



CIWA LEARNING NOTES

BASIN

IMPROVING WATER QUALITY IN LAKE VICTORIA BASIN

BREAKING THE CYCLE OF CLIMATE VULNERABILITY

The World Bank conducted a study in 2021 which looked into the causes of degradation of water quality in Lake Victoria and explored potential engagement areas to improve it. The study documented global and regional lake restoration lessons and recommended a longterm, multi-country strategy for the Lake Victoria Basin (LVB), in the following areas: catchment management, sanitation, industrial pollution management, and water quality monitoring, with livelihood support, gender equity, and social inclusion mainstreamed in this work. The study found that:



Lake Victoria basin. Image credit: World Bank Geo Watershed Generator

- Further deterioration of water quality in the LVB will have spiraling and mutually reinforcing negative impacts on poor LVB residents' poverty and vulnerability to climate change and other shocks.
- Current efforts to address the complex issues causing environmental degradation in the Basin are relatively small-scale, shortterm, and uncoordinated across activities, stakeholders, and donors.
- Addressing these issues requires a long-term, comprehensive, holistic, multi-donor, and multistakeholder approach to leverage, catalyze, and coordinate public and private investments to monitor and improve water quality

and strengthen institutional capacity and infrastructure while keeping the community at the center.

The World Bank is uniquely placed to address the scale and complexity of the challenge given its extensive sectoral and regional expertise, ability to fund large investment projects, experience working in fragile and conflict situations, knowledge about gender and social inclusion, and ability to bring together international donors.

The proposed interventions are estimated to cost around US\$10 billion over 10 years.



Figure 1: Cases and Impacts of Environmental Degradation in lake Victoria Basin

A summary of the causes and impacts of environmental degradation in the LVB (Figure 1):

The main sources of pollution (red-bordered white boxes) are *sediment* from land degradation and erosion from upstream forest and agricultural areas; waste from artisanal gold mines and aquaculture; fecal, liquid, and solid wastes, and untreated industrial effluents from urban areas around the lake and upstream. Such pollution has different impacts (e.g., increases in water hyacinth, pollution of groundwater, contamination of domestic water supplies, destruction of wetlands, and fish-spawning grounds) that ultimately worsen water quality in the lake and rivers feeding into it (increasing biological and chemical oxygen demand (BOD & COD), fecal coliform, nitrogen, phosphorous, heavy metals, sediment, turbidity, etc.). Worsening water quality contributes to a reduction in fish stocks and biodiversity in the lake, deterioration of lake-based livelihoods (e.g., fishing, selling fish, navigation), adverse health impacts (e.g., increasing water-borne diseases), an increase in conflicts (e.g., overfishing areas, and between pastoralists and farmers), worsening climate impacts (e.g., flooding of lakeside settlements, displacing peoplefrom floods and droughts) and affects the drivers of vulnerability (migration, poverty, food security, fragility, violence, gender discrimination and social exclusion) - all of which *increase the vulnerability of the Basin population to climate change*. This cycle of worsening climate vulnerability is detailed below.

ENVIRONMENTAL DEGRADATION IN THE LAKE VICTORIA BASIN

The LVB supports a large and rapidly growing rural population, including internally displaced persons (IDPs) and refugees, most of whom live in extreme poverty. Food insecurity is increasing, and rising population pressure is causing unsustainable land use and habitat degradation. Growing economic pressures are increasing agrichemical and sediment inflows into the lake. Fisheries support livelihoods of people living around the lake but decreasing fish catch (due to pollution and over-fishing) and increasing competition are reducing employment, including in fish-processing (e.g., drying and smoking) and related occupations (e.g., eateries selling food) that used to employ thousands of women. While social exclusion affects several populations within the LVB, women and girls face significant gender gaps, and are vulnerable to HIV/AIDS and other deleterious health and social outcomes. LVB countries are, or are located near,



fragile states, with population and economic pressures increasing conflict.

Lake Victoria provides several critical functions. Besides diluting human and industrial wastes, the lake provides water for domestic, industrial, and agricultural use; cost-effective and affordable shipping and transportation routes; bulk storage for hydropower potential; unique aquatic and terrestrial biodiversity, and fish stocks, which provide a major economic activity and a significant source of protein for sustenance. But the complex interplay of pollutants from upstream rural and agricultural areas with cities and informal settlements around the lake and elsewhere in the LVB impacts water quality and quantity, fish stocks, biodiversity, human health, and, finally, the vulnerability of the Basin population to climate change and other shocks.

Causes of ground and surface water pollution

Four main causes: Sediment from various forms of land degradation (e.g., deforestation, over-cultivation or over-grazing, and soil erosion); agrichemicals (Nitrogen and Phosphorus from fertilizers and livestock wastes and chemical pesticides and herbicides); industrial effluents (including toxic chemicals and heavy metals from industries such as breweries, tanning, paper, fish processing, sugar, coffee, slaughterhouses, mines, and processing activities), and human waste (including raw sewage from open defecation and poorly treated waste from sanitation systems, untreated wastewater from households, and solid waste). Nearly half the pollution into the lake is from human settlements and industrial activities.

Impacts

- Destruction of wetlands: Agricultural development, extraction of sand and clay, and the disposal of industrial and human waste have resulted in the destruction and/or degradation of LVB's fragile natural wetlands (which. provide fish-breeding grounds, support a rich diversity of flora and fauna, and perform several important ecological functions). Mining removes resources from the land, increases labor migration, and often pollutes the environment, which can acidify the land and waterways.
- Worsening river and lake water quality: Data for the LVB is generally poor, but indicate an increase in eutrophication and algal blooms (reducing

oxygen levels and thus harming fish and other lake flora and fauna); rapid growth of water hyacinth (choking waterways and making it difficult for fishermen to access the lake); increasing lake water salinity and turbidity (affecting lakeside agriculture and preventing fish from mating), and reducing fish stocks and biodiversity (compromising the ecosystem's ability to function and provide resources).

- Worsening fishing-based livelihoods, disproportionately affecting women: Overfishing and environmental problems caused fish stocks to decline by 33 percent in just one year (from 2015 to 2016) - with a further drop expected since then and related economic losses to communities that depend heavily on lake fisheries. Declining water levels also reduce fish stocks available for fisheries, in turn decreasing food availability for fish-reliant communities. While growing commercialization and industrialization drove many fish-processing plants away from lake-side areas (depriving women of traditional economic activities) increased scale and regulations have forced many women who previously dried fish for a living out of the fishing industry. Women who set up profitable fish-based enterprises tend to lose out when reduced catch increases competition (causing more men to enter the market and, with greater access to capital than women, to corner women out of the market).
- Increased disease burden for poor people, especially women and children: Health impacts from drinking polluted water are often highest for poor people, whether they are rural, urban, or periurban, or living in lakeside settlements or on lake islands. Those in the informal settlements or fishing villages often are forced to defecate in the lake and, in the absence of alternatives, use the same water for drinking, cooking, and other domestic purposes - exposing them to water-borne diseases. Early childhood diarrhea contributes to high levels of stunting, which in turn affects children's cognitive development and performance at school and can also be deadly. Lack of proper school sanitation facilities leads to high absenteeism and dropout rates, especially for girls. While those who drink or handle the polluted water (e.g., fishermen, car washers, and sand miners) are prone to waterrelated diseases (e.g., malaria, diarrhea, cholera, typhoid, dysentery, schistosomiasis, and worms), some groups tend to be more affected than others. These include poor people, women with HIV/AIDS, children who play around the shores of polluted

water bodies, and those who are already socially disadvantaged and may not be able to afford or access health facilities.

- Continued water quality deterioration seriously impacts the livelihoods and health of poor and vulnerable populations in a vicious cycle: Most of the people living in the Basin are poor and lack access to alternative forms of capital and livelihoods. Combined with rapid population growth and external shocks, this leads to high natural resource dependency, contributing to water quality degradation (as crop lands are overworked, forests depleted, unsuitable land cultivated, groundwater overutilized, and waterways polluted). Deteriorating water quality further exacerbates poverty and vulnerability-(by reducing land and human productivity, undermining livelihoods, contributing to disease, and straining the adaptive capacity of resource-dependent communities), thus creating a vicious cycle of vulnerability and natural resource degradation (see figure 2).
- The LVB is extremely susceptible to climate change: Climate change will exacerbate chronic

poverty and natural resource dependency, and climate-related migration is expected to worsen natural resource degradation. Burundi and Rwanda have been ranked among the countries most vulnerable to climate change impacts. Factors that worsen living standards or increase exposure to natural hazards and climate shocks increase vulnerability to climate change. In the LVB, such drivers of climate change risk include worsening poverty, rising population growth (including from migration and internal displacement), low levels of employment opportunities and economic growth, urbanization (in the context of reduced livelihood opportunities), increasing fragility, conflict and violence, gender discrimination and social exclusion (including gender-based violence), rising food insecurity, deteriorating health conditions, and natural resource degradation.

The compounding effect of reinforcing and cyclical impacts of deteriorating water quality on poverty and vulnerability to climate change highlights the critical urgency of development





TAKING ACTION TO IMPROVE WATER QUALITY IN THE LAKE VICTORIA BASIN

Potential engagement

Details of promising approaches are available in three companion Notes:

- Note 2: Waste Management covering sanitation and industrial waste management
- Note 3: Sustainable Land and Water Management including soil and water conservation
- Note 4: Social & Livelihood Development including fisheries, gender, youth, and social safety nets

Levels of engagement

Based on factors such as the subsidiarity principle, economies of scale, the logic of collective action, and the realization of regional public goods, interventions are possible at different levels:

- Regional activities: These include the coordination of water quality data collection, analysis, synthesis and sharing; harmonization of policies and standards; coordination of policies affecting water quality in the Basin; capacity-building programs with shared resources and experts; feasibility studies, and coordination of national-level implementation. A detailed assessment and targeted capacity enhancement to overcome identified institutional and other weaknesses is, however, a prerequisite for any regional action.
- National activities: Implementation by national Ministries will build capacity, increase convenience, and resonate better with on-the-ground realities. National implementation – based, for instance, on regional feasibility studies of civil works – will include procurement, supervision, and construction of infrastructure; monitoring, evaluation, and course correction; coordinating across institutions, and strengthening capacities, awareness, and motivation of government staff.

Local activities: This critical level for stakeholder engagement must ensure that the community (including women and other socially excluded populations) remains central in all program activities – through trained teams implementing gendersensitive and inclusive activities, including targeted, sensitive awareness-raising and capacity-building, and support for monitoring, livelihoods enhancement, and post-project sustainability.



Activity planning

A preparatory phase to *define*, *update*, *and strengthen regional protocols*, *provide technical*, *logistical*, *and other support* (e.g., for regional coordination through LVBC, regional project preparation by Nile Equatorial Lake Subsidiary Action Program (NELSAP) or the Nile Basin Initiative (NBI), and national Ministry-level implementation preparation); *demonstrate proof of concept* for key activities; and create templates for scaling up and funding by non-Bank financial institutions – with a subsequent expansion phase to set up national programs to reach scale.

- No-regret' entry points: Across relevant sectors, these include actions that *address a significant driver of poor water quality* that will, on its own, meaningfully improve the health and/or livelihoods of communities dependent on the lake; that are *responsive* to government-led intervention and can influence at scale; that are holistic, engaging appropriate institutions and integrating cross-sectoral issues such as gender, social inclusion, fragility, conflict, and the environment, and that clearly demonstrate *additionality and regionality*.
- Preparatory phase activities: An environmental and social benefit cost analysis will estimate costs of inaction and benefits of interventions at regional and country levels and thus demonstrate the economic and financial benefits of proposed interventions. Such an analysis will show that including lake water quality improvement benefits for related projects (e.g., a conventional urban sanitation project) will increase Net Present Values and Internal Rates of Return since beneficiaries who can enjoy cleaner lake water now include the *entire* spectrum of lakeside residents.



FOR MORE INFORMATION:

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