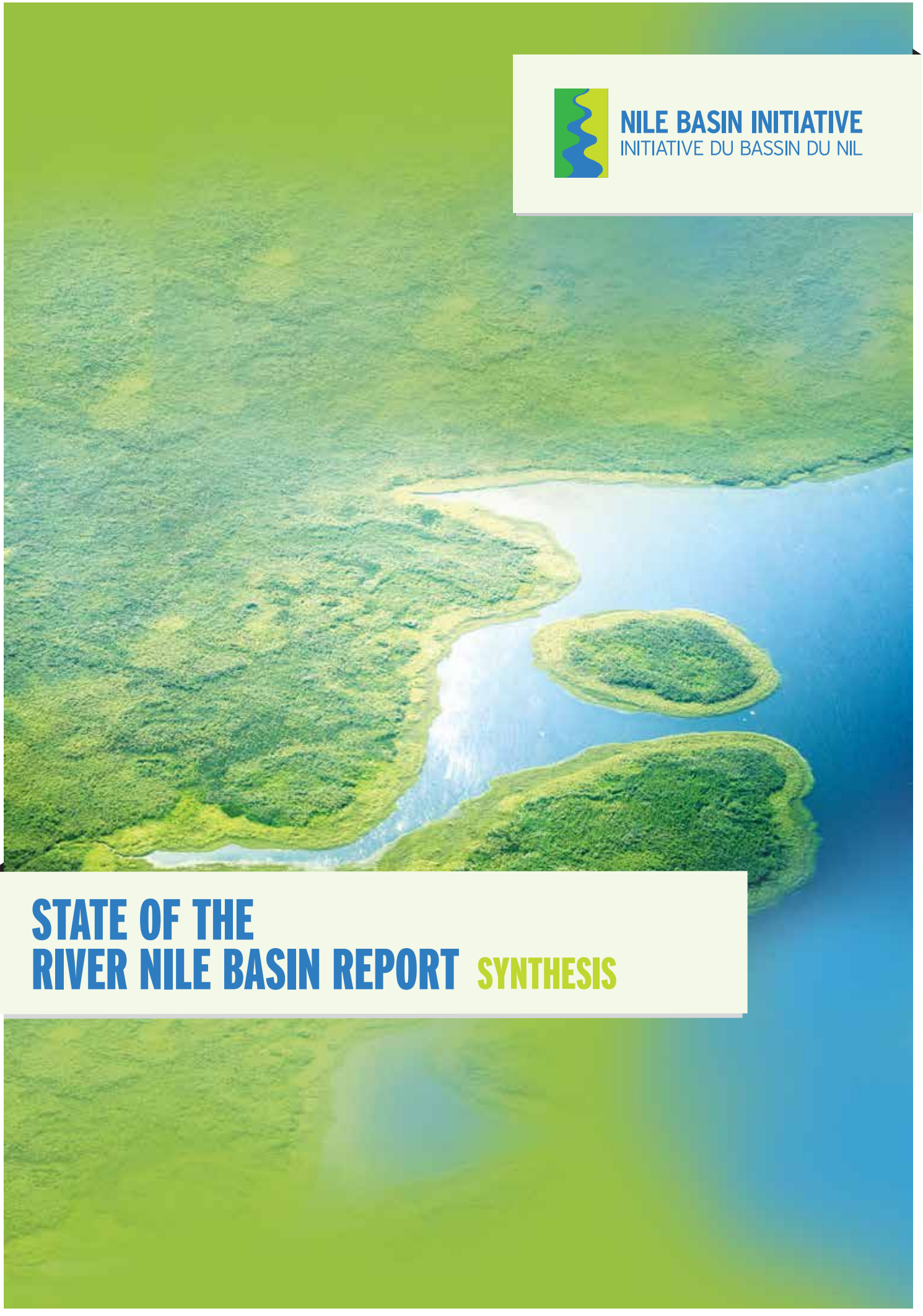

NILE BASIN INITIATIVE
INITIATIVE DU BASSIN DU NIL

STATE OF THE RIVER NILE BASIN REPORT SYNTHESIS

The Nile Basin Initiative (NBI) is an intergovernmental partnership of ten Nile riparian countries that is seeking to manage and develop the common Nile water resources in a cooperative manner and promote regional peace and security.

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Statistics for South Sudan are included under Sudan (especially for the period prior to separation in 2012) except where separate statistics for South Sudan are provided.

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FOREWORD

Dear Esteemed Reader,

I welcome you to the second Nile State of Basin Report, 2020. The first state of Basin report was published in 2012. The 2012 report put together wide-ranging data, and offered analysis on the condition of the water and environmental resources of the Basin, and of socio-economic status in 2012. The report added significant value to the common Basin knowledge-base and has since been used by practitioners, decision makers, researchers, academicians, media, planners, and several other groups as a reference for Basin planning and management.

The Nile is the second longest river on the planet and occupies a special place in world history, being the cradle of many great civilisations. It traverses 10 countries and runs through diverse climate, topographical, environmental and socio-economical landscapes. Since the previous River Nile State of Basin report, the Basin population has grown from 238 million to 272 million people. This population growth is in the face of dwindling resources that are threatened by emerging pressures like climate change, land use change and environmental degradation, urbanisation, etc.

This report builds on the 2012 report by taking stock of the developments that have occurred since then, critically assessing the evolving pressures on the Basin resources and effects in terms on sustainable utilisation of the Basin's water and related resources, and tracking progress towards overcoming the main Basin development challenges. It presents facts, trends, patterns, synthesis, and indicators for both the Basin health and multiple biophysical conditions. It also establishes the foundation and structure for reporting Basin health and monitoring of the impact of measures taken at national and regional levels.

Levels of socio-economic development remain low in most of the Basin countries despite recent signs of strong economic growth. In particular, reducing poverty, inequality, malnutrition, and providing access to basic services in the majority of Nile States still remain major challenges that governments are trying to address. Pressures on the natural environment stem predominantly from land-use changes, mainly driven by agriculture, yet increasingly also by expanding urban areas. Infrastructure and governance systems are already overwhelmed by the magnitude and pace at which water-related challenges develop.

This report is meant to be used as a reference document and source of data and information for when formulating or reviewing policies and also when making decisions on planning, design and implementation of water resources management and development projects. The report is also aimed at further cooperation among stakeholders as a key driver of sustainable and equitable utilisation of Basin resources. The report targets diverse audiences, including politicians, government officials, development workers, media experts, academicians, researchers, and all citizenry of the Nile.

I thank the Nile Basin Initiative Secretariat who prepared the report with support from GIZ, on behalf of the European Union and the German Federal Government who provided the funding. I also thank all the technical staff in the Nile Basin countries that actively contributed to the development of the report.

Wishing you pleasant reading

Hon. Minister Jeanne d'Arc MUJAWAMARIYA
MINISTER OF ENVIRONMENT OF RWANDA, NILE-COM CHAIR

MESSAGE FROM THE EXECUTIVE DIRECTOR

Dear Esteemed Reader,

It is my pleasure to present to you the second Nile State of Basin Report, 2020. This follows the first state of Nile Basin Report published in 2012 which received a good reception among professionals in the Nile Basin including government officials, policy- and decision-makers, development planners, academia, and the general public. It has been used as a key document for assessing trends and patterns in the basin and to support joint assessments of alternative development pathways that lead to sustainable development of basin resources.

This second Nile State of Basin Report is meant to be part of the suite of basin monitoring tools (including, for example, the Nile Basin Water Resources Atlas). This report is aimed at critically assessing facts, trends, patterns, synthesis, and indicators for both the basin health and multiple biophysical conditions and also establishes the foundation and structure for basin reporting. The report gives policy makers, senior government officials, and the international development community a basis for well-informed decision-making.

The challenges facing the Nile Basin are complex and continue evolving. They include population pressure, land use changes and rapid urbanisation, uneven distribution of resources which are dwindling, pollution of water resources and disappearing ecosystem habitats as well as emerging pressures like climate change. Country plans for development of the Nile water resources are constrained by these challenges in addition to limited data and knowledge on the abundance and variability of the resource itself.

Therefore, countries need well synthesised and factual information to enable them make evidence based decisions.

The contents and structure of the report are guided by the six priority areas of the Nile Basin Initiative (NBI) 10-year Strategy (2017–2027), which advocates key strategic directions that were agreed by the NBI member states and sets the ambition for delivery of impact on the ground. The priorities include (i) water security, (ii) energy security, (iii) agricultural development and food security, (iv) environmental sustainability, (v) climate change, and, (vi) transboundary governance. For each of these themes, the current state, main trends, drivers of change, and management responses have been identified.

The indicator matrices developed as part of this process shall form the basis of a Nile Basin Reporting Mechanism that will allow an accurate and comprehensive description of the state of the Nile Basin in a comparable manner, which will progress and the impacts of development to be assessed through future State of the Basin (SOB) reports.

I take this opportunity to thank the staff of NBI as well as members of the Regional Working Group who have contributed towards the development of this key report.

Finally, I extend my gratitude for the support from GIZ, on behalf of the European Union and the German Federal Government who provided the funding for preparation of this State of Basin Report.

Wishing you enjoyable reading,

Prof Seifeldin Hamad Abadalla
EXECUTIVE DIRECTOR, NILE BASIN INITIATIVE

WATER SECURITY IN THE NILE BASIN: A STATUS REPORT

Water security is the focus topic of this State of the Basin report. It is commonly defined as 'the capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability' (UN Water, 2013). The underlying concept of water security is intersectoral and multi-dimensional, while water security also varies by country and even by location. Further, some measures taken to increase water security in one part of the Basin may reduce it in other parts. Hence, assessing the status of water security of the diverse and large Nile Basin is complicated and cannot be covered by a few simple indicators. This report, therefore, has attempted to base the water-security analysis of the Nile Basin as much as possible on quantitative analysis and a broad range of indicators.

The principal factor in the discussion on water security is water for agricultural production, as agriculture is by far the largest consumer of the renewable Nile waters. Food security for urban areas could, theoretically, be achieved through agricultural trade or imports from outside the Basin. But not so for rural areas; food security for the large rural population will depend on local produce. Additionally, there is a strong relation between agricultural modernisation – which requires secure water supply – and rural development.

The link between water security and energy security in the Nile Basin is caused by the preference of several Nile countries for hydropower. Energy security, in turn, is closely related to environmental sustainability, as a large share of the rural and urban population continues to rely on charcoal as their primary source of energy, with devastating environmental consequences. Land degradation will impact on the hydrological cycle and the timely availability of water resources, thereby closing the loop.

Environmental sustainability in the Basin is also closely related to water security. The water-related ecosystems in the Basin, especially wetlands and catchment forests, provide crucial functions for water security: they retain floods, store water for periods of drought, and purify water as it passes through them. But use of the water for agricultural and energy production, and the pollution of that water, is threatening these same ecosystems.

Water security concerns are exacerbated by climate change. It will probably affect every aspect of water security, but its exact implications and magnitude are yet undefined.

Lastly, efforts to ensure water security in the Nile Basin are complicated by the transboundary dimension.

It is within the above context that this chapter synthesises the findings of the water-security analysis in the Nile Basin.

INCREASING PRESSURE ON WATER RESOURCES

« There are increasing pressures on the finite water and other resources of the Nile Basin. »

« Irrigated agriculture is one of the main uses of the water resources of the Nile Basin. »

« The NBI Strategic Analysis has investigated current and projected water demand and use as the basis for analysing joint water resources development scenarios. »

It is evident that the water resources in the Nile Basin are under rapidly increasing pressure. The finite and modest Nile waters are now nearly fully utilised for various productive and environmental purposes, while water demand continues to rise due to population growth and socio-economic development. Additionally, climate change and environmental degradation may adversely impact on long-term water availability.

Two components currently dominate water demand. Irrigated agriculture in Basin uses the bulk of the Nile flows, and evaporation from constructed reservoirs. It is noted that the bulk of the evaporation losses occur in reservoirs whose primary function is to support irrigated agriculture. Hence, pressure on water resources in the Nile Basin is very much related to agricultural production in the arid zone.

From the entire Basin perspective, there is limited water available for further irrigation development. However, in each riparian countries – especially in upstream water source countries, there are plans for expanding irrigated agriculture substantially. In a study conducted by NBI, from a Basin perspective, the projected imbalance between available water and growing water demand is likely to be substantial. Nevertheless, water savings are possible if losses in existing irrigation schemes can be reduced. This includes potential reduction of losses, where the estimated direct evaporation losses are estimated from 100 to 250 mm per year.

Although hydropower is considered non-consumptive water use, developing the remaining potential capacity – exceeding 15 GW after completion of GERD around 2022 – will require retention of extra surface water, leading to evaporation losses. The existing and/or planned over-year storage capacity on the Blue, however, will enable most new facilities to operate in run-of-river mode – with associated low storage and evaporation losses – provided that enhanced cooperation and coordination mechanisms can be agreed upon.

Moreover, reduction of costs for alternative power sources such as solar and wind would reduce the need for developing all remaining hydropower potential, particularly those facilities associated with high evaporation losses. Thus, it is unlikely that achieving energy security will be constrained by availability of water resources.

While projected water demand for municipal and industrial uses (M&I) shows exponential growth, it is generally low as a proportion of overall water demand, except for Egypt. However, most of the water diverted for M and I uses can be returned to the river system if collected and treated. It is noted that Egypt is already recycling an estimated 1.4 BCM/year of municipal wastewater.

Given the high value of water for Municipal & Idustrial purposes, non-conventional water sources – such as desalinated sea water – can be considered to increase water availability. Further, significant water savings are possible through diverse water conservation methods, pricing, policies for industrial use, and creating awareness about the importance of efficient water use. Economic growth and urbanisation will exponentially increase the volume of wastewater across the Basin. While most of this water can be re-used in principle, it will require large cumulative investments in drainage infrastructure and treatment facilities. However, such investments are also critical to support public health, water quality, and environmental sustainability.

Photo: Shutterstock

Thus, it is unlikely that future municipal and industrial water use will lead to unsustainable water deficits provided that diverse efficiency improvement measures are put in place, adequate treatment facilities are established, and reasonable alternatives are developed.

The quality of the Nile waters has generally deteriorated because of population growth and urbanisation, agricultural intensification, and industrial development. Localised high pollution is experienced mainly around urban centres. Hence, there is considerable risk that fresh water downstream of major urban areas may become polluted and de facto unusable.

Rainwater represents a very substantial water resource that is currently underused. Specifically, the productivity of rainwater is low in rainfed farming across the Nile Basin – which covers 87% of arable land. It suggests large untapped water resources and agricultural potential. Most of these areas receive substantial but highly variable rainfall, as illustrated by average transpiration values – representing rainwater used for biomass production – of 750 mm/year or above. This constitutes a very substantial volume of water.

Low rainwater productivity is primarily caused by low crop yields. However, water deficits during plant growth – especially during its last stage- that cause periodic crop failure and low yields are typically small. It implies that water security in rainfed agriculture can be achieved through a combination of local and smaller-scale measures concerned with supplementary irrigation from either surface or groundwater, land and water conservation, and water harvesting. Further, adoption of drought resistant/tolerant crop variants would reduce repeated crop failures due to dry spells. Note that groundwater recharge rates in the sub-tropical zone of the Basin average 250 mm/year, even though it is subject to high spatial variability. The water resources implications of these measures at Nile Basin scale are small because of the low runoff coefficient experienced in large parts of the Nile region, which means that most rainfall never reaches the Nile river system. Thus, water resources for agricultural purposes are available in principle in the Nile region but should be better managed. The huge practical difficulties in increasing yields and extending the productivity of these water resources – mostly rainwater – are acknowledged.

Thus, while pressure on water resources in the Nile Basin is increasing, a wide range of options still exist to achieve water security. Some of these require transboundary cooperation, while others can be implemented at national or even local level.

<< NBI has initiated a Basin-wide strategic hydro-meteorological and water-quality monitoring system to strengthen transboundary water resources planning and management in the Basin >>

<< A significant amount of rainwater is uncollected and therefore unutilised >>

<< Water productivity from irrigated agriculture in the Nile Basin can be greatly improved >>

IMPLICATIONS OF AGRICULTURAL DEVELOPMENT FOR WATER AND FOOD SECURITY

As discussed above, water scarcity in the Nile Basin is directly related to food security, as the agricultural sector is by far the largest consumer of the Nile waters, and because demand for agricultural produce is set to increase very substantially because of demographic trends and the socio-economic development to which countries aspire. Additional food is also needed to address the undernourishment experienced by some segments of the population in all Nile countries except Egypt. While food security can be achieved through a combination of local produce and imports, food for the large rural population must be produced in close vicinity to its actual consumers. It is noted that the dominance of the rural population in the Nile Basin will persist until 2030 and beyond.

Hence, the state of the agricultural sector has direct and profound implications for attaining water security in the Nile Basin.

The performance of the agricultural sector (irrigated and rainfed) in the Basin is generally poor and below potential, except for irrigated agriculture in Egypt and some schemes in Sudan. Food production is insufficient, and all Nile countries are currently net food importers. Additionally, the rural economy is adversely affected by the underperforming agricultural (mainly rainfed) sector , with attendant consequences for poverty alleviation, rural–urban migration, food security, and environmental degradation.

Agriculture in the Nile Basin remains dominated by rainfed farming and livestock grazing. Given the large rural population in the Nile region, this situation is unlikely to change in the near or medium-term future. Basin

Yields – and associated water productivity – are low in rainfed farming and some irrigated schemes across the Nile Basin. The very substantial yield gap points to large agricultural production potential that is currently not realised. While yields are increasing in some countries, the rate of increase is very modest.

Hence, scope for improvements in the agricultural sector are large. Barriers to increases in yield and production remain high, however. Constraining factors are multiple and diverse and must often be addressed in concert to achieve the intended results.

First and foremost, secure supply of water must be guaranteed. The absence of a secure water supply is among the principal factors that have prevented farmers in many parts of the rainfed zone of the Basin from adopting modern farming practices that are associated with high yields.

It is clear, however, that water scarcity will constrain a large expansion of areas under full irrigation supplied by surface water from the Nile or its tributaries.

A very large share of the additional food produce required, therefore, needs to come from the use and improvements – regarding yield, total production, and water productivity – in irrigated systems and large available arable lands in the Baisn and more importantly, from improvements in the large rainfed sector.

Most of the rainfed areas receive substantial but highly variable rainfall. Moisture deficits that lead to periodic crop failure are typically small. It implies that the volume needed for a secure water

Photo: World Bank/ 2010 Arne Hoel

supply in this zone are modest and best achieved through a combination of local and smaller-scale measures concerned with supplementary irrigation or land and water conservation.

It is noted that the above practices (i.e. supplementary irrigation, water harvesting, soil and water conservation, etc.) directly strengthen the resilience of the vulnerable rainfed agricultural sector to the anticipated effects of climate change. At present, this sector is virtually unprepared for the warmer and more variable weather that is predicted for the Basin, with potentially very severe environmental, economic, and social consequences.

However, the large-scale adoption of these practices – which are proven and well-established – are contingent on improving the economic viability of agriculture, including smallholder farming, and on providing adequate support in terms of extension services, rural electrification and roads, establishment of value chains, agricultural research, farm commercialisation, etc. Providing a secure water supply alone will not automatically translate into higher yields and production. Rather, all constraining factors need to be addressed simultaneously. Currently, little progress is being made in the Nile countries to provide the all-encompassing enabling environment for agricultural modernisation. It is noted that agricultural transformation requires an active role by governments but will primarily be implemented by the private sector.

Two more issues deserve mentioning. The first is concerned with agricultural trade. Since none of the Nile countries is currently a consistent surplus producer, food security cannot be achieved in the near and medium-term future through intra-Basin trade of agricultural produce. Trade, however, can contribute to alleviating local and sub-regional food deficits.

The second issue is concerned with the very large food losses observed in the Nile Basin. Although no data are currently available, these losses are estimated at 50% or more. Food is mainly lost during the early (harvesting) and middle stages (processing) of the food supply chain. Food losses represent a waste of scarce natural resources, reduce the profitability of agriculture, and translate into poor water productivity. Hence, reducing food losses is an effective means to strengthen water and food security in the Basin.

<< Energy supply in the Nile Basin is inadequate, unreliable, expensive and fails to reach many rural dwellers >>

GRADUAL DIVERSIFICATION OF ENERGY PRODUCTION MIXES

« Pressures on rivers, lakes, wetlands, and forests are already huge but will further increase as human populations in the Basin grow. »

« Nile Basin countries are making good progress in establishing the physical and institutional infrastructure to promote power trade »

« More economically competitive sources of energy need to be considered as alternatives to hydropower »

The preference of several Nile countries for hydropower provides the link between water security and energy security in the Nile Basin. Currently, some 19% of the Nile Basin's hydropower potential has been developed, but this figure will reach 41% by 2022, when several large hydro-electricity projects in Ethiopia and Uganda will have been completed and be online. Hydropower is the preferred choice for several riparians because of its long economic life and low per unit energy costs. Being able to produce electricity at low cost is imperative to attaining diverse development objectives, since power is currently too expensive for many low- and middle-income consumers.

While the energy sector has made good progress since the SOB 2012 towards meeting SDG 7.1 – which is related to universal access to affordable, reliable, and modern energy by 2030 – electricity supply in all Nile countries except Egypt is still inadequate, and large segments of the population have no access to electricity, in particular in rural areas. The goal to ensure universal access in a region with high population growth and an upward trend in socio-economic development, points towards rapidly rising demand for electricity in the coming decades.

It is evident that long-term power demand cannot be met with hydropower alone. However, the combined Nile countries have adequate alternatives to achieving energy security. The continuous reduction of costs of other renewable technologies – such as geothermal, wind, and solar is worthy of note. These increasingly cost-effective technologies are poised to make up a growing share in the optimal power-generation mixes in the Nile countries.

The dependency on hydropower generated from Nile waters is high in some countries, including Ethiopia, Sudan, and Uganda. In the short-term, this dependency will further increase in Ethiopia and Uganda. By contrast, Egypt obtains only about 6% of its electricity from hydropower. The average for all Nile countries is 22%.

Climate change carries considerable risks to energy supply in countries with a high dependency on hydropower, since the direction and magnitude of the change of flow of the Nile and its tributaries – because of a changing climate – has not yet been established but could be significant. Nevertheless, it is expected that the dependency on Nile waters for energy supply will progressively decrease in the longer term, with the expected diversification of the energy production mixes in combination with the establishment of functional regional power markets.

Important progress is being made in establishing regional power grids, and in linking the Nile Basin countries to regional grids such as the Southern African Power Pool. Work to construct transmission infrastructure between several riparians and other grids is ongoing and scheduled for completion soon.

Additionally, the application of off-grid and mini-grid systems offers an increasingly viable and cost-effective alternative for electricity access in rural areas and could encourage a shift towards decentralised systems. As it will reduce the rural populations' dependence on biomass energy sources, this development will have major positive implications for the environment. In this regard, one could argue that the link in the Nile Basin between energy security and environmental protection is stronger – at least in the longer term – than the relation between energy security and water security.

Photo: Boris Rumenov Balabanov / World Bank

The combined developments described above – diversification of energy production, functioning power markets, and decentralised systems in rural areas based on renewable technologies – substantially strengthen the supply of reliable and affordable energy in the Nile Basin. They also provide the mechanisms to absorb a possible reduction in hydropower in circumstances where climate change – or upstream consumptive water development –led to less or more variable water resources.

Hence, the key challenge to achieving energy security in the Nile Basin is currently related to mobilising large investments for power generation, transmission, and on-grid distribution, rather than with the availability of water resources.

IMPERILLED ECOSYSTEMS

« Investment in and across different economic sectors is required to achieve water security in the Nile Basin »

« Important water-related ecosystems stretch across several Basin countries, and the NBI is key in coordinating and aligning national efforts to protect them »

« National and transboundary initiatives have made considerable advances in safeguarding water-related ecosystems but more efforts are needed as pressures grow rapidly »

The rich natural resources and outstanding biodiversity in the Nile Basin face unprecedented threats. Rivers, wetlands, lakes, and forests provide various ecosystem services that form the foundation of livelihoods for millions and the Basin's economy, which is based largely on subsistence farming. To safeguard them for decades to come, the protection of water-related ecosystems needs to be at the heart of decisions in the management and development of water resources.

Rapidly growing populations and economic growth drive the demand for food. Consequently, rivers and wetlands increasingly compete with agriculture for sufficient fresh water, which is the lifeline of these ecosystems. Meanwhile, more and more dams regulate the Nile River.. Progress concerning environmental flows – a key tool for protecting the flow regime of freshwater ecosystems – is slow. Only Tanzania and Kenya have integrated environmental flows in policies. Recently completed or currently constructed hydropower dams have not been guided by environmental flow assessments. In the backdrop of a planned five-fold increase in hydropower capacity by 2050 – and most of which is associated with large scale water storage, there is an urgent need to expand work on environmental flows. Additionally, enforcement of environmental water targets has generally proved challenging.

Land-use change has contributed to significant loss of wetlands and forests in the Nile Basin. Agriculture is the main driver behind the increasing need for land, yet the expansion of urban areas is becoming increasingly important too. Moreover, unsustainable agricultural practices such as overgrazing or the over-exploitation of fuelwood or fish stocks are a considerable cause of degradation of many water-related ecosystems. Significant progress in protecting water-related ecosystems has been achieved. However, protected areas and restoration projects cover too little of the rivers, wetlands, lakes, and forests, and are often inefficiently managed. Unprecedented pressure from human activity hence requires a significant ramping up of conservation efforts.

Pollution is a rapidly increasing threat to water-related ecosystems in the Nile Basin. Discharge of untreated wastewater and sludge, fertilizer and pesticides from farming, and sediments from land degradation comprise the prime pollutants. They cause direct mortality of species, the destruction of habitat, or changes in aquatic plant composition. Water-quality problems are predicted to grow as more people live close to rivers, wetlands, and lakes. To keep them at bay in the future, the Nile Basin countries need to expand wastewater collection and treatment and redouble efforts to control nutrients, sediments, and pesticides across the watershed.

In summary, the drivers of environmental degradation are growing in the Nile Basin. While policies and management interventions are improving, measures to preserve water-related ecosystems are generally weak and their scope is inadequate. It is noted that implementing many of these measures – such as increasing access to cheap electricity or strengthening the enabling environment for good land husbandry – falls within the mandate of agencies outside the environmental and water domain. This emphasises the multi-sectoral dimension of protecting water-related ecosystems.

IMPROVING RESILIENCE TO CLIMATE CHANGE IMPACTS

Recent climate projections (IPCC, 2018) predict that the Nile region is subject to a warming and more variable climate. The main climate impacts over the Basin are manifested in 1) increased aridity, 2) higher temperatures, 3) more frequent and more severe flooding, 4) more frequent and more intense droughts, and 5) higher variability of rainfall and associated streamflow. However, the extent of future climate change in the Nile region is yet unclear, and different parts of the Basin will be affected in different ways.

Changes in rainfall patterns remain uncertain and vary per region and sub-region. While some models tend to predict a rainfall increase in the equatorial regions and over Sudan, there is little consistency between models, and projections of future mean rainfall are subject to high uncertainty. Because river flow in the main Nile tributaries – specifically those originating in the Eastern Nile region – is very sensitive to a small shift in mean rainfall, the changing rainfall patterns could have considerable impacts on the availability of water resources. However, the magnitude and direction of possible change is still unclear, and model runs show a wide range of outcomes for all sub-basins. By contrast, there is high confidence that higher temperatures lead to increased reservoir evaporation losses.

In any case, climate change is impacting on the water resources in the Nile Basin and could impair the functioning of the economic, livelihood, and natural systems that are reliant on them. The Nile Basin is highly vulnerable to climate impacts because of high poverty levels, the expansive and fragile dryland zone, low water-storage capacity, poor farming practices in the large rainfed area, and the large rural population – still expanding in absolute numbers – that is reliant on the natural resource base for its livelihood.

Thus, in face of significant uncertainties about future climate, strengthening resilience to climate impacts is important in order to meet diverse socio-economic development goals and preserve the progress made so far. In the context of the Nile Basin, strengthening climate resilience will also strengthen resilience to the natural variability of the climate and a broad variety of other climatic, socio-economic, and environmental disturbances. Thus, improving Basin resilience to climate impacts will have multiple co-benefits related to poverty alleviation, sustainable development, catchment management, food security, and associated development objectives.

The analysis of the state of resilience to climate impacts in the Nile Basin reveals that preparations are currently inadequate, and that climate change poses a serious risk to the people living in the Nile Basin.

Specifically, the large rainfed agricultural sector is very vulnerable to climate impacts. Farmers are almost totally unprepared to cope with more unpredictable weather and more frequent dry spells of uncertain duration. Higher risks of crop failure will impede agricultural modernisation and hamper the crucial objective to improve yields in rainfed farming. This has adverse consequences for rural development, poverty alleviation, land degradation and environmental sustainability, and rural-urban migration. Additionally, it is unlikely that food security in the Nile Basin – specifically for the large and growing rural population – can be achieved without improving crop yields, which is becoming more difficult because

« To enhance resilience, NBI is assessing the climate of major water systems and sectors in the Nile Basin »

« Climate change poses serious risks to the social, economic, and environmental systems of the Nile Basin »

« Rainfed agriculture is most vulnerable to climate change and least prepared to cope with its impacts »

« Pastoralism has been generally resilient to climate variability but it is vulnerable to extreme droughts that could lead to conflicts over land and water »

« The energy sector is better prepared for the impacts of climate change due to the mix of energy sources and power trade »

« To mitigate the impacts of climate change, the scaling up of no-regret measures is a sensible course of action »

« Multilateral cooperation promises more benefits and rewards than ever before »

of climate impacts.

Preparations in the pastoralist sector are also inadequate. No measures are in place for improved land management, herd management, or post-drought herd reconstitution. It could compromise the economic viability of the pastoralist lifestyle and encourage rural-urban migration, since economic opportunities outside the pastoralist sector are generally poor in the dryland zone.

The irrigated agricultural sector is unprepared for a scenario in which Nile flows decrease. In the case of bulk water deficits, no mechanisms exist to utilize or manage the remaining water resources over the existing schemes in an equitable and reasonable manner and through a negotiated process, or to systematically reduce the water requirements of irrigation.

Climate resilience in some sectors has improved in recent years. Progress has been made in protecting people and ecosystems in the Main Nile valley and Blue Nile valley against flooding, while the dependency on Nile waters for energy supply will progressively decrease in the longer term with the expected diversification of the energy production mixes, in combination with the establishment of functional regional power markets.

A sensible course of action in an environment with high uncertainty – caused by the unpredictability of the future rainfall and hydrologic regime – is to focus on so-called measures of 'no-regret' that strengthen climate-change resilience while simultaneously contributing to overall development objectives. Robust no-regret measures are effective in a wide range of future weather scenarios. Improved land husbandry, soil and water conservation, small-scale supplementary irrigation, increasing water-storage capacity, and protection of wetlands and other water-related ecosystems that can buffer hydrologic variability are prime examples of effective no-regret measures that create resilience to the high natural climate variability in the Nile Basin while strengthening climate resilience.

The challenge is to scale up climate-change adaptation measures quickly enough to make a significant impact. This will be a daunting task in view of the scale of the action required, but also because the extent of future climate change is still uncertain. However, most measures that strengthen climate change resilience are simultaneously contributing to overall development objectives and are part of existing policies and programs. Accelerated implementation of these 'no-regret' measures by the respective technical agencies is a sensible course of action. It will involve setting up incentive mechanisms to motivate individual actors to implement climate adaptation measures.

Transboundary water resources management is a useful and strategic element of climate-change adaptation. While coordinated flood management is being considered by the riparian countries, limited progress has been made in reducing reservoir evaporation losses through coordinated dam operation. Transboundary action is also required for data collection, data and information sharing, flood forecasting, and for drought early warning.

It is emphasised, however, that most measures to strengthen climate resilience need to be implemented at national level.

Failure to adequately strengthen resilience to climate impacts could have potentially large adverse implications for the ecological, economic, and social systems in the Nile Basin.

TRANSBOUNDARY WATER GOVERNANCE

A scarce and shared resource requires careful management. Ensuring water security for all uses and preparing for climate change requires substantial managerial resources. The capacity for water governance in some Nile countries is affected by factors such as insufficient staffing, insufficient funding, inadequate enforcements of water regulations, insufficient data and modelling tools, shortages of funds for investment in water infrastructure, etc. This situation poses a risk to achieving water security and is a matter of concern.

What is promising is that almost all Nile countries have institutionalised most elements of integrated water resources management (IWRM) in order to address the multi-sectoral dimension of water security and avoid fragmentation.

Managing increasing water stress and competing water uses is complicated by the transboundary nature of the Nile water resources. In the absence of agreed-upon mechanisms for sharing water resources – and the associated benefits – there is the potential for conflict among the Nile Riparian States. However, the findings of this report suggest an active and constructive political commitment to transboundary cooperation by all the Riparian States. This is a critical prerequisite to achieving progress on enacting the Nile Basin Cooperative Framework Agreement and thus securing the sustainability of the transboundary water governance arrangements on the Nile.

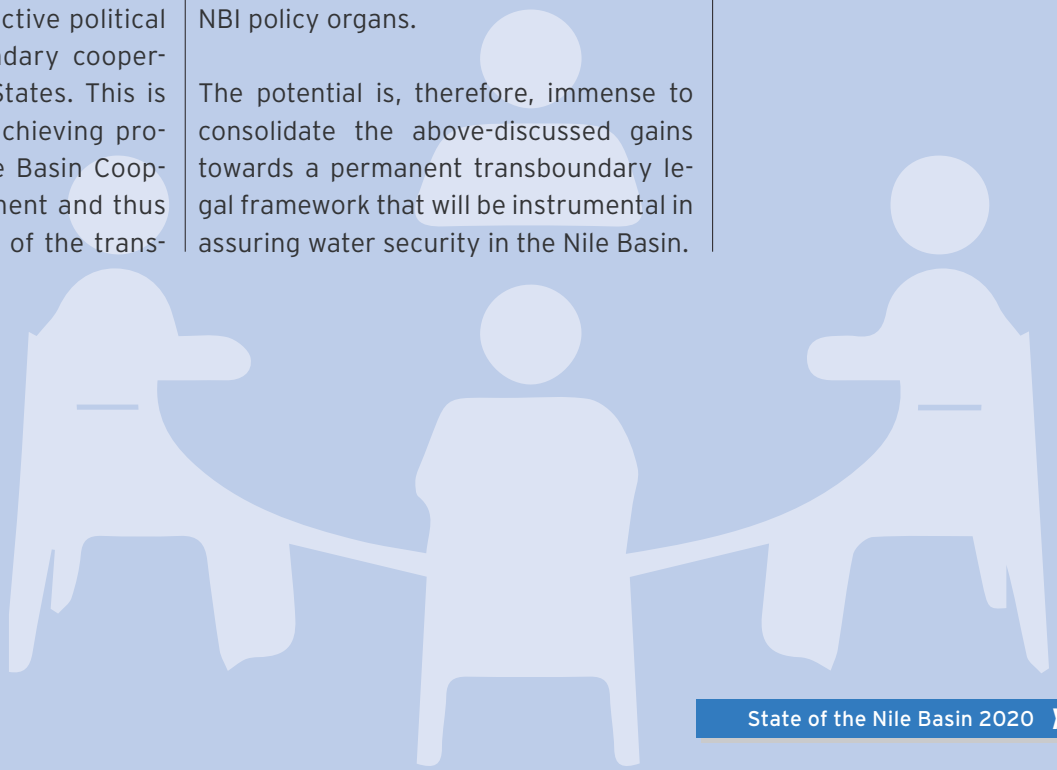
Progress has further been made to strengthen the capacity for transboundary water governance. Functional institutional arrangements are in place in all countries to deal with transboundary water issues. Transboundary water management considerations are, generally, adequately reflected in the policies, laws, strategies, and action plans of individual Riparian States, while a very large number of Nile Basin nationals have been trained in skills required for transboundary cooperation.

Cooperation within the framework of NBI has further enhanced the infrastructure and information that can contribute to achieving water security in the Basin. Identification, development and implementation of transboundary investment projects has resulted in shared benefits and opportunities for further enhancement of trust and cooperation. Additionally, a common and neutral modelling platform – the Nile Basin Decision Support System – has been established that supports policy review and trade-off analysis by the individual states and the NBI policy organs.

The potential is, therefore, immense to consolidate the above-discussed gains towards a permanent transboundary legal framework that will be instrumental in assuring water security in the Nile Basin.

« Business as usual will not deliver the full benefits of transboundary cooperation »

« Effective mechanisms for transboundary water cooperation are emerging and the NBI has played a prominent role in this process »



CONCLUSION

<< There are a number of ways of achieving water security in the Nile Basin but not enough progress has been made in implementing these measures >>

Relative to the number of people living in the Basin and the size of the catchment area, the Nile is a small river in terms of volume of discharge.

Most of the renewable surface water resources in the Nile Basin are used, predominantly for irrigated agriculture in the Basin. Water use for domestic and industrial purposes is small in comparison, while water used for hydropower production is modest because the primary purpose of the main constructed reservoirs -- is to provide irrigation water. It is probable that water availability is already insufficient for ecosystem protection in the Nile Delta.

Since demand for water continues to rise because of population growth and socio-economic development, water resources in the Nile Basin are under rapidly growing pressure. Additionally, there is considerable risk that fresh water downstream of major urban areas will become heavily polluted – and thus become de facto unusable – because of exponentially increasing volumes of wastewater due to urbanisation and industrialisation.

Nevertheless, the Nile countries are in possession of a considerable set of options to achieve water security. These include, but are not limited to:

- extending the productive use of the large rainwater resources;
- improving irrigation efficiencies;
- importing virtual water through food imports;
- reducing large food losses;
- using non-conventional water sources for M&I supply;
- reducing reservoir operation losses through enhanced cooperartion and coordinated reservoir operation; and
- conjunctive use of surface and groundwater.

Thus, while relative water scarcity is real in the Nile Basin, it does not inevitably translate into negative consequences for the diverse ecological, economic, and social systems in the Nile countries.

However, to date there is limited progress in implementing the measures that are available. Specifically, improving water productivity in the critical agricultural sector remains one of the measures that could potentially contribute to water security in the Nile Basin.

Rapids in the Victoria Nile, Uganda

Photo: istock

ONE RIVER ONE PEOPLE ONE VISION

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