Regional Process Commission

Region: Africa

Coordinator: African Ministers’ Council on Water (AMCOW)

Pre-forum version
March 2018
Rising to the Challenge

AFRICA REGIONAL SYNTHESIS REPORT

For the Eighth World Water Forum

Prepared for:
The AMCOW Secretariat
Abuja, Nigeria

February 8, 2018
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAP</td>
<td>Africa Adaptation Programme</td>
</tr>
<tr>
<td>ACMAD</td>
<td>African Centre of Meteorological Application for Development</td>
</tr>
<tr>
<td>ACPC</td>
<td>African Climate Policy Centre</td>
</tr>
<tr>
<td>AFD</td>
<td>Agence Francaise de Développement</td>
</tr>
<tr>
<td>AfDB</td>
<td>African Development Bank</td>
</tr>
<tr>
<td>AGRHYMET</td>
<td>Regional Centre for Agriculture, Hydrology and Meteorology</td>
</tr>
<tr>
<td>AMCEN</td>
<td>African Ministerial Conference on the Environment</td>
</tr>
<tr>
<td>AMCW</td>
<td>African Ministers' Council on Water</td>
</tr>
<tr>
<td>AU</td>
<td>African Union</td>
</tr>
<tr>
<td>AUC</td>
<td>African Union Commission</td>
</tr>
<tr>
<td>AU-DREA</td>
<td>African Union Department of Rural Economy and Agriculture</td>
</tr>
<tr>
<td>AWF</td>
<td>African Water Facility</td>
</tr>
<tr>
<td>BCM</td>
<td>Billion cubic metres</td>
</tr>
<tr>
<td>ca</td>
<td>Capita</td>
</tr>
<tr>
<td>CBD</td>
<td>Convention for Biodiversity Conservation</td>
</tr>
<tr>
<td>CIA</td>
<td>Central Intelligence Agency</td>
</tr>
<tr>
<td>CICOS</td>
<td>International Commission for the Congo-Oubangui-Sangha Basin</td>
</tr>
<tr>
<td>CIDA</td>
<td>Canadian International Development Agency</td>
</tr>
<tr>
<td>CIRDA</td>
<td>Climate Information for Resilient Development in Africa</td>
</tr>
<tr>
<td>CRIDF</td>
<td>Climate Resilient Infrastructure Development Facility</td>
</tr>
<tr>
<td>CSO</td>
<td>Civil Society Organisation</td>
</tr>
<tr>
<td>EAC</td>
<td>East African Community</td>
</tr>
<tr>
<td>EbA</td>
<td>Ecosystem based adaptation</td>
</tr>
<tr>
<td>ECCAS</td>
<td>Economic Community of Central African States</td>
</tr>
<tr>
<td>ECOMAS</td>
<td>Economic Community of West African States</td>
</tr>
<tr>
<td>EFA</td>
<td>Environmental Flow Assessment</td>
</tr>
<tr>
<td>FAO</td>
<td>United Nations Food and Agriculture Organisation</td>
</tr>
<tr>
<td>FEWS NET</td>
<td>Famine Early Warning Systems Network</td>
</tr>
<tr>
<td>GAFSP</td>
<td>Global Agriculture and Food Security Program</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>GIZ</td>
<td>Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH</td>
</tr>
<tr>
<td>GW</td>
<td>Gigawatt</td>
</tr>
<tr>
<td>GWP</td>
<td>Global Water Partnership</td>
</tr>
<tr>
<td>GWSP</td>
<td>Global Water Security and Sanitation Partnership</td>
</tr>
<tr>
<td>ha</td>
<td>Hectare</td>
</tr>
<tr>
<td>HYCOS</td>
<td>Hydrological Cycle Observing System</td>
</tr>
<tr>
<td>ICA</td>
<td>Infrastructure Consortium for Africa</td>
</tr>
<tr>
<td>IPCAC</td>
<td>IGAD Climate Prediction and Applications Centre</td>
</tr>
<tr>
<td>ICT</td>
<td>Information and Communication Technology</td>
</tr>
<tr>
<td>IDA</td>
<td>International Development Association</td>
</tr>
<tr>
<td>IEA</td>
<td>International Energy Agency</td>
</tr>
<tr>
<td>IGAD</td>
<td>Inter-Governmental Authority on Development</td>
</tr>
<tr>
<td>IGRAC</td>
<td>International Groundwater Resources Assessment Centre</td>
</tr>
<tr>
<td>IHA</td>
<td>International Hydropower Association</td>
</tr>
<tr>
<td>IMF</td>
<td>International Monetary Fund</td>
</tr>
<tr>
<td>IPPF</td>
<td>Infrastructure Project Preparation Facility</td>
</tr>
<tr>
<td>IUCN</td>
<td>International Union for Conservation of Nature</td>
</tr>
<tr>
<td>IUWM</td>
<td>Integrated Urban Water Management</td>
</tr>
<tr>
<td>IWRM</td>
<td>Integrated Water Resources Management</td>
</tr>
<tr>
<td>KWh</td>
<td>Kilowatt hours</td>
</tr>
<tr>
<td>LVBC</td>
<td>Lake Victoria Basin Commission</td>
</tr>
<tr>
<td>M&amp;E</td>
<td>Monitoring and Evaluation</td>
</tr>
<tr>
<td>MCM</td>
<td>Million cubic metres</td>
</tr>
<tr>
<td>MDG</td>
<td>Millennium Development Goal</td>
</tr>
<tr>
<td>MW</td>
<td>Megawatt</td>
</tr>
<tr>
<td>NA PA</td>
<td>National Adaptation Programme of Action</td>
</tr>
<tr>
<td>NBI</td>
<td>Nile Basin Initiative</td>
</tr>
<tr>
<td>NCA</td>
<td>Natural Capital Accounting</td>
</tr>
<tr>
<td>NDC</td>
<td>Nationally Determined Contributions</td>
</tr>
<tr>
<td>NEPAD</td>
<td>New Partnership for Africa's Development</td>
</tr>
<tr>
<td>NGO</td>
<td>Non-Governmental Organisation</td>
</tr>
<tr>
<td>ODA</td>
<td>Official Development Assistance</td>
</tr>
<tr>
<td>OECD</td>
<td>Organisation for Economic Co-operation and Development</td>
</tr>
<tr>
<td>OMVS</td>
<td>Organisation pour la Mise en Valeur du Fleuve Senegal (Senegal River Development Organization)</td>
</tr>
<tr>
<td>ORASECOM</td>
<td>Orange-Senqu River Basin Commission</td>
</tr>
<tr>
<td>PES</td>
<td>Payment for Ecosystem Services</td>
</tr>
<tr>
<td>PIDA</td>
<td>Programme for Infrastructure Development in Africa</td>
</tr>
<tr>
<td>PPP</td>
<td>Public-Private-Partnership</td>
</tr>
<tr>
<td>PPP</td>
<td>Purchasing Power Parity</td>
</tr>
<tr>
<td>PUWSD</td>
<td>Programme for Urban Water Security and Sustainable Development in Africa</td>
</tr>
<tr>
<td>RBO</td>
<td>River Basin Organisation</td>
</tr>
<tr>
<td>REC</td>
<td>Regional Economic Community</td>
</tr>
<tr>
<td>RIDMP</td>
<td>Regional Infrastructure Development Master Plan</td>
</tr>
<tr>
<td>SA DC</td>
<td>Southern Africa Development Community</td>
</tr>
<tr>
<td>SDG</td>
<td>Sustainable Development Goal</td>
</tr>
<tr>
<td>STAS</td>
<td>Stampriet Transboundary Aquifer System</td>
</tr>
<tr>
<td>SUWA S</td>
<td>Sustainable Water And Sanitation In Africa Program</td>
</tr>
<tr>
<td>TWh</td>
<td>Terawatt hours</td>
</tr>
<tr>
<td>UN</td>
<td>United Nations</td>
</tr>
<tr>
<td>UN-DESA</td>
<td>United Nations Department of Economic and Social Affairs</td>
</tr>
<tr>
<td>UNDP</td>
<td>United Nations Development Programme</td>
</tr>
<tr>
<td>UNECA</td>
<td>United Nations Economic Commission for Africa</td>
</tr>
<tr>
<td>Acronym</td>
<td>Full Name</td>
</tr>
<tr>
<td>----------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>UNEP</td>
<td>United Nations Environment Programme</td>
</tr>
<tr>
<td>UNFCCC</td>
<td>United Nations Framework Convention on Climate Change</td>
</tr>
<tr>
<td>UNICEF</td>
<td>The United Nations Children's Fund</td>
</tr>
<tr>
<td>UNIDO</td>
<td>United Nations Industrial Development Organization</td>
</tr>
<tr>
<td>UN-OHRLLS</td>
<td>United Nations Office of the High Representative for the Least Developed Countries</td>
</tr>
<tr>
<td>UWA SNET</td>
<td>Uganda Water and Sanitation NGO Network</td>
</tr>
<tr>
<td>WACDEP</td>
<td>Water Climate And Development Programme</td>
</tr>
<tr>
<td>WASH</td>
<td>Water, Sanitation and Hygiene</td>
</tr>
<tr>
<td>WEF</td>
<td>Water-energy-food</td>
</tr>
<tr>
<td>WFP</td>
<td>United Nations World Food Programme</td>
</tr>
<tr>
<td>WHO</td>
<td>United Nations World Health Organisation</td>
</tr>
<tr>
<td>WMO</td>
<td>World Meteorological Organization</td>
</tr>
<tr>
<td>WSP</td>
<td>Water and Sanitation Program</td>
</tr>
<tr>
<td>yr</td>
<td>year</td>
</tr>
</tbody>
</table>
Executive Summary

The Eighth World Water Forum is due to take place from 19th to 23rd March 2018 in the city of Brasilia, Brazil. This report presents the key issues with respect to the Forum themes that Sub-Saharan Africa will table for discussion at the Forum, and that will guide the formulation of follow-up actions for the post-forum period.

The World Water Council has selected the African Ministers’ Conference on Water (AMCOW) to coordinate Africa’s regional process for the Eighth World Water Forum. AMCOW is being supported in the coordination role by the African Development Bank (AFDB) and Global Water Partnership (GWP-Africa). The preparation of the Africa Regional Report has involved wide consultations within the four sub-regions of Sub-Saharan Africa (Eastern, Southern, Central and West Africa) in a process managed by the GWP Sub-regional offices in Africa, and supported by sub-regional consultants. A call for case studies to support the report preparation received positive response and over 15 case studies were submitted by actors in the water sector in Africa. These case studies have been incorporated in the report.

The African continent is well endowed with water resources but faces many issues including the uneven distribution of water resources in space and time; widespread watershed degradation; water pollution; increasing impacts of water disasters arising from climate change and variability; very low development of water resources infrastructure, low levels of access to safe water and safely managed sanitation, weak institutional capacity.

With the above issues in mind, Sub-Saharan Africa has selected the following topics to be the focus of Africa’s discussions at the Eighth World Water Forum:

1. **Climate theme**: water security and climate resilience for Africa’s sustainable development.
2. **People theme**: sustainable and climate resilient WASH services in Africa.
3. **Development theme**: Water-Energy-Food security (WEF) nexus in Africa.
5. **Ecosystems theme**: ecosystem based adaptation at transboundary ecological and hydrological systems in Africa.
6. **Finance theme**: enhancing Africa’s capacity for financing water security in Africa.

The key messages of the Africa Regional Report with respect to the above themes are the following:

**Climate**: Africa is highly vulnerable to impacts of global climate change, and is experiencing an increase in extreme climate and hydrological events (floods and droughts) and sea level rise. Water is among the sectors most affected by climate change. There is great urgency for Africa to adapt to the impacts of climate change given the social, economic and environmental damage it is already causing. While there are a number of ongoing efforts to adapt on the continent by the governments supported by development partners,
Africa generally lags behind on climate change adaptation, and has a huge and widening adaptation gap estimated to be in the range of US$6-14 billion per year.

**People:** It is estimated that 422 million Africans still have no access to safely managed drinking water services; 660 million have no access to safely managed sanitation services; and 173 million practice open defecation. During 1990-2015, great progress was made by African countries in increased access to water and sanitation. While individual countries attained the MDG targets, Africa as a whole did not meet the MDG targets for water supply and sanitation. Access levels in rural areas continue to lag behind those in urban areas, and performance of sanitation and hygiene is far poorer than water supply. Multiple challenges are responsible for the poor performance of the sector, key among which is the inadequacy of financing for water and sanitation investments and facility O&M.

**Development:** The Water-Energy-Food nexus is an approach that could help Africa address the multiple and interrelated challenges of ensuring water security, energy security and food security while safeguarding the sustainability and productivity of land and water resources. A further dimension that needs to be considered in the nexus, based on Africa’s experience, is ecosystem health. The WEF nexus has received serious consideration in Southern Africa, where several regional multi-stakeholder dialogues events have been held to introduce this concept. There are ongoing efforts to develop practical ways of incorporating the nexus in water resources development planning and infrastructure project preparation. On the continent, there are projects that have pioneered the approach in an effort to increase efficiency in resource use. Africa has considerable experience with developing multi-purpose infrastructure projects and will tap into this experience in up-taking the nexus approach.

**Urban:** Although Sub-Saharan Africa is the second least urbanized region in the world (after South Asia) it has the highest rate of urban population growth in the world. Rapid urbanisation is piling pressure on water resources, the capacity of the water supply system to deliver water in quantity and quality to all, and the capacity to manage increasing volumes of waste waste and solid waste. Traditional approaches of urban water and sanitation development are unable to cope with the challenges that the growing cities of Africa are presenting. Efforts to increase access to improved water and sanitation services in urban areas have not been enough to cope with the pace of population growth. Most of the population expansion is occurring in peri-urban slum neighbourhoods where access to services is very poor. In a number of African countries, the Integrated urban Water Management Concept has been introduced and used to prepare integrated masterplans and investment project proposals for urban water and sanitation development. There is great promise in this approach in solving the challenge of Africa’s cities.

**Ecosystems:** Africa has five major kinds of ecosystems: coastal environments; deserts and semi-deserts; mountain environments; savanna grasslands; and forests. Under each of these main ecosystem types are many subtypes. Africa is richly endowed with a highly diverse fauna and flora. Africa’s ecosystems are home to more than 50,000 known plant species, 1,000 mammal species, and 1,500 bird species. Africa’s ecosystems provide a wide range of goods and services, the exploitation of which supports livelihoods for millions of people in the continent. But the ecosystems are under mounting pressure, and their biodiversity is on a fast decline from a diversity of drivers including rapid growth in population, rapid urbanisation, growth in consumption worldwide, increase in investment, improving global macroeconomic conditions, climate change, and disasters and epidemics. Wealth Accounting and Ecosystem Valuation, Ecosystem Based Adaptation (Eba)/use of green infrastructure, Payment for Ecosystem Services (PES) and environmental flows (e-flows) are some of the tools available to environmental managers to deal with the decline of ecosystems while sustaining livelihoods and enhancing resilience to climate change. All of these approaches have been applied in several places on the continent but have mostly been introduced at pilot scale. The largest factor holding back upscaling of these approaches is the limited technical capacity on the continent, and on the whole, there remains little awareness about these approaches amongst sector stakeholders.

**Financing:** Financing of water and sanitation, or specifically, the lack of it, has been a perennial problem for the sector. In 2016, total financing for water and sanitation infrastructure in Sub-Saharan Africa amounted to US$ 7.881 billion. A considerable proportion of this financing (about 42%) was provided by the African governments and a similar proportion (44%) was provided by members of the Infrastructure Consortium for Africa (ICA). An initiative spearheaded by the President of Rwanda – the Kigali Action Plan – surpassed its target of raising €50 million in the first year for investment in water and sanitation in 10 countries. While
these efforts are laudable, they fall far below the level of investment needed to meet the water supply, sanitation, and hygiene SDGs (targets 6.1 and 6.2). The capital investment requirement to meet the SDGs is 3.8 times the total financial commitment to the sector in 2016, even before considering operation and maintenance needs, which are also significant. The review by AMCOW of countries performance with respect to the Sham El-Sheikh commitments showed that three quarters of the countries in Sub-Saharan Africa failed to meet their target of allocating 0.5% of their GDP to sanitation and hygiene, and 5% of the national budget to water and sanitation. This situation increases the urgency to find new and innovative ways of financing water and sanitation if the 2030 targets are to be met. On the continent there are a number of initiatives in country’s such as Kenya to tap into private sector financing for water and sanitation investment. Policy and regulatory frameworks reforms are need to allow capital markets to emerge and operate, and to reduce risks to investors.

The Africa Regional Session in Brasilia will analyse and present the issues elaborated above, and propose additional actions for Africa to address the challenges. The key messages and recommendations will be followed up and implemented through the Africa Water Investment Programme (AIP).

During a high level session in Brasilia, Africa in collaboration with the UN/World Bank High Level Panel on Water (HLPW) will launch and unveil a new initiative – the Africa Water Investment Program (AIP) on Water Infrastructure, Job Creation and SDGs implementation. AIP will support implementation of the key issues identified in the Africa Regional Consultation for the 8th Forum and support implementation of the recommendations of the HLPW. AIP will promote job creation through investments in water security, industrialization, climate resilient development and SDG 6 while working towards attainment of universal access to safe water and safely managed sanitation. AIP is expected to mobilise at least US$100 million by 2020, US$500 million by 2030 and leverage investments in the range of US$30 billion towards large water infrastructure financing gap for Africa.
5. ECOSYSTEMS ....................................................................................................................... 73

6.1 The relevance and current situation in Africa with respect to the ‘Ecosystems’ theme ............... 73
  6.1.1 Issues related to the theme ................................................................. 73
  6.1.2 African ecosystems .............................................................................. 74
  6.1.3 Decline in Sub-Saharan Africa’s ecosystems .......................................... 74
  6.1.4 Factors driving the decline of Sub-Saharan Africa’s ecosystems .......... 74
  6.1.5 Preventing ecosystem decline ............................................................. 74
  6.1.6 Biodiversity hotspots in Africa ............................................................ 75

6.2 Past and ongoing initiatives and their achievements .......................................................... 75
  6.2.1 Ecosystem Based Adaptation (EbA) to Climate Change ......................... 75
  6.2.2 Payment for ecosystem services (PES) ................................................. 78
  6.2.3 Wealth accounting and ecosystem valuation ....................................... 80
  6.2.3 Environmental Flow s ................................................................. 82

6.3 Gaps, challenges and opportunities ............................................................................... 84
  6.3.1 Challenges related to EbA approaches ................................................. 84
  6.3.2 Potential strategies for addressing PES challenges .............................. 84
  6.3.3 Challenges related to payment for Ecosystem Services (PES) ............... 84
  6.3.4 Potential strategies for addressing PES challenges .............................. 85
  6.3.5 Challenges related to wealth accounting and ecosystem valuation ........... 85
  6.3.6 Potential strategies for addressing wealth accounting and ecosystem valuation challenges .............................................................................. 85
  6.3.7 Challenges related to Environmental Flow Assessments ..................... 85
  6.3.8 Potential strategies for addressing Environmental Flow Assessments challenges .............................................................................. 86

6.4 Key lessons and good practices from Africa to the world ................................................. 86
  6.4.1 Lessons from EbA approaches .............................................................. 86
  6.4.2 Lessons from implementation of PES Projects in Sub-Saharan Africa .... 86
  6.4.3 Lessons from wealth accounting and ecosystem valuation in Sub-Saharan Africa .............................................................................. 87
  6.4.4 Lessons from Environmental Flow Assessments in Sub-Saharan Africa ......................................................................................... 87

7. FINANCE ............................................................................................................................ 89

7.1 The relevance and current situation in Africa with respect to the ‘Finance’ theme .................. 89
  7.1.1 Importance of financing for Sub-Saharan Africa ..................................... 89
  7.1.2 Water and sanitation financing in the region .......................................... 89

7.2 Past and ongoing initiatives and their achievements ......................................................... 92
  7.2.1 Policy directives and declarations ....................................................... 92
  7.2.2 Progress on policy directives and commitments .................................. 93
  7.2.3 Bridging the financing gap ................................................................. 94

7.3 Gaps, challenges and opportunities ............................................................................... 96
  7.3.1 Challenges ................................................................. 99
  7.3.2 Opportunities ................................................................. 99

7.4 Key lessons and good practices from Africa to the world ................................................. 99
  7.4.1 Lessons ................................................................. 99

8. THE WAY FORWARD: AFRICA INVESTMENT PROGRAM .............................................. 101
  8.1 Investments in water resources urgently needed ............................................. 101
  8.2 Strengthen leadership, business case for water investments, institutions, knowledge and information ................................................................. 101
  8.3 Address bottlenecks of project preparation .................................................... 101
  8.4 Address bottlenecks of project preparation .................................................... 101
  8.5 Ensure empowerment of youth and women, gender equality and social inclusion ................................................................. 102
  8.6 Africa Water Investment Programme ............................................................ 102
9. REFERENCES ................................................................................................................................. 104

10. PEOPLE CONSULTED ............................................................................................................ 111
1. INTRODUCTION

1.1 Geographic and water resources setting of Africa

Africa, which has a land area of 30.2 million km² (adjacent islands inclusive) is the world’s second-largest continent. Its landmass straddles the equator, with large portions lying within the tropics, making it a hot region. Two thirds (66%) of its surface area is covered by arid and semi-arid lands, including the Sahara – the world’s largest non-polar desert. Only 26.9% of the continent’s surface area is viable arable land.

Rainfall on the continent is characterised by high spatial and temporal variability and low runoff coefficient. Annual rainfall on the continent ranges from below 100 mm in the Sahara, Horn of Africa, and Kalahari, to over 3000 mm in Madagascar, Cameroon, Liberia and Sierra Leone. Runoff at continental level is estimated to be 20% of total rainfall, indicating high evapotranspiration losses due to Africa’s hot climate (UN-Water/Africa, 2006).

Africa has many big rivers, lakes, wetlands and considerable groundwater resources. Eighty out of the world’s two hundred major transboundary river and lake basins are located in Africa, including major transboundary watercourses shared by two or more countries. The major river systems include the Nile, Congo, Volta, Niger, Senegal, Gambia, Orange-Senqu, Okavango, Limpopo, Ruvuma, Rufiji and Juba-Shabelle (Africa Water Atlas, 2010). Africa also has many groundwater aquifers, 83 of which are transboundary (IGRAC, 2014). The major aquifers include the Nubian Sandstone Aquifer System, Northwestern Sahara Aquifer System, Lake Chad Basin, Senegalo-Mauritanian Basin, Ihazar-Illuemeden Basin, Taoudeni Basin, l’Air Crystalline Aquifer, Karoo-Carbonate Aquifer (Congo Basin), Cuvette Aquifer (part of Congo Basin), Curvelai and Ethosa Basin, Northern Kalahari Basin and Karoo Sedimentary Aquifer.

Consumptive water use in Africa is dominated by three sectors, namely domestic water supply (21.6% of withdrawals), agriculture (73.3% of withdrawals) and industry (5.1% of withdrawals). Annual water withdrawals are about 3.7% of total annual renewable water resources, estimated at 5,856 km³. About 70% of the total annual renewable water resources come from surface waters and 30% from groundwater. Per capita water availability is generally low for the continent, but exhibits considerable spatial variation, ranging from 5722 m³/yr in North Africa to 221,984 m³/yr in Central Africa (AMCOW, 2017).

Water management in Africa is faced with many challenges including the high spatial and temporal variability of rainfall, increasing degradation of watersheds driven primarily by population growth and agricultural expansion; soil erosion and reservoir siltation; eutrophication; water pollution from untreated wastes; rapid urbanisation, growing water scarcity, inadequate water resources development; weak human capacity and weak data and knowledge management systems (UNECA, 2000; NBI, 2012).

1.2 Socio-economic profile of Africa

The continent of Africa comprises of 55 states with a combined population of 1.256 billion (which is 16.6% of the world population) growing at an average annual rate of 2.55%. This population size makes Africa the second most populous continent after Asia. The continent also has the world’s youngest population: the median age of the continent is 19.4 years; and persons under 25 years account for 60% of her population (UN-DESA, 2017).

Africa is the world’s most underdeveloped continent. Poverty, illiteracy, malnutrition, poor health and inadequate water supply and sanitation, affect many people in Africa. A total of 33 of the 55 African states are classified as Least Developed Countries (UN-OHRLLS, 2017). The population living below the income poverty line of PPP US$ 1.90 per day in the period 2005-2014 ranges from 2% (Tunisia) to 77.8% (Madagascar). Based on data from 52 countries, 479 million people in Africa (41% of the

---

continent’s population) live below the income poverty line (AMCOW, 2017; and CIA, 2017).

Africa’s GDP in 2016 estimated at US$ 2.19 trillion, is just 2.9% of the world’s GDP (World Bank, 2014b). The per capita GDP for the continent in 2017, particularly that of the Sub-Saharan region US$3,579, compares unfavourably with US$46,212 for major advanced economies (G7); US$37,267 for the European Union; and US$14,262 for Latin America and the Caribbean, in the same year (IMF, 2017).

There is considerable variation in economic production and productivity across the continent. The North Africa and Southern Africa sub-regions, each of which holds 15% of the combined population of Africa, account for 31% and 22% of the combined GDP of Africa respectively. The Central Africa and Eastern Africa sub-regions account for much smaller proportions of the combined GDP of Africa relative to the size of their populations while the contribution of West Africa to the combined GDP of Africa is proportional to its population size (Figure 2).

While Africa remains poor, it is experiencing very rapid economic growth. The continent achieved average real annual GDP growth of 5.4% between 2000 and 2010, adding $78 billion annually to GDP. In 2013, African economies registered the fastest growth rates in the world with an average annual GDP growth rate of 5.6% (AfDB, 2014). Thereafter, growth slowed down but on average the continent has maintained an average real GDP growth of 3.3%, or US$69 billion, a year (World Economic Forum, 2016). Foreign direct investment inflows into Sub-Saharan Africa in 2016 were US$38.6 billion, up from US$4.6 billion in 1996 (i.e. an increase of over 850% over a 20 year period) (World Bank, 2017a).

The services sector is the largest contributor to GDP followed by industry and agriculture. Mining makes a significant contribution to GDP, with nineteen African countries being producers of crude oil and six producers of natural gas. Other important minerals from Africa include diamonds, gold, platinum, uranium, copper and cobalt (CIA, 2017). Important agricultural exports from Africa include cocoa, cotton, tea, coffee, timber, rubber, horticultural products and fish.

1.3 The World Water Forum

The World Water Forum is the world’s largest international water event. Held every three years, the Forum brings together tens of thousands of water experts and policy and decision makers drawn from different spheres of the world to deliberate on water issues. The World Water Forum is organised by the World Water Council (WWC) and serves to build global consensus for action to manage freshwater resources. The World Water Forums are attended by a wide range of participants including international organizations, governments, cities and municipalities, public and private companies, water utilities, universities, research institutes, pressure groups and other civil society organisations coming from over all over the world.

Seven world water forums have been held since the founding of the World Water Council in 1996. The first Forum was held in Marrakech, Morocco in March 1997 while the last – the Seventh Forum – took place in April 2015 in the cities of Daegu and Gyeongju in the Republic of Korea. The next forum – the Eighth World Water Forum – is scheduled to take place from 19th to 23rd March 2018 in the city of Brasilia, Brazil. The Forum will take place under the theme "Sharing Water" and will include three traditional processes, namely: Thematic Process, Regional Process and Political Process. In addition, the Forum will include a Citizens Forum, Exhibitions and a Sustainability Focus Group event.
1.4 Progress on the Seventh World Water Forum Targets for Africa

The process of preparation for the Eight World Water Forum involved review of the progress made in meeting targets set for Africa arising from the Seventh Forum. The Gyeongju targets and progress made on each are summarized in the Table 1 below.

Figure 3: Per Capita GDP of the sub-regions of Africa (source: UN-DESA, 2017 and IMF, 2017).

Table 1: Progress on the 7th World Water Forum Targets

<table>
<thead>
<tr>
<th>Goal and objectives and Targets</th>
<th>Progress 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUTCOME/IMPACT:</td>
<td></td>
</tr>
<tr>
<td>Reduced poverty and improved quality of life to the population in Africa; stronger economic growth for the countries of Africa</td>
<td></td>
</tr>
<tr>
<td>GOALS</td>
<td></td>
</tr>
<tr>
<td>AF Goal 1: Improved health and enhanced participation of the population in socio-economic activities from increased access to adequate safe water and improved sanitation</td>
<td></td>
</tr>
<tr>
<td>Objective 1.1 Access to improved sanitation facilities increased to 90% in urban areas and 75% in rural areas by 2025</td>
<td>In 2015, 41.14% of the urban population and 20.11% of the rural population in Africa had access to basic sanitation facilities; up from 38.81% and 18.29% in urban and rural areas respectively in 2000 (WHO/UNICEF, 2017).</td>
</tr>
<tr>
<td>Objective 1.2 Access to adequate safe water in rural areas and urban poor districts increased to 80% by 2025; level of functionality of water supply facilities improved by 10% by 2025</td>
<td>In 2015, 42.59% of the rural population in Africa had access to basic water supplies; up from 29.37% in 2000; no data on safely managed water coverage levels, and no data for urban poor (WHO/UNICEF, 2017).</td>
</tr>
<tr>
<td>AF Goal 2: Better disaster preparedness and reduced impacts to communities and public infrastructure from natural disasters in Africa</td>
<td></td>
</tr>
<tr>
<td>Objective 2.1 Integrated disaster risk management plans prepared in 50% of the countries by 2025</td>
<td>No monitoring data</td>
</tr>
<tr>
<td>Objective 2.2 Financial allocations to disaster risk management doubled in 50% of the countries by 2025</td>
<td>No monitoring data</td>
</tr>
<tr>
<td>AF Goal 3: Improved sustainability of water resources management and services from increased availability of water resources infrastructure</td>
<td></td>
</tr>
<tr>
<td>Objective 3.1 One (1) water infrastructure projects (for water supply, wastewater treatment, hydropower generation, flood control, navigation, etc.) that has a significant proportion of investment financing mobilised from domestic sources implemented in 10% of the countries by 2025</td>
<td>No data. In 2016, African national governments contributed 41.7% of water infrastructure financing; down from 52.38% in 2014 (ICA, 2017).</td>
</tr>
<tr>
<td>Objective 3.2 Funding of water infrastructure project preparation at sub-regional and regional levels increased by 100% by 2025</td>
<td>No data.</td>
</tr>
<tr>
<td>AF Goal 4: Improved food and energy security from increased food and energy production</td>
<td></td>
</tr>
<tr>
<td>Objective 4.1 One (1) new water infrastructure for agricultural irrigation or one (1) new water infrastructure for hydropower generation constructed in 10% of the countries by 2025; one</td>
<td>No data, but financing commitments in 2016 indicate the region is on course to achieve this target.</td>
</tr>
</tbody>
</table>
### Goal and objectives and Targets

<table>
<thead>
<tr>
<th>Objective</th>
<th>Progress 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) existing water infrastructure for agricultural irrigation or one (1) existing water infrastructure for hydropower generation rehabilitated/upgraded in 10% of the countries by 2025.</td>
<td>No data.</td>
</tr>
<tr>
<td><strong>Objective 4.2</strong> The number of small-scale rainwater harvesting facilities in the countries increased by 10% by 2025.</td>
<td>In 2015 there were 17 transboundary basins that have at least one treaty and at least one RBO; 5 basins where there is at least one treaty but no RBO; 2 basins where there is at least one RBO but no treaty and; 35 moderately-sized transboundary basins where there is no treaty and no RBO (Oregon State University, Transboundary Freshwater Dispute Database 2011). No new RBOs have been created between 2015 and 2017; no data on support to project preparation. By 2015, 87 transboundary aquifers had been identified in African; 25 of these aquifers are 25,000 km² or larger in extent; only 2 transboundary aquifers have at least one treaty and one transboundary aquifer management organization (IGRAC, 2014). A joint governance mechanism was established for the Stampriet Transboundary Aquifer System in 2017.</td>
</tr>
<tr>
<td><strong>AF Goal 5</strong> Increased benefits enjoyed by countries from cooperative management and development of shared water resources.</td>
<td></td>
</tr>
<tr>
<td><strong>Objective 5.1.</strong> Four (4) new transboundary river/lake basin organisations established on the continent and 4 existing transboundary river/lake basin organisations supported to improve preparation of joint water resources development projects, and operation and maintenance of water resources monitoring networks and data sharing systems and tools by 2025.</td>
<td></td>
</tr>
<tr>
<td><strong>Objective 5.2</strong> Two (2) new transboundary water organisation established to manage 2 shared aquifers on the African continent by 2025.</td>
<td></td>
</tr>
<tr>
<td><strong>AF Goal 6: Improved management of the Africa Region post-Forum process</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Objective 6.1.</strong> Africa youth programme on water and sanitation developed and implemented and youth participation in three (3) World Water Forums facilitated.</td>
<td>Not achieved.</td>
</tr>
<tr>
<td><strong>Objective 6.2</strong> Four (4) major African success in the water and sanitation sector documented and widely disseminated</td>
<td>No systematic documentation of African water sector success cases and stories.</td>
</tr>
<tr>
<td><strong>Objective 6.3</strong> Two (2) comprehensive reviews of Africa’s water sector monitoring and evaluation system undertaken and recommended improvements effected; the monitoring and evaluation framework expanded to include a peer review process for the water sector of African countries</td>
<td>An online portal for reporting by African countries on water and sanitation (including SDG WASH indicators was launched by AMCOW in January 2017. The database created is operational and has been used for this report.</td>
</tr>
</tbody>
</table>

### 1.5 The Africa Regional Process for the Eighth Forum

#### 1.5.1 Purpose of the Regional Process

The Regional Process, which involves key actors at sub-regional and regional levels, is one of the fundamental mechanisms for dialogue and gathering of perspectives in preparation for the World Water Forum. It is designed to provide opportunity to actors to take stock of achievements and challenges in addressing targets on water; provide opportunity for a broad range of stakeholders to contribute to the dialogue on water; seek out and capture local perspectives on water issues; enhance sharing and exchange of ideas, experiences, innovations and good practices; and foster synergies for action to address water issues from local to regional levels. The regional process climaxes with the regional sessions at the World Water Forum. These sessions provide a platform for sharing and exchange of ideas, experiences, innovations and good practices between regions of the world. They are also used to build consensus and nurture collective agenda setting and action on water; and build political commitment for action on water.

#### 1.5.2 Coordination of the Regional Process

At global level, the regional process was steered by a Regional Process Commission (part of the International Steering Committee) chaired by the African Development Bank (AfDB), with the Ministry of Integration of Brazil (the hostcountry) as its Vice Chair. This Committee was responsible for drawing an activity plan for the regional processes, providing technical guidance to the preparation of the sub-regional and regional reports; mobilising financial and logistical support for the regional process and drawing the program of regional sessions at the Forum.
At the continental level in Africa, the Regional Process was coordinated by the African Ministerial Council for Water (AMCOW) with technical support from the African Development Bank (AfDB) and Global Water Partnership (GWP). Within each sub-region of Africa, preparatory activities were coordinated by the respective GWP Regional Office and were mainly focused around the preparation of a sub-regional report addressing the Forum themes.

1.5.3 Forum themes

In the past, each region of the world got together to select a set of themes to guide its discussions at the Forum. Themes selected in this manner were, of necessity, reflective of the priorities and key concerns of each region. For the Eighth Forum, the process of theme setting has been modified somewhat. Through an extensive consultative process involving stakeholders from the different regions of the world, a set of themes and topics with relevance across the world were agreed upon for the Eighth Forum. Thus, at the Eighth Forum, deliberations of the different regions of the world will be guided by a common set of themes and topics. This will allow the forum to enhance the sharing and exchange of diverse experiences, success stories, good practices and innovative approaches from across the world in relation to the selected themes. Six themes were selected for the Regional Process of the Eighth Forum, each with a number of focus topics. The themes are Climate, People, Development, Urban, Ecosystems and Finance. In addition, three cross-cutting themes were selected to complement the key themes. They are Sharing, Capacity and Governance.

1.5.4 The sub-regional processes

Due to the large size of the continent, consultations of the regional process mainly took place at sub-regional level. The outputs of the sub-regional processes were then combined to form the output of the regional process.

Africa is sub-divided into five sub-regions, each of which took a lead role in the consultations and review process related to one Forum theme. The five sub-regions are Eastern Africa, Southern Africa, Central Africa, West Africa and North Africa. For the Eighth Forum only four of these sub-regions participated in the Africa Regional Process as the North Africa sub-region was combined with Middle East countries to form the Arab region. The distribution of themes and topics amongst the African sub-regions is shown below.
1.5.5 Preparation of the sub-regional report

Each sub-region recruited a consultant to support the process of consultations and drafting of the sub-regional report. The preparation of the report involved, among other things, the following:

(a) Seeking and establishing partnerships for the regional process with development partners and regional and international organisations such as the Regional Economic Communities (RECs), the European Union, UNEP, IUCN, WWF, CRIDIF and African transboundary RBOs;

(b) Consulting stakeholders from across Africa relevant to the Forum themes through the use of questionnaires, email exchanges and interviews on the sidelines of regional events;

(c) Gathering additional data and information relevant to the Forum themes from public and private sources across on the continent; analysing the data and information;

(d) Drafting the regional report to reflect the key issues with respect to the Forum themes as well as case studies and key lessons from the African experience, and practical actions for address the identified key issues.
Table 2: The themes and topics for the Eighth World Water Forum

<table>
<thead>
<tr>
<th>Theme 1: Climate</th>
<th>Topics*</th>
<th>Lead Sub-Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water security and climate change</td>
<td>a. Managing risk and uncertainty for resilience and disaster preparedness</td>
<td>Southern Africa</td>
</tr>
<tr>
<td></td>
<td>b. <strong>Water and adaptation to climate change</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>c. Water and climate change mitigation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>d. <strong>Climate science and water management: the communication between science and decision/policy making</strong></td>
<td></td>
</tr>
<tr>
<td>Theme 2: People</td>
<td>a. <strong>Enough safe water for all</strong></td>
<td>Eastern Africa</td>
</tr>
<tr>
<td>Water, Sanitation and Health</td>
<td>b. Integrated sanitation for all</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c. Water and public health</td>
<td></td>
</tr>
<tr>
<td>Theme 3: Development</td>
<td>a. <strong>Water for Food</strong></td>
<td>Southern Africa</td>
</tr>
<tr>
<td>Water for sustainable development.</td>
<td>b. <strong>Water for Energy (Water, energy and food security nexus)</strong></td>
<td>West Africa</td>
</tr>
<tr>
<td></td>
<td>c. Inclusive and sustainable growth, water stewardship and industry</td>
<td></td>
</tr>
<tr>
<td></td>
<td>d. Efficient use of surface water and groundwater - urban and rural</td>
<td></td>
</tr>
<tr>
<td></td>
<td>e. Infrastructure for sustainable water resource management and services</td>
<td></td>
</tr>
<tr>
<td>Theme 4: Urban</td>
<td>a. Water and cities (water quality)</td>
<td>Southern Africa</td>
</tr>
<tr>
<td>Integrated urban water and waste management</td>
<td>b. <strong>The circular economy – reduce, reuse, recycle</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>c. Treatment and reuse technologies</td>
<td></td>
</tr>
<tr>
<td>Theme 5: Ecosystems</td>
<td>a. Managing and restoring ecosystems for water services and biodiversity</td>
<td>Central Africa</td>
</tr>
<tr>
<td>Water quality, Ecosystem livelihoods and Biodiversity</td>
<td>b. <strong>Natural and engineered hydrological systems</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>c. <strong>Water and land use</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>d. Ensuring water quality from ridge to reef.</td>
<td></td>
</tr>
<tr>
<td>Theme 6: Finance</td>
<td>a. Economics and financing for innovative investments</td>
<td>West Africa</td>
</tr>
<tr>
<td>Integrated urban water and waste management</td>
<td>b. <strong>Financing implementation of water-related SDGs and adaptation to climate change</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>c. Finance for sustainable development – supporting water-friendly business</td>
<td></td>
</tr>
</tbody>
</table>

* The topics in bold are the topics selected for the Africa Regional Process

Each sub-regional paper provided an Africa-wide picture with respect to the selected theme and topics, and illustrated the narrative with selected case studies received through a call for case studies from across Africa. A brief overview with respect to the theme in Africa was backed with a detailed treatment of the theme using data and information collected from the sub region.

The sub-regional reports were validated at a regional workshop held in Entebbe, Uganda from 18-19th January 2018 attended by 24 participants representing a broad range of stakeholders from the four participating sub-regions of Africa. The sub-regional reports have provided the information used in preparation of the Africa Regional Synthesis report (this report).

The coordinators of the sub-regional processes and authors of the sub-regional reports are shown in the Table 3 below.
Table 3: The coordinators and authors of the sub-regional reports

<table>
<thead>
<tr>
<th>Sub-region</th>
<th>Theme and Topics</th>
<th>Coordinating institution</th>
<th>Sub-regional Coordinator</th>
<th>Sub-regional Consultant</th>
</tr>
</thead>
</table>
| Eastern Africa | **Theme 2: People** | GWP Eastern Africa Regional Office | Gerald Kairu  
gerald.kairu@gwpea.org | Mekuria Andarge Tafesse  
mekuria.tafesse1@gmail.com |
|            | 1. Enough safe water for all |                        |                          |                        |
| Southern Africa | **Theme 1: Climate** | GWP Southern Africa Regional Office | Jembere, Kidanemariam  
K.Jembere@cgiar.org | Ruth Pam Beukman  
ruth.beukman2017@gmail.com |
| | **Theme 3: Development** |                        |                          |                        |
| | **Theme 4: Urban** |                        |                          |                        |
| | 1. Water and adaptation to climate change |                        |                          |                        |
| | 2. Climate science and water management: the communication between science and decision/policy making |                        |                          |                        |
| | 3. Water, energy and food security nexus |                        |                          |                        |
| | 4. Water quality |                        |                          |                        |
| | 5. The circular economy – reduce, reuse, recycle |                        |                          |                        |
| Central Africa | **Theme 5: Ecosystems** | GWP Central Africa Regional Office | Hycinth Banseka  
h.banseka@gwpcaf.org;  
hycinthb@gmail.com | Charles Tanania Kabobo  
tkabobo@yahoo.fr |
| | 1. Natural and engineered hydrological systems |                        |                          |                        |
| | 2. Water and land use |                        |                          |                        |
| West Africa | **Theme 3: Development** | GWP West Africa Regional Office | Dam Mogbante  
dam.mogbante@gwpa.org;  
dammogbante@gmail.com | Fabien Charles Cossi  
hountodji  
fabienho@yahoo.com |
| | **Theme 6: Finance** |                        |                          |                        |
| | 1. Water, energy and food security nexus |                        |                          |                        |
| | 2. Economics and financing for innovative investments |                        |                          |                        |
| | 3. Financing implementation of water-related SDGs and adaptation to climate change |                        |                          |                        |

Within the broad themes and topics provided by the Forum Organisers, participants of the Africa Regional Process selected special topics on which to focus Africa’s discussions at the Forum. The topics are the following:
1. Climate theme: Water Security and Climate Resilience for Africa’s Sustainable Development
2. People theme: Sustainable and climate resilient WASH services in Africa
5. Ecosystems theme: Ecosystem Based Adaptation at transboundary ecological and hydrological systems in Africa
6. Finance theme: Enhancing Africa’s Capacity for financing water security in Africa

1.6 About the Africa Regional Synthesis Report

This report documents the processes leading to, and outputs of, the Africa Regional Process at the Eighth World Water Forum in Brazil. It describes the Africa Regional Process, lists the participants of the Process, outlines the key issues from Africa related to the Forum Themes, and presents key lessons from Africa to the World. It will be the basis for formulation of a post-forum action plan.
2. CLIMATE

2.1 The relevance and current situation in Africa with respect to the Climate theme

2.1.1 Impact of climate change on Sub-Saharan Africa

Climate change is a reality, and Africa is among the most vulnerable continents to the impacts of global climate change and vulnerability. Decadal analyses of temperatures performed under the IPCC Fifth Assessment (AR5) shows Africa to have warmed significantly over the past 100 years. Future warming projections under medium emission scenarios show that in large parts of Africa, the mean annual temperature in the last two decades of the 21st century will be higher than the mean annual temperature in the last two decades of the 20th century by more than 2°C (Niang et al., 2014). It is likely, according to Report, that land temperatures over Africa will rise faster than the global average, particularly in the arid regions.

Key risks related to climate change and variability for Sub-Saharan Africa include climate change-induced shifts in the ranges of some species and ecosystems; loss of coral reefs; reduced crop productivity, including productivity of staple foods; reduced livestock productivity due to inadequate pasture, water scarcity and increased livestock diseases; famine and malnutrition; spread of vector- and water-borne human and livestock diseases, including cholera, malaria, meningococcal meningitis, Rift Valley and East Coast Fever; increased water scarcity, famine and malnutrition; increased flooding and damage from flood-related disasters; and increased migration and refugees (Niang et al. 2014). Conservative estimates put the losses of African economies to impacts of climate change to 1.2% of GDP, or US$10-20 billion annually. Under a business as usual scenario, net economic costs are projected to rise to US$40 billion/year by 2025, which is equivalent of 2.7% of Africa’s GDP (Watkiiss el al., 2010).

BOX 1: Salient features: Climate Change in Africa

- Africa’s high vulnerability arises from: (a) natural fragility of its ecosystems (degradation and desertification 67% surface area); (b) exposure to frequent natural disasters (droughts and floods); and (c) dependence of livelihoods and economic activities on highly climate sensitive natural resources and rain-fed agriculture (70% population, 30% GDP from agriculture)

Source: Abebe, 2011

2.1.2 Status of adaptation in Sub-Saharan Africa

A number of reports (for example UNEP/AMCEN, 2013; Mburia, 2015) have pointed to the urgency of Africa adapting to the impacts of climate change. However, in general, Sub-Saharan Africa’s adaptation to climate change to date has remained poor. The status of adaptation can be summarised by the bullets below (Mburia, 2015):

- Sub-Saharan Africa generally lags behind on climate adaptation strategies and implementation. Scattered and incoherent climate related policies exist but are not sufficient to give the continent a survival chance under adverse climate change impacts. If no efforts are made to change this situation, adverse effects of climate related disasters will far outweigh the capacity of any given country to recover.

- Implementation of climate change adaption policies and strategies is weak, sectoral based, or absent. Very few countries have specific climate change policy or laws. A number of countries have prepared National Adaptation Program of Action (NAPAs) but implementation of these is slow owing to insufficient political commitment and low funding.

- The region’s adaptation challenge will grow substantially, even if the 2020 “Emissions Gap” is closed and global-mean warming held below a 2°C increase above pre-industrial temperatures (UNEP/AMCEN, 2013).

- The region’s ability to adapt sufficiently to climate change is weakened by degraded ecosystems and poor land use due to ever exploitation and poor management.

- The rapid growth in population is putting increasing pressure on the natural resources base thereby increasing vulnerability of ecosystems and communities to impacts of climate change.

- The financial and other logistical requirements for adaptation are far beyond what African governments are able to put aside for climate change adaptation.
The Adaptation Gap Report for Africa (UNEP/AMCEN, 2015) indicates that past global emissions already commit Africa to adaptation costs of US$7-15 billion per year by 2020. So far, roughly US$1-2 billion a year has been flowing to Africa for adaptation through a variety of sources. The report further points out that by 2050, Africa’s adaptation costs could rise to US$50 billion per year for a scenario holding global warming below 2°C, and up to US$100 billion per year by 2050, if the world does not manage to turn away from the current path that could lead to more than 4°C warming by 2100. This is a huge burden that the mostly poor countries of Africa are unable to bear.

2.2 Past and ongoing initiatives and their achievements

2.2.1 Regional and global initiatives

The relevant global initiatives that are supporting the region in responding to the above challenge include the following (not exhaustive):

- **Green Climate Fund**: This is a new global fund created to support the efforts of developing countries to respond to the challenge of climate change. It was set up by the 194 countries who are parties to the United Nations Framework Convention on Climate Change (UNFCCC).

- **Climate for Development in Africa (ClimDev-Africa) Initiative**: This is a joint initiative of the African Development Bank (AfDB), the African Union Commission (AUC) and the United Nations Economic Commission for Africa (UNECA). Its purpose is to facilitate actions aimed at overcoming climate information gaps and supporting analyses leading to adequate policies and decision-making from local to regional level. A special fund has been set up under the initiative (ClimDev-Africa Special Fund) to support the preparation and implementation of climate-resilient development programs that mainstream climate change information. Still under the initiative, An African Climate Policy Centre (ACP) has been established under UNECA that will be promoting the use of climate information for decision making by improving analytical capacity, knowledge management and dissemination activities across the continent.

- **The Programme on Climate Information for Resilient Development in Africa (CIRDA)**: This is an initiative of UNEP with funding from GEF. CIRDA is supporting 11 vulnerable Sub-Saharan Africa countries (Benin, Burkina Faso, Liberia, Sierra Leone, Sao Tome and Principe, Ethiopia, the Gambia, Uganda, Tanzania, Malawi and Zambia) to strengthen national climate information systems. The Program will strengthen national capacities in collecting, generating, analysing and disseminating relevant climate information. It will also provide capacity building on: meteorological, climate and hydrological observing and forecasting systems, disaster risk management and viable communication systems/processes for disseminating alerts, and the use of alternative cost-effective technologies.

- **Adaptation Gap Report**: This is a series of UNEP publications focusing on finance, technology and knowledge gaps in climate change adaptation. There are special reports focusing on adaptation in Africa.

- **Water Climate And Development Programme (WACDEP)**: This is an initiative of the African Ministers’ Council on Water (AMCOW) implemented in several African countries since 2011. It is further described in the text box below.

### BOX 2: Water Climate And Development Programme (WACDEP)

WACDEP is an African Ministers’ Council on Water (AMCOW) programme implemented by GWP and Partners in order to realize the climate change related commitments expressed by African Heads of State and Government in the 2008 Sharm El-Sheikh Declaration on Water and Sanitation. The programme is embedded in the AMCOW Work Plan and is supported by a WACDEP Africa Coordination Unit (CU) based in Pretoria in close coordination with the AMCOW Secretariat. The objectives of the programme are to help the countries to: (a) integrate water security and resilience to climate change in the development planning process; (b) develop partnerships and the capabilities of institutions and stakeholders in reinforcing climate resilience thanks to a better water management; (c) develop funding and no/low regret’ investment strategies for water security, and adaptation to climate change.

The first phase of WACDEP was implemented from 2011-2015. The second phase which is ongoing runs from 2016-2019. In Sub-Saharan Africa, the first phase of WACDEP was implemented in 7 countries located in 4 transboundary basins namely Limpopo Basin (Mozambique, Zimbabwe), Kagera Basin (Burundi, Rwanda), Volta Basin (Ghana, Burkina Faso), Lake Chad Basin (Cameroon). The second phase will involve 9 new countries from Sub-Saharan Africa in addition to five of the original countries (Burkina Faso, Cameroon, Ghana, Mozambique and Zimbabwe). The new countries are Benin, Mali, Senegal, Sao Tome and Principe, Central Africa Republic, Kenya, Uganda, Tanzania and Zambia.

WACDEP 2016 – 2019 focuses on strengthening the resilience of countries to climate change, specifically providing support around the Nationally Determined Contributions (NDCs), the National Adaptation Plan (NAP) processes, Cooperation, and financing.

Source: Beukman, 2018

- **The Africa Adaptation Programme (AAP)**: This program which was launched in 2008 was an initiative
of United Nations Development Programme (UNDP) in partnership with the United Nations Industrial Development Organization (UNIDO), the United Nations Children’s Fund (UNICEF) and the World Food Programme (WFP). It was funded through a US$92.1 million grant from the Government of Japan.

Over a 3 year period concluding at the end of 2012, AAP instituted transformational changes in the 20 African countries in the areas of (a) long-term planning; (b) leadership and institutional capacity; (c) climate-resilient policies and measures; (d) innovative finance; and (e) knowledge generation and sharing. AAP’s support helped enhance the adaptive capacity of the AAP countries, promote early adaptation action and lay the foundation for long-term investment to increase resilience to climate change across the African continent. The 20 AAP countries were: Burkina Faso, Cameroon, Congo, Ethiopia, Gabon, Ghana, Kenya, Lesotho, Malawi, Mauritius, Mozambique, Morocco, Namibia, Niger, Nigeria, Rwanda, Sao Tome Principe, Senegal, Tanzania, and Tunisia.

2.2.1 Adaptation measures in Sub-Saharan Africa

Beginning from the mid-2000s, Sub-Saharan Africa governments and African regional institutions have carried out many activities to manage risks related to disasters through conceptualizing, planning and implementing risk reduction and climate adaptation measures across Africa. The interventions are aimed at addressing the following SDG Targets:

**Target 1.5:** By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters.

**Target 2.4:** By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality.

**Target 13.1:** Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries.

**Target 13.2:** Integrate climate change measures into national policies, strategies and planning

**Target 13.3:** Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning.

The main achievements by sub-regions and countries include the following:

- Development of policies and strategies for risk management and climate change at sub-regional and transboundary river/lake basin level. Early examples include the Disaster Prevention Policy and Strategic Action Plan for Climate Change Vulnerability Reduction and Adaptation of the Economic Community of West African States; the Regional Climate Change Adaptation Strategy of the Southern African Development Community (SADC); and the Climate Change Policy, Climate Change Strategy, and Climate Change Master Plan of the East African Community (EAC).
- Development and implementation of national climate change adaptation policies and strategies as well as National Adaptation Programme of Action (NAPAs) by many African governments.
- Establishment and operation of water and climate observation networks under WMO’s World Hydrological Cycle Observing System (WHYCOS). Three projects have so far been completed in Sub-Saharan Africa (SADC-HYCOS Phase I, SADC-HYCOS Phase II and AOC-HYCOS Pilot Phase); three projects are ongoing in 2018 (Niger-HYCOS, Volta-HYCOS and SADC-HYCOS Phase III); and three projects are under preparation (Senegal-HYCOS; IGAD-HYCOS; and Lake Chad-HYCOS) (WMO OMM, 2018).
- Operation of specialised institutions and programs that collect and analyse hydrological, climate and agricultural related data, including remote sensing imagery, and prepare and disseminate early warning messages and advisories. Three Regional Climate Centres have been established in Africa with technical support from WMO. They are the African Centre of Meteorological Applications for Development (ACMAD) based in Niamey; IGAD Climate Prediction and Applications Centre (ICPAC) based in Nairobi; and the SADC Climate Services Centre (SADC CSC) based in Gaborone. Other relevant programs and institutions are the Regional Centre for Agriculture, Hydrology and Meteorology (AGRHYMET) based in Niamey; Observatoire du Sahara et du Sahel (OSS) based in Tunis; and the Famine Early Warning Systems Network (FEWS NET) based in Nairobi and Pretoria.

A new initiative in strengthening climate data services in West Africa is the WASCAL Project (West African Science Service Center on Climate Change and Adapted Land Use) which is working to strengthen climate change-related research infrastructure and capacity by pooling the expertise of ten West African countries (Benin, Burkina Faso, Cote d’Ivoire, Gambia, Ghana, Mali, Niger, Nigeria, Togo and Senegal). The initiative is supported by Germany (Federal Ministry of Education and Research).

There is a similar initiative in Southern Africa supported by Germany (Federal Ministry of Education and Research). It is known as the Southern African Science Service Centre for Climate Change and Adaptive Land Management (SASSCAL) and involves five African
countries — Angola, Botswana, Namibia, South Africa and Zambia. The objectives of this initiative are (a) to conduct research in adaptation to climate change and sustainable land management; (b) to provide products, services and information for decision-making; and (c) to contribute to the creation of a knowledge-based society through academic and non-academic capacity development programmes. This initiative recently established over 100 weather stations in the five countries thereby contributing to strengthening of climate data collection.

- Substantial increase across Africa in implementation of livelihood-based approaches for managing risks to food production from multiple stressors, including rainfall variability and environmental degradation. Risk management tools such as crop insurance products for small-scale farmers and social protection have been initiated in countries like Ethiopia, Kenya, Malawi, Mozambique, Ghana and Mali.

- Increasing adoption across Africa of a wide array of conservation agriculture practices, including agroforestry and farmer-managed natural tree regeneration, conservation tillage, contouring and terracing, and mulching.

A few cases studies are included below to shed light on these measures.

Installation of surface and groundwater monitoring equipment along a dry river in Sudan (Source: DIU, 2017)

CASE STUDY 1: The Climate Change Adaptation Project, Sudan

Agriculture provides the primary means of livelihood for more than 80% of the population in Sudan and is overwhelmingly (roughly 90%) dependent on rain fed agricultural practices. Climate change is making rainfall very unpredictable, and increasing the frequency of droughts and floods thereby leading to frequent crop failures, severe food insecurity and mounting conflicts over water and pasture by agro-pastoral communities. Supporting rural communities to adapt to climate change is of utmost importance in Sudan where close to 50% of the land area is classified as desert or semi-desert (UNEP, 2007).

The Climate Change Adaptation Project aimed to implement priority adaptation measures to build resilience of traditional farmers and pastoral communities of Sudan, especially women headed households, to the adverse impacts of climate change. The Project was funded by UNDP and implemented by the Higher Council for Environment and Natural Resources (HCERN) over a three year period (2014-2016). Project interventions were targeted at 3,500 highly vulnerable households in four states - South Darfur, Gedaref, River Nile and North Kordofan. The specific adaptation measures introduced, and results realised, are summarised in the table below.

The project has clearly demonstrated that the potential for climate change adaptation in semi-arid lands through simple water conservation measures is large and produces immediate and tangible benefits. The main challenge faced in implementing the project was in maintaining sustainability of the revolving fund established by the project to enable farmers acquire farm inputs. The fund met difficulties due to poor repayment culture. A number of farmers also had low knowledge of new farming methods, which was addressed through increased extension activities.

A possible improvement to the approach, based on lessons from the Sudan experience, is to establish community based farmers’ organizations to champion the adaptation measures as opposed to individual farmers. This eases the access of farmers to micro-credits to implement adaptation measures. Another potential improvement is to expand the scope of interventions to include provision of basic services and infrastructure, including support in produce marketing, for greater benefits to the target communities.

Source: El Gamri, 2016
State | Project Activities and Results
---|---
**South Darfur State (areas around Nyala)** | The main adaptation measures were water harvesting and deep ploughing:
- Farmers received support to construct terraces along the contour lines
- Disc chisel tillage was applied to enhance soil moisture retention
- Farmers received training on control of crop pests and diseases, and preserving stored seeds and agricultural products.
- Stress resistant crop varieties and animal breeds were introduced
In farmlands that were treated by water harvesting and chiselling, cereal yields increased by 3 to 8.6 times over lands practicing traditional methods; and dry matter productivity (for animal feed) increased by 8.8 to 10 times over lands tilled with traditional ploughs.

**Gedarif State (area of Butana and Fashaga)** | The main adaptation measures were water harvesting and deep ploughing as in South Darfur State. Crop yields increased by 4.7 folds and 3.3 folds for sorghum and sesame respectively. Mechanical harvesters that were introduced reduced drudgery, brought down cost of harvesting and reduced post-harvest losses.

**River Nile State (Barber area)** | Tree nurseries with annual capacity of 6,000 seedlings per year were established in 4 different villages in to enhance reforestation and shelterbelt establishment. 45 women were trained in the production, transplanting and protection of tree seedlings.
The shelterbelts (mainly *Eucalyptus* spp.) that were established around small farms in the upper terraces assisted in protecting farms from excessively hot winds and wind-blown sands; created favourable micro-climate around the farms; increased availability of biomass for firewood and charcoal; reduced water consumption and eventually increased crop productivity. Sorghum fodder productivity increased by 1.2 fold; alfalfa fodder production increased by 1.25 fold; and wheat yields increased by 1.67 fold. Even larger changes in crop productivity were realised on irrigated lands, with yields of *Faba* beans increasing by 2.4 fold and yield of *Broad* beans increasing by 1.9 fold.

**North Kordofan State (area of Bara)** | The interventions and results for the North Kordofan State were similar to those of the Nile State. In addition, the project registered an improvement of goat milk production from an average of 0.17 l/head/day to 1.7 l/head/day in the improved breeds; and similar magnitude of improvement in increase in body weight gain and twin incidence.
Rwanda, a small hilly country in central Africa, has been experiencing rapid decline in agricultural production and productivity from widespread soil exhaustion, degradation, erosion and loss of soil fertility from poor farming methods. Rivers, lakes, wetlands and other water bodies are silting up from large fluxes of sediments from surrounding hills where the protective land cover has been removed by agriculture, deforestation, and mining activities. The country is at the same time facing impacts of global climate change characterised by frequent flush floods, mudslides and drought.

To reverse environmental degradation and boost agricultural production and productivity while strengthening resilience to climate change, the Government of Rwanda has embarked on a number of integrated programs on smart agriculture and climate change adaptation. Two of these programs are briefly described below.

**The Land Husbandry, Water harvesting and Hillside Irrigation (LWH) Program**

This Program is aimed at sustaining cultivation and production in hilly agricultural districts suffering from severe erosion. The first phase of the Program ran from 2009-2014 and was funded to the tune of US$45 million by IDA, USAID and the Government of Rwanda. The present phase has a budget of US$113.3 provided by IDA, GAFSP, USAID, CIDA and Government of Rwanda.

The project uses a modified watershed management approach to introduce sustainable land husbandry practices for both rain-fed and irrigated agriculture, and support adoption of modern agricultural techniques for higher production of annual and perennial crops. The project had two main components – on Land Husbandry Technologies, and Water...
Harvesting and Hillsides Irrigation. The Project activities include extensive community sensitization and involvement, formation of farmers’ cooperatives and farmer training. Under the Land Husbandry Technologies component, a wide range of land husbandry techniques were introduced in selected sites, with the specific measures applied at a site depending on site characteristics, particularly slope. The measures included earth bunds, narrow and wide-bench terraces, cut-off drains/ditches, water ways, silt traps, check dams, afforestation and reforestation, and embankment protection with agro-forestry trees. In 2017 a total area of 17,991 ha from 14 sites in four provinces (Eastern, Northern, Western and Southern Provinces) had been treated, and 6,632,817 trees planted for terrace embankment protection.

Strong farmer groups were formed in the sites were land husbandry measures were introduced and trained on agricultural technologies, post-harvest management, marketing, business planning, compost making, trees nursery maintenance and saving. The groups were later assisted to form farmer cooperatives to ease access to microcredit from rural financial institutions.

The Water Harvesting and Hillsides Irrigation component constructed valley dams to capture and store runoff from hillsides for use in irrigation of high value crops in downstream command areas. Medium-size dams (with height of dam wall ranging from 9-12 m) were constructed at several sites to allow for all-year crop production. Small scale hillside irrigation systems were also introduced on the treated hillsides using appropriate infrastructure like irrigation trenches and water pipes. To avoid emergence of water conflicts amongst irrigators, water users associations were created and given ownership of facilities. They were also made responsible for water distribution, collecting water fees, and carrying out maintenance and repairs.

The project has so far involved 64,575 households with more than 292,837 beneficiaries from the 14 project sites. In the project areas, yields of different crops have increased by 3 to 5 times following land treatment. Farmer net income from crop sales has also tripled and household savings risen by 74% (MINAGRI, 2017a).

The Rural Sector Support Program (RSSP)

This is a World Bank funded program under the Ministry of Agriculture and Animal Resources whose objective is to reduce poverty in rural areas through increased agricultural production and income. The Program, which commenced in 2001 and ended in 2017, has been implemented in three phases with a total budget US$163 million.

Under one of the components of the Program (on marshlands and hillsides development/rehabilitation), the area of marshland under irrigation has been increased by 6,440 ha through construction of dams and irrigation canals. These systems support dry season crop production and provide flood protection in the wet season. An area of 24,500 ha of surrounding hillsides was also sustainably protected against soil erosion to prevent siltation of the marshlands. The Program further supported farmers with drying grounds, storage facilities, and produce marketing.

A total of 50,000 households have benefitted from the marshland irrigation and now produce 77,280 tons of paddy rice per year. Farmers in the marshlands doubled their yield for rice and other crops, and more than tripled their incomes. Poverty amongst the beneficiaries fell by almost half over the period of Program implementation (MINAGRI, 2017b).

Lessons

The experience from the above two programs demonstrates that linking water infrastructure with agricultural production and value chains can lead to win-win outcomes for the watershed and rural livelihoods. The programs, which involved the application of land husbandry and water infrastructure measures, some of which were very costly, over very large spatial scales, could not have succeeded without strong commitment and support from the top leadership of the country, thereby underscoring the importance of political support for such measures. A key recommendation from the programs is to reduce over dependence on external funding and replace it with local public and private sector financing. It was also felt necessary to have greater private sector involvement in design, implementation, and monitoring and evaluation of watershed management and agricultural infrastructure interventions.

Hillsides in Rwanda treated with terraces and grass strips under the LWH Program (Photo Credit: MINAGRI)
Smart hillside irrigation structures constructed under the LWH Programme (Photo Credit: MINAGRI)

A farmers in Rwanda harvesting rice grown on irrigated marshlands with support from the LWH Program (Photo Credit: The New Times of Rwanda).
CASE STUDY 3: Improving the resilience of WASH services in the Mayo Tsanaga sub-basin, Cameroon

In the far north region of Cameroon, in the area lying within the Lake Chad Basin, access to safe drinking water and adequate sanitation facilities are respectively 41% and 14.3% and, open defecation is still practiced by at least 22% of the population. This poor situation is accentuated by climate change impacts on the water resources of the Lake Chad Basin. The impacts, felt particularly through raising temperature, flooding and water scarcity, are exacerbating stress on aquifer and fluoride toxicity of groundwater in the Mayo Tsanaga catchment area of the Lake Chad Basin. This in turn is affecting and threatening the oral/dental health of 500,000 people, mostly children.

In response to the above problem, pilot actions were launched in the Mayo Tsanaga catchment, led by the Government of Cameroon and supported by GWP and UNICEF Cameroon. The aim of the initiative was to improve understanding of the impacts of climate variability and climate change on the WASH sector; and invest in WASH services that are climate resilient and sustainable.
Key activities implemented under the initiative include the following:

1. Stakeholder identification and mapping
2. Awareness raising and capacity building of key stakeholders;
3. Assessing the vulnerability of WASH services to impacts of climate change and variability, through a participatory process involving key stakeholder groups in the intervention area. The assessment revealed that in the Mayo Tsanaga catchment, there is high likelihood of flood occurrence and destruction of sanitation facilities (mainly household and institutional latrines) when short intense rains are experienced after a long dry season.
4. Carrying out field sampling and water analysis campaigns to investigate fluoride levels in groundwater. Only 4 out of 36 groundwater sources sampled had fluoride levels falling below the maximum permissible levels stipulated by the WHO 2004 and the local Drinking Water Quality Standards (of 1.5 mg/L, and 0.7 mg/L respectively). The rest of the water sources had fluoride levels ranging from 1.76 mg/L to 6.73 mg/L.
5. Constructing a defluorination unit using locally available materials like charred cow bones and gravel. Also, a gas fired furnace that could char raw, cleaned and dry cow bones was constructed to provide a reliable supply of materials for the defluorination unit. Tests performed to assess the performance of the defluorination unit showed that the plant was performing satisfactorily and providing water of acceptable quality both with respect to fluoride levels and organoleptic features (appearance, colour, taste and odour).

Potential follow up interventions under consideration include the commencement of fluoride monitoring to track changes in groundwater concentration levels with changing seasons and hydrological events, and infer future impacts on water supplies from climate change. Also under consideration is the construction of rainwater harvesting facilities, especially for schools and hospitals, as a way of moving away from dependence on groundwater with its associated fluoride contamination problems.

Source: Onibon H. 2018.

CASE STUDY 4: Controlling flood disasters in the Lukaya Catchment of the Congo Basin through land use management

The Congo River is the second longest river in Africa after the Nile, and the world’s second largest river by discharge after the Amazon. It’s mean discharge is about 41,200 m³/sec (Bossche and Bernacsek, 1990) and its drainage basin covers an area of about 3,700,000 km² shared by 10 countries in Central and Southern Africa (Angola, Burundi, Cameroon, Central African Republic, Democratic Republic of the Congo, Gabon, Republic of the Congo, Rwanda, Tanzania and Zambia). About 62% of the drainage basin lies in the territory of the DR Congo. Mean rainfall in the basin is 1470 mm.

The Congo River and its tributaries flood often, particularly during the period of peak flows from November to January. This occurs naturally following heavy rains when the rivers burst their banks. Usually, flood waves from the upper Congo River system are attenuated through the Cuvette Centrale of the Congo and the wetland of the pool Malebo located downstream of the Cuvette Centrale. These natural depressions play an important role in absorbing and dissipating flood waves of the river. When the Congo River main stem at Kinshasa reaches its carrying capacity, flooding occurs mainly through the backwater effect in nearby upstream tributaries.

When it occurs, flooding causes serious social economic damage, including destruction of houses, flooding of farmlands and crops, drowning of livestock, contamination of drinking water sources and spread of water borne diseases, destruction of infrastructure like roads, bridges, power lines, telecommunication facilities and water supply systems. From time to time, flooding leads to loss of lives. The most recent occurrence of flooding was in January 2018 which led to loss of 50 lives and outbreak of Cholera in the city of Kinshasa. Prior to that in December 2015, there was widespread flooding in the country, especially in the provinces of Central Congo, Bas Congo, Equateur and Kisangani. This flooding led to 31 deaths and displacement of 8,480 people.

Analysis of data on natural disaster events that have been documented between 1964 and 2016 showed that flooding is the highest recurring natural disaster in the DR Congo. A total of 196 flooding disasters were recorded out of 490 natural disasters over this period. In terms of number of people affected, however, drought has the largest impact, and was responsible for 69.6% of the people affected by natural disasters in this period.

The data on hydroclimatic related natural disasters shows an increasing trend in the frequency of these events. This could be attributed to improve reporting of events, but could also be indicative of the impacts of global climate change.

Degradation of the watershed of the Congo River is also thought to be contributing to the increase in flooding through alteration in the hydrological response of the watershed to rains. The largest proportion of the population within the basin is poor and heavily reliant on exploitation of natural resources for sustenance. Subsistence farming is the leading livelihood activity, with slash, burn, forest clearing and shifting agriculture being practised. The rapid rise in population means more and more area of forest is being cleared in this way. Uncontrolled deforestation and mining are also contribution to environmental degradation.

In one of the catchments of the Congo Basin – the Lukaya catchment – the Government of DR Congo launched an initiative in 2014 to
introduce land use management as a means of addressing flooding. The selection of the Lukaya catchment was not only to protect the people that are affected by floods in this catchment, but also protect the water supplies of Kinshasa City. The Lukaya, one of the important sources of water for Kinshasa, is a relatively small river that has its source in the Crystal Mountains (Montagnes de Cristal), from where it runs eastward through Bas-Congo before meeting the Ndjili River.

Anthropogenic activities in the catchment area—mainly cultivation on marginal lands, poultry and livestock rearing, fishing and fish preservation, and sand and gravel mining—are impairing the quality of the river water and increasing frequency of flood incidences. The option of landuse management was considered among other options like infrastructure measures and was decided on because of its cost effectiveness. A participatory approach was used for introducing stakeholders to the IWRM-based solution to climate change adaptation. The activities under the initiative included stakeholder identification and training on IWRM and climate change. The training was led by CB-Hyronet (Congo Basin Network for Research and Capacity Development in Water Resources) and was followed by facilitated, participatory problem-solving session during which stakeholders identified key environmental issues in the catchment and their solutions, and prepared a landuse management plan for the catchment which comprised of selected watershed management measures (such as tree planting and control of cultivation) and zones where the measures are to be applied.

**CASE STUDY 5: Dealing with climate change-induced flooding in Rwanda**

Rwanda, in recent years, has seen an increase in the frequency of severe floods and droughts with catastrophic impacts on human lives, property and public infrastructure. Among the more recent floods with devastating impact are those of the wet season of 2012. Unusually heavy rains in this year flooded extensive parts of the country, destroyed 348 houses; washed away roads, bridges and other public infrastructure; and caused the deaths of 37 people and hundreds of livestock. The worst affected areas were Musanze North Province, Western Province (especially Nyabihu and Rubavu districts) and the Mugogo area between Nyabihu and Musanze district (ReliefWeb, 2012). The Sebeya River, a westward flowing river that drains into Lake Kivu, burst its banks at many points. The Kigali Bus Station in Nyabugogo was also badly damaged. The total economic cost of the floods (crops, livestock, properly and infrastructure losses) was estimated at 58.3 billion Rwanda Francs (US$92.6 million) representing 1.4% of the country’s GDP (REMA, 2013).

The Government embarked on a wide range of measures to repair the damage done by the flooding and increase resilience of the country to future floods. The measures included raising the height of bridges in the Sebeya area, lining river banks with sand bags, planting trees to stabilise river banks, opening up caves (natural tunnels) in the Mugogo area to allow easy passage of flood through the volcanic plane, and clearing debris from bridge structures in Kigali City to prevent ponding of water. Integrated flood management plans were also prepared for the Nyabugogo area in Kigali City, and Musanze volcanic area. An underlying principle of the integrated flood management plans was to give the rivers space to flood rather than trying to contain them (Kabalisa, 2017).
2.3 Gaps, challenges and opportunities

Key challenges encountered in the region are the following:

- Sluggish political systems that are unable to respond quickly to the threats posed by climate change.
- Weak institutional capacity and framework.
- Limited human resource to produce, analyze and interpret and disseminate climate data as a result of poor investment in human capacity development, and in scientific research on climate change impacts, adaptation, and mitigation.
- Poor coordination and implementation of existing legislations.
- Absence of foresight in national development planning and climate resilience.
- International abandonment and unfavourable global settings to enhance Africa’s capacity to develop climate change adaptation and mitigation.
- Large gaps exist in the data needed for climate change analysis. In some countries, climate data exists. However, this information is not incorporated into national/regional development planning or in disaster reduction strategies.
- Inadequate budget allocations to adaptation measures.

2.4 Key lessons and good practices from Africa to the world

The lessons from the efforts of the governments and other agencies at climate change adaptation in Sub-Saharan Africa are the following:

- Climate change adaptation initiatives are best appreciated when they build on and add value to on-going national and regional processes.
- Stakeholder platform critical for national ownership of intervention measures.
- For sustainability of initiatives, it is necessary to invest in capacity development
- Better project preparation greatly enhances the ability to leverage investments to support adaptation measures.
- Evidence-based adaptation is a more robust approach for building community resilience.
- Partnerships are key for implementation: Complementarity and synergies increase impact of intervention measures.
3. PEOPLE

3.1 The relevance and current situation in Africa with respect to the ‘People’ theme

Human development efforts over the past five decades have shown that providing access to water and sanitation is critically important for ensuring human equality, protecting peoples’ dignity, guaranteeing their well-being and ending poverty. The ‘People’ theme seeks to draw attention to the large proportion of the global community, many of whom live in Sub-Saharan Africa, who still do not have access to safe water and decent sanitation, and to those that are taken ill or die each year from water-related diseases. The ‘People’ Theme is intended to support efforts to meet the targets of SDG 6 and the human right to safe water and sanitation (HRWS).

The situation with respect to access to water and sanitation in Africa is poor. Africa has made significant effort and progress in increasing access to water supply and sanitation during the MDG period: During 1990-2015, about 427 million people gained access to improved water supply and 300 million people gained access to improved sanitation. In spite of the gains made, Sub-Saharan African, as a whole, did not meet the MDG targets for both water supply and sanitation (WHO/UNICEF, 2016).

In 2016, the percentage of population in Sub-Saharan Africa using safely managed drinking water services and safely managed sanitation services was 49.7% and 34.3% respectively while the population practicing open defecation was 19.9%. Based on the reports of 42 countries, it is estimated that 422 million Africans do not use safely managed drinking water services; 660 million do not use safely managed sanitation services; and 173 million practice open defecation (AMCOW, 2017).

Across the region, as the above figure shows, the variation of access to safely managed water and sanitation services mirrors the distribution of GDP (see Chapter 1), with countries and sub-regions that have high GDP also having generally higher access levels. Generally, the percentage of population using safely managed water and sanitation services is lower in rural areas as compared to urban areas.

![Figure 5: Percentage of population using safely managed water and sanitation services in the sub-regions of Sub-Saharan Africa](image)

<table>
<thead>
<tr>
<th>Region</th>
<th>Percentage of population using safely managed drinking water services (2016)</th>
<th>Percentage of population using safely managed sanitation services (2016)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Southern Africa</td>
<td>51.8%</td>
<td>52.9%</td>
</tr>
<tr>
<td>West Africa</td>
<td>56.8%</td>
<td>27.3%</td>
</tr>
<tr>
<td>Eastern Africa</td>
<td>41.0%</td>
<td>39.5%</td>
</tr>
<tr>
<td>Central Africa</td>
<td>11.3%</td>
<td>14.1%</td>
</tr>
</tbody>
</table>

Figure 5: Percentage of population using safely managed water and sanitation services in the sub-regions of Sub-Saharan Africa.

![Proportion of population using improved water supplies (2015)](image)

<table>
<thead>
<tr>
<th>Type of Service</th>
<th>Rural</th>
<th>Urban</th>
<th>Available when needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Piped water supply</td>
<td>56%</td>
<td>41%</td>
<td>66%</td>
</tr>
<tr>
<td>Un-piped water supply</td>
<td>17%</td>
<td>41%</td>
<td>46%</td>
</tr>
<tr>
<td>Available when needed</td>
<td>46%</td>
<td>17%</td>
<td>35%</td>
</tr>
</tbody>
</table>

2 Calculated by the Author based on UN-DESA Population figures for 2016 (UN-DESA, 2017) and safe water and sanitation coverage statistics for 2016 from the Africa Water Sector and Sanitation Monitoring and Reporting Database (AMCOW, 2017).
Figure 6: Water and sanitation service coverage levels in urban and rural areas in Sub-Saharan Africa (Source: WHO/UNICEF, 2017).
The above situation shows that access to safely managed water and sanitation in Sub-Saharan Africa is low. Poor sanitation and consumption of contaminated water have numerous social and economic impacts and place a huge burden on national economies. Up to 5% of the combined Gross National Product of Africa is estimated to be lost each year to morbidity and mortality resulting from poor sanitation and consumption of contaminated water (UNECA, 2014). And an analysis of data from 25 countries in Sub-Saharan Africa showed that women and children each day spend at least 40 million hours of otherwise productive time just collecting water (UN, 2012). Concerted efforts of the countries are needed to address this poor situation.

Factors underlying poor performance

The underlying causes for the poor performance of Africa with respect to the MDG and now SDG water and sanitation targets include the following:

- **Inadequate financing:** Inadequate financing was the leading cause for failure to meet the MDGs.
- **Rapid population growth:** The efforts to meet the MDGs were unable to match the rapid rate of population growth. At the present rate of population expansion, the numbers of people without access to safe drinking water and improved sanitation will continue to rise, and meeting the targets of the African Water Vision 2025 may prove hard to achieve.
- **Climate change:** Climate change has been wreaking havoc on the continent and affecting water supply and sanitation services. Regions have been alternating between severe droughts, during which water sources may dry up, and extensive flooding, during which water sources and supply and sanitation infrastructure may be submerged, damaged, destroyed or swept away. This has the tendency of setting back progress made on service extension. Both severe droughts and flooding commonly produce emergency situations which Sub-Saharan Africa countries are ill prepared to deal with. Flooding in particular, in addition to damage to physical water systems, may cause widespread contamination of drinking water sources and outbreak of waterborne diseases.
• **Weak institutional capacity:** Institutions for water supply and sanitation have not attained optimal capacity. There is a dearth of qualified and well-trained technical personnel at all levels.

• **Monitoring and evaluation:** Data collection systems to allow for effective monitoring of performance against indicators are weak and affected planning.

### 3.2 Past and ongoing initiatives and their achievements

#### 3.2.1 Policy framework

For Africa to achieve the Sustainable Development Goals for water and sanitation (universal and equitable access to safe and affordable drinking water, and to adequate and equitable sanitation and hygiene, by 2030) will require consistent investment in water infrastructure, operations and maintenance, efficient management of water resources, and strengthened policy and regulatory frameworks.

Interventions under the 'People' theme are expected to address the targets under SDG Goal 6, namely:

**Target 6.1:** By 2030, achieve universal and equitable access to safe and affordable drinking water for all.

**Target 6.2:** By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations.

**Target 6.3:** By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally.

**Target 6.4:** By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity.

**Target 6.5:** By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate.

**Target 6.6:** By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes.

**Target 6.a:** By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies.

**Target 6.b:** Support and strengthen the participation of local communities in improving water and sanitation management.


#### 3.2.2 National initiatives

The efforts to extend water and sanitation services to unserved rural populations (the urban water sub-sector is addressed under Section 5) largely takes places under national programs and is mainly financed by central/federal and local governments with support from development partners. A few cases studies highlighting the national programs are included in this Section.

#### 3.2.3 Sub-regional initiatives

The Regional Economic Communities (RECs) have water infrastructure programs, some of which target the provision of water supply and sanitation. An example is the Lake Victoria Water Supply and Sanitation Program (LVWATSAN II), a program of the Lake Victoria Basin Commission, which is a specialized body of the East African Community (EAC). The LVWATSAN II Program, which is funded by ADB is improving the water supply and sanitation infrastructure in 15 secondary towns in the lake basin, and through this, contributing to reversal of pollution of the lake.

The Intergovernmental Authority on Development (IGAD) has been implementing its flagship semi-autonomous program – the IGAD Drought Disaster Resilience and Sustainability Initiative (IDDRSI) - since 2011. The program aims to attain drought disaster resilient communities, institutions and ecosystems by 2027. One of the priority intervention areas of the Initiative is on Livelihood Support and Basic Social Services. Under this area, water supply and sanitation interventions are being supported for agro-pastoral communities in arid and semi-arid lands. The IDDRSI Program is funded by multiple donors including Denmark, Norway, Sweden, Finland, Germany, Italy, Switzerland, EU, USAID, the World Bank, the ADB, FAO, UNDP and WFP.
The Southern Africa Development Community (SADC) is implementing its Regional Infrastructure Development Master Plan (RIDMP), which together with supporting strategies, aims to increase access to safe water and sanitation in the SADC region to 75% by 2027. Through the Short Term Action Plan (STAP 2013-2017) for implementing the masterplan, a number of drinking water supply and sanitation projects have been prepared (and are at the stage of resource mobilisation) or are under preparation, including three cross-border water supply projects – Lomahasha/Namaacha, Kazungula and Chirundu. The water and sanitation projects under the RIDMP, when implemented, are expected to extend safe water and sanitation services to 260,000 people.

In West Africa, the Economic Community of West African States (ECOWAS) in 2012 adopted the Guidelines for the Preparation of Water Infrastructure in West Africa. This is intended to speed up the preparation of large infrastructure, including water and sanitation infrastructure. The regional community is also in the process of developing an ECOWAS Masterplan for Infrastructure Development.

### 3.2.4 Regional/Continental Initiatives

**AU/AMCOW Level**

A few initiatives are outlined below.

- **Africa Water and Sanitation M&E Reporting:** The African Union Commission through the Africa Ministers’ Conference on Water (AMCOW) has initiated the preparation of annual reports to assess the state of implementation of the key water and sanitation related commitments made by AU Heads of States. Monitoring reports have been issued for 2014 and 2015. A web-based portal has been created for the reporting system and populated with 2016 data.

- **African Water Facility:** AMCOW has been instrumental in the establishment of a dedicated financing arrangement - the African Water Facility – to support infrastructure development in Africa, including water and sanitation infrastructure. The African Water Facility is hosted by AfDB and has been supporting a large number of water sector projects (See text box under Section 7).

- **Program for Infrastructure Development in Africa (PIDA):** PIDA is an initiative under the NEPAD that is led by the African Union Secretariat with the African Development Bank as the executing agency. The program is aimed at promoting the development of national and continental infrastructure in the Energy, Transport, Information and Communication Technologies (ICT) and Transboundary Water Resources sectors.

### BOX 3: The Rural Water Supply and Sanitation Initiative

The Rural Water Supply and Sanitation Initiative (RWSSI) is an Africa-wide initiative hosted by the African Development Bank (AfDB). RWSSI is a focused regional response to Africa’s rural water supply and sanitation crisis, considering the fact that 8 out of 10 people without access to safe water and sanitation live in rural areas. RWSSI supports rural water and sanitation projects and programs with funding for investment operations, strengthening sector processes and systems, as well as through advocacy and knowledge building. RWSSI’s overall objective is to accelerate access to drinking water supply and sanitation in rural Africa in order to attain the Sustainable Development Goals (SDGs) and the African Water Vision 2025 targets.

Since the inception of RWSSI in 2003, the AfDB has invested €1.53 billion in financing 53 RWSS projects in 35 countries. By December 31, 2015, the initiative had mobilised over €5.93 billion from the AfDB, other donors, African governments, beneficiary communities and the RWSSI Trust Fund. The initiative has provided water supply and sanitation access to an estimated 135 million and 90 million people respectively.

Source: AfDB, 2018

### The World Bank

The World Bank has many initiatives in the WASH sector. The largest initiative in Sub-Saharan Africa has been the Water and Sanitation Program (WSP). This is a multi-donor partnership supporting poor people in obtaining affordable, safe, and sustainable access to water and sanitation services. The Program works directly with client governments at the local and national levels to deliver results, and mobilises funds from a diverse range of donors.
national levels and has led or supported many of the advances made within the water and sanitation sector in developing countries over the last three decades. The WSP worked in six core global business areas under the 2011–2016 business plan, namely (a) scaling up rural sanitation and hygiene; (b) creating sustainable services through domestic private sector participation; (c) supporting poor-inclusive policy reform; (d) targeting the urban poor and improving services in small towns; (e) adapting water supply and sanitation delivery to climate change impacts; and (f) delivering water supply and sanitation services in fragile and conflict-affected states.

In Sub-Saharan Africa, the WSP Program has had interventions in 20 countries (Benin, Burkina Faso, Congo, DR Congo, Ethiopia, Ghana, Kenya, Liberia, Madagascar, Mozambique, Niger, Nigeria, Senegal, Sierra Leone, Somalia, South Sudan, Tanzania, Uganda, Zambia and Zimbabwe). Examples of the interventions include development of policy, strategy and bill on sanitation (Kenya); countrywide survey to assess hygiene and sanitation behaviour (Senegal); development of 5-year business plan on sanitation for four regions (Ethiopia); development of a national integrated sanitation program (Mozambique); development of water supply and sanitation schemes (Niger); pilot project on private sector management of piped water systems (Benin); national mapping and evaluation of over 500 autonomous water supply systems (DR Congo); new billing system and city-wide customer enumeration in Freetown (Sierra Leone); and identifying illegal water connections (Liberia).

In July 2017, a new program – the Global Water Security and Sanitation Partnership (GWSP) – was launched as a successor to the WSP. GWSP aims to make the ambition articulated within the Sustainable Development Goals (SDGs) a reality and will likely support water and projects in Sub-Saharan Africa.

### CASE STUDY 6: Strong progress towards meeting the MDGs on Water and Sanitation: The Case of Ethiopia

Ethiopia was one of 13 Sub-Saharan Africa countries that met the MDG targets on improved drinking water. The coverage for improved drinking water in the country rose from 13% in 1990 to 57% in 2015 (WHO/UNICEF, 2016). Ethiopia did not meet the MDG target on sanitation, but registered strong progress in this aspect too. Access to improved sanitation in the country rose from 3% in 1990 to 28% in 2015 (WHO/UNICEF, 2016). Most significantly, open defecation fell from 92% to 29% over the same period.

The factors that assured Ethiopia’s success are numerous, key among which are the following (GLAAS, 2015):

- **Strong political will:** there was high level political commitment to improve access to water and sanitation. One form of manifestation of the strong political will is the number of government policies, strategies and programs on water and sanitation.

- **These included the National Hygiene and Sanitation Strategy; National Step-By-Step Protocol and Sanitation Action Plan (SAP); National WASH Implementation Framework; National Health Extension Program; and One WASH National Program (OWNP).**

- **Adequate financing:** Adequate allocation of budget to water and sanitation, mobilisation of community contributions, and collection of user fees to meet operation and maintenance costs for WASH facilities was an important element behind the success.

- **Strong planning, coordination and implementation:** the preparation of policies, strategies and programs; coordination of agencies, public and private, concerned with sanitation; and strong organisation of implementation were some of the ingredients of Ethiopia’s success.

- **Investment in institutional and human capacity:** Ethiopia has the education institutions and manpower to tackle the issue of open defecation. About 39,000 Health Extension Workers were trained and deployed in rural areas to educate the communities on sanitation and help bring about a behavioural change that embraces the use of toilets. Education institutions in the country offer courses at undergraduate and postgraduate levels on WASH, public health and water, and are contributing to building the national capacity in water and sanitation. A large number of technical staff received in-service training on WASH under the Promoting Basin Services Program.


### CASE STUDY 7: Coordinating civil society input to water and sanitation service provision: The case of the Uganda Water and Sanitation NGO Network

The Uganda Water and Sanitation NGO Network (UWASNET) is the national umbrella body for Civil Society Organizations (CSOs) in the Ugandan Water and Environment sector. The core functions of the umbrella body relate to strengthening collaboration and networking amongst member CSOs; advocacy and policy influence; promoting partnerships between member CSOs and other stakeholders in the water sector; capacity building; research and development; and learning and knowledge management.

The Civil Society Organisations that operate in the water sector, through the country’s sector-wide approach (SWAP), and under
UWASNET’s coordination, make an important contribution to achieving national water and sanitation targets, and through this, contribution to the national development plan’s goal of poverty eradication.

Currently, UWASNET has a total of 261 member NGOs working in different parts of Uganda, and having interventions in a wide range of themes, one of which is water and sanitation. During the 2016/2017 fiscal year, CSOs in Uganda invested UGX 38.39 million (US$10.75 million) in water supply and sanitation activities. The contribution of CSOs has been decreasing since 2014/15 reflecting the declining accessibility to funding by the CSOs.

Main achievements by CSOs in water and sanitation in the 2016/17 fiscal year were the following:

- **Water Supply**: Construction of 28 springs, 220 shallow wells, 408 boreholes, and 615 rainwater harvesting facilities, and installation of 1,304 water filters (community level water purifiers). A total of 197,075 people were served by the above activities. UWASNET members also contributed to the functionality of water facilities by training 308 hand pump mechanics and repairing 398 boreholes and 132 shallow wells. They also formed 1,797 Water Source Committee (WSC)/Water User Committees (WSCs/WUCs), and trained 1,547 WSC/WUC in basic record keeping, proper water source maintenance, simple leadership skills, generation and updating of water source user registers, and collecting and management of maintenance/user fees.

- **Sanitation and hygiene**: Constructed 79,704 traditional pit latrines and 39,029 hand wash basins in public places. They also trained 3,290 Community Led Total Sanitation (CLTS) facilitators, and triggered 1,609 villages with the CLTS of which 706 were later declared to be Open Defecation Free environments. With respect to school sanitation, they constructed 17,583 latrine stances in schools; trained 2,291 teachers in school WASH, and formed and trained 355 school health clubs.

- **Watershed management and environmental conservation**: In this area, member CSOs provided training on issues of climate change and water catchment conservation techniques. They also formed and trained tree nursery groups, and distributed tree seedlings.

The above activities by the UWASNET members are important in supporting government in moving towards attaining universal access to water and sanitation. Collaboration and coordination between CSOs and local government has led to improved information, non-duplication of services in WASH (between government and CSOs) and prevention of conflicts of interest in WASH activities. UWASNET provides an example of a mutually beneficial partnership between government and civil society for national development.

Sudan is a country located in the northeast Africa having a hot and dry tropical climate, and with large areas falling under arid deserts (the Libyan and Nubian Deserts) and semi-arid drylands. Rainfall, which is usually intense and of short duration, is the main source of water for rain-fed agriculture, domestic water supply and groundwater recharge. But Sudan’s rainfall is characterised by low amounts of rainfall (more than half the country received less than 200 mm of rainfall per year), high spatial and temporal variability, high evaporation rates, unreliability, and subject to drought spells. This creates serious water insecurity for the population in Sudan.

Almost half of Sudan’s population lives in rural areas, with about 80% being dependent on rainfed traditional agriculture and livestock rearing for food and livelihood. Limited or lack of access to water is the main factor hindering the socio-economic development and environmental conservation in rural areas in Sudan away from the Nile River corridor. A closely related issue is instability stemming from conflicts amongst pastoralists, and between pastoralists and farmers for over access to water and pasture. Water scarcity has been at the root of long-running conflicts such as that in Darfur. Sudan did not meet the MDG targets on water and sanitation. Access to improved drinking water and sanitation in 2012 was estimated at 55.5% and 23.6% respectively (CIA, 2017).

The government of Sudan, since early colonial times has addressed this issue through rainwater harvesting. Runoff from rainfall during the wet season (July –September) is intercepted and stored for use in the dry season (December –June). Water is stored in both natural structure such as the Tabaldi tree (baobab), stream beds and natural depressions and lakes like Al Rahad Turda, Fola and Dahal; and artificial structures such as roof tops and household tanks, contour bunds; hafirs (pond or shallow ground reservoir of capacity 15,000 – 200,000 m³) and small dams and embankments (capacity 1-20 MCM). The water from these structures is mainly used for drinking water, livestock watering and agricultural irrigation. In recent years, water purification plants are been added to hafirs and dams to render water safe for human consumption.

Government departments that have been in charge of rainwater harvesting over the years include Soil Conservation Department (1946-1955); Rural Water and Development Corporation (1956-1980); Federal National Water Corporation (NWC) and the State Water Corporations (1980-2009); and Water Supply and Sanitation Unit (WSSU) in collaboration with the Dams Implementation Unit (DIU) and State Water Corporations (SWCs) (2010- present).

Between 2010 and 2013, the Government of Sudan constructed 259 new rainwater harvesting facilities providing additional storage of 45 MCM. Under a new program (the Zero Thirsty Program), launched in 2016, and as a strategy for attainment of the 2030 SDG on water, the government of Sudan aims to reach a target of providing water to within 2 km to all household in the country. Water harvesting facilities constructed under this new initiative include 448 hafirs, 28 small dams, and 227 wells. The target under the Program is to construct 6,300 new water harvesting facilities at a total cost of US$1.0 billion by 2020. Financing for the program has come from the Government of Sudan and members of the Arab Coordination Group (specifically the Arab Fund for Economic and Social Development; Islamic Development Bank; Kuwait Fund for Arab Economic Development; and Saudi Fund for Development).

Main challenges faced in water provision through rainwater harvesting include the following: inadequate funding; lack of basic data to support planning; considerable water losses from evaporation, seepage, silting and water misuse; shortage of well-trained local staff; few contractors with the capacity to provider quality services within States; poor facility management in some State; instability of the water sector institutional setup; absence of an IWRM approach to the water challenge; and insecurity in some areas.

CASE STUDY 9: Integrating Water, Sanitation and Hygiene (WASH) with Watershed Management: Experience from Ethiopia

Integrating water, sanitation and hygiene (WASH) interventions with watershed management activities presents unique opportunities to concurrently tackle the issue of sustainability of ecosystems, and sustainability of water supply and sanitation services for rural communities. In Africa, 422 million people do not have access to safely managed water services, and 660 million do not use safely managed sanitation services (AMCOW, 2017). At the same time, Africa’s freshwater ecosystems, which are being relied on to extend water and sanitation services to the unserved, are coming under increasing stress from multiple pressures including rapid population growth; rapid urbanisation, improving economic prospects for the continent, and the impact of climate change. Not only is watershed degradation affecting the sustainability of drinking water supplies but it also is affecting the health and proper functioning of ecosystems, and hence the ecosystem services upon which rural communities are heavily dependent for their livelihoods and survival.

Introduction of watershed management measures that aim to maintain free-flowing rivers, conserve wetlands and protect groundwater recharge zones within river and lake basins helps to ensure the proper functioning of the natural ecosystems within the basins, supports efforts to strengthen ecosystem resilience and ensures the sustainability of water, sanitation and hygiene services in the face of natural disasters and impacts of climate change. Conversely, strengthening WASH services, particularly proper sanitation and waste disposal, help to reduce pollution of surface and groundwater systems thereby providing a positive impact on the sustainability of ecosystems and the support that they render to WASH activities (Edmond et al., 2013).

A pilot for this concept was implemented in Ethiopia under the Tana and Beles Integrated Water Resources Development Project (TBIWRDP). The TBIWRDP operated from 2008 to 2016 funded jointly by the World Bank, the Government of Finland and the Government of Ethiopia, with a component of community contributions. The Project Development Objective was “to develop enabling institutions and investments for integrated planning, management, and development in the Tana and Beles Sub-basin for integrated water resources development.” The project had three components, one of which - Component B on Natural Resources Management – had the integrated WASH and watershed management activities.

Lake Tana, the source of the Blue Nile (Abbay) and focus of the project, is a valuable but ecologically fragile freshwater resource located in Northwest Ethiopia. Before the project, environmental degradation was widespread in the Tana watershed and was producing high erosion and sediment transport, leading to siltation and flooding of inflowing rivers, deterioration of lake water quality, decline in fisheries and interference with navigation. Rural lands along the shores
of Lake Tana, particularly in the Fogera and Dembia districts (Woredas) were also subject to frequent flooding. Lake Tana is the main reservoir for the 460 MW Beles Hydroelectric Power plant. This is a run-of-the-river scheme that draws water from the lake, tunnels it to an underground powerhouse and later throws it back into the Beles River. Water releases from the Beles power scheme have a direct impact on Lake Tana water levels and flows in the Beles River. For this reason, the Beles sub-basin was included in the project.

The project constructed 6 rural water supply schemes and provided 740 water supply points benefitting 143,000 people. The project also implemented sanitation promotion activities and built public sanitation facilities, including 8 latrines in flood shelter zones. These social benefits and others under the project such as provision of health centres motivated the communities and ensured their active participation in watershed management activities. A total of 44,355 households adopted improved soil and water management practices, far exceeding the project target of 30,000 households. The project employed a wide range of land treatment/soil and water conservation measures including closure of degraded cultivated hillsides and communal grazing lands (to allow natural recovery); gulley treatment with check dams, stone bunds, and grass plantation; treatment of farmland with terracing, contour bunds, and grass strips; planting grasses and shrubs along degraded river banks and on bare-lands; establishing tree seedling nurseries and operating them to create communal and household forest plantations and woodlots; and controlling grazing on communal pastures. A land area of 79,288 ha in the two watersheds was brought under management, and 7,691 ha of new forest plantations/woodlots were established.

The project registered remarkable impacts, including 50% percent reduction in soil erosion and sediment yield from watersheds with conservation measures; improvement in soil fertility, increase in cereal yields (by 19-29%); increase in livestock productivity; and reduction in flooding. The TBIWRDP also had positive impacts on poverty reduction mainly through production and productivity increase, income generation, and improved access to basic services. Project monitoring and evaluation established a diversification in livelihoods and a 12% percent decline in the proportion of poor households over the project period.

The key lesson of the project with respect to integrating livelihood social and economic needs with watershed management and development activities is that it fosters positive incentives to the communities to be fully engaged and promote sustainable watershed management. Another important lesson is that the integrated approach achieves greater tangible results than is possible through a single sectoral effort. The project experience also points to the importance of collecting baseline data and establishing a robust monitoring and evaluation system for objective impact assessment.

Source: World Bank, 2017c
CASE STUDY 10: Integrating the management of a regional aquifer within the framework of a transboundary river basin: the case of Southern Africa’s Stampriet Aquifer System
The creation of a joint governance mechanism

In August 2017, the Orange-Senqu River Basin Commission (ORASECOM) took a decision to set up a Multi-country Cooperation Mechanism (MCCM) for joint management and development of the Stampriet Aquifer System (STAS). The STAS is the only permanent and dependable water source in a large arid belt in the north-western part of the Orange-Senqu basin. The aquifer contains two confined sandstone aquifers overlain by unconfined Kalahari aquifer units and covers an area of 86,647 km² stretching from Central Namibia into Western Botswana and extending to South Africa’s Northern Cape Province. The move to establish the MCCM is a reflection of the conscious choice made by the three countries – Namibia, Botswana and South Africa – to manage and develop the resource cooperatively as opposed to unilateral development, which has a potential to cause competition, overexploitation and conflicts.

Significance of the measure

This action by ORASECOM is an effort to meet Target 6.5 of the United Nations Sustainable Development Goals (SDGs) on Integrated Water Resources Management (IWRM) and transboundary water cooperation. The action is of considerable interest to water experts and scholars for several reasons, namely:

1. It is the first agreement on management of a transboundary aquifer following the 2015 adoption of the SDGs (an agreement in the form of a minute of a formal session of the Commission, not a protocol or treaty);
2. It is the first agreement on management of a transboundary aquifer in the Southern Africa Development Community (SADC) region.
3. Prior to the ORASECOM action, there were only six formal and two informal agreements on transboundary aquifers in the whole world where there are over 600 transboundary aquifers. This points to the rarity of agreements on management of shared groundwater resources.
4. It is the first time in the world that a mechanism for cooperative management of a transboundary aquifer is set up within the framework of a transboundary river basin organisation. The action makes it possible to have conjunctive management and development of surface and groundwater resources in the Orange-Senqu basin – a key IWRM principle.
5. The decision was reached before emergence of any stress on the aquifer. Most efforts to establishment agreements on transboundary aquifers are in response to stress on the resource. The area where the STAS is located is sparsely populated, and water withdrawals are very low.
6. The process to establish the joint governance mechanism progressed rapidly, with just 10 years passing from the time the aquifer was recognised as a potential hotspot (in 2007) to establishment of the MCCM (2017).

The process followed

The process for establishment of the STAS MCCM followed a two-pronged approach that combined science with water diplomacy to facilitate multi-level and interdisciplinary dialogue on the shared aquifer. The two components of the approach are briefly described below.

- **Science-based decision making:** Under this component, a scientific assessment of the groundwater resources was undertaken following a multi-disciplinary methodology that involved the collection of a wide range of data (climatic, hydrological and hydrogeological; socio-economic; environmental; gender; and legal; policy and institutional framework); processing of the data; harmonisation of data across the three countries; creation of a regional groundwater database; analysis of the data; and production of info products from the data. The compilation and analysis of data was carried out by a team of professionals from the three STAS countries. Primary data collected under the study related to stakeholder identification and characterization, including mapping of stakeholder interests.

- **Capacity building and water diplomacy:** In this component, efforts were directed at building consensus and a common vision by means of preventive diplomacy and alternative dispute resolution. Activities included training sessions and carefully crafted simulations, exercises, role plays and interactive lectures that enhanced knowledge...
The interventions allowed competing interests to merge, and facilitated teams from the three countries to work together to craft workable mutually beneficial solutions on the management and development of the STAS. The range of topics covered through the training included water diplomacy, and international water law and policy; negotiation, mediation and facilitation techniques for conflict resolution; multi-level governance and transboundary water management; IWRM; stakeholder participation; gender mainstreaming, etc. The groups targeted by these interventions included decision makers, diplomats, lawyers, water experts, environmentalists, central and local government officials, members of non-governmental organisations, farmers and other stakeholders.

**Underlying supportive factors**

In Africa, there are 83 aquifer systems shared by two or more countries (IGRAC, 2014) but prior to the ORASECOM action, only two of them – the Nubian Sandstone Aquifer System and Northwestern Sahara Aquifer System – had some form of management framework. What is it that allowed the three countries (Namibia, Botswana and South Africa) to move to cooperation instead of unilateral exploitation? There is no common roadmap for establishment of management frameworks for transboundary aquifers. The path taken by the cooperating parties tends to be a response to the unique combination of socio-cultural, political, economic and environmental factors prevailing in the region of intervention.

Nevertheless, understanding the conditions facilitated the establishment of the STAS MCCM over a relatively short time period may provide useful insights for design of management mechanisms for other transboundary aquifers.

Several factors seem to have come together to make the STAS Multi-country Cooperative Mechanism possible. First, the STAS is wholly located in the Orange-Senqu River Basin, which already has legal and institutional systems for cooperative management of the shared water resources of the basin. This simplifies the task of cooperation on the STAS as the same legal and institutional framework can be extended to cover cooperation on the aquifer. The 2000 agreement that established the Orange-Senqu River Basin Commission provides for, under Article 6.1, the creation of ad hoc or standing Working Groups or Committees comprising representatives from the parties to the agreement. This is the provision that was used to establish the STAS MCCM.

Second, all three countries of the STAS are members of the Southern Africa Development Community (SADC). This regional economic block has created an enabling environment for member states to cooperate in the management of international watercourses, and given rise to several international agreements on shared watercourses, including on the Orange-Senqu River Basin. Cooperation under SADC extends beyond water to embrace other spheres of development such as democracy, peace and security; trade and commerce; industrial development; infrastructure development; technology transfer; food security and environmental protection. The greater cooperation under SADC deepens trust amongst member states making it possible for them to cooperate over management of shared water resources.

Third, there is the issue of stronger capacity. While there are still capacity gaps in each of the STAS countries, cooperation on transboundary water management that has taken place under SADC’s Revised Protocol on Shared Watercourses (2000 and the ORASECOM protocol (2000) have raised awareness within the countries on the benefits of transboundary cooperation to far greater levels than can be expected for countries were such cooperative frameworks are not in existence.

Lastly, there is the issue of the fortuitous existence of international organisations willing to support the STAS countries in ensuring sustainable management of the resource. Notable among the agencies that supported the processed for establishment of the MCCM are UNESCO’s International Hydrological Program (UNESCO-IHP), the International Groundwater Resources Assessment Centre (IGRAC) and the Swiss Agency for Development Cooperation (SDC). The SDC provided the funds for the preparatory activities leading to the establishment of the STAS.

**Lessons learnt**

The main lessons from this process is the importance of trust (from the existence of ORASECOM and SADC) in acting as a catalyst for deeper cooperation on management of shared waters; the importance of a sound understanding of resources for informed decision making; and the role of water diplomacy in avoiding potential water conflicts.

Source: Kanabatho et al., 2017; UNESCO-IHP, 2016
3.3 Gaps, challenges and opportunities

3.3.1 Gaps and challenges

The main challenges and constraints experienced by the renewed efforts to extend clean safe water and safely managed sanitation services to rural areas in Sub-Saharan Africa are enumerated below. Many of the challenges that prevented the attainment of the MDGs have persisted. The key challenges are the following:

- **Weak policy and institutional frameworks**: Many countries in Sub-Saharan Africa have WASH policies and strategies. However, the implementation of policy through effectively established institutional framework is often weak. Sector reform to strengthen the policy/legal and institutional framework is needed, and is being pursued by some countries. Among the areas in most need of attention are the policy and legal framework and institutional arrangements for WASH provision in emergency situations; and WASH for pastoral communities.

- **Inadequate investment**: Limited investment from domestic and external sources has continued to hamper sustainable access. The rural water sub-sector, where the largest proportion of the population in Sub-Saharan Africa lives, is relatively less well funded than the urban water sub-sector.

- **Inefficient operation and management of water supply and sanitation services**: Many facilities have fallen into disrepair due to lack of spare parts and maintenance. Most rural water supply and sanitation facilities do not function because of poor management; incomplete handovers with limited capacity built; low capacity for preventive maintenance; ineffective supply chains for spare parts due to inappropriate technology; lack of standardization; and poor planning.

- **Remote location and low access to service providers in remote rural areas**: Rural water supply and sanitation is affected by low road connectivity to small, scattered communities. Administrative capacity is weak and private contractors with technical and financial capabilities are lacking.

- **Poor cost recovery and financial sustainability**: Tariffs for most rural areas in Africa do not cover operation and maintenance costs or generate sufficient funds for system rehabilitation and expansion. This results in poor maintenance leading to frequent breakdowns and dysfunctional water supply systems.

- **General lack of information on water resources availability in arid lands**: There is general lack of information on water and other related natural resources in arid and semi-arid lands to support planning.

- **Lack of full understanding of groundwater**: Groundwater is in most cases the most important source of drinking water for rural communities. Yet groundwater water related data are incomplete, fragmented, or outdated; and local agencies lack the tools and expertise to assess groundwater availability to support development of rural water supplies.

- **Poor conflict management**: In the face of population growth and climate change, there is increasing competition for, and conflicts related to, access to land, pasture and water resources especially in cross-border communities. The policy and regulatory frameworks, institutional mechanisms and other tools for managing such conflicts are week or lacking altogether.
• Low strategic storage capacity: The capacity to store water and ensure reliability of services is low in many of the countries.

• Low rainwater harvesting: The level of harnessing of rainwater to improve water supply is generally low across the region.

• Difficulty of sustaining community institutions: There are a number of challenges in forming, running and assuring the durability of community-based institutions for management of rural water and sanitation services as experience from Madagascar, Zambia and Rwanda has shown. The institutions are slow to build, as membership is contingent on a willingness to participate and contribute resources. There are also often uncertainties related to continuity of community groups.

3.3.2 Opportunities

As well as challenges, there are opportunities that could be tapped to fast track the expansion and improvement of WASH services in the region. The main ones are the following:

• Regional and global attention: focused attention given to WASH services at AMCOW level, and globally in the Sustainable Development Goals, is a good opportunity to enhance integrated and focused attention to the issues. There are numerous global and sub-regional initiatives that provide opportunities to share experiences and strengthen implementation and monitoring. Climate resilient water programs including WASH feature in many programs of regional bodies (such as RECs), and bilateral and multilateral finance organizations.

• Non-traditional sources of water: technologies are improving and becoming more available for tapping non-traditional sources of water, such as sea water desalination being pioneered in Sub-Saharan Africa by Namibia and South Africa, and rainwater harvesting; which is on increase in drylands.

• New financing mechanisms: there are continuing efforts to identify new financing mechanisms. These efforts are yielding fruits such as the Blue Fund to be established for the Congo Basin, and the Billion Dollar Alliance for Rainwater Harvesting (see Section 7). As more financing mechanisms are set up, the possibilities for financing WASH services expand.

3.4 Key lessons and good practices from Africa to the world

The lessons learnt from implementing water and sanitation projects in Sub-Saharan Africa are numerous and include the following:

• Long-term programming: Adopting a program approach ensures that a single long-term water supply and sanitation country program be prepared with easier processing cycles for sub-programs and projects.

• Policy and legislative reforms: Policy and legislation reforms within the context of water supply and sanitation, among other things, articulate clear roles and responsibilities for agencies in the sector responsible for owning utilities, operating and maintaining WASH facilities, setting tariffs, mobilizing investment financing, enforcing standards, building capacity, etc. This has immediate benefits for the sector in terms of improvement in the quality of service.

• Capacity building interventions: A common lesson from successful water supply and sanitation projects is that effective capacity building (of a broad range of stakeholders, including communities) is key to success of WASH interventions.

• Financial sustainability and cost recovery: To keep water supply and sanitation services running continuously, it is important that users/beneficiaries/communities pay for the services. Experience from Malawi and Mozambique show that flexible tariff setting can result in financial sustainability without locking out the poor and marginalized.

• Private sector participation: From the experience in Rwanda, PPPs have shown a strong ability to efficiently manage piped rural water supplies. But PPPs need a favourable environment within which to perform. Such an environment is characterized by a regulatory framework that sets clear parameters for measuring performance of the private operators; opportunities for capacity building; competition; and tariffs that allow private operators get a return on investments. Before delegating a water system to a private operator, the facilities must be fully functional and in good condition. Procurement must be transparent with the winning bidder presenting a sound business plan. In addition, the delegation service contract between the public authority and private operator should cover at least 10 years.
• **Building capacity of the private sector:** Developing and supporting Small and Medium Enterprises (SMEs) greatly enhances local entrepreneurship for building wells and latrines, providing repair services, and supplying spares parts. This enhances the sustainability of rural WASH facilities.

• **Community participation:** Experience shows that rural water supply and sanitation projects that adopt a demand-responsive approach which emphasizes community participation in planning, design, and implementation, and which involve community ownership or management of services, have a high likelihood of success. However, community-based management seems more appropriate for point sources (springs or hand pumps) than for piped systems. The experience from Rwanda, for example, showed that Water User Associations offer limited accountability, and that maintenance and cost recovery are quite challenging when they are given to manage piped water systems.

• **Effective and efficient Operation and Maintenance practices:** Operation and maintenance are crucial for sustaining physical infrastructure.

• **Gender considerations and women’s empowerment:** Involvement in water supply and sanitation projects empowers women, especially when project activities are linked to income-generating activities and productive resources, such as credit. WASH projects with a focusing on gender needs lead to benefits that go beyond water and sanitation. Particular benefits that accrue to women and children include more time for income-generating activities, attending to the needs of family members or their own welfare and leisure. The economy, as a whole, therefore also benefits.
4. DEVELOPMENT

4.1 The relevance and current situation in Africa with respect to the ‘Development’ theme

4.1.1 The Development Theme and Water-Energy-Food Nexus Concept

Freshwater is a strategic resource that underpins all development activities including agriculture, fisheries, energy, industry, cities and municipalities, tourism and recreation, navigation and environment and ecosystems. But the world’s freshwater resources are finite and can be depleted, polluted and destroyed by unwise use. Already, development activities are affecting water quality and the availability and access to water. This in turn is affecting the ability of society to sustain or expand development activities and ensure that water services and goods continue to be enjoyed by present and future generations. Managing water to meet competing and often conflicting demands and ensuring sustainable development is one of the biggest challenges of our times.

Agricultural irrigation and hydropower are two of the largest water using sectors. The ‘Development’ theme will be used to address how coordination between the two sectors can be used to achieve greater efficiency in water use through a WEF Nexus approach. The agricultural sector is faced with the challenge of producing enough food with less water to feed a growing world population. To realise this calls for many changes in food and agricultural systems, including increasing energy uptake. Meeting ever-growing demands for energy requires diversification of energy sources, including production of biofuels by agriculture, thereby creating interdependencies and synergies between agriculture and energy.

4.1.2 The WEF Nexus Concept

The interdependence - or nexus - between water, energy, and food (WEF) security is a global challenge. The Davos World Economic Forum (2011) identified integrated WEF security as one of the greatest challenges to the global economy and sustainable development in the decades ahead, and emphasised the need to address it without delay. The Bonn 2011 Nexus Conference provided a framework and directions for further action.

As a concept, the WEF Nexus is being promoted as a process for allocating and using resources to ensure water, energy and food security for an ever-growing population at a time of climate change, land use transformation, economic diversification and the need to make development pay. The Nexus can also be thought of as a response to perceptions of insecurity on the part of four main groups of stakeholders with widely differing and often conflicting interests. These are state entities, populations, the private sector, and environmentalists (ICA, 2015). The nexus provides an approach by which to engage the main stakeholder groups to broker a suite of trade-offs, compromises and synergies between competing water uses in a way that ensures the sustainability and productivity of land and water resources. If properly applied, the Nexus can be used to make a contribution to achievement of six SDGs.

It is considered that in the short term (within five years) competition, already present, will increase between bulk water and agriculture, and between agriculture and energy. Moreover, within fifteen years, water versus energy challenges will probably emerge in the face of growing water scarcity. Thus, the nexus concept is expected to become ever more relevant in Africa with the passage of time, and to be critical in attaining the Africa Water Vision 2025, and AU’s Agenda 63.

In the sections that follow below, the situation with respect to water, energy and food security will be discussed followed by a consideration of how the nexus approach is being used in Sub-Saharan Africa to address these interlinked security concerns.

4.1.3 Water Security in Sub-Saharan Africa

The United Nations defines water security as “the capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability” (UN-Water, 2013).

Water security, as defined above, encapsulates complex and interconnected challenges and highlights water’s centrality for achieving a larger sense of security, sustainability, development and human well-being. A summary of core elements needed to achieve and maintain water security, include (UN-Water, 2013):

- Access to safe and sufficient drinking water at an affordable cost in order to meet basic needs, and safeguard health and levels of well-being;
- Protection of livelihoods, human rights, and cultural and recreational values;
- Preservation and protection of ecosystems in water allocation and management systems in order to maintain their ability to deliver and sustain functioning of essential ecosystem services;
Water supplies for socio-economic development and activities (such as energy, transport, industry, tourism);

Collection and treatment of used water to protect human life and the environment from pollution;

Collaborative approaches to transboundary water resources management within and between countries to promote freshwater sustainability and cooperation;

The ability to cope with uncertainties and risks of water-related hazards, such as floods, droughts and pollution, among others; and,

Good governance and accountability, and the due consideration of the interests of all stakeholders through: appropriate and effective legal regimes; transparent, participatory and accountable institutions; properly planned, operated and maintained infrastructure; and capacity development.

There are many possible indicators for water security due to its broad scope. Two of the common indicators that relate to water availability are the Water Crowding Index (WCI), used as a proxy for water shortage, and the Water Stress Index (WSI), used as a proxy for water stress. The indicators were calculated for Sub-Saharan countries based on the method of Kummu et al., 2016 and the data held on the Africa Water and Sanitation Monitoring System (AMCOW, 2017). The results show that 10.9% of the countries in Sub-Saharan Africa have high water shortage, and 2.4% have high water stress. This situation is expected to get worse with rising population, economic growth and climate change.
4.1.4 Energy Security in Africa

The International Energy Agency defines energy security as "the uninterrupted availability of energy sources at an affordable price" (IEA, 2017b). Energy security has many dimensions:

Figure 8: Water shortage based on the Water Crowding Index in 46 Sub-Saharan Africa countries. Data from AMCOW, 2017.

Figure 9: Water shortage based on the Water Crowding Index in 46 Sub-Saharan Africa countries. Data from AMCOW, 2017.

Figure 10: Dry landscape in northern Burkina Faso. The country has high water shortage. (Photo Credit: www.travels.kilroy.net).
long-term energy security mainly deals with timely investments to supply energy in line with economic developments and sustainable environmental needs. Short-term energy security focuses on the ability of the energy system to react promptly to sudden changes within the supply-demand balance.

Energy security is a major development challenge in Africa, with some thirty countries experiencing regular power shortages and outages, costing their economies between 1-5% of GDP (Africa Progress Panel, 2017). Africa is richly endowed with energy resources that include crude oil, natural gas, hydropower potential, geothermal energy, coal, peat, biomass, solar, wind and nuclear energy. But while rich in energy resources, Africa is poor in energy supply and consumption. In 2015, Africa, which holds 16.1% of the world’s population, accounted for only 3.2% of the world’s total electricity production estimated at 24,255 TWh. Per capita electricity consumption on the continent, which stands at 566 kWh/ca/yr, is five times smaller than the world average (3,052 kWh/ca) and compares unfavourably with 8,016 kWh/ca/yr in the OECD countries; 4,057 kWh/ca/yr in China; and 2,101 kWh/ca/yr in Latin America (IEA, 2017a). The low energy consumption is a reflection of the low supply and electrification rates on the continent, with 645 million people (54.4% of the Africa’s population) estimated to have no access to electricity (IHA, 2016).

Africa’s energy deficit is seriously stifling its economic growth and affecting job creation, agricultural transformation, and improvements in health, education and standards of living. The energy deficit is large and growing rapidly, driven by rapid population growth and economic development. Hydropower is becoming an increasingly important energy source for meeting the continent’s energy gap. The increased importance of hydropower is due to a number of factors, including its renewable and pollution free nature, long economic life, commonly low unit energy costs, and adoption by countries of the Sustainable Development Goals (SDGs) which includes the production, processing, distribution, marketing, acquisition, and consumption of food. Food security is dependent, among other things, on a sustainable food system, which includes the production, consumption, waste and reuse agricultural value chain – from production to transformation, distribution, marketing, acquisition, and consumption of food. Food security is defined by FAO as physical, social and economic access for all people to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. Many countries in Sub-Saharan Africa are unable to meet the food and nutritional needs of their populations. Food security is dependent, among other things, on a sustainable food system, which includes the production, processing, distribution, marketing, acquisition, and consumption of food. Food security is defined by FAO as physical, social and economic access for all people to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. Many countries in Sub-Saharan Africa are unable to meet the food and nutritional needs of their populations. Food security is dependent, among other things, on a sustainable food system, which includes the production, processing, distribution, marketing, acquisition, and consumption of food. Food security is dependent, among other things, on a sustainable food system, which includes the production, processing, distribution, marketing, acquisition, and consumption of food.

Water, one of the important biophysical constraints to agricultural production, has a vital role in all links along the agricultural value chain – from production to transformation, consumption, waste and reuse (UNESCO, 2012). In an attempt to address the food security challenge in their countries, and given the frequent failure of rainfed agriculture in the face of climate change, many countries in Sub-Saharan Africa now plan to greatly increase agricultural irrigation. This is expected to produce a sharp rise in water demand from the agricultural sector, which already has a large water footprint (NBI Water Footprint) and is the largest consumptive water use sector in Sub-Saharan Africa (NBI, 2012).

Africa mainly relies on rainfed agriculture practiced by smallholder subsistence farmers to feed itself. But rainfed agriculture is highly vulnerable to impacts of climate change and variability and is becoming increasingly unreliable. Despite these drawbacks with rainfed farming, the level of irrigation development in Africa remains low. FAO estimates that only 10% of Africa’s food production comes from irrigated lands (FAO, 2015). The irrigation potential of Africa is estimated at 42.5 million ha (Table 4) but at present only 32.8% of this potential has been developed for irrigation (FAO, 2016a). The area of land that is equipped for irrigation is only 1.2% of the total land area under agriculture estimated at 1,132 million ha in 2014 (FAO, 2017). In three quarters of the countries, the area equipped for irrigation is less than 200,000 ha but significant levels of irrigation development can be found in the countries lying at or near the northern and southern peripheries of the continent (Figure 12).

4.1.5 Food Security in Africa

Food security is defined by FAO as physical, social and economic access for all people to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. Many countries in Sub-Saharan Africa are unable to meet the food and nutritional needs of their populations. Food security is dependent, among other things, on a sustainable food system, which includes the production, processing, distribution, marketing, acquisition, and consumption of food. Food production in Sub-Saharan Africa is held back by numerous factors, both biophysical and non-biophysical. The bio-physical constraints include high dependence on rainfed agriculture, low functionality of irrigation schemes, widespread watershed degradation, low soil fertility, high prevalence of pests and disease and small land holdings. The non-biophysical factors include institutional, policy and economic constraints (NBI, 2012).

The installed hydropower capacity in Africa in 2015 stood at 30.1 GW, accounting for 2.5% of the world’s installed capacity (IHA, 2016). The new deal will be implemented through the Transformative Partnership on Energy for Africa, which is designed to provide a platform to coordinate action among private and public partners and offer innovative financing solutions. The location of ongoing and planned hydropower projects is shown in the figure below.
Figure 11: The installed hydropower capacity (top) and number of ongoing and planned hydropower development projects in Africa (bottom) (Source of data: IHA, 2016; WEC, 2016a; Zerf et al., 2015).
Table 4: Distribution of irrigation potential in Africa by river basin (FAO, 2016a)

<table>
<thead>
<tr>
<th>Basin</th>
<th>Irrigation potential (ha)</th>
<th>% of Africa’s potential</th>
<th>Regions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Congo/Zaïre</td>
<td>9,800,000</td>
<td>23.1%</td>
<td>Central, Eastern, Southern</td>
</tr>
<tr>
<td>Nile</td>
<td>8,000,000</td>
<td>18.8%</td>
<td>Northern, Sudano-Sahelian, Central, Eastern</td>
</tr>
<tr>
<td>Niger</td>
<td>2,816,510</td>
<td>6.6%</td>
<td>Northern, Gulf of Guinea, Central, Sudano-Sahelian</td>
</tr>
<tr>
<td>Zambezi</td>
<td>3,160,380</td>
<td>7.4%</td>
<td>Central, Southern, Eastern</td>
</tr>
<tr>
<td>Lake Chad</td>
<td>1,163,200</td>
<td>2.7%</td>
<td>Northern, Central, Sudano-Sahelian, Gulf of Guinea</td>
</tr>
<tr>
<td>Rift Valley</td>
<td>844,010</td>
<td>2.0%</td>
<td>Sudano-Sahelian, Eastern</td>
</tr>
<tr>
<td>Senegal</td>
<td>420,000</td>
<td>1.0%</td>
<td>Gulf of Guinea, Sudano-Sahelian</td>
</tr>
<tr>
<td>Volta</td>
<td>1,487,000</td>
<td>3.5%</td>
<td>Gulf of Guinea, Sudano-Sahelian</td>
</tr>
<tr>
<td>Orange-Senqu</td>
<td>390,000</td>
<td>0.9%</td>
<td>Southern</td>
</tr>
<tr>
<td>Juba-Shabelle</td>
<td>351,460</td>
<td>0.8%</td>
<td>Sudano-Sahelian, Eastern</td>
</tr>
<tr>
<td>Limpopo</td>
<td>295,400</td>
<td>0.7%</td>
<td>Southern</td>
</tr>
<tr>
<td>Okavango</td>
<td>208,060</td>
<td>0.5%</td>
<td>Central, Southern</td>
</tr>
<tr>
<td>Interior Southern</td>
<td>54,000</td>
<td>0.1%</td>
<td>Central, Southern</td>
</tr>
<tr>
<td>North</td>
<td>2,199,050</td>
<td>5.2%</td>
<td>Northern, Sudano-Sahelian, Eastern</td>
</tr>
<tr>
<td>West</td>
<td>6,268,650</td>
<td>14.7%</td>
<td>Sudano-Sahelian, Gulf of Guinea, Central, Southern</td>
</tr>
<tr>
<td>South</td>
<td>1,584,200</td>
<td>3.7%</td>
<td>Southern</td>
</tr>
<tr>
<td>Central Oriental Coast</td>
<td>1,927,460</td>
<td>4.5%</td>
<td>Sudano-Sahelian, Eastern, Southern</td>
</tr>
<tr>
<td>Madagascar and Islands</td>
<td>1,534,990</td>
<td>3.6%</td>
<td>Indian Ocean Islands</td>
</tr>
<tr>
<td>Africa</td>
<td>42,504,370</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 12: The area equipped for irrigation in Africa (Source of data: FAO, 2016a).
4.2 Past and ongoing initiatives and their achievements

4.2.1 Nexus overview in Sub-Saharan Africa

Various countries in Africa are experiencing GDP growth rates of above 5%. High growth rates accompany an increased need for energy supply and generation, agricultural transformation and a secure supply of water to further drive economic growth and cater for the needs of the industrial, commercial, agricultural and residential sector. Agricultural transformation and intensification is one of the key means by which African governments are hoping to achieve their economic development goals, as well as to achieve food security. The intensification and modernisation of agriculture not only requires large amounts of water for irrigation purposes, but also energy which will - for the foreseeable future - still be supported by biomass from croplands, using large amounts of water (van Eden and Muller, 2015).

Understanding the interdependencies between water, energy and food are therefore critical, most especially for river basins in Sub-Saharan Africa – which are among the most vulnerable to climate change impacts, and other drivers like changing land use and increased urbanization. These dynamics will likely have consequences on water, energy and food security with wider economic development impacts and damage to ecosystems. Countries, basins and the continent of Africa need targeted and sustained nexus (multi-purpose) infrastructure investments to shape sustainable growth and build climate resilience. Today only some 2.5% of investments in (water) infrastructure address this opportunity in Africa (ICA, 2015).

One of the common challenges encountered in efforts to adopt the WEF nexus approach in Sub-Saharan Africa is low understanding of what the concept is, how it relates to the IWRM Concept, and how it can be of use in water resources development and management. In this regard, most of the initiatives in Sub-Saharan Africa have focused on introducing and explaining the concept to a broad range of stakeholders, and piloting water resources development projects based on the nexus concept to demonstrate the benefits of the concept. Some of these initiatives are described in the textboxes below.

**BOX 4: Ongoing WEF Nexus Initiatives in Africa**

Recent initiatives in Sub-Saharan Africa concerning the water-energy-food nexus are the following:

- Implementation of the “Programme on Advancing Dialogue and Investment for Food Security in Water-Energy-Food-Ecosystems Nexus in West Africa”. The launch event for this program was held in December 2017 in Bamako, Mali and was attended by the Economic Community of West African States (ECOWAS), major river basin organisations (namely Senegal Basin Development Organisation (OMVS), Niger Basin Authority (NBA); Volta Basin Authority (VBA); and Gambia River Authority (OMVG)); regional organisations such as Water Resources Coordination Centre (ECOWAS/WRCC), the Permanent Interstate Committee for Drought Control in the Sahel (CILSS), African Network of Farmers and producers (ROPPA), GWP-WA and Country Water Partnerships.

- Implementation of the “Programme d’Appui a la Gestion des Ressources en Eau et du Nexus eau-energie-agriculture dans le Bassin du Fleuve Senegal” – a nexus program in the Senegal River Basin being supported by the EU, with Italy as lead partner. The program has a 4 year duration and budget of EUR 6 million. It will focus on building capacity with regard to application of the nexus concept targeting the OMVS (Senegal River Basin Development Organization) and the countries of the Senegal River Basin.

- Development of a Nexus Regional Dialogue Programme to operationalise the Nexus approach in the Niger River Basin. The program is funded by the European Union and the German Federal Ministry of Economic Cooperation and Development.

- Holding of a series of multi-stakeholder consultation events (water forums) in the SADC region that have addressed the NEF nexus. One of the recent water forum events focused on understanding the concept; a second examined the way in which the nexus can contribute to industrialisation; and a third looked at ways in which the nexus can be used to foster economic development industrialization, value creation and jobs. This is further discussed below.

- Holding a consultative workshop in Addis Ababa in December 2017 to generate ideas for a possible WEF Nexus Program in the IGAD region. The workshop was organised by GWP-EA in partnership with IWMI and was attended by staff of the IGAD Secretariat, Global Water Partnership Eastern Africa, and representatives from four IGAD member states (Ethiopia, Kenya, Sudan and Uganda). Among other things, the workshop pointed out ways in which the concept could be useful to the region, which included serving as a tool to facilitate preparation of bankable projects and attracting investment financing to the region; strengthening cross-sectoral engagement and coordination between WEF institutions; and complementing, rather than replacing IWRM approaches.
4.2.2 The Water-Energy-Food Nexus in SADC region

In Sub-Saharan Africa, the WEF nexus has received the most serious consideration in the SADC Region. SADC intends to play a leading role (globally) in the development of the concept, and plans to fully domesticate the Nexus in terms of approach and application. The region has seriously evaluated the approach, and prioritised the development of a Water, Energy, and Food (WEF) security nexus approach in SADC. Under the Regional Strategic Action Plan (RSAP IV), one of the programmes addressed the WEF nexus.

Following a series of global nexus debates and reports (Bonn and Berlin in 2011 and 2013), the European Commission (in 2015) provided support to a global “Nexus Dialogues Programme” to encourage further rigorous analysis of nexus challenges. Africa is included in this programme, with a dedicated focus in the SADC region and Niger basin. Support to the SADC region is through the SADC - EU Nexus Dialogue Project, which runs from 2016 – 2019. The Project is facilitating technical and political dialogues on the WEF nexus, and is working to establish a nexus governance framework and identify nexus projects in SADC for investment.

One of the biggest challenges for the SADC region is that water is distributed very unevenly. The region is also short of electricity and some countries are highly dependent on hydro-power. This poses a challenge for food production, given that the over-allocation of water resources for food production would have a detrimental impact on energy production. To integrate water with food and energy, the regional body (SADC) has taken steps to raise awareness of the issues and has led comprehensive engagements with stakeholders and International Cooperating Partners to further unpack the nexus and understand its value in the southern African development context.

In the SADC Region, the nexus is typically viewed through two lenses:

- **Nexus in project development**: This is seen as a means of enabling an improved level of efficiency; or making a project/initiative viable that previously wasn’t, by adding a Nexus element that wasn’t there before. It can be seen in terms of:
  - **Efficiency** – economic argument – do more with the same technical/economic resources or allocating project resources to maximise benefits or distinct water, energy or food production
  - **Viability** – financial argument, linked to Efficiency – a single-purpose project may not be financially feasible in and of itself, but by considering other (Nexus) inputs or outputs, it becomes feasible (or “bankable”)
  - **Opportunity** – technical argument linked to both Efficiency and Viability – looking at new ways of doing things by linking with or opening up other upstream or downstream supply chains, thereby producing different outputs or using different inputs that trigger secondary impacts.

- **Nexus in Meta (Regional/National) planning**: This is concerned with optimising a region/countrys endowments (based on its stage of development) to support its economic trajectory, and build efficiencies on top of this (Pegasys, 2017).

Both of the above Nexus lenses exist within, and are influenced by, SADC’s broader socioeconomic and political environment and therefore cannot be viewed in isolation of this.

The SADC Water Division, the SADC River Basin Organisations and regional implementing Partners in southern Africa (such as GWPSA), organised a series of dialogues, workshops and consultations on the importance of the WEF nexus in the region. Starting in 2013, SADC Water division held the 6th SADC Multi-Stakeholder Water Dialogue entitled, *Watering Development in SADC: Exploring the Water, Energy and Food Nexus* (in Lusaka, Zambia). In 2015, the 7th SADC Multi-Stakeholder Water Dialogue was held (in Windhoek, Namibia) - entitled, *Watering Development in SADC: The central role of water in driving industrialisation*. In 2016, SADC and GWPSA worked together towards building technical partnerships for nexus project development and raising resources. These efforts led to SADC being selected as a region in the EU funded Nexus Dialogue project. The most recent ‘nexus consultation’ was the 8th SADC Multi-Stakeholder Water Dialogue on 21st and 22nd November 2017 (Johannesburg, South Africa). The theme was *Fostering Regional Value Chains and Job Creation Through The Water-Energy-Food Nexus Approaches*.

Stakeholders at the dialogues and workshops included delegates from government (water, energy and agriculture, economic planning and industry sectors), NGOs, civil society,
academics and private sector, as well as SADC Secretariat (water, energy, food, trade and industry related directorates), RBOs, and other regional institutions and partners. Views of stakeholders expressed in the consultation events not only moulded the direction of the ‘WEF nexus in the region’ but also demonstrate key issues and recommendations for consideration in broader development actions. A few of the views are summarised in the Box below.

From the dialogues, the SADC countries have agreed to use the nexus approach wherever it is useful, and to domesticate it in national planning frameworks. The SADC countries also intend to use the nexus approach for optimization of multi-purpose infrastructure projects and development of innovative financing options for major infrastructure, with a specific focus on speeding up implementation of the Regional Infrastructure Development Master Plan (RIDMP).

CASE STUDY 11: Tanzania and Malawi Pursue a WEF Nexus Approach to Develop the Songwe River Basin

The Songwe River is an International water course shared by Malawi and Tanzania. The river has its origin in the Rungwe Mountain Ranges in Tanzania from where it flows south-eastwards to drain in Lake Nyasa/Malawi. The river forms the international boundary between Malawi and Tanzania for a distance of 200 km and has a drainage basin covering an area of 4,243 km² that is inhabited by 341,000 people, most of whom are poor and reside in rural areas.

The basin is endowed with fertile alluvial soils and abundant water resources that are heavily relied upon by the population for sustenance. Rapid population growth in recent years is placing significant pressure on environmental resources in the basin and causing severe land degradation. This is leading to siltation and increased flooding of the river, and in frequent changes in the river course and hence of the international boundary. The flooding also affects people living in the densely populated lower part of the basin.

The riparian countries of the Songwe Basin decided to initiate the Songwe River Basin Development Program (SRBDP) to reverse the environmental degradation of the basin and tap on the huge water resources potential of the basin for socio-economic development. SRBDP’s objectives are framed within overall sustainable and climate-resilient interventions for both countries, and include contributing to economic growth, reducing poverty, improving health and livelihoods, enhancing food and energy security for the entire basin, and reducing the socio-economic impacts of the meandering river on communities in the flood plain. The preparation of detailed investment projects drew on the WEF nexus concept to balance needs from multiple sectors.

Program development has progressed under two phases as follows:

- Phase I (2001-2003): Situation assessment and preliminary planning:

  This phase was used to carry out extensive analysis of the basin to provide a full understanding of the needs of the basin, the opportunities and constraints within the basin for addressing the needs; and the best approach for development of the basin. The studies proposed the construction of three flood control dams, while taking the opportunity to develop a hydropower plant within each dam, and irrigation schemes and river stabilisation on the flood plain, including non-structural measures for flood control and environmental conservation. All of these are expected to lead to enhanced livelihoods and increase resilience to climate change.

- Phase II (2004-2017) Detailed Design and Investment Preparation Project: Key activities implemented in this phase are the following: visioning and preparation of a 10 year basin development program; Detailed design and preparation for priority investment projects conducting a Strategic Environmental and Social Assessment (SESA) for the Program and conducting environmental and social impact assessments, and preparing Environmental and Social Management Plan (ESMP), and Resettlement Action Plan (RAP) for the investment project; and institutional development.

The SRBDP is part of the SADC’s Regional Strategic Action Plan for international water resources management. The institutional
development activities resulted in the ratification in 2017 of a treaty establishing the Songwe River Basin Commission. The Basin Commission operates from its secretariat in the town on Kyela, Tanzania.

The detailed design and investment project preparation activities under Phase II had a duration of 32 months and cost US$6,469 million and were financed through a US$3,973 million grant from the African Water Facility; another US$1,372 million grant from the NEPAD Infrastructure Project Preparation Facility (IPPF); US$0.456 million from the Republic of Malawi; and US$0.668 million from the United Republic of Tanzania. Economic analysis and costing of the priority investment projects was carried out through a grant from the DFID-funded Climate Resilient Infrastructure Development Facility (CRIDF).

The main output from Phase II is the US$829 million Songwe River Basin Program which involves building a multipurpose dam to impound water for a 180-MW hydro powerhouse (will be shared equally between the two countries), provide water for an irrigation scheme covering about 3,000 hectares in each country, and control floods in the densely populated lower part of the basin. Other components of the program include rural electrification and social infrastructure and institutional capacity building. The WEF nexus concept was among the principles behind the approach in detailed project design.

The program is envisaged to be developed through the use of a public-private partnership (PPP) approach. The IPPF and the African Legal Support Facility, another initiative hosted by AfDB, are exploring the funding of an adviser to the project to handle issues related to PPPs. The Global Environmental Facility (GEF) has already provided a grant of US$6.4 million for implementation of the software component “Strengthening Transboundary Cooperation and Integrated Natural Resources management in the Songwe River Basin”. This will play a complementary and supportive role to the investment project.


### BOX 5: SADC Stakeholder Views on the WEF Nexus

- The Nexus Approach is an opportunity to advance the SADC Developmental Agenda.
- The importance of the ecosystem in the nexus approach needs to be emphasised.
- The scale at which a nexus approach is considered is important and will require different tools, analysis and approaches for implementation.
- In order to integrate a nexus thinking in planning and driving investments there is a need to understand trade-offs through conducting in-depth analysis and assessments.
- More practical interventions are needed to facilitate breaking down the culture of working in sectoral silos.
- The nexus dialogue should drive and facilitate the development of financing strategies aimed at engaging new sources of funding; and should to tap into innovative financing, such as blended finance.
- Consider the possibility of broadening (beyond water) the mandates of regional institutions like River Basin Organizations so that they can be involved in driving the nexus approach.
- The promotion of regional integrated planning is needed to address the potential misalignment of SADC infrastructure corridors with boundaries of transboundary water resources; coordinate transport, energy and water infrastructure development; support vertical and horizontal (relevant) policy harmonisation; and understand the enablers and disablers of regional harmonisation in SADC.

Source: Beukman, 2018

### 4.2.3 Past multi-purpose infrastructure projects in Sub-Saharan Africa

The WEF nexus approach is not entirely new in Africa. There have been infrastructure projects designed to serve multiple objectives, and balance between competing needs for water from the domestic, agricultural, energy and environmental sectors, among others, without necessarily using the ‘WEF nexus’ term. The nexus approach is therefore expected to build on Africa’s previous experiences in multi-purpose project preparation. The Table 5 below lists existing large multi-purpose dams in Sub-Saharan Africa.

#### Table 5: The largest multi-purpose dams in Sub-Saharan Africa (reservoir capacity > 1 BCM) (source: FAO, 2016b)

<table>
<thead>
<tr>
<th>Country</th>
<th>Name of dam</th>
<th>River</th>
<th>Major basin</th>
<th>Year of Completion</th>
<th>Dam height (m)</th>
<th>Reservoir capacity (million m$^3$)</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angola</td>
<td>Gove</td>
<td>Cunene</td>
<td>South West Coast</td>
<td>1974</td>
<td>58</td>
<td>2,574</td>
<td>IR, HP</td>
</tr>
<tr>
<td>Angola</td>
<td>Quimininha</td>
<td>Bengo</td>
<td>South West Coast</td>
<td>1975</td>
<td>41</td>
<td>1,560</td>
<td>IR, WS</td>
</tr>
<tr>
<td>Burkina Faso</td>
<td>Bagre</td>
<td>Nakambe</td>
<td>Volta Basin</td>
<td>1992</td>
<td>40</td>
<td>1,700</td>
<td>IR, HP, FC, LW</td>
</tr>
<tr>
<td>Cameroon</td>
<td>Lagdo</td>
<td>Benoue</td>
<td>Niger River Basin</td>
<td>1983</td>
<td>40</td>
<td>7,800</td>
<td>HP, FC, NV, RC</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>Koka</td>
<td>Awash</td>
<td>Rift Valley</td>
<td>1960</td>
<td>42</td>
<td>1,900</td>
<td>IR, HP</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>Megech</td>
<td>Abbay</td>
<td>White Nile</td>
<td>UC</td>
<td>76</td>
<td>1,800</td>
<td>IR, WS</td>
</tr>
</tbody>
</table>
4.3 Gaps, challenges and opportunities

4.3.1 Challenges encountered in application of the nexus concept in infrastructure development

While the nexus concept holds great promise for reducing inefficiencies and eliminating unnecessary competition between the water, energy and agricultural sectors, there are many obstacles and constraints that hold it back from wide adoption on the continent. Due to these constraints, the vital process of mainstreaming trade-offs, compromises or synergies as integral elements of the formal approaches for strategic infrastructure planning has not progressed to a significant extent in any country. The key challenges experienced in Sub-Saharan Africa are summarised in the Table 6 below.

Table 6: Obstacles and constraints working against the nexus approach (modified after ICA, 2016)

<table>
<thead>
<tr>
<th>Category</th>
<th>Obstacles and constraints</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Institutional challenges</strong></td>
<td>Linear thinking and institutional and policy silos - silo thinking on the part of experts in regional authorities, national authorities and serving with development partners remains a significant obstacle against the kind of lateral thinking needed to identify and promote nexus style solutions. Agricultural and energy policies, for instance, continue to be drafted in isolation of water policies and vice versa.</td>
</tr>
<tr>
<td></td>
<td>Poor institutional framework - national and development partner institutional arrangements often do not favour integrated thinking but reinforce silo thinking.</td>
</tr>
<tr>
<td></td>
<td>Weak human resources capacity - especially with respect to lateral thinking</td>
</tr>
<tr>
<td></td>
<td>Slow institutional evolution – Institutions respond and adjust to reforms at a slow pace,</td>
</tr>
<tr>
<td></td>
<td>Inflexible plans - rigid national and regional development plans and associated milestones and indicators that are unable to adapt to new policy frameworks</td>
</tr>
<tr>
<td></td>
<td>Political resistance - sometimes even the best economic or technical approaches are inadequate to fix problems of political economy</td>
</tr>
<tr>
<td></td>
<td>Uneasy power relations – the economic, judicial and formative power relationships between national institutions and transboundary interests make it difficult to find regional solutions to local problems. These relations are unlikely to improve in the short to medium term.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Country</th>
<th>Dam Name</th>
<th>River Basin</th>
<th>Year</th>
<th>Capacity (Mn m³)</th>
<th>Sector(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kenya</td>
<td>Masinga</td>
<td>Tana</td>
<td>1980</td>
<td>70</td>
<td>UC, HP, FC</td>
</tr>
<tr>
<td>Mali</td>
<td>Manantali</td>
<td>Bafing</td>
<td>1988</td>
<td>70</td>
<td>IR, HP</td>
</tr>
<tr>
<td>Mali</td>
<td>Selingue</td>
<td>Sankaran</td>
<td>1982</td>
<td>23</td>
<td>IR, HP, FC</td>
</tr>
<tr>
<td>Mozambique</td>
<td>Cahora Bassa</td>
<td>Zambezi</td>
<td>1974</td>
<td>171</td>
<td>IR, HP, FC</td>
</tr>
<tr>
<td>Mozambique</td>
<td>Massingir</td>
<td>Elefantes</td>
<td>1976</td>
<td>48</td>
<td>IR, HP, FC</td>
</tr>
<tr>
<td>Mozambique</td>
<td>Chicamba Real</td>
<td>Revué</td>
<td>1959</td>
<td>75</td>
<td>HP, FC</td>
</tr>
<tr>
<td>Mozambique</td>
<td>Corumana</td>
<td>Sahié</td>
<td>1988</td>
<td>46</td>
<td>IR, HP, FC</td>
</tr>
<tr>
<td>Nigeria</td>
<td>Jekara</td>
<td>Jekara</td>
<td>1976</td>
<td>14</td>
<td>IR, WS</td>
</tr>
<tr>
<td>Nigeria</td>
<td>Mohammadu Ayuba</td>
<td>Hadedja</td>
<td>1975</td>
<td>5,353</td>
<td>IR, WS</td>
</tr>
<tr>
<td>Nigeria</td>
<td>Dadin Kowa</td>
<td>Gongola</td>
<td>1988</td>
<td>42</td>
<td>IR, HP, WS</td>
</tr>
<tr>
<td>Nigeria</td>
<td>Tiga</td>
<td>Kano</td>
<td>1974</td>
<td>48</td>
<td>IR, WS</td>
</tr>
<tr>
<td>Nigeria</td>
<td>Zungeru</td>
<td>Kaduna</td>
<td>UC</td>
<td>90</td>
<td>IR, HP, WS, FC</td>
</tr>
<tr>
<td>South Africa</td>
<td>Hendrik Verwoerd</td>
<td>Orange</td>
<td>1971</td>
<td>73</td>
<td>IR, HP, WS</td>
</tr>
<tr>
<td>South Africa</td>
<td>Van Der Kloof</td>
<td>Orange</td>
<td>1977</td>
<td>108</td>
<td>IR, HP, WS</td>
</tr>
<tr>
<td>South Africa</td>
<td>Bloemhof (2)</td>
<td>Vaal</td>
<td>1970</td>
<td>33.7</td>
<td>IR, WS</td>
</tr>
<tr>
<td>Sudan</td>
<td>Jebel Aulia Dam</td>
<td>White Nile</td>
<td>1937</td>
<td>22</td>
<td>IR, HP</td>
</tr>
<tr>
<td>Sudan</td>
<td>Roseires</td>
<td>Blue Nile</td>
<td>1966</td>
<td>60</td>
<td>IR, HP</td>
</tr>
<tr>
<td>Sudan</td>
<td>Khashm El Gibra</td>
<td>Atbara</td>
<td>1964</td>
<td>35</td>
<td>IR, HP</td>
</tr>
<tr>
<td>Togo</td>
<td>Nangbeto</td>
<td>Mono</td>
<td>1987</td>
<td>44</td>
<td>IR, HP</td>
</tr>
<tr>
<td>Zimbabwe</td>
<td>Nyatana</td>
<td>Mazowe</td>
<td>UC</td>
<td>3,500</td>
<td>HP, WS</td>
</tr>
<tr>
<td>Zimbabwe</td>
<td>Condo</td>
<td>Save</td>
<td>UC</td>
<td>1,230</td>
<td>IR, HP</td>
</tr>
</tbody>
</table>

UC= Under construction; IR = Irrigation; HP = Hydropower; WS = Water Supply; FC = Flood control; NV = Navigation; RC = Recreation; LW = Livestock Watering
### 4.3.2 Potential solutions to challenges

Possible solutions to the above challenges are the following:

1. Changing institutional policy in water, energy and agricultural institutions at local, national and regional levels; and of development partners; to embrace the nexus concept and adopt indicators and metrics that are compatible with it.

2. The policy change should include acknowledgement of the importance of scale, and promote decentralised planning and implementation.

3. Strengthening the technical capacity of institutions involved in water, energy and agricultural management; and building capacity of policy makers and planners in lateral thinking and the nexus concept.

4. Diversifying single subject curricular at university level to embrace integrated planning and the nexus concept (for fields related to water, energy and agriculture).

5. Increasing efforts at enforcing applicable regulations so as to minimise negative social and environmental impacts while increasing positive impacts.

6. Encouraging trade-offs, compromises and synergies amongst the three elements of the nexus; building equitable value chains based on compromise; promoting trade-offs that reflect economics not institutional mandates.

7. Investing in detailed preparatory studies that accurately identify and assign rightful values to all potential costs and benefits (direct and indirect) of multi-purpose infrastructure projects.

8. Promoting the establishment of well-regulated market mechanisms that allocate costs and benefits while being independent of institutional compartmentations.

9. Promoting the search for regional solutions to local problems.

10. Promoting cross-sector financing (tariffs from one sector support the development of another sector) and intensifying efforts to increase service cost recovery; and


### 4.4 Key lessons and good practices from Africa to the world

Key lessons from the experience in the sub-region are the following:

- Considerable effort is required in general awareness raising to increase appreciation of the WEF nexus concept and its applicability in addressing IWRM challenges.

- Focused capacity building is needed for the public and private sectors to produce a technical cadre capable of applying the WEF nexus concept in water resources development planning and infrastructure project preparation.

- Customised guidelines and tools are needed to enhance the application of the WEF nexus concept in water infrastructure project preparation.
- Application of the WEF nexus approach in project approach improves the attractiveness of projects to potential financiers as it demonstrates good practices and efficiency in scarce natural resource use.

- A tendency of sectoral actors to resist abandonment of the ‘silos thinking’ may work against the effective application of the WEF nexus concept in the region. Greater efforts are needed to promote integrated planning and increased coordination across disciplines and sectors.
5. URBAN

5.1 The relevance and current situation in Africa with respect to the ‘Urban’ theme

5.1.1 Urbanization

Urbanisation refers to the progressive shift in the population from rural to urban areas. Urbanization is one of the most significant trends in Sub-Saharan Africa at present, with rural populations migrating at unprecedented rates to urban hubs in search of employment and better social services (Hedrick-Wong and Angelopulo, 2011).

Urbanization is key to boosting productivity and economic activity in Sub-Saharan Africa. Shifting underemployed rural people to more productive employment in urban areas is fundamental to lifting productivity overall, which in turn constitutes a sustainable platform for future investment and growth. However, unless it is carefully planned and implemented, urbanisation has the potential to exacerbate already pressing problems including crime, lack of employment opportunities, electricity blackouts, low access to improved water supplies, low access to improved sanitation facilities, poor solid and liquid waste management, low access to affordable housing; poor infrastructure like roads and drainage facilities; poor health care and poor education services (Chenal, 2016).

5.1.2 Urbanization in Sub-Saharan Africa

Sub-Saharan Africa is the second least urbanized region in the world, after South Asia. Sub-Saharan Africa in 2016 had a population of 1.033 billion people, close to four tenths of whom (38.26%) were resident in urban areas (World Bank, 2017d). Across the continent the same year, Africa had 53 cities that had a population of one million and over (UN-Habitat, 2016).

But whereas the region is one of the least urbanized, Sub-Saharan Africa experiences the highest rates of urban population growth in the world. In the period 2010-2015, urban centers in Sub-Saharan Africa grew at an average annual rate of 4.01% – the highest for any region of the world (UN-DESA, 2014). Nineteen of the forty eight countries of Sub-Saharan Africa have annual urban growth rates above the region's average (Figure 13). By 2050, it is projected that more than half (56.5%) of Africa’s population will be residing in urban areas (UN-Habitat, 2014). Most of the urbanization in Sub-Saharan Africa over the next 30 years will occur in fast-growing small towns that lack mature infrastructure (Bahri et al. 2016). It is also projected that nine of the largest fifty cities of the world in 2050 will be located in Sub-Saharan Africa. The nine cities are Kinshasa, Lagos, Khartoum, Dar Es Salaam, Luanda, Nairobi, Addis Ababa, Abidjan and Kano (UOIT, 2017).

Rapid urbanisation is piling pressure on water resources, the capacity of the water supply system to deliver water in quantity and quality to all, and the capacity to manage increasing volumes of waste (JMP, 2015). In addition, changing urban landscapes are impacting local hydrological cycles and the environment by reducing natural infiltration processes, producing rapid peak storm water flows, and increasing wastewater discharges and solid waste generation. Rapid urban expansion is leading to increase in air, water and soil pollution...
from cars and factory exhaust gases, municipal and industrial waste water, and solid waste. Rapid urbanisation is also leading to rapid expansion of slums in the major cities. According to UN-Habitat, more than half (55.9%) of the urban population in Sub-Saharan Africa (about 220 million people) lives in slums where services and infrastructure are very poor (UN-Habitat, 2016).

5.1.3 Urban water and sanitation sub-sector performance in Sub-Saharan Africa

Institutional set-up for urban water management follows no consistent pattern in Sub-Saharan Africa. One important dichotomy is with respect to decentralization, with about one-third of countries (primarily francophone) retaining a single national water utility, and the remaining two-thirds (primarily Anglophone) having undergone some process of decentralization to local jurisdictions (Banerjee et al., 2008). Where service is centralized, a significant minority has chosen to combine power and water services into a single national multi-utility. The performance of the water utilities in Sub-Saharan Africa is generally low. Services in many African cities and towns are characterized by intermittent supplies, insufficient pressure, poor water quality, constant customer complaints, frequent breakdowns, inefficient operations, poor maintenance, politically-controlled low tariffs and low finance levels (Cross and Morel, 2008). Non-revenue water averages 32.7% (Figure 14), compared to a good-practice benchmark of 23.0% for developing countries (Banerjee et al., 2008). Labour productivity averages 12 employees per thousand connections, compared to a good-practice benchmark for developing countries of five employees. On average utilities just cover their operating costs, with an operating-cost-coverage ratio of 1.06, compared to a good practice benchmark of 1.3 for developing countries. Average collection efficiency is 86% of billings (Figure 14).

5.2 Past and ongoing initiatives and their achievements

5.2.1 Policy Framework

One of the policy statements under the AU’s flagship policy – Agenda 2063 – sets an aspiration with respect to the quality of services in African cities. The statement, found under Aspiration No 1, envisions a situation where “by 2063, Africa shall be a prosperous continent, with the means and resources to drive its own development, and where cities and other settlements are hubs of cultural and economic activities, with modernized infrastructure, and people have access to all the basic
necessities of life including shelter, water, sanitation, energy, public transport and ICT).

The relevant targets in the SDGs with respect to the ‘Urban’ theme are the following:

**Target 6.1**: By 2030, achieve universal and equitable access to safe and affordable drinking water for all.

**Target 6.2**: By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations.

**Target 6.3**: By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally.

![Graphs showing Key performance data for water and sewerage utilities in Sub-Saharan Africa based on latest data for the period 2004-2009](Source of data: Africa Infrastructure Knowledge Program Database)

**Target 6.4**: By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity.

**Target 11.5**: By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations.
Target 11.6: By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management.

11.b By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015–2030, holistic disaster risk management at all levels.

In the New Urban Agenda adopted in 2016 by the United Nations General Assembly following the United Nations Conference on Housing and Sustainable Urban Development (Habitat III), members of the General Assembly (who include Sub-Saharan Africa countries) committed themselves to working towards an urban paradigm shift for a New Urban Agenda that will: (a) readdress the way cities and human settlements are planned, financed, developed, governed and managed, recognizing sustainable urban and territorial development as essential to the achievement of sustainable development and prosperity for all; and (c) adopt sustainable, people-centred, age- and gender-responsive and integrated approaches to urban and territorial development by implementing policies, strategies, capacity development and actions at all levels, based on fundamental drivers of change.

The above policies guide the interventions being made in the region on urban water and sanitation development.

5.2.2 Urban sub-sector reforms

Widespread urban water sector reforms were carried out in Sub-Saharan countries in the 1990s, with the aim of addressing the above weaknesses, creating commercially oriented utilities, increasing private participation and investment, and bringing the sector under formal regulation. Corporatization is the most widely adopted reform measure and tool for increasing commercial orientation of the sector. In about half of the countries, some limited degree of private sector participation has been achieved.

In many of the countries, reforms have been underpinned by introduction of major new legislation and creation of regulatory bodies for the urban water and sanitation subsector. In the case of the majority of francophone countries, strong regulatory frameworks have been introduced without recourse to regulatory agencies. Around half of the countries have made reasonable progress in improving transparency of regulatory decisions based on the adoption of well-defined technical tools for regulation, while also achieving some degree of accountability. Notwithstanding, none of the countries has succeeded in achieving a significant degree of autonomy in regulatory decision making (Banerjee et al., 2008).

The limited success of private sector participation has led to a renewed focus on strengthening the corporate governance of public utilities. The prevalence of good governance practices remains relatively low, with little more than half of the utilities having some formal performance monitoring framework (such as a performance contract), a reasonably autonomous board of directors (including at least one independent member), and some level of managerial freedom in hiring and firing decisions (Banerjee et al., 2008).

5.2.3 Water and sanitation service provision in the face of rapid urbanization

Rapid urbanization in Africa imposes a major challenge for the expansion of improved water supply sources and sanitation facilities. Since the 1990s, access to improved water and sanitation services in urban areas has been on the increase. However, efforts to increase access to improved water and sanitation services in urban areas have not been enough to cope with the pace of population growth. Most of the population growth has occurred in peri-urban slum neighbourhoods, and utilities have not been able to extend their networks fast enough to cover the growing populations (Banerjee et al., 2008). As a consequence, the absolute numbers of people in urban areas without access to improved water and sanitation facilities has increased (Torres, 2012). The Figures 15 and 16 below show coverage levels for piped water and sewerage connections in the largest 53 cities in Sub-Saharan Africa.
Banarjee and Morella (2011) estimated the spending needs for Sub-Saharan Africa to meet MDG targets related to urban water and sanitation to be US $9.2 billion per year, which is 1.4% of the GDP of Sub-Saharan Africa. Close to two thirds of this figure (US$ 5.7 billion) is for operation and maintenance of urban water and sanitation systems. A similar level of spending is needed in the present day to keep pace with the fast rate of urbanisation and growth of demand for urban water and sanitation services.

5.2.4 Solid waste management in Sub-Saharan Africa

The volume of municipal solid waste generated in Sub-Saharan Africa is about 62 million tonnes per year, which is about 5% of global waste generation. Per capita waste generation is generally low in the region, but spans a wide range, from 0.09 to 3.0 kg/capita/day, with an average of 0.65 kg/capita/day (Hoornweg and Bhada-Tata, 2012). The countries with the highest per capita waste generation rates are island states, likely due to waste generated by the tourism industry, and a more complete accounting of all wastes generated. Solid waste generation in Sub-Saharan Africa is projected to rise to 161.3 million tonnes per year in 2025 (Hoornweg and Bhada-Tata, 2012).

Multiple methods of waste collection are used on the continent, including house-to-house collection; community bins/skips; self-delivery of garbage by generators, and contracted services. Less than half (48%) of the garbage generated in the cities in Sub-Saharan Africa is collected, although there is considerable variation in the performance of waste collection amongst the cities. The garbage collection rate of Sub-Saharan Africa is the lowest of the regions of the world, and compares unfavourably with the neighbouring Middle East and North Africa Region, where 85% of municipal garbage is collected and disposed (Hoornweg and Bhada-Tata, 2012). Close to sixtents (57%) of the municipal solid waste in Sub-Saharan Africa is comprised of compostable organic matter.

Despite the high content of organic matter in solid waste of the region, only a tiny fraction (1%) of the waste is composted. In contrast, only 27% of the garbage in the OECD countries is organic but 11.5% is composted. Similarly, the fraction of solid waste that is recycled in Sub-Saharan Africa is small relative to the other regions of the world.
The largest proportion of the garbage in Sub-Saharan Africa is disposed in open spaces, dumps and poorly prepared landfills where it has a high likelihood to cause pollution and poses a public health nuisance. Dumps and landfills account for 93.3% of solid waste disposal in Sub-Saharan Africa. In contrast, no dumping is practiced in the OECD countries, and landfills account for 42.2% of waste disposal in these countries (Figure 18).

Figure 16: Proportion of households in major Sub-Saharan Africa cities with sewerage connections (Source of data: UN-Habitat, 2016).

Figure 17: Composition of municipal solid waste in Sub-Sahara Africa and OECD countries (Source: Hoornweg and Bhada-Tata, 2012).
5.2.5 Storm Water Management in Sub-Saharan Africa

Low-lying districts in most cities in Sub-Saharan Africa periodically suffer from flooding due to poor storm water management. The factors behind this situation are wide ranging, and include location of cities in areas vulnerable to flooding; inadequate storm water drains; poor operation and maintenance of storm water facilities; frequent blockage of drains from disposal of solid and liquid wastes in drains; human settlement in flood-prone areas; reduction of green spaces and conversion of open land meant for flood absorption into built-up areas; increase in proportion of paved and impervious surfaces; poor urban planning; weak policy and legal framework for urban management; weak enforcement of laws and regulations concerning urban development; weak coordination between stakeholder institutions; low budgetary allocations to storm water management, and impacts of climate change.

The effects of poor municipal storm water management include displacement of people and businesses; damage to private property and public infrastructure like roads, bridges, power lines, telecommunication lines, water supply facilities; etc.; loss of human lives; water pollution; and spread of water borne diseases. Urban flooding affects all city dwellers but has a disproportionately larger impact on the urban poor and slum dwellers. The poor neighbourhoods in cities typically have poor drainage facilities; poor sanitation, poor quality housing and high congestion, which make them extremely vulnerable to impacts of urban flooding.

Flooding in cities across Sub-Saharan Africa has increased in frequency and severity since the 1990s due to the impacts of global climate change. The cities most affected by climate-change induced flooding include Kano, Lagos, Freetown, Niamey, Bangui, Brazzaville, Kinshasa, Luanda, Malabo, Dar Es Salaam, Kampala, Kigali and Maputo (UN-Habitat, 2014).

Figure 18: Solid waste disposal methods in Sub-Saharan Africa and the OECD Countries (Source: Hoornweg and Bhada-Tata, 2012).
5.3 Gaps, challenges and opportunities

5.3.1 Challenges of urban water and sanitation service provision

The main challenges that African cities face in providing water and sanitation services are the following (Torres, 2012):

1. Increasing water stress and scarcity: The demand for water is rising rapidly across Sub-Saharan Africa driven by multiple factors including population growth, expanding agriculture, industrialization, economic growth, expansion of the middle class and increased spending power of the population. This rise in demand is leading to increasing water withdrawals and water overuse evidenced by the drying up of rivers, drop in groundwater tables, decline in water-based ecosystems and conflicts amongst water user groups (UNDP 2006). At the continental level, domestic water use accounts for only 21.6% of total water withdrawals, with 73.3% being used for agriculture and 5.1% used by industry. Despite the relatively low level of domestic water demand, the ability of governments to meet the rising demand for cities is being affected by the unsustainable nature of rising total water withdrawals, and a number of cities are suffering from water shortages.

2. Climate change: Africa has experienced a strong warming trend over the last 100 years (Niang et al., 2014). The change in climate is producing a number of impacts, including an increase in the frequency of floods and droughts that lead to widespread water pollution and increasing costs of water treatment, damage to water and sanitation infrastructure, and acute shortage and rationing of water. In water scarce areas, extended dry periods are increasing the vulnerability of shallow groundwater systems, roof rainwater harvesting, and surface waters (Bahri 2012).

3. Aging and deteriorated existing urban water and sanitation infrastructure: In Sub-Saharan Africa, much of the infrastructure for water and sanitation (including water sources, water treatment plants, water storage tanks and reservoirs, water distribution systems, wastewater treatment plants and sewerage systems) has exceeded its design period, and is in a poor state of functionality due to years of neglect. Due to lack of regular maintenance schedules, lack of knowledge of specific classes of assets, insufficient data on the value (and extent) of the infrastructure assets and lack of an efficient support tools for managers and decision makers, the assets have not received the needed attention for maintenance and replacement. This situation threatens the quality and reliability of water and sanitation services, increases the level of non-revenue water, decreases service access levels, and decreases the continuity and sustainability of water.
and sanitation services. But the cost of rehabilitating the infrastructure is substantial, estimated at over US$2.16 billion per year for Sub-Saharan Africa (Banerjee and Morella, 2011). It has been difficult for countries to set aside funds for repairing and maintaining existing systems given the demand for extension of services to a still large unserved population in urban and rural areas.

4. **High investment requirement for expansion of water and sanitation infrastructure**: A substantial amount of investment is needed to address the rise in demand for water and sanitation services from population expansion and economic growth. The total amount of investment required for expansion of infrastructure in Sub-Saharan Africa is estimated to be US$3.6 billion per year (Banerjee and Morella, 2011). If this investment is not made in a timely manner, the figures will rise significantly in the coming years due to the combined effect of infrastructure ageing, and increasing numbers of urban dwellers without access to improved water supply.

5. **Financing Gap**: Related to the above factor, there is a substantial gap between the level of financing that countries, with the support of development partners, are able to raise; and the financing needed to expand water and sanitation services in step with the rise of population and demand for water and sanitation services in urban areas.

6. **High operational and financial inefficiencies**: The performance of many water and sewerage utilities in Sub-Saharan Africa is poor as elaborated above. Gains from improving operational and financial efficiency could translate into lower operational costs and higher operational revenue, which in turn could free resources that could be used for asset rehabilitation and service coverage expansion.

7. **Poor governance arrangement**: Urban water governance arrangements are poor, characterised by a lack of coordination between departments responsible for water resource management, water supply, sanitation, storm water management, as well as between sectors such as water, housing, transport, energy, green development and urban planning. This lack of good governance is compounded by a shortage of new investments in institutional and human capacity development.

8. **Lack of data**: There is inadequate data on virtually all aspects of the operations of water and sewerage utilities. This impacts on ability to properly manage the services.

9. **Watershed degradation**: Water catchments in the neighbourhood of cities, some of which are sources of water used to supply cities, are undergoing rapid degradation thereby threatening the sustainability of city water supplies (Nature Conservancy, 2016). Progress in catchment conservation has remained slow to date.

5.3.2 Potential strategies for addressing Urban Water and Sanitation Challenges

Potential strategies for addressing the water and sanitation challenge in urban areas include the following:

1. **Climate change adaptation**: Building resilience into urban water and sanitation systems to enable them cope with impacts of global climate change through e.g. increasing redundancies in the system; introducing technology that is better able to cope with new stresses; carrying of risk and vulnerability assessments of urban water and sewerage systems; and introducing the use of Water Safety and Security Plans and Emergency Response and Recovery Plans for urban water and sewerage utilities.

2. **Increasing water use efficiency**: Increasing efficiency of water use through introduction of water efficient technologies in agriculture, industry and domestic water supply; carrying out repairs and rehabilitation to reduce non-revenue water; carrying out demand management through economic tools such as awareness creation; and recycling and re-using water, especially in agriculture and industry.

3. **Prioritize rehabilitation works**: Setting aside funds to allow for rehabilitation of existing water and sanitation infrastructure in a phased manner.

4. **Innovative financing models**: Identifying and tapping non-traditional sources of financing for water and sanitation infrastructure such as commercial banks, corporate bonds, equity markets and public-private partnerships (though e.g. service contracts and management contracts).

5. **Capacity building**: Undertaking training of staff of water and sewerage utilities with the aim of improving operational and financial efficiency.

6. **Urban sector reform**: Continuing and completing ongoing reform of the urban water and sanitation subsector in Sub-Saharan Africa to improve public accountability, operational and financial efficiency; and environmental sustainability.
7. **Pro-poor strategies:** embracing pro-poor strategies that aim to extend service to the urban poor through targeted interventions and broader actions at the municipal level, including: offering households a menu of service options, with differentiated costs that reflect their willingness to pay; establishing appropriate pro-poor tariffs and subsidies; expanding the choice of service providers; and increasing hygiene awareness through social marketing as a means to improving health and sanitation (Cross and Morel, 2008).

8. **Integrated urban Water Management:** Rolling out the Integrated Urban Water Management approach, which address the multiple challenges facing the sector in a coordinated manner, to cities across Sub-Saharan Africa.

### 5.3.3 Opportunities

There are a number of opportunities for addressing the above challenges. These include ongoing urban sector reforms, and new urban water programs that advocate an integrated approach to urban water and sanitation management.

### 5.3.4 The Integrated Urban Water Management (IUWM) Concept

Most cities in Africa are expected to experience rapid urbanization in the coming decades leading to growing demands for water services and putting mounting pressure on local and distant water resources, and on the capacity of the water supply and sewerage systems to manage ever increasing volumes of water and wastewater. Traditional models of urban planning and water management have shown their limitations in terms of financial profitability, technical performance, social equity, environmental sustainability and ability to cope with impacts of climate change. Therefore, there is a need for a paradigm shift that goes beyond conventional performance indicators and promotes innovative ways of managing water and wastewater in an urban setting. Torres (2012) argues that the traditional approach of one source, one system, and one discharge cannot close the water gap. A more integrated, sustainable, and flexible approach that takes into consideration new concepts such as water fit to a purpose, is needed in African cities.

The Integrated Urban Water Management (IUWM) Concept (GWP, 2013) is this new approach and framework. Among other things, the IUWM approach:

- advocates management interventions to cover the entire urban water cycle, extending to parts of the watershed outside of the urban area;
- changes the way in which water resource availability is assessed, going from only considering surface and groundwater sources, to also considering rainwater harvesting, and gains from water demand and non-revenue water management;
- recommends for municipal liquid and solid waste to be viewed as valuable resources with potential for use in irrigation, urban agriculture, organic fertilizer production, aquaculture and biogas;
- emphasizes a multi stakeholder approach for better coordination and involvement of key stakeholders at all levels, including women and community groups;
- gives serious consideration to introduction of decentralized systems for service provision that are more adaptive to change and respond better to local needs need;
- recommends greater use of natural systems or green infrastructure for water and wastewater treatment; and
- places greater emphasis to the role of urban water management in building resilience to climate change.

The Concept is being piloted across Africa through the Programme for Urban Water Security and Sustainable Development in Africa (PUWSD).

---

**Table 7: Comparing and contrasting conventional and IUWM approaches**
**Conventional approach** | **Conventional approach**
---|---
Waste, sanitation and stormwater = nuisance | Waste, sanitation and stormwater = resource
Sources of water: surface and groundwater | Alternative sources: Surface water, groundwater, rainwater, wastewater, stormwater
Same water quality for all uses | Matching quality with intended use
Municipalities focusing on accounting | Municipalities focusing on value creation, business opportunities, job creation, economic benefits
Grey infrastructure | Green and grey infrastructure
Centralized systems | Approach by clusters, decentralized systems
Linear approaches to collect, treat, use and discharge | Circular approaches - water, energy and resource recovery
Fragmented institutions | Coordinated management
Top down planning | Involvement of key stakeholders at city and basin levels

**CASE STUDY 12: The Programme for Urban Water Security and Sustainable Development in Africa (PUWSD)**

The Programme for Urban Water Security and Sustainable Development in Africa (PUWSD) is a new African initiative running from 2016-2020 premised on the IUWM principles. The objective of PUWSD is to support integration of urban water security in development planning and decision making processes, through enhanced technical and institutional capacity and investments in resilience building and sustainable development. The ultimate aim is to ensure the provision of equitable and sustainable water supply and sanitation services, and to contribute to the achievement of urban water-related Sustainable Development Goals. The Programme was developed by the Global Water Partnership (GWP) in partnership with the African Water Facility (AWF).

The Programme comprises six projects covering six Africa countries. Each project, financed by the Africa Water Facility, features multiple components, including a component on preparation of an Urban Water and Sanitation Master Plan following the IUWM approach; a component on preparation of catalytic investment projects to build early confidence and demonstrate the value addition of IUWM to local water and sanitation management approaches; and a component on training and awareness raising to build capacity on IUWM. Project implementation is following a highly participatory approach to ensure balanced input from government agencies, municipal authorities; businesses, the urban poor, civil society organisations and development partners during the masterplan development process. In a second phase of the project, another six cities in Africa, including Addis Ababa, Abidjan and Douala, will be supported to address water and sanitation challenges. Key facts on the six ongoing projects are presented below.

**Table 8: The six ongoing projects under the PUWSD Program**

<table>
<thead>
<tr>
<th>Country and Project</th>
<th>Components</th>
<th>Budget (€ million)</th>
</tr>
</thead>
</table>
| Project: Development of the IUWM Master Plan for West Kinshasa | • IUWM Master Plan development  
• Feasibility study for water supply project in Kinshasa west  
• Capacity building | 2.5 |
| Country: DR Congo | | |
| Project: Development of Sanitation Master Plans for 8 urban cities | • Sanitation Master Plan for major urban areas  
• Preparation of bankable investment projects based on integrated water and waste management approach and likely to contribute to their resilience to climate change | 1.9 |
| Country: Madagascar | | |
| Project: Development Plan and Feasibility Study for Urban Sanitation, Drainage and Solid Waste | • Preparation of an Urban Sanitation, Drainage and Solid Waste Development Plan  
• Preparation of a detailed design and ESIA for priority investment projects | 1.8 |
### Country and Project Components

<table>
<thead>
<tr>
<th>Country and Project</th>
<th>Components</th>
<th>Budget (€ million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management in Chimoio and Inhambane</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Country: Mozambique</td>
<td>• Preparation of an Integrated Sanitation Master Plan for Seychelles</td>
<td>1.1</td>
</tr>
<tr>
<td></td>
<td>• Resource mobilization for sanitation projects prioritized in the Master Plan</td>
<td></td>
</tr>
<tr>
<td>Project: Integrated Sanitation Master Plan for the Seychelles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Country: Seychelles</td>
<td>• Preparation of an Integrated Urban Water Management Master Plan that includes scenarios, detailed technical designs and an investment plan</td>
<td>2.3</td>
</tr>
<tr>
<td></td>
<td>• Capacity building of relevant stakeholders</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Preparation of a Sub-catchment management plan for the Marondera area</td>
<td></td>
</tr>
<tr>
<td>Project: Developing an Integrated Urban Water Management Master Plan for Marondera Municipality</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Country: Zimbabwe</td>
<td>• Preparation of an Freetown Water and Sanitation Master Plan</td>
<td>2.9</td>
</tr>
<tr>
<td></td>
<td>• Prepared of prioritized short-term investment projects</td>
<td></td>
</tr>
<tr>
<td>Project: Greater Freetown Water Supply and Sanitation Master Plan and Investment Studies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Country: Sierra Leone</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Kinshasa, DR Congo. One of the cities targeted for support under the PUWSD Program (source: www.africajumpstart.com)
Support to the city of Kinshasa under the PUWSD Program

Kinshasa is a city with a high population growth rate (5%) and a population estimated around 10 million in 2014, which is projected to increase to between 14 and 17 million by 2030. Although the city is built along the Congo River, drinking water is sourced from several small rivers and groundwater in some suburban areas.

Drinking water supply services for most parts of the city are provided by REGIDESO – a public utility company. Access to safe water supply for the city stands at 64%, with about 10% of inhabitants being served by small autonomous service systems managed by user associations. The production of drinking water in the areas serviced by REGIDESO falls short of the daily demand by 300,000 m³. The water shortage is far larger when areas outside the service area of REGIDESO are considered. The water requirement in the next 10 years is projected to rise to 1.2 million m³/day, which is slightly more than 2 times the current level of production.

Regarding wastewater and excreta management, Kinshasa has a largely non-operational sewer system dating from the pre-independence period. Septic tanks and latrines are traditional systems currently used, and open defecation practices are still common in the peri-urban areas. The emptying of septic tanks is done by private operators who discharge faecal sludge directly into the rivers. It is estimated that nearly 70% of solid waste are found in uncontrolled landfills, mostly at the level of river banks.

Give the above challenges and the limited ability of conventional approaches to solve, the city of Kinshasa is turning to the IUWM approach which offers a holistic approach to water management and sanitation, and the possibility to make the management of liquid and solid waste an income-generating productive activity. The Government of the DR Congo has requested the support of AWF for the preparation and development of an IUWM Master Plan for the city of Kinshasa and a feasibility study for the drinking water supply in the Western part of the city, where around 3.5 million people live without adequate water facilities. The expected duration of the project is 30 months and its total cost is 2.46 million euros of which 76% (1.875 million euros) is funded by the AWF, 15% by the GWP and 9% as contribution from the Government of the DR Congo.
Support to the city of Freetown under the PUWSD Program

In 2012 Sierra Leone experienced a severe outbreak of cholera that affected over 5,000 people and caused 63 deaths. The outbreak brought into sharp focus the issue of poor sanitation on low safe water coverage in the city.

Water services in Freetown are provided by Guma Valley Water Company (GVWC), a public utility owned by the Government and Freetown City Council. The average daily water production of GVWC is approximately 70,000 m³, which is roughly half of the daily demand estimated at 130,000 m³. Due to this huge deficit, water is rationed in many areas in the city, with almost no customers getting 24-hour supply. In the peri-urban areas and the densely populated poor sectors, customers receive supplies once a week or none at all.

In terms of the proportion of the population served, the city has met the national targets of 74% and 66% for safe water supply and sanitation respectively. However, these figures mask the serious problems related to the unreliable, and poor quality service, and the poor state of the physical infrastructure for water and sanitation. The Guma Valley dam and distribution network were designed for approximately 300,000 people but at present it serves a population of about 1 million expected to rise to 22 million in the near future. The entire system is aged and of insufficient capacity to serve current demands. The majority of the distribution network dates mostly from 1961, with only one pressure zone for the entire network. About 300 to 400 leakages are reported and repaired per month, but many go unattended leading to high non-revenue water.

With regards to water resources, the current and potential future catchments are located in the Western Area Protected Forest Reserve which has sufficient potential to meet current and future water demands. However, the catchments are threatened by erosion/degradation, inadequate land use management, and construction on publicly owned land, including GVWC assets.

With these serious problems, the Government of Sierra Leone has approached the African Water Facility for support in preparation of a project to address the water and sanitation challenges of the city following an IUWM approach. The project is estimated to cost just under €2 million of which 66.8% will be grant finance provided by AWF, 23.5% another grant from DZB and 9.7% as contribution from Guma Valley Water Company.

The project is expected to prepare a water and sanitation masterplan for Freetown based on the IUWM Concept. It will also prepare priority investment projects in water and sanitation, including rehabilitation and expansion of the current water supply system, and extension of water and sanitation services to new areas such as the proposed new airport and satellite city.

CASE STUDY 13: Sustainable Water And Sanitation In Africa (SUWASA) Program

Urban growth across much of Sub-Saharan Africa is generating considerable pressure on public and private utilities to provide safe and reliable water and sanitation services. The municipal water and sewerage infrastructure of many African cities also faces daunting challenges from age, lack of maintenance, or difficulty of connecting communities that lack water and sanitation access.

To assist the region in addressing these challenges, the United States Agency for International Development (USAID) implemented the program on Sustainable Water And Sanitation In Africa (SUWASA) from 2009 to 2015. SUWASA was a US$41.4 million initiative to improve and expand the delivery of water and sanitation services in urban and peri-urban areas, and achieve long-term financial viability and institutional sustainability of the urban water and sanitation subsector. SUWASA was not designed to provide substantial new access to water and sanitation facilities or to support major new investments in infrastructure in the sector. Rather, SUWASA was designed to support, demonstrate, and promote new ways of operating in the sector that would improve sector efficiency and build a path to sustainably enable water services providers themselves to deliver better service to their customers. Technical assistance was supplemented with limited financial support for infrastructure improvements and commodity procurements to support the success of reform initiatives.

The SUWASA Program implemented 17 projects falling in nine Sub-Saharan countries in the six years of its duration. The beneficiary countries were Ethiopia, Kenya, Liberia, Mozambique, Nigeria, South Sudan, Senegal, Uganda and Zambia. The interventions covered five key themes, namely:

a. Sector reforms: promoting autonomy and accountability of service providers through policy, legal, and institutional reforms;

b. Regulatory reforms: promoting definition of clear regulatory frameworks, appropriate tariff setting...
mechanisms, performance monitoring, and benchmarking;

c. **Commercial financing:** developing investment finance strategies and facilitating commercial finance based on sound project design and financial analysis that incorporates effective risk-mitigation measures;

d. **Utility reforms:** developing and implementing performance improvement plans to increase the utilities’ operations and financial sustainability; and

e. **Sanitation reforms:** promoting citywide approaches to FSM, institutional strengthening, and investment planning.

Though fundamentally a sector reform project, SUWASA assistance resulted in 64,937 people gaining new access to an improved drinking water source and 117,336 people receiving improved service quality from an improved drinking water source, funded through contributions from the Small Investment Program (SIP) and through commercial financing arrangements. A summary of the interventions in the nine countries is indicated below.

<table>
<thead>
<tr>
<th>Country and Project</th>
<th>Key activities</th>
</tr>
</thead>
</table>
| **Country: Ethiopia**  | • Developing a new tariff policy and structure for the water supply;  
                          • Developing a framework for the management of water kiosks;  
                          • Upgrading billing and accounting systems to reflect best practice  
                          • Developing a strategic business and investment plan for HTWSSE.  
                          • Introducing performance improvement activities, including human resource management, asset management, and performance contracts. |
<p>| <strong>Project:</strong> Support to HAWASSA Water Supply and Sanitation Services Enterprise (HTWSSE) | |
| <strong>Country: Kenya</strong>  | • Piloting the pre-paid meter model of water service provision for low-income areas of Nakuru. |
| <strong>Project:</strong> Nakuru prepaid meter pilot project. | |
| <strong>Country: Kenya</strong>  | • Piloting a commercial financing model to support house connections for low-income residents in Kisumu | <strong>Project:</strong> Kisumu piped water extension pilot project. |
| <strong>Country: Kenya</strong>  | • Supporting water service providers to develop bankable investment proposals |</p>
<table>
<thead>
<tr>
<th>Country and Project</th>
<th>Key activities</th>
</tr>
</thead>
</table>
| **Project:** Commercial utility finance. | • Supporting the Water and Sanitation Trust Fund to facilitate commercial financing approaches for water infrastructure.  
• Working with commercial banks to develop tailored products for lending to water service providers.  
• Developing a model gender mainstreaming strategy for water utilities |
| **Country:** Liberia  
**Project:** Support for economic regulation for urban water sector. | • Assisting the Liberia Water and Sewer Corporation (LWSC) to develop a tariff-setting methodology based on accurate accounting of the actual cost of water services in small towns;  
• Complementing the USAID/Liberia Municipal Water Project in restoring piped water service in Robertsport. |
| **Country:** Mozambique  
**Project:** Development of licensing and regulatory framework for private water operators. | • Developing a licensing and regulatory framework for private water providers (FPAs) operating in the Maputo metropolitan area  
• Developing a communications strategy to support implementation of the new licensing and regulatory framework  
• Carrying out the first comprehensive georeferenced inventory of existing FPAs, water systems and water connections in Maputo and Matola |
| **Country:** Nigeria  
**Project:** Urban water sector-wide reform for Bauchi State. | • Designing and supporting the establishment of a regulatory unit for water and Sanitation services under the Ministry of Water Resources and Rural Development.  
• Developing an infrastructure investment plan for urban water and sanitation  
• Leveraging US$65 million in investment finance from the World Bank for water and sanitation infrastructure development.  
• Building the state’s capacity for water quality monitoring, including the provision of basic laboratory testing equipment. |
| **Country:** Nigeria  
**Project:** Support to Bauchi State Water Board. | • Designing and supporting the transformation of Bauchi State Water Board to Bauchi State Water and Sewerage Corporation (BSWSC)  
• Developing a strategic plan for BSWSC underpinned by financial sustainability and improved customer care  
• Supporting the establishment of a Water Operators Partnership between BSWSC and Swaziland Water Services Corporation (SWSC) |
| **Country:** Nigeria  
**Project:** Ebonyi State – Water sector reforms. | • Supporting the establishment of the Board of Directors for Ebonyi State Water Corporation (EBSWC)  
• Designing and supporting the establishment of a regulatory unit for water and Sanitation services  
• Introducing commercial approaches to water service provision based on recovery tariffs and improved customer care.  
• Upgrading and computerising the EBSWC billing and accounting system.  
• Supporting the establishment of a Water Operators Partnership between EBSWC and Lusaka Water and Sewerage Corporation (LWSC) |
| **Country:** Nigeria  
**Project:** Rivers State – Water sector reforms. | • Supporting the establishment of the Rivers State Water Services Regulatory Commission (RWSRC), and Rivers State Small Towns Water and Sanitation Agency (RSSSTOWA);  
• Supporting capacity building for management of water infrastructure projects  
• Initiating use of computerized billing and accounting systems, and strengthening internal controls in Port Harcourt Water Company (PHWC).  
• Supporting the establishment of a Water Operators Partnership with the Nairobi Water Company to encourage peer-to-peer learning |
| **Country:** Senegal  
**Project:** Improved faecal sludge management services and oversight in selected communities. | • Conducting an assessment of the status of Faecal Sludge Management (FSM) in the Municipality of Tambacounda, including onsite storage, emptying, transportation, and disposal facilities and practices;  
• Developing a plan for FSM in Tambacounda municipality, including infrastructure investments needed by public and private operators and agencies; |
### Country and Project
<table>
<thead>
<tr>
<th>Country</th>
<th>Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Sudan</td>
<td>Urban water sector-wide reform for South Sudan.</td>
</tr>
<tr>
<td>South Sudan</td>
<td>Support to Wau water station.</td>
</tr>
<tr>
<td>South Sudan</td>
<td>Support to Maridi water station.</td>
</tr>
<tr>
<td>South Sudan</td>
<td>Juba Sanitation Project.</td>
</tr>
<tr>
<td>Uganda</td>
<td>Support for establishment of an autonomous water regulatory agency.</td>
</tr>
</tbody>
</table>

### Key activities

<table>
<thead>
<tr>
<th>Country: South Sudan</th>
<th>Urban water sector-wide reform for South Sudan.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project:</strong> Support to Wau water station.</td>
<td></td>
</tr>
<tr>
<td><strong>Project:</strong> Support to Maridi water station.</td>
<td></td>
</tr>
<tr>
<td><strong>Country:</strong> South Sudan</td>
<td></td>
</tr>
<tr>
<td><strong>Project:</strong> Juba Sanitation Project.</td>
<td></td>
</tr>
<tr>
<td><strong>Country:</strong> Uganda</td>
<td></td>
</tr>
<tr>
<td><strong>Project:</strong> Support for establishment of an autonomous water regulatory agency.</td>
<td></td>
</tr>
<tr>
<td><strong>Country:</strong> Zambia</td>
<td></td>
</tr>
<tr>
<td><strong>Project:</strong> Support to National Water Supply and Sanitation Council.</td>
<td></td>
</tr>
</tbody>
</table>

- Supporting Senegal’s national sanitation agency (ONAS) in implementing a computerized call center for real-time tracking and deployment of private sector desludging trucks in the Dakar metropolitan area.

- Supporting the establishment and commissioning of the Board of Directors for the South Sudan Urban Water Corporation (SSUWC);

- Supporting the development of the first SSUWC Corporate Plan including corporate vision, mission, and strategies.

- Supporting the establishment of a Water Operators Partnership between SSUWC and Uganda’s National Water and Sewerage Corporation (NWSC)

- Supporting the preparation of technical papers on the water and sanitation sector

- Jump-starting water services in Wau and Maridi following months of no services

- Through small infrastructure investments, improving services for the existing customer base and adding new connections for unserved residents.

- Developing new billing systems for the two towns based on the Juba model

- Supporting the establishment of a water management committee in each town to encourage stakeholder participation

- Developing and launching the Juba Sanitation Reform and Investment Plan in collaboration with the Sanitation Working Group

- Developing a billing system for Juba Water System.

- Designing the institutional framework for a new autonomous body – the Uganda Water and Sewerage Regulatory Authority (UWASRA)

- Developed a roadmap for the establishment of UWASRA

- Producing a comprehensive analysis on lessons learned from private financing for water infrastructure in small towns based on the Design-Build-Operate/Output-Based Aid (DBO/OBA) approach.

- Developing a cost-of-services model for tariff review by Zambia’s water services regulator – the National Water Supply Sanitation Council (NWASCO);

- Supporting NWASCO finalize Guidelines on Tariff Setting and prepare a handbook on the Cost-of-Services Model
5.4 Key lessons and good practices from Africa to the world

5.4.1 Lessons from introduction of the IUWM Concept in Sub-Saharan Africa

Lessons learnt so far from implementation of the IUWM approach under the program are the following (GWP and AWF, 2016):

- Countries and municipalities are showing positive response to the initiative, and are eager to engage
- Effective involvement of broad range of stakeholders is crucial to success of urban water and sanitation interventions
- Strong political leadership and commitment is key starting point to initiate change
- The IUWM concept provides holistic and coordinated approach to city's development
- Technical assistance, capacity building and coaching activities are essential interventions alongside other technical interventions under the IUWM approach.
- Across Africa there is high demand for change but capacity of actors to respond is clearly insufficient
- The IUWM initiative has strong scaling up potential.

5.4.2 Lessons learnt from SUWASA

The key lessons from SUWASA are the following (USAID, 2015):

a. **Sector reforms.** Deep understanding is required of the political systems at national, regional, or local governments levels and the constraints they place on sector reform. Creativity and flexibility in approach is required when dealing with the bureaucratic and protracted processes of advocating and mobilizing stakeholders for policy, legal, and institutional reforms that promote autonomy and accountability.

b. **Regulatory reforms.** Regulatory reforms tend to get mired in bureaucratic legislative processes which are slow and difficult to advance. Regulatory reform activities require much longer gestation periods than other types of project interventions, and are subject to political processes that do not lend themselves to interventions with relatively rigid and short timeframes.

c. **Commercial financing.** New ways are needed to bridge the sector's financing gap, along with reforming sector governance and improving financial viability of utilities. There are emerging opportunities for utilities to tap domestic financial markets for sector investments and to complement dwindling public resources for the sector. Access to commercial financing can be a powerful incentive for water utilities to reform and improve performance, particularly with the focus on improved governance and improved internal generation of resources.

d. **Utility reforms.** Successful utility reforms must be driven by commercial approaches to improving performance and financial viability. Without financial viability, providers are not able to service either existing or new populations, and consequently governments are forced to provide operating subsidies. Investments without reform do not yield sustainable service improvements while reform without investments is unlikely to bear expected fruits. Achieving financial viability often takes several years and requires a multifaceted strategy. Focusing on Performance Improvement Plans and upgrading business systems (including billing, accounting, and customer information systems) in line with overall corporate planning has been shown to be a highly effective utility reform approach.

e. **Sanitation reforms.** Unclear and complex institutional structures and lack of a clear institutional home for sanitation hinder progress on urban sanitation in Sub-Saharan Africa and often results in completely unregulated private sector sanitation services. In many countries, urban sanitation reform lags far behind water supply. Commonly, mandate for sanitation lies with institutions that have neither the technical capacity nor presence on the ground while technically competent institutions do not have the legal mandate to engage in sanitation activities. In many countries, the private sector plays a significant role in sanitation, especially in Faecal Sludge Management. However, this role is neither properly recognized nor regulated.

**BOX 6: Water and Cities in Southern Africa**

The southern African sub-region is the continent’s most urbanized sub-region after Northern Africa. In 2011 only 3 countries—Angola, Botswana and South Africa—had urban majorities, with 59.2% 61.7% and 62.0% of the country populations residing in urban areas. By 2050, an additional six countries (DR Congo, Lesotho, Mozambique, Namibia, Tanzania, Zambia and Zimbabwe) are expected to have attained urban majorities (UN-Habitat, 2014).

While all part of the same region, cities located along the coastline, and those located further inland, encounter distinctly different climatic and environmental challenges. Coastal cities are under constant threat from sea level rise, coastal erosion, flooding, salt water intrusion of freshwater aquifers, water scarcity and serious consideration for sea water desalination. Cities that lie further inland may experience higher or lower rainfall than their coastal counterparts as well as higher temperatures, heat waves, flooding or acute water scarcity. Windhoek faces the toughest water scarcity challenge of all southern African countries, and has tried to cope by launching a strong demand management drive and recycling wastewater.
Challenges facing urban planners in the sub-region are numerous and include sprawl (uncontrolled expansion); substantial housing backlogs; poverty and inequality; segregation; slum and informal settlement proliferation; solid waste accumulation; poor stormwater drainage; inadequate infrastructure; and poor service provision. The PUWSD program provides an important opportunity for addressing some of the urban water and sanitation challenges in Southern Africa. Four of the first six projects in the program are from the SADC Region.
6. ECOSYSTEMS

6.1 The relevance and current situation in Africa with respect to the ‘Ecosystems’ theme

6.1.1 Issues related to the theme

An ecosystem is a community of living organisms existing in conjunction, and interacting, with the non-living components of their environment (which comprises things like air, water, light and mineral soil) (Tansley, 1935). Ecosystems are regarded as the ‘basic units of nature’ and are of the various kinds and sizes.

One of the characteristic features of ecosystems is the biodiversity that they support. Biodiversity is defined as “the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.” (Millennium Ecosystem Assessment, 2005). Biodiversity contributes to many elements of human well-being, including security, basic material for a good life, health, good social relations, and freedom of choice and action both directly (through provisioning, regulating, and cultural ecosystem services) and indirectly (through supporting ecosystem services).

Aquatic ecosystems, are among the important ecosystems in Sub-Saharan Africa, and provide a wide range of goods and services, the exploitation of which supports livelihoods for millions of people in the region. In recent decades, human pressure on rivers, lakes, wetlands and other water-related ecosystems in the region has been rising steadily, not only threatening biodiversity but also the many essential goods and services that healthy freshwater ecosystems provide to society, including the provision of clean drinking water on which life is dependent.

Balancing the water needs for humans and ecosystems is a major challenge for modern society. Restoration of hydrological connectivity and the identification and provision of environmental flows for river and wetland systems can make an important contribution to achieving this balance. Cost-effective approaches combining grey and green infrastructure to reduce water pollution are needed, not only for urban and industrial sources but also to minimize the delivery of sediment, nutrients and other contaminants from diffuse sources. Improving resilience of catchments and waterways to extreme weather events will also become increasingly important in the face of a changing climate and growing population. New strategies and tools are needed to quantify the full costs and benefits of these actions to society, and to effectively communicate these values to decision makers and the broader community.

The ‘Ecosystem’ theme will be used to assess the status of Africa with respect to these challenges and identify ideas and actions that can be taken up in the post-forum period.

6.1.2 African ecosystems

Africa has five main kinds of ecosystems: coastal environments; deserts and semi-deserts; mountain environments; savanna grasslands; and forests. These ecosystems closely mirror Africa’s climatic zones. Under each of these main types there are a number of sub-units as shown in the figure below. Each ecosystem has its typical environment and climate, and the people that live there have adapted to its conditions and learned to use its resources.

Figure 19: The main ecosystems of Africa (Geography, 2017)

Africa is endowed with a highly diverse fauna and flora. The continent is habitat to about a fifth of all known species of plants, mammals and birds in the world, and a sixth of the amphibians and reptiles. The continent is home to more than 50,000 known plant species, 1,000 mammal species, and 1,500 bird species (UNEC/UNIDO, 2006). Africa contains over 3,000 protected areas including 198 marine protected areas, 50 biosphere reserves, and 80 wetlands of international importance (Devisscher, 2010).
6.1.3 Decline in Sub-Saharan Africa’s ecosystems

All of Africa’s ecosystems have been markedly transformed through anthropogenic activities. Ecosystems in Sub-Saharan Africa started to undergo significant transformation around the turn of the 20th Century under colonial administrations, and experienced great acceleration in transformation rates in post-colonial administrations, in the last quarter of the 20th Century. Sub-Saharan Africa’s tropical rainforests have been cut down for timber and its savannah grasslands, woodlands and other biomes have suffered equally, being cleared to make way for agricultural land and human settlements. By 2005, it was estimated that half of Africa’s most biologically rich terrestrial areas lost more than 50% of their area due to cultivation, degradation or urbanisation (Millennium Ecosystem Assessment, 2015). While the increase in cropland in places such as North America and China has stabilised, in Sub-Saharan Africa it is still on the increase.

The population size and range of Africa’s mammals is on the decline due to habitat alteration, fragmentation and destruction, and by poaching. Species that used to roam large parts of the continent have become locally extinct in many parts, and many species are threatened with total extinction. The spread of invasive species across the continent is contributing to the decline of native species.

A number of large dams were constructed on the major rivers of Sub-Saharan Africa in the 1950s to 1960s and resulted in reduced water flows to the ocean leading to loss of mangrove forests on the estuaries of the major rivers.

6.1.4 Factors driving the decline of Sub-Saharan Africa’s ecosystems

The drivers of loss of biodiversity and of changes in ecosystem services are either steady, show no evidence of declining over time, or are increasing in intensity. The drivers of ecosystem change and biodiversity decline are numerous, and have been classified differently by different authors. The African Ecological Futures Report (AfDB and WWF, 2015) categorises the drivers into two namely: (a) immediate drivers – which encompasses those factors responsible for directly driving changes, such as rapid growth in population, rapid urbanisation, growth in consumption, increase in investment and rising global resource demand; and (b) broader context drivers – which encompasses indirect factors that modify the influence of immediate drivers, such as trends in democratisation, global macroeconomic conditions, climate change, and disasters and epidemics.

One of the most serious drivers of ecosystem change is the demographic factor. The population of Africa has been growing tremendously over the past 100 years and is projected to continue expanding beyond 2100. Over the past 35 years, the population has more than doubled, and now stands at 1.26 billion (UN-DESA, 2017). By 2050, Africa will contribute 57.2% of the increase in the world’s population and by 2100, half of the people in the world under the age of 18 will be resident in Africa. This rapid population growth leads to, among other things, increased demand for food, housing, transport, energy and water and sanitation, and is at the root of all anthropogenic pressures on biodiversity and ecosystems goods and services.

The impacts of the drivers manifest in the following ways: (a) habitat transformation, particularly conversion to agricultural land; (b) overexploitation, especially overfishing, deforestation and poaching; (c) biotic exchange, particularly the spread of invasive alien species and disease organisms; (d) waste accumulation, nutrient loading and pollution; and (e) anthropogenic climate change.

6.1.5 Preventing ecosystem decline

Unprecedented efforts are needed to achieve significant reduction in the rate of biodiversity loss in Sub-Saharan Africa. One of the important actions it to embark on measures to addressing the direct and indirect drivers of ecosystem degradation and biodiversity decline, and put in place enabling conditions for ecosystem and biodiversity conservation. Examples of such measures (not exhaustive live) include:

- Promoting the sustainable intensification of agriculture through adoption of modern technologies that are more efficient in use of inputs, including water and energy, and have lower impact on the environment.
- Implementing measures to mitigate and adapt to global climate change.
- Slowing the growth in nutrient loading through efficient farming systems and investment in waste purification technologies.
- Integration of biodiversity conservation and development planning.
- Increased transparency and accountability of government and private-sector performance in decisions that affect ecosystems, including through greater involvement of concerned stakeholders in decision-making.
- Promoting measures on sustainable use of resources such as: (a) widening the application of the ecosystems approach and other related approaches like sustainable
forest management, integrated river basin management, and integrated marine and coastal area management; (b) introducing payments, and markets, for biodiversity and ecosystem services; (c) and incorporating considerations of biodiversity conservation into management practices in sectors such as agriculture, forestry, and fisheries.

Some of the above measures are discussed in the sections below.

6.1.6 Biodiversity hotspots in Africa

Across the world there are a number of biogeographic regions that are endowed with a rich diversity of living organisms under threat of destruction from human activities. Such regions are known as biodiversity hotspots. According to Conservation International, there are thirty-four such areas in the world, eight of which are located in Africa. If the present threats to ecosystems remain unchanged or continue to rise, biodiversity in Africa’s hotspots is likely to decline rapidly, and new hotspots are likely to emerge.

Table 9: Biodiversity hotspots in Africa (Source: Conservation International, 2016)

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Cape Floristic region</td>
<td>Western Cape region, South Africa</td>
</tr>
<tr>
<td>8</td>
<td>Coastal Forests of East Africa</td>
<td>Indian Ocean coastline from Southern Somalia, through Kenya and Tanzania, to southern Mozambique</td>
</tr>
<tr>
<td>10</td>
<td>Eastern Afromontane</td>
<td>Mountain chains associated with the African Rift system and Eastern Arc mountains, stretching from Ethiopia, Uganda, Kenya, Tanzania, Rwanda, Burundi, DR Congo, Malawi, Zimbabwe to Mozambique</td>
</tr>
<tr>
<td>11</td>
<td>Guinean Forests of West Africa</td>
<td>Atlantic Ocean coastline stretching from Guinea, through Sierra Leone, Liberia, Cote d’Ivoire, Ghana and Nigeria to Cameroon.</td>
</tr>
<tr>
<td>13</td>
<td>Horn of Africa</td>
<td>Horn of Africa countries – Eritrea, Ethiopia, Djibouti, Somalia and Northern Kenya.</td>
</tr>
<tr>
<td>17</td>
<td>Madagascar and Indian Ocean Islands</td>
<td>Madagascar, Seychelles, Comoros and Muscare</td>
</tr>
<tr>
<td>19</td>
<td>Maputaland-Pondoland-Albany</td>
<td>The South-eastern coastline of Africa stretching from Southern Mozambique through Lesotho to South Africa.</td>
</tr>
<tr>
<td>29</td>
<td>Succulent Karoo</td>
<td>Atlantic coastline in Namibia and South Africa</td>
</tr>
</tbody>
</table>

6.2 Past and ongoing initiatives and their achievements

6.2.1 Ecosystem Based Adaptation (EbA) to Climate Change

Ecosystem-based adaptation (EbA) is a concept gaining increasing importance due to its great potential to reduce vulnerability of people, particularly people living in developing countries, to a range of climate change impacts and provide significant co-benefits for biodiversity and people. The Ad-hoc Technical Working Group under the Convention for Biological Diversity (CBD) has provided the following definition for this term:

“Ecosystem-based adaptation is the use of biodiversity and ecosystem services as part of an overall adaptation strategy to help people to adapt to the adverse effects of climate change.”

Essentially, Ecosystem-based adaptation, or EbA, is a broad collection of management interventions designed to protect, conservation, restore, and ensure wise use and sustainable management of, natural ecosystems so as to increase resilience and reduce the vulnerability of people and the environment to impacts of global climate change. EbA purposefully uses ‘green infrastructure’ and ecosystem services to increase human societies’ resilience in the face of climate change. Hence, EbA is an anthropocentric approach concerned with the way ecosystems can help people adapt to both current climate variability and future climate change (Olivier et al., 2016). Such approaches include, for example, sustainable agriculture, integrated water resource management, wetland restoration, and sustainable forest management (IUCN, 2018a).

The EbA approach complements or even substitutes other adaptation measures, such as hard or ‘grey’ infrastructure measures. In addition, the ecosystem-based, natural solutions tend to generate valuable co-benefits, such as carbon sequestration, biodiversity conservation, or food production (Olivier et al., 2016). These approaches are gaining increasing attention, as they are accessible to the rural poor in developing countries, and can be cost-effective.

In contrast to the more conventional natural resources and biodiversity management approaches, EbA purposefully assesses and selects intervention measures in the context of an overall climate change adaptation strategy. It is important to
point out, however, that a substantial number of EbA projects have started out as traditional nature conservation or natural resource management projects, and have only after some time realized adaptation benefits.

The EbA approach is being embedded in a growing number of climate change adaptation and livelihood enhancement projects across Sub-Saharan Africa. It is illustrated below by the case of the WISE-UP to climate project in Ghana.

**BOX 7: Potential Ecosystem Based Adaptation measures**

Examples of possible EbA measures include improved management, conservation or restoration of:

- forests, wetlands and organic soils to enhance their regulatory function within the hydrological regime in the context of water scarcity from decreasing rainfall and longer dry spells;
- pastures, forests and meadows that protect communities from enhanced soil erosion, mud flows and landslides in the face of increasing torrential rains;
- vegetation that protects communities against dust storms and other consequences of desertification, during prolonged dry periods;
- riverine landscapes, wetlands or floodplains in flood prone areas and watersheds in response to situations of increase in rainfall intensity and volume.

Whether or not such measures can be classified as EbA depends on the specific context of the project.

---

**CASE STUDY 14: The WISE-UP to Climate Project: Supporting actors in the Volta River Basin make water infrastructure investment decisions in a changing climate**

**The WISE-UP to Climate Project**

WISE-UP to Climate Project is an initiative that seeks to facilitate the process of actors within a river basin reaching sound decisions on the conjunctive use of built and natural infrastructure to address climate change threats, and ultimately, work towards poverty reduction, water-energy-food security and biodiversity conserving. The project raises awareness on, and demonstrates, the potential to use natural infrastructure as a complement to conventional built infrastructure in adapting to climate change and enhancing climate resilience. Starting from building a broad knowledge base on the hydrological setting of the river basin, the ecosystem goods and services being consumed by riparian communities, and the socio-economic setting of the basin, the project brings together basin stakeholders in a facilitated iterative learning process to reach an optimal mixed portfolio featuring built water infrastructure (e.g. dams, irrigation canals, water treatment works, water storage reservoirs, etc.) and ‘natural infrastructure’ (e.g. wetlands, floodplains, forests, etc.).

The approach used by WISE-Up to Climate involves several distinct steps key among which are the following:

- assembling a multi-disciplinary team of experts that comprises water resources scientists, hydrologists, ecologists, engineers, agriculturalists; computer modellers, sociologists, economists, political economists and climate change specialists;
- working together with counterparts in the river basin to build the project’s knowledgebase. This involves compiling and reviewing reports and data on a wide range of topics;
- carrying out hydrological and climate change analysis to river discharge and associated benefits under different climate change scenarios;
- carrying out an ecosystem infrastructure investment analysis; in this assessment, eco-hydrological functions of built and natural infrastructure are explored in the context of climate adaptation through a range of techniques, including modelling, ecosystem service mapping and the development of “benefit functions” linked to hydrological functions; among other things, economic hydrographs are constructed to help visualise the timeline of natural infrastructure benefits throughout the year.
- conducting a political economy research on decision logics and political drivers to understand why and how basin stakeholders make the investments decisions they do and how climate change is understood and features in the decisions;
- carrying out economic valuation to assigned monetary value to benefits and costs of various water resources management or infrastructure development options; this allows for different scenarios to be directly compared in trade-offs analysis.
- carrying out river basin impact modelling and trade-off analysis; this integrates the quantified and valued natural infrastructure benefit functions to arrive
at a set that has the most efficient and robust combinations of built and natural infrastructure investment options for given climate change scenarios;

- undertaking stakeholder engagement through capacity building and adaptive learning;
- presenting the results of analysis graphically to stakeholders for review and reach a decision on the preferred infrastructure investments;

The WISE-UP to Climate Project ran from August 2013 to December 2017 and was funded by the International Climate Initiative (IKI) of the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB). Implementation was led by the International Union for Conservation of Nature (IUCN) in partnership with six agencies namely the Overseas Development Institute (ODI), Basque Centre for Climate Change (BC3), University of Manchester, International Water Management Institute (IWMI), Water Research Institute (WRI) of the Council for Scientific and Industrial Research (CSIR) of Ghana, and the African Collaborative Center for Earth System Sciences (ACCESS) of the University of Nairobi. The Project was implemented in two basins in Sub-Saharan Africa: the Volta Basin in West Africa, and the Tana Basin in Kenya, East Africa. The former is further described below.

**The Pwalugu Project**

The Volta basin is a major transboundary river basin in West Africa shared by six countries (Ghana, Burkina Faso, Côte d’Ivoire, Mali, Togo and Benin). The WISE-UP Project focused on the proposed Pwalugu multipurpose dam located on the White Volta River in Northern Ghana, close to the Burkina Faso border. The project is a major investment initiative expected to catalyse wider economic development in the poorer northern regions of the country. Project components include hydro-electric power generation, irrigation development, flood management, reservoir fisheries development and tourism development. Ecosystem services were less well known, but were identified by the project to include the sustenance of recession agriculture; floodplain livestock grazing; artisanal fisheries in the river and satellite ponds and drinking water provision. The communities living near the Pwalugu dam site were found to be heavily reliant of these services, and were obtaining over half of their livelihood income from products and services directly dependent on the river flow. Using trade-off analysis, WISE-UP to Climate demonstrated that it is possible to build infrastructure on the White Volta River and still maintain water flows for ecosystem services. The project showed that foregoing 28% of the potential energy generation in Pwalugu can result in maintaining recession agriculture in the floodplains downstream of the proposed dam site.

*Source: IUCN, 2018b.

**Figure 20:** Economic Hydrograph for the White Volta River at the proposed Pwalugu dam site
6.2.2 Payment for ecosystem services (PES)

The Millennium Ecosystem Assessment (2005) defines ecosystem services as “the benefits that humans obtain from ecosystems” and identified four broad types of services that ecosystems provide to man. These are provisioning services, such as food, water, fuelwood, building materials, medicines, etc.; regulating services like climate regulation, hydrological regulation, water purification, air purification and disease regulation; cultural services such as spiritual, aesthetic, recreational, educational and scientific services; and supporting services such as pollination, primary production and soil formation. Ecosystem services support all sectors of society in Africa but are most critical to rural communities who are directly dependent on ecosystem provisioning services for a large part of their survival.

The concept of Payment for Ecosystem Services (PES) is a way of giving economic value to the natural services rendered by ecosystems, and providing financial incentive to communities to motivate them to take up conservation activities aimed at protecting or restoring ecosystems and their beneficial services. In Sub-Saharan Africa, there is growing potential for markets and payments for the ecosystem services (PES), including deals related to carbon sequestration, biodiversity conservation and watershed protection. These emerging markets and payments have the potential to encourage sustainable land and watershed management, conserve biodiversity, improve rural livelihoods and contribute to poverty reduction in the region.

Payment for Watershed Services (PWS) is a subset of PES focusing specifically on creating markets for the ecosystem services naturally provided by the watersheds of river and lakes. Examples of services that PWS programs target to preserve include water purification, flood buffering, flow regulation, erosion control and river bank stabilization. It is often more practical and cheaper to invest in upstream watershed management activities than to building extensive flood protection structure, construct and expand water treatment facilities; undertake extensive desilting operations; or transfer clean water from far away locations. PES and PWS programs are sometimes referred to as natural or “green” infrastructure projects because, in place of traditional concrete “monument” infrastructure to address challenges such as flood damage, water scarcity, water quality degradation or urban stormwater runoff, they opt to use natural landscapes and services produced by the ecosystems therein, to address these problems.

African watershed service markets have been slow to develop, with watershed PES schemes in Sub-Saharan Africa constituting only 2-5% of the active, in-development and proposed PWS schemes currently identified for developing countries (Bennett et al., 2013). Aglobal assessment of the state of watershed payments in 2012 estimated the value of PES transactions across Africa relating to watershed management to amount to US$864.7 million for the period 1995-2011. The area of watershed brought under management from these transactions was 2.3 million ha (Bennett et al., 2013). The greatest interest in PES on the continent comes from eastern and southern African countries, particularly South Africa, Kenya, Tanzania and Uganda. A list of selected recently completed, active and in-planning projects in Sub-Saharan Africa is shown below to illustrate the scope of projects on the continent.

<table>
<thead>
<tr>
<th>Program title and description.</th>
<th>Country</th>
<th>Payer and nature of payment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working for Wetlands Program</td>
<td>South Africa</td>
<td>Public good payer Voluntary payment</td>
</tr>
<tr>
<td>This is an initiative of the Department of Environmental Affairs (DEA) in partnership with the Department of Water and Sanitation (DWS), Department of Agriculture, Forestry and Fisheries (DAFF) and Department of Public Works of the Republic of South Africa. The project is aimed at rehabilitating degraded wetlands and promoting their wise use. At the time of the Program’s launch in 2002, it was estimated that between 35% and 60% of South Africa’s wetlands had been lost or severely degraded. The Program was designed to achieve the protection of wetlands in a manner that maximizes employment creation, supports small businesses and transfers relevant and marketable skills to beneficiaries. Under the Program, members of the local community around target wetlands are payed to undertake conservation works including building concrete, earthen or gabion structures to arrest erosion, trap sediment and re-saturate drained wetland areas; plugging artificial drainage channels; propagating plants, re-vegetating and bio-engineering degraded wetland areas; and building boardwalks, bird hides and interpretive signboards to enhance the recreational, tourism and educational value of the rehabilitated wetlands. Since 2004, the programme has invested over R826.8 million (about US$69.1 million) from the Expanded Public Works Programme (EPWP) in the rehabilitation of over 1,000 wetlands and created 23,472 job opportunities in the process. Other benefits include improved livelihoods, protection of agricultural resources, enhanced biodiversity, improved water quality, reduced impacts from flooding and sustained base-flows in rivers (DEA, 2016).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Working for Water (WfW) Program</td>
<td>South Africa</td>
<td>Public good payer Voluntary payment</td>
</tr>
</tbody>
</table>
| This is a public works program that hires unemployed persons to remove from water catchments invasive plant species that are contributing to sedimentation and drying up of water systems. Removing a large
<table>
<thead>
<tr>
<th>Program title and description.</th>
<th>Country</th>
<th>Payer and nature of payment</th>
</tr>
</thead>
<tbody>
<tr>
<td>eucalyptus tree, for example, which can draw 150 m$^3$ of water a year through its roots, essentially puts all of that water back into the river system. Launched in 1995, WfW is now the biggest conservation programme in Africa. In 2012, WfW employed nearly 30,000 people and invested US$109 million in watershed restoration activities over 160,000 hectares of watershed. The funds came from the government’s poverty relief fund as well as water use fees for households. It is estimated that the program has saved South Africa more than US$5 billion in avoided costs from invasive plant impacts (Turpie et al., 2008; de Lange &amp; van Wilgen, 2010).</td>
<td>South Africa</td>
<td>Beneficiary pays Voluntary payment</td>
</tr>
<tr>
<td><strong>Cape Town City Council</strong>  This is an invasive plants species-removal program similar to WfW that is underway in Cape Town. Under the Programme, Cape Town City Council has partnered with CapeNature, a local conservation group, and public and private landowners, to clear invasive aquatic plants to improve supplies and water quality for the city.</td>
<td>South Africa</td>
<td>Polluter pays Voluntary payment</td>
</tr>
<tr>
<td><strong>Water Balance Programme</strong>  This programme helps private corporations (including South African Breweries, Sanlam, Sonae Novobord and Woolworths) improve their water use efficiency and then offset the remainder through catchment restoration via WfW contracts.</td>
<td>South Africa</td>
<td>Beneficiary pays Voluntary payment</td>
</tr>
<tr>
<td><strong>Lake Naivasha Equitable Payments for Watershed Services (EPWS)</strong>  This project, financed by WWF and CARE, has supported a compensation mechanism linking upstream farmers with downstream users. A receding shoreline, expensive clogging of irrigation systems due to sediment, and declining biodiversity and landscape beauty are all cited as motivating factors for buyers, whom at present include the Lake Naivasha Water Resource Users Association (LANAWRUA), representing large-scale horticulture farms, ranchers, and hoteliers near the lake. Farmers in the upper catchment, represented by local Water Resource Users Associations (WRUAs) receive annual vouchers worth US$17 each that can be redeemed for agro-inputs, in exchange for implementing agricultural best management practices and protecting riparian areas. The mechanism has led to improved food security and livelihoods among participants.</td>
<td>Kenya</td>
<td>Beneficiary pays Voluntary payment</td>
</tr>
<tr>
<td><strong>Uluguru Mountains</strong>  The Programme is a replication of the Lake Naivasha Equitable Payments for Watershed Services program. Under the Programme, the Dar Es Salaam municipal water supplier DAWASCO has begun to compensate villages in the Uluguru Mountains for changing land-use practices, including implementing agroforestry and limiting erosion, as well as riparian rehabilitation. Two hundred households in the upper catchment participate, with payments channelled through village councils. Coca-Cola and South African Breweries signed MOUs in 2011 to join the program as buyers of the ecosystem services.</td>
<td>Tanzania</td>
<td>Beneficiary pays Voluntary payment</td>
</tr>
<tr>
<td><strong>Uganda Breweries/National Wetland Programme</strong>  In this Programme, a Kampala brewery - Uganda Breweries Limited - makes voluntary payments to the National Wetlands Program of the Ministry of Water and Environment in order to ensure the protection of nearby wetlands, which are valued for their ability to filter water pollution from brewery operations.</td>
<td>Uganda</td>
<td>Polluter pays Voluntary payment</td>
</tr>
<tr>
<td><strong>Pro-Poor Rewards for Environmental Services project (PRESA)</strong>  The project is located in the Kipangazi catchment of the River Tana in Kenya. Watershed degradation and torrential seasonal rains lead to widespread soil erosion, loss of soil fertility, and siltation of the hydropower dams on the Tana River. Under the Programme, coffee and tea farmers in the Kipangazi catchment receive payments from Kenya’s hydroelectric power provider (KenGen) in return for the implementation of soil, water and watershed conservation measures such as terracing, grass strips, ridges and trenches and tree planting. The farmers reap price premiums for their coffee and tea in exchange for sustainable forest management techniques that sequester carbon and facilitate biodiversity protection, from coffee and tea certifiers - UTZ Netherlands and Rainforest Alliance – a second group of buyers (Firmian et al., 2011).</td>
<td>Kenya</td>
<td>Beneficiary pays Voluntary payment</td>
</tr>
<tr>
<td><strong>Green Water Credits – SIP-Private Public Sector Partnership on Capacity Building for SLM (Proposed)</strong>  Under this Programme to be located in the Shire River Catchment (outflow of Lake Malawi), upstream farmers are proposed to receive payments for improving agricultural water use efficiency, and embracing catchment afforestation and soil and water conservation measures resulting in less runoff, better soil retention, higher water infiltration, improved groundwater recharge, reduced peak flows and higher dry season base flows (Ferriera and Abbot, 2015). The potential buyers of the upstream services include the water utility for Blantyre City, a power utility (the Electricity Supply Commission of Malawi) which owns four</td>
<td>Malawi</td>
<td>Beneficiary pays Voluntary payment</td>
</tr>
</tbody>
</table>
Program title and description. | Country | Payer and nature of payment
---|---|---
hydropower stations along the Shire River (Nkhole B and Tedzani I, II and III), and Lower Shire Valley Irrigators.

Field pictures of the Working for Wetlands Program in South Africa (source: www.zaforestryonline.co.za)

The Uluguru Mountains, Morogoro Region, Tanzania – one of the areas where a PWS has been introduced. (Source: commons.wikimedia.org)

6.2.3 Wealth accounting and ecosystem valuation

Natural capital — including resources like water, forests, fisheries, rivers and wildlife — represents a critical asset, especially for lower income countries, where it makes up a significant share of total wealth. These critical resources are being degraded in Sub-Saharan Africa at alarming rates, and with them, the capacity to sustain future populations. The systematic under-valuation of ecosystem services and failure to recognise their contribution to job creation and economic development was identified by the Millennium Ecosystem Assessment as one of the underlying causes for rapid ecosystem degradation and biodiversity loss (Millennium Ecosystem Assessment, 2005). Traditional measures of economic performance such as GDP have been unable to capture the full contribution of natural capital and fail to accurately depict the trade-offs associated with development at the cost of nature. Thus, there is need for natural capital accounting and ecosystem valuation to aid policy making, and guide the management and wise use of natural capital in support of sustainable development.

The concept of Natural Capital Accounting (NCA) has emerged as one of the leading tools for working towards sustainable development. Natural Capital Accounting is defined as “the measurement of stocks of natural resources (both renewable and non-renewable) and the flows of benefits (ecosystem goods and services) they provide” (Reuter et al., 2016). NCA seeks to capture and integrate the contribution of nature into the systems that the private and public sectors use to make decisions.

CASE STUDY 15: Deforestation in Kenya: a case study in natural resource accounting

In Kenya, recent economic valuations of the country’s forests have catalyzed a response to conserve and rehabilitate that vast natural resource. Deforestation deprived Kenya’s economy of an estimated 5.8 billion shillings (US$68 million) in 2010, far outstripping the roughly 1.3 billion shillings injected from forestry and logging each year, according to a joint report by the Kenya Forest Service (KFS) and UNEP.

The Role and Contribution of Montane Forests and Related Ecosystem Services to the Kenyan Economy, evaluated in 2012, points out that the contribution of forests is undervalued by some 2.5 per cent, putting the estimate of its...
annual contribution to GDP at around 3.6 per cent.

Between 2000 and 2010, deforestation of the country's water towers amounted to an estimated 50,000 hectares, leading to a reduced water availability of approximately 62 million cubic metres per year. This has also affected Kenya's economy, which is vulnerable to inflation spikes during periods of drought.

In response, the Kenyan government is now working to rehabilitate the water towers, in particular the Mau Forest Complex. The Mau Forest Complex, covering an area of 400,000 hectares, is the largest closed-canopy forest ecosystem of Kenya, and a natural asset of national and regional importance. This critical ecosystem helps sustain water supplies of urban areas for domestic and industrial use, and supports the livelihoods of millions of rural people living Kenya and the neighbouring countries.

More than 21,000 hectares of forestland in the Mau Complex have been repossessed by the government since 2011, and some 10,000 hectares have been rehabilitated. A number of programmes and activities have also been launched to improve the livelihoods of communities living in and adjacent to the forests.

Source: UNEP, 2013.

Countries in Sub-Saharan Africa are among the pioneers in the world in the application of NCA as a tool for sustainable development. Wealth accounting and the valuation of ecosystem services are critical to Sub-Saharan Africa's future growth, as the region undergoes unprecedented development largely dependent on exploitation of the region's natural resources base. The rapid development is putting unprecedented pressure on the natural resources.

In May 2012, ten Sub-Saharan African countries, along with various public and private organizations, adopted the Gaborone Declaration for Sustainability in Africa (GDSA). This is a transformative platform for achieving sustainable development in Africa and focuses action in three areas, namely: (a) incorporating the value of natural capital in public and private policies and decision-making; (b) pursuing inclusive sustainable production in agriculture, fisheries, and extractive industries while maintaining natural capital; and (c) generating data and building capacity to support policy networks.

The countries of the GDSA are Botswana, Gabon, Ghana, Kenya, Liberia, Mozambique, Namibia, South Africa, Rwanda and Tanzania. Two other countries – Madagascar and Uganda – have been participating in NCA initiatives and are likely to join the GDSA in future. All of these countries have undertaken ecosystem valuation at national or sub-national level, and all, with the exception of Liberia, have implemented NCA initiatives at national or sub-national level since the announcement of the GDSA. The NCA initiatives typically take the form of planning and preparation for accounting activity; developing a pilot account; fully developing the account; and repeating/updating the account several times.

The natural resources that have received the highest level of interest, and been the focus of NCA initiatives in the region are water, forests/timber, minerals, land and energy. The full list of natural resources targeted by NCA initiatives in Sub-Saharan Africa is shown in the Table 11 below.

The NCA initiatives of the Sub-Saharan Africa countries have been supported by multiple partners, including Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), the World Bank Wealth Accounting and Valuation of Ecosystem Services (WAVES) program; United Nations Environment Programme (UNEP), United Nations Statistical Division (UNSD); Forest Investment Program (FIP); and the Economics of Ecosystems and Biodiversity (TEEB) Program.
### Table 11: Past, current, and planned natural capital accounting (NCA) activities in Sub-Saharan Africa (created from information in Reuter et al., 2016)

<table>
<thead>
<tr>
<th>National Accounts</th>
<th>Botswana</th>
<th>Gabon</th>
<th>Ghana</th>
<th>Kenya</th>
<th>Liberia</th>
<th>Madagascar</th>
<th>Mozambique</th>
<th>Namibia</th>
<th>Rwanda</th>
<th>South Africa</th>
<th>Tanzania</th>
<th>Uganda</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aquatic Resources</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carbon</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ecosystem Accounts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fisheries</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forests/Timber</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lakes and Rivers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land Degradation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minerals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soil</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wetlands</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wildlife</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- = Past effort; ● = ongoing effort; ● = future activity; ○ = Shown interest in; □ Lower priority for country

### BOX 8: Wealth Accounting and the Valuation of Ecosystem Services (WAVES) Program

Wealth Accounting and the Valuation of Ecosystem Services (WAVES) is a World Bank-led global partnership that aims to promote sustainable development by systematically integrating values for natural capital in their national accounts systems, and, through the national accounts, mainstream natural capital valuation in both macro-economic indicators that monitor development progress, and natural resource management.

The key partners in this initiative are core implementing countries, contributing donor partners, and participating partners. Among the core implementing partners are three countries from Sub-Saharan Africa — Rwanda, Botswana and Madagascar. The other partner countries are Guatemala, Costa Rica, Colombia, Indonesia and the Philippines. The contributing donor partners are Denmark, European Commission, France, Germany, Japan, The Netherlands, Norway, Switzerland and The United Kingdom. The participating partners are numerous, and include several UN Agencies (UNEP, UNDP, UNCEEA), Non-Governmental Organisations, academic and research institutions, and local governments.

WAVES supports the partner countries in implementing natural capital accounting (NCA) — a system for generating data on natural resources, such as forests, energy water and minerals, which are not included in traditional statistics. NCA follows standards approved by the United Nations to ensure trust, consistency and comparison across time and countries, and facilitates a new way of assessing economic growth—beyond GDP.

Source: WAVES, 2018.

### 6.2.3 Environmental Flows

Environmental Flows refer to the quality, quantity, and timing of water flows required to maintain the components, functions, processes, and resilience of aquatic ecosystems. Environmental flows are central to supporting sustainable development, sharing benefits, and addressing poverty alleviation. Without deliberate efforts to protect the essential characteristics of natural flows, human development is more likely than not to lead to marked alteration and ultimately to destruction of ecosystems.

There are many examples of impairment and destruction of ecosystem functions by anthropogenic alteration of flow regimes or rivers in Africa. The damming of major rivers such as the Nile, Zambezi, Niger, Tana, Pangani, Pongolo and Volta have led to changes in the volume and timing of flows of water, sediments and nutrients in the areas downstream of the dams leading to general decline in aquatic biodiversity with total disappearance of some species; collapse of estuarine fisheries; sediment accretion in wetlands; erosion of delta fans; and increased erosion of ocean shorelines (Dukiya, 2013; Biswas and Tortajada, 2012, Gyau-Boakye 2001; Heath and Plater, 2010). There are many other river basins where ecosystems are under stress and threat of destruction from excessive consumptive water use (mainly in irrigated agriculture) in upstream areas.
Examples of river systems with such problems include the Mara River, Great Ruaha River, Katavi River.

In Africa, appreciation of the importance of preserving environmental flows is growing but efforts to mainstream environmental flow determinations in water resources planning and water allocation are still at infancy. The water policies of many Sub-Saharan African countries provide for consideration of environmental and ecosystem needs in water allocation. However, the methodology to make such determinations, and institutional and human capacity to apply the methodology, has not been properly developed.

CASE STUDY 16: Participatory approach to environmental flows to support transboundary governance in the Pungwe, Buzi and Save River Basins in Southern Africa

The Governments of Mozambique and Zimbabwe have adopted Integrated Water Resources Management (IWRM) approaches for the management of national and transboundary water resources. Water resources planners and managers from the two countries identified the lack of capacity to assess and manage environmental flow requirements – a critical element of the IWRM approach – as a major constraint to effective implementation of IWRM approaches at national and transboundary levels. Specifically, uncertainty was expressed with regard to the procedures to be followed in undertaking environmental flow assessments, and the roles of different stakeholders in the process were considered unclear. The two countries sought technical assistance from the International Union for Conservation of Nature (IUCN) under the Building River Dialogue and Governance Programme (BRIDGE) to introduce environmental flow assessments in three transboundary river basins - Pungwe, Buzi and Save – that they share between them.

In addressing this need, the BRIDGE Program demonstrated e-flow measurements to stakeholders from the two countries using a phased approach comprising the steps below:

- **Awareness raising**: developing the awareness of policy makers and water resources managers about socioeconomic and ecological benefits from, and principles of integrating environmental flows in transboundary water resources management.

- **Demonstration**: Demonstrating procedures for environmental flow assessment in a selected pilot river basin, with the aim to develop an understanding of the techniques used for environmental flow assessment.

  - **Learning by doing**: facilitating and guiding stakeholders and multidisciplinary country teams to go through the entire process of performing e-flow assessments and reaching decisions on environmental flow allocations.

In addition to the above actions, the BRIDGE Program supported the review of national policies and regulations that are important for implementation of e-flows to provide a picture of governance challenges likely to be faced by the two countries in implementation of e-flows.

An integral part of e-flow assessments that participants in the pilot training performed is the consultation of different stakeholders/interest groups and capturing their views on the desired state of the river. A report is under preparation that documents these findings for the Buzi Basin where the pilot training was conducted. The report will also list the ecosystem services derived from the river system, enumerate threats to maintaining or achieving the desired state of the river system, and identify critical sites at which environmental flow determinations will have to be made and enforced to ensure provision of desired ecological and socioeconomic services.

The joint performance of the e-flow determinations by teams from the two countries provides for transparent results on e-requirements that are likely to incorporate interests of stakeholders from the two countries and, therefore, likely to be more acceptable to both.

Source: UNEP, 2013.
There are two exceptional cases to environmental flow management in Africa – South Africa and Tanzania. South Africa is one of the pioneers in the world in the development and rigorous application of environmental flow assessments in water resources management. The country has policies for flow assessment and river classification based on biotic and abiotic features, and a monitoring network and indicator system for monitoring the health of aquatic ecosystems. Tanzania has a water policy that gives priority to environmental and ecosystem needs. It also has a Water Resources Management Act (No. 11 of 2009) that requires that water resources development in the country’s river basins be based on Integrated Water Resources Management and Development (IWRMD) Plans in which adequate allocations have been made for environmental needs. The implementation of this policy and law has led to full-fledged environmental flow assessments being conducted on several river systems such as the Pangani, Wami-Ruvu, Great Ruaha, Little Ruaha and Kilombero Rivers.

6.3 Gaps, challenges and opportunities

6.3.1 Challenges related to EbA approaches

From the experience in Ghana and Kenya, most of the challenges that limit the introduction of natural infrastructure in climate change considerations are related to governance and include low funding for agencies, especially at local government level, responsible for infrastructure project preparation; weak policy implementation; weak human resources capacity; limited data for scenarios analysis; and low coordination between the various agencies needed for multipurpose infrastructure project planning.

6.3.2 Potential strategies for addressing PES challenges

Most of the above challenges could be addressed through targeted capacity building.

6.3.3 Challenges related to payment for Ecosystem Services (PES)

At present, PES in Sub-Saharan Africa occurs on an ad hoc basis, is largely dependent on government or donor funding and exists primarily as small-scale pilot projects. Challenges responsible for this situation include the following (Austin, 2006):

1. Technical information gaps at project design stage. Ecosystem services must be quantifiable and measurable so that a value can be agreed upon and payments can be made. Lack of quantitative information makes it difficult to conceive and prepare viable PES projects.
2. Poor design leading to inability of data collection during project implementation to provide scientifically sound evidence of watershed service improvements.
3. Lack of capacity to design and manage PES projects. This being a relatively new concept in the region, there is still low capacity for its implementation.
4. Absence of institutions to support on-the-ground implementation and follow-up of PES projects.
5. Difficulty of setting up mechanisms for certifying and monitoring service delivery.
6. Difficulty of setting up an efficient and transparent system for making payments due to the informal nature of many small-scale community operators.
7. Difficulty of finding buyers willing and able to pay for ecosystem services. The women and children in Sub-Saharan Africa who spend many hours walking to collect water from local springs, ponds and streams do not have the money to pay for the natural water filtration services that they rely on for clean, healthy drinking water. Successful PES programs in this setting must recruit another buyer who also benefits from the ecosystem and is willing and able to pay for its preservation or restoration. Where buyers can be found, communities stand to benefit doubly from PES markets: first by earning money for protecting the
ecosystem, and second by ensuring sustainability of the ecosystem service they benefit from.

8. Unclear systems on property rights and land tenure in much of rural Africa.

9. Difficulty of finding start-up capital for projects that require an initial investment.

10. Logistical challenges and high transaction costs where many small-scale operators have to be involved.

6.3.4 Potential strategies for addressing PES challenges

Despite the hurdles described above, there is a lot of enthusiasm for PES for in Africa and a sense that it could be a better tool than government or donor funded projects in the long run. Promoters of the concept in the region have adopted numerous approaches for dealing with the challenges. These include:

1. Providing small loans (micro-credit) to local communities which they can re-pay upon receiving the first ecosystem payment.

2. Setting up contract farming systems through which consumers of ecosystem goods and services invest money in farmers involved in production of the goods and services. Once ecosystem services begin to flow, the investor obtains a return on his investment.

3. Using intermediate commercial institutions, such as village banks and micro-credit institutions, to distribute payments to small-scale participants on behalf of large overseas corporate buyers of ecosystem services.

4. Undertaking awareness raising and capacity building targeting central and local government institutions and local communities residing near the Ecosystem Service Producing Units.

6.3.5 Challenges related to wealth accounting and ecosystem valuation

Main challenges reported by Sub-Saharan Africa countries in implementing NCA initiatives were the lack of data; weak technical capacity; failure to incorporate accounts into national statistics; irregular update of accounts; and low awareness of NCA amongst decision makers (Figure 21). Other challenges encountered by the countries include lack of long-term funding for NCA activities; week communication between government entities; and insufficient supporting legislation (Reuter et al., 2016).

6.3.6 Potential strategies for addressing wealth accounting and ecosystem valuation challenges

The possible solutions to the above challenges include the following:

- Investing in establishment, and operation and maintenance, of data collection systems on national accounts.
- Incorporating capacity building component in NCA initiatives targeting technical staff of key government agencies.
- Carrying out awareness raising on importance of national accounts targeting technical staff and policy makers of governments ministries responsible for economic planning; and staff of development partners.

6.3.7 Challenges related to Environmental Flow Assessments

The challenges encountered in implementation of environmental flows in Sub-Saharan Africa include the following:

- There is lack of capacity for assessing the environmental flow requirements in different biophysical and socio-economic settings. There is a general shortage of such river scientists in Sub-Saharan Africa.
- There is paucity of data and large gaps in the critical information needed for effective environmental flow determination such as on stream flows sediment loads, water quality, fish species assemblage, macro-benthic invertebrates, aquatic vegetation, river geomorphology, cultural uses of water, etc.
- At national level, political interference often prevents rigorous implementation of environmental flows and allows some sectors to draw water from the environmental quota.
- Determination and application of Environmental Flow Requirements is costly in most cases, and government...
agencies responsible for setting and enforcing environmental flows do not have the adequate budgets for this.

- Environmental Flow Assessments is still a new discipline and awareness and technical capacity for its application is low in most Sub-Saharan Africa countries.
- Cross-sectoral coordination is weak amongst the key government agencies for water related sectors (water resources management, drinking water, energy, agriculture, livestock, fisheries, environment, wildlife, etc.). This makes it difficult to determine and apply meaningful environmental flow requirements.
- Due, partially to the low number of women in technical fields in the water sector, it is difficult to gender-balanced team for e-flow assessments.

6.3.8 Potential strategies for addressing Environmental Flow Assessments challenges

The possible solutions to the above challenges include the following:

- Invest in human and institutional capacity building for e-flows with particular emphasis of female scientists. In response to the need for scientists in the region with technical skills for performing e-flow assessments, WaterNet is developing a training program to address this need.
- Increase efforts in Sub-Saharan Africa to adopt policies and water legislation that provide for Environmental Flow Assessment and environmental reserve.
- Increase budget allocations to water and environmental sector agencies for implementation of EFAs.
- Improve the development of methodology that are less costly and less data intensive to allow introduction of EFAs in countries that have serious data gaps and weak human capacity.
- Increase efforts in awareness raising in lead agencies for water resources and environmental management, and in relevant stakeholder institutions.
- Strengthen cross-sectoral coordination amongst a wide range of water-related sectors for effective mainstreaming of Environmental Flow Assessments.

6.4 Key lessons and good practices from Africa to the world

6.4.1 Lessons from EbA approaches

The key lessons include the following:

- ‘Business as usual’ approach to water infrastructure planning is no longer viable in the face of climate change.
- Natural infrastructure is a vital national asset that strongly supports rural livelihoods, sustains economic development, and helps communities to adapt to climate change. However, it remains undervalued and poorly recognised in countries.
- Managing both natural and built infrastructure helps to balance and enhance benefits in the basin. With careful planning, combinations of built and natural infrastructure can be found that address specific climate and development challenges.
- For a successful outcome that incorporates natural infrastructure in built infrastructure projects, the trade-offs inherent in mixed portfolios need to be negotiated through transparent and inclusive decision-making processes involving key decision makers and stakeholders in the basin.
- Applications for climate finance and making a case for natural infrastructure solutions should involve local and basin-level stakeholders for their participation guarantees that the solutions selected with be acceptable and readily embrace by them.

6.4.2 Lessons from implementation of PES Projects in Sub-Saharan Africa

1. The Working for Wetlands Program learned many valuable lessons during the course of rehabilitating hundreds of wetlands. One of the most significant of these is that good stewardship, in the form of ownership of and engagement with the rehabilitation process by landowners and wetland users, is a vital ingredient for successful and sustainable rehabilitation.
2. Directly linking economic benefits to local community efforts to protect and conserve ecosystem services helps to keep members of the community incentivised and involved.
3. Consistency in monitoring and follow-up is essential for projects success.
4. Using local commercial institutions to distribute payments to members of the local community can help to reduce the complexity of PES transactions.
5. Substituting requirement for formal land titles with firm confirmation from village and local government authorities or cultural leaders of land ownership by local farmers.

6. When people see their neighbours getting paid for protecting ecosystems, they get interested and want to participate. This can held projects to roll-out pilot initiatives.

7. To achieve better and more credible results, PES programmes need to integrate quasi-experimental elements such as establishment of control groups, and collection of baseline data and key output and outcome data that can be used to prove additionality (i.e. impacts directly attributable to the PES Programme).

6.4.3 Lessons from wealth accounting and ecosystem valuation in Sub-Saharan Africa

The experience of the Sub-Saharan countries at implementation of Natural Capital Accounting have shown that it is a worthwhile effort that generates data and information that can support the protection of critical natural ecosystems. The efforts have revealed that the contributions of natural resources to national GDP is often times considerably undervalued. The NCA initiatives have enabled the countries obtain a better appreciation of the value of their ecosystems, and to initiate policy decisions to protect them. Some examples of the potential economic value of ecosystems gained through wealth accounting initiatives are:

- Forestry in Tanzania is officially estimated to contribute close to 2.3% of GDP. However research indicates that if the wider benefits are factored in, the real contribution is over 4 percent of GDP (UNEP, 2013).
- Emerging research suggests that the contribution of the value of forests to the GDP of Uganda is around US$136 million, which amounts to about 4% of GDP (UNEP, 2013)
- Economic valuation of the Okavango Delta in Botswana revealed that regulating services of the delta have an economic value in excess of 50% of the combined contribution of tourism, agriculture and natural resources harvesting in the Delta (Reuter et al., 2016).

6.4.4 Lessons from Environmental Flow Assessments in Sub-Saharan Africa

Key lessons in EFA applications are the following:

- The lack of clear understanding and appreciation of the social, economic and ecological benefits of providing for environmental flows continues to be a hindrance to wide adoption integration of environmental flow processes during water resources planning. Continued awareness raising is needed to address this challenge.
- Having policies, laws and strong political support is needed if environmental flow requirements are to be respected. This is because most of the economic activities that result in large water diversions or abstractions are politically driven.
- Countries need to allocate adequate budgets to environmental flow determinations and enforcement to adequately protect aquatic ecosystems.
- It is difficult to carry out environmental flow assessments, but even more difficult to implement them. Strong institutional and human capacity, including adequate budgets are needed, among other things, for effective implementation of EFAs.
- Efforts need to be increased to strengthen the operation and maintenance of water resources monitoring systems as the data they generate is critical in environmental flow determinations.
- For environmental flow determinations within a transboundary setting to work, there needs to be transparent communication and information sharing across the countries so that all needs are considered in coming to decisions on e-flows.
- Given the highly technical nature of e-flow assessments, there is need in the region to have dedicated units within national water sectors and transboundary RBOs, dedicated to performing and managing environmental flows.
- For effective management of e-flows, stakeholder engagement needs to be continuous and not a “once-off” project driven exercise.
7. FINANCE

7.1 The relevance and current situation in Africa with respect to the ‘Finance’ theme

7.1.1 Importance of financing for Sub-Saharan Africa

Water Security is a major multidimensional requirement for achieving the Sustainable Development Goals (SDGs). However, in Sub-Saharan Africa, the availability of finance with which to implement the wide-ranging interventions needed to attain water security is a challenge. The ‘Finance’ theme at the Eighth World Water Forum will address this challenge through a review of emerging innovations on the continent on payments for water and sanitation.

One of the critical financing issues with respect to Sub-Saharan Africa is the investment needed to bridge the huge water infrastructure gap, which gap has been widening with the rapid expansion of population, and growing risks related to climate change. A related issue is the investment needed to rehabilitate and replace ageing infrastructure. Theme discussions will closely examine the role of the public as well as the private sectors in water and sanitation development, and in the bridging of the investment gap.

The ‘Finance’ theme discussions are further expected to explore opportunities for mitigation of business and fiduciary risks associated with water, and the improvement of public policies to stimulate investments, including those from capital markets. Also, discussions are expected to provide for sharing of experiences on the practical applications of tariffs, taxes and transfers as a tool for innovative financing.

All of these topics are hugely relevant for Africa where finance is a key constraint for progress.

7.1.2 Water and sanitation financing in the region

In 2016, total financing for water and sanitation infrastructure in Sub-Saharan Africa amounted to US$ 7.881 billion, which was 15.9% of total infrastructure finance in the region (Figure 22). Table 12 lists some of the projects financed in the region in 2016.

The source of financing for the water and sanitation infrastructure in 2016 was from members of the Infrastructure Consortium for Africa (ICA) (44.3%); African national governments (41.7%); the Arab Coordination Group (9.5%); and other bilateral/multilaterals (4.6%) (ICA, 2017). The traditional sources of external infrastructure financing in Africa are listed in Table 13 below. A large share of water infrastructure in the region is domestically financed, as the figures above indicate, with the central government budget being the main driver of infrastructure investment. Domestic financial resources in Sub-Saharan Africa have increased considerably in recent years from debt relief, increased revenue collection, gains from the commodity price boom, and, more generally, improved macroeconomic and institutional policies (Sy, 2017).
7.1.2 Water and sanitation financing gap in the region

The current level of resource allocation to water and sanitation infrastructure is significantly much lower than the level of investment needed to meet the United Nations Sustainable Development Goals (SDGs). A recent study by the World Bank (Hutton and Varughese, 2016) puts the estimate for the capital investment requirement to achieve the water supply, sanitation, and hygiene SDGs (targets 6.1 and 6.2) in Sub-Saharan Africa at US$35.4 billion per year, or about 2.01% of the Gross Regional Product. This capital investment requirement is 3.8 times the total financial commitment to the sector in 2016 even before considering operation and maintenance needs.

Table 12: Selected water projects financed in Sub-Saharan Africa in 2016 (excluding projects financed wholly by the national governments) (Source: ICA, 2017)

<table>
<thead>
<tr>
<th>Project</th>
<th>Country</th>
<th>Total Commitment</th>
<th>Financing Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kenyan Towns Sustainable Water Supply and Sanitation Program</td>
<td>Kenya</td>
<td>US$ 40.3 million</td>
<td>African Development Bank (AfDB)</td>
</tr>
<tr>
<td>Export and Extension Targeted Modern Irrigated Agriculture Project</td>
<td>Rwanda</td>
<td>US$ 120 million</td>
<td>Exim Bank India</td>
</tr>
<tr>
<td>Integrated Irrigation and Rural Development Program</td>
<td>Ethiopia</td>
<td>US$ 100 million</td>
<td>Exim Bank Korea</td>
</tr>
<tr>
<td>Wastewater Treatment System Development Project</td>
<td>Tanzania</td>
<td>US$ 90 million</td>
<td>Exim Bank Korea</td>
</tr>
<tr>
<td>Potable Water for Semi-urban and Rural Communities</td>
<td>Niger</td>
<td>US$ 25 million</td>
<td>Exim Bank India</td>
</tr>
<tr>
<td>Rehabilitation and Improvement of the Tanzania Water Supply System</td>
<td>Tanzania</td>
<td>US$ 92 million</td>
<td>Exim Bank India</td>
</tr>
<tr>
<td>Water Sector Institutional Development Project (Phase II)</td>
<td>Angola</td>
<td>US$ 200 million</td>
<td>The World bank</td>
</tr>
<tr>
<td></td>
<td></td>
<td>US$ 156 million</td>
<td>Agence Française de Développement (AFD)</td>
</tr>
<tr>
<td>Lusaka Sanitation Program</td>
<td>Zambia</td>
<td>US$ 113 million</td>
<td>European Investment Bank (EIB)</td>
</tr>
<tr>
<td>Mamelles Sea Water Desalination Project – Dakar</td>
<td>Senegal</td>
<td>US$ 250 million</td>
<td>Japan International Cooperation Agency (JICA)</td>
</tr>
<tr>
<td>Roseires Irrigation Project (Phase 1)</td>
<td>Sudan</td>
<td>US$ 198 million</td>
<td>Arab Fund for Economic and Social Development (AFESD)</td>
</tr>
<tr>
<td>Parakou Water System Rehabilitation Project</td>
<td>Benin</td>
<td>US$ 9.4 million</td>
<td>West African Development Bank (BOAD)</td>
</tr>
<tr>
<td>Extension And Rehabilitation of Drinking Water Services Programme</td>
<td>Congo</td>
<td>US$ 111 million</td>
<td>Agence Française de Développement (AFD)</td>
</tr>
<tr>
<td>(under Société Nationale de Distribution d’Eau)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A new water treatment works under construction in Mpumalanga, South Africa (Source: www.biganfrica.com).
In order to meet the ambitious SDG targets, Sub-Saharan Africa countries need to accelerate and intensify efforts to mobilize domestic and external financing resources, use the resources more efficiently, and identify and leverage new and innovative sources of infrastructure financing.

Tax revenues, as discussed above, make up a large portion of domestic public resources commitment to water infrastructure development. Countries of the regional have made considerable effort to improve tax revenue collection, and broaden the tax base. Consequently, the average tax-to-GDP ratio in Sub-Saharan Africa has risen from 18 percent in 2000-2002 to 21 percent in 2011-2013 (Sy, 2017). But even if major potential efficiency gains are captured, Africa would still face a considerable infrastructure funding. Thus, it is imperative that the countries identify and develop alternative financing sources.

### CASE STUDY 17: The Billion Dollar Business Alliance for Rainwater Harvesting

The Billion Dollar Business Alliance (BDBA) for Rainwater Harvesting is a partnership of UN Agencies, International Non-Governmental Organisations, Research Institutions, local financial institutions, and government ministries aimed at assisting rural areas in Sub-Saharan Africa attain SDG targets on water, food security and livelihoods. The alliance is working to establish a responsive financing system to support smallscale farmers acquire rainwater harvesting technology and strengthen policy and governance systems for rainwater harvesting.

The alliance intends to establish an integrated farm pond system that will be leveraged to sustain a massive upscaling of farm pond technology in Rural Africa. The support system will focus on the farmhouse and ensure it is able to obtain everything it needs to start and operate a farm system relying on pond irrigation.

The BDBA will be a ‘one-stop-shop’ for smallholder farmers desiring to acquire all necessary inputs (technology, financing, training, farm inputs, markets, etc.) to establish and operate a farm production system relying on pond irrigation. To ensure better production, lower risks to farmers and financial institutions, and faster returns on investment, the BDBA will adopt an innovative financing mechanism: Built, Manage and Transfer (BMT). Under the BMT financing model, BDBA will guarantee production, marketing and repayment of loans by working closely with farmers to build the system, manage it to ensure optimal production, link farmers to markets, and enable them sell their produce. Once the investment cost has been recouped, the operation and maintenance will be transferred to farmers while continuing to strengthen marketing linkages.

The BDBA will incorporate agro-enterprise insurance to further reduce the risks to farmers and lenders. BDBA will ensure that farmers have access to appropriate technology (dam-liners, drip irrigation pipes, pumps, water tanks and greenhouses) alongside technical support from government extension workers, and NGO’s. With such support sustained for a reasonable period, BDBA will greatly enhance the chances of farmers breaking free from the vicious cycle of poverty.

The above concept will be piloted, tested and perfected in Kenya before being rolled out to other Sub-Saharan Africa countries. The pilot project was launched in April 2017 and is led by the Kenya Ministry of Water and Irrigation. The partners of the Kenya pilot project include the United Nations World Food Program, International Agro-forestry Centre (ICRAF/CGIAR), Kenya Ministry of Water and Irrigation, World Vision International, Kenya Rainwater Harvesting Association, Kenya Climate Innovation Centre, and Equity Bank.

### Table 13: The external financiers of Africa’s Infrastructure

<table>
<thead>
<tr>
<th>Group</th>
<th>Group Members</th>
<th>Banks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe</td>
<td>European Commission</td>
<td>Kuwait Fund for Arab Economic Development (KFAED)</td>
</tr>
<tr>
<td></td>
<td>France</td>
<td>Saudi Fund for Development (SFD)</td>
</tr>
<tr>
<td></td>
<td>United Kingdom</td>
<td>Arab Bank for Economic Development in Africa (BADEA)</td>
</tr>
<tr>
<td></td>
<td>Germany</td>
<td>Abu Dhabi Fund for Development (ADFD)</td>
</tr>
<tr>
<td>The Americas</td>
<td>United States of America</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Canada</td>
<td>China</td>
</tr>
<tr>
<td></td>
<td>Brazil</td>
<td>Japan</td>
</tr>
<tr>
<td>Arab Coordinator Group</td>
<td>Islamic Development Bank (IDB)</td>
<td>India</td>
</tr>
<tr>
<td></td>
<td>Arab Fund for Economic and Social Development (AFESD)</td>
<td>South Korea</td>
</tr>
<tr>
<td></td>
<td>OPEC Fund for International Development (OFID)</td>
<td>World Bank Group (WBG)</td>
</tr>
<tr>
<td>Multilateral Development Banks</td>
<td></td>
<td>African Development Bank (AfDB)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>European Investment Bank (EIB)</td>
</tr>
</tbody>
</table>

Source: BDBA, 2018
7.2 Past and ongoing initiatives and their achievements

7.2.1 Policy directives and declarations

Political commitments

Inadequacy of financing has for long been among the leading causes of Africa failing to meet MDGs and SDG targets. Accordingly, there have been many policy directives, commitments and declarations made by African political leaders aimed at addressing the issue of water financing notable among which are the following:

- **PANAFCON 2003.** The Pan-African Implementation and Partnership Conference (PANAFCON) was the ground-breaking platform held in Addis Ababa in December 2003 where 40 African Ministers of Water and 1000 other stakeholders met to address the implication of the outcomes of the World Summit on Sustainable Development (WSSD) on regional water initiatives, and Africa’s role in the implementation of the outcomes of the Summit. Among other things, Africa Heads of State and Government Committed to allocate at least 5% of their national budgets to water and sanitation.

- **eThekwani Declaration:** was issued by African Ministers of Water in February 2008 urging African countries to allocated a minimum of 0.5% of GDP to sanitation and hygiene.

- **Sham El-Sheikh Commitment:** was issued by African Heads of State and Government in July 2008. The Heads of State upheld the eThekwani declaration on sanitation by the African Ministers of Water and committed their countries to significantly increase domestic financial resources allocated for implementing national and regional water and sanitation development. They called upon the Ministers of Water to work with Finance Ministers to develop local financial instruments and markets for investments; and committed to mobilize increased donor and other financing for the water and sanitation initiatives. They tasked the Ministers of Water to report on progress towards these commitments on an annual basis.

- **The Kigali Action Plan:** Kigali Action Plan launched by the African Union in 2014 sought to bring drinking water, basic toilets and hygiene to millions of Africans in 10 countries. Its overarching goal was to mobilise – in 2015 – catalytic funding of at least €50 million as a first step to bringing rural water supply and sanitation services to an additional 10 million people in the 10 African countries. The programme, agreed upon with the African Development Bank and spearheaded by the Government of Rwanda, was also designed to raise the priority given to water and sanitation in national spending across the African continent.

- **The Addis Ababa Action Agenda:** The Addis Ababa Action Agenda (AAAA) was adopted by Heads of State and Governments gathered at the Third International Conference on Financing and Development that was held in Addis Ababa, Ethiopia in July 2015. The conference was held in preparation for the Summit at which Agenda 2030 and SDGs would be adopted. In this declaration, the world leaders affirmed their strong political commitment to address the challenge of financing and creating an enabling environment at all levels for sustainable development. They committed to take specific targeted measures in a wide range of areas to ensure the availability of finance to support sustainable development. The measures (not exhaustive list) include:
  - Strengthening mobilisation and effective use of domestic resources;
  - Strengthening the enabling environment for domestic resource management, including the rule of law and combat corruption;
  - Establishing democratic and transparent institutions;
  - Broadening tax base, improving revenue administration, and increasing efficiency of tax collection;
  - Developing policies and strengthening the enabling environment to incentivize the private sector to adopt sustainable practices, and foster long-term quality investments;
  - Developing domestic capital markets, particularly long-term bond issuance, to meet long-term financing;
  - Using insurance, investment guarantees and new financial instruments to increase foreign direct investments to developing countries;
  - Increasing efforts for countries to meet their ODA targets; and
  - Increasing efforts to use ODA to catalyse resource mobilisation from other sources.

Essentially, the declaration has identified in a very comprehensive manner, all of the actions necessary to address the investment gap in Africa. Where difficulties arise is in the implementation of those actions.

- **The N’gor Declaration on Water Security and Sanitation:** In this declaration issued in 2016 by African Ministers of Water, the countries committed to implement past...
declarations on water and sanitation, to prioritize the implementation of programs that seek to extend access to water supply and sanitation such as the Kigali Action Plan, the pan-African Productive Sanitation Programme, and ‘Operation 2M4M’; to closing the infrastructure gap by promoting the implementation of water projects under the Program for Infrastructure Development (PIDA), and to ensure that national targets on investment in water and sanitation are consistent with national sustainable development targets.

- **Durban Political Declaration:** This declaration was adopted in Durban, South Africa in March 2017 on the occasion of the World Water Day. Among those present were members of the High Level Panel on Water (HLPW), African Ministers Council on Water (AMCOW), African Union Inter-sectoral Ministers, UNESCO Special Envoy for Water in Africa, United Nations (UN) Agencies, Provincial and Local Governments of South Africa, and Business people. The declaration requests the African Heads of States and Government through African Union Commission (AUC) to prioritize Water and Sanitation as central to Africa’s Economic Development and Growth. The declaration commits countries to increase budgetary allocation to match the central role of water security and sanitation in Agenda 2030, and requests AMCOW, African Development Bank (ADB) and AUC in collaboration with development partners, to convene meetings of Ministers responsible for Water and Finance to develop and implement appropriate financing policies and models for water and sanitation.

**Relevant SDGs**

All of the targets related to Sustainable Development Goal 6 (enumerated under Section 3) are relevant to the Finance theme. Also relevant for Sub-Saharan Africa are the following targets under Goal 17.

- **Target 17.1:** Strengthen domestic resource mobilization, including through international support to developing countries, to improve domestic capacity for tax and other revenue collection.

- **Target 17.3:** Mobilize additional financial resources for developing countries from multiple sources.

- **Target 17.5:** Adopt and implement investment promotion regimes for least developed countries.

- **Target 17.14:** Enhance policy coherence for sustainable development.

- **Target 17.16:** Enhance the Global Partnership for Sustainable Development, complemented by multi-stakeholder partnerships that mobilize and share knowledge, expertise, technology and financial resources, to support the achievement of the Sustainable Development Goals in all countries, in particular developing countries.

- **Target 17.17:** Encourage and promote effective public, public-private and civil society partnerships, building on the experience and resourcing strategies of partnerships.

**7.2.2 Progress on policy directives and commitments**

Review of the performance of Sub-Saharan Africa countries with respect to the above commitments shows that considerable progress has been made, but a lot more remains to be done to raise the level of financing needed to achieve global targets on water and sanitation in Sub-Saharan Africa. The performance evaluation in this report is based on the African Union’s 2015 Annual Report on Implementation of the Sharm El-Sheikh Commitment (AMCOW and AU-DREA, 2016). Six Sub-Saharan Africa countries (Cabo Verde, Comoros, Djibouti, Eritrea, Guinea Bissau and Somalia) did not submit data for the report.

The African Union (AU) report shows that for both the PANAFCON and eThekwani targets, three quarters of the Sub-Saharan countries had not managed to attain the funding targets (Figure 23). Only 12 (Botswana, Burkina Faso, Chad, Ethiopia, Gabon, Lesotho, Madagascar, Mali, Sao Tome and Principe, Senegal, Tanzania and Zambia) of the 48 Sub-Saharan Africa countries had met the PANAFCON 2003 target of allocating at least 5% of their national budget to water and sanitation. A further four countries (Benin, DR Congo, Mauritius and Sudan) had allocated between 3 and 4.9% of their national budget to water and sanitation. With respect to the eThekwani Declaration, only 10 (Cameroon, Chad, DR Congo, Gabon, Lesotho, Madagascar, Mali, Mozambique, South Africa and Tanzania) out of the 48 Sub-Saharan Africa countries had met the target of allocating at least 0.5% of their GDP to sanitation and hygiene. A further four countries (Malawi, Mauritius, Rwanda and Swaziland) had allocated between 0.3 and 0.49% of GDP to sanitation and hygiene.

The AU report further shows that during the initialisation phase of the Kigali Action Plan, the collective efforts of the water community in Africa resulted in the mobilisation of more than €56.4 million towards the construction of 12,388 water supply facilities and 154,658 basic sanitation facilities prioritised by the participating Member States (Burundi, Central African Republic, Chad, Lesotho, Liberia, Madagascar, Mali, Mauritania, Sierra Leone and South Sudan). These interventions will in total cost about €375 million, and activities are already underway to strengthen the capacity of the participating Member States for them to individually formulate and implement the Country Programmes through which they will both construct the prioritised infrastructure and also provide the relevant services (AMCOW and AU-DREA, 2016).
The first phase of the Action Plan has obviously been a success (it exceeded the target of mobilising €50 million), but it was only a pilot exercise targeting just 10 countries, and meant to support the transitioning of the unfinished business of the MDGs relating to water supply and sanitation, to the anticipated SDGs’ aspirations of universal access by 2030. The AU plans to make the Kigali Action Plan Funding Round-table an annual event for the 5-year duration of the Action Plan to drive the mobilisation of resources for extension of water supply and sanitation services to the large unserved population in Africa. The round-table event will be used to bring together representatives of Member States; funding and bilateral implementing partners; the private sector; and the local leadership from the project areas to review progress, as well as the resources commitments and implementation responsibilities of the Action Plan.

7.2.3 Bridging the financing gap

Local and national level

A study in East Africa has identified promise in mobilising private domestic finance through Public-Private Partnerships and Tariff and Repayable Financing. Still in East Africa, there are encouraging developments to mobilise private financing to support water and sanitation investments at farmer and water utility level.

Sovereign bonds are growing in importance as an alternative to traditional sources of development finance (official development assistance, commercial loans and credit lines) in Sub-Saharan Africa. A sovereign bond is a debt security issued by a national government and can be denominated in a foreign currency or the government’s own domestic currency. Several governments in the region have issued sovereign bonds to mobilise financing from capital markets for large infrastructure projects. Fourteen Sub-Saharan Africa countries (Angola, Cameroon, Côte d’Ivoire, Ethiopia, Gabon, Ghana, Kenya, Mozambique, Nigeria, Rwanda, Senegal, South Africa and Zambia) have issued such bonds between 2010 and 2015 and mobilised US$33.61 billion from the issuances (World Bank, 2017). A large proportion (40.0%) of this figure was mobilised by just one country – South Africa.

CASE STUDY 18: Alternative Water, Sanitation and Hygiene (WASH) Financing Mechanisms in Kenya and Uganda

---

Figure 23: [Top] Performance of Sub-Saharan Africa countries with respect to the PANAFCON and [Bottom] eThekwani commitments. (Data source: AMCOW and AU-DREA, 2016).
In most Sub-Saharan Africa countries, budget allocations to the water and sanitation sector are inadequate to bridge the gap between service provision and demand for services. This creates a need for alternative sources of financing to help bridge the financing gap.

The Civil Society Budget Advocacy Group (CSBAG) – a Uganda pressure group – conducted a study in 2016 to assess the financing mechanisms being employed in WASH programme and recommend alternative financing options to enhance WASH programme finance. The study identified two alternative financing mechanisms used in Kenya and Uganda with great potential to broaden the scope of WASH financing and improve on the efforts to extend services to the unserved. The two mechanisms were Public-Private Partnerships and Tariff and Repayable Financing.

A Public-Private Partnerships (PPP) is a contractual agreement involving the private sector in the delivery of public services. PPP is a mechanism recognized and promoted by the governments of Kenya and Uganda and widely used for service delivery. The partnerships can take various forms of agreements or concessions between the public agency and private entity including arrangements such as build-and-transfer; build-lease-and-transfer; build-operate-and-transfer; build-own-and-transfer; build-operate-share-and-transfer; build-own-operate-share-and-transfer. These partnerships allow a concessionaire to use own funds to construct and thereafter operate a facility to recover his/her investment costs, operation and maintenance costs and a reasonable return thereon from tolls, fees, or other charges levied; or from a post payment from the public authority on completion of the project. They represent an important mechanism of mobilising private financing from domestic and external sources.

Tariff and repayable financing involves the mobilization of financing from a variety of sources, which may include reducing costs (via efficiency gains or the choice of cheaper service options), increasing the basic sources of finance that can fill the financing gap, i.e. tariffs, taxes and transfers (“3Ts”) and mobilizing repayable finance (including loans, bonds and equity either from the market or from public sources) in order to bridge the financing gap.

A local success story for Tariff and Repayable Finance Mechanism is to be found in western Kenya where low-income communities in the towns of Kisumu and Nakuru gained access to affordable and clean water through innovative financing arrangements involving local commercial banks, water service providers (WSPs) and the urban poor under the USAID-funded SUWASA Program. The Kenya project helped the utilities in Kisumu and Nakuru to develop bankable infrastructure financing proposals, supported banks to determine creditworthiness of the utilities, and worked with consumers to understand their demand and willingness to pay for water. The approach was based on helping WSPs meet their mandates to serve the urban poor and recover their costs; banks to tap a new market opportunity; and urban poor consumers to gain improved access to clean, safe water at a cost that is a fraction of what they previously paid.

The Study recommended the adoption of PPP mechanisms by local governments for WASH service provision to rural communities; and the Tariff and Repayable Finance Mechanism by urban utilities for service extension to unserved low-income areas.

Source, WaterAid, 2017

CASE STUDY 19: Mobilising private finance to unlock the financing gap in Kenya’s water Sector

Kenya has over 22 million people (or about 45% of the population) who do not have access to clean and safe drinking water. One of the main reasons for this situation is inadequate financing for water and sanitation. The Government of Kenya is only able to provide about 35% of an estimated 1.7 trillion (about US$16.7 billion) required to meet the goal of achieving universal access to clean and safe water by safe sanitation by 2030.

Kenya Markets Trust (KMT) is a Kenyan organization that works in partnership with the private sector, central and local government agencies, and local and international NGOs, to nurture sustainable market growth by changing the underlying incentives, capacities and rules that shape the way in which market systems operate. KMT with funding from the UK’s Department for...
International Development (DFID) and Gatsby Africa (GA) has launched a drive to stimulate the emergence of alternative and innovative financing mechanisms within the water sector. Of particular interest to KMT are financing models able to tap into private sector financing in the form of commercial financing, blended financing, public private partnerships, equity investments, and the capital markets. One such financing that KMT has partnered with is the **Kenya Pooled Water Fund (KPWF)** which is itself an initiative of the **Kenya Innovative Finance Facility for Water (KIFFWA)**. KIFFWA is a dedicated Kenya-based entity destined to be a self-sufficient organisation that provides early stage capital and finance expertise to support the creation of viable water investment opportunities and attract private providers of finance. KIFFWA was established by the Netherlands Water Partnership (NWP) under a four-year program (2016-2019) funded to the tune of €10 million by the Embassy of the Kingdom of The Netherlands in Nairobi.

The Kenya Pooled Water Fund – the first facility under KIFFWA – focuses on supporting the development and financing of bankable proposals prepared by water and sewerage utilities (Water Service Providers). The fund operates by attracting and combining donor guarantees with local capital markets (bonds issuance) to lend to water and sewerage utilities at affordable rates and over long time frames, the required finances for water and sanitation service augmentation and extension.

Six Kenyan water and sewerage utilities – Embu, Thika, Nairobi, Kisumu, Nyeri and Meru – have shown interest to participate in the first round of bond issuance. KMT is supporting two of the utilities (Embu and Thika) to develop technical designs and complete tender and contract documents in preparation for the bond issuance.

The Kenya Pooled Water Fund is projected to mobilise over US$40 million in investment finance during its implementation phase. An initial reserve fund of US$2.5 million has already been allocated to the KPWF by the government of Kenya, with an additional US$2.5 million expected by Jun 2018.


---

*Women in Toa Tugawe, Kisauni Mombasa que to fetch water. The KPWF will support water utilities to extend services to unserved people in Kenyan municipalities (source: www.kenya-markets.org).*
Regional and continental level

Growing interest in patient development capital, renewed efforts to mobilise African capital, and the continued search for new sources of finance and funding types in Africa have yielded some fruits. Notable fund source and types emerging from these efforts include the following.

a. **African Water Facility**: This initiative is described in the box below.

b. **Africa50**: This infrastructure investment platform was launched by the African Development Bank (AfDB) in 2015 to facilitate infrastructure development by acting as a bridge between the public and private sectors, helping to eliminate bottlenecks for both private projects and Public-Private Partnerships (PPPs). In 2017, the fund had 25 shareholders comprising of 23 African governments, the AfDB, the Central Bank of Morocco (Bank Al Maghrib) and the Central Bank of West African States (Banque Centrale des États de l’Afrique de l’Ouest – BCEAO). The AfDB has contributed US$ 830 million to the initial share capital of the fund. Africa50 made its first investment through a Joint Development Agreement with Norfund and Scatec Solar in support of an 80 MW Solar Photovoltaic Independent Power Producer (IPP) Project in Nigeria (ICA, 2017).

c. **New Development Bank (NDB)**: This investment bank, established by the BRICS countries (Brazil, Russia, India, China and South Africa), made its first commitments to Africa’s infrastructure development in 2016 with a US$ 180 million loan to South Africa’s state owned power utility, Escom, to finance the construction of transmission lines to connect 500MW of renewable energy from IPPs to the national grid.

d. **Blended Finance Facilities**: Blended finance is defined as ‘the strategic use of development finance and philanthropic funds for the mobilization of private capital flows to developing countries’ resulting in positive results for both investors and communities (WEF, 2015). Blended finance is an important tool for realization of the United Nations Sustainable Development Goals (SDGs) in the developing world and offers the possibility to scale up commercial financing for developing countries and to channel such financing toward investments with development impact. A recent survey by the World Economic Forum identified 36 blended financing funds/facilities in Sub-Saharan Africa with a combined capital of US$ 5.8 billion (WEC, 2016). Examples of the existing facilities in Africa include NEPAD-IPPF; EU-Africa Infrastructure Trust Fund; Africa Agriculture and Trade Investment Fund; Beira Agricultural Growth Corridor Catalytic Fund; Conflict-Affected and Fragile Economies Facility; Danish Climate Investment Fund; Green Africa Power; InfraCo Africa; and Pan African Infrastructure Development Fund (WEF, 2016). Levels of awareness of this type of funding and its potential benefits are low among private sector investors and developers in Africa thereby limiting its potential to contribute to infrastructure development in the region.
e. NEPAD-IPPF (The New Partnership for Africa’s Development - Infrastructure Project Preparation Facility): NEPAD-IPPF – one of the better known blended financing facilities – is a specialised multi-donor fund set up in 2005 under the African Development Bank (AfDB) to address the lack of investment-ready infrastructure projects – one of the key constraints to economic development in Africa. NEPAD-IPPF provides grants to African governments, Regional Economic Communities (RECs), Power Pools, Transboundary River Basin Organisations, transport corridor authorities and intra-Africa related institutions for use in the preparation of high quality/valuable regional and continental infrastructure projects. Eligible projects for support fall under the transport, energy, water and ICT sectors. Contributors to the fund include the AfDB, Canada, Denmark, Germany, Norway, Spain, United Kingdom and USAID. Since 2005, NEPAD-IPPF has approved 72 grants for regional infrastructure projects, leading to investment financing of over US$ 7.3 billion, thereby contributing significantly to Africa’s integration and development agenda (AfDB, 2018). In 2016, the NEPAD-IPPF provided commitments of US$14.8 million and disbursements of US$7.8 million. Of the 2016 commitments, US$1.3 million (2.3%) was for water infrastructure investments in the Orange-Senqu River Basin (ICA, 2017).

f. The Africa Growing Together Fund (AGTF): This is a US$ 2 billion co-financing fund set up in 2014 by the Asian Development Bank (ADB) and the People’s Bank of China (PBOC) to support Infrastructure Development in Africa. It is administered by the African Development Bank.

g. Brazil: Brazil is increasing in importance as a source of official development assistance and foreign direct investment in Africa. At the public level, the National Development Bank of Brazil (BNDES), Brazilian Cooperation Agency (ABC), and the Brazilian Agricultural Research Corporation (EMBRAPA) have disbursed funds to the tune of US$2.9 billion to Sub-Saharan Africa in the areas of agricultural production, agro-processing, bio-fuel production and infrastructure. Foreign direct investment from Brazil to Africa is mainly targeted at the mineral extraction Sector.

Other potential infrastructure investment financing sources

Other potential sources and types of infrastructure investment finance that countries of the region could explore include pension funds, sovereign wealth funds and diaspora funds. A number of Sub-Saharan Africa countries – notably South Africa, Namibia, Botswana, Kenya and Lesotho – have relatively large pension funds that could potentially be used to support infrastructure development (Sy, 2017). Pension funds together with sovereign wealth funds (SWFs) could be big investors on the continent, but to attract this type of institutional investor will require reforms and new financial instruments in the Sub-Saharan African countries where investable assets are located, and reforms in the countries in which larger investors are regulated.

BOX 9: African Water Facility (AWF)

The African Water Facility (AWF) is an initiative led by the African Ministers’ Council on Water (AMCOW) to mobilise resources to finance water resources development activities in Africa. The Facility was established in 2004 and is hosted and managed by the African Development Bank (AfDB).

The AWF helps African countries meet goals and targets on water and sanitation sector set by the Millennium Development Goals and Sustainable Development Goals, and the African Water Vision 2025. Since 2006 the AWF has mobilised €151.2 million in grant financing from 15 bilateral, multilateral financial institutions, foundations and African governments. The resources have been used to prepare 104 projects in 52 African countries. On average each €1 contributed by the AWF has attracted €34 in additional follow-up investments.


A number of development partners have initiated efforts to address the above challenges to bring institutional investors on board. The Agence Française de Développement (AFD), for example, is engaged in the task of developing financial instruments to attract institutional investors. Several other development partners are looking at ways to guarantee or mitigate risks in projects to attract institutional investment in some projects (ICA, 2017). At continental level, the NEPAD Agency has mobilised members of the international business community to advise on ways of mitigating risk for infrastructure investments in Africa (Box 10).

BOX 10: De-Risking Infrastructure and PIDA Projects in Africa

As a practical step to addressing obstacles to investment in infrastructure in Sub-Saharan Africa, The NEPAD Agency in 2016 organised a series of high level leaders’ dialogues and panel discussions of the Continental Business Network (CBN) to deliberate on the issue of infrastructure investment in the region. The outcome of the dialogues was compiled into a report of the CBN that made 10 recommendations for scaling up the successful development and finance of Africa’s regional and national Infrastructure projects. The recommendations are the following:
1. Champion a platform and process to better understand the private sector project development ecosystem and investment criteria, and invest in the required increased effectiveness and efficiency of the project development cycle.

2. Invest in the development of publicly-disclosed “Preliminary Infrastructure Investment Assessments (Project Assessments)” that optimize the alignment between development dividends and investability criteria.

3. Champion the establishment of an infrastructure co-investment platform forum for African pension and sovereign wealth funds, as a means to mobilize domestic and international pension and sovereign wealth fund investment into de-risked African regional and domestic infrastructure investment projects.

4. Exponentially increase the amount of project development funding and create a development partner-led, new, expedient and transparent procurement framework that incentivizes project developers to invest in the project development phase, and institutional investors to provide debt and equity capital.

5. Develop an open menu of project ownership and financing options; improve the enabling and information environment for regional and national infrastructure projects; and identify and mitigate regulatory risks, to ensure that applicable treaties, cross-border agreements, parliamentary approvals and tax codes etc., are clearer and more predictable for project developers, investors and ratings agencies.

6. Establish a new collaborative work process that can mitigate risks in PIDA, regional and national infrastructure projects, focused on identifying project viability gaps and required interventions to achieve investability, rather than focusing in vain on finance sources for poorly-structured projects that do not meet investment criteria.

7. Encourage the use of project finance structures, working with the wide array of public and private sector leaders and development partners, to overcome project viability gaps and support the risk mitigation and financial close of PIDA and large infrastructure projects.

8. Champion the improvement of the enabling environment and strengthening of domestic capital markets as a vehicle for infrastructure investment.

9. Champion the scaling-up and utilization of existing and innovative risk mitigation instruments to incentivize investment in infrastructure, working closely with finance experts and sponsoring “Risk Mitigation Innovation Labs” made up of public and private sector leaders.

10. Champion the implementation of regional harmonization interventions (such as regional procurement bodies/authorities) that can facilitate the development of bankable and sustainable regional infrastructure projects, both on a systematic regional level as well as within each individual regional project structure.

Source: NEPAD, 2016.

7.3 Gaps, challenges and opportunities

7.3.1 Challenges

Many challenges still stand in the way of increasing water and sanitation financing in Sub-Saharan Africa. The main challenges include:

- Weak policy and regulatory frameworks, and slow speeds of policy and regulatory reforms, needed to support the development of domestic capital markets, and to provide an enabling environment for utilization of pension funds in investment financing.
- Narrow tax base in many countries, and continuing inefficiencies in tax collection and administration.
- Weak capacity for preparation of quality project proposals, this despite recent efforts to enhance capacity in key regional institutions.
- Low capacity to establish viable capital markets.
- Low number of bankable projects ready for financing.

7.3.2 Opportunities

The experiences in Kenya show that there is great potential to mobilise private finance to support water and sanitation investment at household and utility level.

7.4 Key lessons and good practices from Africa to the world

7.4.1 Lessons

Key lessons are the following:

- The presence of competent local actors who can partner with international agencies and businesses improves the possibility to attract private financing to support investment in developing counties.
- The readiness of governments to act as guarantors of bonds also improves the possibility to attract private financing to support investment in developing counties.
- Operating dedicated project preparation facilities can remove the bottleneck related to the lack of bankable
project proposals, and greatly increase the flow of financing to developing countries.
8. THE WAY FORWARD: AFRICA INVESTMENT PROGRAM

8.1 Investments in water resources urgently needed

Investments in water resources are urgently needed in order to harness the tremendous potential held by Africa’s abundant water resources to contribute to achieving SDG targets. This includes investments both in infrastructure, to manage and develop the physical resource base to contribute to inclusive growth and mitigate risks, as well as in institutions, to put in place acceptable and appropriate governance frameworks that ensures sustainability, equity, and transparency in the management and development of the resource base and the distribution of resulting benefits.

In recent years, majority of countries in Sub-Saharan Africa have focused on establishing sustainable development trajectories that grow climate-resilient economies, create jobs, reduce persistent poverty, and improve overall stability, while empowering women and providing opportunities for youth – as reflected in their ambitious SDG targets. Water is a critical ingredient across such development trajectories, both as a critical input into growth-inducing energy, agriculture, industry, and the services sectors, and as a primary channel via which climate change impacts economies, livelihoods, and ecosystems.

In spite of obvious and mounting investment needs, the existence of prioritized lists of investments at continental, regional, and national levels, the presence of strong political will, and the availability of both public and private finance, the actual pace of investment in Africa remains very slow, hampering the progress needed to achieve the continent’s SDG targets. It is high time to understand and address the reason behind this, and proactively address it if countries are to achieve their SDGs.

While Africa has made progress on water governance, establishing water management institutions at basin and national level with clear mandates for water management and service provision, further actions are needed to enhance the foundation for water infrastructure investments.

8.2 Strengthen leadership, business case for water investments, institutions, knowledge and information

The countries in Africa need to redouble efforts at improving the enabling environment for investment. In particular, increased efforts need to:

- Strengthen leadership, the business case for water investments and strong institutions.
- Facilitate access to knowledge and the exchange of good practices
- Pursue advocacy, networking and promote partnerships and action
- Improve knowledge generation and dissemination, including new information relevant to water-related SDGs
- Strengthen communication actions for implementation of the water-related Goals

8.3 Address bottlenecks of project preparation

Countries of the region need to urgently address two key bottlenecks identified as resulting in stagnation of investment preparation and implementation, namely:

(a) The need for independent, integrated, inclusive economic analysis to fully understand the role of water in the economy and prioritize focus areas and investments most urgently required to facilitate growth;

(b) The need for transaction management across all stages of the project cycle, to enable effective translation of development planning to ‘on the ground’ physical infrastructure assets that will contribute to sustainable growth and shared prosperity.

8.4 Enhance capacity, innovative public-private partnerships

While the capacities required for economic analysis and transaction management exist in entities outside the public sector within countries and indeed are of great value, country-
driven decision making and investment implementation cannot effectively accelerate without having some level of institutional capacity and experts embedded internally in the public sector.

To meet SDGs, capacity development support need to be scaled up across African- building capacities, strengthening public-private partnerships to address project preparation constraints, bottlenecks and critical gaps for leveraging investments.

8.5 Ensure empowerment of youth and women, gender equality and social inclusion

Africa’s population, and particularly its workforce, is young. Women and youth have been systematically disadvantaged at all levels of decision making, on the one hand adversely impacting women and girls’ wellbeing, workforce opportunities and outcomes, and wider roles within the home and community, and on the other, persistently holding back society from achieving its full potential.

To truly alleviate poverty, boost shared prosperity, and improve overall stability, economic growth in countries needs to enhance employment and entrepreneurship opportunities for youth and ensure the highest standards in advancing gender equality and inclusion.

Four Action Areas for Gender Equality and Social Inclusion, captured in GWP’s 2017 Gender Action Piece and endorsed by the High Level Panel on Water, can ensure the highest standards in advancing gender equality and inclusion. These are:

1. Institutional leadership and commitment;
2. Gender and inclusion analysis that drives change;
3. Meaningful and inclusive participation in decision-making and partnerships; and
4. Equal access to and control of resources.

8.6 Africa Water Investment Programme

The Africa Investment Programme (AIP) will be launched during the 8th World Water Forum, and is envisioned to leverage USD30 billion in investments that contribute to the SDGs in Africa by 2030.

AIP aims to achieve this by mobilizing US$100 million by 2020, US$300 million by 2025, and US$500 million by 2030. With an estimated leverage ratio of 1:60 based on AfDB water investment ratios, AIP will leverage at least US$30 billion additional investments towards implementation of water related SDGs.

Addressing the constraints to Africa’s growth and development calls for large scale investment in water security, including smart and context-dependent coordination and sequencing of infrastructure investments and institution investments. The bottlenecks preventing country-driven investment preparation and implementation must be targeted.

During the consultations for the 8th World Water Forum and also as part of the follow up to the recommendations of the UN/World Bank High Level Panel on Water, stakeholders and leaders across public and private sectors called for the establishment of an Africa Water Infrastructure investment Programme, as a response.

The Africa Investment Programme (AIP) will promote investments in water security for Job Creation, Industrialization and SDG Implementation on the continent. AIP will also support implementation of the recommendations and outcomes of the HLPW, and serve as a legacy of the African members of the HLPW championed by South Africa, supported by Mauritius and Senegal—the three HLPW members from Africa.

AIP will close the gap between the continent’s water-related SDGs and its massive needs for investment – in built and natural infrastructure, information systems, and supporting institutional frameworks.

The Investment Programme will be implemented by African countries with support from Global Water Partnership (GWP) in collaboration with the AfDB, World Bank, African Union, African Ministers Council on Water (AMCOW), NEPAD, and other partners to be identified.

The Investment Programme builds on the African priority themes for the 8th WWF and ongoing collaboration between GWP, AfDB, Africa Water Facility, AMCOW and others; on water governance, water-climate-development, water-food-energy nexus, ecosystem management, water and sanitation, transboundary waters, integrated urban water management and others.

The programme will contribute to transformational change that advances the aspirations of the Africa Water Vision 2025, the Africa Union Agenda 2063, ADB High Five priorities, the global 2030 Agenda for Sustainable Development, Paris Agreement on climate change and African Heads of states Sharm El Sheikh Declaration on water and sanitation.
9. REFERENCES


Regional Process leading to the Eighth World Water Forum. 81 pp.


African Regional Process Report
Regional Process Commission


Pegasys, 2017. Fostering regional value chains and job creation through the Water-Energy-Food Nexus approaches. Discussion paper for SADC 8th multi-stakeholder water dialogue, 21-22 November, Johannesburg, RSA


http://climateanalytics.org/files/schaeffer_et_al__2013__africao__s_a_daptation_gap_technical_report.pdf


van Eden A. and Muller J. 2015. Rapid African Growth results in the dire need to understand the Water-Energy-Food Nexus. E+C Spot On. Online article accessed on February 6, 2018 at:

WaterAid, 2017. Alternative Water, Sanitation and Hygiene (WASH) Financing Mechanisms in


## 10. PEOPLE CONSULTED

### Pan Africa Region Coordinating Team

<table>
<thead>
<tr>
<th>Name of Expert</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mr. Osward Chanda</td>
<td>AfDB</td>
</tr>
<tr>
<td>Mr. Alex Simalabwi</td>
<td>GWP</td>
</tr>
<tr>
<td>Mr. Ossete Jean Michael</td>
<td>AfDB/AWF</td>
</tr>
<tr>
<td>Ms. Nalubega Maimuna</td>
<td>AfDB</td>
</tr>
<tr>
<td>Dr. Canisius Kanangire</td>
<td>AMCOw</td>
</tr>
<tr>
<td>Mr. Kidanemariam Jembere</td>
<td>GWP</td>
</tr>
</tbody>
</table>

### Southern Africa Sub-Region

<table>
<thead>
<tr>
<th>NAME</th>
<th>DESIGNATION</th>
<th>ORGANIZATION</th>
<th>ADDRESS</th>
<th>CONTACTS</th>
<th>EMAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Piet Kenabatho</td>
<td>Senior Lecturer</td>
<td>University of Botswana</td>
<td>Box 21137 Gaborone, Botswana</td>
<td>Tel: 267 35525509 Cell: 267 73930993</td>
<td><a href="mailto:pietkenab@hotmail.com">pietkenab@hotmail.com</a></td>
</tr>
<tr>
<td>Thabo Nobala</td>
<td>Consultant</td>
<td>Native Seed Consulting</td>
<td>P.O. Box 1647 Maseno 100, Lesotho</td>
<td>Tel: 266 283 29644 ; Cell: 266 587 39644</td>
<td>Consultant</td>
</tr>
<tr>
<td>Geoffrey Chavula</td>
<td>Director</td>
<td>Shire River Basin Management Programme</td>
<td>Box 302242 LiLongwe 3, Malawi</td>
<td>Cell: 265 992035144</td>
<td><a href="mailto:gchavula@gmail.com">gchavula@gmail.com</a></td>
</tr>
<tr>
<td>Pedro Simone</td>
<td>Consultant</td>
<td>Consultant</td>
<td>Box 565 Vladimir Lenin Ave. 11Floor Maputo, Mozambique</td>
<td></td>
<td><a href="mailto:simonepisimone@yahoo.com">simonepisimone@yahoo.com</a></td>
</tr>
<tr>
<td>Venessa Quatre</td>
<td>Director</td>
<td>Consultant</td>
<td>Box 2017 Seychelles</td>
<td>Cell: +2642621259</td>
<td><a href="mailto:venquatre@gmail.com">venquatre@gmail.com</a></td>
</tr>
<tr>
<td>Tafadzwa Mabhaudhi</td>
<td>Research Fellow</td>
<td>University of KwaZulu Natal</td>
<td>P/Bag X01 Scottville 3201 Pertermersburg</td>
<td>Tel: +27 33 2605442 Cell: +27 74109845 Fax: +27 33260094</td>
<td><a href="mailto:Mabhaudhi@ukzn.ac.za">Mabhaudhi@ukzn.ac.za</a></td>
</tr>
<tr>
<td>Qandile Hlhe Simelane</td>
<td>Nexus Consultants</td>
<td>National Consultant</td>
<td>Box 5875 Manzini Swaziland</td>
<td>Tel: +268 76043003 Cell: +268 25505023</td>
<td><a href="mailto:qandilehle@gmail.com">qandilehle@gmail.com</a></td>
</tr>
<tr>
<td>Adolphine Kateka</td>
<td>Senior Lecturer</td>
<td>University of Dar-Es-Salaam</td>
<td>P.O. Box 43543</td>
<td>Cell: 255764438086</td>
<td><a href="mailto:a.kateka@yahoo.co.uk">a.kateka@yahoo.co.uk</a></td>
</tr>
<tr>
<td>Chimwang’a Maseka</td>
<td>Water Development Consultant</td>
<td>Zambia Water Partnership-Action For Water</td>
<td>Box 50895 Lusaka Zambia</td>
<td>Cell: +260977860260</td>
<td><a href="mailto:cmaseka@gmail.com">cmaseka@gmail.com</a></td>
</tr>
<tr>
<td>Wellington Dzvairo</td>
<td>Director</td>
<td>Consultant GLIMSS</td>
<td>3A Borden Close, Greendale, Harare</td>
<td>Tel: 263 4487994 ; Cell: 263 772 263743</td>
<td><a href="mailto:wdvdzairo@gmail.com">wdvdzairo@gmail.com</a></td>
</tr>
<tr>
<td>Kenneth Msibi</td>
<td>Policy Strategy Expert</td>
<td>SADC Secretariat</td>
<td>P.O Box 0095, Gaborone</td>
<td>Tel: 267 395 1863</td>
<td><a href="mailto:kmsibi@sadc.int">kmsibi@sadc.int</a></td>
</tr>
<tr>
<td>Dumisani Mndzebele</td>
<td>PM-Infrastrucre</td>
<td>SADC Secretariat</td>
<td>P.O Box 0095, Gaborone</td>
<td>Tel: 267 395 1863</td>
<td><a href="mailto:dmndzebele@sadc.int">dmndzebele@sadc.int</a></td>
</tr>
<tr>
<td>Joy Phiri</td>
<td></td>
<td>SADC Secretariat</td>
<td>P.O Box 0095, Gaborone</td>
<td>Tel: 267 395 1863</td>
<td><a href="mailto:jphiri@sadc.int">jphiri@sadc.int</a></td>
</tr>
<tr>
<td>Isaac Esipisu</td>
<td>Communications Expert</td>
<td>GWP-SA</td>
<td>333 Gross Vender Hartfield Gardens</td>
<td>Tel: +27 12 4302121</td>
<td><a href="mailto:I.Esipisu@cgir.org">I.Esipisu@cgir.org</a></td>
</tr>
<tr>
<td>Kidanemariam Jembere</td>
<td>Senior Advisor</td>
<td>GWP-SA</td>
<td>334 Gross Vender Hartfield Gardens</td>
<td>Tel: +27 12 4302121</td>
<td><a href="mailto:K.Jembere@cgir.org">K.Jembere@cgir.org</a></td>
</tr>
<tr>
<td>Patricia Lumba</td>
<td>GWP-Consultant</td>
<td>GWP-SA</td>
<td>335 Gross Vender Hartfield Gardens</td>
<td>Tel: +27 12 4302121</td>
<td><a href="mailto:P.Lumba@cgir.org">P.Lumba@cgir.org</a></td>
</tr>
<tr>
<td>Cathrine Mutaburwa</td>
<td>Programme Manager</td>
<td>GWP-SA</td>
<td>336 Gross Vender Hartfield Gardens</td>
<td>Tel: +27 12 4302121</td>
<td><a href="mailto:C.Mutaburwa@cgir.org">C.Mutaburwa@cgir.org</a></td>
</tr>
</tbody>
</table>
# African Regional Process Report
## Regional Process Commission

<table>
<thead>
<tr>
<th>Name</th>
<th>Organization</th>
<th>Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>James Dalton</td>
<td>IUCN</td>
<td><a href="mailto:james.dalton@iucn.org">james.dalton@iucn.org</a></td>
</tr>
<tr>
<td>Palesa Mokorosi</td>
<td>IUCN</td>
<td><a href="mailto:p.mokorosi@iucn.org">p.mokorosi@iucn.org</a></td>
</tr>
</tbody>
</table>

### Eastern Africa Sub-Region

<table>
<thead>
<tr>
<th>Name of Expert</th>
<th>Organization</th>
<th>Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr Ahmed Khalid Eldaw</td>
<td>GWP-EA</td>
<td></td>
</tr>
<tr>
<td>Gerald Kairu</td>
<td>GWP-EA</td>
<td></td>
</tr>
<tr>
<td>Engineer Hamere Wondimu</td>
<td>Individual Expert</td>
<td></td>
</tr>
<tr>
<td>Mr Teferra Woudeneh</td>
<td>Individual Expert</td>
<td></td>
</tr>
<tr>
<td>Dr Adam M. Adam</td>
<td>Advisor, Ministry of Water Resources &amp; Electricity, Sudan</td>
<td></td>
</tr>
<tr>
<td>Dr Tarig Elgamri A. Ibrahim</td>
<td>Sudan</td>
<td></td>
</tr>
<tr>
<td>Mr Eshetu Dejen</td>
<td>IGAD</td>
<td></td>
</tr>
</tbody>
</table>

### West Africa Sub-Region

<table>
<thead>
<tr>
<th>Name of Expert</th>
<th>Organization</th>
<th>Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dam Mogbante</td>
<td>GWP-AO</td>
<td><a href="mailto:dam.mogbante@gwpao.org">dam.mogbante@gwpao.org</a></td>
</tr>
<tr>
<td>Armand Houanyé</td>
<td>GWP-AO</td>
<td><a href="mailto:armand.houanye@gwpao.org">armand.houanye@gwpao.org</a></td>
</tr>
<tr>
<td>Félicité CHABI GONNI épse VODOUNHESSI</td>
<td>GWP-AO</td>
<td><a href="mailto:felicite.vodounhessi@gwp.org">felicite.vodounhessi@gwp.org</a></td>
</tr>
<tr>
<td>Krystel Malenge</td>
<td>Eau Vive International</td>
<td><a href="mailto:kristel.malegue@eau-vive.org">kristel.malegue@eau-vive.org</a></td>
</tr>
<tr>
<td>André Zogo</td>
<td>PNE-Bénin</td>
<td><a href="mailto:zandre2002@yahoo.fr">zandre2002@yahoo.fr</a></td>
</tr>
<tr>
<td>Arnaud Adjagodo</td>
<td>PNE-Bénin</td>
<td><a href="mailto:arnaudadj@yahoo.fr">arnaudadj@yahoo.fr</a></td>
</tr>
<tr>
<td>Maxime Téblikou</td>
<td>PNE-Bénin</td>
<td><a href="mailto:teblekoun@gmail.com">teblekoun@gmail.com</a></td>
</tr>
<tr>
<td>Peter Henry SULE</td>
<td>PNE-Nigéria</td>
<td><a href="mailto:phsule@yahoo.com">phsule@yahoo.com</a></td>
</tr>
<tr>
<td>Moses BECKLEY</td>
<td>PNE-Nigéria</td>
<td><a href="mailto:moses.beckley@yahoo.com">moses.beckley@yahoo.com</a></td>
</tr>
<tr>
<td>Leila Nokie SAMBARE/ZERBO</td>
<td>PNE-BF</td>
<td><a href="mailto:zerbo_leila@yahoo.fr">zerbo_leila@yahoo.fr</a></td>
</tr>
<tr>
<td>GARBA Radji</td>
<td>PNE-Niger</td>
<td><a href="mailto:garbaradji54@yahoo.fr">garbaradji54@yahoo.fr</a></td>
</tr>
<tr>
<td>ZINSOU Didier</td>
<td>A8N</td>
<td><a href="mailto:didierzinsous@yahoo.fr">didierzinsous@yahoo.fr</a></td>
</tr>
<tr>
<td>NAKOHOUN Lokou Pascal</td>
<td>Ministère de l'eau et de l'assainissement - Burkina Faso</td>
<td><a href="mailto:locoupascal@yahoo.fr">locoupascal@yahoo.fr</a></td>
</tr>
<tr>
<td>PALM/ZOWELENGRE Emma</td>
<td>Ministère de l'eau et de l'assainissement - Burkina Faso</td>
<td><a href="mailto:zowemmy@yahoo.fr">zowemmy@yahoo.fr</a></td>
</tr>
<tr>
<td>M. GBODOGBE Jean-Claude</td>
<td>Ministère des Mines, de l'Energie et de l'Eau - Bénin</td>
<td><a href="mailto:jc.gbodogbe@gmail.com">jc.gbodogbe@gmail.com</a></td>
</tr>
<tr>
<td>KOFFI KOUAME Fernand</td>
<td>Direction Générale de la Gestion et de la Protection des Ressources en Eau - Ministère des Eaux et Forêts – Côte d'Ivoire</td>
<td><a href="mailto:kouamef@yahoo.fr">kouamef@yahoo.fr</a></td>
</tr>
<tr>
<td>SANOGO Boubacar</td>
<td>Direction Nationale de l'Hydraulique - Mali</td>
<td>bсаного<a href="mailto:2007@yahoo.fr">2007@yahoo.fr</a></td>
</tr>
<tr>
<td>TABALABA Boureima</td>
<td>CN-CIEPA/WASH - Mali</td>
<td><a href="mailto:tabalabab@yahoo.fr">tabalabab@yahoo.fr</a></td>
</tr>
<tr>
<td>KARBO Atahirou</td>
<td>Ministère de l'Hydraulique et de l'Assainissement - Niger</td>
<td><a href="mailto:atahiroukarbo@yahoo.fr">atahiroukarbo@yahoo.fr</a></td>
</tr>
</tbody>
</table>
Africa Regional Process Report
Regional Process Commission

<table>
<thead>
<tr>
<th>Name of Expert</th>
<th>Organization</th>
<th>Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHAIBOU Tankari</td>
<td>Ministère de l'Hydraulique et de l'Assainissement - Niger</td>
<td><a href="mailto:chaiboutan@yahoo.fr">chaiboutan@yahoo.fr</a></td>
</tr>
<tr>
<td>ADJAMA Affo Bôni</td>
<td>Ministère de l'agriculture, de l'Élevage et de l'Hydraulique - Togo</td>
<td><a href="mailto:a.boni.2007@yahoo.fr">a.boni.2007@yahoo.fr</a></td>
</tr>
<tr>
<td>EWAROU Kpatcha</td>
<td>Ministère de l'agriculture, de l'Élevage et de l'Hydraulique - Togo</td>
<td><a href="mailto:ewaroukpatcha@yahoo.fr">ewaroukpatcha@yahoo.fr</a></td>
</tr>
<tr>
<td>DIENG Ndiame</td>
<td>Eau Vive Sénégal</td>
<td><a href="mailto:ndiame.dierg@yahoo.fr">ndiame.dierg@yahoo.fr</a></td>
</tr>
<tr>
<td>NDIAYE Joseph</td>
<td>Eau Vive Sénégal</td>
<td><a href="mailto:jndiaye@eau-vive.org">jndiaye@eau-vive.org</a></td>
</tr>
<tr>
<td>TACKO DIALLO Mame</td>
<td>Eau Vive Sénégal</td>
<td><a href="mailto:mtdiallo@eau-vive.org">mtdiallo@eau-vive.org</a></td>
</tr>
<tr>
<td>SANTANNA Im'Yana</td>
<td>Eau Vive Togo</td>
<td><a href="mailto:isantannaa@eau-vive.org">isantannaa@eau-vive.org</a></td>
</tr>
<tr>
<td>SENE Abdoulaye</td>
<td>Comité national préparatoire pour l'organisation du 9ème Forum Mondial de l'Eau &quot;Dakar 2021&quot;</td>
<td><a href="mailto:seneabdou@hotmail.com">seneabdou@hotmail.com</a></td>
</tr>
<tr>
<td>BAYE MASSE TAAL</td>
<td>Comité national préparatoire pour l'organisation du 9ème Forum Mondial de l'Eau &quot;Dakar 2021&quot;</td>
<td><a href="mailto:baimass1@yahoo.com">baimass1@yahoo.com</a></td>
</tr>
<tr>
<td>SULE Peter Henry</td>
<td>GWP-Nigeria, Nigeria Integrated Water Resources Management Commission</td>
<td><a href="mailto:phsule@yahoo.co.uk">phsule@yahoo.co.uk</a></td>
</tr>
<tr>
<td>ADJAGODO Arnauld</td>
<td>GWP-Bénin</td>
<td><a href="mailto:aarnauld@yahoo.fr">aarnauld@yahoo.fr</a></td>
</tr>
<tr>
<td>FOUTI Jean</td>
<td>Direction Générale de l’Eau du Bénin</td>
<td><a href="mailto:fondjemys@yahoo.fr">fondjemys@yahoo.fr</a></td>
</tr>
<tr>
<td>BAZOUN Janvier</td>
<td>CCRE/CEDEAO</td>
<td><a href="mailto:bazdoumou@gmail.com">bazdoumou@gmail.com</a></td>
</tr>
</tbody>
</table>

Participants at Regional Validation Workshop for the Draft Africa Regional Process Report

<table>
<thead>
<tr>
<th>Names</th>
<th>Organisation</th>
<th>Position</th>
<th>Telephone</th>
<th>Email contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Osward Chanda</td>
<td>AfDB</td>
<td>Ag. Director</td>
<td>+255-75750094</td>
<td><a href="mailto:O.Chanda@afdb.org">O.Chanda@afdb.org</a></td>
</tr>
<tr>
<td>Ossete Jean Michael</td>
<td>AfDB/AFW</td>
<td>Ag. Coordinator</td>
<td>+255-77305267</td>
<td><a href="mailto:J.Ossete@afdb.org">J.Ossete@afdb.org</a></td>
</tr>
<tr>
<td>Nalubega Maimuna</td>
<td>AfDB</td>
<td>Eng.</td>
<td>+255-77309543</td>
<td><a href="mailto:M.Nalubega@afdb.org">M.Nalubega@afdb.org</a></td>
</tr>
<tr>
<td>Mecuria Assefaw</td>
<td>AfDB</td>
<td>Financial Expert</td>
<td>+27-120036900</td>
<td><a href="mailto:M.Assefaw@afdb.org">M.Assefaw@afdb.org</a></td>
</tr>
<tr>
<td>Toure Mahamane</td>
<td>ECOWAS</td>
<td>Programme Officer</td>
<td>+226-7045529</td>
<td><a href="mailto:mdtoure@yahoo.fr">mdtoure@yahoo.fr</a></td>
</tr>
<tr>
<td>Alex Simalabwi</td>
<td>GWP Africa</td>
<td>Executive Secretary</td>
<td>+27-630573688</td>
<td><a href="mailto:alex.simalabwi@gwp.org">alex.simalabwi@gwp.org</a></td>
</tr>
<tr>
<td>Kidanemariam Jembere</td>
<td>GWP-Africa</td>
<td>Technical Advisor</td>
<td>+27-94147689</td>
<td><a href="mailto:K.Jembere@cgiar.org">K.Jembere@cgiar.org</a></td>
</tr>
<tr>
<td>Hycinth Baneka</td>
<td>GWP-Caf</td>
<td>Regional Coordinator</td>
<td>+237-675334532</td>
<td><a href="mailto:hycinth.baneka@gwpcaf.org">hycinth.baneka@gwpcaf.org</a></td>
</tr>
<tr>
<td>Ahmed Khalid Eldaw</td>
<td>GWP-EA</td>
<td>Regional Coordinator</td>
<td>+256-757680896</td>
<td><a href="mailto:Ahmed.K.Eldaw@gwpea.org">Ahmed.K.Eldaw@gwpea.org</a></td>
</tr>
<tr>
<td>Camille Karangwe</td>
<td>GWP-EA</td>
<td>Regional Comm. Officer</td>
<td>+256-789961744</td>
<td><a href="mailto:camille.karangwa@gwpea.org">camille.karangwa@gwpea.org</a></td>
</tr>
<tr>
<td>Doreen Byanjenu</td>
<td>GWP-EA</td>
<td>Program Admin. Assistant</td>
<td>+256-790516211</td>
<td><a href="mailto:dbyanjenu@nilebasin.org">dbyanjenu@nilebasin.org</a></td>
</tr>
<tr>
<td>Kairu Gerald</td>
<td>GWP-EA</td>
<td>Program Manager</td>
<td>+256-776446392</td>
<td><a href="mailto:gerald.kairu@gwpea.org">gerald.kairu@gwpea.org</a></td>
</tr>
<tr>
<td>Houany K. Armand</td>
<td>GWP-WA</td>
<td>Executive Secretary</td>
<td>+276-04549800</td>
<td><a href="mailto:armand.houanye@gwpao.org">armand.houanye@gwpao.org</a></td>
</tr>
<tr>
<td>Nampiti Matete</td>
<td>IUCN-ESARO</td>
<td>Technical Coordinator - Water</td>
<td>+27-1234228394</td>
<td><a href="mailto:nampiti.matete@iucn.org">nampiti.matete@iucn.org</a></td>
</tr>
<tr>
<td>Ayenew Tessa</td>
<td>Nile Basin Discourse</td>
<td>Regional M&amp;E Officer</td>
<td>+256-759320059</td>
<td><a href="mailto:atesa@nilebasiniscourse.org">atesa@nilebasiniscourse.org</a></td>
</tr>
<tr>
<td>Tom Ogol</td>
<td>SEI - Africa</td>
<td>Project Associate</td>
<td>+254-720761544</td>
<td><a href="mailto:tom.ogol@sei.international.org">tom.ogol@sei.international.org</a></td>
</tr>
<tr>
<td>Tariq El Gamri</td>
<td>Sudan Water Partnership</td>
<td>Vice Chair</td>
<td>+249-922596300</td>
<td><a href="mailto:tariq.ncr@yahoo.com">tariq.ncr@yahoo.com</a></td>
</tr>
<tr>
<td>Piet Kenabatho</td>
<td>University of Botswana</td>
<td>Associate Professor</td>
<td>+267-73930993</td>
<td><a href="mailto:pietkenab@hotmail.com">pietkenab@hotmail.com</a></td>
</tr>
<tr>
<td>Nicholas Azza</td>
<td>Freelance</td>
<td>Consultant</td>
<td>+256-751241000</td>
<td><a href="mailto:nileman.azza@gmail.com">nileman.azza@gmail.com</a></td>
</tr>
<tr>
<td>Hountonjd Fabien</td>
<td>GWP-WA</td>
<td>Author/T.C. Member</td>
<td>+229-66008202</td>
<td><a href="mailto:fabienho@yahoo.com">fabienho@yahoo.com</a></td>
</tr>
<tr>
<td>Name</td>
<td>Contact Type</td>
<td>Position</td>
<td>Phone</td>
<td>Email</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>---------------</td>
<td>----------------</td>
<td>----------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>Charles Tanania Kabobo</td>
<td>Private</td>
<td>Consultant</td>
<td>+243-820528809</td>
<td><a href="mailto:tkabobo@yahoo.fr">tkabobo@yahoo.fr</a></td>
</tr>
<tr>
<td>Vincent De Paul Kabalisa</td>
<td>Private</td>
<td>Consultant</td>
<td>+250-785545307</td>
<td><a href="mailto:kabalisa@hotmail.com">kabalisa@hotmail.com</a></td>
</tr>
<tr>
<td>Ruth Beukman</td>
<td>Private</td>
<td>Consultant</td>
<td>+27-824432259</td>
<td><a href="mailto:ruth.beukman2017@gmail.com">ruth.beukman2017@gmail.com</a></td>
</tr>
<tr>
<td>Mekurua Tafesse Andarge</td>
<td>Private</td>
<td>Consultant</td>
<td>+251-910884462</td>
<td><a href="mailto:mekuriafesse1@gmail.com">mekuriafesse1@gmail.com</a></td>
</tr>
</tbody>
</table>