

The Water Resources Investment Strategy (WRIS)

Shire River System, Malawi

Lake Malawi and the Shire River system is Malawi's largest water resources and provides essential water to sectors that are key to Malawi's development and economy, including power, agriculture, public water supply, fisheries and navigation. Agriculture is the pillar of Malawi's economy and also the country's largest water consumer, with approximately 79% of water used for irrigation. The availability and reliability of water resources are vulnerable to factors such as seasonal rainfall, invasive aquatic weeds, sedimentation, catchment degradation and climate change, which pose big threats on the country's food security. There also exists a strong link between water resources and energy generation in the context of Malawi's long-term development objectives. Around 98% of Malawi's grid electricity is generated by hydropower plants on the Shire River. As the local economy develops and population grows, the power demands rapidly increase potentially beyond Malawi's current energy generation.

The strong and sustainable economic growth and infrastructure development is key to reducing poverty in Malawi. The Water Resources Investment Strategy (WRIS) which has been developed aims to assist Malawi in delivering sustainable water resources management and development in order to achieve both national and international development targets.

The WRIS consists of two distinct phases. Component I contains a Water Resources Assessment (WRA) of the whole of Malawi, whilst Component II analyses, determines and prioritises the water sector interventions required to facilitate economic growth. The emphasis of the WRIS is on the development of multi-purpose investments that seek to meet a range of water needs for productive purposes, i.e. economic development (in agriculture, industrial/commercial, energy etc.), and at the same time help to deliver water supply requirements.

The issue

Case background/context

The Lake Malawi-Shire River hydrological system represents Malawi's single most important natural resource system. The Shire provides water for a number of productive purposes, including: hydropower, agriculture, fisheries, transport, tourism, urban water supply and rural water users along the length of the river, in addition to various environmental functions.

Agriculture is the pillar of Malawi's economy. With 85 percent of the population residing in rural areas, agriculture accounts for over 80% of employment, over one-third of GDP, and about 80 percent of merchandise exports. Agriculture is the largest water consumer, with approximately 79% of water used for irrigation annually. Dependency on water makes agricultural activities vulnerable to erratic rainfall patterns in Malawi. The resulting droughts and floods have cumulatively affected

millions of people and caused loss of lives, infrastructure destruction, crop failure, and sanitation problems.

Besides agriculture, water also has large stakes in the energy sector. Around 98% of Malawi's grid electricity is generated by hydropower plants on the Shire River. Yet, the current installed hydropower capacity is less than the growing demand and unable to meet peak demand owing to frequent equipment breakdown and environmental factors such as sedimentation and increasing aquatic weed growth. It was estimated that only 8% of the population (approximately 30% of urban households and less than 1% of rural households) has access to electricity. The planned expansion of generation capacity within the middle Shire cascade would further increase dependence on the Shire River for power generation.

High population density and poverty have led to significant human pressure on the environment and degradation of the Shire Basin's natural resource base, notable land and forests. The growing population expands land area under cultivation and exploits forests and woodlands for firewood and charcoal production. Deforestation, soil erosion and sedimentation form the most serious threats to the environment and natural resource base in the Shire River Basin, resulting in the increased incidence of erosion, run-off and flash floods. High loads of sediment are deposited in river beds, reservoirs and floodplain wetlands, affecting irrigation canals, fisheries and hydropower generation. Water resources are increasingly degraded through silt loads, sedimentation, eutrophication, biological contamination and effluents. These problems are a direct result of catchment degradation, unsustainable land use and management practices, and increased use of chemical fertilizers without complementary soil and water conservation measures.

The response

The main objective of the case

In order to equip Malawi with the ability to deal with the challenges ahead relating to continued resource scarcity, economic growth and poverty reduction, it is essential to use and manage the country's water resources sustainably and efficiently. The Water Resources Investment Strategy (WRIS) was introduced to achieve such goals. The emphasis of the WRIS is on the development of investments that aim to meet a range of water needs for productive purposes, i.e. economic development (in agriculture, industrial/commercial, energy etc.), and at the same time help to deliver water supply requirements. Within this context, the specific objectives of the WRIS are:

- To analyse the economic development objectives of the country and how water resources affect the country's achievements in economic growth and poverty reduction;
- To identify key water-related challenges for the country's economic development in the medium and long-term;
- To set-up priorities for water sector interventions in time and geographically; and
- To identify priority water resources sector investments.

In the assessment, Malawi's drainage system was divided into 17 Water Resources Areas (WRAs) and these WRAs were further subdivided into 78 Water Resources Units (WRUs). The nature and capacity of the current water infrastructure and the water supply-demand situation across Malawi

was analysed by WRU. The WRAS aims to provide a basic assessment of the potential impacts on the current and possible future status of Malawian water resources.

The WRIS built on the work carried out on WRAS, and went on to assess the role of water resources in the investment through analysis of the key water-reliant industries, such as irrigation and hydropower. Special attention was paid to the Lake Malawi-Shire River system and the hydro-economics of water uses by sector and location. The constraints and opportunities that water resources placed on economic development were explored at a Water Resource Area (WRA) scale. This included the need for increased water storage for irrigation and the hydrological constraints on hydropower development and irrigation.

Specific objectives of the WRIS were to analyse the economic development objectives of the country and how water resources affect the country's achievements in economic growth and poverty reduction; identify key water-related challenges for the country's economic development in the medium and long-term; set up priorities for the water sector interventions in time and space; and to identify priority water resources sector investments.

The results

Outcomes

Policies and projects have been put forward to implement recommendations from WRIS. In the revised draft of Malawi National Irrigation Policy and Development Strategy (NIPDS), the need for using a nexus approach was acknowledged by highlighting cross-disciplinary co-ordination to develop mutually beneficial development proposals as part of a coherent water policy framework in Malawi. An example reflecting the spirit in the strategy is the South - Shire Valley Irrigation Project (SVIP), which can establish both sustainable smallholder farming and commercial farming while abating devastating annual floods along the Shire River Valley. The concept of this project is to draw water from The Kapichira Power Station (a hydroelectric power plant on the Shire River) through a main canal passing through a 100 metre above sea level contour canal along higher ground to the west the Shire River up to Bangula in Nsanje, which can feed small water canals into the valley for irrigation farming. In times of heavy rain this main canal can carry water above Kapichira to Shire River below Ruo River thereby leaving room for water from the eastern Shire Highlands or Thyolo escarpment to flow into the Shire River, reducing the negative effect of heavy flooding. This is a market oriented project, inclusive of smallholders and public-private partnerships, to improve water and energy efficiency in the agricultural production from north of the Chikhwawa district headquarters to Bangula in Nsanje, where irrigation depended on the water pumped directly from the Shire River.

In response to the expansion of industry in the cities, as well as the anticipated significant increase in population, the Lilongwe Water Board commissioned New Water Source Feasibility Studies in its areas. The recommendation in the feasibility study was to invest in a multipurpose dam on the Diamphwe River, designed to supply drinking water to Lilongwe and also for irrigation and fisheries. The Malawi government in 2015 has already provided \$43 million to the Board. The government is also working with other international financiers like World Bank and African Development Bank



(AfDB) to mobilise more funds. The Diamphwe project is planned for implementation by 2018 and is meant to enable the Lilongwe Water Board to meet demand for water supply in the city until 2040.

A high level economic analysis has been undertaken analysing the costs and benefits of the use of water resources by different sectors. The rationale for this is to inform prioritisation of water 'use' and consequently water resource investments. The results will indicate relative economic priorities of key water-using sectors in Malawi (irrigation, hydropower and public water supply) in terms of both the economic value of water use where trade-off is required and economic internal rates of return on investment in each sub-sector. This analysis framework will play an important role in informing investors of potential costs for different sectoral uses of water and identify optimal sectoral allocations of water to yield the largest net benefit to the Malawian economy as a whole.

References

ATKINS and Wellfield (2011), *Water Resources Investment Strategy, Final Report, Component 2*

ATKINS and Wellfield (2011), *Water Resources Investment Strategy, Main Report, Component 1 – Water Resources Assessment*

Scott Hendrick (2014), *Overview of the Water-Energy Nexus in the United States*. <http://www.ncsl.org/research/environment-and-natural-resources/overviewofthewaterenergyxexusintheus.aspx>

Kingsley Jassi (2015), *Lilongwe Water Board needs K125bn for Diamphwi dam*, <http://www.times.mw/lilongwe-water-board-needs-k125bn-for-diamphwi-dam/>