women in development were discontinued. The Millennium Declaration includes a commitment

Box 10. Impact of Water Supply and Sanitation on Gender

In Morocco, the Rural Water Supply and Sanitation Project of the World Bank aimed to reduce the burden on girls "who were traditionally involved in fetching water" in order to improve their school attendance. In the six provinces where the project is based, it was found that girls' school attendance increased by 20% in four years, in part because the girls spent less time fetching water. At the same time, convenient access to safe water reduced the time that women and young girls spent collecting water by 50-90%³⁷.

to achieving gender equality and the empowerment of women, as well as a pledge to reduce by half the proportion of people with no access to safe drinking water and basic sanitation by 2015. The Moroccan example in Box 10 shows the impact of water supply and sanitation in improving the lives of women and youth.

It is estimated that women are responsible for half the world's food production. Women's access to land ownership and to water has often been limited by discriminatory legal rights and customs. Equitable access to water for productive activities can empower women to address the root causes of poverty and gender inequality. Ensuring that the gender perspective is successfully incorporated into the global water agenda, and pursuing both gender mainstreaming and water management programs targeted specifically at women are challenges faced by both men and women in the continent.



³⁷ Source: World Bank, 2003, Report No: 25917

3.6 Investment Requirement

A recent assessment made by AfDB shows a 67 percent investment gap in the requirements for water supply and sanitation in 2007. In this light, the African Water Vision and the MDGs provide useful frameworks for identifying the investment requirements for transforming the water sector in Africa. A preliminary assessment shows that an average annual investment of US\$ 20 billion is required over the coming 25 years to attain the water-related MDGs. Table 3.1 gives a breakdown of this investment requirement by sector.

Table 3.1 Investment requirement for Africa Water Vision³⁸

Item	Description	Target 2025 Annual Investment (US\$ billion)
1)	Water supply for basic needs	5.00
2)	Sanitation and hygiene	7.00
3)	Irrigation and water productivity improvement	4.00
4)	Water for industry, energy and transport	2.10
5)	Flood and drought management	0.40
6)	Policy and institutional reform	0.35
7)	Knowledge and information	0.45
8)	Awareness and education	0.45
9)	Research and development	0.25
Total		20.00

Launched at the 3rd World Water Forum in Japan, the 2003 Camdessus Report codified what was known about water sector financing, including recommendations on how to access new sources of financing. The report indicated that all sources should be tapped to attain agreed water targets and that the prerequisite for achieving these targets is improved sector governance, better cost recovery and some national public funding. It also indicated that achieving the various targets will require the mobilization of public, private and community resources, as well as a two- or three-fold increase in development assistance (ODA) levels. It also pointed that donors should be held to account for their commitments to increase aid to the water sector³⁹.

For African governments to meet the financial requirements for water development, they must: feature water investments prominently in priority investment plans through the Poverty Reduction Strategy Papers (PRSPs), raise government budgetary allocations for water, promote good governance, establish cost-recovery measures without jeopardising access to the poor, and encouraging private sector participation by creating environments for sustainable investment financing.

³⁸The African Water Vision for 2025. Equitable and Sustainable Use of Water for Socio-economic Development, ECA, AU and AfDB.

³⁹Report of the World Panel on Financing Water Infrastructure, Financing Water For All, WWC, 2003



4. AFRICAN RESPONSES TO WATER DEVELOPMENT CHALLENGES

African water stakeholders have been developing political, social, institutional, financial and technical tools to face the challenges enumerated in Chapter 3, and have been taking advantage of existing opportunities to create an enabling environment for water resource development. Some of these responses of African stakeholders and international partners are described in the following sections:

- 1) Emerging Political and Policy Frameworks
- 2) Water for Growth and Development
- 3) Implementation of IWRM
- 4) Water Supply and Sanitation for All
- 5) Water Management for Food and the Environment
- 6) Risk Management

In addition, local communities, institutions, governments and regional organizations in Africa have developed several innovative local practices and instruments which, if scaled-up or replicated across the continent, would address some of these challenges. A brief summary of selected local actions is also included in each section, with further details in Annex 6..

4.1 Emerging Political and Policy Frameworks

4.1.1 Political Support and Commitments

African leaders have shown strong political commitment to confronting the water challenges facing the region. The launching of NEPAD and AMCOW, and the political support they have been receiving demonstrates this. The objectives of these organizations are in line with the objectives of the African Union, as stated in the (February 27, 2004) Sirte Declaration. The main goal of this declaration is to contribute to the eradication of poverty and to place African countries, individually and collectively, on the path towards sustainable growth and development. Extracts from the Fourth Extraordinary Session of the Assembly of Heads of State and Government – Sirte Declaration⁴⁰ are given in Box 11.

Box 11. Extracts from the Sirte Declaration

Support the African Ministerial Council on Water (AMCOW) in its role of preparing plans and policies related to water resource management on the continent.

Encourage bilateral agreements on shared water resources and enjoin the Regional Economic Communities to develop appropriate regional protocols to guide integrated water resources management.

Strengthen existing river and lake water basin organizations, where they exist, and establish new ones, wherever appropriate, to inter alia:

- Develop and promote water resources through support to infrastructure projects, including the construction of dams and canals, sinking of wells and providing irrigation equipment;
- Exploit water falls to provide electric power and link it to the Continent's general network;
- Carry out studies on untapped water in areas where it is available in large quantities to benefit the continent, in accordance with the principles of international law, including the protocols concluded among all the riparian States.

Adopt the African Water Facility and acknowledge the African Water Vision 2025 for comprehensive integrated development of the water sector.

4.1.2 African Ministers' Council on Water (AMCOW)

Ministers responsible for water in 41 African countries decided to establish AMCOW at a meeting in Abuja in 2002. AMCOW was established primarily to promote cooperation, security, social and economic development and poverty eradication in member states, through the management of water resources and provision of water supply services. The mission of AMCOW is to provide political leadership, policy direction and advocacy in the provision, use and management of water resources for sustainable socio-economic development and maintenance of African ecosystems.

Box 12. AMCOW's functions AMCOW's functions are to:

- Keep the state of Africa's water under review and promote desirable actions of common interest to Africa.
- Facilitate regional and international cooperation through the coordination of policies and actions amongst African countries regarding water resources issues;
- Support transnational cooperation on water-related issues through development of common positions on matters of global concern as well as cooperation in the implementation of relevant conventions and international agreements;
- Encourage mechanisms that will promote best practices in water policy reforms, integrated water resources management, food security, and water supply and sanitation; also assist in delivery in national regional and subregional programmes;
- Provide a forum for dialogue with UN agencies and other partners on water programmes;
- Promote participation in regional studies regarding climate changes, develop observation networks, encourage information exchange, set up strategies for the management of water resources in time of drought and floods, and develop policies and strategies for arresting the water crisis in Africa;
- Keep under review and constantly seek to strengthen the financing of the water sector in Africa.

4.1.3 Adoption of the African Water Vision (AWV)

The African Water Vision for 2025 was adopted in March 2000 at The Hague. The AWV is a vision of a future where the full potential of Africa's water resources is utilised to stimulate and sustain the region's economic development and social well-being. This is a shared vision of **"an Africa where there is equitable and sustainable use and management of water resources for poverty alleviation, socio-economic development, regional cooperation and the environment"**.

The AWV calls for a new way of thinking about water and new forms of regional cooperation. At the regional level, it calls for partnership and solidarity among countries that share common water basins. At the national level, it requires fundamental changes in policies,

strategies and legal frameworks, as well as changes in institutional arrangements and management practices. It will necessitate the adoption of participatory approaches, management at the lowest appropriate level, and the mainstreaming of gender issues and the concerns of young people. At the global level, it calls for assistance from Africa's development partners in mobilizing seed funding for the urgent developments needed to underpin sustainable management of the region's water resources. The framework for achieving this vision sets milestones and targets, and calls for:

- Strengthening governance of water resources;
- Improving water wisdom;
- Meeting urgent water needs;
- Strengthening the financial base for the desired water future.

4.1.4 Adoption of IWRM

The key lesson from water development in the last two decades is the need for a comprehensive and integrated approach to unlock the full benefits of sustainable water management for poverty reduction and economic growth. Integrated Water Resources Management (IWRM) recognizes that water has an ecological, social and economic use, and that water management has to be optimized within these systems. Hence, a number of workshops and conferences are being organized to create awareness and build capacity in IWRM. The GWP, AfDB and other stakeholders are promoting IWRM in the region. Through the support of the GWP, the West Africa, Central Africa, Eastern Africa, Southern Africa and North Africa (Mediterranean) Water Partnership in the sub-regions has been formed to promote the concept and implementation of integrated water resources management. IWRM is a long-term approach which should be embraced alongside, rather than prior to, concrete investment programs in the water sector. Though implementation of IWRM policy in African countries would take time and a great deal of effort and investment, a number of countries are beginning to adopt an IWRM approach within their water policies. The adoption of an IWRM-based policy will play a significant role in their socio-economic development.

4.2 Water for Growth and Development

4.2.1 Regional Efforts

African countries, realising that water has an impact on seven of the eight MDGs and can induce growth and

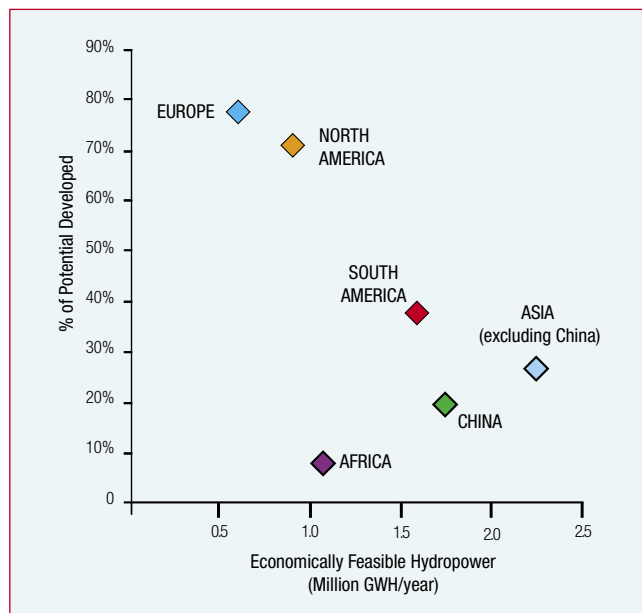


development beyond the MDG targets, have undertaken several water investment programs with the meagre resources available to them. Good examples of this are the Lesotho Highland Water Project, which is a multi-billion dollar water transfer and hydropower project implemented by the governments of Lesotho and South Africa, and the Kesem-Tendaho irrigation project, involving the construction of two dams for storage of 2.5 billion m³ of water and the development of 120,000 ha of irrigated land with about US\$ 700 million in funds allocated from Ethiopia's local government budget. However, much more must and can be done.

The World Bank estimate for hydropower development (Figure 4.1) shows how little is being done in the sector in Africa. While Europe has developed over 70% of its hydropower potential, Africa has developed only five percent⁴¹.

As was mentioned earlier, African countries have established the NEPAD to promote sound political and economic governance, and to initiate and facilitate multi-country programs and promote resource flows to and within the continent.

Figure 4.1 Hydropower Development



Source: World Bank

⁴¹ Water for Growth and Development: A Framework for Analysis, the World Bank, 2005

AMCOW has also established the AWF to build Africa's water infrastructure institutions and management capacity to catalyze investment in the sector. Along with African countries, international partners have undertaken several initiatives to enhance water resources development. The following sections describe the main regional and international contributions to growth and development.

4.2.2 NEPAD: Water and Sanitation Infrastructure Programme (WSIP)

NEPAD's WSIP falls within the larger framework of the partnership initiative, the aims of which include developing regional infrastructure, harmonizing sectoral procedures, enhancing financial flows towards investment in infrastructure, and developing skills and knowledge for the installation, operation and maintenance of infrastructure.

A strategy comprising a Medium- to Long-Term Strategic Framework (MLTSF) and a Short-Term Action Plan (STAP) has been developed by NEPAD for implementing the WSIP. The STAP consists of policy, capacity building and facilitation activities and key infrastructure projects that are already identified and therefore can be implemented once funding and necessary preparatory activities are completed. The MLTSF focuses on three main areas: i) Management and Development of African Water Resources to ensure water security and to strengthen the capacity to manage transboundary water resources; ii) Expansion and Improvement of Water and Sanitation Services; and iii) Enhancing Finance for Resources Development.

The Programme exemplifies the importance of defining clear-cut mechanisms for consultation and coordination of stakeholder activities relating to regional integration. The WSIP focus on achieving the infrastructure base over long term perspectives.

4.2.3 The African Water Facility (AWF)

The AWF is led by the African Ministers' Council on Water (AMCOW) and is established as a Special Water Fund managed by the African Development Bank. The AWF is an instrument conceived to facilitate the availability of financial resources to build Africa's water infrastructure institutions and management capacity to meet the targets and goals of the African Water Vision and the Millennium Development Goals (MDGs). The objective of the AWF is to improve the enabling environment and strengthen

water resources management so as to attract the massive investment necessary to achieve the regional objectives. The AWF addresses the problems of water development at the local level, as well as at the policy and institutional levels. Since most multilateral funding is directed at the national level, the fact that AWF is providing a non-sovereign financing is of important significance. The facility targets NGOs, CBOs, regional and subregional sectoral organizations, as well as central and local government institutions.

The Facility has been established to provide financial support for small-scale infrastructure projects submitted by beneficiaries, to support IWRM implementation at the national and regional levels through policy and institutional development, effective planning and implementation, and to facilitate transboundary water resources management by supporting joint development of shared resources.

4.2.4 World Bank

The World Bank, by far the largest provider of development assistance to Africa, has significantly increased its assistance over the past five years. The Bank directs more than 20% of its new lending toward public sector governance. Interventions cover expenditure management, civil service reform, decentralization, accountability mechanisms, and legal and judicial reform.

The Bank's total WSS portfolio under supervision in 2005 was about \$7 billion and Africa receives 18% of this amount. The Bank also attaches greater importance to capacity-building efforts in Africa. It provides catalytic grants to the Partnership for Capacity Building in Africa and assistance for the establishment of the African Institutes for Science and Technology, which seek scientific and technical achievement through regional approaches.

The World Bank is also playing a major role in facilitating the establishment of transboundary water basins and the development of water resources in the basins. Currently, the bank has ongoing activities in the Senegal and Niger water basins in West Africa; the Lake Chad and Congo basins in Central Africa; and the Nile basin in East Africa. The World Bank is also playing a crucial role in developing new ideas and strategies to use water resources for growth and development.

4.2.5 UN-Water/Africa

UN-Water/Africa (formerly Inter-Agency Group on Water in Africa (IGWA)) comprises several UN agencies,

including the Economic Commission for Africa, United Nations Environmental Programme, World Meteorological Organization, United Nations Educational, Scientific and Cultural Organization, Food and Agriculture Organization of the United Nations, United Nations Children's Fund, United Nations Development Programme, United Nations Human Settlements Programme, Water and Sustainable Development Programme in Africa, New Partnership for Africa's Development, and African Development Bank Group.

UN-Water/Africa was formed to coordinate and harmonize water activities in Africa by various UN and other subregional NGOs. Its other objective is to promote joint collaborative activities by these agencies in the African water sector. The United Nations Economic Commission for Africa (UNECA) is the Secretariat for UN-Water/Africa.

4.2.6 The EU Water Initiative (EUWI)

The EU Water Initiative, launched at the WSSD in Johannesburg, is a comprehensive partnership designed to help countries achieve water and sanitation targets. The EUWI will support the sustainable delivery of water and sanitation infrastructure and improve water governance and Integrated Water Resources Management (IWRM) practices in African, Caribbean and Pacific (ACP) countries by helping to address the financing gap. The EU is already investing over €1.4 billion a year in water-related development aid and scientific co-operation. The European Commission has committed €10 million to promote co-operation in the management of water resources, between countries that share river basins, with primary focus on Africa. The EU Council approved €250 million for the Facility in 2004, and a further €250 million is likely to be approved in 2005. The Facility is demand-driven and is designed as an instrument to support and deepen the involvement of actors in ACP States in the design and implementation of water policies.

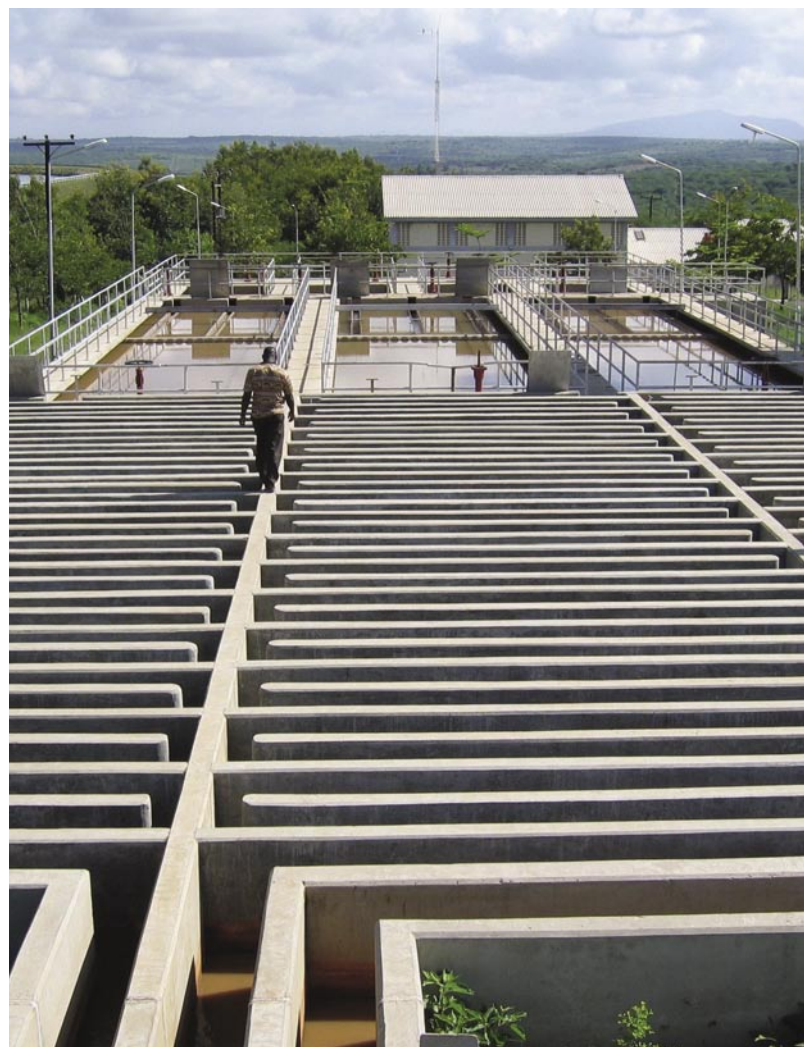
4.2.7 The Africa Partnership Forum (APF)

The Africa Partnership Forum came into being in 2003. APF matches NEPAD in both its breadth and scope, and its objective is to maintain international support for NEPAD and to monitor the partnership. It is emerging as the key international venue for the advancement of NEPAD. The Africa Partnership Forum has chosen to focus on economic growth, education, HIV/AIDS, peace and security, and food security.

The Africa Partnership Forum comprises personal representatives of the G8 Heads of State and some OECD countries, including five key international institutions: the International Monetary Fund, the UN, the World Bank, the African Development Bank and the World Trade Organization. It also includes all twenty African representatives of the NEPAD Heads of State and Government Implementation Committee (HSGIC) and the Executive Secretaries of the Regional Economic Communities.

APF is a key forum for discussing and monitoring commitments made by the G8 governments at a senior political level, regarding policy issues, strategy and priorities in support of Africa's development. Its members work together as equals in the forum and ensure synergies and coherence with other international forums. G8 partners contribute 74% of Official Development Assistance (ODA) to Africa. Along with eleven other countries, APF participants account for 98% of ODA to Africa.

In line with this, on October 6, 2005, the African Development Bank was made host to the secretariat and facilitation mechanism of the Africa Infrastructure Consortium.



4.2.8 The Infrastructure Consortium for Africa (ICA)

The G8/Africa meeting in London, convened by the British Department for International Development on May 5, 2005, brought together a cross-section of participants, including representatives of all G8 member countries, the African Union (AU), the NEPAD Secretariat, the Economic Community Of West African States (ECOWAS), the European Union (EU), the World Bank and the African Development Bank (AfDB).

The meeting acknowledged that African and donor initiatives have started to focus more on infrastructure and available financing, but it noted that there is still a significant gap in funding for both national and regional infrastructure. The meeting supported the recommendation of the Commission for Africa (CFA) report that there be a \$10 billion spending increase each year, eventually rising to \$ 20 billion as capacity to manage additional resources increases. It is against this backdrop that participants agreed to the proposal to establish a joint Infrastructure Consortium, building on the valuable work already underway to support Africa's efforts to provide the required regional infrastructure. The primary objective of the Consortium is to build a strategic partnership among donors to facilitate the development of infrastructure in Africa in support of economic growth and poverty reduction. Ultimately, the Consortium could focus on the effectiveness of investments and longer-term outcomes. The key sectors covered by the consortium are water and sanitation, energy, transport, telecommunications and urban infrastructure.

4.2.9 Canada's Water Initiative

Following the G8 Summit in June 2002, Canada announced a major initiative to support African development with water management as one of the focus areas. The Canadian International Development Agency (CIDA) provides support to policy/strategy development and building capacity for the implementation of policies and plans for sustainable water resources management in Africa. This includes support to:

- African Development Bank (AfDB), to develop financially viable water projects;
- African Water Facility in partnership with the AfDB, to provide grant investment support for water resources management and water service provision in Africa;
- Multi-donor Water Partnership Program, to support the application of its IWRM policy and to improve AfDB's capacity in the water sector and;

- UN-Habitat's Water and Sanitation Trust Fund, to assist committed African cities and communities to promote investment in water and sanitation with a focus on the very poor.

4.2.10 Local Actions in the Area of Water for Growth and Development

- Regional Solar to Improve Access to Water in the Rural Sahel: To take advantage of the availability of groundwater during the nine months of the year when there is no rainfall, the Sahel region responded by introducing solar-powered boreholes on a large scale at the regional level. This resulted most importantly in providing access to water supply and, secondarily, in expanding the market for solar technology for use in education, health, small businesses, homes and other community institutions.
- Performance Contracting Applied to Water in South Africa: Excessively high pressure was causing high water losses in the Emfuleni Municipality water supply system. A private company was contracted to provide pressure control infrastructure on a BOOT basis, which included training municipal staff during a five-year contract period. The contractor gets 20% of the savings from the control of losses over the contract period, while the municipality sees benefits through the remainder of the life of the assets. This local action demonstrates how water (and energy) wastage may be addressed by using a performance-based, benefits-sharing contract with a private company.
- Community-based Water Leaks Project in Cape Town (South Africa): Households are often unaware that they are being billed for water wasted in their homes, and when they are, they do not have access to help. This local action shows how training households in key skills such as plumbing and financial literacy, while also raising awareness of the issue, can help minimise household water leakage and wastage, thus saving water resources.
- Food Security and Natural Resources Management in the Baidiam District in Mauritania: Due to the precipitation cycles characteristic of arid regions and due to human action, natural resources have been diminishing in Mauritania. This has led to increasing food insecurity, driving the population toward land of lower marginal value. By introducing spate irrigation and confidence-building mechanisms among the communities, it has been demonstrated that the

value of land can be increased and that food and land security can be achieved.

- The South African Multi-stakeholder Initiative on the World Commission on Dams (WCD) was established to harmonize SA policy and legislation with WCD findings. Creating a Coordinating Committee composed of all stakeholders including the private sector, and organizing an annual forum for about 120 organizations from various sectors, including representatives of neighbouring states with shared water, helped to contextualize the World Commission on Dam's findings for South Africa.
- MDG Capacity-strengthening project for Africa – UNESCO-IHE: Africa lacks the human and institutional capacity to undertake vital research activities. UNESCO-IHE created the opportunity for fifteen masters-level research students from six different countries to undertake research in various subjects related to the MDGs. This contributes to strengthening of human resource capacity of the countries to reach the MDGs, while providing solutions to accelerate the process beyond the boundary of the student's organization.

4.3 Implementation of IWRM

4.3.1 IWRM Principles and Practices

The implementation of IWRM will play a significant role in the socio-economic development of the region and will require a number of reforms in policy, strategies and institutional setups. Some countries may find this difficult to achieve quickly, but can begin by focusing on specific water challenges associated with development goals. South Africa, for example, has developed one of the most progressive approaches to water in the world by focusing first on the challenge of providing every citizen with access to good quality drinking water. This strategy is being used by many African countries that have not yet adopted an IWRM policy.

Accelerating the adoption of IWRM principles and practices requires a great effort to create awareness and knowledge among regional governments and the professional sector. The GWP, NEPAD and AfDB are working to create awareness and capacity. Partner organizations are also introducing new initiatives such as the TIGER Initiative and the G8 Africa Action Plan and Transboundary Water Management, designed to assist the implementation of IWRM technologies.

4.3.2 Regional Cooperation and Transboundary Water Basin Organizations (TWBO)

IWRM calls for the adoption of the basin as the basic unit for the management of water resources. This requires a shared vision on the part of all stakeholders in the water basin. African countries have been establishing transboundary water basin organizations, and networks of basin organizations, and have been cooperating with various professionals working in the sector, including journalists.

There have been great efforts to establish new water basin organizations and strengthen existing ones. A parallel effort is also being directed at creating cooperation and coordination among water basin organizations in the framework of the African Network of Basin Organizations (ANBO). NEPAD's, emphasis on regional cooperation and integration is also creating the opportunity to link national and subregional approaches to managing water resources.

Although the transboundary character of water basins is often seen as a source of conflict and tension between and among riparian countries, in reality the development of transboundary water basins can also serve as a unique vehicle for promoting subregional and regional cooperation and, thus, promote peace, harmony, and social and political stability across the region.

An example of regional cooperation is the SADC Protocol. Within SADC, there are several successfully functioning WBOs which are supported by a Water Coordination Unit and governed by the Revised Protocol on shared Watercourse Systems. Elsewhere in Africa, there are also the successful examples, including OMVS, CBLT, NBA and NBI. Box 13 gives a brief description of the SADC protocol.



Box 13. SADC Protocol on Shared Watercourse Systems

Southern Africa's important rivers include the Zambezi, the Limpopo and the Orange-Senqu. Water resources in parts of the region are scarce and unevenly distributed. The fourteen SADC member countries have undertaken several important initiatives aimed at making shared river courses sources of cooperation rather than conflict. They have agreed, in principle, on integrated and cooperative management of transboundary river basins.

The general framework for such cooperative endeavours is provided by the (Revised) SADC Protocol on Shared Watercourse Systems (1995/2000) and the SADC water sector (established 1996). In addition, sixteen agreements related to transboundary water courses are in place, including agreements establishing general watercourse commissions, agreements concerning single watercourses and agreements dealing with specific watercourse projects (e.g. dams). Several bilateral and multilateral general water course commissions, specialized river and lake basin commissions, technical committees and development authorities responsible for integrated water resources management (IWRM) of transboundary river courses have been set up by the SADC governments.⁴²

4.3.3 Establishment of Regional Water Partnerships in Africa

Sub-regional water partnerships have been established in eastern, western, southern, central and northern Africa/Mediterranean as subsidiaries of the Global Water Partnership. These sub-regional partnerships bring various sectors and interest groups together to identify and discuss their common water problems and to develop action plans based on IWRM. The Sub-Regional Water Partnership Programs have in turn been instrumental in the establishment of Country Water Partnerships. These are working partnerships among all those involved in water management: government agencies, public institutions, private companies, professional organizations, multilateral development agencies and others committed to the Dublin-Rio principles.

The mission of the Global Water Partnership is to "support countries in the sustainable management of their water resources."

The GWP's objectives are to:

- Clearly establish the principles of sustainable water resources management;
- Identify gaps and stimulate partners to meet critical needs with their available human and financial resources;
- Support action at the local, national, regional or river basin level that follows principles of sustainable water resources management;
- Help match needs to available resources.

4.3.4 Establishment of the African Network of Basin Organisations (ANBO)

The initiative towards better governance of water basins includes the establishment of the African Network of Basin Organisations in July 2002, which aims to fill a marked gap in communications and exchanges of experience, expertise and know-how related to IWRM.

ANBO's objective is to promote integrated water resource management at the level of water basins as an essential tool for sustainable development. According to this objective, the African Network endeavours to:

- organize for its members common activities of national, regional and continental interest, based on IWRM principles;
- assist African riparian countries that do not yet have bodies in charge of joint water resources management, with the creation and development of transboundary basin organisations;
- facilitate the implementation of tools suitable for institutional and financial management, for knowledge and monitoring of water resources, for the organisation of databases, and for the concerted preparation of master plans and action programmes in the medium and long terms;
- encourage popular education on these issues;
- promote these principles in international co-operation programmes.

4.3.5 The Africa Civil Society Network on Water (ANEW)

ANEW was established in 2003, during the AMCOW Pan-African Implementation and Partnership Conference on Water in Addis Ababa. The meeting was attended by forty representatives of African NGOs and networks working on

⁴² Transboundary Rivers and Crisis Prevention, Bonn International Centre for Conversion, BICC Water Page, 2005.

water issues from all over the continent. ANEW was set up to ensure that African civil society voices are represented in international and regional water policy forums and to ensure that their voices are heard during the increasingly political water-related debates. Accordingly, ANEW aims to promote dialogue, learning and cooperation on water issues in the region, and to facilitate and support the participation of African CSOs in water policy formulation and the implementation of development plans in the African water sector.

4.3.6 The Africa Water Journalists' Network

A network aiming to boost the quality and quantity of reporting on water issues in African countries was launched on March 22, 2005, in Addis Ababa, Ethiopia. The Africa Water Journalists' Network brings together more than a thousand journalists who share information and story ideas through a forum on the network's website. The network will begin producing an Internet-based newsletter called the Water Chronicle. The network is expected assist in the promotion of African Water Issues both in the local and international media, develop a knowledge base about water among the population and promote transparency and accountability.

4.3.7 G8 Africa Action Plan and Transboundary Water Management

As a part of international efforts towards implementing the plan, the G8 agreed to support NEPAD and its African partners through two initiatives in the field of transboundary water management.

The first initiative focuses on strengthening cooperation among river basin organisations. This is a nine-year project costing about eight million euros. Germany has committed two million euros for the first three years. This first phase will include consultations with all stakeholders and will serve to design the project structure, its mode of delivery and activities. The project consists of capacity building for AMCOW, cooperation among river basin organisations and support for the development of information as a basis for water management.

The second initiative is for mapping donor support. The survey aims at developing an overview of the current activities of G8 member states in the field of transboundary water management in Africa. In 2004, during the Stockholm Water Week, an initial overview of the conclusions suggested:

- G8 member states concentrate on larger river basins with large populations and high population densities;
- Most donors are active in the Nile, Niger, Zambezi, Limpopo and Senegal basins;
- The largest African river basin, the Congo, is not yet receiving direct G8 support;
- In general, a precondition for donor support to a river basin is that the countries involved have in place at least a minimally structured water basin organisation.

4.3.8 The TIGER Initiative

In response to the resolutions adopted at the 2002 Johannesburg World Summit on Sustainable Development, the European Space Agency (ESA) launched the TIGER Initiative. The objective of the Initiative is to use space technology to improve knowledge about the water cycle and to develop sustainable Earth observation services for integrated water resource management in Africa as a special contribution to the NEPAD/AMCOW process and the achievement of WSSD goals⁴³. The initiative is supported by the space agencies of Canada, Japan and the United States. Pilot projects focusing on food security, aquifer management epidemiology and wetland monitoring have been launched by the European and Canadian space agencies. The TIGER strategic plan for Africa 2005-2015 was developed at the TIGER 2004 workshop in Pretoria. TIGER is engaged in building capacities in Africa to utilise space technologies to improve the sustainability of water resources management, to initiate related projects and to seek funds for the continuation of these activities in the future.



⁴³ Space and Water for Life, TIGER Strategic Plan for Africa 2005-2015, Pretoria, November 2004

4.3.9 Local Actions on Implementation of IWRM Principles and Practices

- **AQUIFER: Tunisia exploiting space for the management of the (NWSAS) transboundary aquifer (SASS):** To increase the confidence level of decision makers in matters related to shared water resources, there was an urgent need for objective, spatial information that could be accepted by all the countries (Libya, Algeria and Tunisia) sharing the North-Western Sahara Aquifer System. Use of Earth Observation in the management of NWSAS made it possible to acquire information required for discussions and decisions about the aquifer. This technology can be used to assess risks and the possible impact of actions, and can assist in joint and shared decision making. The process can also be used for other transboundary groundwater aquifers in the region.
- **IWRM in the Nakanbe Basin in Burkina Faso:** Low rainfall and fast-growing demand for water characterises the Nakanbe Basin, resulting in potential for many water-related conflicts. IWRM principles and practices were introduced by establishing local water committees and involving all stakeholders through participatory communication. This has considerably reduced the number of conflicts and water is now shared better among all village users.
- **Decentralization of WRM in Uganda:** The national programme for Decentralization of WRM requires IWRM activities to be implemented at the local level. However the inadequate technical and financial resources of local governments, and the lack of awareness among local communities have posed difficulties. The pilot phase of the decentralization programme has helped raise awareness among local communities regarding the roles and responsibilities of different stakeholders in water resources management and has helped raise the profile of water resources management among local governments.
- **May Zegzeg Integrated Watershed Management Project in Ethiopia:** Despite improved rainfall conditions in the northern highlands in recent years, drought and famine continue to affect the local population due to the low infiltration capacity of the soil. Appropriate water conservation and watershed management, including both physical and biological conservation measures, were used to solve this problem in May Zegzeg basin. Consequently, increased spring discharges were observed and irrigation was introduced for the first time.
- **Pioneering Actions in Managing the Transboundary Nubian Sandstone Groundwater Aquifer:** The Nubian Sandstone Aquifer System (NSAS) is a non-renewable resource. Given the scarcity of water in the region, there is an enormous risk that the resources can be misused. A regional strategy and implementation programme for the utilisation of the Nubian Sandstone Aquifer System is based on principles of rationality and wisdom in the management of the shared resource. This process can be applied to other similar aquifers
- **One basin, nine countries – a shared vision by the Niger Basin Authority (ABN):** ABN is in the process of developing a vision shared by its nine member states, aiming at comprehensive development of the potential of the basin, upon negotiation and acceptance by all the member countries. Detailed operational objectives have been established to enable ABN to achieve its strategic objectives. These include a Sustainable Development Action Plan, a legal and institutional framework, development of water resources in a sustainable and equitable manner, and adoption of a pragmatic, consensus-building approach to the development of the shared vision. Once adopted, this process will translate the political commitment of its nine member states into a joint action programme that defines long-term objectives and provides the related strategic orientations.
- **Promoting IWRM in the Mara Basin of East Africa:** The Mara River Basin is a transboundary basin shared by Kenya and Tanzania. The basin faces threats of an environmental nature and the situation is exacerbated by a failure of local, national and regional legislation, and a lack of institutional structures to address water resources issues. A project has been formulated to support application of IWRM principles and practices, working with stakeholders on each side of the Kenya-Tanzania border. The project hopes to influence the formulation of legal systems, especially transboundary agreements between the two riparian states, to: support creation of appropriate institutions for IWRM; promote the principle of payment for environmental services; and benefit the local organizations.
- **Strengthening River Basin Organisations in the SADC Region:** The Orange-Senqu River Commission (ORASECOM), established in 2000 in southern Africa,

based on a political consultation process, has made significant progress towards the establishment of a Permanent Secretariat with the executive mandate and capacity to implement basin-level projects. ORASECOM is now equipped to implement commission-level projects through its own efforts and with the participation of all member countries.

Following this, in the Limpopo River Basin, an agreement to establish the Limpopo River Commission was signed in 2004 by the four riparian states: Botswana, South Africa, Zimbabwe and Mozambique. In the Zambezi River Basin, an agreement on the establishment of the Zambezi Watercourse Commission was signed on July 13, 2004, in Kasane, Botswana. The road taken to form the Permanent Executive Secretariat services by ORASECOM is a "good practice" that may be followed by other river organizations in the region and elsewhere.

- **The NWSAS Project as a Local Action for Joint Management of Shared Aquifers:** The North-Western Sahara Aquifer System (NWSAS) is shared by Algeria, Libya and Tunisia. From 0.4 billion m³ in 1950, the exploitation of the NWSAS had risen to 2.5 billion m³ in 2000. The impact of over-exploitation of the aquifer extends beyond the national borders, with generalized drops in water levels and degraded water and soil quality. A strategy for joint management of the system is based on sharing common information and knowledge. A reliable forecasting of the impacts of over-exploitation of this non-renewable water resource was developed by the Sahara and Sahel Observatory (OSS). This led to new confidence and solid cooperation among the riparian countries for joint implementation of the projects. This approach is being replicated on the Iullemeden System (SAI), shared by Mali, Niger and Nigeria. The Sahel and eastern Africa systems study will use the same approach as in North Africa.
- **OMVS: Water for sustainable and solidarity-based development:** Mauritania, Guinea, Mali and Senegal are the riparian countries of Senegal River basin. Flow variation of the river had caused inter-annual floods and reduced flow had disrupted agriculture. In 1972, the Organisation pour la Mise en Valeur du Fleuve Senegal (OMVS) was established by Mali, Mauritania and Senegal. An integrated management plan covering the four riparian countries was prepared and several projects are implemented by OMVS. The construction of the Diama and Manantali dams partially regulated river

flow, allowing agriculture expansion and diversification, hydropower production, and other benefits. The OMVS experience proves that water resources management at the basin level can work in Africa and that it is possible to create reliable socio-economic entities based on the joint and cooperative management of transboundary basins.

- **Establishment of Stakeholder Forum for Lake Guiers in Senegal:** Local authorities had been excluded from the management of the water resources of Lake Guiers. This resulted in poor management of land and water resources and negative side effects. A participatory management process was organized, with a stakeholders' forum consisting of both grassroots and international representatives. The Forum brought awareness of the lake's potential as well as of the risks associated with poor management. The exploitation of natural resources has improved since, and the tensions related to water access have subsided. The Lake Guiers experience can easily be replicated in other reservoirs in Senegal and in the sub-region.

4.4 Water Supply and Sanitation for All

4.4.1 Efforts Towards Meeting Water Supply and Sanitation Provisions

Water supply and sanitation have recently been receiving greater prominence on the regional agenda. Initiatives in the water supply and sanitation sector include the AfDB-RWSSI, the WB Infrastructure Action Plan, NEPAD Water and Sanitation Infrastructure Programme (WSIP), the EU Water Initiative and UN-HABITAT-WSTF (Water Supply and Sanitation Trust Fund). In addition to these there are regional programs on capacity building, and policy and knowledge support by WSP-AF, WUP, ITN and others.

These involvements have led to (i) decentralization of planning, management and operation of WSS schemes, especially in rural settlements (Benin, Tanzania, Ethiopia, Nigeria, Burkina, Cameroon, Mali, Niger, Rwanda, Chad, Tunisia and others); (ii) increasing private sector participation and the development of public-private partnership (PPP) management models for urban centres and small towns (Uganda, Senegal and others); (iii) development of financing instruments (Benin, Madagascar, Uganda and others); and (iv) sector reforms (for example, in Senegal, with the creation of an asset-holding company, a private operator and a national sanitation agency).

4.4.2 AfDB Rural Water Supply and Sanitation Initiative

The African Development Bank has launched a rural water supply and sanitation framework referred to as the Rural Water Supply and Sanitation Initiative (RWSSI). The initiative was launched during the first AfDB Water Week in 2004 and has the backing of AMCOW, as well as regional and international partners. The Initiative aims to accelerate improved and sustainable water supply and sanitation services through increased investment and use of innovative approaches, and through gender mainstreaming in programme implementation, management and operations. The RWSSI targets aim for 66% access to safe water supply by 2010 and 80% access by 2015. If successful, it is estimated that about 277 million additional people would have access to drinking water and 295 million will benefit from sanitation services by 2015.

The Initiative was accepted at the Paris Conference by African countries, representatives of developed countries, multilateral and bilateral donor agencies, and civil society organizations. The commitments made at the conference are provided in Box 14.

The total investment required for achieving eighty percent coverage by 2015 is estimated to be about US\$14.2 billion, with thirty percent of the overall requirements obtained through ADF replenishment and AfDB loans, fifty percent from bilateral and multilateral donors, fifteen percent from recipient governments and five percent from the beneficiary communities. International donor conferences will be organized to mobilize funds and commitments to support the implementation of RWSSI. So far, financing has been

Box 14. Commitments Made at the Paris Conference

We are therefore committed to:

1. support the African Development Bank's Initiative for Rural Water Supply and Sanitation in Africa;
2. mobilize human and financial resources and undertake the required projects to achieve the African Water Vision;
3. include access to water supply and sanitation at the centre of African development strategies by taking these targets into account in the PRSPs;
4. coordinate our activities at the national and local levels;
5. establish a regional mechanism for surveillance domiciled at the ADB, for tracking progress towards the achievement of the Millennium Development Goals for water and sanitation in rural Africa;
6. take into consideration local needs and demands;
7. develop innovative financial instruments and facilitate public-private partnerships suitable for the rural sector;
8. consult with NEPAD and AMCOW to ensure coordination to enhance synergy among existing initiatives.

approved for eight countries, programme implementation has started in four countries and preparation will be underway to commence RWSSI programme in another seventeen countries by the end of 2007.

4.4.3 Water and Sanitation Programme for Africa Region (WSP-AF)

WSP-Africa (WSP-AF) works within the framework of the WSS MDGs to help client countries accelerate the implementation of sector reforms that focus on increasing WSS service provision for the poor. The role of WSP-AF is to aid the initiatives of its partners by providing direct advice and assistance. It focuses on developing policies, finding innovative solutions, promoting best practices and developing capacity for sustained service access. WSP-AF strives to be a valued, high-level source of impartial advice and experience, based on comparative knowledge of successful local actions. Through its African field network, the programme can be a flexible and responsive local partner for local policy dialogue and capacity



building. The WSP-AF is also capacitated to test promising ideas, document lessons from their implementation and encourage their adoption within larger financing plans.

4.4.4 UN-HABITAT, Water and Sanitation Trust Fund (WSTF)

UNHABITAT established a Water and Sanitation Trust Fund (WSTF) in October 2002, to help reach Target 10 of the seventh MDG. The WSTF provides a grant-financing mechanism whose key objectives are to create an enabling environment for pro-poor investment in water and sanitation in urban areas, and to support capacity building at local level to manage these investments in a sustainable manner. Currently, the WSTF is implementing the Water for African Cities Programme and the Lake Victoria Region Water and Sanitation Initiative.

The strategic vision of the Water for African Cities Programme is to reduce the urban water crisis in cities through efficient and effective management of water demand, to build capacity to reduce the impact of urbanization on freshwater resources, and to boost awareness of and information exchange on water management and conservation issues. The programme is currently being demonstrated in seventeen African cities in fourteen countries.

The Lake Victoria Region Water and Sanitation Initiative targets water and sanitation provisions in secondary towns in the Lake Victoria region and is primarily targeted at rehabilitation of existing infrastructure, with due emphasis on local capacity building. The programme is now being implemented in seven towns.

The WSTF is supported by the governments of Canada (through the Canada Fund for Africa), the Netherlands, Norway and Sweden, and current pledges and commitments to the trust fund come to US\$ 60 million.

The African Development Bank and UNHABITAT have been strengthening their collaboration to help African countries meet the Millennium Development Goal related to water and sanitation in urban areas. Specifically, cooperation is envisaged between the African Water Facility and the WSTF.

4.4.5 The African Water Association (AfWA)

The AfWA was established in 1980 and currently has more than eighty water and sanitation utilities as members. The AfWA's objectives are to: i) coordinate the search for knowledge and the latest developments in the technical, legal, administrative and economic fields for drinking

water production, supply and sanitation; ii) promote the exchange of information on methods, processes and procedures of drinking water production and supply, and sanitation, and iii) initiate, encourage and promote cooperation and exchanges in professional training.

In line with its objectives, the AfWA:

- provides its members with the results of research and inquiries into all branches of water production and supply, and sanitation;
- maintains close ties with all regional, national and international agencies devoted to problems related to drinking water and sanitation;
- organizes international congresses, seminars, workshops and technical sessions;
- in July 1996, launched the Water Utility Partnership, in collaboration with the Regional Centre for Low Cost Water and Sanitation (CREPA).

4.4.6 Water Utility Partnership

The Water Utility Partnership (WUP) is an African regional capacity-building programme with a focus on urban water utilities, including services for the urban poor. It is a joint programme initiated by four institutions: the African Water Association (AfWA); the Regional Centre for Low Cost Water and Sanitation (CREPA); Training, Research and Networking for Development (TREND); and the World Bank. The programme was launched in July 1996 during an international conference on the reform of the water sector in Africa. In addition to these founding agencies—and in the broader context of programme implementation—the WUP considers all agencies providing support for the implementation of this programme to be partners.

The goal of the WUP Programme is to facilitate an increase in the coverage of water supply and sanitation services, and to improve the quality of this service through increased investment and the reform of utilities. WUP aims to bring together all utilities, other service providers and support agencies in the water supply and sanitation sector in Africa. It seeks to develop a database of successful experiences (good practices) and to provide all partners with methodological, technical and information tools. Participation in its activities is open to all water service providers on the continent.

4.4.7 The United States Water for the Poor Initiative

This initiative is targeted to expand access to clean water and sanitation services, improve watershed management,

and increase the efficiency of water in industrial and agricultural activities. The investment in Africa would be:

- for projects intended to enhance access to clean water and sanitation services, including water and sanitation projects, to serve the urban poor in South Africa; initiate small-scale potable water supply and sanitation programmes for poor rural communities in Ghana, Mali and Niger, through the West Africa Water Initiative; and establish an innovative financing programme that has supported a safe drinking water system in India;
- to provide increased protection of watersheds by integrating management activities for surface water, groundwater and coastal resources, and to work within an international alliance to produce a state-of-the-art GIS system to improve watershed management capabilities.

4.4.8 The West Africa Water Initiative (WAWI)

The goals of this initiative embrace the institutional perspectives of its twelve individual partners. It is based on an effort to provide rural water and sanitation as the entry point for community development. WAWI intends to work with communities and governments in Ghana, Mali and Niger to:

- increase the level of access to sustainable safe water and environmental sanitation services among poor and vulnerable populations;
- reduce the prevalence of water-borne diseases, including trachoma, guinea worm and diarrhoeal diseases;
- ensure ecologically and financially sustainable management of water quantity and quality.

WAWI also hopes to promote a new and potentially replicable model of partnerships and synergies to encourage technical excellence, programmatic innovation, and long-term financial, social and environmental sustainability in water resources management.

4.4.9 Local Actions on Water Supply and Sanitation for All

- **The Siraro Water Supply Scheme in Ethiopia** addresses the topical issue of economies of scale in rural water projects. By adopting a hierarchical structure of representation in the managing body, a number of villages were able to develop a single regional water supply with a single managing agency

and high economies of scale, without the villages losing control over management. The structure of village committees, represented at higher and higher levels, can be replicated in multi-community efforts where this structure offers definite advantages.

To respond to the intractable problem of removal of toxic substances in treated sewage, a local action in Egypt entitled Oxidation Pond with Kaolin Bed for Sewage Treatment in Rural Regions has pioneered an innovative technology: By using a bed of readily available kaolin, the experiment has shown that effluent quality can be improved at little cost.

- **Private Sector Management of Simplified Water Supply Systems (SWSS) in Mauritania:** In order to address the problem of ineffective operations and management, a programme was developed to devolve management of water supply and sanitation to the community and the private sector. Through this reform process, the management of SWSS was contracted to a private operator by the community and a new financing method was developed for operations and maintenance. The initiative covers the whole country and has been a success.
- **Assessing Prepay Water Metering in the Informal Settlements of Windhoek in Namibia:** Post-pay metering and prepay metering co-exist in Windhoek. In the communities with the post-pay system, a large majority of residents do not pay their portion of the bill, leaving the rest of the community to pay extra. This local action shows how the introduction of prepay water metering provides affordable access to water in a manner that puts responsibility for water consumption in the hands of individual users.
- **The Kzusabori Technology Transfer and Sustainable Community Water Development in Kenya.** The Njukini area of Kenya is semi-arid and is faced with severe shortage of safe, reliable water. The Kzusabori System is a unique Japanese technology that can manually drill deep wells (over 50m). The system was introduced to the area and local communities were trained how to use it. Within a short time, the communities were able to drill wells by themselves and provide safe reliable water to the community.
- **Sanitation for a Rural Girls' School in Uganda:** The over-use of pit latrines and some flush toilets in a girls' secondary school in Uganda had led to very unhygienic conditions with bad smell, flies and groundwater pollution. The water table was high and space for new

pit latrines was limited. The sanitation systems were converted into an ecosan system: urine was collected in jerry cans and re-used as fertilizer. The project was implemented by local entrepreneurs who provide the service for income generation. There has been significant improvement in the quality of groundwater and in general living conditions in and around the school.

- Pioneering the Use of Strategic Communication Approaches in Kenya's Water Sector Reform Process:** Effective communication is an essential component of any important reform or advocacy process. This local action illustrates the use and benefits of strategic communication in the water reform process. Some of the water utilities using this communication campaign have seen great impacts. For example, the Nairobi Water & Sewerage Company's Bill Bila Bilaa campaign managed to correct thousands of billing problems in three months, significantly increasing their revenues and greatly improving the company's image.
- Project to rehabilitate fifty simplified water supply systems in the regions of Maradi, Tahoua and Zinder (Niger)** show that a delegated management model based on a partnership between water user associations and small, local private operators can still keep the local communities in the driver's seat in terms of project objectives and implementation procedures.
- Evolution of Water and Sanitation in Disaster Mitigation in Ethiopia:** Cyclical droughts and floods are serious threats to life and livelihood. This local action illustrates that proactive strategies that combine emergency intervention with development initiatives are more cost-effective in economic terms and increase the populations' resilience to droughts and floods. The action has decreased project implementation costs as interventions are undertaken in a planned environment (rather than emergency responses) and in the process allows realization of economies of scale.
- Kiambiu Water and Environmental Sanitation-KIWESA Project in Nairobi, Kenya:** Kiambiu village is a slum area of Nairobi City that does not enjoy the provision of basic infrastructure services. An intervention involving the community was planned. The Kiambiu Usafi Group was formed to mobilize and lead the community in clean-ups and clearing of garbage. A community contribution was raised and technical and financial support was obtained from Maji

Na Ufanisi (NGO) to construct 24 sewer public toilets cubicles with water tank and kiosk, which they planned to run as a business. As of September 2005, three toilet blocks were put up and 20% of the residents are able to access clean affordable drinking water, toilet and bathroom services. To date, groups from all over Kenya and neighbouring Tanzania, have been visiting Kiambiu Slum to learn from these water and sanitation actions.

- Local Action for Better Water Service Provision – Tanzania:** In 2002, a new water policy was introduced by the Government of Tanzania. In the context of reform, small-scale private investment increased but there were no mechanisms for regulating private sector involvement. In 2002, WaterAid initiated participatory video (PV) to ensure poor people themselves are able to speak directly to decision-makers. The project was done in Mpwapwa district, where consultations revealed that transparency and accountability were key concerns in six villages. The film helped villagers understand the shortcomings in the management of local water schemes. For the communities and private operators, it also clarified their rights, roles and responsibilities in the running of the water project, as well as raising confidence in the community. By combining people's testimonies with evidence of their situation, the participatory videos have created a powerful medium for communication.

4.5 Water Management for Food and the Environment

4.5.1 Africa's Commitment to Achieve Food Security

The management of water for agriculture and the environment calls for: new approaches to investment in agriculture; innovative new technologies for agricultural water use; promotion of irrigated agriculture in the context of IWRM; promotion of participation of beneficiaries, CSOs and the private sector in project planning and implementation, awareness-raising and optimization of the use of available water resources.



Much has been accomplished in the application of these strategies. At the regional level, the NEPAD Comprehensive African Agricultural Development Programme (CAADP) is one which clearly shows African commitment to do its best to achieve food security in an environmentally suitable way.

4.5.2 NEPAD-CAADP

The NEPAD-CAADP initiative is a manifestation of African governments' commitment to address issues of agricultural sector growth, rural development and food security. It aims to promote interventions that best respond to Africa's well-known food insecurity. CAADP has been designed to promote investment in four key areas that can make a difference to Africa's food and agriculture situation: i) extending the area under sustainable land management ii) reliable water control and improving rural infrastructure iii) trade-related capacities for improved market access, and increasing food supply and reducing hunger; and iv) agricultural research and dissemination and adoption of technology. CAADP estimates that a total need of US\$ 250 billion could be leveraged, with over half coming from national public and private sources and the remaining 45% from external sources. In Maputo in 2003, African heads of state and government made a commitment to allocate at least 10% of their national budgets to agriculture within 5 years⁴⁴.

The AU-Sirte Declaration outlines measures to harness water resources in support of agricultural development in Africa. African agriculture ministers have endorsed the establishment of CAADP focal points at the national level to encourage the implementation of CAADP and a Forum of Permanent Secretaries to support effective and coherent implementation of CAADP at the national, regional and continental level.

4.5.3 Collaborative Programme of the AfDB, FAO, IFAD, IWMI and the World Bank

In 2001, the AfDB, FAO, IFAD IWMI and the World Bank identified the low level of investment in agricultural water management in Africa as a major development issue. These agencies created a collaborative programme aimed at improving the quality of assistance to governments, inducing greater investment flows and influencing the assistance provided by bilateral donors. The programme also aims to support NEPAD in translating its vision regarding the role of irrigation in rural development. Through the program, these studies were prepared:

- Regional demand for products of irrigated agriculture
- Irrigation project planning and implementation
- Constraints and opportunities for private sector participation
- Agricultural water use from a basin
- Agricultural water development for poverty reduction
- Cost of irrigation development
- Health and environmental aspects
- Agricultural water use and livestock
- Assessment of potential for improving agricultural water management

The results of the studies has so far shown that new investments in agricultural water development in Africa should be underpinned by: sound policy frameworks for investment; long-term institutional development; a focus on basic public goods such as roads and agricultural research; empowerment of stakeholders and the target population for intervention; and increasingly encouraging private sector participation⁴⁵.

4.5.4 Local Actions for Water Management for Food and the Environment

• Integrated Watershed Management through Progressive Terracing Techniques in Rwanda:

The sedimentation of Lake Burela and Buhondo through soil erosion by runoff water had reduced reservoir capacities and thus affected the capacity of hydropower plants. Integrated Watershed Management techniques were introduced, along with innovative soil erosion and sedimentation control measures. This resulted in reduced soil erosion and, secondarily, increased eco-tourism.

• Nile Dialogue by Nile Basin Society: IWRM

principles require the involvement of all stakeholders in all phases of water development. In the past, NGOs were not involved in project planning, study, design or implementation. The Nile Basin Initiative (NBI) Confidence Building and Stakeholder Involvement Programme using an e-conference by the Nile Basin Society has demonstrated the potential of cost-effective ways of promoting stakeholders participation in the planning and implementation of regional projects.

⁴⁴ Initiative in Support of NEPAD-CAADP Implementation, FAO 2005.

⁴⁵ Investment in Agricultural Water for Poverty Reduction and Economic Growth in Sub-Saharan Africa: A Collaborative Programme of AfDB, FAO, IFAD, IWMI and World Bank, 2006.

- **Community Participation as a Tool for Negotiations and Gender Conflict Management into Peace-Building in Uganda:** Uncontrolled grazing by livestock had led to a number of environmental and social problems in Pallisia District in Uganda, including the loss of vegetation on communal pastures and rice fields, and contamination of drinking water sources. Introduction of community participation and dialogue to resolve the problem has averted a potential conflict between men and women and transformed the situation into a mutually beneficial activity.
- **River to River Project:** Water hyacinths in the Niger River basin in Niger and Mali were severely impacting human activities as they invaded rice paddies and block water filtration plants and pumping stations. They were also hosting snails and mosquito larvae which, respectively, act as host and vector for the spread of schistosomiasis and malaria. By applying an integrated community participation approach, providing environmental and health education, introducing innovative technologies and capitalizing on existing cultural beliefs, the negative aspects of the water hyacinths were changed into beneficial effects.
- **Umm Bronga Water Harvesting and Spreading Dam in Sudan:** The North Darfur (Sudan) had been experiencing erratic rainfall and a series of droughts, resulting in great loss of livestock, crop production, natural vegetation cover and wildlife, leading to general food insecurity. By building a multi-purpose dam for spate irrigation and for sub-surface water storage for domestic water supply, food insecurity in the area was reduced and people were provided with water supply.
- **Integrated Water Resources Management: Koga Irrigation in Ethiopia:** The livelihood of communities around Koga area are at risk due to frequent drought and food shortages caused by moisture stress. The Koga irrigation project was designed around IWRM principles and practices, with infrastructure, agricultural extension, soil conservation, health and capacity-building components. Implementation of this holistic approach to the irrigation project has addressed poverty, food insecurity and the socio-economic and environmental problems of the area.
- **The Gory Experience in Mali:** The importance of creating awareness about water use and protection among children is often overlooked. This local action highlights the importance of training children at

school about water protection at the same time as water projects are being implemented. Following this, the Malian government realised there was a need to include water education in the education system and an intergovernmental committee for water and education was created.

- **Treated Sewage Water Irrigation Project in Tunisia:** Tunisia receives average annual rainfall of less than 300mm. To cope with this problem, the Tunisian government has established a long-term water development plan to maximize the quantity of usable water. This local action is a good example of the use of unconventional water resources. Treated sewerage is used for irrigation to overcome the water stress in the area.

4.6 Risk Management

4.6.1 Development of Disaster Risk Reduction; Strategies for the Region

Africa is prone to various disasters. Clearly, the increased impact of disasters is one of the major factors holding back poverty reduction and socio-economic development in the continent. Recently, the African Union Commission (AUC) and the NEPAD Secretariats, with the support of the UN International Strategy for Disaster Reduction (ISDR–Africa), assumed leadership to initiate and undertake consultations aimed at addressing disaster risk reduction in the continent. The process resulted in the development of an Africa Regional Strategy for Disaster Risk Reduction whose aim is to be incorporated in development policy and activities. The strategy was adopted by the African Ministerial Conference on the Environment (AMCEN) in June 2004 and was also positively received by the Heads of State in July 2004.

Since then, a regional action programme has been developed and the ECOWAS Secretariat is developing a common policy to facilitate a holistic approach to disaster risk reduction in West Africa, while the IGAD Secretariat is developing a training manual to facilitate capacity-building in disaster risk reduction among its member states.

Furthermore, fourteen African countries have already developed national platforms with representation from all major line ministries, aimed at addressing disaster risk reduction in development processes. To cite a few, the Kenya national platform has integrated disaster risk reduction in its national policy; Uganda has added disaster management as a pillar of sustainable development; the

Madagascar national platform has carried out disaster risk management training in the eleven regions of the country; the Senegal national platform is active on policy issues; and the Djibouti national platform has made it possible to develop the country's first national strategy on disaster risk reduction since independence.

4.6.2 Promotion of Science and Technology

Achieving the goals on water will require investments in science and technology. The first NEPAD Ministerial Conference on Science and Technology, held in Johannesburg, South Africa (November 6-7, 2003), decided that water sciences and technologies would constitute one of NEPAD's flagship programmes. The G8 Africa Action Plan also recognizes the importance of strengthening Africa's scientific research and technical institutes for water. The NEPAD flagship programme will be designed to strengthen the continent's ability to harness and apply science and technology to address the challenges of securing adequate clean water and managing the continent's water resources. A meeting of experts in May 2005 has generated specific recommendations on ways and means of establishing an African network of centres of excellence in water sciences and technology.

4.6.3 Data Collection and Transmission

In view of the inadequacy of hydrological stations in Africa, the WMO has developed components of the World Hydrological Cycle Observing System (WHYCOS) for Africa. The System is composed of four regional Hydrological Cycle Observing System (HYCOS) projects: Mediterranean, SADC and Western and Central Africa (pilot) HYCOSs are operational in Africa; Niger and Volta-HYCOS are being implemented; implementation of SADC (second phase) and IGAD HYCOSs are to start soon; and Lake Chad and Senegal HYCOSs are being developed. Nile- and Congo-HYCOSs are in preparation⁴⁶. The main areas of interest are real-time data collection/transmission, technology transfer and Internet-oriented outputs. Successful implementation of the HYCOS projects in Africa will aid research and development in the field of hydrology.

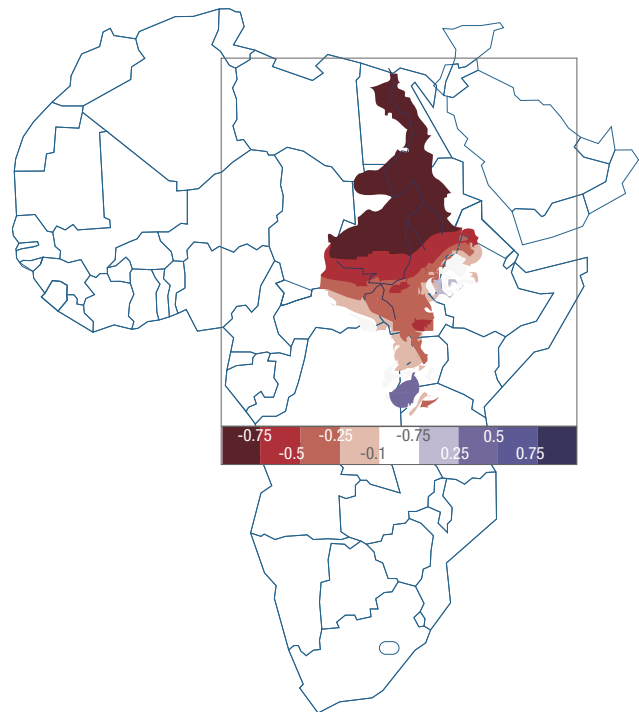
The World Water Assessment Programme (WWAP) has also developed (on a pilot basis) spatial representation of a set of water resource data for Africa. The Data Synthesis System (DSS) for Africa is an operational, digital

information system for water resource assessment, within a geographic information system framework accessible via the World Wide Web. The system includes a broad suite of spatial and statistical data encompassing point scale and gridded socio-economic and bio-geophysical products for data exploration and download. This data is organized according to water indicator themes and is presented in the spatial context of the river basin to analyse the changing nature of water in relation to human needs and activities at the global, regional and case study scales. Figure 4.2 provide examples of how indicators are being synthesized and presented for the Nile basin⁴⁷.

As part of the effort to expanding the knowledge base on African waters, the following three volumes will soon be published by UNEP:

1. The transboundary freshwater agreements and treaties for the whole African continent;
2. The Atlas of African Lakes - through satellite imagery;
3. A book on groundwater resources protection in Africa, by African experts.

Figure 4.2 Nile Basin Map Showing Climatic Moisture Index



⁴⁶ WMO, Nov.2004

⁴⁷ UN/WWAP, 2003. 1st UN World Water Development Report: Water for People, Water for Life. Paris, New York and Oxford. UNESCO and Berghahn Books.

4.6.4 Local Actions Exhibiting Innovative Risk Management

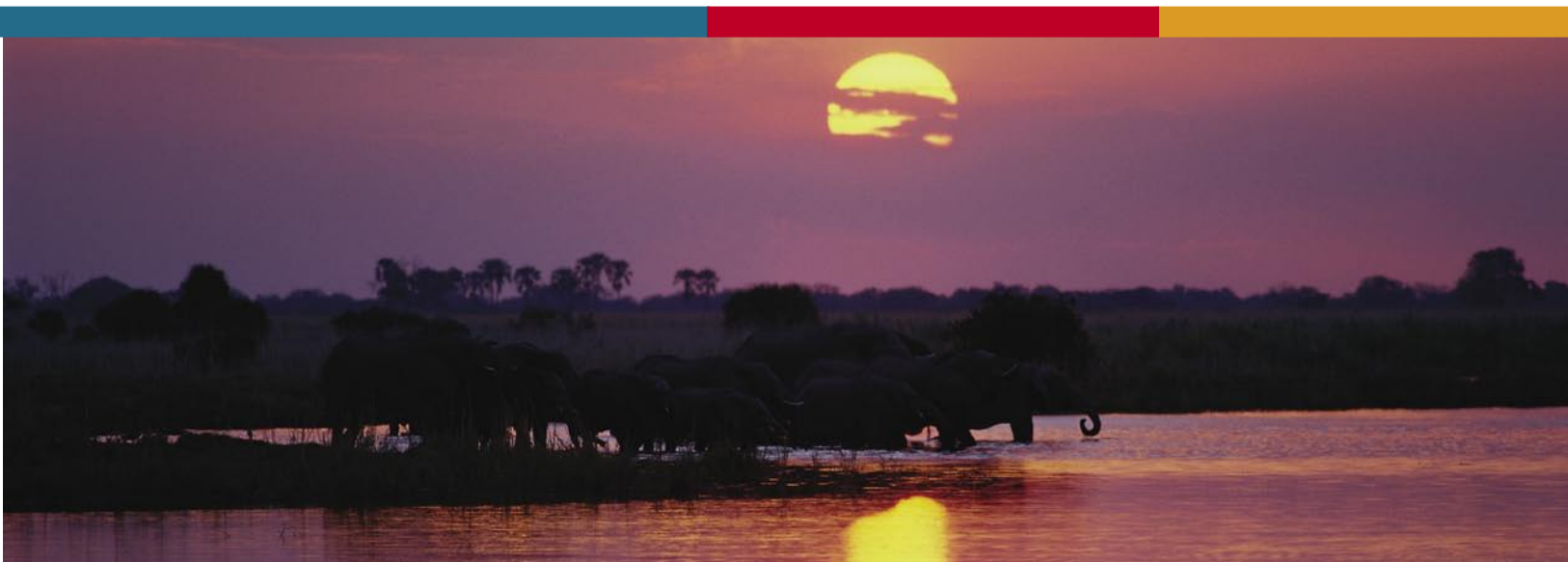
- **Risk Management in the lullemeden Aquifer in North-west Africa:** The lullemeden is a transboundary groundwater multi-aquifer basin shared by Mali, Niger, Nigeria and Algeria. The equitable exploitation of the aquifer is complicated by great uncertainty regarding policy and scientific issues. This local action shows that conflicts can be minimized and cooperation among countries can be promoted by undertaking joint risk management through a common consultative mechanism whereby stakeholders identify and formulate a common perspective, address the environmental risks and share the resulting socio-economic costs.
- **Contribution to Flood Monitoring and Adaptation Strategies in Zimbabwe:** A large number of people are vulnerable to the effects of floods. This local action shows how review and improvement of evacuation procedures and engineering standards to adapt to expected flooding would reduce the impact of flooding on human livelihoods and reduce loss of infrastructure and property.
- **Kenya Sand Dams:** The Kitui District of Kenya faces extreme droughts. With the assistance of NGOs, communities constructed low-cost sand dams to store water within an artificial sand aquifer built behind the dam. These activities have reduced the effects of extreme droughts and have demonstrated that droughts can be somewhat mitigated without large infrastructure investments.
- **Flood Forecasting System for Integrated Natural Resources Management in the Niger Inner Delta in Mali:** The inner delta of the Niger in Mali is an important ecosystem with many livelihood activities affected by variations in water resources related to

the flooding of the Niger and the Bani rivers. The flood forecasting system that has been created has improved information-sharing and consensus-building among stakeholders and technicians involved in the management of the delta, and has improved irrigation management and fisheries planning activities.

- **Protection against Flooding in Greater Tunis:** The City of Tunis, with a population of more than 2.7 million, was recently flooded by runoff flows from upper parts of catchment basins. Storm drainage management models and GIS software were used in a project designed to solve this problem, based on the September and October 2003 floods in Tunis which resulted in loss of life and property when water levels rose to four meters above street levels in parts of the city. The technology used in the design of this project can be applied to similar conditions in other parts of the region.

4.6.5 Pace of Meeting the Challenges

The preceding sections show that African countries are gaining momentum towards meeting MDG targets and are increasingly committed to facing the challenges involved. However, at the current rate of implementation, the targets are unlikely to be met. The WHO and UNICEF 2004 report on **drinking water target** states that in Sub-Saharan Africa progress "was impressive, moving from 49% coverage in 1990 to 58% in 2002" but that "at this rate, it will not meet the MDG target by 2015". Africa, therefore, needs to take a quantum leap forward. Better information is needed in order to better understand the nature of the problem and design appropriate solutions. Also, greater coordination is needed among the various actors in the sector to enhance intervention efforts, to attract financing to implement action plans, and to accelerate the implementation of water infrastructure.



5. CONCLUSIONS AND THE WAY FORWARD

5.1 Conclusions

5.1.1 Underdevelopment of Water Resources

The preceding analysis of Africa's water-related characteristics, the challenges facing the region, the main constraints to water development, and the opportunities and responses to these challenges lead to the following conclusions.

The 2002 Africa Water Vision (AWV), with its Framework for Action (FFA), and the 2003 PANAFCON action plans are designed to address the challenges facing the region in the water sector. They provide a pertinent framework for planning, implementation and ongoing dialogue at all levels of water development and service provision in Africa. AMCOW and its organs demonstrate growing commitment to these ideals and to boosting their development.

Water can make an immense difference in Africa's development, if managed well and used wisely, but requires a joint effort by the public and the private sectors. According to the WHO/UNICEF Joint Monitoring Programme (JMP) report, water has impacts on seven of the eight MDGs. Given clear policies and strategies and real commitments to implementation, water can help eradicate poverty, reduce water-related diseases and achieve sustainable development. A study conducted by WHO points out that achieving the target for both water supply and sanitation would bring economic benefits: each dollar invested would give an economic return of between three and 34 dollars, depending on the region⁴⁸.

Africa has a large volume of unutilised, renewable freshwater resources. Only four percent of potential fresh water is utilised, while most of the remainder flows directly to oceans or is absorbed by deserts. There is tremendous potential in terms of water supply, hydroelectric power, fisheries, navigation and irrigation. Water resources development in Africa calls for innovative management of water resources that will take into consideration these untapped resources, the unmet demand for water development, and the enabling environments needed to develop water resources.

Only 3.8% of resources have been developed for the three major water uses: agriculture, water supply and industry. Significant water resources development could help mitigate the impacts of water insecurity, and the spatial and temporal variability of available water. According to the International Water Management Institute, only four of the 20 countries expected to experience absolute water scarcity in the 21st century will be in Africa. However, 22 African countries will be among the 24 countries projected to experience economic water scarcity⁴⁹. Therefore, the challenge for most African countries is to raise funds needed to build sufficient water and sanitation infrastructures.

5.1.2 Water for Growth and Development

Need for major water infrastructure: Most countries have not invested sufficiently in water infrastructure and institutions. Major infrastructure must be built to mitigate flood and drought, and to provide access to water resources for health, productive uses and pollution control, before Africa can achieve water security.

In areas where production is intended for surplus and trade, it is important to distinguish clearly between water management for growth and development and water management for secure livelihoods and poverty reduction. Most countries in the region are engaged in small projects addressing short-term needs. For development to take place, African countries should make commitments to invest in water infrastructure up to the level where growth becomes self-sustaining.

The NEPAD's WSIP and CAADP –which direct financial flows towards investment in infrastructure, and target the development of skills and knowledge for the installation, operation and maintenance of infrastructure– are relevant examples of tools for managing water for growth and development in Africa.

⁴⁸ Evaluation of the costs and benefits of water and sanitation improvements at the global level, WHO 2004.

⁴⁹ Future Harvest News Report, March 17, 1977.

Need for the development of human, social and institutional capacity: the available human resources in the region, in terms of both number and level of skills, are inadequate to meet the huge investment required in the water sector. In the past, investment in the water sector was mainly focused on infrastructure. For this to yield the expected returns, it is equally important to invest in water institutions and the capacities required for running them. Perhaps even more important is the need to invest in developing social capacity, through education and information aimed at strengthening the local knowledge of communities and community-based organizations. African countries and their partners should be making a concerted effort to develop human, social and institutional capacity in the region.

In addition, growth is more likely when a vibrant private sector is deeply involved in the development of the sector. A level playing field and optimal sector and micro-economic policies are essential pre-requisites. Some local actions have shown that even modest efforts to involve the small local private sector has made a difference in the provision of public utilities in East and West Africa.

Integrated management of transboundary water resources at the basin level poses legal and political challenges, given the complexity of allocating water resources among users and uses. This becomes even more difficult if there is no legal instrument or final authority through which differences can be resolved. In this situation, minor problems can create tensions and affect the management and development of international water basins. Adequate measures should therefore be taken to develop the needed human, institutional and legal capacity to manage water infrastructures.

Financing of Water Initiatives: In collaboration with partner organizations, African countries have made relentless efforts to attract funding to the water sector in the form of grants, debt relief, and loans. They have agreed to prioritize water and sanitation in their national plans – including the PRSPs – and to allocate ten percent of their national budget to agriculture and food security. The African Development Bank, World Bank and EU have made significant commitments to contribute towards meeting the MDGs. Several developed countries are also providing bilateral technical and financial assistance to meet the MDGs. In particular, the G8 has agreed to contribute substantially to the implementation of NEPAD-WSIP. So far, the NEPAD-WSIP funding has gone mainly to the

energy sector, while the water-related pillars of CAADP have not yet received any significant funding.

With respect to the streamlining of financing to the water sector, AMCOW has established the African Water Facility (AWF) to facilitate the availability of financial resources to build Africa's water infrastructure institutions and management capacity, and to act as a catalyst to leverage other financial inflows to the sector. By providing direct financing to NGOs, CBOs, sub-sovereign institutions and central governments, the Facility seeks to go to the source of the problem.

The financial investment required to meet the 2025 AWW has been estimated at about US\$ 20 billion per year. The 2002 CAADP estimate for agricultural development is about US\$ 251 billion. Of this, about US\$37 billion is targeted to increase the area under irrigation to 20 million hectares by 2015. There has been some progress in securing grants and debt relief, but it falls far short of what is required and most of it is still in the form of pledges yet to be honoured. Specifically, investment is urgently required in large infrastructure that would leverage development. High priority should be given to devising financial instruments to attract bilateral, international and private sector investment to meet urgent and critical needs in water resources development and to provide access to services for drinking water supply and sanitation, agriculture and food security, energy and environmental sustainability.

5.1.3 Implementing IWRM

Adoption of IWRM Policy: Recent assessments indicate that existing water policies in most countries need to be scaled up or adapted to conform to and embrace IWRM principles and practices. Countries that do not have water policies are encouraged to develop new ones in line with IWRM principles and practices. Efforts are being made by the GWP and the AfDB to build RMC capacity to develop IWRM policies. IWRM implementation is it's a priority area of AWF activity. With this assistance, most countries could develop an IWRM policy in the next two to three years.

Though IWRM implementation is considered by some experts as a prerequisite for investment, recent developments suggest that IWRM is a long-term process that should be adopted and implemented alongside, rather than as a prerequisite for, concrete investment programs in the water sector.

Strengthening and Establishing Water Basin Organizations (WBOs): IWRM calls for the management

of water resources at the basin level. The SADC WBOs are governed by a Protocol on Shared Watercourse Systems, and the Senegal River basin OMVS also has a basin-wide agreement. Most of the remaining transboundary WBOs are operating in an environment lacking basin-wide management agreements. There is a strong need to build the capacity of the WBOs and to develop and adopt legal instruments for the utilisation of water resources at basin and region levels.

Moreover, in order to increase their capability and effectiveness in undertaking more activities, WBOs must establish mechanisms to enable them to generate their own financial resources.

Transboundary and Inter-Basin Water Transfer:

The availability of water in the Region is highly variable. Some countries are endowed with abundant water resource and some are facing water stress and scarcity. Inter-basin water transfer is one of the possible means to reduce this variance. Such transfer projects are complex, requiring sound engineering as well as environmental, social and economic impact studies. So far, the region has successfully accomplished three inter-basin water transfer projects: the Calueque transboundary inter-basin transfer scheme, where water is transferred from the Kunene river in Angola to Namibia; the transfer of water from the Orange river to the Fish and Sundays rivers; and the transfer from the Tugela river to the Vaal river. Another example of transfer is the Lesotho Highlands Water Project, which transfers water from one sub-catchment area of the Orange Senqu river in Lesotho to the Voal sub-catchment area in South Africa. Desk studies of the Congo River have shown that water can be

transferred to water-deficient countries south of Congo, possibly benefiting South Africa, Namibia, Botswana, Angola, Zambia and Zimbabwe. Congo river water can also be transferred to the north of Congo and to the Lake Chad and Nile basins.

Information, knowledge, monitoring and evaluation: The absence of a functional system for information and knowledge is the most important issue in monitoring. There is a compelling need to develop appropriate information and knowledge mechanisms for all water and sanitation-related activities.

The need for data, information and managed knowledge, ultimately leading to wisdom in water management and governance is a key factor affecting the planning and monitoring of water development activities. Decision makers in the water sector should be sensitized to the value and importance of data, information and hydrological services. New ways of obtaining information where high technology may well be the "appropriate" technology are demonstrated by the increasing adoption of real-time data acquisition attributes of HYCOS systems as well as the use of Earth Observations for water management data. The growing number of HYCOS installations in the continent is encouraging.

Soil Erosion and Reservoir Sedimentation: In order to ensure a degree of water security, the region will be investing heavily in impounding water. The average rate of loss of reservoir volume due to sedimentation in Africa is over 1% per year. Accelerated soil erosion results in siltation of river channels and reservoirs, and mitigation measures involve controlling soil erosion and appropriate catchments management techniques.



5.1.4 Water Supply for All

The low water supply and sanitation coverage in the region takes a heavy toll on the social and economic progress of African countries. According to the UNDP Human Development Reports, in 2004 only half the countries in the region were moving satisfactorily towards achieving the water supply and sanitation MDGs, while the rest were either far behind, slipping back or lacking data to report.

A concerted effort is being made by African countries, the African Development Bank, the World Bank, bilateral donors, NGOs, UN organizations and other regional and international organizations to mobilize resources to provide water supply and sanitation. These efforts are constrained by the available level of human resources and institutional capacity. Full access to water supply and sanitation services by 2025, as stipulated by the Africa Water Vision and the MDG, is to be achieved in incremental steps with targets set at: 66% access by the year 2010 and 80% by 2015. Obviously, mechanisms must be developed to monitor attainment of the MDGs.

Sustainable access to safe drinking water and adequate sanitation requires improving and sustaining the quality of existing services, tailoring new services to respond to demand, and establishing sound environmental management practices. This also calls for: adopting policies that provide incentives to invest and operate efficiently; building and strengthening local institutions and human resources; creating and disseminating knowledge on what works in local circumstances; adopting appropriate and innovative technology; improving service quality; increasing coverage area; involving stakeholders; and securing the necessary financing.

Access to sanitation services is much lower in most countries than access to water supply and sanitation. Hence, sanitation and hygienic education should be given greater prominence in the effort towards achieving the MDGs. Water supply, sanitation, gender and HIV/AIDS are intrinsically linked; therefore, any effort in water supply and sanitation should also focus on gender mainstreaming.

For some countries facing water scarcity, desalination is one of the technologies available for the provision water supply. The Hamma large-capacity desalination plant in Algeria and the small household and rural community plants in South Africa and Mauritius are examples of desalination plants operating in the region. Prospective users should be aware that although the cost



of the technology is declining, the appropriateness and availability of human and institutional capacity to operate the technology still need to be considered.

5.1.5 Water Development for Food and the Environment

Although the proportion of malnourished persons in sub-Saharan Africa has remained in the 33–35% range since around 1970, the absolute number of malnourished people in Africa has increased substantially, from around 88 million in 1970 to over 200 million in 1999–2001. The NEPAD-CAADP aims to promote interventions that best respond to the food security and malnutrition problem, while the AU-Sirte declaration outlines measures to harness water resources for agricultural development in Africa.

In order to confront poverty and hunger in Africa, an annual investment of US\$ 4.7 billion is required. This can be realized if appropriate policy changes are put in place at the regional and country levels to induce good governance, promote good water resources management practices, attract investment in agriculture and negotiate for better access to markets.

When policies incorporate IWRM principles and practices—recognising water as an environmental good—the protection of ecosystems becomes an intrinsic

part of the development process. It may be necessary to make additional investments to reverse existing negative environmental effects, to enhance positive ones or simply to enhance capacity to manage water for the environment. Several local actions demonstrate that windfall benefits to livelihoods can result from efforts to: to adapt agriculture to the agro-climatic zone; recover wetland ecosystems –or in some cases, create new ones; and engage in soil and water conservation.

5.1.6 Risk Management

Strategy for Disaster Risk Reduction: Africa is prone to various hazards. Hydrological disasters have a negative impact on poverty reduction and socio-economic development in the continent. In response to this, the AU has adopted an Africa Regional Strategy for Disaster Risk Reduction and a regional action programme.

Disaster affects the security and sustainability of livelihoods. The effects of steady growth and development can be wiped out by a single catastrophic effect. Careful analysis of the social and economic impacts is required to appropriately design measures for managing these risks. Hydrological and meteorological data acquisition and processing are especially important in risk management, especially for use in designing early warning systems.

The negative impacts of floods and droughts can be averted by applying a “stitch in time” in development programmes that provides vulnerable areas with the means to cope with likely hazards. Water storage, either on the surface or underground, is a classic way to mitigate water variability –one that must be incorporated in development programs as a risk mitigation measure. Innovative solutions include: building community resilience to hazardous conditions; drought-resistant crops such as sorghum/millet; hardier livestock such as camels and ostriches; and early warning systems for floods. The region should develop a large diversity of strategies for coping in various circumstances.

5.2 The Way Forward

Africa’s water-related problems are interrelated, creating vicious circles that reinforce one another. On one extreme there is absolute poverty and on the other there is great demand to heavily invest on water infrastructure, and human, social and institutional capacities. However, water can make an immense difference to Africa’s development if it is managed well and used wisely. Given clear policies and strategies, and real commitments to implementation,

water can help to eradicate poverty, reduce water-related diseases and achieve sustainable development.

5.2.1 Attaining Growth and Development

Achieving basic water security and harnessing the positive potential of water is a prerequisite to attaining sustained growth and development . For this reason, countries are asked to prioritize water in their PRSPs and to commit themselves to minimum investment in water infrastructures.

High priority should be given to securing the pledges made and attracting additional investment from bilateral, international sources and the private sector to meet investment requirements for: capacity-building, institutional reform, building the knowledge base, and developing water infrastructure and services.

This should start with African governments securing the confidence of international support agencies and local investors by demonstrating their commitment to good governance and credible institutions. This includes transparency, accountability, gender equity, adequate institutions and legal mechanisms.

International donors should recognize the efforts made by African countries and increase their assistance to the NEPAD Water and Sanitation Infrastructure Program, African Water Facility, RECs, WBOs and countries, to achieve self-sustaining growth.

5.2.2 Implementation of IWRM

IWRM can be tackled by addressing a specific problem or a challenge as an entry point. African countries that do not have an IWRM policy should try to introduce IWRM through project activities, while institutions entrusted with providing support for IWRM plans and implementation should scale up their efforts.

A protocol for the management of water basins between countries at the water basin, subregional and regional levels is overdue. All efforts to bring this about should be strengthened and streamlined in consultation with the RECs. The accord should devise mechanisms to enable the water basin organizations to become self-financing bodies.

There is a need to develop appropriate monitoring and evaluation mechanisms for sanitation and water activities; hence the efforts started by the AWF to establish Regional Mechanisms for Sanitation and Water Monitoring and Evaluation and to provide support for the same at the country level should be reinforced.

As part of IWRM implementation, efforts should be reinforced to: find appropriate solutions to the problem of soil erosion to minimize the loss of reservoir volume to sedimentation; deepen knowledge of groundwater watershed management, particularly groundwater exploitation and quality; and expand the use of desalination technology in water-stressed areas .

5.2.3 Meeting the MDG Target for Water Supply and Sanitation

The way forward for African countries to meet the MDG water and sanitation targets is to:

- Upscale all efforts to decentralize water supply and sanitation services to appropriate administrative levels and create water governance at all levels of management that is transparent, open, accountable, gender-responsive, participatory, communicative, effective, and socially, culturally, and environmentally acceptable.
- Invest adequately in building gender-balanced institutional, technical and managerial capabilities at all levels of the professional ladder, from artisans to planners and designers.
- Give prominence to sanitation, including extensive and intensive health and hygiene education at the community level.
- Take appropriate measures to protect groundwater and surface water quality from pollution.
- Ensure the development of appropriate monitoring and evaluation mechanisms for water supply and sanitation at the local and national levels, to reinforce the global WHO/UNICEF joint monitoring program.

With the current level of funding to the sector, the MDGs targets are unlikely to be achieved. Bilateral and multilateral organizations should therefore increase

their assistance to regional programs such as the RWSSI, Water for African Cities and others, to boost the effort towards achieving the MDGs targets.

5.2.4 Achieving Food Security

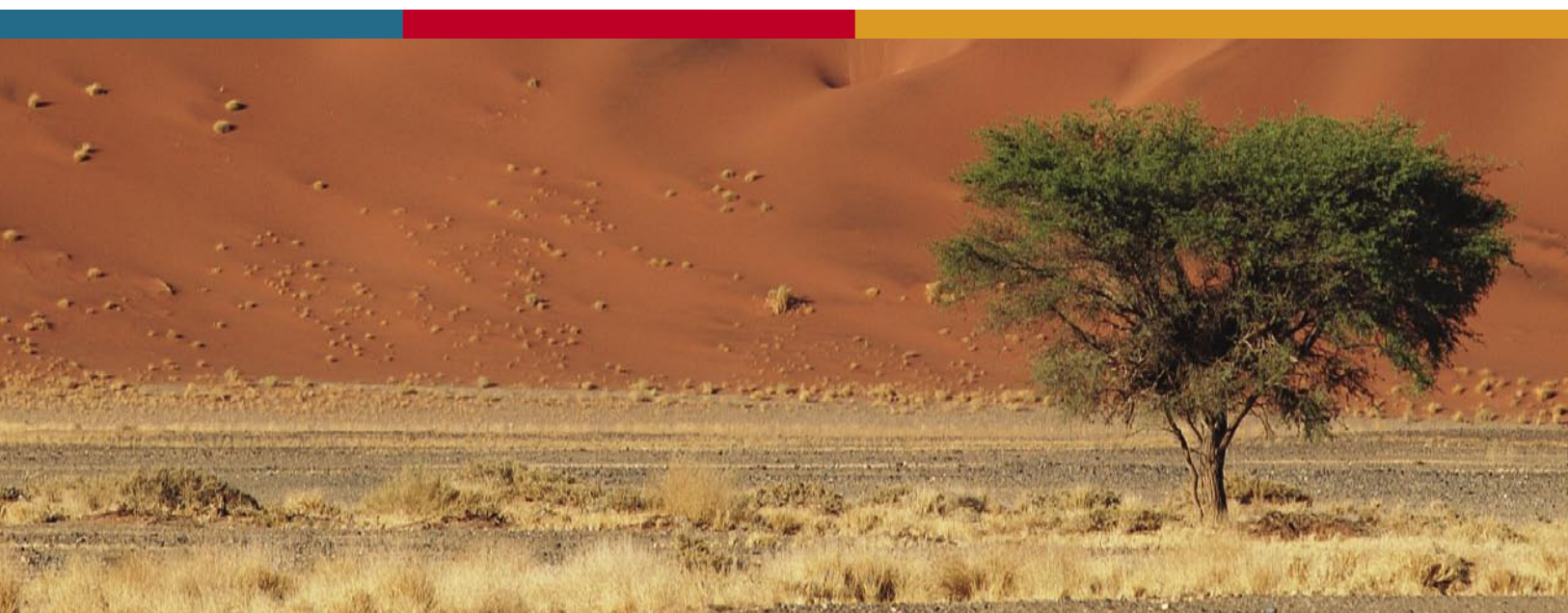
One of the ways to increase agricultural production and to achieve food security is by intensifying production on existing cultivated land. The development of irrigated agriculture on both small and large scales should be promoted urgently through regional irrigation initiatives. The NEPAD-CAADP targets twenty million hectares to be under irrigation by 2015 as part of the effort to achieve food security in the region. Financial support to develop water infrastructure and the needed human and institutional capacity should be provided by all those committed to eradicating poverty from the region.

In view of Africa's high hydrological variability, efforts should be targeted to providing the necessary water storage infrastructure and increasing the efficiency of agricultural water use through appropriate measures such as the reuse of treated wastewater and production of high value crops.

5.2.5 Managing Risk

In order to reduce the impacts of floods, droughts and other natural disasters caused by global climate change, there is a need for a comprehensive approach to risk management that includes investing in water infrastructure and establishing or strengthening disaster forecasting, as well as timely warning systems at the regional, subregional and national levels.

To avert the impacts of variable rainfall and climate change, more investment is needed in data acquisition, information processing and rapid dissemination of information to vulnerable groups.



ANNEX 1

list of references



- a) African Development Indicators (ADI) 2005.
- b) African Development Report 2004.
- c) African Economic Outlook 2004/2005, OECD, African Development Bank, 2005.
- d) African Environment Outlook, UNEP, 2002.
- e) African Water Development Report, UN-ECA, 2003.
- f) Agriculture Towards 2015/30 estimates, FAO, 2000.
- g) Bird Life IBA, Fact Sheet ET039, Koka Dam and Lake Gelila.
- h) Centre for Sustainability and the Global Environment, Nelson Institute for Environmental Studies University of Wisconsin-Madison.
- i) Current Status of National Efforts to Move Towards Sustainable Water Management Using an IWRM Approach, Informal Stakeholder Baseline Survey, Global Water Partnership VERSION 1, April 2004.
- j) Evaluation of the costs and benefits of water and sanitation improvements at the global level, WHO, 2004.
- k) Flushing of Sediments from Reservoirs, Dr W. Rodney White, HR Wallingford, UK.
- l) Fourth Extraordinary Session of the Assembly of Heads of State and Government, September 8-9, 1999, Sirte, Libya.
- m) Future Harvest News Report, March 17, 1977.
- n) Human Development Report, UNDP, 2004.

- o) Human Development Report, UNDP, 2002.
- p) IFPRI, Looking Ahead: Long-term Prospects for Africa's Agricultural Development and Food Security, August 2005.
- q) Initiative in Support of NEPAD-CAADP Implementation, FAO, 2005.
- r) Interconsult, Lilongwe, Malawi.
- s) Investment in Agricultural Water for Poverty Reduction and Economic Growth in Sub-Saharan Africa, A Collaborative Programme of AfDB, FAO, IFAD, IWMI and World Bank, 2006.
- t) Irrigation in Africa South of the Sahara, FAO, Investment Centre Technical Paper 5, Rome.
- u) Land Resource Stresses and Desertification in Africa, P.F. Reich, S.T. NumbeM, R.A. Almaraz and H. Eswaran, 2001.
- v) Naturalization of Lake Malawi Levels and Shire River Flows, Challenges of Water Resources Research and Sustainable Utilisation of the Lake Malawi-Shire River System, Osborne N. Shela.
- w) Policy for Integrated Water Resources Management, AfDB, 2000.
- x) Population Division of the Department of Economic and Social Affairs of the United Nations, December 2005.
- y) Press Release/GE Infrastructure, Water & Process Technologies, June 25, 2005.
- z) Rainfall variability and drought in sub-Saharan Africa since 1960, FAO, 1996.
- aa) Report of the World Panel on Financing Water Infrastructure, Financing Water For All, WWC, 2003.
- bb) Review of Water Resources by Country, Water Reports 23; FAO UN Rome, 2003.
- cc) Semantics Aside: The Role of the African Diaspora in Africa's Capacity Building Efforts, Brain Drain in Africa, Facts and Figures, The Association for Higher Education and Development (AHEAD).
- dd) Source: World Bank, 2003, Report No: 25917.
- ee) Space and Water for Life, TIGER Strategic Plan for Africa 2005-2015, Pretoria, November 2004.
- ff) The African Water Vision for 2025, Equitable and Sustainable Use of Water for Socio-economic Development, ECA, AU and AfDB.
- gg) The State of Food Insecurity in the World, FAO, 2004; World Development Indicators, World Bank, 2004; UNESCO Database, 2004; Country Report on MDGs, UNDP; Human Development Reports, UNDP, 2003 and 2004; World Population Prospects, UN Population Division, the 2002 Revision.
- hh) Transboundary Rivers and Crisis Prevention, Bonn International Centre for Conversion, BICC Water Page, 2005.
- ii) UN-HABITAT.
- jj) Vital Climate Graphics Africa, UNEP/GRID-Arendal.
- kk) Water for Growth and Development: A Framework for Analysis, the World Bank, 2005.
- ll) Water for Growth and Development: A Framework for Analysis, the World Bank, 2005.
- mm) Water for People...Water for Life, UNESCO, 2003.
- nn) Water Supply and Sanitation Assessment, AfDB, September 2005.
- oo) Water transfer versus desalination in North Africa: sustainability and cost comparison. Saad A. Alghariani, Alfateh University, Tripoli, Libya, March 2003.
- pp) WMO, November 2004.
- qq) World Energy Council, 2004 Survey of Energy Resources.
- rr) WSSD Plan of Implementation.

ANNEX 2

human poverty index⁵⁰ (hpi-1) rank, 2000⁵⁰

HDI Rank	County	Human poverty index (HPI-1) rank, 2000	HDI Rank	County	Human poverty index (HPI-1) rank, 2000
1	Norway	..	152	Mauritania	82
47	Seychelles	..	153	Zambia	66
64	Libyan Arab Jamahiriya	27	154	Senegal	79
67	Mauritius	15	155	Congo, Dem. Rep. of the	65
97	Tunisia	..	156	Côte d'Ivoire	70
100	Cape Verde	37	157	Eritrea	74
106	Algeria	39	158	Benin	80
107	South Africa	..	159	Guinea	..
111	Equatorial Guinea	..	160	Gambia	84
115	Egypt	48	161	Angola	..
117	Gabon	..	162	Rwanda	77
122	Namibia	57	163	Malawi	73
123	Morocco	59	164	Mali	81
124	India	55	165	Central African Republic	78
125	Swaziland	..	166	Chad	86
126	Botswana	..	167	Guinea-Bissau	85
128	Zimbabwe	60	168	Ethiopia	87
129	Ghana	45	169	Burkina Faso	..
132	Lesotho	42	170	Mozambique	83
134	Kenya	49	171	Burundi	..
135	Cameroon	47	172	Niger	88
136	Congo	46	173	Sierra Leone	..
137	Comoros	51			
139	Sudan	53			
141	Togo	63			
147	Madagascar	61			
148	Nigeria	58			
149	Djibouti	56			
150	Uganda	67			
151	Tanzania, U. Rep. of	54			

⁵⁰ Human Development Report, UNDP, 2002

ANNEX 3

progress towards achieving the millenium development goals⁵¹

Progress towards Millenium Development Goals		Goal 1 Eradicate extreme poverty and hunger Target: Halve the % of people suffering from hunger Undernourished people (as % of pop)	Goal 4 Reduce child mortality Target: Reduce <5 and infant Mortality rates by 2/3 Under five mortality rates (per 1,000 lives)	Goal 7 Ensure Environmental sustainability Target: Halve the % of people without access to safe water Access to safe water (%)	Number of goals on target to be achieved Out of 7
HDI Rank*					
106	Algeria	Slipping back	Slipping back	Slipping back	4
161	Angola	Slightly off	Slipping back	On track	2
158	Benin	On track	Far behind	On track	3
126	Botswana	Slipping back	Slipping back	On track	5
169	Burkina Faso	On track	Far behind	On track	2
171	Burundi	Slipping back	Far behind	On track	1
135	Cameroon	Slightly off	Slipping back	On track	1
100	Cape Verde	..	On track	On track	5
165	Cent. Afr Rep	Far behind	Far behind	Achieved	1
166	Chad	On track	Far behind	On track	2
137	Comoros	Slipping back	On track	Achieved	3
136	Congo	Slightly off	Far behind	..	2
155	Congo, DRC	Slipping back	Far behind	..	1
156	Côte d'Ivoire	Slightly off	Slipping back	On track	1
149	Djibouti	On track	Far behind	Achieved	3
115	Egypt	On track	On track	Achieved	6
111	Equat. Guinea	..	On track	..	2
157	Eritrea	Far behind	On track	On track	2
168	Ethiopia	Slipping back	Far behind	Slightly off	0
117	Gabon	Slipping back	Far behind	..	2
160	Gambia	Far behind	Far behind	..	3
129	Ghana	Achieved	Slightly off	Achieved	4
159	Guinea	Slipping back	On track	Far behind	2
167	Guinea- Bissau	0
134	Kenya	Far behind	Slipping back	Slightly off	3
132	Lesotho	Slightly off	Far behind	On track	4
999	Liberia	Slipping back	Far behind	..	0
64	Libya	Achieved	On track	Far behind	3
147	Madagascar	Slipping back	Far behind	Far behind	3
163	Malawi	on track	Slightly off	Slightly off	4
164	Mali	Far behind	Far behind	On track	3
152	Mauritania	On track	Far behind	Far behind	3
67	Mauritius	On track	On track	Achieved	7

Progress towards Millennium Development Goals		Goal 1 Eradicate extreme poverty and hunger Target: Halve the % of people suffering from hunger Undernourished people (as % of pop)	Goal 4 Reduce child mortality Target: Reduce <5 and infant Mortality rates by 2/3 Under five mortality rates (per 1,000 lives)	Goal 7 Ensure Environmental sustainability Target: Halve the % of people without access to safe water Access to safe water (%)	Number of goals on target to be achieved Out of 7
123	Morocco	Slipping back	On track	On track	5
170	Mozambique	Slightly off	Far behind	..	0
122	Namibia	Achieved	Far behind	Achieved	5
172	Niger	Slightly off	Far behind	..	0
148	Nigeria	Achieved	Far behind	Slightly off	1
162	Rwanda	Far behind	Slipping back	..	2
119	São T and Principe	..	Far behind	..	1
154	Senegal	Slipping back	Far behind	On track	4
47	Seychelles	..	On track	..	3
173	Sierra Leone	Slipping back	Far behind	..	1
999	Somalia	Slipping back	Far behind	..	0
107	South Africa	..	Slipping back	On track	4
139	Sudan	On track	Far behind	On track	3
125	Swaziland	Far behind	Slipping back	..	3
151	Tanzania	Slipping back	Far behind	Achieved	4
141	Togo	On track	Far behind	Far behind	2
97	Tunisia	Achieved	On track	On track	7
150	Uganda	Slightly off	Slightly off	Slightly off	2
153	Zambia	Slipping back	Slipping back	On track	2
128	Zimbabwe	Far behind	Slipping back	On track	3
Achieved		5	0	8	
On track		10	11	19	
Slightly off		8	3	5	
Far behind		8	27	5	
Slipping back		16	11	1	
No data		6	1	15	
Total		53	53	53	
Satisfactory Performance Ratio (Achieved and On track)		28.3%	20.8%	50.9%	

⁵¹FAO, The State of Food Insecurity in the World 2004; World Bank, World Development Indicators, 2004; UNESCO Database, 2004; UNDP Country Report on MDGs; UNDP, Human Development Reports, 2003 and 2004; UN Population Division, World Population Prospects, the 2002 Revision.

ANNEX 4:

international water basins draining more than 30,000 km² ⁵²

N°	Name of catchment	Basin area basin(x 1000 km2)	Countries sharing the basin
1	Congo	3690	Angola, Burundi, Cameroon, Central African Republic, Congo, Democratic Republic of Congo, Rwanda, Tanzania, Zambia
2	Nile	2850	Burundi, Democratic Republic of Congo, Egypt, Eritrea, Ethiopia, Kenya, Rwanda, Sudan, Tanzania, Uganda
3	Niger-Benué	2230	Benin, Burkina Faso, Cameroon, Chad, Côte d'Ivoire, Guinea, Mali, Niger, Nigeria
4	Lake Chad	1900	Cameroon, Central African Republic, Chad, Niger, Nigeria, Sudan
5	Zambezi	1290	Angola, Botswana, Malawi, Mozambique, Namibia, Tanzania, Zambia, Zimbabwe
6	Orange Senou	800	Botswana, Lesotho, Namibia, South Africa
7	Lake Turkana	500	Ethiopia, Kenya, Sudan, Uganda
8	Juba-Shebelle	450	Ethiopia, Kenya, Somalia
9	Limpopo	400	Botswana, Mozambique, South Africa, Zimbabwe
10	Volta	390	Benin, Burkina Faso, Côte d'Ivoire, Ghana, Mali, Togo
11	Senegal	340	Guinea, Mali, Mauritania, Senegal
12	Okavango	320	Angola, Botswana, Namibia, Zimbabwe
13	Ogoue	220	Cameroon, Democratic Republic of Congo, Equatorial Guinea, Gabon
14	Ruvuma	150	Malawi, Mozambique, Tanzania
15	Awash	120	Djibouti, Ethiopia
16	Cunene	110	Angola, Namibia
17	Sabi (Save)	103	Mozambique, Zimbabwe
18	Gambia	78	Gambia, Guinea, Guinea-Bissau, Senegal
19	Sassandra	78	Côte d'Ivoire, Guinea
20	Comoé	77	Burkina Faso, Côte d'Ivoire
21	Baraka	60	Eritrea, Sudan
22	Cross	48	Cameroon, Nigeria
23	Oueme	48	Benin, Nigeria, Togo
24	Komati	46	Mozambique, South Africa, Swaziland
25	Pangani	35	Kenya, Tanzania
26	Maputo	34	Mozambique, South Africa, Swaziland
27	Cavally	32	Côte d'Ivoire, Guinea, Liberia
28	Gash	32	Eritrea, Sudan

⁵²Policy for Integrated Water Resources Management, AfDB, 200

ANNEX 5:

basic information on arrangements for the management of some WBOS

Senegal River Basin

Three of the four riparian countries in the Senegal River Basin (Mali, Mauritania, and Senegal) have established the OMVS, which provides the legal and institutional framework for cooperation. Key national and regional institutions are in place and there is an extensive information base on the basin that can be used for cooperation.

Gambia River Authority

The Organization pour la Mise en Valeur du Fleuve Gambie (OMVG) is the Gambia River Authority. This organization, established in 1978, is similar to the OMVS, and involves Senegal, Gambia, Guinea Bissau, and Guinea. It is headquartered in Dakar, Senegal.

Niger River Basin

The Niger River basin covers nine countries in West and Central Africa (Benin, Burkina Faso, Cote d'Ivoire, Guinea, Mali, Niger, Nigeria, Cameroon and Chad) and in this context provides great opportunity for regional economic integration. The Niger basin countries have demonstrated their commitment to fostering joint development of the basin and have established the Niger Basin Authority.

Lake Chad Basin

There are seven riparian countries in the Lake Chad Basin (Nigeria, Niger, Algeria, Sudan, Central African Republic, Chad and Cameroon) of which five (Nigeria, Niger, Central African Republic, Chad and Cameroon) are members of the Lake Chad Basin Commission (LCBC).

Congo River Basin

The Congo River basin is the largest river basin in Africa, with an annual flow of 1,269 km³/year, which is equal to 32% of the renewable water resources for the whole of Africa. The Basin covers nine countries (Zambia, Tanzania, Burundi, Rwanda, Central Africa, Cameroon, Congo Brazzaville, DRC, and Angola) with about 60% of the basin area in DRC Congo. Most of the countries (Burundi, Rwanda, Central Africa, Congo Brazzaville, DRC, and Angola) have been in conflict and no formal basin-wide institutional framework has been established so far.

Nile River Basin

The Nile river basin covers ten countries (Tanzania, Burundi, Rwanda, DRC, Uganda, Kenya, Ethiopia, Eritrea, Sudan and Egypt). Nine of the ten counties (excluding Eritrea) are members of the Nile Basin Initiative and implementation is well underway. This international and regional cooperative arrangement has given good results in enabling the implementation of the shared vision and subsidiary action programmes.

Zambezi River Basin

Eight countries (Angola, Botswana, Malawi, Namibia, Mozambique, Tanzania, Zambia and Zimbabwe) share the Zambezi river basin. Under the umbrella of the SADC Protocol on Shared Water Courses, these riparian countries established Zambezi Watercourse Commission (ZAMCOM) in July 2004.

Okavango River Basin

The Okavango River Basin falls within Angola, Botswana and Namibia. The three riparian countries have established a cooperative framework by setting up the Okavango River Basin Commission (OKACOM).

Orange-Senqu River Basin

The Orange-Senqu river basin falls within Lesotho, South Africa, Botswana and Namibia. In 1986, Lesotho and South Africa signed a treaty establishing the Lesotho Highlands Water Project, an inter-basin cross-border project transferring water from Lesotho to South Africa, and created a joint permanent technical commission later named the Lesotho Highlands Water Commission. In 1992, an agreement was signed between Namibia and South Africa establishing a Permanent Water Commission to provide technical advice to the parties. The agreement to establish the Orange-Senqu River Commission (ORASECOM) was signed on November 3, 2000 in Windhoek (Namibia) by the four basin states: Botswana, Lesotho, Namibia and South Africa. The Commission advises the four member states on the management of water resources in the Orange Senqu river basin.

ANNEX 6:

local actions

1. Introduction

In response to a call made by the organizers of the 4th World Water Forum and the Africa Regional Beacon, a total of 230 local actions were registered. Most of the local actions have points of interest, but given the nature of the Regional Report, only forty local actions (eight in each thematic area) have been selected for inclusion. The main criteria used for the selection of the local actions were:

- Can it be replicated or scaled up?
- Is it innovative?
- Does it contribute to the water development effort?
- Does it contribute to the economy?
- Does it convey the message clearly?

Summaries of these local actions are presented below under each thematic heading.

2. Theme I: Water for Growth and Development

2.1 Regional Solar to improve access to water in the Rural Sahel

This local action involves a massive response at a regional level, mainly with infrastructure solutions, to the problem of water variability in the Sahel region. Although rainfall lasts only a quarter of the year, groundwater can be exploited to respond to the rural poverty problem and local economic growth needs of the rural population. The availability of abundant solar energy was also exploited for pumping and other energy needs.

Institutionally, implementation consisted of national level structures (CILS National Committees) in each country, as well as local management committees. The private sector also took an active part in providing the technology.

The qualitative programme benefits are: greater community access to water supplies and dissemination of solar technology that has spread beyond water supply to

the education and health sectors, small businesses, homes and community institutions.

The project is now building on the success of cost recovery (which shows community recognition of the benefits of the project) and on a stronger supplier chain (resulting from sustainable dissemination of solar technology through the water development effort).

2.2 Performance Contracting Applied to Water in South Africa

This local action addresses water (and energy) wastage in low-income households, using a performance-based contract with a private company, in which savings benefits are shared.

A contracting company provided the initial financing to construct pressure control infrastructure on a BOOT basis, which includes training municipal staff over a five-year contract period. The contractor reaps 20% of the savings benefit over the contract period, while the municipality gains through the remaining life of the assets.

The key lesson comes from the crosscutting perspective of innovative financing. It is possible that a number of similar opportunities go unnoticed in other municipalities.

2.3 Community-based Water Leaks Project

This project, initiated in the Khayelitsha area in Cape Town (South Africa) is aimed at addressing the problem of leakage and wastage in the households of a poor community. It had been observed that most households are unaware that they are being billed for water wasted in their homes, and when they are, they do not have access to skilled help.

This model project consists of training households in essential skills such as plumbing and financial literacy, conducting audits, fixing leaks, undertaking participatory research on awareness and undertaking awareness-raising. The project has developed guidelines for replication of the



model and is developing recommendations based on the experiences gained.

The project benefits are significant both for the households and the local and central governments, in terms of resources savings, financial savings and greater empowerment of the community members. The financial savings will also have multiplier effects.

2.4 Food Security and Natural Resources Management in the Baidiam District – Mauritania

This local action in Mauritania addressed the critical issue of diminishing natural resources, due in part to human action. In a typical vicious cycle characteristic of these arid regions, increasing food insecurity drives the population towards land of even lower marginal value. The project aimed to improve the security of rain-fed agriculture as well as recession (spate) irrigation, while making land available to the previously landless.

Following a land diagnosis, the action consists of development of land management rules to follow construction of three water-spreading and three infiltration-inducing dams protected by a zizyphus tree perimeter.

The development outcomes will be measured after the first harvest in January 2006. However, since the dams

have filled in the first year of operation, the local action has accomplished the prerequisite for better utilisation of natural and other resources. Plans are being made to face the new challenges created by the improved situation, such as the resolution of land claims –especially in view of the increased value of land in the command areas of the dam— and the need for cost recovery, especially for operation and maintenance.

In addition to the physical gains, the community has gained in knowledge and self-confidence. The key innovation is considered to be land diagnosis and land agreements. To avoid conflict over dams, the local action included a thorough diagnosis with the participation of users and applying user-validated methods. Using GIS, land surveyors identify cultivable lands and the impact of dams on these lands. Land owners and tenants are identified and mapped. The process facilitates negotiations of participation and participants get to know their rights to access after construction. Owners can define conditions under which they are willing to allow access to land and this is validated by a general assembly and authorized by the regional authorities. The agreement is reference point should there be a post-installation conflict.

2.5 NEPAD Water and Sanitation Infrastructure Programme (WSIP)

NEPAD's WSIP falls within the larger framework of the partnership initiative, the aims of which include developing regional infrastructure, harmonizing sectoral procedures, directing financial flows towards investment in infrastructure, and developing skills and knowledge for the installation, operation and maintenance of infrastructure.

The NEPAD Medium- to Long-Term Strategic Framework (MLTSF), now being formulated, aims to act as a firm foundation for continuous and consistent development of infrastructure based on coherent goals, and to define and institute a monitoring framework for implementation. It will serve to exchange good practices among Regional Economic Commissions (RECs) and among sectors.

The Infrastructure Short-Term Action Plan (STAP) consists of policy, capacity-building and facilitation activities, and key infrastructure projects, including in water and sanitation. The programme exemplifies the importance of defining clear-cut mechanisms for consultation and coordination of stakeholder activities relating to regional integration.

2.6 South African Multi-stakeholder Initiative on the WCD

A multi-stakeholder initiative was established to contextualize the World Commission on Dams' findings for South Africa. The Initiative has been analyzing SA policy and legislation and making its recommendations on social impacts, enhancing governance of water, energy resources development, and promoting river health and sustainable livelihoods.

The Initiative is run by a Coordinating Committee comprised of representatives of the private sector, financial sector, central government (Department of Water Affairs and Forestry), dam-affected communities, NGOs, and water and power utilities. In addition, a forum of about 120 organizations from sectors represented on the Coordination Committee meets annually and includes representatives of neighbouring states with shared stored water resources.

The process is expected to improve national government policy and practice in terms of planning (public participation), environmental issues (pristine rivers, impact mitigation) and social impacts (resettlement, reparations) at a national, regional and continental level,

while also improving channels of communication among stakeholder groups. The initiative has enjoyed the support of the UNEP Dams and Development Project which has used it as an example of a good practice.

Implementation of the first phase recommendations include drafting a national policy on compensation and reviewing guidelines for popular participation.

2.7 MDG Capacity-strengthening Project for Africa

The UNESCO-IHE project is directed at strengthening human resource capacity to reach the MDGs by helping professionals from Africa to tackle water and sanitation problems through focused research. Fifteen masters research students from six different countries are undertaking research in various subjects linked to the MDGs.

These researchers address a specific problem or constraint within the context of their own institution, study it in its particular context, and analyze it within a theoretical framework based on relevant international scientific literature. Each study analyzes trends and seeks to establish underlying causal relationships so as to add relevance to the subject. Solutions can then be applied at a wider scale at the national or international levels in terms of theory, methodology, technology and institutional innovation.

Key boundary conditions are efficient water use, environmental sustainability, conflict resolution and the MDGs.

3. Theme II: Implementing IWRM

3.1 AQUIFER: Tunisia Exploiting Space for Transboundary Aquifer Management – NWSAS (SASS)

The AQUIFER project is a demonstration project through which the European Space Agency (ESA) supports national authorities and international institutions in managing transboundary aquifer management with GIS-compatible products and services. It is intended to strengthen IWRM practices by providing support with Earth Observation (EO) applications and to establish a body of independent service providers at the local level to continue support well beyond the duration of the project. It is targeted at the users managing the lullemeden aquifer as well as the North-west Sahara aquifer systems, which cross the territories of Tunisia, Algeria, Libya, Niger and Mali.

The project provides products and services such as land use cover and change maps, digital terrain models

(DTMs), surface water extent and dynamics, estimates of water abstraction evapo-transpiration maps, maps of irrigated areas, and water and vegetative cover over the target area. While Earth Observation provides only surface information, it does so in a manner that allows estimation of sub-surface conditions indirectly through identification of recharge areas, location of abstraction point, land cover, and location of fractures in aquifer systems. EO does this over a wider area base than is possible with discrete observations, although these also help provide information for calibration and modelling.

As shared water resources in general and shared aquifers in particular increasingly become sources of conflict, availability of information that is equally credible to all concerned stakeholders is becoming a key to conflict resolution. The information will be used to assess risks and possible impacts of actions, and will assist in joint and shared decision making in the interests of all concerned.

3.2 IWRM in the Nakanbe Basin in Burkina Faso.

This local action addresses a problem encountered in the introduction of IWRM in the Nakanbe Basin of Burkina Faso. The Nakanbe, is one of the four basins of the country, with problems of low rainfall, underlying geology of crystalline basement, fast-growing demand, more than four hundred dams, and conflicts over water management. IWRM was introduced through the IWRM Programme (GIRE 2004-2009) and the Plan of Action, as well as the establishment of a River Basin Management Committee. The RBM Committee suffered from significant inertia, being made up of too many members with too little motivation. As a result, there were no concrete initiatives or actions undertaken.

The response was to introduce the Local Water Committees to a bottom-up approach, as presented in this local action.

This experience shows that introduction of the IWRM approach should include local structures and that NGOs can be effective in helping set up these local structures, or helping broaden the scope of existing ones. It has been observed that stakeholders confuse them with the already existing Water Supply Committees, which focus only on the supply aspect.

3.3 Decentralization of WRM in Uganda

The national Decentralization of WRM programme in Uganda, piloted in the local governments of Mbale, Tororo and Kasese, demonstrates that IWRM activities must

ultimately be implemented at the local level. Depending on the issue at hand, it defines the roles at four levels: central government provides financial and technical support as well as stakeholder coordination; local governments are responsible for ensuring successful implementation through oversight and supervision; communities are responsible for implementation; and civil society is involved in mobilization, awareness raising and capacity building.

Experience from this local action underscores the importance of indigenous knowledge and the role of civil society, given its understanding of the local communities and its ability to mobilize the population.

3.4 May Zegzeg Integrated Watershed Management Project

This demonstration programme in the Dogua Tembien area of Tigray addressed the problem that, despite improved rainfall conditions in the Ethiopian highlands, drought and famine continue to affect the local population due to the low infiltration capacity of the soil.

The regional government initiated the programme in which researchers from Mekelle University studied water conservation and watershed management in the target area starting in 1994. Farmers, assisted by the local authorities, used the results of the research to implement conservation activities in a 400-hectare area. This included physical and biological conservation measures and an end to free-range grazing. By-laws were drawn up to describe users' rights and duties. The programme included capacity building. Field training was given to farmers and student groups.

Despite the fact that this initiative required a major change in land use, key results were obtained in the first year in terms of improved hydrological cycle and crop yields. The enhanced infiltration capacity of the soil has led to increased spring discharges and emergence of new springs, and new irrigation has started in some areas for the first time.

3.5 Pioneering Actions in Managing the Transboundary Nubian Sandstone Groundwater Aquifer

The Nubian Sandstone Aquifer System (NSAS) is a non-renewable resource. Given the scarcity of water in the region, there is an enormous risk that the resources could be considered unlimited, while only a portion may be physically and economically exploitable through strategies

that maximize benefits while minimizing the negative effects of development and exploitation. The regional aquifer is shared between Chad, Egypt, Libya and Sudan.

It was in this context that the Nubian Sandstone Aquifer System (NSAS) Regional Programme undertook a number of activities leading to the formulation of a regional strategy for the utilisation of the NSAS. This strategy was based on principles of rationality and wisdom in the management of the shared resource. The objectives of the programme were:

- a) Creating an enabling environment for the formulation of a regional strategy: The Joint Authority for Study and Development was revitalized and expanded to include Chad, and a Regional Programme Steering Committee was formed to oversee the work plan and budget.
- b) Assisting in the capacity-building of the national institutions of the four countries sharing the aquifer: Following a needs assessment, hardware and software were purchased, and training programmes were held on key subjects.
- c) Formulating a regional strategy for the sustainable utilisation of the Nubian Sandstone Aquifer System: The programme undertook studies to establish a NSAS technical information system covering about 2,100 wells and their attributes, a GIS system with regional, hydro-geological and water quality maps, a mathematical model and simulation of different scenarios of exploitation, and draft agreements by the National Coordinators on the protocol for information-sharing, including development of a website.
- d) Tackling the socio-economic parameters to create an equitable balance between population and groundwater resources. Socio-economic aspects of development were studied and synthesized, and recommendations aimed at enhancing the welfare and economics within the holistic development of the NSAS were made. A system of regional indicators was established.

3.6 One Basin, Nine Countries – A Shared Vision

The Niger Basin Authority (NBA or ABN in French) is in the process of developing a vision shared by its nine member states, consisting of comprehensive development of the basin's potential, negotiated and accepted by all the member countries. It is an ideal of the most rational possible integrated development plan for the optimal

development of all the resources in the River Niger basin, with a view to generating the highest number of benefits for all the member states. The shared vision translates the political commitment of the member countries for a joint action programme that defines long-term objectives (to 2025) and strategic orientations, and develops specific mechanisms and tools to make it possible to reach these objectives.

The strategic objectives pursued by the Shared Vision consist of:

- development of the Shared Vision for the development of the River Niger Basin
- comprehensive and integrated management of all the resources in the basin ;
- Reinforcement of cooperation and joint actions among the riparian countries;
- Reinforcement of cooperation between the NBA and the international community of development partners.

Detailed operational objectives have been established to enable the NBA to achieve the strategic objectives. They include: a Sustainable Development Action Plan (SDAP) developed on a consensual and strategic basis; a legal and institutional framework to encourage dialogue and consultation for cooperative action among the riparian countries in the basin; sustainable and equitable development of water resources; and adoption of a pragmatic, consensus-building approach to the development of the shared vision.

In order to ensure stakeholder participation, there will be national workshops and a dialogue process with liaisons with regional structures to ensure coherence with national and regional plans.

The members of the Niger Basin Authority are: Benin, Burkina Faso, Cameroon, Cote d'Ivoire, Guinea, Mali, Niger, Nigeria, Chad.

3.7 Promoting IWRM in the Mara Basin of East Africa

The Mara River Basin is a transboundary basin shared by Kenya and Tanzania, and is also part of the larger Nile Basin. The basin faces threats of an environmental nature, exacerbated by a failure of local, national and regional legislation, and a lack of institutional structures to address water resource issues. These problems have wide-ranging consequences on production, livelihoods and natural

resources, and ultimately on the Masai Mara National Reserve and Serengeti National Park conservation areas.

The international NGO GLOWS (Global Water for Sustainability) has initiated a project to support the full-scale Integrated Water Resources Management in the Mara River Basin, working with stakeholders on each side of the Kenya-Tanzania border and with the East African Community on transboundary issues. Project objectives involve a vision of the Mara Basin in which relevant IWRM principles are applied. Implementation engages a broad spectrum of stakeholders, including government agencies, inter-governmental organizations and NGOs.

The project hopes to impact sustainability on four fronts: influencing formulation of legal systems, especially the transboundary agreements between the two riparian states through the Lake Victoria Basin Commission; supporting the creation of appropriate institutions for IWRM, such as water user groups, accepted in both countries as acceptable forms of local participation; strengthening existing institutions, such as the local offices of the stakeholder ministries; and supporting the efforts of the 4th Forum to maintain a long-term presence in the basin.

The project includes two interesting innovations: first, promoting payment for environmental services, by illustrating the economic value added to the tourism industry by proper environmental management and the need to fund these services; and second, the composition of the project participants, with local organizations benefiting from the support and expertise of a worldwide network of the international participants who, in turn, learn from the coordinated activities across multiple projects.

3.8 Strengthening River Basin Organisations in the SADC Region

The Orange-Senqu River Commission (ORASECOM) in southern Africa has adopted a political consultation process to give itself an **executive secretariat**, with the mandate and capacity to implement basin-level projects. The member countries –Botswana, Lesotho, Namibia and South Africa– have achieved this through a delicate process of confidence and trust among political organisations. Decisions were slow in coming but were made consensually. Respect and fairness were applied when dealing with controversial issues.

The road to forming the Executive Secretariat serves as a "good practice" that will be followed by other

river organizations in the region and elsewhere. The commissioners of the basin organisation, and the technical and legal task force, prepared the ministers responsible for water to agree on the new structure. Sufficient funds have been made available by member states for recurrent expenses. SADC created an enabling environment, while GTZ provided technical expertise and facilitation.

The result is that ORASECOM is now equipped to implement commission-level projects through its own efforts and with the participation of all member countries. IWRM plans and, subsequently, appropriate transboundary water projects have been implemented, with widespread social, economic and environmental impacts for the people in the basin. SADC has captured the outcome as "good practice" and advises its member states accordingly.

3.9 The NWSAS Project as a Local Action for Joint Management of Shared Aquifers

The North-Western Sahara Aquifer System (NWSAS) Project shared among Algeria, Libya and Tunisia, was undertaken by the Sahara and Sahel Observatory (OSS) in the framework of its Water Program, developing scientific and technical dialogue between the countries sharing water resources. The objective is to promote good governance of transboundary waters by developing the concept of "Basin Awareness".

Exploitation of the NWSAS has increased intensively from 0.4 billion m³ in 1950 to 2.5 billion m³ in 2000, with water drawn at more than eight thousand points. The impacts of this exploitation, which extends beyond the national borders of a single country, has brought about a generalized fall in water levels and the degradation of water and soil quality. Such impacts translate, in ecological and economic terms, into desertification, salinization, fresh water scarcity for inhabitants and tourism activities, a drop in agriculture production and increased poverty.

Aware of the risks facing human well-being, as well as the sustainability of ecosystems, the countries mandated the OSS to help them develop a strategy for joint management of the system, based on a deep knowledge and reliable forecasting of the impacts of the overexploitation of this non-renewable water resource.

Objectives of the NWSAS project:

- Promoting "basin awareness" to favour joint management of shared water resources;
- Supporting the countries' development and implementation of common strategies and

management tools to improve human well-being and secure the sustainability of water resources and ecosystems;

- Establishing "basins observatories".

Main achievements:

- The study provided new, deeper knowledge of the aquifer as a whole system, at the geological, hydro-geological and environmental levels;
- Providing a common information system that allows monitoring of the behaviour of the aquifers and the joint management of its resources;
- Facilitating the adoption of consensual planning schemes, allowing each country to use its part of the shared waters equitably;
- Ensuring participative management involving all stakeholders, particularly local populations;
- Facilitating establishment, by the countries, of relevant juridical and institutional frameworks to enable good governance of shared waters;
- Forging mutual confidence: joint implementation of the project and the exchange of experiences and information between countries helped establish solid cooperation and forged confidence;
- Mainstreaming socio-economic and environmental aspects, in addition to hydraulic aspects, raised awareness of the negative impacts of overexploitation and strengthened solidarity among the three countries;
- Involvement in decision-making;
- Paving the way to the duplication / adaptation of the experience.

This approach is now being duplicated within the framework of the project on the Lullemeden System (SAI) shared by Mali, Niger and Nigeria. Other similar basins of the OSS zone of action (North Africa, the Sahel and East Africa) will use the same approach.

3.10 OMVS: Water for Sustainable and Solidarity-based Development.

The Senegal River basin (SRB) in West Africa is drained by the 1,800-km-long Senegal river in four riparian countries: Guinea, Mali, Mauritania and Senegal. In the past, inter-annual irregularity in water flow was characteristic of the river. Irregular inter-annual flooding posed a major problem for the basin, as it decreased the potential for development. Conversely, the years with extremely reduced water flow were also disastrous, since agriculture was

severely disrupted and particularly low water levels during the dry season resulted in extensive salt water intrusion.

In 1972, the Organisation pour la Mise en Valeur du Fleuve Senegal (OMVS) was established by three of the riparian states: Mali, Mauritania and Senegal. The institutional framework includes: the Council of Ministers (conceptual design and control); the High Commission (OMVS executive body); the Water Standing Committee (an advisory body of the Council of Ministers); two management and operating agencies for the dams; a Consultative Committee of Partners in Development; and a Regional Planning Committee whose role is to harmonize national programmes with all actors and stakeholders in the basin.

An integrated management plan for the river basin was prepared and partially implemented. The OMVS programme is built on a mid- to long-term vision, with clearly-defined steps for at least the next 25 years. The programme provides support to the four riparian countries in the basin (Guinea, Mali, Mauritania and Senegal) to jointly strengthen their regional approach to sustainable management and development of the basin. Several major projects are implemented under the OMVS.

The construction of the Diama Dam and the Manantali Dam have resulted in significant (40%) regulation of river flow, allowing agriculture expansion and diversification, hydropower production, drinking water supply, transport, flood protection and preservation of the environment. In addition, a potential of 375,000 hectares of irrigated land and 800 GWh of hydropower per year has been secured. Dakar receives up to half its water supply from the Senegal river and so will Nouakchott in the very near future.

OMVS' experience proves that water resources management at the basin level can work in Africa, and that it is possible to develop reliable socio-economic agencies, based on the joint and cooperative management of transboundary basins.

3.11 Establishment of Stakeholder Forum for Lake Guiers in Senegal

Lake Guiers is a freshwater source located in the upper delta of the Senegal river, providing water to the City of Dakar and serving several other agricultural purposes. Because water management had not been decentralized, local authorities had been excluded from the management of the water resources of Lake Guiers. This resulted in mismanagement, leading to negative side effects on land

use, agricultural losses and deterioration of economic and social infrastructure.

The solution was to introduce a participatory management process beginning in 1999, through creation of a Stakeholders' Forum consisting of grassroots and international representatives, including farmers' and fishermen's unions, villages and town groups located around the lake, industries, provisional and central government ministries, and the OMVS.

The Stakeholders' Forum has raised awareness of the lake's potential, as well as the risks associated with poor management of the lake's water resources. Communities have developed initiatives to fight against the use of agrochemicals, and to control the spread of bilharzias and invasive aquatic plants. There has been improvement in the exploitation of natural resources. Small-scale gardening is booming, while the local economy has diversified. From a social point of view, the consultation process itself has diffused tensions related to water access.

The Lake Guiers case provided experience in: community participation in the management of a strategic water resource involving numerous and competitive stakeholders; the methodologies applicable to the process of formalising and legitimating stakeholder involvement; and the utilisation of a consultative structure as well as an institutional one. The lessons of this case can easily be replicated in other reservoirs in Senegal and the sub-region.

4. Theme III: Water Supply and Sanitation for All

4.1 Siraro Water Supply

The Siraro area is deprived of surface water sources and the groundwater has a very high fluoride content. The technical problems were solved by developing potable water from a groundwater aquifer high in the mountains and distributing it through a network of pipes extending as far as 70 km from the source.

The Siraro Water Supply is a community-managed system that provides water to about 50,000 people spread among twenty villages and three small towns in three districts in the Oromia region of Ethiopia.

Each village and town is represented by a seven-member Water Committee, each of which is represented by two members in a 46-member Water Board General Assembly. Of these, nine members are elected to the Water Board Executive Committee, which is responsible for the management of the scheme. All committee and board

members provide their services free of charge.

The Water Board Executive Committee is served by a Board Administrative Office with 86 hired staff, consisting of an administrator, a technical chief, an accountant, plumbers, water sellers and pump guards.

The water is sold to the consumers at rates set in consultation with the Oromia Regional Water Bureau (ORWB) – currently US\$ 0.58/m³ for house connections and US\$ 0.47/m³ for public fountains. The rate covers operation and maintenance costs and permits significant savings. ORWB provides technical support to the Water Board and oversees about 25 similar but larger water schemes.

Currently, five years after its establishment, the Siraro water supply scheme is a self-sustaining, fully community-managed water supply operation that has proved that communities can operate and maintain complex water schemes.

The Oromia Regional Water Bureau has financed the initial capital investment as well as a car and two motorcycles, while the beneficiaries finance the operating and maintenance costs. Such an initiative will work even better with gravity schemes requiring minimal pumping, or borehole sources using solar and wind energy sources. The whole scheme can be replicated in other areas, as the ORWB is now doing in 24 other places.

4.2 Oxidation pond with kaolin bed for sewage treatment

Wastewater treatment in rural areas lags far behind potable water supply, since conventional sewage treatment works are relatively expensive. Most low-cost wastewater treatment in villages can pollute groundwater and is not suitable for irrigation of crops and plants.

The aim of this action is to develop and design an appropriate concept base for treatment of wastewater in Egyptian villages and in similar villages in other developing countries. This technology consists of a biological filter bed of kaolin ore used as an adsorbent for the removal of toxic organic compounds as well as heavy and toxic metals

This simple sewage treatment plant consists of three ponds units. The sewage liquor is spread onto the surface of the first bed made up of coke (carbonized coal), rocks or specially fabricated plastic media with a large surface area. The liquor is distributed through perforated rotating arms radiating from a central pivot. The distributed liquor trickles through this bed and is collected in second basin at the base, which contains a bed of kaolin with a large

surface area (grain size < 100 microns). The kaolin acts as an adsorbent for adsorption of toxic organic compounds and heavy and toxic metals. The resulting liquor is moved into a sedimentation pond.

The wastewater from this treatment does not have any toxic organic or inorganic pollutants, will not pollute groundwater and can be used safely for pollutant-free irrigation of crops and plants. This technique will not cost much, since kaolin is cheap.

The institutions involved in this programme are the Social Fund for Development, universities and institutes, international organizations working in Egypt, the Egyptian Environmental Affairs Agency and local NGOs.

The idea behind this simple sewage treatment plant is new and innovative. It is the result of researches into natural adsorbents for the removal of toxic metals from sewage and wastewater, and can be applied in rural villages.

4.3 Private Sector Management of Simplified Water Supply Systems

The operation and maintenance of water supply and sanitation systems (WSSS) in Mauritania are centrally managed with poor results. To address this problem, a programme was developed to devolve management of water supply and sanitation to the community and the private sector.

The initiative encourages local management of WSSS and promotion of cost recovery systems to ensure adequate operations and management in the short term, and total financial self-sufficiency in the medium and long term. Responsibilities in accordance with the reform include:

- Local population and associations: choosing the types of installations and ensuring follow-up and payment for services.
- Private operators: operating and maintaining the installations.
- Mayors: assuming ownership.
- Government: regulating the sector and providing up-front financing for the installations.

Along with the reform program, the following is planned: (i) greater training of maintenance personnel and local water management committees; (ii) better definition of the role of the state in the revision of the water code; (iii) support for the merger of water associations in order to take advantage of economies of scale.

The reforms are expected to yield the following positive outcomes: (i) reliable supply of drinking water in rural and semi-urban areas; (ii) greater local capacity to implement and manage WSSS; (iii) financial equilibrium in the sub-sector; (iv) gradual increase in sub-sector investments by the beneficiaries; (v) permanent employment created in the operation and maintenance of WSSS; and (vi) increase in the well-being of the population at the national level.

Innovations under this programme include: direct takeover of the management of WSSS by local communities; setting up the ANEPA, the financing method of operation and maintenance; and the new transparency of the system. The initiative covers the whole country and has been a success because the population has been willing to pay for the services.

4.4 Assessing Prepay Water Metering in Informal Settlements in Windhoek

Namibia faces great challenges to water resource management. The northern area of Windhoek is composed of informal settlements with both post-pay and prepay metering. The majority of the communities use the post-pay system, in which communal standpipes freely dispense water and one bill is calculated at the end of the month for the consumption of the entire community and divided equally among residents, regardless of individual water consumption. A large majority of residents do not pay their portion of the bill, leaving the rest of the community to pay extra.

The study focuses on investigating the advantages and disadvantages of both metering systems, based on user feedback and records provided by the city. The major stakeholders involved in this study were the City of Windhoek, the people in the informal settlements and the Desert Research Foundation of Namibia.

The result of the study indicated:

- The prepayment system was preferred by both the prepayment and the monthly payment communities.
- The households in the post-pay communities spend an average of 29% of their incomes on water, while households in prepay communities spend an average of 5%.
- Water expenditure per person per month in post-pay communities is twice as high as in prepay communities.
- 93% agreed that paying for water is necessary.
- The capital and maintenance costs associated with prepay meters are prohibitively high.

- The maintenance cost of a prepay meter is about three times that of an average meter in the City.
- The prepay meters need technological improvements to make them affordable to all communities.
- Since some people cannot afford to pay at all, the prepay system should include an appropriate subsidy system for these people.

The prepay metering scheme, if implemented with caution, will serve to provide affordable access of water in a manner that puts responsibility for water consumption in the hands of the individual users.

4.5 The Kzusabori Technology Transfer and Sustainable Community Water Development

Njukini (Kenya) is a semi-arid area of Maasai land, faced with a severe shortage of safe, reliable water. The project was carried out from January to September 2005, training community people with the Kzusabori technology to supply safe water and to improve their living and health conditions for self-reliance.

The Kzusabori System is a unique Japanese technology: it is the only one in the world that can drill deep wells (over 50m) by manual methods. The Kzusabori is categorized as a percussion method and is a precursor of the modern, machine-boring system. These hand-drilled wells are about 120mm in diameter. In areas where bamboo is available, it can be used for drilling and casing, following the original Japanese method. If bamboo is not available, PVC, iron or steel materials can be used. Some of the advantages of the technology are:

- It requires neither electricity nor oil.
- All equipment and materials are locally available.
- Wells are drilled by human power only.
- One set of the equipment costs about US\$ 2,000.00 and can be used over and over again.
- The simplified Kzusabori System is easily transferred to local people.

Three people received eight months' training to become trainers, and ten community people learned the technology and can drill wells by themselves, making safe, reliable water available to the community.

The stakeholders involved in the programme were: the local community; the African Medical and Research Foundation (AMREF); the Japan International Cooperation Agency (JICA); the Ministry of Gender Sports, Culture and Social Services; and the Ministry of Water Resource

Management and Development of the Republic of Kenya.

Kzusabori is a middle technology that is suitable for sustainable community development and can be adapted to any local circumstances. Training people in the Kzusabori System is ideal for sustainable water development in rural Africa.

4.6 Rural Water Supply and Sanitation Initiative (RWSSI)

In response to the Africa Water Vision and the MDGs, the African Development Bank Group conceived the Rural Water Supply and Sanitation Initiative (RWSSI) in 2002 to accelerate access to water supply and sanitation services in rural Africa. The initiative stipulates intermediate targets of 66% access by 2010 and 80% by 2015. It seeks to help mobilise and facilitate resource flows to accelerate RWSS investments in Africa. Assessments of country water sector situations have been carried out for 33 countries and an RWSS data base was then developed for these countries. Implementation has begun in five pilot countries and preparations are underway to commence RWSSI Programmes in 22 other countries by the end of 2007 at the latest.

RWSSI helps to elevate the priority accorded to sanitation and water supply in rural areas of Africa where the majority of the poor live. African governments are increasing budget allocations to these sectors. Donors have pledged increased support and have intensified cooperation with the African Development Bank on joint programmes. In particular, the World Bank has agreed to undertake joint monitoring and evaluation of the sector, as well as reviews of the progress towards achievement of the MDGs at the national and continental levels.

Distinctive features of the Initiative include its flexibility in implementation, based on adopting the best strategy for the situation including: swaps, partnerships and area-based interventions; its emphasis on capacity building in decentralized governing institutions, communities, private sector and local workers; its fast-tracking mechanisms for programme preparation, procurements and disbursements; and its overall programmatic approach.

4.7 Sanitation for a Rural Girls' School in Uganda

Kalungu is a village in the Masaka District of southern Uganda. Its Girls' Secondary School has about 350 students. Prior to the project, the school used 35 pit latrines and some flush toilets whose sewerage was disposed without treatment into soak pits, while grey

water was discharged into ditches outside the school grounds. This led to very unhygienic conditions with bad smells, flies and groundwater pollution. The water table was high and space for new pit latrines was limited.

The solution consisted of constructing 45 dry diverting pit latrines with urine collected in jerry cans and re-used as fertilizer. Solids were collected in locally-constructed wooden containers, dried in a covered composting area and later reused in a banana (matoke) plantation. Demonstration dry diverting toilets were constructed for staff. Wastewater was pre-treated in a septic tank with effluent led in a horizontal subsurface flow constructed wetland system.

The project was implemented by local entrepreneurs who gained knowledge of the technology and can use it for their own income generation. There has been significant improvement in the quality of groundwater and in general living conditions in and around the school premises, while pupils and teachers are proud of their achievement.

4.8 Pioneering the Use of Strategic Communication Approaches in Kenya's Water Sector Reform Process

Effective communication is an essential component of any important reform or advocacy process. WSP-Africa has been asked to help African water ministries and their water sector institutions to improve their currently poor communications capacity. Kenya has been the pioneer, with WSP-AF assisting the Ministry of Water and Irrigation with the production of a comprehensive, research-based, national reform communication strategy. Partners on this project were the World Bank and GTZ. It is the first professional strategy of its kind in the water sector in Africa, and can be used as a reference for other countries embarking on similar pioneering communication strategies.

The use of strategic communication in Kenya is still a new thing, so it is too soon to start gauging long-term impacts. However, a range of impacts are emerging already, including: increased knowledge of water reform issues among stakeholders; an increasingly customer-oriented approach among institutions; increased use of information dissemination and two-way communications (public participation) among institutions; improved coordination among different players in the sector for greater efficiency and effectiveness; and greater sharing of knowledge.

Some of the water utilities that use communication campaigns have seen great impacts. For example, the Nairobi Water & Sewerage Company's Bill Bila Bilaa campaign successfully corrected thousands of billing problems in a three-month period, significantly increasing its revenues and greatly improving its image.

4.9 Project to Rehabilitate 50 Simplified Water Supply Systems in the Maradi, Tahoua and Zinder Regions

Lessons from the Water Sector Project (PSE) in Niger show that a management model based on a partnership between water user associations and small-scale local private operators can keep the local communities in the driver's seat in terms of project objectives and implementation procedures.

The activity consisted of rehabilitating fifty simplified water supply systems (most of them with a small pipe network) in three regions of Niger and enhancing their management system. This project was initiated by the ministry in charge of water with the aim of ensuring the effectiveness and sustainability of clean water supply to rural centres in these regions. Another aim was to promote a management model based on delegating this function to private operators without excluding local community rights and responsibilities in water supply affairs. The project was implemented between July 2002 and July 2005.

The model demonstrates the supervisory role of the community in delegated management. The communities were responsible for selecting a technical solution to rehabilitate the system, and depositing the initial ten percent of the cost of the works cost into a bank account. They received training in water service management, participated in the selection of a management operator and supervised his work.

This shows that delegated management is a response to the deficiencies of direct community-based management, while avoiding the problems associated with outright divestiture. The key factor is for communities to receive adequate training from national or international experts. Other prerequisites are unambiguous contractual relationships between the operators and the community, and existence of a regulatory framework for the rural water supply sub-sector.

4.10 Evolution of Water and Sanitation in Disaster Mitigation

Cyclical droughts and floods are serious threats to life and livelihoods. UNICEF's experience in Ethiopia suggests that proactive strategies that combine emergency intervention with development initiatives are cost-effective in economic terms and in humanitarian terms.

The Water Environment and Sanitation emergency task force has responded to the threats by including accelerated development interventions in the emergency appeals, supporting capacity building, providing more versatile drilling equipment, and pre-positioning supplies and equipment in priority areas. Priority areas are those identified through a systematic assessment of impacts of the 2003 drought. Light-weight drilling equipment was deployed and hands-on capacity to undertake accelerated drilling was provided in regions where conventional rigs and private commercial drillers were unable or unwilling to venture.

The strategy has been facilitated by a change in stakeholders' attitude towards disaster preparedness: regional offices have prioritized drought-prone areas for development intervention; donors are giving attention to vulnerable groups and areas; and local governments and civil society in these areas are including development intervention plans to combat drought.

The action has significantly increased the population's resilience to the social and economic consequences of droughts and floods. Costs decrease as interventions are undertaken in a planned environment (rather than emergency responses) and as a result of economies of scale. This will reduce the proportion of emergency assistance in development assistance.

4.11 Local Action for Better Water Service Provision

In 2002, a new water policy was introduced by the Government of Tanzania, giving communities responsibility for the planning and management of their water schemes. Local government, meanwhile, will be responsible for regulation and facilitation, and the central government will provide the policy and legislative framework.

In the context of reform, small-scale private investment was on the rise, but there were no mechanisms or guidelines in place for regulating private sector involvement. For this reason WaterAid began working with local partner organizations, communities, private investors and district governments to understand the implications of small-scale privatization and to

contribute to the development of a regulatory framework through research.

In 2002, WaterAid initiated participatory video (PV) to facilitate this process. The idea of using video was to ensure poor people themselves are able to speak directly to decision-makers. The project was carried out in Mpwapwa district with ten villages, where most of the water schemes using pump and engine had failed, and where the problem turned out not to be technology but management, policy and regulatory issues.

The consultations revealed that in all six villages in Mpwapwa, lack of transparency and accountability were key concerns for the villagers. Financial reports were simply read aloud and no copies were being made available to the communities. In addition, there was no consultation regarding raising the price of water. Villagers also identified problems with the contracting and regulation of private investors.

As a result of the discussions following video shows in Mpwapwa, the village water committees agreed to make financial reports available to the villagers. The communities were also made aware of the process by which they could bring forward any concerns to the village government.

The films helped villagers and WaterAid to understand the shortcomings in the management of local water schemes. For the communities and private operators, they also clarified their rights, roles and responsibilities in the running of the water project. In addition, communities gained the confidence to analyse their own problems and find solutions, and to speak out when problems arise. By combining people's testimonies with evidence of their situation, the participatory videos are a powerful medium for communication. As well as helping communities clarify their rights, roles and responsibilities in relation to government and private contractors, they have increased their confidence to analyse their own problems and find their own solutions.

4.12 Kiambu Water and Environmental Sanitation – KIWESA Project in Nairobi

Kiambu slum is one of the many slums found within the perimeter of Nairobi City. Kiambu village does not enjoy basic infrastructure services and also lacks social institutions/structures. 95% of residents use stand-up toilets, most of which are located in unhygienic environments. More than 75% of residents lack toilets in their homes and most toilets are located on the bank of the river posing a high pollution risk.

The project aims at assisting the community to improve its dire water supply and sanitation situation. This intervention has been carried out in three phases:

Communities were mobilized and organized through clean-ups and clearing of garbage. This was followed by a Participatory Urban Appraisal (PUA) workshop in which the community identified lack/poor provision of toilets and water as their most pressing problem. The community formed Kiambiu Usafi Group to lead the activity. Assisted by Maji Na Ufanisi NGO, the community designed 24 sewer public toilet cubicles with water tank and kiosk, which they planned to run as a business. They negotiated with the Nairobi City Council for plots, and water and sewer licenses. They raised some funds from community contributions and negotiated for funding and technical support from Maji Na Ufanisi.

As of September 2005, three toilet blocks with showers, toilets, clothes washing facilities and water storage tanks have been installed in the Kiambiu slum and work is progressing on the others.

So far 20% of residents are able to access clean, affordable drinking water, toilet and bathroom services. Most of the poor quality toilets have been pulled down voluntarily by the community. Currently, the village has become very clean, with regular clean-ups organized by the Kiambiu Usafi Group members. As a result, the status of the Kiambiu community has been raised.

The project has also created many jobs for the slum community (water vendors, toilet cleaners and office administration staff) and is generating a lot of funds from the sale of water and the utilisation of toilet and shower facilities.

Groups from all over Kenya and neighbouring Tanzania, have been visiting Kiambiu Slum to learn about the water and sanitation interventions. The approach used in Kiambiu can be replicated elsewhere in the region.



5. Theme IV: Water Management for Food and the Environment

5.1 Integrated Watershed Management through Progressive Terracing Techniques

Soil erosion in runoff water from the areas of Nyangwe and Kagoma in Bukamba district (Rwanda) were causing Lake Burela and Lake Buhondo to fill with sediment. This had affected the capacity of hydropower plants, due to reduced reservoir capacities. The Nyangwe and Kagoma areas are located within the national park for endangered mountain gorillas.

In order to achieve soil erosion control and thereby reduce sedimentation in the lakes, an integrated watershed management was used. The techniques used include:

- Training of selected local people as technicians on matters concerning environmental and wild life conservation, eco-tourism management and agro-forestry;
- Sensitizing local authorities and the local population;
- Selecting different shrubs to be used as fodder for livestock or applied to soil as green manure, and trees that can be used as timber or fuel wood;
- Establishing a progressive terracing system;
- Implementing terracing activities.

Watershed management was successfully implemented by the community with the technical assistance described above. Implementation of the project has resulted in reduced soil erosion and additional fodder for cattle, and has promoted eco-tourism. Following successful completion of the project, donors have recommended the extension of the programme to cover the whole area surrounding the national park.

5.2 Nile Dialogue: Nile Basin Society

IWRM principles require the involvement of all stakeholders in all phases of water projects. In the past, NGOs were not involved in the planning, study, design or implementation of projects. In 2005, the Nile Basin Initiative (NBI) established a Confidence Building and Stakeholder Involvement program. As a result, the Nile Basin Society (NBS) has been transformed from a small discussion forum into a true participant in the Nile Basin Initiative.

Participation is managed through e-conferencing (<http://dgroups.org/groups/Nile-Dialogue/>). In the beginning, the Overseas Development Institution of the UK played the role of facilitator, while NBS acted as technical

administrator; later, NBS played both roles. Participating NGOs are selected by local NGOs according to their experience in water issues and their capacity to represent collective NGO opinion. Through the e-conference, participants will be provided with relevant documents and are expected to enrich the documents by providing comments and alternative ideas, and by conveying the concerns of the local population affected by the projects.

The e-conference provides a technique for maximizing the participation of NGOs at an affordable cost, leading to sound projects that address the needs of the people.

5.3 Community Participation as a Tool for Gender Conflict Management and Peace-Building

Community participation techniques were engaged to resolve a conflict between men keeping livestock and women growing rice in the Budaka wetlands (Pallisa District) in Uganda.

Uncontrolled grazing by livestock had led to a number of environmental and social problems, including loss of vegetation on communal pastures and rice fields, and contamination of drinking water. This gave rise to growing tension between rice growers (women) and livestock keepers (mostly men).

The following community participation techniques were used to address the issue:

- Undertaking stakeholder analysis to identify the community, knowledge base and ring leaders, and to take stock of the existing social problems;
- Undertaking environmental analysis and developing a land use map with the community;
- Sensitizing the communities to appreciate the problems encountered by rice plantations and livestock keepers;
- With the community, developing complementary activities such as limiting the length of grazing time, using crop residue for livestock feeding, providing compensation for lost vegetation through a community reforestation program, reducing agrochemical use, and developing water sources.

Through this participatory process, it became possible to ensure equitable access to environmental resources and to create a safe and harmonious community that had been on the brink of fighting.

5.4 River to River Project

By applying an integrated community participation approach that includes environmental and health education and the introduction of innovative technologies, and by capitalizing on existing culture, the negative impact of water hyacinths were changed into beneficial effects.

The project was developed to solve the problem of water hyacinths and other invasive species which have invaded the Niger River in Niger and Mali. These plants have severely impacted human activities by invading rice paddies and blocking water filtration plants and pumping stations. They also host snails and mosquito larvae, which spread schistosomiasis and malaria, respectively. The hyacinth tufts also provide shelter for potentially harmful species such as snakes and leeches.

Through the project, the communities were able to use the water hyacinths as compost to enrich sandy soil with organic matter, as a filter media for water treatment, as a major input for manufacturing handicraft products, and as fuel after compacting them into briquettes.

Consequently, the plant was controlled, women doubled their production because of enriched sandy soil, purified water became available, fewer trees were being cut as briquettes were made available, and women's income rose with increased sale of handicrafts made of water hyacinths.

5.5 Umm Bronga Water Harvesting and Spreading Dam

By constructing a multipurpose dam for spate irrigation and for inducing subsurface water storage for domestic water supply, it was possible to reduce food insecurity in the Umm Bronga village in the North Darfur State of Western Sudan. The North Darfur in Sudan has experienced erratic rainfall and a series of droughts, resulting in great loss of livestock, crop production, natural vegetation cover and wild life, leading in turn to food insecurity.

The community and the local government were involved in the planning, construction, maintenance and monitoring of the dam. Local elders provided information that helped locate the site for the dam on the basis of the communities' experience of flooding and the water courses of the wadi. The dam is 2.3 km long and has a spillway with gates. Construction of the dam has made it possible to impound runoff water for irrigation, and the impounded water has recharged the groundwater.

The effects of the project were:

- The dam allowed farmers to grow larger quantities of staple foods and cash crops, including sorghum and snuff tobacco.
- The farmers used to migrate during the off-season to urban areas to work as casual workers or petty traders. After the dam was built, none of them left the area.
- Fodder from wild grasses and agro-waste were made available for livestock.
- The water stored by the dam has enhanced the subsurface aquifer, resulting in natural regeneration of deep-rooted tree shrubs. Also, the crops grown in winter have helped stabilise the soil against wind erosion. The burden of cultivation on goz soils has also been reduced.
- It became possible for Umm Bronga people and people from other villages to collect subsurface aquifer water from shallow wells.
- The Umm Bronga school remained open throughout the year.
- Farmers are able to pay for health and education.
- The Umm Bronga system has been incorporated into the school curriculum.

5.6 Integrated Water Resources Management: Koga Irrigation Project

This project will address the poverty and food insecurity problems of communities in the area, whose livelihoods are at risk due to frequent drought and food shortage caused by moisture stress on their rain-fed farming. A holistic approach is being used to achieve the project's objectives, which cover:

- Irrigation infrastructure development.
- Agricultural extension, crop development and livestock development.
- Soil conservation, forestry development and environmental protection.
- Health (HIV/AIDS, Malaria, schistosomiasis), water and sanitation
- Capacity-building Component (gender mainstreaming, microfinance, etc)

The federal, regional and local administration, as well as the local community are involved in project implementation. A training centre for the community will also be established at the project site to ensure the sustainability of the project.

5.7 The Gory Experience

The objective of this exercise is to train children at school about water protection, while building a fresh water network in the village. The activity was undertaken by twinning schools in Mali and in Paris. The teachers of the two schools corresponded and organized the twinning arrangement. The teacher of the Malian school in Gory and the teachers at Balanchine school in Paris prepared teaching material adapted to the local situation. A one-week intensive water class was conducted simultaneously in the two schools, while the water supply system for the Gory community was being put in place.

The Malian Ministry of Education, the National Hydraulics Office (Agence de l'Eau Seine Normandie) in France and Eau de Paris also participated in the implementation of the project. The process has resulted in:

- involving the children in the design of water projects, preparing them for future responsibilities as adults;
- using the school as an instrument for dialogue within the families;
- building concepts and tools to train trainers themselves;
- creating awareness among children of the importance of water supply and hygiene.

The Malian Government also created an intergovernmental committee to include water education in the education system.

5.8 Treated Sewage Water Irrigation Project in Tunisia

Tunisia receives average annual rainfall of less than 300mm. To cope with this problem, the Tunisian Government has established a long-term water development plan to maximize the quantity of usable water. The government encourages the utilisation of treated sewage water to irrigate the perimeters of fruit trees and fodder crops. In 1997 in Tunisia, about six thousand hectares of perimeters were irrigated by treated sewage water and the government is now aiming to expand this to 9,200 ha in 2006.

In this context, a Treated Sewage Water Irrigation Project was implemented with an ODA loan from Japan. Through the project, 1,124 ha of land was irrigated, using over one million cubic meters of treated sewage water. This is expected to contribute to the improvement of agricultural products (mainly olives and fruits) and to make it possible to introduce cattle-raising. The project

will thus contribute to food security in the country and to higher income for farmers.

In the framework of this project, a study was carried out to recharge underground water with treated sewage water in the area of Jerba-Aghir. This increased the opportunity to solve the problem of lowering underground water tables due to over-exploitation.

Before starting the project, local government officials visit farmers and encourage them to form a farmers' association. These associations are then registered under the local administration system and receive technical and sometimes even financial assistance from the government. When the project is completed, the constructed irrigation system is transferred to the associations for operation and maintenance.

6. Theme V – Risk Management

6.1 Risk Management in the Lullemeden Aquifer

The Lullemeden is a transboundary groundwater multi-aquifer basin shared by Mali, Niger, Nigeria and Algeria. The aquifer is confronted with great uncertainty in terms of policy and science. It had to be developed based on joint risk management under a common consultative mechanism. Countries identify and formulate a common perspective, address the environmental risk and share the resulting socio-economic costs. This common approach promotes joint cooperation and minimizes conflict.

International organizations such as the Global Environmental Facility (GEF), UNESCO/IHP, FAO and ESA collaborate with the environment and water ministries of the riparian states to establish consultative mechanisms, and a legal and socio-economic cooperative framework. Sustainability is anchored in consensus- and commitment-building, and Transboundary Diagnostic Analysis and Strategic Action Programming (TDA/SAP).

6.2 Contribution to Flood Monitoring and Adaptation Strategies in Zimbabwe

In view of the consequences of floods, especially on the vulnerable populations in Zimbabwe, three government departments (the Civil Protection Unit, Meteorological Department and Zimbabwe Nation Water Authority – ZINWA) teamed up in partnership with UICN to implement a project aimed at developing adaptation strategies to floods. The project is being implemented in the Beitbridge District in the Limpopo Basin (shared with Botswana, South Africa and Mozambique).

The goal of the project is to contribute to the improvement of livelihoods of communities in flood-prone areas in Zimbabwe by reducing the impact of floods on human livelihoods and mitigating loss to infrastructure and property. Specific activities include review and improvement of evacuation procedures and engineering standards to adapt to expected flood eventualities.

Surveys undertaken in the project have revealed unfavourable trends in the periodicity of cyclones, decreasing rainfall, increasing temperatures and declining livelihoods as a result of flooding of irrigation infrastructure and other effects on the population attracted to flood zones by the schemes. Weaknesses were revealed in communicating early warnings, especially before Cyclone Eline. The project has mapped flood-prone and safe areas at different recurrence intervals and has set building standards for houses and domestic assets (such as granaries). River crossings have been targeted for improvement to reduce the impact of floods.

In total, the project is expected to improve the quality of lives of local people and leave them less vulnerable to floods and flood damage. It also addresses the phenomenon of climate change.

6.3 Kenya Sand Dams

During the last ten years, a local NGO called 'SASOL' has implemented a methodology to mitigate extreme droughts by developing 'sand dams' in the Kitui District of Kenya. The dams cost about US\$ 5,000 and are built through community inputs. Labour costs are provided by the farmers who will use and maintain the dams. The dams allow water to be stored in an artificial sand aquifer created behind the dam. In this way, water loss due to evaporation is reduced to a minimum. In ten years, SASOL has developed 435 dams. About 60-65,000 people have already been provided access to water with an investment of US\$ 34.8 per capita. The average walking distance to water has been reduced dramatically, increasing economic growth in the region.

The project has proved that with limited resources and community inputs, droughts can be mitigated without large infrastructure investments. Local knowledge and cooperation is the key to the success of the sand dams. A thorough participatory process is therefore inherently linked to the development of such dams.

There are two issues that need to be addressed to scale up the project methods in other regions:

- The sand dam methodology has not been assessed in terms of its vulnerability to long-term effects such as climate change.
- Institutional knowledge must be developed to scale up the methodology to other regions; for example, how farmers should be organized to maintain the dams and how national governments can facilitate this process.

6.4 Flood Forecasting System for Integrated Natural Resources Management in the Niger Inner Delta in Mali

The inner delta of the Niger river in Mali is an important ecosystem with many livelihood activities. The variations in water resources resulting from the flooding of the Niger and the Bani rivers leads to resource-sharing issues.

As part of the AGRHYMET climate change project, a pilot project for integrated management of the delta's resources initiated in 2004. Through a participatory procedure this project identified the main needs for use of the resources in different flood conditions. Also, a flood forecasting system has been created and is being implemented.

This system is expected to: improve the sharing of information among users; create a framework for consensus-building among stakeholders and technicians involved in the management of the delta; improve the management of irrigation activities, including optimized seasonal irrigation; and improve planning of fisheries, based on prior knowledge of flood levels.

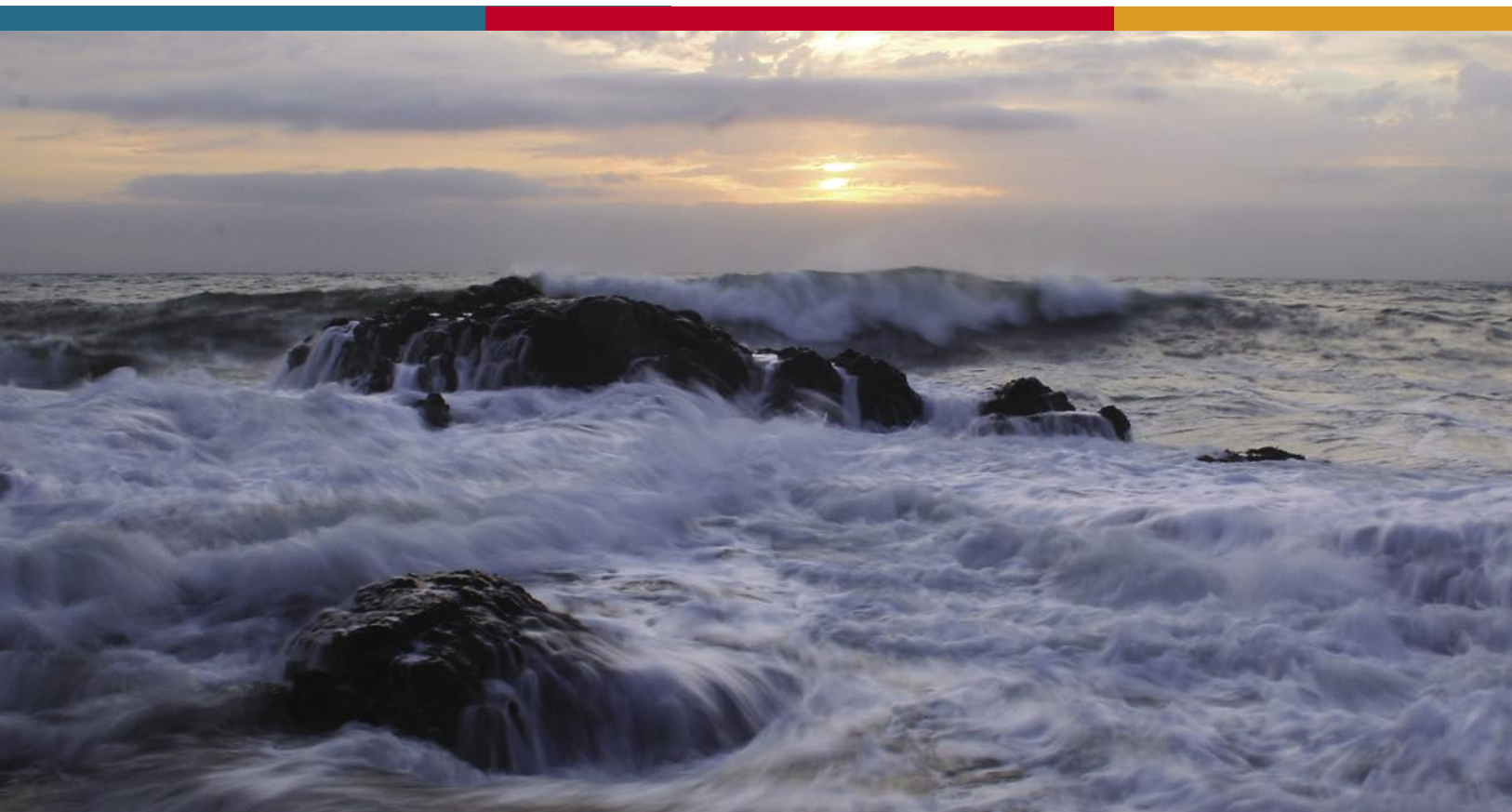
6.5 Protection against Flooding in Great Tunis

The City of Tunis, with a population of more than 2.7 million, is flooded by large runoff flows from upper parts of catchment basins. These upper areas are steep, while the lower areas are almost flat, letting water accumulate in the city's streets and salt lakes. Rapid urbanization increases the surface area impervious to water and shortens the time it takes for water to concentrate, increasing peak flows.

The project is aimed at solving the problems of recent flooding, which resulted in loss of lives and property when water levels rose up to four meters above street levels in parts of the city.

Following the floods in September 2003, flooding problems have been studied and the 18 major basins have been analysed, using storm drainage management models and GIS software. An economic study of financial and social impacts has been carried out and linked to field observations.

The resulting project will benefit all residents of Tunis, by protecting houses in a 4,000-hectare area, as well as shopping and industrial areas, the emphasis being on saving of human lives. This method can be adapted to other flood-ridden areas.



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