Africa's Watershed Moment

Building water resilience for the Continent's sustained and inclusive development

Working Document - Technical Report

PEGASYS INSTITUTE

Contents

About this technical report

This is a WWF and AB InBev commissioned report written by the Pegasys Institute.

Africa: a Water-Dependent Continent

Africa's growth is dependent upon water

Africa is richly endowed with relatively untapped natural resources. The remarkable growth in many African countries over the past decade was largely underpinned by the development of agricultural and mineral resources, largely for export to other parts of the world. It seems that this will be the basis for continued growth, at least in the medium term until African economies begin to diversify and beneficiate these resources for consumption and trade.

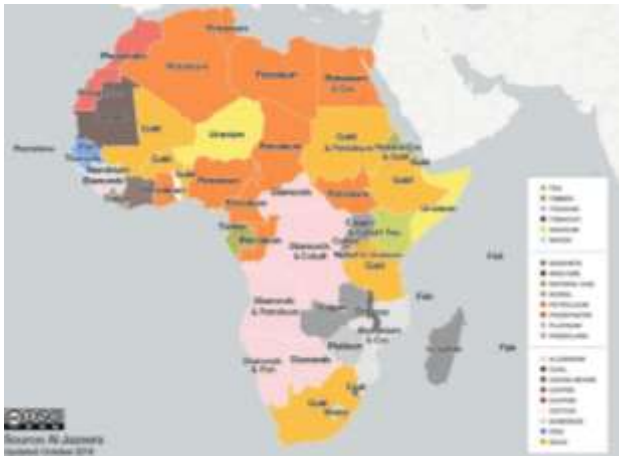


Figure 2 Africa's natural resources. Source: (Al Jazeera, 2016)

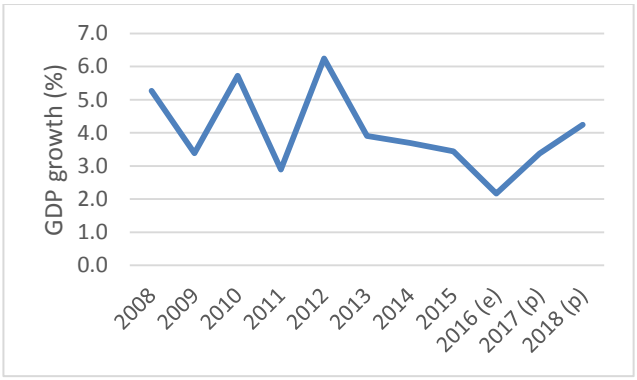


Figure 1 Growth in Africa (e: estimated and p: prediction)[1]

Both improved productivity and the growth of primary agrarian economies are highly dependent on water for irrigation. Moreover, 60 % of jobs in Africa and 17% of GDP are related to agriculture, and it is the greatest source of rural employment and livelihoods for the Continent's 600 million rural inhabitants (SSA). While in Africa about 85% of the water is used in agriculture (Institute Water for Africa), above 90% of agriculture is still rain-fed (95% of sub-Saharan) (IWMI, n.d.) and is thus vulnerable to seasonal and inter-year rainfall variations. Dependence on agriculture is even more pronounced in the least developed and most fragile states; three quarters of the world's poorest nations are located in Sub-Saharan Africa, while 14 African states are considered as fragile (Fund for Peace, 2017).

Figure 3 Map of Africa with current croplands (green), croplands with poor soil (yellow) and uncultivated land with fertile soil (black) Source: (National Geographic, n.d.)

[1] Pegasys, based on data by from (African Economic Outlook, n.d.)

Extractive mineral economies are also dependent upon water, although more indirectly through energy requirements and the disposal of mine waste water. About half of Africa's energy is coal based, followed by hydropower and the combustion of imported fuels (Castellano, Kendall, Nikomarov, & Swemmer, 2015), all of which require reliable supply of water for their turbines or cooling. Hydropower is by far the first source of renewable energy on the continent and accounts for one-fifth of today's power supply in Sub-Saharan Africa (using less than 10% of the estimated technical potential). With economic diversification, manufacturing industry is similarly dependent upon water supply, energy and waste disposal, as well as reliable supply of raw agricultural and mineral inputs.

It is important to consider that growth rates of 7% imply a doubling of GDP every decade. Where these are related to the primary agricultural and secondary manufacturing economies, the quantity and reliability of water required to sustain this growth will increase exponentially until this growth is diversified and therefore decoupled from direct water dependency.

Figure 4 Water Resources in Africa per capita

A billion more people in African

It is also expected that the Africa population will double by 2050. With expected urbanisation rates, 80% of this additional 1 billion people will reside in cities, with more urban dwellers than rural inhabitants by 2040. The manufacturing and services economies of these cities will need to grow rapidly to accommodate the aspirations of these people, while the supply of water, energy and food must increase accordingly. The experience in other parts of the world indicate that the water demand associated with a trebling of the urban population will be significant (see Chapter 5 on cities).

Figure 5 Urban and Rural Population (in 1000s) in Sub-Saharan Africa, 1950-2050 forecast

The economic opportunity for Africa provided by an increasingly youthful population will only be leveraged if workers are healthy and educated. Water access to households has been demonstrated to be a critical enabling factor for the health and education of children and their long-term productive contribution to society, particularly for girls. Providing reliable services to cities can be more efficient than sparse rural settlements, but this requires coherent investment and urban planning. The converse is that sprawling slums without services contribute to the continued impoverishment of their inhabitants and the broader economy.

A continent with hydrological challenges

Africa has 9.3% of the planet's freshwater, or about 4 000 km^3, to support 15% of the world's population and 2,9% of the world's GDP (International Monetary Fund, Retrieved 6 March 2017). While the average volume of water available per capita is lower than average, it is very unevenly distributed in space and time, which makes the Continent's hydrology amongst the most challenging on the planet. This unevenness is expected to become more extreme with climate change, with arid regions becoming dryer and wet regions suffering more intense floods. A further challenge is that 93% of the Continent's freshwater is

located within transboundary rivers or aquifers, so neighbouring countries have influence over each other's water-related development.

Harnessing this variable hydrology to enable social and economic development requires more significant investment in water-related information, institutions and infrastructure, than regions with a more benign hydrology. In addition, functioning catchment and aquatic ecosystems are more critical in buffering the most severe impacts of extreme climatic events. Unfortunately, while most other parts of the world have developed their water management capacity, there has been chronic underinvestment in water management across the continent over the past century. An indicator of this is that Africa's water storage capacity is only 200 cubic meters per capita (The World Bank, n.d.).

A recent report compiled for the OECD makes the strong argument that water endowment and investment catalyses economic growth, which in turn enables further investment in water for productive purposes. However, growth also increases the economic value at risk from water related hazards, such as floods, droughts and disease (Sadoff, 2015). Inadequate investment in water management not only constrains development, but also increases the vulnerability of any growth. Africa's extreme hydrology therefore poses massive risk to the Continent's and individual countries' development agenda. For example, severe droughts in Malawi, such as the 1991-2 drought, are estimated to cause a contraction of the country's GDP by 10%, and regular droughts one of 0.5%. Turning to floods, an example is that of Mozambique, where floods and other weather hazards trigger annual loses of about 1.1% of the country's GDP. In 2000 alone, Mozambique's GDP fell from a forecasted 7% to 1.5% (The World Bank, 2014).

Not all water development is inclusive

It is clear that economic development requires investment in economic infrastructure to ensure the predictable and stable supply of water, energy and food for a country, as well as reliable transport and communications networks. Investment is water management and infrastructure it a key aspect of a country's economic infrastructure, and provides protection for these other sector's infrastructure to extreme floods.

However, unlike other most other resources, water is not only an economic good (or non-substitutable input to economic production), but is also necessary for human life, rural livelihoods and the sustenance of aquatic ecosystems that provide goods and services to local communities. This means that development and management of water resources to catalyse economic development can degrade downstream resources that thereby impoverishes the people that depend upon it. Similarly, formalisation of water management systems and land rights, can perversely marginalise the people that have been using these resources for years.

Inclusive water-related development requires conscious attention to the winners and losers of any intervention, particularly for rural communities whose livelihoods are typically closely dependent on water resources.

The opportunity for resilience

Africa's uneven and variable hydrology will be exacerbated by climate change, or conversely the hazards associated with climate change will be manifest primarily through water. Water-dependent economic development will be doubly jeopardised, as development pressures begin to stress currently under-utilised resources and the variability of these resources becomes more uncertain. The water management challenge is only going to get more difficult, in an already complex environment. Building water-resilient

economies and communities will be critical to sustaining development gains and ensuring markets and consumers that are able to drive and thrive with this economic growth, even under a changing climate.

Resilience has two important dimensions, namely (a) the ability to *absorb or withstand climate-hydrological or developmental shocks and stresses and maintain function in the face of these*, and (b) the ability to *adapt, reorganize and evolve into new sustainable states that are more adapted to hydrological and development conditions and are better prepared for further changes*. In the water resources context, the former depends upon appropriate water management and development, which requires the availability of relevant financial and human resources. The latter requires that options to transform the system have not been foreclosed through poor planning, as well as the resources required to transform the system or development pathway. This applies at a household, community, city, national or even Continental scale.

It is also important to recognize that the requirements to build water resilience evolve during a country's development trajectory. Both the climate-water pressures and the necessary focus for building resilience in fragile states, will be quite different to those for a growing primary (agricultural or extractive) resource-based economy. Similarly, these will change significantly as the country transitions to a diversifying emerging industrial economy.

Who commissioned this, why and for whom

Both AB InBev and WWF have a keen interest in building water-related resilience in Africa, for business, people and nature. This common interest led these global organisations into this collaboration, to understand and advocate for the importance of investment in the water sector to catalyse economic and social development and mitigate the impacts of climate change and water hazards.

The aim of this paper is to argue for relevant government and business interventions for water management at different stages of a country's development, in order to create water-resilience of economic production and peoples' livelihoods, supported by the protection of valuable ecosystems. It is targeted politicians, senior bureaucrats and business leaders that influence investment decisions across the African Continent, particularly those who are not directly within the water sector. The paper is written as a call to action to ensure that the Continent's economic trajectory overcomes its hostile hydrology and climate hazards, so that economic planning and financial allocations are made considering the relevance of water to development. The report is built on the acknowledgement that well-managed water is a key resource to achieve a large array of sustainable development goals.

The paper is built on a longer technical report that investigated over 30 water-related case studies involving some aspect of water in the economy. These cases were largely focuses on priority countries for AB InBev and WWF in Southern, East and West Africa, and therefore the paper has a strongly Sub-Saharan Africa focus. It is arranged around four key themes that emerged through the cases and are highly topical for the water sector, namely: economic growth and trade; food and agriculture; migration and fragility; and cities and diversification.

Sustained Growth Requires Water Investment

Water is required in some way for all economic production and consumption, whether it is used in business operations and their supply chains, or to ensure healthy and educated workers and customers. In order to support current economic growth rates, it is expected that the current water use in Africa will increase greatly by 2030. Achieving the Sustainable Development Goals (SDGs) in Africa will require careful balancing of the needs of economic growth and industrialisation, shifting demographics and maintaining functioning rivers, wetlands, lakes and aquifers to sustain reliable and clean water supply to the developing Continent.

Water is embedded in every product

The concept of water footprint, or the quantity of water required to produce a commodity, has gained vogue in the past decade. It is a useful measure of the water requirement along the entire supply chain and can be applied to understand the use of embedded water by businesses, cities or countries, as well as the economic productivity of water and the value of water traded between countries. An important observation from water footprint studies is that most water used in the production of agricultural and mineral commodities is related to water and energy used for their cultivation or extraction, rather than the operations of food & beverage or mineral & metal processing plants.

Where water is abundant, the efficiency of water use in production is of less relevance. However, for countries or regions with lower water endowments that are becoming increasingly stressed, such as Southern and East Africa, comparative advantage and economic productivity of water used in production should be considered in economic and trade policy. Increasing economic productivity of water in the context of the land and labour requirements, should be the focus of policy-makers, rather than simplistically arguing for shifting production patterns. This is an area for greater management effort and investment by government and business and requires attention alignment between sectors and businesses.

A resource rich but climate challenged Continent requires investment in water to grow

It has been estimated that $93 billion investment per annum is required to close the current water, energy, transport and ICT infrastructure backlog in Africa (Wold Bank , 2008), and that between 50 and 100 billion per year would be required to build resilience to climate change by 2050.[2] A country without infrastructure cannot access, process or trade its natural resources, and for many landlocked African countries, this requires regional or transboundary infrastructure. On the other hand, a country that is not prepared for management, response and recovery to water disasters will be doomed to perpetual backsliding through loss of live and infrastructure.

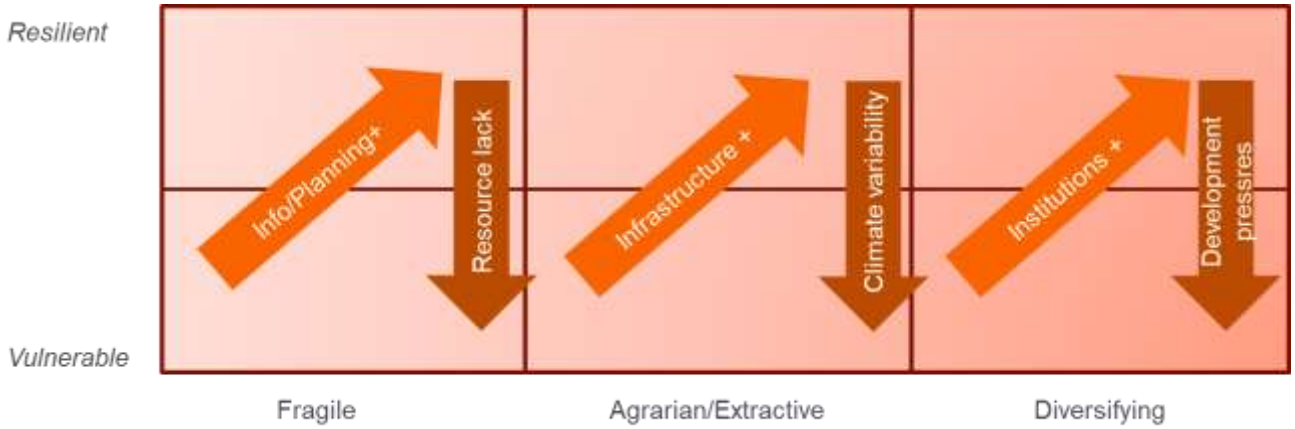
Investment in water management and infrastructure needs to be viewed at an economy-wide scale, rather than only on a project-by-project basis, because the economic multipliers of investment in good water management and development have been shown to be significant (see the Uganda case). The challenge of traditional evaluation of investments in water management is that the ongoing future benefits are discounted against the current costs. However, without the initial investment the opportunities to catalyse development and manage water risks are likely to be lost, with the consequent negative impacts on business confidence and economic production.

[2] 50 billion/year is an adaptation costs estimate for a scenario with global warming at less than 2˚C extra by 2100 compared to today, while 100 billion/year is an estimate under a scenario with global warming reaching more than an additional 4 ˚C by 2100. (Michiel Schaeffer and al.)

Africa's water resources are currently under-developed and are not terribly stressed. However, this situation is likely to change in the next decade as water demands increase and water availability alters with climate change. Unfortunately, lack of water stress can lead to complacency, even though it has been demonstrated across the world that early engagement of water issues, including transboundary cooperation, provides greater long-term benefits. The importance of proactive investment in appropriate policies, strong institutions, adequate information, robust infrastructure and sustainable ecosystems cannot be over-emphasised, both to catalyse development and manage water hazards.

Building economic water resilience must reflect a country's degree of fragility or diversification

Africa is home to (i) some of the most fragile states on the planet with limited capacity for investment and dramatic vulnerable to hydrological variability, through (ii) largely agrarian and/or extractive economies that are highly dependent upon water resources for economic development, to (iii) diversifying emerging economies undergoing rapid urbanisation that are beginning to decouple from direct water dependence for their development. Countries at each of these stages of development have distinct challenges, as well as specific opportunities to catalyse growth, limit hazards and achieve their SDGs. Building water resilience for economic growth as well as their people should therefore consider the countries stage in development, as well as the specific water endowment and nature of water hazards facing the country.



It is critical to note that shifting towards a resilient and diversified economy (represented by the top left) is not a linear or straight-forward process, because (a) vulnerabilities inherently increase with development as a country's "value-at-risk" from flood and drought increases and demand approaches the available supply, and (b) the impacts of development through primary or secondary manufacturing production introduce new or additional stressors such as deteriorating water quality and over-abstraction of available water resources. Furthermore, climate change is already contributing and is expected to result in more extreme events and increasing climate variability, which itself increases vulnerability. Therefore, even with a general trend to increasing development, there is pressure on resilience that if not managed effectively may result in economic constraints or back-sliding of the entire economy and vulnerability of the poorest people.

Business opportunities and risks also change with a country's development trajectory

Every business leader understands that stability and predictability is critical to maintaining the investment climate, developing markets and ensuring the company's long-term economic value. Investment in water management and development to ensure reliable water supply is a key aspect of maintaining this stability under uncertain climate, as well as ensuring healthy workers and consumers. The challenge is that across Africa there has been massive under-investment in water, which will increasingly lead to physical, regulatory and reputational risks. Where capacity is low or investment is inadequate, it is in their direct

interest for businesses to advocate for or even catalyse this investment and partner with government and civil society groups to improve water management.

At the most extreme, extractive or agricultural businesses find themselves developing infrastructure and becoming *de facto* municipal service providers to local communities in fragile states. There are huge opportunities to improve the resilience of this infrastructure and these services in collaboration with international development organisations, using new sources of global finance. In other developing countries, this role changes to one of advocacy and partnership to strengthen institutions and assist in financing infrastructure that serves both business and local communities.

Water Investment in Uganda

Uganda is endowed with substantial natural resources, including fertile soils, regular rainfall, forests, minerals and oil. Water is a key driver for agriculture sector, the most important sector of the economy and an employer of a third of the country's workforce. Water is also central to other economic activities, such as fishing and tourism, and hydropower provides 60% of the country's electricity. Uganda faces continuing challenges to natural resources management, in light of climate change, demographic shifts and economic growth. It has been estimated that to meet the growth target outlined in the Uganda development strategy, the country will need to treble its reliable water supply. Significant water investment and good water management will be critical to ensure the growth of Uganda's manufacturing, agricultural, and service sectors.

According to a recent governmental study, while water and environmental goods and services (EG&S) in Uganda have high economic value, the costs associated with EG&S degradation are very high [This study was mandated by the Ministry of Water and Environment (MWE) of Uganda and performed by Industrial Economics]. By studying the interactions among raw resources (arable land, water and wetlands) in natural systems, water management interventions and the economic growth, this study found that "without proper investment in environmental and water management, projected GDP and employment in Uganda could suffer significantly (Strzepek, Boehlert, Willwerth, & Neumann, 2016)."

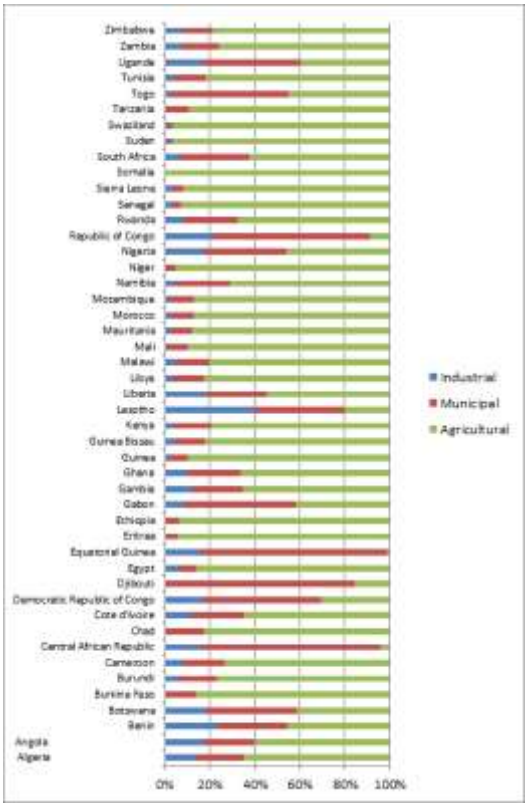
Using economic models, it was estimated that Ministry of Water and Environment's (MWE) "proposed investments in water and environment goods and services yield significant economy wide impacts – by 2040, the beneficial effects of these investments result in a 3.5% to 3.9% difference between a business as usual (BAU) and High Investment scenarios, equivalent to $120 per capita." In other words, investments in water management interventions would facilitate a more efficient system, with benefits greatly exceeding initial costs. According to their estimate, "for both the moderate and high investment scenarios, the GDP returns alone are roughly 8 to 9 times the investment cost in undiscounted terms, and at least 3 to 4.5 times investment costs when benefits and costs are discounted at 10%. The results clearly show that the investments provide direct GDP benefits well in excess of their costs."

In the end, according to the study, "GDP gains from MWE interventions are more than eight times investment costs for the incremental change from a business as usual to a full MWE investment scenario. Further, this GDP growth benefits households substantially as incomes and consumption increase over time, which leads to alleviation of poverty." (Strzepek, Boehlert, Willwerth, & Neumann, 2016). Expected GDP benefits from better water management are multiple. These benefits include: "the direct facilitation of economic activity through such actions as water provision and timber replanting, as well as indirect effects on capital protection through reduced flooding and on fishing through water filtration services of wetlands protection." Moreover, a large proportion of benefits would be "realized through enhanced health (and reduction in the need for government support of health care costs for waterborne or airborne exposures to pollutants), and for the 'gathering time' savings that water and non-timber fuelwood provision provides for adults to participate more fully in the growing labour market, and children to enhance labour market skills through education."

Source: Strzepek, Kenneth; Boehlert, Brent; Willwerth, Jacqueline; Neumann, James, The Contribution of Water Resource Development and Environmental Management to Uganda's Economy, 2016, Industrial Economics, Cambridge, MA, USA

Feeding a Billion More People Requires Water Resilience

Over the next 35 years, the Sub-Sahara African population is expected to increase by over a billion people. These 2 billion people will need access to water for food, energy and water security, as well as hygiene. Moreover, water is likely to be a crucial component for many rural dwellers to sustain their livelihoods. Considering that household water consumption typically ranges from 25 to 100 litres per capital per day and that industrial production generally requires about 100 to 200 litres, but that meeting a person's daily diet requires between 2000 and 3000 litres, it is clear that this increasing population will have the greatest impact on water through agricultural use (Jackson, 2009). Agriculture is the largest user of water in Sub-Saharan Africa (87% of total water use) (Food and Agriculture Organization (FAO), 2008), and improved water management will be required to support the development of this sector in stimulating agrarian and rural economies, as well as feeding the rapidly increasing African population.



Africa's role in global food production and feeding the continent

Africa boasts 60% of the world's arable land and has an increasingly youthful population to develop this potential. The Continent should therefore be expected to play a significant role in meeting the food requirements and changing consumption habits of the world.

However, food insecurity is a challenge in many parts of Sub-Saharan Africa, with 50% of people living in extreme poverty and 25% of the population being malnourished. Under the current trajectory, food insecurity is likely to increase with population growth. Since the mid-60s, agricultural production in Africa has increased by a significantly lower rate than population growth. This compounded by increasing urban incomes is expected to treble cereal demands in Sub-Saharan Africa by 2050, which far outstrips the current rates of increase of cereal cultivation and productivity. Imports of cereals are likely to increase from a current 20% to at least 50% during this period, so far from feeding the world, Africa would need to be fed by the rest of the world. As an example, cereal yields would have to increase from the current 20% of their potential to 80% just to maintain today's level of self-sufficiency. Hence, Africa must increase investment in agriculture and improve productivity, in order to just grow sufficient cereals to feed its future population (Reuters, 2017).

Commercialisation of agriculture, trade and comparative advantage

To meet this global challenge, Africa needs to increase the production of crops, improve nutrition and raise rural incomes, all while working within constraints of land and water. To achieve sustainable intensification, African states will require knowledge and technology, supported by sustainable investment. Agriculture represents approximately 20% of Africa's GDP, 20% of its export goods and 90% of rural incomes. It also provides jobs to about 60% of Africa's workforce, most of whom are smallholders and pastoralists. Despite rapid urbanisation, the Sub-Saharan African rural population is still expected to increase over the next few decades, and thus any commercialisation of agriculture will require a combination of commercial farms supported by outgrower schemes; displacement of rural people for commercial farming entrenches poverty.

Almost 20% of total harvested land is dedicated to cash crops, a number that has remained constant since 1990. Cultivating cash crops rather than food crops can be part of a specialisation and commercialisation strategy to exploit comparative advantages. The underlying premise is that households can increase their income by selling the goods on the international market which provides the highest returns on land and labour, in order to fund household consumption and investment in increased productivity. Similarly countries increase GDP and earn valuable foreign exchange. In addition, farmers that produce cash crops in Africa are generally offered better training and financing opportunities, to make investments in irrigation and improved productivity. In numerous places in Africa, the ability of farmers to overcome credit market failures is limited, and agricultural credit is only available through cash crop schemes. The converse is that local farmers are exposed to volatility in world commodity prices and that there is an opportunity cost for building food self-sufficiency.

Cash cropping by commercial farms or outgrowers can also have a positive indirect effect on local food cropping productivity and food security. Acquired technological know-how can be transferred to food croppers, and investments in cash cropping commercialisation schemes can spill over to a whole region, including the requirement for improved transport, communications, energy and water infrastructure to ensure reliable delivery of products to global markets. To ensure successful commercialisation, investors must have confidence that the infrastructure throughout the supply chain is robust to external shocks and stresses, such as extreme climatic events, which requires investment in disaster preparedness and management. In this sense, the interests of food and beverage business therefore aligns with those of local communities, creating the opportunity for partnerships between business, government and civil society.

Productivity increases through irrigation

Improved water management and investment is necessary to ensure food security and increased agricultural productivity for a growing African population. Irrigated cropland in Africa is only at 20% of its full irrigation potential and only 3.5% of total cropland is irrigated (WWDR4, 2012). Rainfed agriculture in the more marginal regions of Southern Africa, East Africa and the Sahel is particularly vulnerable to changing climate, so fragile and agrarian countries will require increased investment in irrigation to ensure their economic and livelihoods resilience. However, because it is starting from such a low base, trebling of irrigated land in Africa is expected to only increase food production by 5% by 2025 (WWDR4, 2012).

To meet food security challenges, the AICD estimates that investments over a 50-years horizon need to reach about US$18 billion for small-scale irrigation systems in Africa and $2.7 billion for large-scale systems (WWDR4, 2012). Investing in irrigation is a rational choice for African states' use of limited financial resources, as such investments have proven to have as much as four times greater impact in terms of alleviating poverty because it is typically targeted at the poorest rural inhabitants (WWDR4, 2012. However, increasing irrigation also means increasing fresh water abstraction for the agricultural sector and will impose greater externalities on other sectors and ecosystems as water resources become increasingly developed.

Freshwater fisheries, protein and disempowerment

Terrestrial agriculture is not the only means of feeding Africa's increasing population. Indigenous fresh water fish provide a crucial source of animal protein and micronutrients to local communities throughout Africa. In many African communities, inland fish are the primary source of these vital food components, and represent 40% of the continent's fisheries, thereby contributing to food security, as well as local livelihoods of the fishermen and viability of the local rural economies (Jackson, 2009). Fisheries in seven African river basins were observed to support 227,000 full-time fishermen and had an estimated value of US$295 million. Inland fisheries can range from family-based artisanal units to commercial enterprises with

motorised boats, but, in most cases in Africa, these are small-scale, household based (Neiland & Bene, 2006). Fishing is usually done for subsistence and the fish consumed locally. There are however exceptions, such as in Lake Victoria, where the fishing of Nile Perch is intensive and done at commercial levels, mainly for export.

Inland capture fisheries are economically and socially undervalued and biologically underappreciated, mainly due to a lack of data on fish consumption and production. Fishing is considered as less of a priority than other services provided by freshwater, such as hydropower, municipal supply and irrigation, largely due to inadequate information on the topic. Priority is given to water-development projects that can negatively affect the fish population in lakes and rivers, by changing flow dynamics and the connectivity of rivers, as well as the landscapes that impact on the hydrology and quality of these water resources. These impacts, together with the introduction of alien species for commercial fisheries, such as the Nile Perch in Lake Victoria, threaten wild fish populations and fisheries' productivity.

For local populations, a decrease in fish abundance and quality leads to a decrease in protein consumption, as other sources are usually too expensive or difficult to obtain. Local communities often see their traditional subsistence activity become unviable; most times, the infrastructure development project that triggers this decrease in fish populations does not create replacement jobs. Moreover, local populations do not often immediately enjoy new benefits from built infrastructure. Greater consideration needs to be given to the consequences of infrastructure development on these fisheries and the potential agricultural requirements to replace lost food supply through additional land, productivity and/or irrigation. This hidden value of Africa's rivers and lakes requires improved understanding and consideration.

Agricultural Development and SAGCOT in Tanzania

Tanzania has laid out a clear vision to transform itself into a middle-income nation and transition from a predominantly agricultural to a mixed and semi-industrialised economy by 2025. Tanzania's economy is also in transition with manufacturing, construction and services accounting for a growing share of economic activity. Tanzania's economic growth over the last five years has been rapid and consistent with these goals, with GDP expanding at an average rate of 6.9% between 2010 -2015.

Despite these improvements, the reality in Tanzania is that poverty remains high and agriculture, which accounts for 29% of GDP continues to be of central importance and provide the majority (75%) of all jobs. Despite abundant water resources, availability is highly variable in space and time and is a constraint for Tanzanian growth. Taking into account environmental flow requirements, during dry periods, national demand is 150 % of accessible water. Under a business as usual scenario and factoring in economic growth projections, this increases to 216 % by 2035.

There are already clear signs that water insecurity is having a negative impact on economic growth in Tanzania. The severe drought of 2005/6 resulted in 1% loss of GDP and a 20% decline in agricultural sector growth. The impacts of drought and flooding are expected to cause losses of 0.7-1.7% of aggregate GDP by 2030. These aggregate figures tell a powerful story, but should be considered alongside the direct human impact that water stress can have on communities and individuals. As harvests fail and conflict over water erupts, hunger and violence quickly follow.

The Southern Agricultural Growth Corridor, Tanzania (SAGCOT) is an example of how focussed efforts to increase agricultural production create pressures and opportunities for enhanced water resource management. Much attention has been given to SAGCOT as a key strategic initiative aiming to deliver economic growth and improved food security. If focusses on developing clusters of farmers with access to

infrastructure, markets and local agri-processing facilities to allow them to increase their operations and build a more integrated and productive set of agricultural value chains. The plans for development across the corridor are extensive, with the intention to create 400, 000 jobs and increase agricultural revenues by $1 billion. The Big Results Now! (BRN) initiative also supports growth in the agricultural sector and presses for expansion of sugar, maize and rice production. Both of these schemes require, and assume, a significant expansion in irrigated land and increased water demands.

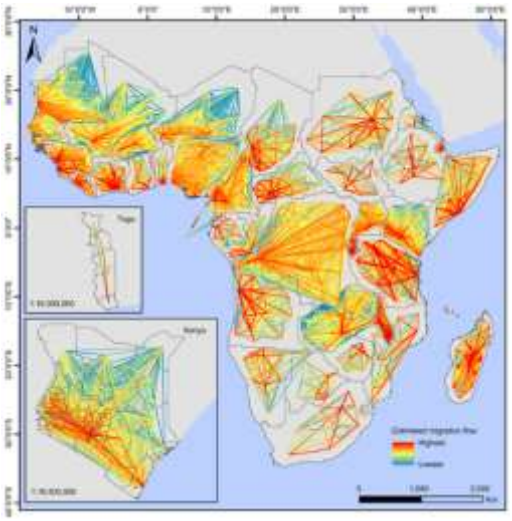
In order to realise its mission, SAGCOT will require significant quantities of water to be available at appropriate quality and on an equitable basis. SAGCOT is also an area of significant ecosystem value with various National Parks contributing substantially to the Tanzanian economy through the tourism industry and provide a range of vital ecosystem services. However, expanding agricultural activity, a growing population and an expanding hydropower sector have created demands on the use of finite water resources. SAGCOT is already experiencing water stress in some of its sub-basins and there are clear signals that reduced water availability and denuded ecosystems have the ability to directly undermine economic performance and put SAGCOT's vision at risk. As climate stress and variability increases the risks to SAGCOT and its mission will intensify.

Through initiatives such as the 2030 Water Resources Group (WRG), new models for public-private collaboration and partnership are being sought. Individual companies are also showing how collective action initiatives can be established to effectively manage operational and reputational risks. To catalyse action, compelling and inclusive business models are now needed. can be found that show how companies. These models need to be more widely shared and opportunities to provide scaled solutions must be embraced.

Source: Pegasys, 2014, Water Security Sector Study for Tanzania

Rural Water-related Vulnerability Drives Migration

The livelihoods of rural communities in Sub-Saharan Africa are highly dependent on water. Water availability stresses have therefore affected livelihoods activities and triggered migration throughout Sub-Saharan Africa. International migration within Africa involves about 17 million people yearly (United Nations High Commissioner for Refugees (UNHCR), 2011), while urbanisation is the most significant form of intra-country migration. The vast majority of Africans leaving their home move within the continent. In many African countries, the combination of climate variability, climate change, political instability, lack of economic opportunities and poor water resources management has far-reaching implications for vulnerable rural communities who are dependent on natural resources for subsistence livelihoods. One response to such pressures is migration of rural populations, either temporary or permanent. In 2016, the World Economic Forum rated large scale involuntary migration as the most likely global risk[3] with massive impact. While the world's attention is primarily on conflict driven refugees, it is highly likely that in Africa climate-water driven migration will increase dramatically over the next decades.



Climate-water hazards drive people to migrate and exacerbate insecurity in fragile regions

A vicious cycle plays out in Africa with water scarcity or flooding impacts on agricultural productivity, deteriorating fisheries, loss of live or damaged property, acting as threat multipliers in already socially, politically and economically vulnerable contexts. These climate-water hazards provide a push for livelihoods-driven migration, which in turn result in conflicts and competition between displaced populations and host communities. The resulting poverty and social instability may also create fertile ground for violent groups to develop. This vicious cycle is particularly important in fragile states, such as in the Sahel region. Fragility can relate to different dimension of risk and vulnerability, one being a low capacity to adapt to social, economic and environmental shocks and disasters[4]. Environmental factors can thus enhance fragility, and fragility in turns translates in low levels of adaptive capacity.

Increasing trends towards water scarcity in the eastern and southern parts of the Continent, whether due to climate change, over-abstraction or infrastructure-altered flow regimes, can disturbed subsistence and customary practices of rural communities forcing them to move away from their historical territory. It is estimated that by 2025, half of the population of Africa will be living in areas of water scarcity of water stress (Jackson, 2009). On the other hand, losses and disease associated with water-related extreme flood or drought events can be a strong push-factor, making migration the most viable survival option. The movement of people as a result of natural disasters is often considered as environmental or climate migration. In the last decade, floods have displaced a significant number of people within or towards Nigeria, Ethiopia, Somalia, [5] Niger, Chad, Sudan, South Sudan, Kenya, Mozambique.

Commercially-led rural development and water reforms can also impoverish rural communities

Development of Africa's rural economies requires the predictability and stability provided by water policy reform and associated formal water management regimes. However, where these and land tenure reform

[3] A "global risk" is defined as an uncertain event or condition that, if it occurs, can cause significant negative impact for several countries or industries within the next 10 years (World Economic Forum, 2016)

[4] These dimensions are 1) violence (peaceful societies); 2) access to justice for all; 3) effective, accountable and inclusive institutions; 4) economic foundations; 5) capacity to adapt to social, economic and environmental shocks and disasters (World Economic Forum, 2016)

[5] In these three countries, Niger, Ethiopia and Somalia, numbers exceeded 50'000 people per state in 2013, Internal Displacement Monitoring Centre (IDMC) & Norwegian Refugee Council (NRC)

do not explicitly address the issues associated with the most marginal groups, people with limited livelihoods options may lose their rights or access to water. Given that water access is critical for African rural livelihoods, this exacerbates climate-water variability as a push for migration. This is given its ultimate expression in the leasing or sale of land to foreign commercial interests, commonly referred to as "land-grabs", usually to supply export crops for non-African investors or corporate supply chains. Otherwise well intentioned policy reform to support commercial investment, may have perverse outcomes in the disposition of rural people, with the resulting pressure on people to move in order to survive.

Investment in water supply has huge benefits for the poor and the economy

On the other hand, well-crafted water policy interventions and management regimes that enable commercial investment alongside public sector driven small-holder development, provides more sustainable rural development models and reduces the vulnerability of communities to climate-water shocks and stresses. Investments in water supply, sanitation and wastewater services generate substantial benefits for public health, the economy and the environment (OECD, 2011), as well as being a platform for building household resilience to water-related climate and development impacts. The benefit-to-cost ratio from the provision of basic water supply and sanitation services has been reported to be as high as 7 to 1 in developing countries (OECD, 2011).

By freeing up time, particularly for women and girls, household access to reliable water supply enables education, while the health benefits of water access are well documented. For companies, this means a healthy and educated labour force and customers. There is an increasing focus on livelihoods-linked water access in rural areas, to enable decentralised small-scale irrigation that has been shown to provide greater relative returns that large-scale dam-based irrigation schemes (International Food Policy Research Institute (IFPRI), n.d.). At the same time, investment in water governance and institutions is critical to ensure the sustainable and inclusive development of these rural livelihoods and the protection of the interests of all stakeholders.

Migrants often move to marginal land, which compounds their vulnerability

Migrants tend to settle in marginal areas, vulnerable to water-related shocks or stresses. Parcels of land on which informal settlement or refugee camps are built often lack (functioning) water infrastructure and are more exposed to natural hazards than other land already occupied by locals. Informal settlements in the periphery of urban centres tend to be exposed to flash floods or landslides; refugee camps also tend to be vulnerable to water, climate and environmental shocks and stresses. As an example, in March 2015, the UNHCR had to relocate more than 50,000 South Sudanese refugees from the flood-prone camps of Lietchuor and Nip Nip in Ethiopia as a pre-emptive measure against recurrent disasters (UNHCR, 2015). These shocks and stresses are likely to be exacerbated by climate change.

Migration can present an unanticipated pressure on water resources and infrastructure in the host location[6]. Such pressure often results in tensions between displaced communities and host populations. The current situation of migrants across Africa calls for increased investments in order to maintain or expand existing infrastructure to meet increasing demand. Investments are, however, often restricted due to a lack the financial, technical or institutional resources or because of a lack of political will. This occurs not only because the beneficiaries may be foreign nationals, but also as the duration of their stay tends to be understated, as there continues to be some cyclical movement between their place of origin and refuge when they are climate-economic migrants and in an attempt to deny that refugee camps have often

[6] Among the largest receiving states of economic migrants in recent years are South Africa and Côte d'Ivoire. The largest recipients of asylum seekers and refugees are South Africa, Tanzania, the Democratic Republic of Congo, Kenya, Chad, Uganda, Sudan, Zambia, and Ethiopia.

developed into long-term settlements. Investment to build water resilience of communities in fragile states is an important dimension of tacking this challenge.

Fragility, Climate variability and Migration in Lake Chad

Between 1960 and 2000, the Lake Chad basin experienced one of the most substantial and sustained reductions in rainfall anywhere in the world. A combination of increasing aridity and poor water management reduced Lake Chad from 25,000 km2 in the early 1970s to its current 2,500 km2. The droughts of 1972-1975 and 1982-1985 were significant events in the reduction of the size of the Lake, but this was exacerbated by the construction of large irrigation schemes and a number of dams along the Chari-Logone and Kamadugu-Yobe Rivers.

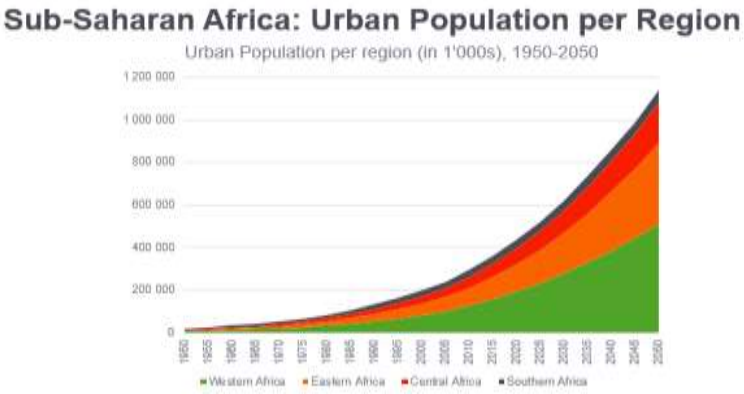
The Lake is surrounded by underdeveloped countries with high levels of acute and chronic poverty. These countries lack dynamic private sectors, show low levels of labour productivity, have under-developed infrastructure, and are overly reliant on the informal sector and subsistence agriculture. Economic growth has been further hampered by a series of civil wars and significant increases in military expenditure. There has been a southward movement of people around the basin since the northern portion of the Lake shrank in the 1970s/80s, giving rise to increased inter-ethnic competition and conflicts. The population of the region is over 30 million people, and growing at between 2.5 and 3.0 % annually.

The water scarcity and flooding in some parts, with the resulting loss of livelihoods has driven local people into a range of alternative behaviours that include drug trafficking and arms trading, and there is a strong argument that it has fed into the rise of Boko Haram, which has killed over 10,000 people in the Nigeria portion of the Lake basin. The violence of the Boko Haram movement and the counter-insurgency responses has led to 2.6 million displaced people in the Lake Chad basin – an area in which 11 million people are in need of humanitarian aid and seven million people are severely food insecure. Most of the displaced people are internally displaced within their own countries (93%). Over half a million children's lives are at risk from starvation if aid does not reach them urgently. In 2016 the Lake Chad Basin Commission, with support from the World Bank and the French Development Agency, released a US$1 billon action plan to increase climate resilience in the basin, improve livelihoods, and improve the Lake's contribution to regional food security. However, weak institutions continue to hamper the implementation of this plan.

Source: The Guardian, *The Small African Region with More Refugees than All of Europe*, 26 November 2016, and Uche T. Okpara, Lindsay C. Stringer, Andrew J. Dougill, Mohammed D. Bila *Conflicts about water in Lake Chad: Are environmental, vulnerability and security issues linked?,* October 2015

Cities as the Engines of Water-resilient Development

Projected rates of urbanisation are expected to result in a trebling of the population in cities by 2050, with the urban population exceeding the rural population of Sub-Saharan Africa by about 2040. Half of these urban dwellers will be in West Africa, which the majority in coastal cities on the Gulf of Guinea, and another third in East African cities. African cities will be both the drivers of economic growth, diversification and trade, and will have an increasing requirement for water, food and energy, all of which require reliable water supply. The water resilience and sustainable development of African cities will be dependent upon the management of their interactions with national and transboundary water resources.



Cities are deeply connected to their rural hinterland through water

While roads and physical infrastructure are the most apparent linkage between cities and their hinterland, there is a flow of people, water, energy, food and minerals to cities to support the economy and people of these cities. Rural economies and people also depend upon migrants' remittances, finance and goods from cities in a symbiotic relationship. Beyond its water footprint, cities are prone to flooding and potentially disease from upstream water resources, while waste and washoff from cities themselves can cause severe contamination of downstream rivers and estuaries. Inadequate municipal infrastructure and management may contribute to contamination of the groundwater resources upon which the city depends, such as over-abstraction causing sea water intrusion in Maputo or pollution of local aquifers in Lusaka.

The dependency and vulnerability of cities to the water resources of their neighbouring catchments means that the economic growth of these urban centres requires effective management and timeous investment in these water resources, considering the tradeoffs between water use for supply, energy and food, and the management of flood, drought and disease hazards. Changing climate will primarily impact on cities through water, and therefore poses even greater hazards and potentially constraints to the sustained development of these urban centres. Urban leaders typically assume that cities water demands will be met as a priority, but this overlooks the complex interactions between water and cities and the institutional arrangements that govern the management of water resources (see the Lusaka case). Devolution of water management to County level in Kenya poses challenges for the transfer of water from the neighbouring Tana River to meeting the growing demand of Nairobi.

Cities enable efficient provision services for economic growth and people's wellbeing

African cities face multiple challenges to meet the basic needs of their population, from the lack of robust infrastructure and efficient institutions, to poverty and the size of slums and of the informal sector. Over 60% of sub-Saharan Africa's urban population lives in slums and 61% of urban employment jobs are found in the informal sector (UN-Habitat). Within cities, the poorest people tend to be the most vulnerable to water related hazards, because their settlements are located on the steepest or most flood prone land and they often have limited water supply, sanitation or waste infrastructure. This is exacerbated by rapid urbanisation and the influx of migrants to many African cities. Informal or intermittent jobs of the inhabitants hampers cost recovery and investment in providing municipal services, which is compounded by weak governance, lack of information, inadequate resources and limited institutional capacity. This situation is particularly apparent in the most fragile or least developed states, but is also widespread across African cities.

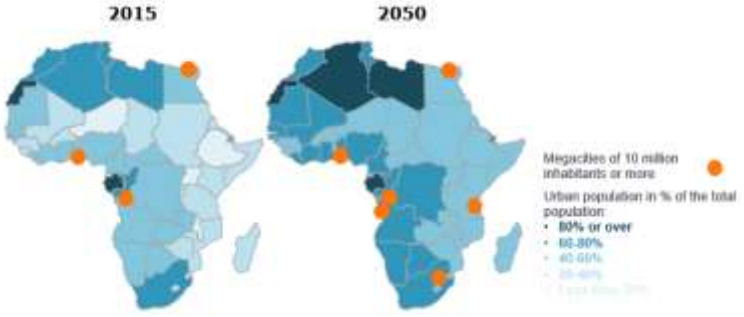
In Africa, about a third of poor households' income are spent on the treatment of water-related diseases like malaria and diarrhoea (World Health Organisation (WHO)). The World Health Organization (WHO) estimates that a small increase in investment in household access to safe water can have a 3 to 7 times multiplier effect on GDP, due to improvements in health and education of the working population (World Health Organisation (WHO)). Because of their higher densities, cities provide the most efficient opportunity to provide services to poor inhabitants, as long as the water resources are effectively managed and spatial land use challenges are overcome. Where this is done effectively, cities become the drivers of sustained economic growth and opportunities, through increasing financial resources and capacity.

Conversely, the risk of not providing adequate services, affordable food and stable employment can lead to social instability and unrest, with the resulting drain on economic development. One of the greatest climate risks to urban utilities is the potential loss of long-term tariff revenue associated with the economic disruption of major flood disasters. However, inclusive growth requires investment to overcome the water-related vulnerability of all urban inhabitants, in addition to municipal spending that prioritises wealth at risk from water hazards. This balance requires a more structural approach to urban development than the project-based initiatives typical in African cities, and needs to be built on the resilience that natural infrastructure provides in the urban landscape.

Diversification supports decoupling from economic water dependence and vulnerability.

Urban economies are typically diversified and built around manufacturing and services, even if in support of agriculture and extractives in the surrounding region. While these sectors require reliable and good quality water supply and energy, the economic value produced from water is much higher than in the primary economy and the economic impact of droughts tends to be lower. Urban economic growth supports tax revenue which in turn can enable the development of water infrastructure and strengthening of institutions that catalyses further development and reduces the impacts of water risks. If managed effectively, this virtuous cycle builds water resilience and progressively decouples the urban economy from water variability. The challenge for African cities is to initiate this cycle, particularly in the context of rapid urbanisation, limited resources and inadequate capacity prevalent in fragile and least developed economies. Development assistance is critical to support the initial investment, but once some degree of urban economic development is catalysed, it is in the interest of business to advocate and support further investment in water management for production purposes, as well as domestic consumption for their workers and potential customers.

Investing in secondary cities provides a buffer and can catapult (leapfrog) development



African capital cities are currently the destination of most migrants, because of the perceived resources and opportunities to be found. These capitals already extract significant water, energy and food from the countryside, and already have sprawling slums and severe service backlogs, all of which will be compounded if they remain the main destination for urbanisation. Secondary cities throughout Africa have not yet developed significantly, but will need to attract more people through decentralised growth that initially builds on the water-dependent rural economies in which they are situated. Infrastructure development and the water footprint is more localised, can be decentralised and may be based on less-costly appropriate technologies. This decentralisation and diversification builds economic resilience for a

country beyond a limited number of economic nodes. In this process African governments and business have the chance to build on global experience to avoid the problems faced by other countries.

Lusaka and its Water Vulnerability

The capital of Zambia, Lusaka, is a key economic growth hub, impacting the whole country's economic development. Lusaka is highly dependent on the water of the Kafue river, for three main reasons: for municipal water supply, for the irrigation of agricultural supplies, as well as for the production of energy, since hydropower represents 95% of total electricity generation.

The water of the Kafue is not only key for the capital city; it is also key to rural and industrial areas. Water is critical for the livelihoods of the Kafue's 800 000 rural and agrarian inhabitants, not only for smallholder agriculture, but also for the functioning of ecosystems, providing goods and services. It is estimated that 60% of the total Zambian population is directly dependent on ecosystem goods and services. Further, mining, a key industrial sector driving the Zambian economy, relies on hydropower to fulfil its energy needs. Mining represented 57% of the total electricity consumption in 2015.

Despite this high dependence on water, Zambia has not been able to adequately protect its water resources. Challenges arise mainly around growing cities and groundwater. With an average annual population growth of 3.8%, and with uncontrolled urban development, the district of Lusaka is facing increasing pressure, and so are the water resources supplying the city. Lusaka is currently supplied by groundwater sources (~130 000 m3/day), which are polluted by sewage and other contaminants (e.g. solid waste dumps or industrial spills) percolating down to the Lusaka aquifer. The development of urban areas within the recharge areas of the Lusaka aquifer adds to these challenges. Treatment and disinfection of borehole water is not always adequate and thus some boreholes are regarded as unsafe sources. Therefore, water and sanitation has become a challenge in the city.

To address water security challenge in Lusaka, a multi-stakeholder partnership between actors of public sector, private sector and civil society actors was formed. The Lusaka Water Security Initiative (LuWSI) is a platform analysis, planning, coordination and action to improve water security for Lusaka. It also identifies, develops and implement concrete projects to improve water security. The Initiative has worked on preventing groundwater pollution, and maintaining the future flows of the Kafue River.

Source: *ZB, WWF Zambia and WARMA, 2017. The Social and Economic Value of Water in Zambia: Summary of Key Narratives*

Catalysing Water-Resilient Development

The thesis of this paper has been that the effective management and development of water will be critical to catalysing Africa's economic development, as well as alleviating climate-water related risks. It has done this by unpacking the dependency of four themes that are emerging as critical to water on the Continent, namely growth, food, livelihoods and cities. In conclusion, six cross-cutting observations are put forward as critical to building water-resilience of Africa's economies over the next few decades.

Water critical to achieving the Sustainable Development Goals for Africa

The SDGs are a series of 17 goals (with 169 targets) adopted by 193 states, in order to work towards a better world. SDG 6 is explicitly linked with water, and aims at ensuring availability and sustainable management of water and sanitation for all.[7] In addition to SDG 6, a number of the other SDGs are impacted directly or indirectly by the management and health of water bodies across the African continent (listed in the table below). Through these linkages, it is apparent that achievement of many other SDGs will be dependent upon effective management of water resources and supply systems, particularly in Africa where water is such an important part of social and economic development, as well as environmental protection.

	SDGs whose achievement is highly dependent on water
1	Ending poverty
2	ending hunger
3	ensuring healthy lives and promoting well-being
6	**ensuring availability and sustainable management of clean water and sanitation**
7	ensuring access to affordable, reliable, sustainable and modern energy
8	promoting sustained, inclusive and sustainable economic growth, full and productive employment and decent work
9	building resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
11	making cities and human settlements inclusive, sage, resilient and sustainable
13	taking urgent actions to combat climate change and its impacts
15	protecting, restoring, and promoting sustainable use of terrestrial ecosystems, sustainably managing forests, combating desertification, and halting and reversing land degradation and halting biodiversity loss

Opportunity to leap-frog using global lessons

Many African countries are only now beginning to develop their water resources for economic production and thus investment in infrastructure and institutions can learn from the mistakes and lessons of other countries that have already followed similar paths in other parts of the world. This is particularly relevant for the management and development of Africa's rivers, lakes and aquifers, considering the needs of people and nature while catalysing economic growth and commercial interests.

A focus on resilience and adaptation

Climatic and hydrological variability already challenges economic development in most economies, while it is recognised that water is the primary pathway through which climate change will impact on African households, business, cities and infrastructure. Building water resilience at all of these scales is therefore the primary means of adapting to climate variability and change. The requirements to build resilience relate to creating infrastructural, institutional, social and financial capital, while protecting natural capital. Creation of wealth at a country and household scale is fundamental to adaptation, because poverty limits

[7] The legal text contains provisions for access to water, access to sanitation, pollution prevention, sustainable withdrawals and efficiency, integrated water resource management, ecosystem health, international cooperation and community participation.

adaptive options. For Africa creating wealth depends upon effective water management and thus increased investment in water management is critical for economic growth and climate resilience.

Urban flood management and rainwater harvesting in Maputo

Mozambique's, capital city, Maputo, lies in the cyclone path. Despite the city's economic importance, contributing over 30% to national GDP, its residents live off less than US$2 per day (Nhaca and Vieira 2010) and 75% of them live in low-lying informal settlements. Rising sea levels in Maputo do not only put the informal settlements at risk, but the salt intrusion puts the city's freshwater sources at risk. Climate change projections of higher intensity, lower frequency rainfall will only exacerbate the city's situation, increasingly destructive floods and droughts. Managing flood risks in a coastal city is critical to protecting infrastructure that supplies potable water, electricity and food supply to the city's vulnerable population. The government has begun relocation programs for people in high-risk low-lying areas and is set to develop a Master Drainage and Sanitation Plan, targeting drainage investments and innovative rainwater harvesting to help control floods and improve storage.

Luis Nhaca and Mauricio Vieira, Tools for Sustainable Urban Development and to Deal with Climate Change at Maputo City, Mozambique, 2010

Innovative investment and financing mechanisms

The investment climate for Africa has shifted dramatically over the past decade, with traditional development assistance being overtaken by climate finance, private sector finance, investment by countries in the global South, remittances from the global African diaspora, as well as national government finance. Most of this investment has gone into the communications, transport and energy sectors, but now is the time for the African water sector to develop innovative mechanisms to access and leverage these new sources of investment. At the same time, development assistance must be channelled into supporting the most fragile states to address their specific vulnerabilities. There is a need to build infrastructural, institutional and information networks, in a coordinated and coherent manner across countries and river basins, as the foundation upon which water-resilient economies can be constructed. This water-resilience will be critical in withstanding ongoing shocks and stresses of climate variability and adapting to the ravages of climate change on the continent, as well as achieving and maintaining the African SDGs.

Innovative Financing for Livelihoods Project in the Okavango River

While being endowed with the globally iconic Okavango Delta, the Okavango River basin, shared by Angola, Namibia and Botswana, remains subject to extreme poverty and under-development. The human population in the basin consists predominantly of rural communities who are dependent upon rainfed agriculture. There are plans, particularly in Angola and Namibia, for the large expansion of cultivated areas, hydropower and urban supply that will have consequences for river flow, the delta and the people who make use of it to derive an income and livelihood for their families. The challenge for the countries is to find the appropriate balance between conservation and development of the basin's resources. The transboundary Okavango Commission (OKACOM) has initiated and completed various basin studies, culminating in a multi-sectoral investment opportunity analysis (MSIOA) which provides guidance for investments in the basin considering economic and developmental objectives of the three countries. Significant attention was placed on livelihoods interventions to build local water resilience, and this is the focus of the basin investment programme that is intended to be funded by a Green Climate Fund (GCF) application. This is being supported by the establishment of an endowment fund for the Okavango Delta

that hopes to attract contributions from high net-worth individuals and foundations as a means of translating the deltas bio-capital into improvements in livelihoods that in turn protect the environmental integrity of the basin, as an incentive to ongoing cooperation between the three countries.

Source: The Permanent Okavango River Basin Water Commission. 2011. Cubango-Okavango River Basin Transboundary Diagnostic Analysis. Maun, Botswana: OKACOM, 2011

Systemic portfolio planning underpinning investment

There is increasing recognition that building water resilience requires systemic multi-sectoral investment planning, rather than more traditional sectoral or project related planning. While basin strategies and water masterplans have delivered projects in the past, the changing financing environment and the uncertainty introduced by climate change requires investment planning with two important characteristics. Firstly, a portfolio of projects must be evaluate in terms of their developmental impacts as well as their robustness to alternative climate futures, rather than a project-by-project evaluation that may lead to unintended consequences, such as foreclosing options or sunk assets. These portfolios typically address a combinations of water infrastructure, institutional strengthening and information systems that together create viable and sustainable interventions. They are also increasingly including other sector components that ensure that the productivity gains of water interventions can be sustainably leveraged, such as flood resilient roads between improved irrigated or terraced farms and their commercial markets that meet commercial requirements for reliable agricultural products. Secondly, the relevant sources of finance for each component or suite of projects are evaluated early in the planning process, in order to ensure that the resulting portfolio of projects presented in an investment framework can attract the appropriate financing through innovative financing mechanisms, rather than remaining on shelves as a project wish-list.

Innovative Partnership creating the Olifants Minewater Cooperating Body

The Strategic Water Partnership Network (SWPN) is a national collaborative platform between the private sector and government in South Africa, which was partly initiated by SABMiller before its merger with AB InBev. As one of the central pillars of this partnership, the Thematic Working Group for Effluent and Waste Water Management (EWWM) has a focus on addressing the challenge of mine-water contamination and the problem of mine drainage from the Witbank coalfields in the upper Olifants River Catchment. Following a joint problem analysis between the regulators and the mining companies, it was recognised that coal mining in the region had 20 years of operations left after 100 years of mining that has left legacy issues of abandoned (ownerless) mines. Coordinated action is required to ensure the long-term sustainability of the catchment and clarification of post-closure liability of the industry. This will require a combined technical-institutional-financial response to address the complex web of problems and their underlying causes. As a first step to doing this, a formal partnership has been established and funded between government and the mines, named the Mine Water Coordinating Body (MWCB) to enable collaboration and to implement the required catchment-wide water management approaches.

Source: SWPN (2015) Institutional and financing models for the sustainable treatment and reuse of minewater

New partnerships

Governments, businesses, international organisations and development agencies all have a role in advocating for and enabling water investment in Africa. SDG 17 recognises the need to create partnerships that will support the achievement of development outcomes, while the dramatic global adoption of corporate water stewardship reflects the appetite of business to collectively address the challenges of water management and development in water vulnerable regions. This paper is the result of one such

partnership between a multinational corporation and an international environmental organisation, which has embraced collective action in river basins in which the two organisations have direct interest.

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