



## **Acknowledgments**

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# FOREWORD



## The future of water in Africa

In its march towards development, Africa is slowed by the difficulties that many states face in finding the essential tools for encouraging significant and sustainable growth.

The development of the African continent must be secured. First, human security is needed, principally translated to the capacity to feed and ensure the health of its ever-growing population.

Then, economic security is needed to guarantee industrial and agricultural production and the expansion of services within a financial and customs framework that is fair and creates incentives. It is followed by true water and energy security, which is a pre-requisite to foster fair development between territories and groups of human beings.

There is no development without water but not all water should be dedicated to development. It is in these terms that the future of water in Africa, as well as on other continents, should be understood. Because water, has become a scarce resource in many places, Africans can no longer think in the short-term. Water resources and its security should be considered over time, as well as geographically.

Giving back to nature the water needed for the prosperity of future generations, both in terms of quality and quantity, is a duty, one that corresponds to the expression of the right to water and sanitation for each African man and woman. Guarantying access to water depends on the existence of three complementary pillars, which form the basis for a priority to water: finance, governance and knowledge.

There is no national or local water policy without a strong and clear interaction between these three elements. All this must be placed within the context of demographic growth, urban concentration, improving living conditions, worsening pollution and climate evolution.

In the face of these significant enduring threats, the issue of financial means translated to the capacity to invest and maintain operating infrastructure is an essential one.

The World Water Council has been working on these issues since its creation in 1996. Prior to the 3<sup>rd</sup> World Water Forum held in Kyoto, Japan in March 2003, the Council approached Michel Camdessus, former IMF Director General, to make proposals for determining the nature and amount of investments necessary, in particular in Africa.

As an extension of the resulting and still relevant Camdessus Report, the French Minister of Foreign and European Affairs called upon the expertise of the World Water Council to work more specifically on an African approach for financing water.

The unyielding support offered by France to encourage the development of African capacities has led to the creation of this report, which endeavours to demonstrate that there is not one single approach in the field of water, but on the contrary, a mosaic of approaches and, therefore, of solutions in terms of investment.

May this report constitute a humble, yet useful contribution, to bring efficiency and coherence to the future management of water on the African continent.

Loïc Fauchon  
*President,  
World Water Council  
Marseille,  
15 September 2011*

# EXECUTIVE SUMMARY

Without reliable access to water, communities all over the world are condemned to a subsistence lifestyle, vulnerable to the impacts of global changes. Industry cannot be established without reliable water and related electricity. Entire populations suffer from water-borne diseases due to poor levels of sanitation and hygiene. Levels of education are negatively impacted (especially for girls), as children are often charged with collecting and carrying water, sometimes over large distances on a daily basis.

Furthermore, as recently seen yet again in the Horn of Africa, crops can fail due to a combination of factors including drought or flood conditions, turning entire communities into refugees in often already politically unstable and environmentally stressed regions.

But what does this mean for policy makers trying to decide where to invest public funds to bring about sustainable development in a continent as large, diverse and complicated as Africa; a continent faced with seemingly insurmountable challenges and yet at the same time so full of potential?

This report argues that an effective investment framework must be able to adapt to different levels and contexts. In addition, within a strong development narrative, a framework that integrates the contributions that water can make to growth and development as a whole provides a useful basis for discussion and engagement between policy makers, water and other stakeholders and investors across Africa. By developing such a framework, this report aims to encourage a positive transformation for Africa's future through the establishment of the most appropriate investment patterns at the most impactful levels. The shared nature of Africa's water will, of course, be a central element of the discussion.

This report on Water for Growth and Development in Africa wishes to convey a global message to those working both inside and outside the international water community: Wise investments in managing and developing Africa's water resources are integral to the future growth and prosperity of the continent. The questions of what, where and how to invest are therefore at the heart of this report.



Men on bus, Ivory Coast.

# WATER IN CONTEXT IN AFRICA

A fundamental fact to be kept in mind when entering any discussion or analysis on water in Africa is that almost all of Africa's water is shared across 13 major river basins. This presents both a collective action challenge as well as an opportunity to bring resource management closer together. This management is driven by decision making occurring at three key institutional levels: local, national and regional.

This report argues that it is essential to take into account all of these institutional contexts when shaping any future investment. Moreover, at the heart of the framework proposed in this report lies the achievement of three interdependent "securities", namely, human security, economic

security and water security. Together, these form the focus for investment actions at the different institutional levels. Furthermore, actions that reinforce water security have an immediate impact on human and economic security and encourage sustainable development as a whole, thus framing the logic for their prioritisation.

The basic premise of the proposed investment framework is, therefore, that action on these three securities intersects with the three institutional levels in which investment decisions need to be made. Each intersection within this 3x3 decisional framework must be duly considered in order to determine the best possible investments actions for sustainable development in Africa.

## THIS REPORT

In the year 2000 the World Bank asked a simple question - Can Africa Claim the 21<sup>st</sup> Century? The answer relates to the future of growth and development on the continent. With little economic diversification, compounded by capital flight and loss of skills to other regions of the world, the World Bank argued that Africa's place in the global economy was "eroding". The same year, at the 2<sup>nd</sup> World Water Forum held at The Hague, within the World Water Council's World Water Vision exercise, the African countries, supported by the United Nations Economic Commission for Africa, came to an agreement on a common water approach, "Africa Water Vision for 2025", which obtained wide support amongst development partners. However, it took until 2008 for the 1<sup>st</sup> Africa Water Week to take place in Tunis, where the Tunis Declaration made by governments and international organisations recognised that water plays a key role in the socio-economic development of Africa.

This was one of a number of declarations leading up to and contributing to the Africa Regional Preparatory Process for the 5<sup>th</sup> World Water Forum, held in Istanbul in March 2009. This process was co-ordinated by the African Development Bank on behalf of the African Ministers' Council on Water, and it recognised the necessity to move from commitments to action by producing a report entitled

*"Bridging Divides in Africa's Water Security: An Agenda to Implement Existing Political Commitments"*. Additionally, a Ministerial Roundtable entitled 'Making Water a Tool for Development in Africa' was convened during the 5<sup>th</sup> World Water Forum in the presence of ministerial representatives from 22 countries and a number of international organisations. During this preparatory process and fitting perfectly with its conclusions, the World Water Council embarked upon a course of dialogue and discussion aimed at assessing future investment opportunities and directions for water in Africa, keeping in mind the Africa Water Vision for 2025.

To further this course of work and to attempt to address the question posed by the World Bank, "Can Africa Claim the 21<sup>st</sup> Century?" this report examines the existing literature and assesses in more detail experience from different basins of the continent. The aim is to establish a simple analytical framework through which to create a common ground for dialogue between policy makers, investors and water stakeholders in Africa. This course of action is essential for understanding what investments are necessary for development in the short, medium and long terms, while at the same time balancing the sometimes different and competing demands for the fundamental shared water resources of the continent.

# HUMAN, ECONOMIC & WATER SECURITY IN CHANGING CONTEXTS

Three types of securities lie at the heart of the framework proposed in this report. The report links issues together and shows how the investment framework will have to deal with a range of often interrelated challenges:

## HUMAN SECURITY

Human security is a concept that has gained worldwide recognition since the 1994 Human Development Report. Produced ahead of the World Social Summit in 1995, the report stated that, "To address the growing challenge of human security, a new development paradigm is needed that puts people at the centre of development, regards economic growth as a means and not an end, protects the life opportunities of future generations as well as the present generation's and respects the natural systems on which all life depends" (UNDP, 1994).

On current trends, with Africa's population set to double in the next 40 years, an immense strain will be placed on existing resources. There will be a shift to much greater levels of urbanisation, often to poor informal settlements with little or no supporting infrastructure. If action is not taken, this will perpetuate conditions for entrenched human insecurity across large sections of Africa's population. Ensuring safe, reliable water and sanitation will be a major on-going future priority, as will be assistance in establishing enabling environments for sustainable livelihoods.

The main social change contexts that should be taken into consideration when examining the future of water resources in Africa include the following:

- Africa is currently home to nearly one billion people or about 15% of the global population.
- By 2030, half of all Africans will live in urban centres compared to only 38% in 2005.
- Food riots, which took place in many African countries in 2008 and 2010, were triggered by a sharp increase in the price of food.
- Africa's population distribution is highly uneven.

- The relationship between population growth, natural environments and migration is frequently complex and not necessarily simply a one-way move from rural to urban areas.
- With 5% of Africa's GDP lost annually due to poor access to water and sanitation, health and hygiene issues cut right across all themes covered in this report and are fundamental to improving human security.

The social context to water investments in Africa will therefore necessarily become a fine balance between actions that sustain existing livelihood systems in farming areas with actions that promote the development and establishment of new livelihoods in developing economies.

## ECONOMIC SECURITY

The shared benefits of strong and sustainable economic growth are vital for the future development of Africa and for underpinning the capacity to support human security. Investments in water that underpin such development will contribute important economic and social benefits and help to support future economic security. At the same time, however, robust economies will only be sustainable in the long term if water investments contribute simultaneously to economic diversification.

Investment and economic diversification in Africa will require integration between and across economic levels. Given the many and complex overlapping memberships of river basin organisations and economic communities, identifying and shaping future water investments through regional-level strategies of economic cooperation will become an imperative and a centrepiece of more connected resource governance.

The main economic change contexts that should be taken into consideration when examining the future of water resources in Africa include the following:

- Most African national economies are not diversified and are instead dependent upon a small number of commodity exports subject to volatilities in global commodity prices.

- African economies have historically lost market share to Asian and Latin American producers, caused by barriers to trade including weak links to global supply chains, exacerbated by the high cost of transport in Africa, particularly for its landlocked countries.
- After Europe, Africa remains the second most important export market for most African countries, highlighting the importance for the development of regional integration across the continent.
- Since 2000, Africa's direction of external trade has shifted eastwards, particularly towards China, with African countries now providing many of the key metals and other commodities required to drive Chinese growth.
- Oil and gas are an increasing focus of Africa's global export portfolio with an estimated 7% of all proven oil reserves and 5% of global gas supplies, but the benefits of these reserves are limited to a few countries, notably Algeria, Angola, Nigeria, Sudan and Uganda.
- African countries trying to diversify their economies, are often adversely affected by chronic power shortages, therefore the development of hydro-power is critical to securing the future energy supplies of many regions, but this will need to be linked to regional approaches towards trade and development, principally through power-pooling.
- One of the most critical areas for future growth and development in much of Africa will be the agricultural sector, raising the questions of how and where to increase the productive potential of agriculture on the continent.
- It is estimated that investments in small-scale water technologies such as low-till or zero-till agriculture, supplemental irrigation, groundwater recharge and rainwater harvesting could yield a direct net benefit of an estimated USD 100-200 billion for the 100 million farmers who could adopt such tools.

The economic context to water investments in Africa will therefore need to build upon regional co-operation bringing together both private and public sector stakeholders to develop a more holistic overview of regional water management as a shared and multi-use resource, which is key to the economic diversification needed to achieve higher levels of economic security.

## WATER SECURITY

Water Security has two dimensions: resource availability and its quality. This report argues that water security is the critical foundation on which to build both human and economic security.

Ensuring effective governance of water resources is a central feature of water availability. This includes protecting the natural stock of water against overuse and pollution, as well as against peaks and troughs in availability, further exacerbated by the effects of global changes. However, it also includes maintaining availability within the natural environment to ensure that ecosystem services are also sustained.

Achieving water security in Africa has complex dimensions that should be taken into consideration when examining the future of water resources in Africa:

- Projections to 2025 indicate that water-scarce countries in Africa will increase in number.
- While Africa receives an average of 20,000km<sup>3</sup> of rainfall a year, only 20% of the total rainfall on the continent contributes to renewable water resources.
- Extreme regional variation in rainfall between years has long been an obstacle to development across Africa.



A child jumps into a public fountain to cool off on a hot day in downtown Algiers, Algeria.

- The challenge for future investment in water resources needs to focus on its distribution and storage, the costs of access and the fact that it is mainly shared.
- 13 major river basins cover most of Africa, with most of these being shared by 5 or more countries.
- There is also an important connection between these hydrological systems and major aquifers in Africa for rural communities in particular, whose access to shallow aquifers provides their primary source of water for domestic use, even though some of these sources have no apparent recharge.
- Currently, over 80% of water use in Africa is for agriculture, in comparison with 44% for OECD member countries.

The cross-cutting nature of water means that it is the cornerstone upon which investment for economic development in Africa must build upon. However, due to the necessity of sharing the resource, these investments would benefit from increased levels of regional co-operation and co-ordination. Investments need to take into account anticipated changes in demand for, as well as distribution and availability of water resources. Without water security, it will be impossible to achieve human and economic security in Africa.

## REGIONAL ANALYSIS

Taking into account water in human and economic contexts, the report examines three major river basins in Africa to assess in more detail experiences from different parts of the continent. These are the Nile Basin, the Niger Basin and the Zambezi Basin. Each is a major region acting as a focal point of political and economic integration.

From the analysis of these case studies, we draw together common experiences, identify differences where necessary, and from these have constructed a simple framework for policy and decision making on water investment in Africa. Each section includes a focus on one “hotspot” and a key country from the region.

The purpose of this analysis is not to provide a strictly regional comparison, but rather to draw out the key issues from each region to help inform the development of the framework presented in this report. From the analysis

undertaken, certain key conclusions and messages begin to emerge, all of which need to be taken into account when using the framework:

- There are very high rates of urbanisation in Africa with both in-situ growth and significant permanent, circulatory or temporary rural-urban migration.
- Services provision often lags behind this rapid growth, leaving new urban arrivals with little or no access to adequate water and sanitation. This undermines health and productivity, reinforces poverty.
- The demands created by a high rate of population growth mean there is a need to invest in and empower women in Africa to reduce the crude birth rate and increase overall productivity.
- High rates of unemployment in Africa require job protection and creation in the agricultural sector, while at the same time shifting economies to more diversified and urbanised economies.
- Buffering against variability in water supply and water shortages is necessary to ensure stable economic growth in Africa through the provision and enhancement of both natural ecosystem services and man-made infrastructure.
- The costs and benefits of water allocations for different uses such as mining and agriculture must be properly understood to reduce poverty and damage to the environment in Africa.
- Windfall revenues from the trade in mineral resources are relatively short-lived (usually spanning decades) and, therefore, need to be wisely invested in order to create the right stimulus for African economies to further develop and diversify.
- Increasing regional cooperation and removing trade barriers, not just regionally, but with international trading blocs such as the EU, is vital to stimulating economic growth in Africa.
- Natural resources are essential for future socio-economic development in African countries, so investments are therefore needed to counter the degradation of soils, the collapse of fisheries, the drainage of wetlands, the overharvesting of wood for fuel and construction, and the pollution of rivers and lakes.
- Buffering against climate change and increased weather variability is critical to shielding socio-economic development and economic growth in Africa from severe shocks, when it already has a highly variable climate.



## CONCEPTUAL FRAMEWORK

The analysis in this report builds a picture of the enormous social and economic changes taking place in some of Africa's key river basins. This is driving change to the natural environment on the continent, including the pattern of water resource availability. While past and present trends seem to present a bleak scenario, there are many positive development directions to follow. What this analysis shows is that investing in response to these changes and their drivers requires a sound understanding of the multiple mosaics which overlay one another across the continent. These include the mosaics of shared river basins, economies and social systems, as well as the hugely complex political and institutional mosaics of multiple and overlapping river basin organisations (RBOs) and regional economic communities (RECs). In short, this is a highly complex environment which urgently requires the development of a sound business case for future water investments to enable sustainable economic development across the continent.

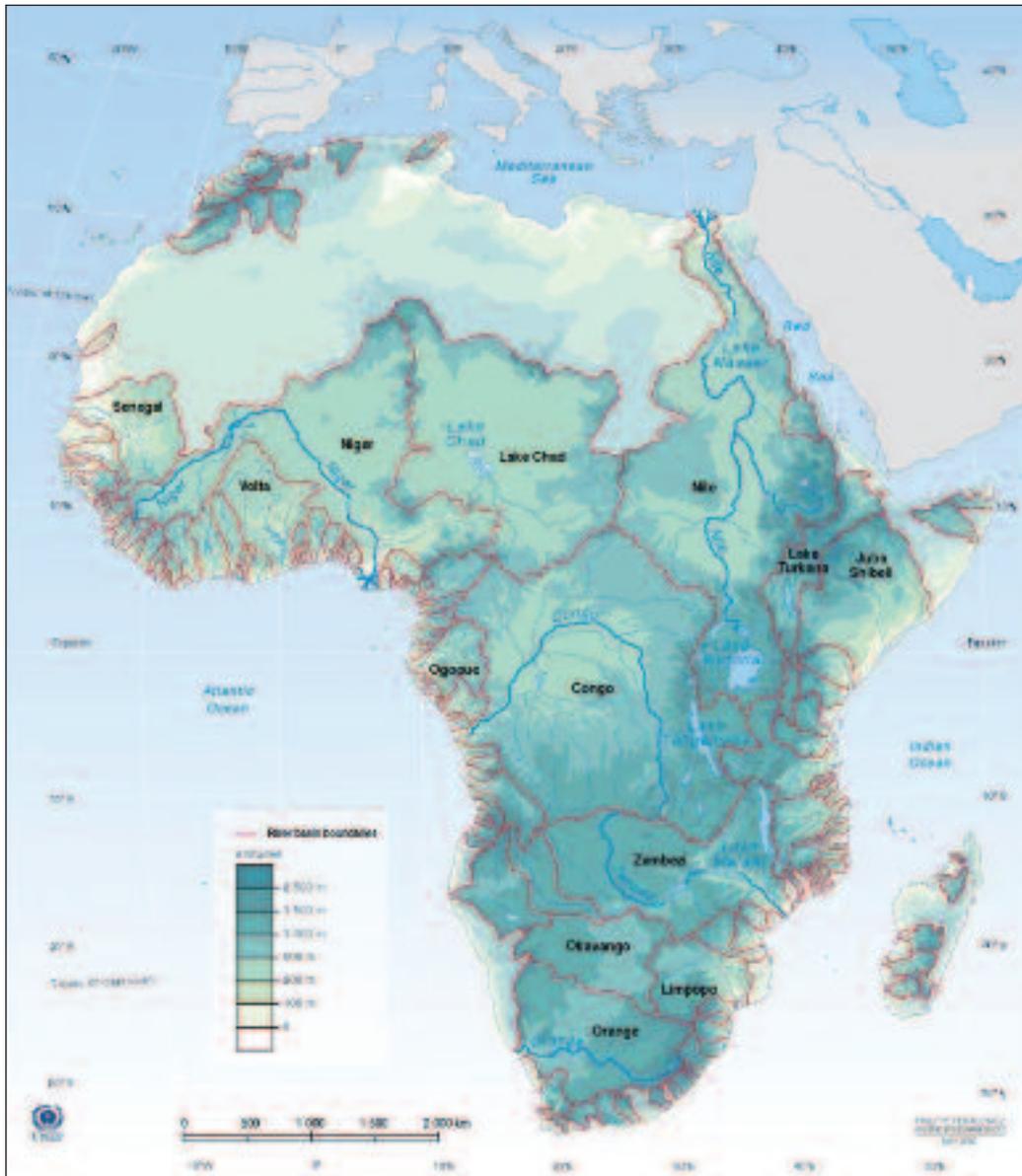
To create the framework, the report first presents a decision making "route map" which highlights how the emerging framework for water investment may be applied to achieve the desired economic development in Africa. The route map is, in fact, a cyclical process that links together a political commitment

to achieve the human, economic and water securities, as set out in this report, to the contextual drivers for change. This allows policy makers to develop potential responses and then select the right investment modalities. Once implemented, the impacts of these investments are then monitored and evaluated using a sustainable development lens, looking at the accrued social, economic and environmental benefits achieved by placing investments for water at the forefront. Policy makers can then determine how these investments are helping governments to achieve their objectives. Examples of success will reinforce the political objectives of investment in the three securities in an ever-changing world.

With an established roadmap to hand, we can now begin to develop and populate a broad skeleton framework for water investment as proposed in Table I. Moving from A1 to C3 is a progression from local water investments that help achieve human security to regional investments that secure water resources for future generations. The framework is flexible to allow governing authorities to still concentrate on their respective policy priorities, so the indicators included in this table should not be seen as an exhaustive list. Inherent to the framework is the idea that considering all these levels is central to long-term sustainable development and equitable growth in Africa.

**Table I: A skeleton framework for policy and decision making on water investment in Africa.**

	A. HUMAN SECURITY	B. ECONOMIC SECURITY	C. WATER SECURITY
1. LOCAL APPROACHES	E.G.: <ul style="list-style-type: none"> <li>• JOBS AND INCOME</li> <li>• ENERGY</li> <li>• FOOD</li> <li>• LOCAL HEALTHCARE</li> <li>• URBAN PLANNING</li> </ul> ETC.	E.G.: <ul style="list-style-type: none"> <li>• JOBS AND INCOME</li> <li>• ENERGY</li> <li>• FOOD</li> <li>• HEALTH</li> <li>• EDUCATION</li> </ul> ETC.	E.G. <ul style="list-style-type: none"> <li>• JOBS AND INCOME</li> <li>• ENERGY</li> <li>• FOOD</li> <li>• MIGRATION</li> <li>• DISASTER PREPAREDNESS</li> </ul> ETC.
2. NATIONAL APPROACHES	E.G.: <ul style="list-style-type: none"> <li>• JOBS AND INCOME</li> <li>• ENERGY</li> <li>• FOOD</li> <li>• HEALTHY WORKFORCE</li> <li>• NATURAL CAPITAL</li> </ul> ETC.	E.G.: <ul style="list-style-type: none"> <li>• JOBS AND INCOME</li> <li>• ENERGY</li> <li>• FOOD</li> <li>• HEALTH</li> <li>• TRADE</li> </ul> ETC.	E.G. <ul style="list-style-type: none"> <li>• JOBS AND INCOME</li> <li>• ENERGY</li> <li>• FOOD</li> <li>• MIGRATION</li> <li>• TRADE</li> </ul> ETC.
3. REGIONAL APPROACHES	E.G.: <ul style="list-style-type: none"> <li>• JOBS AND INCOME</li> <li>• ENERGY</li> <li>• FOOD</li> <li>• FLOOD CONTROL</li> <li>• URBAN PLANNING</li> </ul> ETC.	E.G.: <ul style="list-style-type: none"> <li>• JOBS AND INCOME</li> <li>• ENERGY</li> <li>• FOOD</li> <li>• HEALTH</li> <li>• TRANSPORT</li> </ul> ETC.	E.G. <ul style="list-style-type: none"> <li>• JOBS AND INCOME</li> <li>• ENERGY</li> <li>• FOOD</li> <li>• MIGRATION</li> <li>• TRANSPORT</li> </ul> ETC.



**Map I: Africa's Major River Basins**

Source: Aaron T. Wolf et al., 1999; Revenga et al., *Watersheds of the World*, World Resources Institute (WRI), Washington DC, 1998; Philippe Rekacewicz, *Atlas de poche, Livre de poche*, Librairie générale française, Paris, 1996 (revised in 2001).

# I. INTRODUCTION

## I.1 A GLOBAL MESSAGE

Water for Growth and Development conveys a global message to those working both inside and outside the international water community: Wise investments in managing and developing Africa's water resources are integral to the future growth and prosperity of the continent. Foremost, this is a policy choice, but it must also be seen as an imperative. These investments are a necessary part of Africa's development, but need to be packaged effectively within overall infrastructure improvements. The African Development Bank estimates that 5% of Africa's GDP is lost annually due to poor access to water and sanitation, 2% due to power cuts, and between 5% and 25% due to droughts and floods in affected countries. A further 5% could be lost in the future because of climate change (AfDB, 2009e). At the same time only a small proportion of government budgets are allocated to water supplies for citizens and to managing water resources for the good of the wider economy. There is therefore a clear disconnect between impact and investment.

The questions of what, where and how to invest are at the heart of this report. Answers are not easy nor are they immediate. Africa is a diverse mosaic of economies, societies and cultures. This means that investments have to be context-specific and sensitive to different trends across the continent – including where people are moving to urban centres in greater numbers, where rain-fed agriculture is especially vulnerable, and where hydropower investment is feasible as well as socially and politically

viable. Even given this diversity it is still possible to provide broad guidance on how to build sustainable and effective future investments, which is the main goal of the report. At the same time, it is acknowledged that the “fine-tuning” in terms of policy and actual implementation will need to take place within complex political-economic systems at national levels and below.

A key starting point in the analysis is the simple fact that most of Africa's water is shared within 13 major river basins (see Map 1). Across the continent, almost all countries share water with their neighbours. This presents a collective action problem, but also an opportunity for tying together regional resource management and regional economic integration. In doing so, nations and regions can begin the production of regional public goods – better transport, as well as resource and human infrastructure – which can stimulate and sustain future growth and development, ensuring greater environmental resilience.<sup>1</sup>

A starting point in the analysis is recognition of three key institutional levels driving decision making in these political economies.

- First and foremost, are the sovereign national governments including their key policy levers and finance mechanisms, not least of which is their focus on foreign direct investment and aid flows.

<sup>1</sup> A public good is a commodity, measure, fact or service (i) which can be consumed by one person without diminishing the amount available (non-rivalry); (ii) which is available at zero or negligible marginal cost to a large or unlimited number of consumers (non-exclusiveness); and (iii) which does not bring about disutility to any consumer now or in the future (sustainability). A regional public good is a public good which displays spill-over benefits to countries in neighbourhood of the producing country, in a region (OECD, 2004).



UN Conference Center in Addis Abeba, Ethiopia.

- Second are the regional level bodies. These can be divided into two main groups:
  - a. Regional economic communities within which national economies are nested – sometimes repeatedly – and that are increasingly playing a key role in shaping economic and social policy on the management of regional public goods.
  - b. River basin organisations that overlap and criss-cross many of these regional economic communities and sovereign nations, which are gaining in institutional strength.
- Third, with an increasingly important focus in light of anticipated need to adapt to climate change, are the decentralised, localised and sometimes community-level institutions that play a part in shaping how investment decisions materialise on the ground and are made sustainable.

This report argues that it is essential that all of these institutional contexts, moving from the local to the national and to the regional levels, are taken into account when shaping any future investment framework.

In combination with these levels are the achievement of three “securities” which lie at the heart of the framework proposed in this report. These are:

- Human security
- Economic security
- Water security

Together, these form the focus for investment actions at the different institutional levels outlined above. In tying together these securities and institutional contexts we arrive at a basic investment framework which provides a set of development narratives for policy makers to follow. A simple version can be found in Table 2 on the opposite page, providing a tool with which to examine regional and basin level examples, as well as national contexts, so as to help shape the investment messages provided within this framework.

The basic premise is that the three securities cut across the three institutional environments in which investment decision will need to be made. Investing in water for growth and development involves decisions and trade-offs to be taken into account within this framework which lead to development pathways that converge, rather than diverge. It also helps to construct an effective development narrative for decision makers.

## 1.2 AN INVESTMENT FRAMEWORK NARRATIVE

Table 2: A non-exhaustive summary framework for policy and decision making on water investment in Africa.

		A. HUMAN SECURITY	B. ECONOMIC SECURITY	C. WATER SECURITY
1. LOCAL	LOCAL INSTITUTIONS	<ul style="list-style-type: none"> <li>Ensuring access to safe drinking water and sanitation for the most vulnerable can help protect local environments and improve local health.</li> </ul>	<ul style="list-style-type: none"> <li>The diversification of livelihoods can be supported through the protection of access to natural capital, including land, forest and water resources.</li> </ul>	<ul style="list-style-type: none"> <li>Coordinated local actions are critical to supporting delivery of sub-national, national and regional-level policies to ensure wider water security, in concrete terms.</li> </ul>
	NATIONAL GOVERNMENTS	<ul style="list-style-type: none"> <li>Protecting and conserving water resources can help service the needs of populations and sectors, especially in rapidly growing urban areas.</li> </ul>	<ul style="list-style-type: none"> <li>Economic levers and instruments can be used to make the most rational water investment choices in the context of regional integration, trade and other economic factors including food security.</li> </ul>	<ul style="list-style-type: none"> <li>Effective benefit sharing frameworks can be achieved by balancing the needs of national water security for domestic needs and agricultural uses, with, where necessary, the regional level electricity generation efforts.</li> </ul>
3. REGIONAL	REGIONAL ECONOMIC COMMUNITIES (RECs)	<ul style="list-style-type: none"> <li>Water sector prioritisation decisions within regions affect migration and employment opportunities.</li> </ul>	<ul style="list-style-type: none"> <li>Better sharing of water resources can help expand markets, encouraging diversification of economies and enabling new areas of economic growth.</li> </ul>	<ul style="list-style-type: none"> <li>New growth areas will place demands on resource availability. Joint provision of infrastructure will be required to protect and conserve shared water resources.</li> </ul>
	RIVER BASIN ORGANISATIONS (RBOs)	<ul style="list-style-type: none"> <li>Better water management can improve disaster preparedness while also reducing risks and vulnerabilities to communities.</li> </ul>	<ul style="list-style-type: none"> <li>Careful management of river basins can help to improve water quality and availability, secure river transportation, promote sustainable fishing practices and optimise the production of energy through the construction of new hydro-electric dams.</li> </ul>	<ul style="list-style-type: none"> <li>Ensuring a balance between the economic and social demands on water resources requires the provision of water storage and protection infrastructure.</li> </ul>

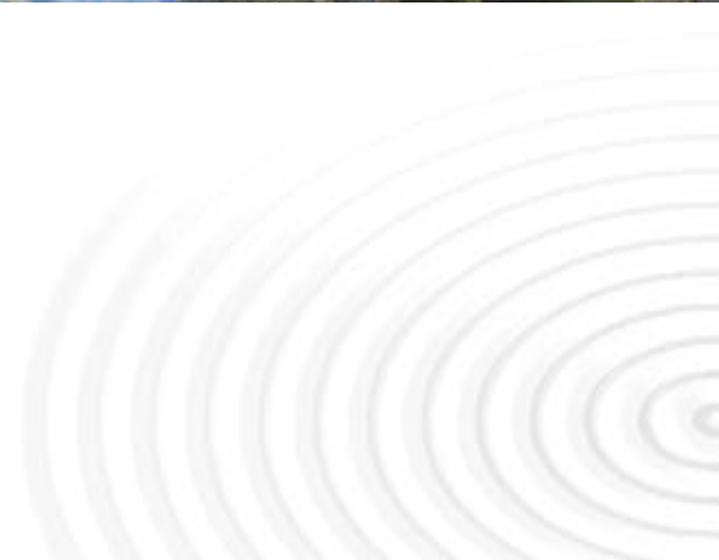


Building a water point, Chad.



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Teaching Hygiene.



## 2. BACKGROUND, PURPOSE & METHODOLOGY

In the year 2000 the World Bank asked a simple question - Can Africa Claim the 21<sup>st</sup> Century? The question related to the future of growth and development on the continent. With little diversification, capital flight and loss of skills to other regions the World Bank argued that Africa's place in the global economy was "eroding" (World Bank, 2000). The same year, at the 2<sup>nd</sup> World Water Forum held at The Hague, within the World Water Council's World Water Vision exercise, the African countries, supported by the United Nations Economic Commission for Africa, came to an agreement on a common water vision "Africa Water Vision for 2025" which obtained wide support amongst development partners.

However, it took until 2008 for the 1<sup>st</sup> Africa Water Week to take place in Tunis, where a declaration by governments and organisations, the Tunis Declaration, recognised that ensuring water security through the equitable and sustainable management of water is and must remain the top development challenge for the foreseeable future for the African continent.

Specifically addressing water security for Africa's socio-economic development, the Tunis Declaration was, however, just one of a number of declarations leading up to and contributing to the Africa regional preparatory process for the 5<sup>th</sup> World Water Forum, held in Istanbul in March 2009. Others include the Sharm El Sheikh Commitments for Accelerating Achievements of Water and Sanitation Goals (African Union, July 2008); the eThekweni Declaration and AfricaSan Action Plan (32 African countries convened under the auspices of AMCOW, February 2008); the Declaration of the Ministerial Conference on Water for Agriculture and Energy in Africa: The Challenges of Climate Change (FAO, December 2008); and stakeholder messages from the Lusaka and Accra consultation meetings for the 5<sup>th</sup> World Water Forum (December 2008 and January 2009). Each identified improving financing measures as a primary concern for water security in Africa. They also emphasised the central role of water as a means for achieving wider human and economic security.

Coordinated by the African Development Bank on behalf of the African Ministers' Council on Water, the African Regional Process for the 5<sup>th</sup> World Water Forum recognised the necessity to move from the commitments stated in those declarations to action on the ground, as evidenced by the title of their final report, *"Bridging Divides in Africa's Water Security: An Agenda to Implement Existing Political Commitments"* (AfDB, 2009e). At the forefront of these concerns was investment:

"A major scaling up of finance for expansion of Africa's water infrastructure (up to USD50 billion per annum with a gap estimate of USD30 billion per annum) is needed and this must begin soon in ways that deliver economic growth... Governments must play the central role in pulling financing actions together." (WWC, 2009, p. 7).

Additionally, a Ministerial Roundtable entitled *"Making Water a Tool for Development in Africa"* was convened during the 5<sup>th</sup> World Water Forum in the presence of ministerial representatives from 22 countries and a number of international organisations. The participants, again, asserted that water security is a prerequisite for growth and development.

During this preparatory process and fitting perfectly with its conclusions, the World Water Council (WWC) embarked upon a course of dialogue and discussion aimed at assessing future investment opportunities and directions for water in Africa, keeping in mind the United Nations Economic Commission for Africa's Africa Water Vision for 2025. The principal question underlying this process was what type and pattern of water investments can and should be made in future to support growth and development on the continent? The underlying assumption was that links exist between the scale and range of investments in water and economic development success based on the historical record of countries in many other regions of the world from Europe to the Middle East and North America. The intention of this report is not, therefore, to seek further proof for this link, but rather to examine what shape and pattern future investments in Africa could take.

To address this question this report examines the existing literature and establishes a simple analytical framework through which to assess in more detail experience from different parts of the continent.<sup>2</sup> Our report examines three major river basins (the Nile, the Niger and the Zambezi); each of which represents large regions of the African continent (in the north-east, west and south-east respectively) and could thereby be construed as regional focal points for political and economic integration. From the analysis of these case studies, we draw together common experiences, identify differences where necessary, and from these have constructed a simple framework.

The framework provides a common ground for dialogue between policy makers, investors and water stakeholders in Africa. This is important as they all try to understand what investment is necessary for development in the short, medium and long-terms, while balancing their often different and competing demands for the fundamental shared water resources of the continent. The framework is also important because it helps policy makers to identify the broader interrelated social and economic aspects of water that need to be taken into account when making investment decisions. These decisions need to take into account not only the short and medium-term benefits, but also the opportunity for long-term benefits leading to sustainable economic development in Africa. Taking this long term view is crucial for all future generations on the continent.

<sup>2</sup> The major sources of data used are publicly available reports and statistics, in particular those provided by the UN and by regional development institutions. Further investigation of important "grey" and/or academic literature, in combination with more detailed econometric analysis specific to countries and regions, will continue.



*Irrigation canal, Tanzania.*





# 3. HUMAN, ECONOMIC & WATER SECURITY

This section outlines the three “securities” which lie at the heart of the framework proposed in this report and represent the pillars of sustainable development. It is also important to keep in mind that water security is in fact the critical foundation on which to build both human and economic security.

## 3.1 ACHIEVING HUMAN SECURITY

Human security is a concept that has gained worldwide recognition since the 1994 *Human Development Report*. Produced ahead of the World Social Summit in 1995, the report stated that, “To address the growing challenge of human security, a new development paradigm is needed that puts people at the centre of development, regards economic growth as a means and not an end, protects the life opportunities of future generations as well as the present generation’s and respects the natural systems on which all life depends” (UNDP, 1994). The concept has two basic dimensions relevant to this report:

- Ensuring productive individuals capable of fulfilling their own development capacities
- Ensuring access to natural capital resources in order to support human well-being and reduce the potential for conflict

Africa faces future challenges on both counts.

The continent’s population will double in the next 40 years to 2 billion, placing an immense strain on existing resources. By 2020 Africa will have 11 mega-cities with 5 million or more inhabitants and almost 720 cities with populations of more

than 100,000 (UNECA, 2007a). By 2030, half of the African population will reside in urban centres (UN HABITAT, 2010), many within smaller towns and informal settlements (World Bank, 2005). On current trends, in many of these cities access to services will be patchy or non-existent and much of the future urban population will be poor (World Bank, 2005). This will perpetuate conditions for entrenched human insecurity across large sections of Africa’s population. Nearly 80% of urban dwellers already live in informal settlements where there are major gaps in basic services including education, health care, water and sanitation. Ensuring safe, reliable water and sanitation will be a major on-going future priority, as will be assistance in establishing enabling environments for sustainable livelihoods, including supporting small-scale income generation, employment creation and social stability. Ensuring a population of more healthy and productive people with greater access to key livelihood assets - particularly though not exclusively in urban areas - will contribute immensely to future human security across Africa.

## 3.2 ACHIEVING ECONOMIC SECURITY

The shared benefits of strong and sustainable economic growth are vital for the future development of Africa and for underpinning the capacity to support human security. In much of Africa, this will depend on the creation of added value in agriculture, particularly where this sector either continues to support most of the labour force or dominates the commodity exports of a country – or both. Future economic development in many countries will need to be labour-intensive. Investments in water that underpin such development will contribute important economic and social benefits and help to support future economic security.



*Traders work on the floor of the Ghana Stock Exchange in Accra, Ghana.*

At the same time, however, robust economies will only be sustainable in the long term – given the future vagaries in climate and shifts in global trading patterns in particular – if water investments contribute simultaneously to economic diversification. Agriculture can be a starting point, helping to develop other important sectors of the economy, including services. But in many cases, extractive industries will also be important. As generators of substantial export revenues, this sector can catalyse the development of a

more varied service sector and a stronger manufacturing base. However, extractive industries require a lot of water for their production, with the resulting wastewater generally becoming contaminated with chemicals. Investments in water necessary to support diversification will vary widely, but include protecting water resources from degradation to ensure strong natural environments (key for the tourism sub-sector), ensuring reliability of energy supplies through socially and economically sustainable hydropower development, and removing the hazards and barriers to development associated with extreme weather events such as flooding and drought.

A final element in achieving economic security is the integration between and across economic levels. Given the many and complex overlapping memberships of river basin organisations and economic communities, identifying and shaping future water investments through regional-level strategies of economic cooperation will become an imperative and a centrepiece of more connected resource governance. As an example of how human and economic securities are interlinked, more than three quarters of economic migrants in Africa actually stay within the continent itself (UNCTAD, 2009). Therefore effective investments that help to shape regional economic development can have important migration effects, helping to provide incentives for population movement towards new growth poles and away from more vulnerable areas. In the longer term, water investments can play a key role in contributing to the development of growth corridors, expanding trade within Africa, exploiting comparative advantages between countries (and regions) and enlarging markets for goods and services. These regional-level benefits should become part of wider “benefit-sharing” arrangements involving joint investments in the development of shared water resources between countries.



## 3.3 ACHIEVING WATER SECURITY

According to UNESCO-IHE (Institute for Water Education), water security involves protection of vulnerable water systems, protection against water related hazards such as floods and droughts, sustainable development of water resources and safeguarding access to water functions and services. It does not include notions of strategic military security considerations.

Therefore, for the sake of this report, Water Security has two dimensions: availability and quality. This is the critical foundation on which to build both human and economic security. Ensuring effective governance of water resources is a central feature of water availability. This includes protecting the natural stock of water (both ground and surface) against overuse and pollution, as well as against peaks and troughs in availability. However, it also includes ensuring availability within the natural environment to ensure that ecosystem services are sustained.

Achieving water security in Africa has complex dimensions. Most major river basins in Africa are shared by 5 or more countries. Achieving the goal of water security across the continent therefore involves closely integrated decision making between countries as well as at national and local levels. A key element in protecting supplies and ensuring water quality will be effective adaptation to climate change. Extreme variation in rainfall between years has long been an obstacle to development across Africa. With increasingly frequent extremes and observed declines in river flow and run off, this is likely to become a greater challenge in the future (UNDESA, 2008). Buffering water resources against climate change as well as changes to demand and supply will require “no regret” investments and long-term inclusion of risk mitigation and adaptation strategies within investment decisions.<sup>3</sup> One of the present challenges is in translating the nature of change predicted by different climate models into scientific knowledge that can lead to actionable investments at a policy level.



Water & Cities Photo Contest 2010.

<sup>3</sup> The World Bank refers to “no-regret” investment and adaptation as not being affected by uncertainties related to future climate change because it helps address problems associated with current climate variability, while at the same time, builds adaptive capacity for future climate change. (<http://beta.worldbank.org/climatechange/content/note-6-identification-and-analysis-possible-adaptation-options>)



© Arne Hoel/The World Bank

Ghana.



# 4. CHANGE CONTEXTS IN AFRICA

In order to be thoroughly understood, the three securities described in the previous section must be analysed with respect to context, in an effort towards catalysing positive change. This section outlines key aspects of social, economic and environmental change that have a bearing on future investments in water. Rather than being an exhaustive assessment – there are many better sources for that – the section tries to link issues together and show how the emerging investment framework will have to deal with a range of often interrelated challenges.

## 4.1 SOCIAL CONTEXTS

Three main social issues need to be taken into consideration when examining the future of water resources in Africa.

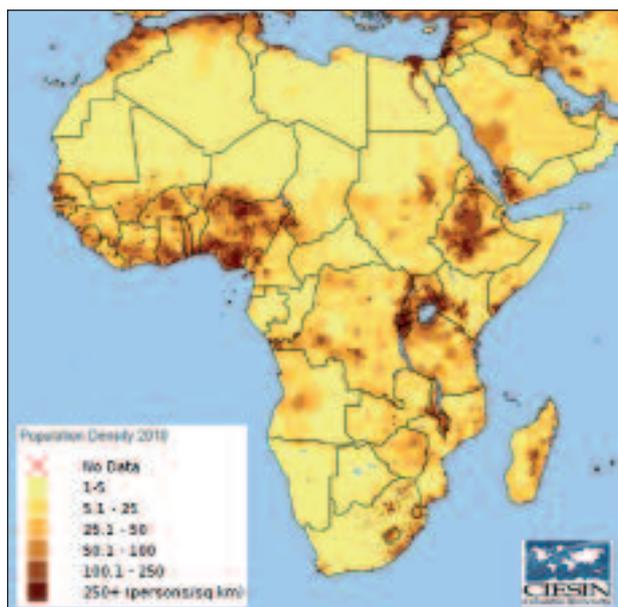
Firstly, Africa is home to nearly one billion people or about 15% of the global population. The pace of growth in Africa outstrips other parts of the world and, according to UN medium-variant projections, Africa's population will double between now and 2050. The continent also has the highest rate of global urbanisation, with urban populations growing at twice the rate of their rural equivalents, or roughly 3.23% per annum (UN World Population Prospects, 2006; UN World Urbanisation Prospects, 2007).

Secondly, by 2030, half of all Africans will live in urban centres compared to 38% in 2005 (UN HABITAT, 2010). Many of these people will add to the burgeoning informal settlements where some 70% of the urban population currently resides (World Bank, 2005). Growing pressures on services and economic opportunities in these areas will be substantial, particularly in terms of the inter-related areas of water, sanitation, energy and healthcare.



*School children in uniform walk long distances to and from school in the rural Kwa Zulu Natal, South Africa.*

Finally, food riots, which took place in many African countries in 2008 and 2010, were triggered by a sharp increase in the price of food. Avoiding such situations in the future will require African governments to plan for an increase in national food production in order to fulfil the demand. This requires, amongst other things, strengthening irrigation capacity and efficiency to increase agricultural production, particularly if increasing the amount of water available for agriculture is not possible.



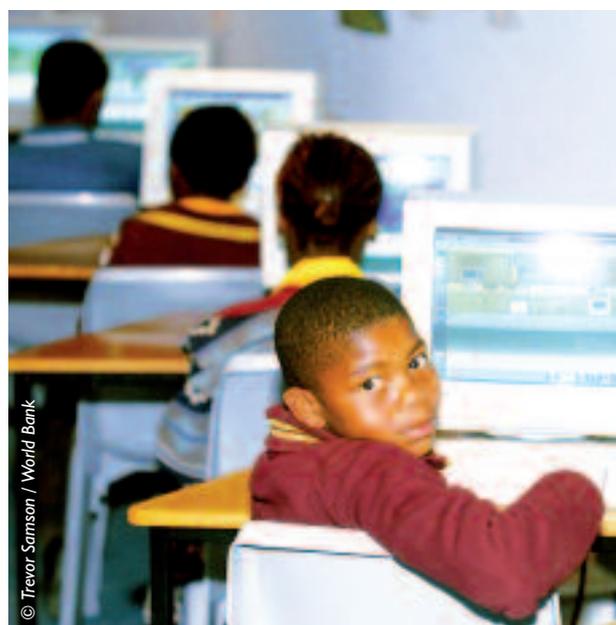
**Map 2: Africa's population mosaic.**

Source: <http://www.ciesin.columbia.edu> (data for 2010)

In addition, Africa's population distribution is highly uneven as shown in Map 2. In Sub-Saharan Africa, 43% of the population inhabits East Africa, 35% inhabits West Africa, 15% inhabits Central Africa, and just 7% inhabits Southern Africa (UNDESA, 2008). Areas of high population density (with over 300 inhabitants/km<sup>2</sup>) are abundant throughout East Africa, including the Ethiopian highlands, Rwanda, Burundi, and around Lake Victoria in Kenya and Uganda. Large parts of West Africa, particularly along coastal regions, also display high densities. Within these areas, push and pull factors drive population movement within and between countries, including from rural hinterlands to urban areas, and from marginal pastoral or agro-pastoral systems into rain-fed farming regions. In Egypt, just a thin strip of land supports most of the country's population, leading to one of the highest population densities in the world in the Nile Valley and Delta. Densities reach up to 1,165 inhabitants per km<sup>2</sup> (FAO, 2005). In many areas of West Africa, including coastal Nigeria, Ghana, Benin and Cameroon, major areas of employment pull migrant labourers from rural hinterlands and neighbouring countries, with many ending up in vast and often unhealthy informal urban settlements. Rapid population growth in rural areas will further add pressures on the local environment, exacerbating land degradation and reducing the amount of land available for farming. This will become a major push factor in increasing future urbanisation (OECD, 2008a).

The relationship between population growth, natural environments and migration is frequently complex and not necessarily simply a one-way move from rural to urban areas. Many people in urban areas maintain strong connections to their rural roots, both socially and financially. Overall, it has been estimated that environmental degradation associated with population pressure, including deforestation and exhausted soils, reinforces poverty and costs economies an around 4-8% of their GDP (ibid). At the same time, however, the displacement of people and the lack of viable livelihood alternatives lead to rapid growth in informal urban settlements where further costs may restrict economic development due to increased health problems and the costs of widespread unemployment. The challenges of turning around economies and addressing the needs of growing populations are therefore mixed and include managing natural capital assets more effectively, reducing biomass loss, providing greater access to services in growing urban areas, and helping communities to diversify their sources of income.

The social context to water investments in Africa will therefore necessarily become a fine balance between actions that sustain existing livelihood systems in farming areas with actions that promote the development and establishment of new livelihoods in healthy urban environments.



IT training for kids who live in the surrounding farm areas of Stutterheim outside East London in the Eastern Cape. South Africa.





Port of Tema, Ghana.

## 4.2 ECONOMIC CONTEXTS

At a national level only a handful of Africa's economies – amongst them South Africa, Egypt and Nigeria – can be called diversified (i.e. an economy based on various sectors, such as agriculture, manufacturing and trade). South Africa is perhaps the only genuinely industrialised economy on the continent. Out of the 48 countries in Sub-Saharan Africa (SSA), 27 had achieved an average real growth above the world average GDP growth in 2010 (IMF, 2011).<sup>4</sup> Hence, whilst there has been a rosy picture painted of Africa's economic success in recent years much of this success has been unevenly distributed. Most of this growth took place before the decline in demand for commodities linked to the global economic recession.

Most other countries are dependent upon a few commodity exports, which given the volatility of global commodity prices, continue to contribute to the economic vulnerability of these countries (AfDB et al., 2011). Not surprisingly, therefore, non-oil exporting countries fared less well, in particular those reliant on key agricultural commodities, which account for almost half of all SSA countries. In such countries, a single agricultural export can account for some 50-75% of the total value of commodity exports (UNDESA, 2008).

Excluding the volatility in commodity prices, past structural problems for these economies have included their loss of market share to Asian and Latin American producers, as well as barriers to trade such as weak links to global supply chains. Transport costs are another factor that weakens competitiveness, given that on average in SSA these costs are 136% of any other region in the world. This poses a particular challenge for Africa's landlocked nations, within which 35% of the continent's population lives (ibid; UNCTAD, 2009).

The rapid increase in recent years of non-agricultural exports makes it appear that trade within Africa has stagnated. Exports of fuels and minerals for external markets have increased considerably over the decade (UNDESA, 2008; UNCTAD 2009), which has left intra-African trade figures stuck at around 8.7% of total exports for the period 2004-2006, far below the proportion found in other regions (UNCTAD, 2009). However, this figure masks the importance of intra-African trade in other commodities. In fact after Europe, Africa remains the second most important export market for most African countries. More than 50% of the exports of 5 countries do not leave the continent, with more than a quarter of 14 other

<sup>4</sup> For the purposes of this report, SSA countries are: Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo, Democratic Republic of Congo, Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Ivory Coast, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, Swaziland, Tanzania, Togo, Uganda, Zambia, Zimbabwe (and recently South Sudan).

countries' exports remaining within Africa (ibid). According to UNCTAD (2009, p24), "a simple average of the share of intra-African trade in African countries' exports reveals that it is worth 21% of total exports".

This is important for the development of regional integration across the continent. It suggests that this trade is more significant than is sometimes reported and that this intra-regional trade is also more diversified than trade beyond the continent (ibid). It could, therefore, underscore some of the need for stimuli to encourage economic diversification, given the right set of conditions. That some three quarters of this trade occurs within regional trading blocs highlights the significance of these institutional structures and their importance in shaping future water demand and supply within particular regions. For example, the OECD notes that demand for food in particular is likely to increase, given the anticipated future spike in urbanisation. Agro-industry represents a major potential employer and could well increase its market share in intra-regional exports of foodstuffs. This has important implications for how and where water demand and supply is managed, and also has important employment implications. In Senegal, for instance, this kind of industry employed half of the country's industrial workers and a third of its seasonal workers in 2003 (OECD, 2008c).

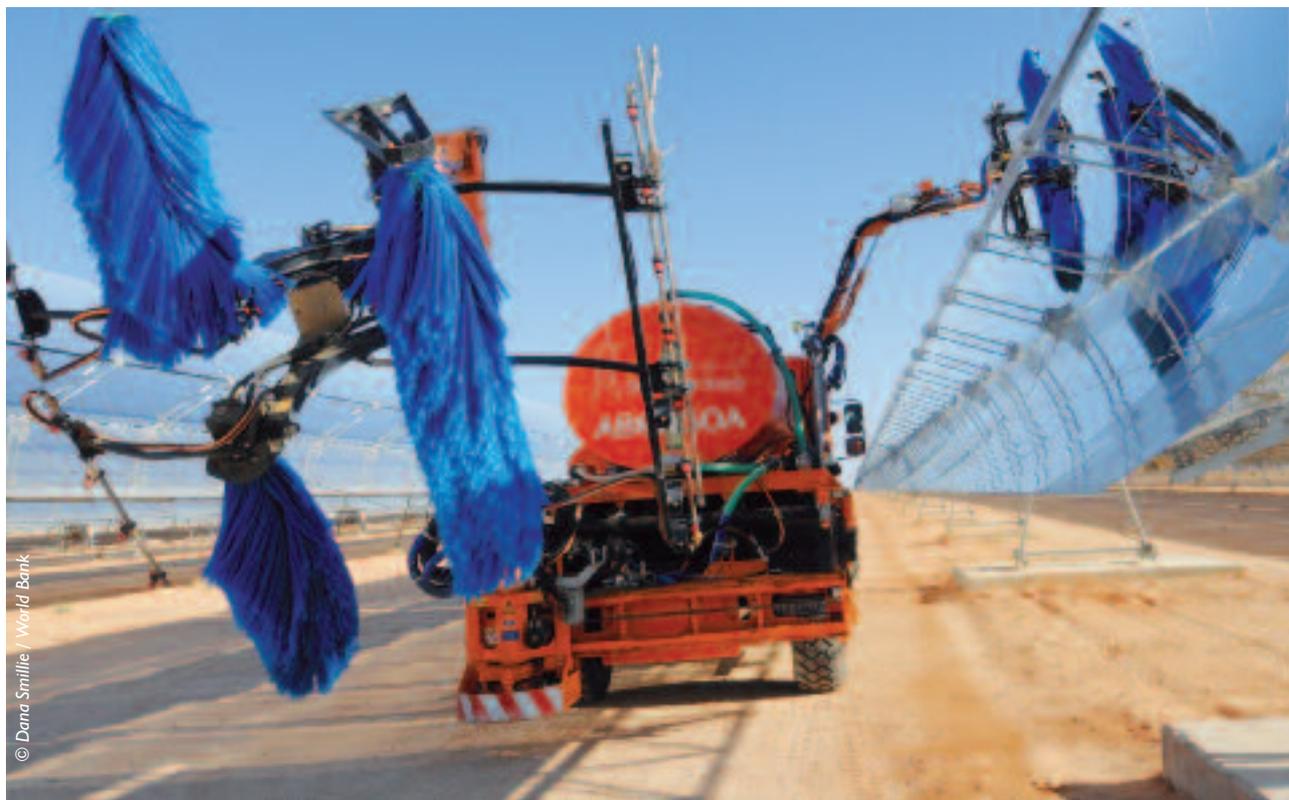
Beyond intra-regional trade, the shifting global direction of trade with the rest of the world is also noteworthy. Africa's direction of trade has

shifted eastwards and particularly to China since 2000. African countries now provide many of the key metals and other commodities required to drive Chinese growth and this relationship is expected to strengthen in the coming years. In 2006, for example, Africa's exports to China were 14% of the continent's total exports, having steadily grown from below 2% in 1999 (Goldstein et al., 2006). China and India together account for about 7% of world agricultural imports from Africa (OECD, 2008d) and this figure is growing. The demand for Africa's primary resources, including the large tracts of arable land that are still unexploited, will continue to drive this direction of trade in coming years.

Hydrocarbons are an increasing focus of Africa's global export portfolio. The continent has an estimated 7% of all proven oil reserves and 5% of global gas supplies (WEF, 2008). The benefits of these reserves are limited to a few countries, notably Algeria, Angola and Nigeria, but new countries are emerging including Sudan and Uganda in East Africa. It is estimated that nearly a quarter of all USA energy needs will come from Africa in the coming years.<sup>5</sup> In the midst of this abundance, however, the continent's population itself has the lowest levels of per capita energy use globally, currently running at about a third of the OECD average. The result of this deficit is that Africa loses an estimated 2% of its GDP annually due to power shortages (AfDB, 2009d), and about 30 SSA countries suffer acute energy deficits (IMF, 2008). In practical terms, in some

<sup>5</sup> Estimated to reach 25% by 2015 (WEF, 2008).

*Cleaning solar panels, Ain Beni Mathar, Morocco.*

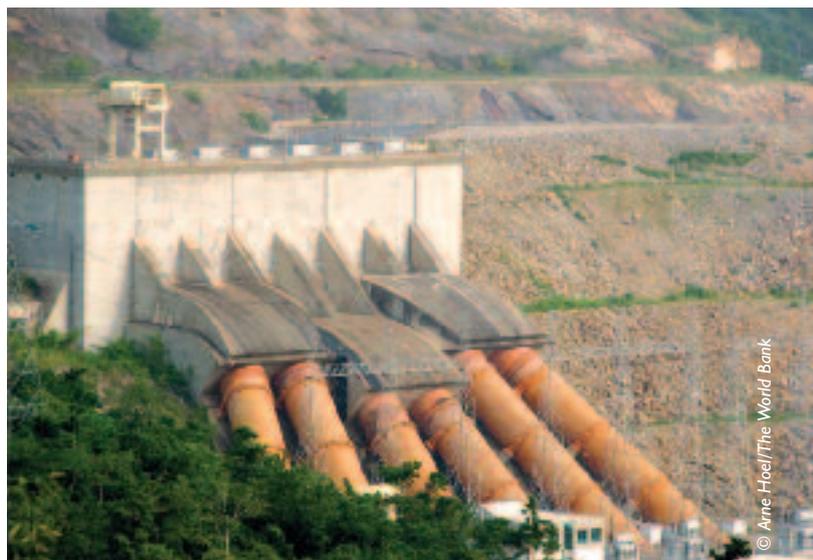


cities this means electricity is supplied for only 3 out of 5 working days each week. A lack of electricity is therefore one of the most insurmountable barriers to economic development and diversification across the continent. One of the outcomes of the energy shortfall, particularly regarding the resources required for heating and cooking, is that there is a continued tax on environmental resources, principally woody biomass fuels.

Development of hydropower is critical to the future energy supplies of many regions. However, to date only about 7% of economically feasible hydropower has been developed (AfDB, 2009c). Africa's basins have many high-potential sites for power production including the proposed Grand Inga Dam on the Congo River which alone could generate nearly 40,000 MW of electricity, or a third more than the total power generating capacity of Ethiopia which is often described as one of Africa's "water towers".<sup>6</sup> However, such developments are not without controversy and there has been particular controversy surrounding recent developments in some East African countries. Some locations lead to major system loss through evaporation, so the siting of reservoirs in locations where these losses can be minimised will become a priority. At the same time, in some cases, there are also concerns over the impact of changes in rainfall patterns on the capacity to replenish reservoirs. For instance, recent drought conditions have reduced power outputs from countries with significant reliance on hydropower such as Burundi, Ghana, Kenya, Tanzania and Uganda, leading to increased reliance on thermal generation (AfDB, 2009c).

One key aspect of future hydropower development will be the need to link it to regional approaches towards trade and development, principally through power-pooling. This will be essential if future dams are to make their best "contribution to African citizens", according to the African Development Bank (AfDB, 2009c). Economies such as South Africa's, as well as some in East and West Africa, now view power pooling and interconnections as central to their future development. There is a widely held view that this would further encourage intra-African trade and support a wider platform for future investment (World Bank, 2000).

Ghana is a case in point. Although it is a rapidly emerging economy that is trying to diversify, the country is adversely affected by chronic power



Hydropower plant in Ghana.

shortages. The rapidly growing population of some 24 million (World Bank Data and Statistics, 2010) depends mainly on agriculture for their livelihoods. The country's Poverty Reduction Strategy Paper has underscored the need for diversification and industrialisation which would complement the emerging oil boom and help to safeguard against fluctuating commodity prices for agricultural products (Republic of Ghana, 2005). To do this, however, the country needs a reliable supply of energy. The main source of surface water and energy production is the Volta River. Shared between 6 countries, management of the river falls to a permanent joint commission. However, major infrastructure developments along the river have been carried out separately by individual countries and no mechanism exists for joint river development to benefit all riparian states. This has led to a fragmented and uncoordinated approach under which Ghana has attributed insufficient water levels in its Akosombo hydropower plant to developments upstream in Burkina Faso. The Akosombo Dam supplies most of Ghana's energy but cannot sustain production due to decreased water levels (FAO, 2005). Without reliable power, the country's attempts at achieving growth and economic diversification are hindered. This provides a good example of the need to build future growth and development on the back of converging regional integration processes and river basin management.

One of the most critical areas for future growth and development will be the agricultural sector. In SSA countries, this sector generates about 20% of GDP and provides jobs for more than 70% of the labour force across some 20 countries (UNDESA, 2008).

<sup>6</sup> The DRC is estimated to have a total hydropower potential of 100,000 MW, about 13% of the total global potential (World Bank, 2007b).



Geologists at the Olkaria Geothermal Energy Power station in Naivasha, Kenya.

Much of the production is for subsistence, which is one reason why food production in most of SSA (except for West Africa) has not kept pace with population increases. At the same time this means the sector is critically important for Africa's food security. Although the estimated consumption of food exceeded domestic production by 30% in the mid-1990s, that percentage is now reducing (UNDESA, 2008). However, a further decline in the performance of this sector would dramatically increase the food aid requirements and food import bills of many African countries.

Two key questions are how and where to increase the productive potential of agriculture on the continent. An increase in agricultural productivity could be one of the engines of economic growth in many countries, but it has been noted that fewer than 40% of gains in cereal production have actually come from increased yields; the rest have been due to an expansion in farming area (Runge et al., 2003). This clearing of forest, draining of wetlands and the conversion of pasture to arable land results in a rapid extension and intensification of farming systems (Dixon et al., 2001). Whilst this can include many fertile areas, it may also mean a shift into more marginal farming areas which could exacerbate the future risks associated with highly variable rainfall regimes. Some of the responses to this risk could include improving the management of moisture in

the soil profile. Water held in soil profiles accounts for some 70% of available freshwater accessible to plants and is fundamental to agricultural productivity (UNEP 2007). Water that actually runs in river systems as stream-flow comprises just 11% of available water.

Irrigation is another potential solution and one that has been promoted in many policy recommendations. Most investment to date has gone into the withdrawal of water, of which 70-80% is used for irrigation (ibid). However, as the Africa Water Vision notes, even if irrigated areas treble in size to over 16M ha in coming years, this would represent only a 5% contribution to the 3-fold increase in food production required by 2025 (UNECA et al. 2000). The rest will come from either food imports or national production by the rain-fed sector. For this reason, there is an increasing emphasis on improving existing rain-fed areas before investing in more expensive irrigation schemes. It is estimated that investments in small-scale water technologies, such as low-till or zero-till agriculture, supplemental irrigation, groundwater recharge and rainwater harvesting, could yield a direct net benefit of an estimated USD 100-200 billion for the 100 million farmers who could adopt such tools (SIWI, 2005).

In Maputo, Mozambique, the Heads of State and Governments of the member states of the African Union committed in 2003 to allocate at least 10%



of their national budgetary resources towards agriculture and rural development (Maputo Declaration on Agriculture and Food Security, 2003). It was argued that an increasing focus on intensification – providing more inputs to boost yields in a given plot of land – and productivity improvements in rain fed areas can help African countries achieve food self-sufficiency and reduce the annual food import bill of USD 17 billion per year (AfDB, 2009).

What is also increasingly apparent is that such water investments are not just about sectorial and national economic growth. Women, for example, provide most of Africa's labour and some 70% of agriculture labour, which amounts to 30% of the continent's aggregate GDP. Moreover, women are most often responsible for water-related tasks in the home, and much of their time is devoted to collecting water for their families; time therefore not available to pursue other economically profitable endeavours. Water infrastructure development will contribute to improving standards of living and human security. It is, thus, essential that women be involved during the planning and implementation of investment projects to ensure the success of these projects and

contribute effectively to the economic development of the African continent as a whole.

It is logical that better regional management of water resources can be achieved through the creation of regional organisations. With this idea in mind, the key water sector representatives from 17 Arabic countries (6 of which are on the African continent) founded the Arab Countries Water Utilities Association (ACWUA) in 2008 to work on the management of utilities, water resources management, water-related health issues, utilities reform, benchmarking, capacity building and training.<sup>7</sup> This organisation is made up of state and private sector representatives. This public-private partnership allows the organisation to make better use of their combined assets and to take a more holistic view on water issues. This is vital for encouraging successful investment.

<sup>7</sup> ACWUA members: Algeria, Bahrain, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, Palestine, Saudi Arabia, Syria, Tunisia, United Arab Emirates, Yemen.

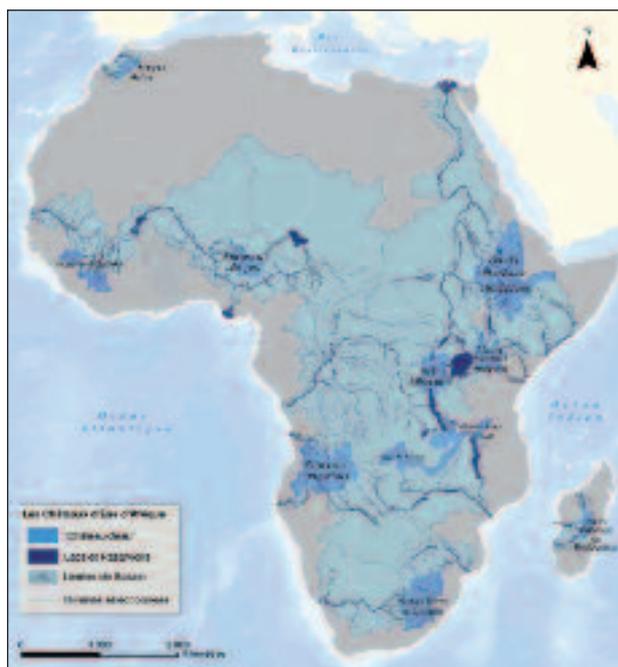
## 4.3 WATER CONTEXTS

Overall Africa receives some 20,000km<sup>3</sup> of rainfall a year (UNECA, 2006). The challenge for future investment in the resource is less about the amount of available water, but more about its distribution, the costs of access and the fact that it is mainly shared. Map 3 illustrates (through the proxy of vegetation cover), how much of the continent's water derives from its "wet middle", where most rain falls. To the north and south (particularly the south west) the continent is far drier. In different places across the continent, and particularly at the margins of the "wet zone", rainfall variability can be as high as 40% above or below the norm (UNECA et al. 2000). The result is what Grey and Sadoff (2006; 2007) have called a particularly "difficult hydrology" of changing stream flow regimes, natural hazards associated with drought and flooding, and high human and financial costs. As a fatal example, the current famine in the Horn of African has partly been caused by a lack of rain.



**Map 3: Africa's normalised difference vegetation index (NDVI) for March.**

Source: <http://www.nasaimages.org> NDVI average March



**Map 4: Africa's major river basins.**

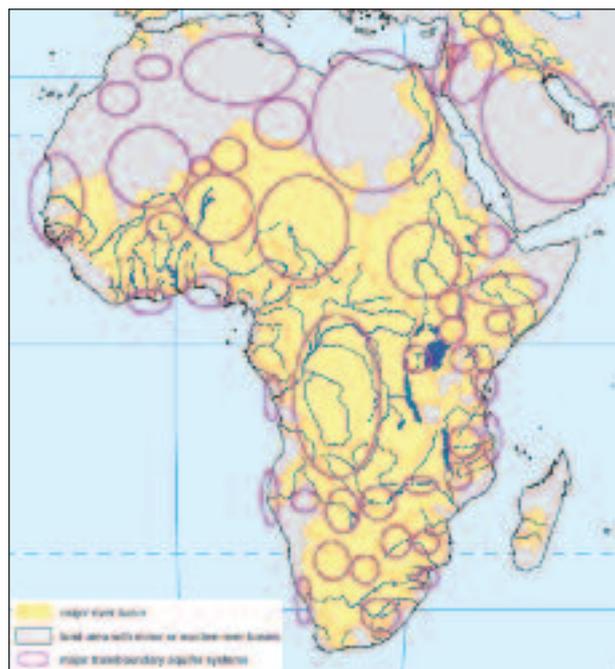
Source: UNEP

On average, only 20% of the total rainfall on the continent contributes to renewable water resources. This is in part due to the high rates of evaporation and evapotranspiration, which result in net losses from the system. The amount contributed to renewable resources, therefore, varies widely by region from as little as 6% in the Sudano-Sahelian Region in the north, to 9% in Southern Africa, and at least 25% in Central Africa (UNECA/UN-Water, 2006).

Overall, most of the continent is covered by 13 major water basins (see Map 4). Just 9 of these provide more than 50% of the continent's total annual runoff (FAO, 2003a). The African continent has ample water resources; there are more than 160 lakes within these systems, many of which are concentrated in the eastern half of the continent. Some of Africa's rivers—the Nile, Niger and Congo included—are amongst the largest and longest in the world. The Congo River alone represents some 73% of Central Africa's total annual renewable water resources. In East Africa, the river Nile “exports” water north into the far drier Sudano-Sahelian zone from its two main branches. Historically, the flooding associated with the Blue Nile branch has provided the basis upon which human civilisation within the Nile valley has been established. Upstream on the Nile, surface water is concentrated in Lake Victoria which is shared by Kenya, Uganda and Tanzania and represents the largest lake by surface area in Africa.

There is also an important connection between these hydrological systems and major aquifers in Africa, as can be seen in Maps 5 and 6. For rural communities in particular, access to shallow aquifers provides their primary source of water for domestic use. These sources also help to buffer communities against rainfall variability. This so-called “invisible resource” provides domestic water for an estimated 75% of Africa's population (UNECA et al. 2000). The relationship between rainfall, runoff and groundwater resources in the 13 shared basins provides a particularly important link between investment decisions to enhance the stock of the resource, allocation between sectors, and access to the resource for domestic use as one key aspect in human security.

Some sources of groundwater are classified as fossil water, with no apparent recharge. The Nubian sandstone aquifer is a case in point.<sup>8</sup> Libya's exploitation of this resource through the Great Man-made River (GMR) water supply project is the most extensive water transfer scheme on the continent, with 30% of transferred water intended for industrial and domestic use and 70% for irrigating existing and reclaimed lands (Government of the Libyan Arab Jamahiriya, 2006). Libya's substantial oil revenues have funded a large-scale exploitation of this fossil resource. Few other countries are equipped to



**Map 5: Africa's trans-boundary aquifers**

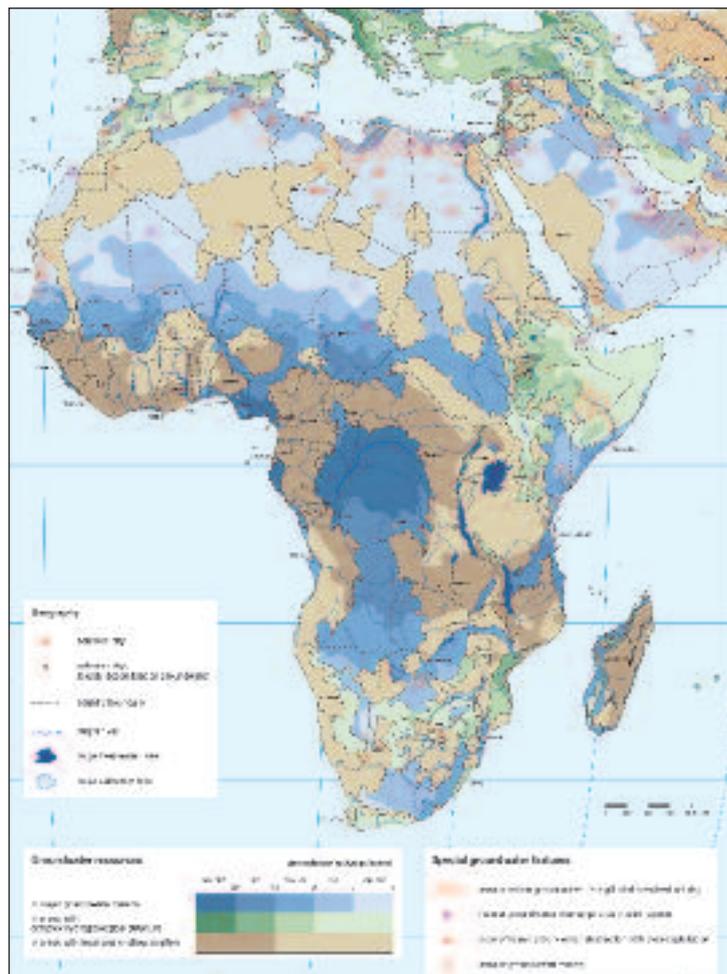
Source: BGR/UNESCO / <http://www.whymap.org>

<sup>8</sup> Which has an estimated water reserve of about 150,000 to 457,000 km<sup>3</sup>, of which more than 6,500km<sup>3</sup> is deemed exploitable and shared by Libya and Egypt in the Northern Region, and Sudan and Chad in the Sudano-Sahelian Region (Vrba and van der Gun, 2004).

undertake such expensive solutions to their water access problems.

Projections to 2025 indicate that water-scarce countries in Africa will increase in number. Increasing population growth will lead to over-consumption of available internal renewable water, especially to the north of the continent. This will exacerbate economic scarcity (i.e. when the offer could not satisfy the demand) of the resource. In densely populated areas such as the Ethiopian highlands, available resources may fail to meet demand, despite water appearing to be plentiful at certain times of the year. This is already the case in arid and semi-arid regions of the country including the Awash Valley and the Somali Region. More generally across this region localised conflict may result. The Ewaso Ngiro River in Kenya, for example, became a source of violent conflict in 2006 when drops in water levels caused by irrigated flower farms competed with river water for small-scale farmers and pastoralists. For the later, in particular, the river's water represents a key form of security during the dry season (IIED and SOS Sahel UK, 2010). With insufficient attention to protecting and delivering the resource equitably amongst key users, local conflicts could increase in number and scope.

Currently, the bulk of water use in Africa (81%) is for agriculture, in comparison to an average of only 44% for OECD member countries (OECD, 2007). This is followed by domestic water supply (10%) and industry (4%). Paradoxically, agriculture miss water (in spite of it being the major user) what is partly attributable to insufficient infrastructure and a lack of capacity to manage and store water. There is also a wide variation between regions and countries in the proportions of withdrawals for each sector. Although most water withdrawals are for irrigation only, some 4-6% of all agricultural land in Africa is currently irrigated, and most of this is concentrated in the northern half of the continent. Much less irrigation has been developed in SSA (UNDESA, 2008; Svendsen et al., 2009). At the same time, it is estimated that the small fraction of land that is irrigated accounts for 38% of the value of agricultural production for the continent as a whole (Svendsen et al., 2009). This investment pointer would suggest that, where economically



**Map 6: Africa's groundwater resources**

Source: BGR/UNESCO / <http://www.whymap.org>

viable, irrigation and water control can have a huge impact on economic development, if sufficiently well managed.



cc creativecommons.org - Christopher Rose

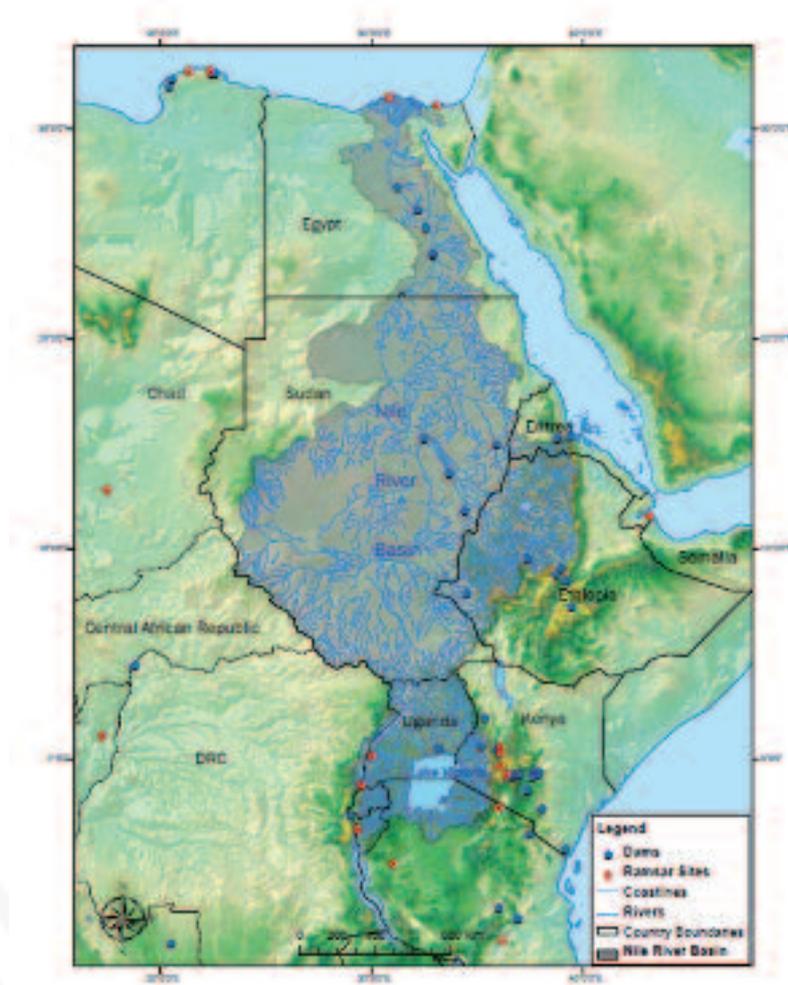
*The Nile at sunset, El Gezîra, Cairo, Égypte.*



# 5. REGIONAL ANALYSES

Taking into account the analysis above, the following sub-sections provide regional case study analyses from East, West and Southern Africa. These are not meant to be seen as a strict regional comparison, but rather are aimed at drawing out key issues from each region to help inform the final investment framework presented in section 6. Each selection includes a focus on one hotspot and key country from the region.

## 5.1 THE NILE



Map 7: Africa's Nile River Basin

Source: UNEP (2008)

## 5.1.1 SOCIAL CHANGE

**Table 3: Selected Social Indicators for Countries in the Nile River Basin in 2009**

	Total population 2007	Projected population 2020	Rate of natural increase 2005-2010 (%)	Population density (km <sup>2</sup> )	Urban population from total (%)	Population living below USD2/day income poverty line 2000-2007 (%)	Adult illiteracy over 15 years (%)	Children underweight for their age under five 2000-2006 (%)	HDI ranking 2009
Burundi	7.8	10.3	2.1	314	11	93	41	39	174
DRC	62.5	87.6	2.8	28	35	80	33	31	176
Egypt	80.1	98.6	1.9	82	43	18	34	6	123
Eritrea	4.8	6.7	2.9	49	22	n/a	36	40	165
Ethiopia	78.6	108	2.7	81	18	78	64	38	171
Kenya	37.8	52	2.7	68	22	40	26	20	147
Rwanda	9.5	13.2	2.6	394	19	90	35	23	167
Sudan	40.4	52.3	2.1	17	45	n/a	39	41	150
Tanzania	41.3	59.6	3	48	26	97	28	22	151
Uganda	30.6	46.3	3.3	161	13	76	26	20	157

Source: Human Development Report (UNDP, 2009)

The Nile basin is home to some 300 million people, or about a third of Africa's total population. Population pressure in the Nile basin is rising at a staggering rate. In the next 40 years, based on UN projections, the current population will double to over 860 million. In Uganda, which has one of the highest growth rates in the world, its population will have trebled by 2050. On present trends, Burundi's population doubles every 30 years (UN World Population Prospects, 2006). As the Table 3 shows, in Rwanda and Burundi, this is leading to high levels of population density. The range of urbanisation across the basin varies considerably, from as low as 11% in Burundi to as high as 43% and 45% in Egypt and Sudan respectively.

Countries in the Nile basin demonstrate often low levels of political and social stability as seen with the recent uprisings in Egypt and the creation of Africa's newest state, South Sudan. The pressures of climate change and high rainfall variability only contribute to an already complicated socio-political environment.

More than two-thirds of the basin countries are classified as low in human development, with high rates of adult illiteracy and income poverty.

The stark difference between Egypt and other basin countries is revealed in the percentage of population living below an income poverty line defined as USD2 a day. In Egypt, this was 18% in 2007, in Ethiopia 78%, and in Tanzania 97%. Only Kenya came close to Egypt with a rate of 40%, but it also had one of the lowest rates of adult illiteracy. Poverty can also vary widely within countries. In Sudan, for instance, poverty is as high as 90% in Southern Sudan and 50% in the north (Table 3).

Much of the basin's population is overwhelmingly young. Half are under the age of 15 and inhabit rural areas. High unemployment is a major development concern. Increasingly, the informal sector is providing the only routes to employment, particularly in rural areas. In Kenya, growth in the informal sector in particular has been significant, accounting for some 90% of all new jobs between 2006 and 2007.

Addressing many of these social change issues is a priority for governments. Policies include incentivising population movement away from overpopulated areas, for instance away from Egypt's Nile Valley into the "New Valley" developments through the Toshka project. Likewise,



in Ethiopia, the government for many years has tried (with only limited success) to move people out of high density highland areas to relieve pressure on farming systems. Many barriers to social change persist. These include the rigidity of land tenure systems, group identity with a particular geographical space, and the challenges of gender empowerment. The bottom line for many people is that they move in order to find human and economic securities.



The Nile at Khartoum, Sudan.

## 5.1.2 ECONOMIC DYNAMICS

Table 4: Selected Economic Indicators for Countries in the Nile River Basin in 2010

	USD GDP per capita 2007	Remittances as a % of GDP 2007	Value added agriculture as a % of GDP 2007	Agricultural labour force as a % of the economically active population 2007	Value added services as a % of GDP 2005	Value added manufacturing as a % of GDP 2005	Value added industry as a % of GDP 2005	RBO membership*	REC membership*
Burundi	115	0	31.64	90	41	8	18	2	2
Egypt	1,729	6	13.98	27	46	16	34	1	1
Eritrea	284	n/a	21.19	75	53	6	19	1	2
Ethiopia	245	2	42.97	79	37	4	12	1	2
Kenya	645	5.4	24.19	72	48	11	17	2	3
DRC	143	n/a	48.83	59	28	6	26	2	3
Rwanda	343	1.9	38.85	90	47	6	14	2	2
Sudan	1,199	3.7	30.16	54	37	6	27	1	2
Tanzania	400	0.1	37.74	77	34	6	14	4	2
Uganda	381	7.2	25.06	76	43	7	23	1	3

Source: Africa Development Indicators (World Bank, 2010)

\*WWC estimates

In its own right the Nile basin is a complex economic mosaic. For a long time, Egypt's economy has dominated the other upstream states. As shown in Table 4, Egypt has by far the highest per capita GDP and the lowest proportion of its economy and labour force involved in agriculture. In the past, before Sudan's oil economy took off, Egypt's GDP was roughly the equivalent to all other upstream states' combined. Most of the country's economy is driven by industry, manu-

facturing and services, in addition to agriculture. Furthermore, in common with Kenya and Uganda, a significant amount of remittance income is received annually.

In contrast to Egypt's more stable, mixed economy, many other upstream states are highly dependent on agriculture. These economies include Burundi, Ethiopia, Rwanda, Tanzania and Uganda. In these countries the major livelihood systems are driven by access to natural capital

assets, particularly land, biomass for energy and water (largely rainfall, but increasingly irrigation in the commercial sector). In the case of Ethiopia's GDP variability in relation to rainfall, there is a clear association between the two trends. This "rainfall dependence" has caused some to categorise the country as being "virtually hostage to hydrology" (World Bank, 2006a). Whilst there is truth to this when viewing GDP fluctuations in the short term, in the longer term there are even more serious trends associated with the loss of soil fertility and declining productivity per unit. Many of these trends are not rainfall-dependent, but are influenced by population pressure, cropping patterns (including the influence of global warming), and the burning of biomass (including animal dung) for fuel, which otherwise would be used to improve soil fertility and moisture retention. A simple focus on rainfall variability can lead to overly simplistic conclusions on future water investments.

Increasingly, some states are exploiting their newfound hydrocarbon potential. In Sudan, 5 billion barrels of proven oil reserves were documented in 2009, the majority of which lie to the south (US-EIA, 2009). This has substantially increased the GDP growth of Sudan and raised income levels across the country. Sudan's GDP is now diverging significantly from that of the other states in the region and is more in line with Egypt's. As a result of its oil wealth the Sudanese government has embarked on a series of ambitious projects, including large hydropower dam construction. A similar pattern may be emerging in Uganda, where large oil reserves have also recently been discovered.<sup>9</sup> In all cases the challenge lies in using revenues effectively to spur wider diversification of economies and, above all, the creation of employment opportunities.

<sup>9</sup> Uganda's oil reserves could be as much as that of gulf countries, Ms. Sally Kornfeld, a senior analyst at the U.S Department of Energy, has said.

## 5.1.3 RESOURCE PRESSURES

Table 5: Selected Resource Indicators for Countries in the Nile River Basin

	Internal renewable water per capita 2008 (m <sup>3</sup> )	Annual freshwater withdrawals total 2000 (bcm)	Annual freshwater withdrawals 2000 (% internal resources)	Not using improved water source 2006 (%)	Number of shared river basins > 100,000 km <sup>2</sup>	Hydropower production 2007 (% of total)	Energy use 2007 (kg oil equivalents per capita)	Proven oil reserves 2005** (thousand million barrels)	Proven gas reserves 2005** (thousand million oil barrel equivalents)
Burundi	1,246	0.29	1.3	29	2	n/a	n/a		
Egypt	22	68.3	3,794.4	2	1	12.39	496	3.70	11.90
Eritrea	568	0.30	20.8	40	4	0	840		
Ethiopia	1,511	n/a	4.6	58	2	96.2	151		
Kenya	534	1.58	13.2	43	2	51.43	n/a		
DRC	14,006	0.36	0.0	54	2	99.68	289		
Rwanda	977	0.15	1.6	35	2	n/a	n/a		
Sudan	726	37.3	124.4	30	1	31.95	363	6.40	
Tanzania	1,977	n/a	6.2	45	3	60.14	443		
Uganda	1,232	n/a	n/a	36	1	n/a	n/a	2.0*	

Source: Africa Development Indicators (World bank, 2010)

\* World Bank figure

\*\*ECOWAS-SWAC/OECD estimates

The Nile River Basin countries share a range of resource pressures as shown in Table 5. With the exception of the DRC (whose renewable water per capita largely responds to the huge Congo River it has at its disposal), many other countries have per capita levels below 1,000m<sup>3</sup>, which means they are highly dependent on external sources. Egypt in particular has an extremely low figure, illustrating the almost total dependence on water resources flowing into its territory. Kenya, Sudan and Rwanda also have similarly low access to renewable water. At the same time, only Egypt and Sudan undertake very substantial withdrawals from the river. This underscores the importance of irrigation for their agricultural economies. These withdrawals are several times the amount of water generated from within these two countries, with Egypt being by far the biggest consumer. As shown in Map 8, all of these countries are already in a situation of water stress (i.e. when the demand for water exceeds the available amounts during a certain period or when poor quality restricts its use).<sup>10</sup> The founding of the Republic of South Sudan in 2011 as an upstream state may compound tensions over the right to use the water resources of the Nile.

In order to ensure equitable and sustainable management and development of the shared water resources of the Nile Basin, 9 riparian states established a RBO in 1999, the “Nile Basin Initiative (NBI)”.<sup>11</sup> The deadlock on negotiation for a Cooperative Framework Agreement (CPA) to establish a permanent Nile River Basin Commission through

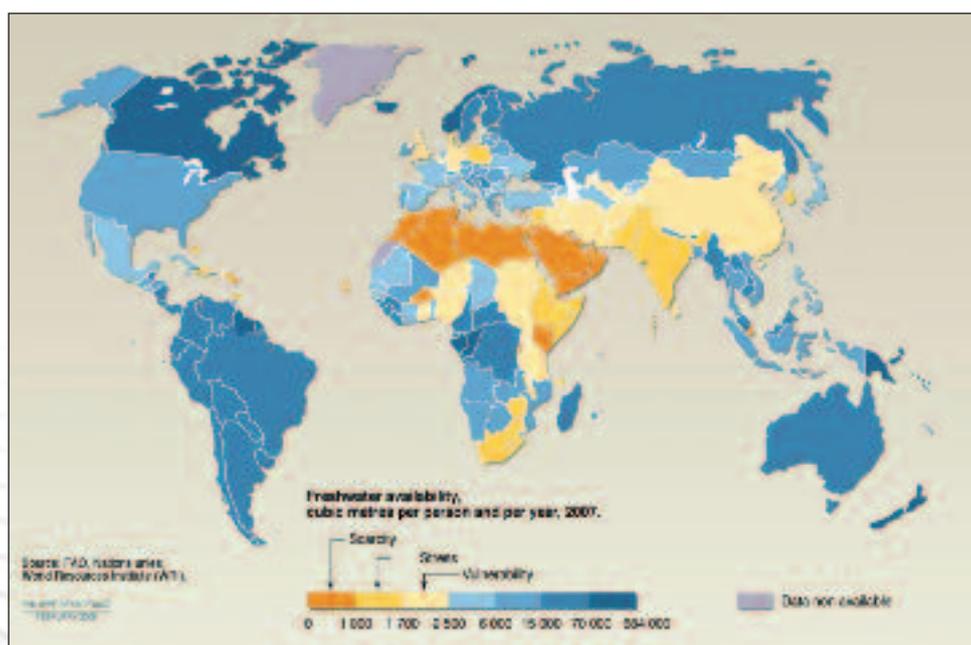


Labourers dig on the banks of the swollen Blue Nile, just off the road from Khartoum east to Wad Medani (Sudan).

which member countries would act together to manage and develop the resources of the river, that shows the difficulty to reconcile the downstream and upstream states.<sup>12</sup>

Several Nile countries rely on hydropower for their energy production (although not necessarily exclusively from the Nile system). The huge Nile flood provides 80% of the main Nile flow and has the capacity to generate some 30,000MW in Ethiopia alone. In nearly all cases, current energy use per capita is far below the average from other global regions. In a country such as Ethiopia, this leads to dependence on woody biomass fuels. As a result of forest clearance and unsustainable agricultural practices, about half

of Ethiopia's agricultural highlands—the breadbasket of the country—are significantly eroded, with an additional 20,000km<sup>2</sup> unlikely to sustain future cropping (Appelgren et al., 2000). Where land pressures and inappropriate agricultural practices combine with steep slopes, rainfall can become rapidly less productive, with 5% of rainfall contributing to crop growth as opposed to 20% in normal soils (UNEP, 2007). This compounds the problem of low productivity.



### Map 8: World Freshwater Availability

Source: FAO, World Resources Institute

<sup>10</sup> UNEP definition, see: [http://www.grid.unep.ch/product/publication/download/fresh\\_eu\\_glossary.pdf](http://www.grid.unep.ch/product/publication/download/fresh_eu_glossary.pdf)

<sup>11</sup> NBI members: Burundi, Democratic Republic of Congo, Egypt, Ethiopia, Kenya, Rwanda, Sudan, Tanzania, Uganda.

<sup>12</sup> International Peace Institute “A political storm over the Nile” (December 2010), see: [http://www.humansecuritygateway.com/documents/IPI\\_APoliticalStormOvertheNile.pdf](http://www.humansecuritygateway.com/documents/IPI_APoliticalStormOvertheNile.pdf)

The inherent fragility of Ethiopia's economy is, in part, due to fluctuations in rainfall. With annual growth fluctuating by +20% to -20%, there is in effect no "average" or "normal" year (Devereux, 2000). The two implications for food security are that the agriculture sector requires a structural transformation, and the role of this sector as a whole has to be reduced significantly (ibid). It is estimated that a 10% decline in rainfall below its long-term average reduces national food production by 4.4% (ibid).

Development projects along the Nile illustrate both the gains and challenges of major infrastructure development. For example, Egypt has fully developed its hydraulic infrastructure to make the most of its limited water resources, principally through the development of the High Aswan Dam. This dam enabled a large-scale increase in irrigated area, much of it in the Nile Delta. However, the country now faces serious challenges to its growth and development. With its population projected to rise to nearly 120 million by 2050, increasing numbers of people will be vulnerable to future sea level rises in the Delta region. Increasing global temperatures, due to a rise in global greenhouse gas emissions, could result in a sea level rise of between 1 and 3 meters by the end of this century, according to conservative projections (Davis, 2007). A one meter rise alone would be a heavy blow for Egypt, displacing millions of people and severely reducing agricultural production in the Delta, an area producing nearly half of all the country's crops and about 60% of its food (ibid).

Another resource factor that is often overlooked in relation to rainfall and production is the

human and economic securities associated with range management and livestock. In 64% of Ethiopia, where rainfall is too scarce and variable to sustain rain fed agriculture, pastoralism is the only production system capable of transforming resource scarcity into productive assets. The very mobility of pastoralists enables them to respond flexibly to changes in rainfall and pasture availability. In Ethiopia, the livestock sector ranks second only to coffee in generating foreign exchange. In 2006 Ethiopia generated USD 121 million from its trade in livestock and livestock products (IIED and SOS Sahel UK, 2010).

However, these pastoral systems also depend upon wetlands and other areas of permanent water resources to sustain herds through dry seasons. If access to these areas is denied through the conversion of wetlands into agriculture, or preferential land allocation exclusively for farming, then the whole production system is compromised, despite being an extremely low-input system with over 95% of the inputs coming from the sun and soil (Hesse and MacGregor, 2006). In turn, governments face huge costs to either generate the livestock supply to meet demand or to import meat, milk and other livestock products from abroad. Additionally, there is a water cost involved, as extensively-grazed livestock require much less water than industrially-reared livestock. The former rely on pastures nourished by rainwater stored in the soil (green water); as opposed to industrial livestock which are partially fed on irrigated feed crops (Hoekstra and Chapagain, 2007).

*Kalangala, Ssese Islands, Lake Victoria, Southwestern Uganda.*



## HOTSPOT: LAKE VICTORIA

East Africa is a region that has witnessed significant moves towards greater regional integration in recent decades. The East African Community is beginning to shape a new regional political-economic landscape. As the largest body of water in Africa by area, Lake Victoria provides livelihoods for one third of the combined populations of the three countries sharing the lake (Uganda, Tanzania, and Kenya) and is at the hub of regional integration processes (UN Habitat, 2004). Most of the population around the lake is rural and depends directly on the natural resource base for its livelihood. Half of this population is regarded as income poor, living on less than USD1 a day (ibid). By 2015, some 20 million additional people are expected to be living around the lake (UNEP, 2006).



**Image 1: Lake Victoria and the Great Lakes, East Africa**

Source: UNEP 2010

Population density is already high by global standards, and rates of population increase around Lake Victoria already exceed those for any other region in Africa.

The lake is also crucial for economic growth, contributing about one third of the combined GDP of the three countries (Awange and Ong'ang'a, 2006). This is mainly through revenues from fishing, agriculture, agro-processing, tourism, and small scale manufacturing. At the same time, however, the resource itself is under threat. The lake is at its lowest level in 80 years, which may be due to a combination of natural variability in rainfall, climate change and water releases for hydropower generation (Miller, 2009). While sharp declines in water levels during 2004/2005 were partially attributed to drought, the main cause was the over-release of water at Uganda's Kiira Dam.

Urbanisation, poverty and environmental degradation represent important pressures on Lake Victoria's resources. Urban areas are growing at up to 5% annually, mostly as a result of rural-urban migration. This is driven by dwindling land resources and productivity in rural areas and a lack of alternative livelihood opportunities. By 2015, urban populations will have increased by 50%, mostly in the form of unplanned growth. In most areas, services provision is lagging behind this rapid growth, leaving new urban arrivals with little or no access to adequate water and sanitation. This undermines health and productivity and reinforces poverty. A 2004 UN-Habitat survey of 30 towns – 10 in each of the riparian countries – showed that over 85% of the population had no access to safe drinking water or appropriate sanitation. This indicates a situation that seems far worse than that portrayed in national statistics (UN Habitat, 2009).

A number of environmental factors are damaging the lakes ecosystem. Untreated sewage flows into the lake from growing urban centres, industrial chemical pollutants runoff from lake-shore industries such as tanneries, agro-processing plants and abattoirs, and the release of a high nutrient land sediment load from rural areas runs directly into the lake. The result has been serious eutrophication. Phosphorus and nitrogen levels are now 5 times higher than figures reported in the 1960's (Awange and Ong'ang'a, 2006). The water hyacinth infestation appears to be returning (NASA, 2007) and lake water has become increasingly deoxygenated. Together these factors have contributed to reducing water quality, increasing incidence of disease in stagnant polluted waters, provoking sharp declines in deep water fish stocks, and in massive fish kills (Awange and Ong'ang'a, 2006). Some 13% of the lake basin's wetlands are now seriously degraded (IRIN, 2008). All of these impacts can further result in impacts felt in downstream countries of the Nile.

The social and economic impact of this degraded resource base will be particularly serious. This lake also supports the largest inland fishery in Africa. Fishing accounts for over 25% of the region's GDP (EAC & UA, 2008). Three-quarters of the Nile perch catch alone is processed and exported, generating revenues of USD350-400 million. Many other species supply the local and regional markets. Almost 2 million households are directly supported by the fishing industry, which supplies fish (and therefore protein) for 22 million people in the region (Lake Victoria Fisheries Organisation, 2011). Combined with the reduced water quality, unsustainable levels of fishing driven by the high gains from processing and export of Nile perch have seriously affected fish stocks. The numbers of fishermen doubled in each of the three riparian countries between 1994 and 2004. A lack of restrictions on the numbers of people who engage in fishing, and poor enforcement of legislation to curb damaging fishing practices, including the landing of undersized fish, are likely to place continued pressure on fish stocks (Odada et al., 2004).

Human security, economic security and the security of the resource itself are, therefore, closely intertwined in and around Lake Victoria. M. Charity Ngilu, Kenya's Minister of Water and Irrigation has noted that the environmental problems of the lake basin need a broad range of collaborative actions "that go beyond the water sector" (UN Habitat, 2008). To address

these mounting pressures, the Lake Victoria Basin Commission (LVBC) has been established. The LVBC is now girding itself for collective action towards more sustainable management and use of natural resources, recognising that this is critical if long term economic and development gains are to materialise around the lake.

The LVBC embodies the idea of a single, coherent legal entity which brings together all development efforts in the Lake Basin under one banner. In 2005, the "Vision and Strategy Framework for the Management and Development of Lake Victoria Basin" was published.<sup>13</sup> This document outlines the long term strategic plan for the sustainable development and management of the basin, and highlights the need for a coordinated approach to collective action between states. The document outlines sector strategies in the policy areas of:

- a) ecosystems, natural resources and environment;
- b) production and generation of income;
- c) living conditions, poverty and quality of life;
- d) population and demography; and
- e) governance, institutions and policies.

A ministerial decision between riparian states has established a commitment to use this framework as a planning tool for all future development initiatives in and around the lake (Okurut, 2009).



Lake Victoria, Tanzania.

<sup>13</sup> See <http://www.lvbc.com.org>



Jinja, Uganda.

## 5.1.4 COUNTRY FOCUS: UGANDA – GROWTH AND ENERGY

Uganda's economy is one of the fastest growing in Africa (AfDB, 2009). The service sector, which contributed more than 40% of GDP in 2005, is leading this growth. Financial services, transport and communications – especially mobile phones – have all played a key role. Wholesale and retail trade have seen particularly strong growth in recent years. It is now expected that further growth in the industrial sector will be spurred on by the discovery and exploitation of oil fields in the north-west. However, agricultural growth, which accounts for more than three-quarters of all jobs, has stagnated. Its contribution to GDP has steadily declined over the last 10 years, contributing only 25% in 2007, down from 30% in 2000 (World Bank Data and Statistics Database). This is despite the fact that agriculture constitutes over 90% of export earnings (Republic of Uganda, 2007), primarily from coffee, fish and cotton.

In the speech launching the 2009 African Economic Outlook, the Hon. Syda N.M Bbumba, Uganda's Minister of Finance, stated that a major focus is now required on diversifying the national and regional economy, through enhanced exports and a focus on intra-regional trade under the East African Community (EAC).<sup>14</sup> The minister highlighted the need to focus on added value rather than simple trade in raw commodities. Uganda is now trying to revitalise and modernise

its agriculture with a special focus on agro-processing and is beginning to invest in roads as one way of improving domestic and regional market access, while reducing transport costs. It is also investing in power generation and transmission to service both urban and rural areas.<sup>15</sup> To facilitate intra-regional trade, under the EAC's Customs Union, tariffs and non-tariff barriers are being removed. The free movement of labour is already possible under the EAC.

Against this backdrop of increasing support to integration and economic growth, Uganda still faces major social challenges, foremost amongst which is rapid population growth. Overwhelmingly rural in nature, the population is set to treble by 2050 (UN World Population Prospects, 2008). Anticipated population growth rates of 3% in rural areas and 5% in urban areas are expected by 2015 (UN World Urbanisation Prospects, 2007). Low rates of urbanisation in comparison to other African countries will persist with the exception of the Lake Victoria littoral region (Republic of Uganda, 2007). Uganda has the largest cropland per capita ratio of any African country but fragmentation of holdings and poor soil quality and erosion remain serious problems and are a major push factor to the Lake Victoria region (UNECA, 2002).

<sup>14</sup> See: [http://www.afdb.org/fileadmin/uploads/afdb/Documents/Minister%27s%20Speech\\_AEO%20230709.pdf](http://www.afdb.org/fileadmin/uploads/afdb/Documents/Minister%27s%20Speech_AEO%20230709.pdf).

<sup>15</sup> This is central to the country's five-year National Development Plan (NDP), which follows on from the national Poverty Eradication Action Plan (PEAP).

At present, some 85% of rural households produce food and cash crops and raise livestock on landholdings of less than 2ha (UNEP and UNDP, 1999). Poverty is persistent among these smallholders, leading many to seek alternative livelihoods along the lakeshore, including in the fisheries sector.

In response to land degradation, farmers have expanded the area under cultivation rather than improved farming practices. In response to some of these challenges, the country has prepared the Programme for the Modernisation of Agriculture (PMA) under the National Development Plan (NDP), which particularly focuses on commercialising smallholder farming, increasing land productivity, opening access to markets, and encouraging non-farm employment.<sup>16</sup> There are also moves to align the NDP with the continent-wide Comprehensive Africa Agriculture Development Programme (CAADP) under the New Partnership for Africa's Development (NEPAD), which aims to achieve economic growth through agriculture led development.

Energy demand is a critical constraint on the economy's capacity to diversify. The Ministry of Energy and Mineral Development estimates that demand will reach 7.5GWh/year by 2025

(Re-Impact, 2007). To support national plans focused on greater non-farm employment and enhanced growth in the industrial and service sectors, Uganda is increasing its focus on power generation. Currently, total installed capacity is around 400MW (mainly through hydropower), but production is significantly hindered by the low water levels in Lake Victoria. This leads to estimated daily shortages of between 100-130MW (ibid), which costs the economy about USD250 million a year (The Guardian, 2007). Only some 5-10% of the urban population have access to electricity, while in rural areas this can be as low as 1%, severely hindering capacity to increase rural non-farm employment (Re-Impact, 2007).

Most hydropower is generated by the Nalubaale and Kiira Dams, which mainly supply urban centres in the country. An interconnector between Uganda and Kenya allows trade in power between the countries, and a line is being developed between Arusha and Nairobi to bring Tanzania into the regional power pool (Water-technology.net, 2009). The construction of the Bujagali Dam, with an expected 250MW capacity, is slated for completion at the end of 2011 and will add significant electricity capacity to the region.

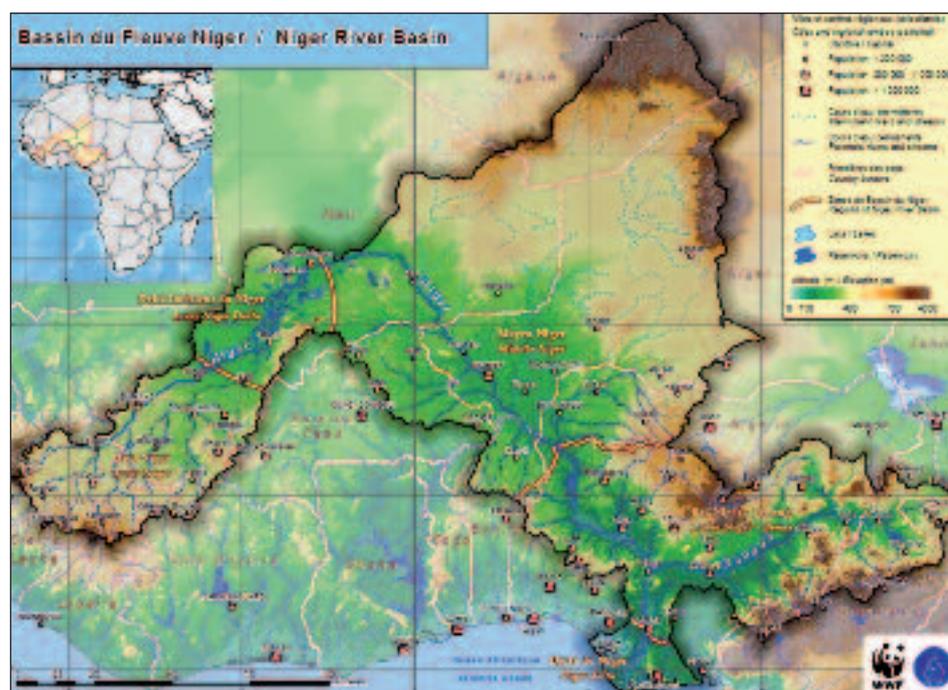
<sup>16</sup> Even though crop agriculture is dominant, non-farm employment is already becoming increasingly important in rural areas (Republic of Uganda, 2002).



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A member of UWEAL (Uganda Women Entrepreneurs Association Limited) viewing the Bujagali Falls.

## 5.2 THE NIGER



Map 9: Africa's Niger River Basin

### 5.2.1 SOCIAL CHANGE

Table 6: Selected Social Indicators for the Niger River Basin Authority Countries

	Total population 2007	Projected population 2020	Rate of natural increase 2005-2010 (%)	Population density (km <sup>2</sup> )	Urban population from total (%)	Population living below USD2/day income poverty line 2000-2007 (%)	Adult illiteracy over 15 years (%)	Children underweight for their age under five 2000-2006 (%)	HDI ranking 2009
Benin	8.4	12.2	3	78	42	75	60	23	161
Burkina Faso	14.7	21.9	3.5	56	20	81	71	37	177
Cameroon	18.7	24.3	2.3	40	58	58	32	19	153
Chad	10.6	14.9	2.9	9	28	83	68	37	175
Ivory Coast	20.1	27	2.4	65	50	47	51	20	163
Guinea	9.6	13.5	2.9	40	35	87	71	26	170
Mali	12.4	16.8	2.7	10	33	77	74	33	178
Niger	14.1	22.9	3.9	12	17	86	71	44	182
Nigeria	147.7	193.3	2.4	166	50	84	28	29	158

Source: Human Development Report (UNDP, 2009)

10 countries in West Africa share the Niger River, comprising Guinea, Benin, Burkina Faso, Cameroon, Ivory Coast, Mali, Niger, Nigeria, Chad and Algeria (to a limited extent). For the purposes of this report, only members of the Niger Basin Authority (NBA) are referred to, (listed in Table 6). By 2050, nearly a third of Africa's population will be living in countries of the Niger River Basin (UN World Urbanisation

Prospects, 2007). Between 2000 and 2050, the population is expected to increase 3-fold to nearly 600 million, which will result in a considerable increase in demand for water for domestic, agricultural and industrial uses, as well as hydropower generation.

Major urban development and burgeoning informal settlements in mega cities and growing urban settlements in rural areas are fast becoming a

critical development challenges. By 2025, two-thirds of the region's population will be urbanised (UN World Urbanisation Prospects, 2009). Ensuring the health and productivity of the urban population will be a key constraint on government budgets, but these can also enable significant economic activity in the region allowing it to prosper and thrive.

As Table 6 shows, the region's population is dominated by Nigeria's, which will reach almost 200 million by 2020. Population density in this country is already twice that of any other basin state and its proportion of urban population is only equalled in Ivory Coast. In spite of Nigeria's economic strength, a huge proportion of the population (84%) still lives on less than USD2 a day. This puts the country on a par with Chad, Guinea and Niger, the latter being officially the least-developed country in the world, languishing at the bottom of the *Human Development Index* (UNPD, 2009). Therefore, whilst one of Africa's largest economies plays a key downstream role within the basin, it still has major social development and human security challenges to overcome.

Rural poverty and lack of employment, particularly across the Sahelian belt to the north of the basin, drives much of the current economic migration to cities. This partly explains why over the past 45 years, the urban population in West Africa has



Niger River Delta

increased 10-fold (ECOWAS-SWAC/OECD, 2007) with some 45% of the population now classed as urban. This is expected to reach 65% by 2025 (UNPD, 2009). Ivory Coast's urban population will probably grow more than 6 times faster than the rural population between 2010 and 2015, and in Nigeria, urban growth is expected to outstrip rural growth by a factor of 6. These social change dynamics are a major decision-making challenge within the basin.

One of the key drivers of urban growth is rural poverty. Except for Nigeria, Niger Basin countries are amongst the poorest in the world (UNEP, 2008). Upstream, over 70% of the population is rural and in Niger this figure is more than 80%. Providing more secure livelihoods for these large rural populations, particularly those engaging in livestock husbandry and agro-pastoralists, will be critical to helping stem rural-urban migration.

## 5.2.2 ECONOMIC DYNAMICS

Table 7: Selected Economic Indicators for the Niger River Basin Authority Countries

	USD GDP per capita 2007	Remittances as a % of GDP 2007	Value added agriculture as a % of GDP 2007	Agricultural labour force as a % of the economically active population 2007	Value added services as a % of GDP 2005	Value added manufacturing as a % of GDP 2005	Value added industry as a % of GDP 2005	RBO membership*	REC membership*
Benin	601	4.1	32.19	47	54	8	13	1	2
Burkina Faso	458	0.7	33.02	92	42	14	22	2	3
Cameroon	847	0.8	19.03	51	49	17	30	3	3
Chad	658	n/a	20.94	69	29	5	53	2	3
Ivory Coast	1,027	0.9	22.81	41	51	19	26	1	3
Guinea	487	3	18.99	81	42	4	33	2	2
Mali	556	3.3	33.69	77	36	3	22	2	3
Niger	294	1.9	**39.98	84	43	6	17	2	3
Nigeria	1,118	6.7	32.39	27	23	3	43	2	2

Source: Africa Development Indicators (World Bank, 2010)

\*WWC estimates \*\* 2003 figure



**Map 10: ECOWAS member's countries**

Source: *Sahel and West Africa Club (2005)*

As shown in Table 7, over half of the Niger Basin countries rely on agriculture for more than 30% of their GDP. Manufacturing provides more than 10% of GDP in only 3 countries: Burkina Faso, Cameroon and Ivory Coast. That Nigeria is not included amongst these is surprising, considering the importance of oil revenues as reflected in the relatively high proportion of value-added industry as a percentage of GDP. 6 of these countries are members of 3 different regional economic communities, highlighting the major overlap between their communities.

Per capita GDP is highest in the Ivory Coast and Nigeria. However, overall across the basin this lags behind global GDP growth, indicating that the effects of rapid population increase are felt through declining relative incomes (UNEP and WRC, 2008). Unsurprisingly, therefore, unemployment is rampant and underemployment among the young remains a major contributor to migration and urbanisation.

Between 2000 and 2008, Niger Basin countries experienced an average economic growth rate of 3.6%, which is partly attributed to economic adjustments and improved macro-economic performance (ECOWAS/EU, 2008). A rise in commodity prices (including oil), relatively stable political conditions and a sizeable increase in development assistance also contributed (ibid).

The regional economic power house is Nigeria, an oil-export driven economy with the largest established oil and gas reserves in Africa. In most of the other NBA states, 40-60% of export earnings come from the agricultural sector (Wetlands International, 2008). In 5 countries, this sector

employs over 60% of the workforce. In these highly agriculture-dependent economies, a few staple commodities dominate, leaving income security dependent on global markets and susceptible to climate variability. Agriculture contributes 35% to the GDP of the Economic Community of West Africa (ECOWAS), and over 30% to 5 of the 9 Niger Basin economies. Most agriculture is rain-fed, and only 1.2% of West Africa's 75.5 million hectares of arable land is developed for irrigation, of which a fraction (0.8%) is used effectively (ECOWAS-SWAC/OECD, 2007).

Agricultural products exported from the region to Europe include food crops and flowers, while Asia receives mainly cotton. The region as a whole is a major global producer of other key commodities, including cocoa, coffee, palm oil and various oilseeds. The range of these commodity production processes suggests that major capacity exists to develop stronger value chains using appropriate credit facilities, workforces and other infrastructure.

Livestock trade is worth more than USD 150 million in West Africa, including within the basin. This is a sub-sector with considerable potential for expansion, due to the anticipated 250% growth in demand for livestock products in the region by 2025. A major cause is growing urban demand (IIED and SOS Sahel UK, 2010). Furthermore, livestock contributes more than 40% to total agricultural GDP in many



Nigeria.

countries of the Sahel, with the majority of herds owned and reared by pastoralists. Given that national accounts do not capture the many other values related to the social and ecological benefits to which extensive livestock production contributes, this contribution to total GDP is likely to be underestimated (IIED and SOS Sahel UK, 2010).

Intra-regional trade in livestock represents an important but unofficial form of economic integration. For instance, Nigeria buys 95% of Niger's animal production, which is increasing, especially in eastern Niger (IIED and SOS Sahel UK, 2010). ECOWAS also recognises the importance of transhumant livestock production and has put in place mechanisms to facilitate cross-border mobility (ibid).<sup>17</sup>

Key to future development of the wider economy in the basin and the region is stronger utilisation of the region's water resources potential. The Niger basin has very high hydro-electric potential amounting to some 30,000GWh/year. Currently only around a fifth has been exploited (Wetlands International, 2008). Key dams on the river (of which there are 15 in total) include Kainji, Jebba and Lagado

(ECOWAS-SWAC/OECD, 2006). Kainji and Jebba are of critical importance to Nigeria's energy production, providing some 68% of hydropower and 22% of all the energy produced in that country (World Bank, 2003). In 1999, ECOWAS members created an international organisation in the electricity sector, the West African Power Pool (WAPP), in order to establish cooperation for improved efficiency of power supply and increased access to energy for its citizens.<sup>18</sup>

Nigeria is currently concerned that upstream construction of dams in Mali and Niger will worsen the already significant 20-50% reduction in flows resulting in a diminished capacity to produce hydro-electricity, not to mention crop productivity (ECOWAS-SWAC/OECD, 2006b). Reduced flows in the Inner Niger Delta in Mali also caused by upstream dam developments have had considerable impacts on livelihoods. This includes substantially reducing fisheries, livestock and paddy productivity, and causing losses in ecosystem services.

<sup>17</sup> "Transhumance" is the seasonal migration of livestock to suitable grazing grounds.

<sup>18</sup> See: <http://www.ecowapp.org/>

## 5.2.3 RESOURCE PRESSURES

**Table 8: Selected Resource Indicators for the Niger River Basin Authority Countries**

	Internal renewable water per capita 2008 (m <sup>3</sup> )	Annual freshwater withdrawals total 2000 (bcm)	Annual freshwater withdrawals 2000 (% internal resources)	Not using improved water source 2006 (%)	Number of shared river basins > 100,000 km <sup>2</sup>	Hydropower production 2007 (% of total)	Energy use 2007 (kg oil equivalents per capita)	Proven oil reserves 2005* (thousand million barrels)	Proven gas reserves 2005* (thousand million oil barrel equivalents)
Benin	1,189	0.13	1.3	35	2	0.75	606		
Burkina Faso	820	0.80	6.4	28	2	n/a	1,068		
Cameroon	14,302	0.99	0.4	30	4	66.86	n/a		0.70
Chad	1,374	0.23	1.5	52	2	n/a	391	0.90	
Ivory Coast	3,732	0.93	1.2	19	1	31.91	n/a		
Guinea	22,984	1.51	0.7	30	4	n/a	290		
Mali	4,722	6.54	10.9	40	4	n/a	n/a		
Niger	238	2.18	62.3	58	2	n/a	745	35.90	32.80
Nigeria	1,461	8.01	3.6	53	2	27.87	722	1.50	

Source: Africa Development Indicators 2010

\*ECOWAS-SWAC/OECD estimates

Future irrigation development in the region will enable greater value added from use of the 1,300 billion m<sup>3</sup>/year of available renewable water resources (excluding Cameroon and Chad). As shown in Table 8, at present, only Nigeria makes substantial use of its internal water resources, followed by Mali, Niger and Guinea. Overall in the ECOWAS, regional water withdrawal is less than 1%. Of this regional withdrawal, 75% is used to irrigate a tiny fraction of the region's irrigated land, 17% is used for domestic consumption and 7% for industry (ECOWAS-SWAC/OECD, 2006b).

Mindful of these and other development pressures within the basin, the NBA is coordinating national resource development policies, and seeking integrated planning and management of the basin. The NBA was initially established in 1963 by 9 states. The institution's original objective was to ensure national projects did not negatively affect neighbouring countries. This has subsequently expanded to wider aims that include coordination of national resource development policies, planning and joint infrastructure development. A 2004 "Paris Declaration" saw countries adopt a shared vision for the river. The 8<sup>th</sup> Summit of NBA Heads of State and Government in 2008 agreed upon a number of key documents on investment in the basin (5,558 billion euros for the Priority Five-year Plan) and accelerated development of the Taoussa Dam in Mali, Fomi Dam in Guinea and Kandadji Dam in Niger. Together, they constitute a major element of the investment programme, corresponding to approximately 48% of the total cost of the Priority Five-year Plan. In 2009, a Niger Basin 'Water Charter' was established.

7 out of the 9 NBA countries are represented in ECOWAS, the key regional institution working towards economic integration in West Africa, and supported by the West African Economic and Monetary Union (WAEMU). These 2 regional economic groupings now work jointly towards regional economic integration. ECOWAS aims to establish a common market to "create a broad, open and competitive economic area, fostering economies of scale, attracting investment, promoting growth and playing a key part in the fight against poverty" (EU, 2008).

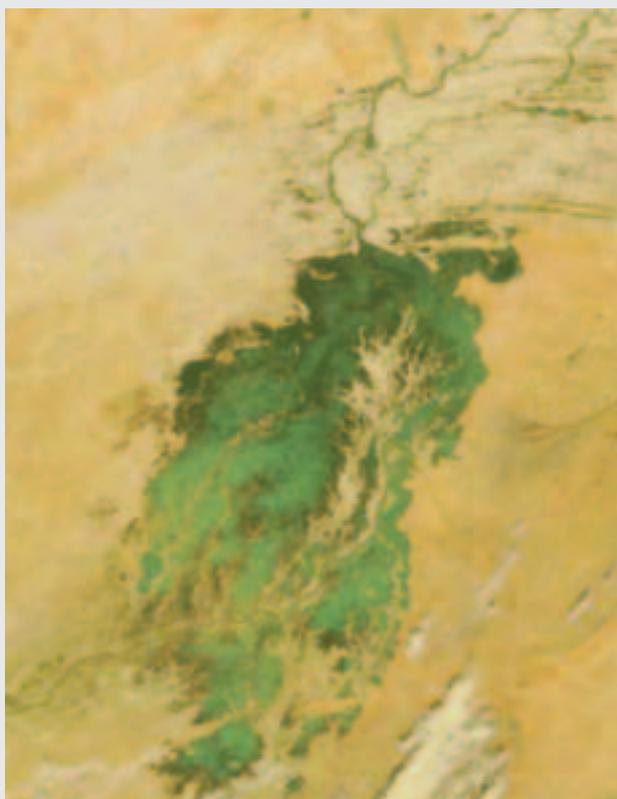


*A farmer prepares his land for irrigation.*

An important linking step between the regional economic integration challenges on the Niger and the regional economic development policies has been the establishment of a Permanent Forum for the Coordination and Monitoring of the Integrated Management of Water Resources in West Africa ("Cadre Permanent de Coordination et de Suivi"). This forum aims to promote and facilitate consultative frameworks for riparian countries and to foster joint management of the resource (ECOWAS-SWAC/OECD, 2006b). Over the next few years, regional priorities include the liberalisation of internal trade and the introduction of a common set of external tariffs, promoting intra-community trade, facilitation for goods and services, trade capacity building (particularly to promote exports), and the free movement of people throughout the region. The forum also seeks to improve the linking up of infrastructure (transport, telecommunications, energy and hydraulic networks) across the region and to harmonise economic and sectorial policies (ibid).

Nevertheless, despite a clear intent to consolidate efforts at the regional level, major challenges remain. Regional priorities are still inadequately reflected in national plans and programmes (especially national poverty reduction strategies) and still struggle against national level protectionist responses, persistent tariff and non-tariff barriers, and weak road and telecommunications interconnectivity.

## HOTSPOT: THE INNER NIGER DELTA



**Image 2: The Inner Niger Delta, Mali**

Source: NASA 2008

The Inner Niger Delta in Mali supports a population of about a million people who engage in a range of livelihood occupations. The Delta, which covers some 30,000 km<sup>2</sup>, was classified a Ramsar site in 2004<sup>19</sup>. The site is a major area of globally important biodiversity, with 3 to 4 million resident or migratory birds from all parts of the world (NBA, 2008). The development of upstream irrigation is believed to be threatening the flooding regime of the delta, which is critical for both flood recession agriculture and for foraging by pastoralists.<sup>20</sup> The Delta is a key resource in an otherwise arid region and attracts pastoralists from a number of neighbouring countries. Some of the highest density herds in Africa can be found within the Delta.

In the past, traditional systems of management coordinated by different groups ensured a minimum of disruption to mixed pastoral, agro-pastoral and agricultural livelihoods. In common with Lake Victoria, there is growing pressure on fisheries in the Delta and several economically important species are declining or have become extinct.<sup>21</sup>

<sup>19</sup> The Convention on Wetlands of 1971, see: [http://www.ramsar.org/cda/en/ramsar-about-about-ramsar/main/ramsar/1-36%5E7687\\_4000\\_0\\_\\_](http://www.ramsar.org/cda/en/ramsar-about-about-ramsar/main/ramsar/1-36%5E7687_4000_0__)

<sup>20</sup> The Delta expands to some 20,000 km<sup>2</sup> in the wet season and contracts to less than a fifth of that size in the dry season.

<sup>21</sup> See: [http://www.worldwildlife.org/wildworld/profiles/terrestrial/at/at0903\\_full.html](http://www.worldwildlife.org/wildworld/profiles/terrestrial/at/at0903_full.html)

### 5.2.4 COUNTRY FOCUS: NIGER'S DEVELOPMENT FRAGILITY

Niger is the poorest country in Africa and is at the bottom of the global HDI rankings. The population is the most rural of all Niger Basin states and is centred on agricultural production. This contributed some 39% to GDP in 2003 and provides some 40% of all export receipts (FAO, 2005). Most of the rural population make a living from rain-fed agriculture.

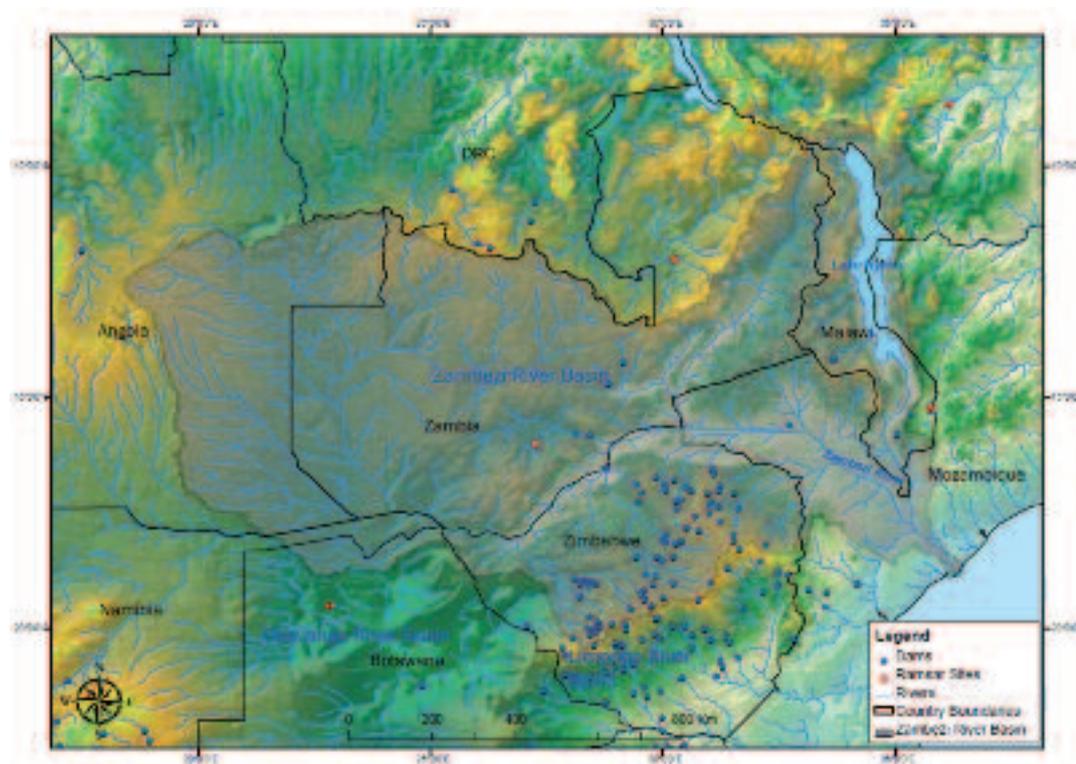
Poverty is high. Some 86% of the population earn less than USD2 a day. This is most marked in rural areas (ibid). Because on the whole people depend upon rain-fed agriculture to make a living, the overwhelming majority of the population is densely concentrated in the south of the country along the Nigerian border, where rainfall agriculture is more feasible. Most of the country's agricultural production is for subsistence, with farmers growing mainly rice, millet and sorghum. Only 25% of agricultural production generates revenue for the country (ibid). These farming systems are extremely vulnerable to

recurrent drought and little capacity exists to store water or to store, transport and process food.

The country's renewable surface water (33.65km<sup>3</sup>) depends heavily on flows from neighbouring countries, primarily from the Niger River and Lake Chad. Currently, only about 6.5% of total renewable water is withdrawn (204m<sup>3</sup>/year of the available 2,710m<sup>3</sup>/year), 95% of which is used for agriculture, and only 4% and 1% goes to services and industry respectively (ibid). Most water withdrawals are used to irrigate smallholder farms in wetlands, which have become increasingly fragmented and degraded due to the population increase of the last 20 years. This has resulted in a loss of more than 80% of the country's freshwater wetlands, which have traditionally provided important ecosystem services for the country, not least being important dry season grazing for the country's substantial livestock population (UNESA, 2006).



## 5.3 THE ZAMBEZI



Map 11: Africa's Zambezi River Basin

Source: UNEP (2008)

### 5.3.1 SOCIAL CHANGE

Table 9: Selected Social Indicators for the Zambezi River Basin

	Total population 2007	Projected population 2020	Rate of natural increase 2005-2010 (%)	Population density (km <sup>2</sup> )	Urban population from total (%)	Population living below USD2/day income poverty line 2000-2007 (%)	Adult illiteracy over 15 years (%)	Children underweight for their age under five 2000-2006 (%)	HDI ranking 2009
Angola	17.6	24.5	2.6	14	59	70	33	31	143
Botswana	1.9	2.2	1.3	3	61	49	17	13	125
Malawi	14.4	20.5	2.8	158	20	90	28	19	160
Mozambique	21.9	28.5	2.3	28	38	90	56	24	172
Namibia	2.1	2.6	1.9	3	38	62	12	24	128
Tanzania	41.3	59.6	3	48	26	97	28	22	151
Zambia	12.3	16.9	2.6	17	36	82	29	20	164
Zimbabwe	12.4	15.6	1.4	32	38	n/a	17	17	n/a

Source: Human Development Report (UNDP, 2009)



Tanzania.

By 2020 the population of the 8 countries comprising the Zambezi River Basin will amount to some 170 million people. The southern Africa region as a whole had a total population of 204.7 million in 2000, which is projected to more than double to 500 million by 2050 (UN World Population Prospects, 2006). Past increases in population were mainly attributed to declining mortality in the context of high fertility rates, resulting in high overall rates of growth. However, the average annual rate of population growth for southern Africa is projected to decline to 1.7 and 0.9 in 2020 and 2050 respectively. This suggests a transition to a lower rate characterised by lower total fertility (i.e., 3.5 in 2020 and 2.2 in 2050) and lower crude death rates (i.e., 12 per 1,000 in 2020 and 9.9 per 1,000 in 2050). By 2050, the region is likely to experience fertility rates only moderately above the population replacement level (ibid).

In comparison with other basins in the study, overall population is relatively low and density has yet to become a key issue. The basin is slightly more urbanised than others with an average rate of around 40%, but there is an increasing trend towards urbanisation. As indicated in Table 9, Malawi has the highest rate of urbanisation in the region, with projections showing that 3.8 million Malawians will be living in urban areas by 2012, a 400% increase on 1988 levels. Overall, the proportion of people living in urban areas across the basin increased from 11.2% in 1960 to

35.4% in 2006. Only Botswana and Angola currently have more than 50% of their population living in urban areas (UN World Urbanisation Prospects, 2007).

Continued urbanisation in southern Africa will pose a number of challenges. From a water perspective, amongst other things, it will increase the need for water for domestic purposes. However, many municipalities in the basin are already unable to provide adequate piped water, sanitation and waste disposal services, mainly due to the rapid urban growth (UNEP, 2002). In Tanzania, the demand for water already outstrips urban supply, as urban dwellers multiply and supply systems remain inadequate (ibid). Unplanned urbanisation also has significant consequences for the environment. Most water bodies close to urban areas in southern Africa tend to have localised high coliform bacteria counts due to the discharge of untreated sewage (SADC and RISDP, 2002). In addition, dams whose catchment areas have been heavily urbanised are frequently eutrophic (ibid). Water quality degradation attributed to rapid levels of urbanisation reduces the amount of water available for consumptive and productive purposes or requires costly treatment before re-use.

Rural-urban migration is the key driver of change, with people drawn by perceptions of better employment opportunities and quality of life. Additional rural “push factors” include declining returns from agriculture and shortage of land. Agriculture supports 70% of the population in the region and will be a focus of future development planning. Challenges facing the sector include inequitable access to land and water, high transportation costs, poor infrastructure, underdeveloped markets, and low prices for agricultural products.

In spite of significant rates of economic growth, formal sector employment in the region has been falling since the 1990s. High rates of unemployment are partly attributed to the high levels of retrenchment that accompanied economic reforms in the 1990s, and overall decline in agricultural sector activity. This has been exacerbated by the fact that the sectors which are growing and driving economic growth, namely mining and oil production, are capital rather than labour-intensive. As such, they are incapable of creating significant





Victoria Falls, Zambia.

employment opportunities for the huge available labour pool, which is increasing due to population growth.

Unsurprisingly, given the high levels of unemployment, poverty in southern Africa is chronic and rising, and predominantly rural in character. In at least 5 of the 8 basin countries more than 70% of the population lives on less than USD2 a day. Concurrently, there are significant disparities in access to basic services, such as improved water supply between urban and rural areas. Angola ranks lowest in terms of urban access, while Mozambique and Zambia rank lowest in terms of rural access. However, significant improvements in rural access have been noted in Malawi and Namibia.

The rural character of poverty may be due to the fact that a majority of rural areas in the basin are located in arid and semi-arid regions. This is compounded by a legacy of historical processes of land alienation which accompanied the development of commercial agriculture in Angola,

Lesotho, Mozambique and Zimbabwe. As such, rural poverty in southern Africa partly stems from structural inequalities in the access to land and water embedded in earlier processes of land acquisition. Added to this are several factors including the decline in investment in agricultural development by national governments and international agencies, underdeveloped markets for rural produce, a lack of capital and inputs, and low prices for agricultural commodities.

## 5.3.2 ECONOMIC DYNAMICS

**Table 10: Selected Economic Indicators for the Zambezi River Basin**

	USD GDP per capita 2007	Remittances as a % of GDP 2007	Value added agriculture as a % of GDP 2007	Agricultural labour force as a % of the economically active population 2007	Value added services as a % of GDP 2005	Value added manufacturing as a % of GDP 2005	Value added industry as a % of GDP 2005	RBO membership*	REC membership*
Angola	3,623	n/a	7.65	70	20	4	73	3	3
Botswana	6,544	1.2	1.79	43	41	3	49	3	2
Malawi	256	0	29.25	80	41	12	18	1	2
Mozambique	364	1.3	24.46	81	43	14	23	3	1
Namibia	3,372	0.2	10.33	36	55	12	27	3	3
Tanzania	400	0.1	37.74	77	34	6	14	4	2
Zambia	953	0.5	21.04	65	46	11	29	1	2
Zimbabwe	261	n/a	13.42	58	52	9	17	1	2

Source: *Africa Development Indicators* (World Bank, 2010)

\*WWC estimates

Despite the region suffering high rates of unemployment and widespread poverty, southern Africa experienced steady levels of economic growth from 1997 to 2008, averaging 5.7% (OCDE, 2009). Over time, the rate varied from 3.1% between 1997 and 2002, to 7.4% in 2007. In this period, Angola and Mozambique were the fastest growing economies in the region, with an average rate of 13.7% and 7.7% respectively. Angola's economic growth was driven by increasing oil production, while in Mozambique macroeconomic stability and donor support played an important role. However, Zimbabwe is the worst performing economy in the region, with a negative average rate of -5.5%. The decline in economic growth in Zimbabwe from 2000 to 2009 is largely explained by its intractable political and economic crisis (UNECA, 2008b).

The Zambezi river basin riparian states are members of the Southern African Development Community (SADC), created in 1992 to take the place of the Southern African Development Coordination Conference to reinforce economic integration between southern African countries.<sup>22</sup> This economic bridge-building has encouraged water sector cooperation through a Protocol on Shared Watercourses,<sup>23</sup> a Groundwater and

Drought Management Project<sup>24</sup> and Water Sector ICP Collaboration Portal.<sup>25</sup>

As Table 10 shows, 6 countries within the Zambezi River Basin have more than 50% of their work force employed in agriculture, although the proportion of value added agriculture remains relatively low in all countries except Tanzania and Malawi. Mining in Angola is the predominant activity, while in Botswana it is a combination of mining and service sector industries. There is a major divide in terms of per capita GDP between Angola, Botswana and Namibia and the other 5 states in the basin. Botswana's GDP per capita is 10 times that of Mozambique's.

Key drivers of economic growth in southern Africa are services, mining and agriculture. However, from 1990 to 2008, the services sector has been the leading contributor, indicating a structural shift in the region (ODI, 2008). For instance, in 1999 and 2006, the services sector contributed 44% and 47% to the region's economic growth respectively. The agriculture sector's contribution to economic growth has been low, ranging from 8.3% in 2002 to 8.7% in 2006 (UNECA and UA, 2008). Despite this, the agricultural sector remains vital, as it employs 70% of the region's work force (ibid).

<sup>22</sup> SADC members: Angola, Botswana, Democratic Republic of Congo, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia, Zimbabwe (Total: 15 states).

<sup>23</sup> See: <http://www.africanwater.org/SADCprotocol>. <sup>24</sup> See: <http://sadc-groundwater.org/> <sup>25</sup> See: <http://www.icp-confluence-sadc.org/>

Agriculture is an important sector in Malawi, Mozambique, Tanzania, Zambia and Zimbabwe. Nearly 52 million hectares are cultivated yearly in the basin, of which just 146,869 hectares, are under irrigation. Malawi, Zambia and Zimbabwe together cultivate 85% of this area (SADC et al., 2008). Approximately 70% of the total population in the Zambezi River Basin resides in rural areas and depend upon rain fed and flood based subsistence agriculture for their livelihoods. The latter is practiced along flood plains, swamps, wetlands and along the margins of larger water bodies. Subsistence fishing in surface water bodies is also a major livelihood activity. Food security and agricultural development are both key to future development. The current estimated water use for irrigated agriculture and livestock does not exceed 2% of the mean annual stream flow of the Zambezi. Given the huge amount of land that could be irrigated and the availability of water resources, commercial and small-scale irrigated agriculture has the potential to transform economies within the basin. Appropriate small-holder irrigation development, if strategically developed, can help to shift subsistence rain-fed agriculture (into which most rural poor are locked) towards small-scale commercial agriculture, contributing to economic growth and socio-economic development. This will also depend on transport infrastructure to provide access to markets.

Foreign exchange earned from agriculture is mainly from exports to the EU of raw and unfinished products including tea, coffee, sugar, cotton, horticultural products, fruits and fish. These exports are tied to trade agreements and initiatives including the *Cotonou Agreement*.<sup>26</sup> Whilst such agreements have the potential to increase agricultural production, positive results are not always discernible for Africa within a globalised market dynamic. The EU's Common Agricultural Policy (CAP), for example, grants subsidies to EU farmers, thus reducing market prices for EU agricultural products. The strengthened competitiveness of these products obviously has repercussions on the global market, including for Africa in terms of both import and export commodities (Goodison, 2002; Stoneman and Thompson, 2007).

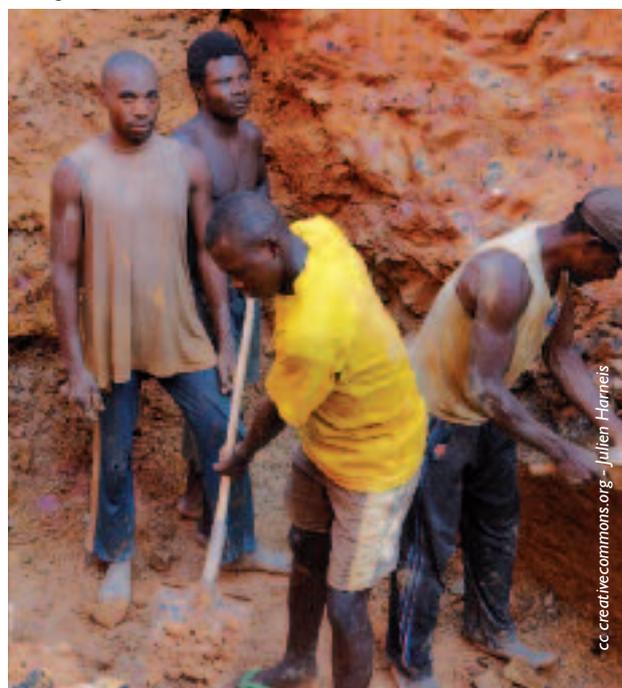
As an example, in July 2004, as part of the CAP reform, the EC abolished the "intervention price" of sugar and replaced it with a "reference

price", which reduced the price of sugar by 30%. This was in line with making the price of sugar competitive, and led to a fall in EU sugar prices from Euros 632 a tonne to Euros 422 a tonne. Similarly, the price offered for raw sugar for southern African countries (which was true for other African, Caribbean and Pacific countries) was reduced from Euros 523.70 a tonne to Euros 329 a tonne, representing a 37.2% decline. In terms of the impact on water resources in the region, there is a distinct possibility that agricultural developments can be undermined by emerging trends in global agricultural reforms and trade, including undermining the development of local value added food product industries (Goodison, 2007; Stoneman and Thompson, 2007).

Oil and mineral resources have played a prominent role in the economic growth of Angola (oil), Botswana (diamonds) and Zambia (copper). Exports of oil and mineral resources dominate trade between southern African countries and the USA which imports between 75-80% of the oil and minerals exported from southern Africa (Stoneman and Thompson, 2007). This trade is governed mainly by "*The African Trade and Development Act*" commonly referred to as the "*Africa Growth and Opportunity Act*" (AGOA) signed on May 18, 2000.<sup>27</sup> The Act is primarily aimed at encouraging increased trade and investment between the USA and sub-Saharan Africa, including countries in southern Africa (excluding Zimbabwe). This is to be achieved partly

<sup>27</sup> *Eligible countries:* Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Chad, Comoros, Congo (Brazzaville), Democratic Republic of Congo, Djibouti, Ethiopia, Gabonese, Gambia, Ghana, Guinea-Bissau, Kenya, Lesotho, Liberia, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Nigeria, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leon, South Africa, Swaziland, Tanzania, Togo, Uganda, Zambia (Total: 38 states).

*Mining in Kailo, DRC.*



<sup>26</sup> See: [http://europa.eu/legislation\\_summaries/development/african\\_caribbean\\_pacific\\_states/r12101\\_en.htm](http://europa.eu/legislation_summaries/development/african_caribbean_pacific_states/r12101_en.htm) <[http://europa.eu/legislation\\_summaries/development/african\\_caribbean\\_pacific\\_states/r12101\\_en.htm](http://europa.eu/legislation_summaries/development/african_caribbean_pacific_states/r12101_en.htm)> "

through reduced tariff and non-tariff barriers to trade and reciprocal trade agreements.

This trade is dominated by oil exports. In 2007, oil exports from eligible countries in Africa to the USA constituted 95% of trade under AGOA, which mostly benefitted Angola (Naumann, 2009; Bread for the World, 2003). This fact underscores the dominance of oil in trade relations between the USA and Africa. At the same time, the export of agricultural products to the US has not increased under the Act. In view of this, it has been pointed out that without the parallel removal of domestic agriculture subsidies in the USA, AGOA will never be able to unleash the economic and poverty alleviation potential of southern African agriculture (Bread for the World, 2003; Stoneman and Thompson 2007; Naumann, 2009). Reform of trade agreements that enhance the export of agricultural products from southern Africa to the EU and USA could, therefore, have a significant impact on economic growth and socio-economic development, and could increase productive uses of water in agriculture and other related industries.

The demand for water is expected to increase as southern African countries respond to overseas market opportunities and as the region's population rises. More importantly, the increased prominence of the services sector in economic growth and its links to agriculture are expected to increase the demand for water for agricultural production. For example, some service industries, such as tourism, have been shown to be strongly linked to agricultural growth through the increased demand for locally-produced agricultural products (mainly food) (ODI, 2008). In addition, the use of water for hydropower generation is set to increase in response to the growing demand for the constant supply of power within the region, including for industry. Most countries in the region do not have adequate power to meet their current demands. Frequent power outages in Southern Africa are estimated to have dampened GDP growth by half a per cent (ibid). Copper mines in Zambia, which consume 50% of the country's electricity, are constrained by lack of power supply (ibid).



IUCN, Tales of Water

Water pump, Tanzania.

## 5.3.3 RESOURCE PRESSURES

Table 11: Selected Resource Indicators for the Zambezi River Basin

	Internal renewable water per capita 2008 (m <sup>3</sup> )	Annual freshwater withdrawals total 2000 (bcm)	Annual freshwater withdrawals 2000 (% internal resources)	Not using improved water source 2006 (%)	Number of shared river basins > 100,000 km <sup>2</sup>	Hydropower production 2007 (% of total)	Energy use 2007 (kg oil equivalents per capita)	Proven oil reserves 2005* (thousand million barrels)	Proven gas reserves 2005* (thousand million oil barrel equivalents)
Angola	8,213	0.35	0.2	49	4	84.48	1,089	9.00	
Botswana	1,249	0.19	2.9	4	2	0	343		
Malawi	1,087	1.01	6.3	24	3	n/a	485		
Mozambique	4,481	0.63	0.6	58	4	99.91	n/a		
Namibia	2,892	0.30	4.9	7	2	92.32	418		
Tanzania	1,977	n/a	6.2	45	3	60.14	443		
Zambia	6,355	1.74	2.2	42	1	99.42	604		
Zimbabwe	934	4.20	34.3	19	3	56.78	759		

Source: Africa Development Indicators 2010

\*ECOWAS-SWAC/OECD estimates

As indicated in Table 11, the surface water of southern Africa is unequally distributed and concentrated in trans-boundary river basins, including the Zambezi, Limpopo and Orange Rivers. Whilst being well-endowed with agricultural land, water, wildlife and mineral resources, and having experienced increasing rates of economic growth in the past decade, the majority of the region's 250 million people still live in conditions of extreme poverty and socio-economic underdevelopment.

Within this context, there is an increasing realisation that natural resources can play a key role in regional economic growth, poverty alleviation and socio-economic and industrial development. The Southern African Development Community (SADC) has placed water resources at the centre of regional cooperation and integration through an institutional and legal framework that is intended to guide the region towards sustainable, integrated and coordinated planning, development, utilisation and management of water resources.

Climate variability is a key feature of the resource environment in the Zambezi basin, exemplified by the serious drought in 1992 and

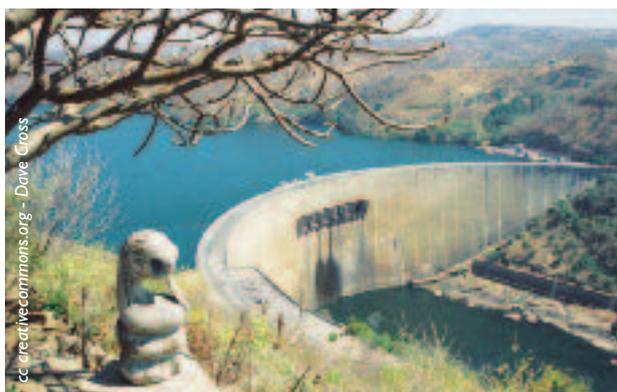
floods in 2002 and 2008. Climate change analysis conducted by the Inter-governmental Panel on Climate Change (IPCC) for southern Africa indicates a drying trend for much of the region, with a shortened rainfall season, which, combined with increasing temperatures, may dramatically alter water resource availability, wetlands coverage and aquatic ecosystem functioning. The anticipated drying trend will reduce soil moisture in many countries, with serious implications for the region's smallholder farmers. In Malawi, Mozambique, Zimbabwe, and Zambia, most farmers rely on rainfall and live in already water-constrained areas.

There is a policy consensus in the SADC on regional and sub-regional integrated and coordinated water resources development, centred on wide-scale water sector reform. The region's water reforms seek to promote the concept of integrated water resources management within water policy frameworks at national and transnational level. However, despite the wide-scale adoption of integrated water resources management, far more is needed to enhance the contribution of water to regional development.

Increasingly there is focus on future development of the Zambezi, the region's largest river basin. The Zambezi Watercourse Commission (ZAMCOM) was created in 2004 under the SADC, in response to perceived opportunities for water to be more effectively harnessed in support of regional development.<sup>28</sup> It aims to coordinate and consult on major hydraulic works, plan joint investments, harmonise water use and licensing in the region, and promote the development of infrastructure to enable greater benefit sharing.

One of the key features of the Zambezi River Basin is extensive hydropower development. The Southern African Power Pool will tap into the region's significant potential for hydropower generation through projects at Lake Kariba, Lake Cahora Bassa, Lake Malawi and the Itzhi–Tezhi Gap. Partly due to the high altitude at which most of the Zambezi River flows, the river basin has significant additional hydropower potential. The two major existing dams, Kariba and Cahora Bassa, consume through evaporation about 15% of the available run-off in the Zambezi Basin and generate some 4,683MW of power. However, recent power outages and load shedding indicate that current supply is inadequate. Half of all electricity in Zambia, for instance, is consumed by the copper mining industry, and frequent power outages and load shedding adversely affect this industry, which has knock-on impacts on the rate of economic growth.

Future power generation potential is estimated to be 13,000MW, representing a 300% increase on current levels. From 2008 to 2025, the Southern African Power Pool envisages increased levels of hydropower generation in the Zambezi Basin through the development of power plants in the Kariba sub-basin, the Shire River/Lake Malawi sub-basin, the Kafue sub-basin, and through the



Kariba Dam in Zimbabwe, with Nyaminyami, the Zambezi River God.

Cahora Bassa II and Mepanda Uncua dams, both in the Tete sub-basin. These will permit the integrated generation and transmission of electricity that can benefit the SADC region as a whole.

Regional integration and governance of the resource has been developed under the *Revised SADC Protocol on Shared Watercourse Systems*, and through the principles set out in the SADC Regional Water Policy and SADC Regional Water Strategy. One of the objectives of ZAMCOM in this regard is “to promote the equitable and reasonable utilisation of the water resources in the Zambezi River Basin as well as the efficient development and management thereof”. In so doing, ZAMCOM seeks to contribute to sustainable economic growth, poverty reduction and socio-economic development in SADC countries. The ways in which ZAMCOM aims to achieve SADC's development goals are outlined in the “*Integrated Water Resources Management Strategy and Implementation Plan for the Zambezi Basin*”. This document outlines the main challenges for managing water resources, provides a detailed overview of future water availability and water utilisation in the river basin, and indicates how key activities contribute to economic growth, poverty reduction and socio-economic development.

ZAMCOM's structure includes representatives from the 8 riparian states, SADC Water Division, the Zambezi River Authority and the ARA–Zambezi. The SADC Water Division plays a coordinating role, while riparian countries own the process of water development and management. ZAMCOM has a Project Steering Committee composed of national contact persons in each riparian country, representatives from the SADC Water Division Zambezi River Authority, and cooperating partners.

To advance the goals of the Revised SADC Water Protocol, the *Southern African Development Community Regional Water Policy*, was developed in 2005 and provides an overarching framework for sustainable, integrated and coordinated development, utilisation, protection and control of national and trans-boundary water resources in the region (SADC, 2006). In addition, it provides the context and intent for water resources management, representing the aspirations and interests of member states. The SADC Regional Water Policy also seeks to promote regional integration, economic growth, socio-economic

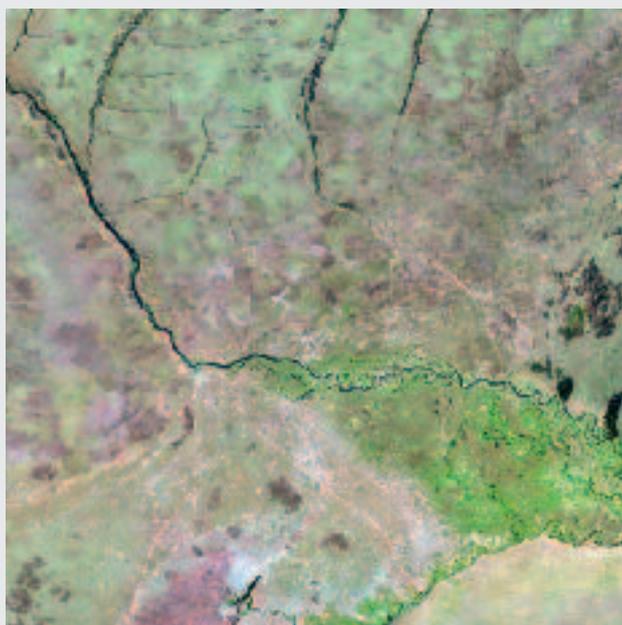
<sup>28</sup> ZAMCOM did not come into force until September 21, 2011.

development, and improvement in the quality of life for all people of the region (ibid).

A Regional Water Strategy was finally developed as the framework for implementation of the Policy and Protocol, indicating actions, responsibilities and timeframes (SADC, 2006). However, actions towards the realisation of the Revised SADC Water Protocol are outlined in the *Regional Assistance Strategy Paper for Integrated Water Resources Development and Management* (RASP-IWRDM), which has just completed its second phase, 2005–2010 (and is a sub-component of SADC's Regional Indicative Strategic Development Plan (RISDP)).

The RASP–IWRDM identifies 31 priority water resource interventions, programmes or projects across the 7 areas of intervention as central to the achievement of the objectives of the Revised SADC Water Protocol. These include developing the legal and regulatory framework, institutional strengthening, developing linkages with sustainable development policies, data collection, management and dissemination, awareness building, education and training, stakeholder participation, and infrastructure development.

## HOTSPOT: LOWER ZAMBEZI FLOODING



**Image 3: Flooding along the Zambezi River (August 28, 2001)**

Source: <http://earthobservatory.nasa.gov/IOTD/view.php?id=3611>



**Image 4: Flooding along the Zambezi River (April 23, 2003)**

The lower Zambezi floodplain in Mozambique has been the scene of major emergencies in recent years with huge destruction of property and loss of life. Some attribute this to various factors including population encroachment in floodplain areas, changes to the seasonal flooding patterns caused by upstream dam operation and the impact of increasing climate variability in the region.

In 2008 some 50,000 people were displaced by flooding in the Zambezi valley during the middle of the wet season. The impact of the flooding was

widespread, including the loss of crops that would have been harvested later in the year. As a result of better planning for such events the loss of life was far lower than in earlier years (in particular 2000 and 2007). Nonetheless, as Oxfam reported, the long-term impacts are serious, rendering communities more livelihood-insecure. The increased poverty results in a cycle of greater vulnerability, with families taking greater risks to earn an income, including living and farming in more fertile areas closer to the river.<sup>29</sup>

<sup>29</sup> See: [Oxfam.org/en/emergencies/mozambique/in-depth](http://Oxfam.org/en/emergencies/mozambique/in-depth)

In order to fight against the Zambezi's flooding, UNPD Chief Technical Advisor, Titus Kuuyuor, working for the National Institute for Disaster Management, recommends building new dams in the area. Moreover, the water harvested in

theses dams could be used for irrigation during the dry period.<sup>30</sup> An investment in such a project will ensure more safety and stability for the region, which is essential for economic growth.

<sup>30</sup> See: <http://www.undp.org/mz/pt/What-we-do/Crisis-and-Environment/Press-Releases/Looking-for-more-sustainable-solutions-for-flood-risks-and-disasters-in-Zambezi-River-basin>



Maize breeder, discussing irrigation pipes to be installed at the Chiredzi Research Station in Zimbabwe.

### 5.3.4 COUNTRY FOCUS: ZIMBABWE'S WATER SECTOR REFORMS

Zimbabwe was at the forefront of southern Africa's water sector reforms which commenced in the mid-1990s. Central to Zimbabwe's water reform was the need for a sustainable water resources management strategy that contributed to economic growth, poverty reduction and socio-economic development to benefit the whole country (Matinenga, 1999; Government of Zimbabwe, 1998a). This partly stemmed from the significant role agriculture played at the level of local livelihoods and the national economy. This fact was brought into sharp focus by frequent droughts, particularly during 1992. These events underscored the fragile nature of the water resource base, and the adverse impact it has on economic growth, socio-economic development and poverty.

The new legal and institutional framework outlined in key policy documents (e.g., "Towards an Integrated Water Resources Management Strategy in Zimbabwe"), the Water Act of 1998, and the 1998 Zimbabwe National Water Authority (ZINWA) Act, signalled the shift in water management policy and strategy towards economic growth and poverty reduction. The 1998 Water Act paved the way for the delineation of the country into 7 catchment (and sub-catchment) areas. The Water Act provided an excellent framework for sustainable watershed management where all the stakeholders were given an opportunity for input.<sup>31</sup> Furthermore, a clear policy is likely to secure investors.

<sup>31</sup> The importance of policy and institutional coordination on implementation (FAO, 2005)

The new Water Act led to the establishment of catchment and sub-catchment councils, which are decentralised institutions of water management tasked with the responsibility for creating an effective user-management interface, including stakeholder participation, issuing water permits, monitoring water use, controlling pollution and enforcing regulations. The 1998 ZINWA Act created the Zimbabwe National Water Authority, which is an apex organisation for the management of water resources, hierarchically arranged by sub-catchment, catchment and nation. ZINWA's main function is to advise the minister responsible for water on the formulation of national water policy and strategies pertaining to water resources planning, development and management. At the catchment and sub-catchment level, ZINWA's functions include the provision of technical assistance in coordinating development, management and the utilisation of water resources.

Central to the management of water resources by ZINWA and the Catchment Councils are Catchment Outline Plans. These plans provide

a guiding framework for water resources development, allocation and use across different sectors (e.g., water for domestic use, manufacturing, mining, agricultural and environmental purposes) in pursuit of the social and economic development of a particular catchment (Government of Zimbabwe, 1998). The key role of ZINWA and Catchment Councils is to support the management and protection of water resources so that resources are available for social and economic development activities. This constitutes the underlying principle of Zimbabwe's reforms and similar reforms undertaken in South Africa, Tanzania and Malawi.

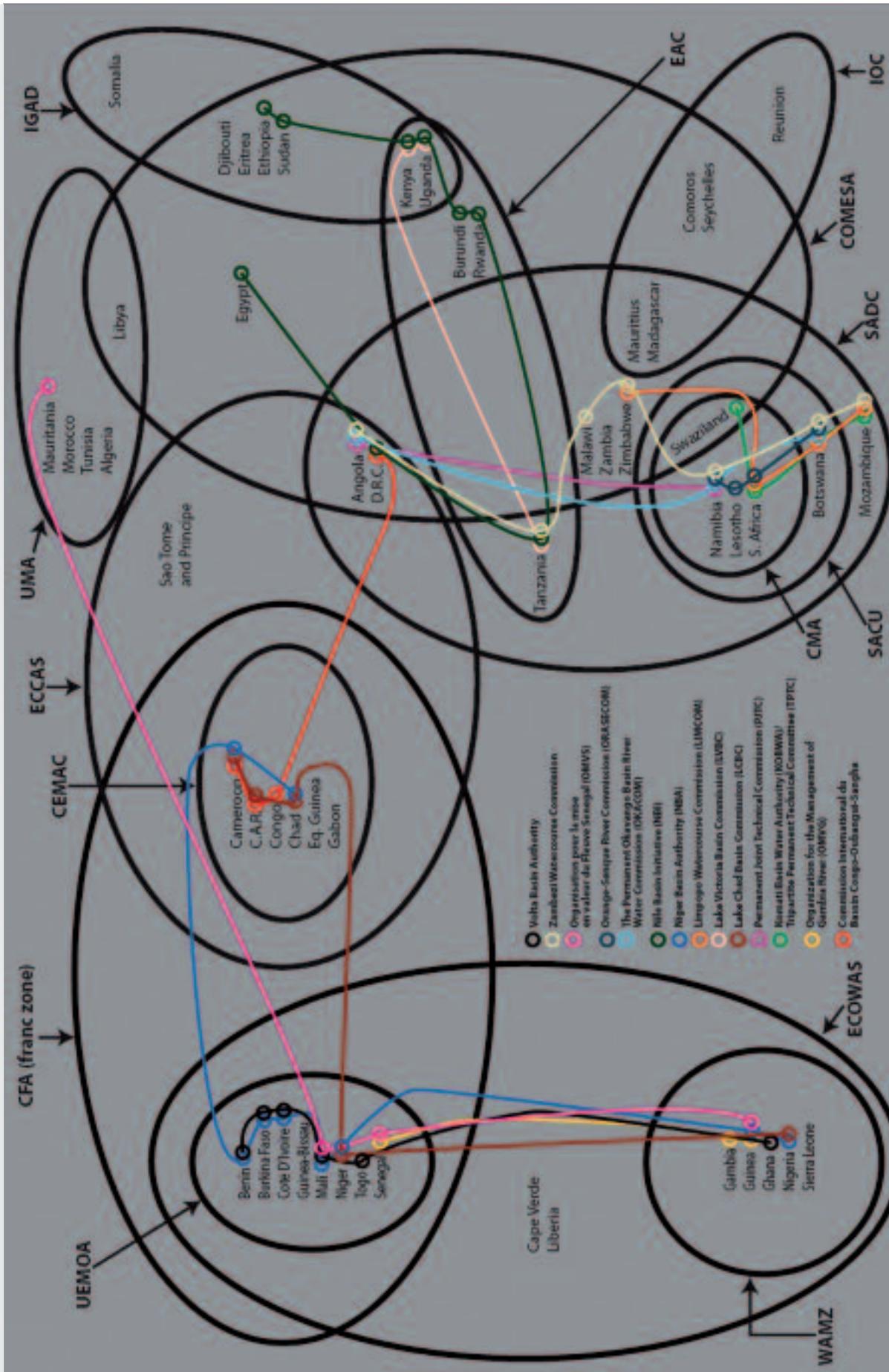
Although Catchment Outline Plans provide a critical planning framework for the contribution of water resources to social and economic development at catchment and national level in Zimbabwe, greater efforts are still needed to encourage the completion and implementation of these plans in a timely manner so that they become effective tools for development (Mabiza et al., 2007).



Lake Kariba, Zimbabwe.

cc creativecommons.org - Sarah Clegg

Figure 1: The overlapping institutional “spaghetti” of Africa’s Regional Economic Communities (RECs) and River Basin Organisations (RBOs)



Adapted from UNCTAD (2009) and other sources



## 6. CONCEPTUAL FRAMEWORK

### THE MOSAICS OF SHARED RIVER BASINS, ECONOMIES, SOCIAL AND INSTITUTIONAL SYSTEMS IN AFRICA

The foregoing analysis has built up a picture of the enormous social and economic changes taking place in some of Africa's key river basins. This is driving change to the natural environment on the continent, including the pattern of water resource availability.

What this analysis shows is that investing in response to these changes and their drivers requires a sound understanding of the multiple mosaics which overlay one another across the continent.

These include the mosaics of shared river basins, the mosaics of different economic and social systems, as well as the hugely complex political and institutional mosaics, such as those illustrated in Figure 1, showing the multiple and overlapping nature of river basin organisations (RBOs) and regional economic communities (RECs). In short, this is a highly complex investment environment in which it is imperative to be able to make a sound business case for future water investments.

## 6.1 “ROUTE MAP”

### A PROPOSED DECISION MAKING “ROUTE MAP” FOR WATER INVESTMENT IN AFRICA

With this complex mosaic in mind, Figure 2 shows a decision making “route map” which highlights how the emerging framework for water investment may be applied to achieve economic development in Africa.

The route map begins with a commitment to meeting the political objectives of human, economic and water security and identifying what the key drivers are for change in these contexts. Policy makers may then begin to identify potential responses to either adapt to or bring about the changes necessary to meet the political objectives. Analysis is then required to understand what investments are needed to deliver these responses, and decisions are made about which investments are going to bring about the best results in the short, medium and long terms. Once investment

decisions have been made, these decisions then need to be implemented at local, national and regional levels, ensuring that efficiencies are made where possible through good coordination of investments, to avoid unnecessary duplication or potential conflicts of interest. Then, it is essential to monitor, evaluate and report on the success of these investments in water using a sustainable development lens. Examples of success will reinforce the political objectives of investment in the three securities in an ever-changing world.

It is important to note that this is a simplified route map and will need to be adapted to the socio-political and environmental circumstances of each country. In reality the sequencing of these actions tends to be more complex than displayed here.

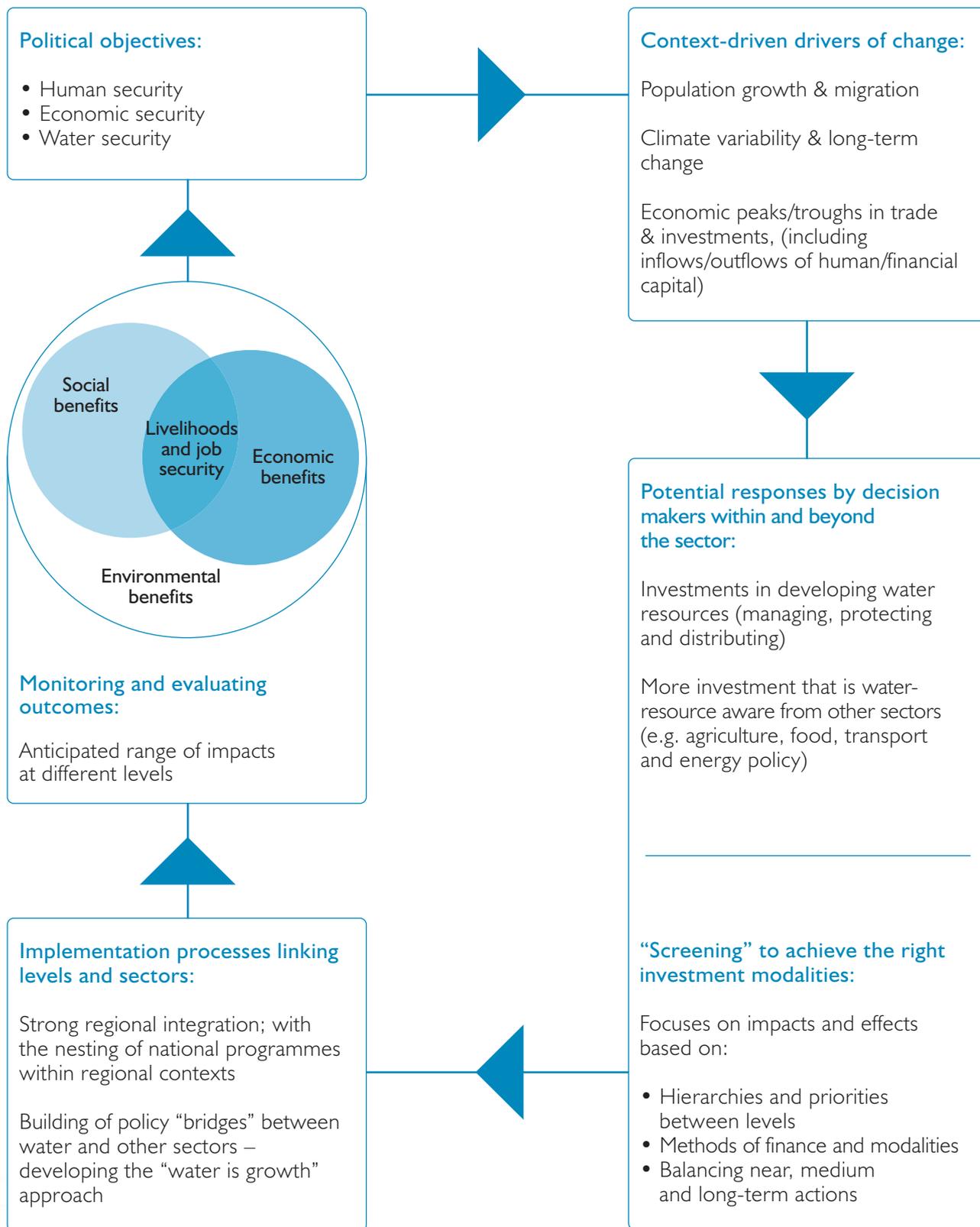


Figure 2: Eliciting a Political Response

## 6.2 A FRAMEWORK

### A FRAMEWORK FOR POLICY AND DECISION MAKING ON WATER INVESTMENT IN AFRICA

With the roadmap established, and using the basic framework for policy and decision making on water investment in Africa, presented in the introduction of this report (Table 2). We can begin to develop and populate a broader framework for water investment as proposed in Table 12. The framework posits human, economic and water securities against the three levels of decision-making: local, national and regional. Whilst at each intersection there are many options for investments based on political priorities, we concentrate

here on a non-exhaustive analysis of investments related to jobs and income, energy, and food, but could easily also look at priorities such as healthcare, trade or education. The considerations presented within the framework are drawn from convergences in the examined case studies of this report. Inherent to the framework is the idea that achieving these securities at every level is central to long-term sustainable development and equitable growth in Africa.

# AFRICA : AN INVESTMENT FRAMEWORK FOR WATER TO PROMOTE GROWTH AND DEVELOPMENT

Table 12: A framework for policy and decision making on water investment in Africa.

A. HUMAN SECURITY	1. LOCAL APPROACHES	2. NATIONAL INVESTMENTS	3. REGIONAL INTEGRATION
	<p><b>JOBS AND INCOME</b></p> <ul style="list-style-type: none"> <li>Scaling up water supply and sanitation provision to rural areas is part of efforts at improving human security for women in particular and assisting the overall well-being of households.</li> <li>Establishing multiple use water supply schemes that service both domestic and small-scale livelihood needs increases household income earning potential and contributes to women's empowerment.</li> <li>Providing services to informal urban settlements reduces human insecurity amongst migrant communities, while increasing their health and productivity.</li> </ul> <p><b>ENERGY</b></p> <ul style="list-style-type: none"> <li>Extending electricity to households in rural areas increases access to education, improves health and supports the well-being of women and children in particular.</li> <li>Developing micro-hydropower schemes, where feasible, at a local level increases security of energy supplies and enables a greater provision of household needs.</li> <li>Introducing local programmes to protect watersheds and forest resources as part of soil and water conservation initiatives increases retention of water in shallow aquifers that supply poor households.</li> </ul> <p><b>FOOD</b></p> <ul style="list-style-type: none"> <li>Implementing supplementary irrigation schemes supports greater food security and helps to buffer against the impacts of climate variability in marginal environments.</li> <li>Supporting more sustainable livestock development through water schemes that store surface water in ponds and check dams is beneficial to pastoral communities.</li> </ul>	<p><b>JOBS AND INCOME</b></p> <ul style="list-style-type: none"> <li>Reducing concentrated pressure on resources (including water and energy) and potential vulnerability due to poor sanitation and wastewater treatment can be achieved through national policies on employment and service delivery that increase incentives to migrate to rural growth poles and not major urban centres.</li> <li>Planning and protecting national watersheds and managing sustained access to key natural capital assets improves livelihood-security in vulnerable environments.</li> <li>Using government and private sector investment supports agricultural commercialisation through increased market access via rural feeder roads, improved inputs and extension services, and stronger water saving and retaining practices.</li> </ul> <p><b>ENERGY</b></p> <ul style="list-style-type: none"> <li>Investing nationally in rural electrification and other forms of energy supply for cooking and heating helps to protect watersheds, and increases biomass in soils, improving the absorption and retention of moisture.</li> <li>Linking hydropower developments to a national grid system enhances the capacity of small-town growth hubs to generate diversified livelihood opportunities for migrants.</li> </ul> <p><b>FOOD</b></p> <ul style="list-style-type: none"> <li>Developing programmes that support water supplies for pastoral and agro-pastoral areas enhances the availability of livestock meat and dairy products for domestic consumption and export.</li> <li>Including help to establish supplementary irrigation, crop selection and low-cost fertiliser techniques in local programmes will support farmers in intensifying production.</li> </ul>	<p><b>JOBS AND INCOME</b></p> <ul style="list-style-type: none"> <li>Investing in regional growth poles encourages migration away from vulnerable environments and towards hubs where resources are concentrated on employment generation and service delivery.</li> <li>Coordinating investments across River Basin Organisations (RBOs) and Regional Economic Communities (RECs) help focus on export-oriented industries and the development of intra-regional trade.</li> <li>Coordinating regional policy on migration and labour markets prevents massive displacement of unemployed between countries and unsustainable levels of urbanisation.</li> </ul> <p><b>ENERGY</b></p> <ul style="list-style-type: none"> <li>Creating and reinforcing regional power interconnections enable the pooling of power to improve access to electricity in urban centres.</li> <li>Incorporating a focus on the environmental impacts of regional power and energy strategies reduces the potentially negative impacts of hydropower development and supports the management of medium and large-scale watersheds.</li> </ul> <p><b>FOOD</b></p> <ul style="list-style-type: none"> <li>Developing regional trade in foodstuffs supports customs unions and single regional market development.</li> <li>Focusing regional food securities can be achieved by increasing value from small-scale farmers, improving transport and storage of crops and increasing livelihood security of local households through diversifying their sources of income.</li> </ul>

## B. ECONOMIC SECURITY

### 1. LOCAL APPROACHES

#### JOBS AND INCOME

- Investing in multi-purpose water points at community level supports rural income diversification and the promotion of non-farm rural income.
- Investing in piped water supplies in urban and peri-urban areas supports the development of industry aimed at agro-processing.
- Investing in rural growth poles and service delivery centres helps to anchor populations in rural areas through increased employment availability.
- Providing a minimum basic allocation of water for all is essential for human well-being. This can support individual welfare as well as the overall productivity of households.

#### ENERGY

- Investing in energy to rural areas enables the trialling and adoption of different kinds of pumping technology to support supplementary irrigation.
- Implementing national programmes to replace the use of charcoal by kerosene can significantly reduce the loss of woody biomass, particularly surrounding urban areas.

#### FOOD

- Developing rural water supply schemes that are drought-proof contributes to livelihood security and prevents loss of income (and therefore access to food) during low-rainfall years.
- Linking multiple use water technologies to small-scale irrigation encourages horticulture for sale and own consumption, improving the health and nutrition of families.

### 2. NATIONAL INVESTMENTS

#### JOBS AND INCOME

- Supporting SME development in small urban centres can be achieved through the establishment of national initiatives that include the provision of piped water (including for dairies, small-scale production of drinks, other food products and soaps).
- Ensuring water supplies to support growth in the service industry, through the introduction of effective tariff structures helps to create incentives for water conservation and reduced production of wastewater.
- Developing secure water supplies for extractive industries should be linked with more rigorous controls on the management of wastewater from industrial processes.

#### ENERGY

- Creating national tariff systems helps support energy provision to poorer households, including the provision of energy for small-scale rural processing industry (milling, refining of oils, etc.).
- Implementing national energy plans helps balance hydropower development with other alternative energy sources including wind power, solar power and thermal generation.

#### FOOD

- Linking national food security strategies to the development of export trade is key, while balancing the export of “virtual water” through the production of food crops and cash crops.
- Increasing focus on the refinement of agricultural commodities to add value to farmer produce will increase returns to farming, encouraging greater commercialisation.
- Integrating water for cultivation with rain fed farming and pastoralism can be achieved through national agricultural water management strategies.

### 3. REGIONAL INTEGRATION

#### JOBS AND INCOME

- According REC employment, training and migration policies and RBO employment opportunities and programmes for skills acquisition encourage coordinated movement of the population in support of particular areas of industry.
- Developing growth poles and corridors encourage urban development in areas where services can be better provided, allowing wastewater and other environmental issues to be more adequately managed.
- Encouraging regional trade integration supports the expansion of employment in new industry, including agro-processing, light manufacturing and services.
- Protecting particular livelihood systems and industries – especially fisheries – is necessary when key shared resources are threatened by pollution from large cities.

#### ENERGY

- Working with RECs and RBOs together can help develop regional water-sensitive energy strategies that seek greater pooling of energy resources through the interconnection, joint financing and production of energy programmes and through hydropower strategic development that is attuned to future water availability, supply augmentation and other river management processes (including flood control and ecosystem protection).
- Taking a regional approach to reducing the use and production of woody biomass fuels (particularly charcoal) can help restore watersheds, reduce runoff and increase soil moisture storage.

#### FOOD

- Focusing regional food policies help improve food security and increase trade in food stuffs between countries - including dairy and meat livestock products.
- Agreeing on how to balance trade in virtual water within regions and between regions or other trading blocs, including regulating the impact of land sale and lease to external investors, will impact upon future water resource availability.



## 1. LOCAL APPROACHES

### JOBS AND INCOME

- Developing programmes that employ labour to improve access to water supplies offers a doubly positive impact, including activities such as tree-planting to protect watersheds, bunding to help capture soil moisture and using alternatives to biomass fuels to improve soil profiles.
- Establishing small dams in areas of high rainfall variability increases access to water for livestock in dry seasons and in poor rainfall years.
- Encouraging “self-supply” projects with government support enables household level improvements to water access (including shallow wells, spring protection and small-scale irrigation using collector wells and other technologies).

### ENERGY

- Encouraging investment in small-scale hydropower development can supply households and communities through better water conservation programmes in micro catchments and can improve stream flow.
- Increasing water access for gardens, livestock and regulating stream flow for micro-hydropower generation can be achieved through a combination of small-scale dam development and watershed protection and afforestation.

### FOOD

- Pre-positioning of “drought proofing” measures (including boreholes in semi-arid areas without head works and the tanking of water to prevent massive human and livestock displacement) help support food security programmes linked to increasing livelihood security.
- Applying farmer extension services supports the development and use of more drought-tolerant varieties and the creation of water use efficiency technologies.

## 2. NATIONAL INVESTMENTS

### JOBS AND INCOME

- Encouraging farmers to produce higher-value crops for processing and export while helping to conserve water stocks in areas of scarcity can be achieved through national economic strategies focusing on the establishment of new industrial development areas.
- Training of workers in new industries and the creation of effective rural feeder road networks that reduce transport costs to farmers when accessing markets while also improving information flows enable farmers to make better advance decisions on sowing, harvesting and the development of farms.
- Enhancing crop per drop and reducing wastage during harvest and in storage, thereby reduces (relative) demand on water resources over time.
- Specifically focusing on women's training in agricultural development improves productivity, as a majority of African farmers are women.

### ENERGY

- Developing water storage and hydroelectric power as part of multi-purpose schemes in social and natural environments can both benefit from and support this new infrastructure.
- Supporting a reduction in woody biomass removal (including charcoal production) through energy pricing at national levels can enhance watershed regeneration; with particular attention paid to energy demand of growing urban areas on rural hinterlands.

### FOOD

- Linking national food security programmes to balancing food imports and national grain reserves are important, while encouraging the home production of higher-value cash crops.
- Using national irrigation programmes can encourage the development of small and medium-sized irrigation areas that are supported by road, communications and other social infrastructure to improve their economic return.

## 3. REGIONAL INTEGRATION

### JOBS AND INCOME

- Encouraging greater cooperation between RECs and RBOs can be viewed as part of a wider benefit-sharing framework (involving employment, etc.)
- Developing growth corridors and nodes that are supported by investments in roads, communications and transport/navigation encourages targeted migration.
- Investing increased returns and productivity—including from greater regional trade—in water conservation, protection and demand management should be carried out across basin countries (or sub-basin groups).
- Increasing policy coherence and alignment improves the quality, quantity and distribution of water resources within and between countries, thereby enhancing the overall stock of the resource for future generations.

### ENERGY

- Linking together national hydropower strategies under regional strategies that are based on locating and managing dams to maximise power output and capture of the kinetic energy of the resource should be done while taking into account social and environmental impacts.
- According regional pricing strategies as part of regional power-pooling encourages a region-wide approach to protecting woody biomass energy resources, particularly the protection of upland catchments to reduce siltation that can lead to flooding.

### FOOD

- Linking regional food security strategies helps develop:
  - a) improved rain-fed cropping and regional development of agricultural specialisation in rain fed arable areas;
  - b) irrigation strategies for the most suitable and productive environments and crops, related to growth node development and emerging processing industries;
  - c) strategic food security reserves combined with agreed regional policies on the sale or leasing of land to external investors to reduce adverse impacts on water availability.
- Using regional approaches helps support wide practices for increasing soil moisture retention with a focus on mulching, reducing run-off and terracing.



## 7. CONCLUSIONS

# MAKING THE CASE FOR INVESTMENT IN WATER IN AFRICA

This report argues that no single investment framework is appropriate for all levels and in all contexts. Hence, the most useful kind of framework is not one that treats water as an isolated issue, but rather one that helps to connect the key contributions water makes to growth and development with the wider range of social, economic and resource management issues that impact different countries and regions. This framework provides a basis on which to build future investment plans, decision making and financing modalities.

In looking at three of Africa's river basins—the Nile, Niger and Zambezi—with further analysis of the countries within these basins, which together encompass half of all African countries, one of the common key defining elements is the question of how to balance population growth, migration and employment opportunities on the one hand with the nature of regional processes on the other. There is a huge conveyor-belt of change taking place across Africa that is relentlessly drawing people to urban centres in search of work and other opportunities. Future investments will need to accomplish two quite complex things: improve the lives and health of urban populations, while also ensuring that there is support in rural areas to create greater income-earning and other development opportunities. This includes investing in urban services and infrastructures as

well as rural employment and agricultural development. It also means ensuring energy supplies for cities and providing key energy resources for rural areas as well as protecting key resources from degradation in areas of population concentration.

However, within a strong development narrative, a framework that helps to marry together the contributions water can make to growth and development will help to capture the greater attention of policy makers and investors. Despite this complex mosaic of shared river basins, economies and social systems in Africa, a pathway for catalysing positive change for the African continent must be forged, based on water as the key to further sustainable development. We, therefore, have presented two simplified tools for aiding in the complex task of determining the most impactful investment actions: a decision making “route map” for water investment in Africa and a decisional framework that focuses on human, economic and water securities in relation to local, national and regional contexts.

From the analysis undertaken to produce this framework, certain key notions and messages begin to emerge, all of which need to be taken into account when using the framework. These are identified on the following two pages.

- **Population Growth:** Most African countries will continue to face rapid population growth. This is occurring faster than in any other region in the world. This growth demands a significant and sustained investment in public infrastructure and services.
- **Women:** It is also clear that investing in women's employment and education will make significant inroads in reducing the crude birth rate and will pay dividends in terms of agricultural productivity and the security of rural livelihoods.
- **Urbanisation:** Many African countries will continue to face very high rates of urbanisation, with both in-situ growth and significant rural-urban migration being the main drivers. Whilst people may not remain in urban areas, they are likely to return frequently (circulatory or temporary migration is a feature in some regions, for instance southern Africa). Special emphasis is therefore needed on providing water and sanitation services in small and medium towns to facilitate their transformation into vibrant urban centres; with particular attention to be paid to informal urban settlements. This will also enable the greater diversification of rural non-farming livelihoods.
- **Employment:** Many African countries face high rates of unemployment. Water investments need to contribute to job creation in the context of wider national and regional development strategies. Whilst many African countries need to protect and create jobs related to the agricultural sector, there is also a need to shift their economies from dependence upon a few commodity exports to more diversified (and urbanised) economies. Supporting greater regional integration and trade with countries outside Africa will help to promote this economic diversification.
- **Water Infrastructure:** Significant and stable economic growth is vital for African countries to develop. Buffering against variability in water supply and water shortages is therefore necessary to ensure stable economic growth. This entails the provision of a minimum infrastructure platform, including the protection and enhancement of existing natural green infrastructure that provides vital ecosystem services.
- **Mining:** Economic growth in some countries will continue to be based on the capital-intensive exploitation of mineral resources. This often requires significant inputs of water and energy, sometimes competing with other uses and with potentially significant impacts on natural resources and communities. The costs and benefits of water allocations for different uses must therefore be properly understood to minimise consequences which could seriously aggravate poverty and further undermine environmental health.
- **National Investment:** Investing state revenues in infrastructure, soft measures and appropriate water management is central to accessing markets and encouraging sustainable economic growth. Windfall revenues from trade in mineral resources are relatively short-lived (usually spanning decades) and, therefore, need to be wisely invested to create the right stimulus for economies to further develop and diversify. This requires the engagement of a wider range of stakeholders including civil society and the private sector.
- **International Cooperation:** Increasing regional cooperation and removing trade barriers, not just regionally, but with international trading blocs such as the EU, is vital to stimulating economic growth. The small size of most domestic African markets and low per capita incomes requires the creation and enhancement of regional cooperation to strengthen market position, attract sizeable and targeted investment, and enable regional/international trading leverage. A sharp increase in regional economic cooperation at governmental level is required, but critically, so is the linking of these processes to stronger cooperative management of shared water resources. Within shared river basins and regional economic communities, the establishment of shared funds based on these windfalls could enable the stronger provision of regional public goods in the long-term.
- **Natural Resource Protection:** Natural resources are essential for future socio-economic development in African countries. Ensuring that farms, fisheries, forests and rangelands remain productive, healthy and sustainable requires the conservation of natural assets. Investments



are therefore needed to counter the degradation of soils, the collapse of fisheries, the drainage of wetlands, the overharvesting of wood for fuel and construction, and the pollution of rivers and lakes. All of these are critically linked to the effective management of water resources at a basin scale. Healthy and well-managed rivers, lakes, aquifers and soils are vital if poverty is to be alleviated and economies are to grow in the long-term.

- **Climate Change:** Buffering against climate change and increased weather variability is critical to shielding socio-economic development and economic growth from severe shocks. Projected changes in climatic conditions will see an increase in the unpredictability of Africa's already highly variable climate and will bring more frequent extreme weather events.

Water resources are particularly affected and adaptation measures need to be established that can protect the most vulnerable and ensure that floods and droughts do not damage Africa's future growth potential.

- **Health:** This is a cross-cutting issue. For example, by providing better access to safe drinking water and sanitation will help to improve the health of Africans across the continent, in combination with school education programmes and public campaigns. Having healthier communities will lead to reduced absenteeism from work and will help to increase productivity and therefore support the development of stronger economies. This has implications for human, economic and water security.



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Reuters

*flood waters in Umdowanban, Sudan.*

*Merowe Dam in northern Sudan.*

The authors of this report recommend that its findings and proposed framework be used as a basis for further dialogue and discussion amongst all key stakeholders, in Africa and abroad, striving for sound investment strategies that will lead to sustainable development, to ensure that this century sees Africa's transformation and development through the establishment of the most appropriate investment patterns at the most appropriate level. These discussions will culminate at the 6<sup>th</sup> World Water Forum to be held in Marseille in March 2012 and continue at other international events in the following months and years.

At the heart of structuring this investment framework is the establishment of an effective means to govern the resource properly at different levels and in the context of major social, economic and environmental changes. This report aims to help policy makers get these actions right in order to ensure water's role at the heart of future growth and development in Africa is fully recognised.

# LIST OF ACRONYMS

AFD	Agence Française de Développement (French Development Agency)
AfDB	Africa Development Bank
AWF	African Water Facility
AGOA	African Growth and Opportunity Act
AMCOW	African Ministers' Council on Water
BCM	Billion Cubic Metres
CAADP	Comprehensive Africa Agriculture Development Programme
CAP	Common Agricultural Policy
CAR	Central African Republic
CFA	Cooperative Framework Agreement
CPCS-GIRE	ECOWAS Permanent Forum for the Coordination and Monitoring of the Integrated Management of Water Resources in West Africa
DANIDA	Danish International Development Agency
DFID	Department For International Development (U K)
DRC	Democratic Republic of Congo
EAC	East African Community
ECOWAS	Economic Community Of West African States
EIB	European Investment Bank
EU	European Union
FAO	Food and Agriculture Organisation of the United Nations
GDP	Gross Domestic Product
GEF	Global Environment Facility
GMR	Great Man-made River (water supply project, Libya)
GWh	Gigawatt hour
ha	Hectare
HDI	Human Development Index
IIED	International Institute for Environmental Development
IMF	International Monetary Fund
IPCC	Inter-governmental Panel on Climate Change
IRIN	Integrated Regional Information Networks
IUCN	International Union for Conservation of Nature
IWMI	International Water Management Institute
IWRDM	Integrated Water Resources Development and Management
km	Kilometre
LVBC	Lake Victoria Basin Commission
LWATSAN	Lake Victoria Region Water and Sanitation Initiative
M	million
MDG	Millennium Development Goal
MW	Megawatt
n/a	Not available

NAPA	National Adaptation Programme of Action
NASA	National Aeronautics and Space Administration
NBA	Niger Basin Authority
NBI	Nile Basin Initiative
NDP	National Development Plan
NDVI	Normalised Difference Vegetation Index
NEPAD	New Partnership for Africa's Development
ODI	Overseas Development Institute (UK)
OECD	Organisation for Economic Cooperation and Development
PEAP	Poverty Eradication Action Plan
PJTC	Permanent Joint Technical Commission for Nile Waters
PMA	Programme for the Modernisation of Agriculture
RASP	Regional Assistance Strategy Paper
RISDP	Regional Indicative Strategic Development Plan
RBO	River Basin Organisations
REC	Regional Economic Communities
SADC	Southern African Development Community
SARDC	Southern Africa Research and Documentation Centre
SIDA	Swedish International Development Cooperation Agency
SIWI	Stockholm International Water Institute
SME	Small and Medium Enterprise
SSA	Sub-Saharan Africa
SWAC	Sahel and West Africa Club
UN	United Nations
UN HABITAT	United Nations Human Settlements Programme
UNCTAD	United Nations Conference on Trade and Development
UNDESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Programme
UNECA	United Nations Economic Commission for Africa
UNEP	United Nations Development Programme
UNFPA	United Nations Population Fund
US-EIA	United States Energy Information Administration
USA	United States of America
USD	United States dollars
WEF	World Economic Forum
WRC	South African Water Research Commission
WWC	World Water Council
ZAMCOM	Zambezi Watercourse Commission
ZINWA	Zimbabwe National Water Authority

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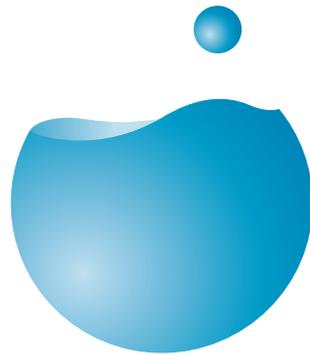
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WORLD WATER COUNCIL - CONSEIL MONDIAL DE L'EAU - CONSEJO MUNDIAL DEL AGUA

Espace Gaymard - 2-4 Place d'Arvieux - 13002 Marseille - France

Tel : +33 (0)4 91 99 41 00 - Fax : +33 (0)4 91 99 41 01

[wwc@worldwatercouncil.org](mailto:wwc@worldwatercouncil.org)

[www.worldwatercouncil.org](http://www.worldwatercouncil.org)