

Executive summary

The East African Rift Valley Lakes (EARVL), GIWA region 47, runs from the northern end of Lake Turkana Basin to the southern tip of the Lake Malawi/Nyasa Basin and includes all the natural habitat and associated human communities found within the Rift Valley and on the adjacent escarpments (Figure 1). It encompasses parts of the following countries; Ethiopia, Kenya, Sudan, Uganda, Tanzania, Rwanda, Burundi, Democratic Republic of Congo (DR Congo), Zambia, Malawi and Mozambique. The main lakes include Victoria, Tanganyika, Malawi, Turkana, Albert, Edward, George and Kivu. All are tropical and together comprise the African Great Lakes ecoregion. However, each lake lies within its own separate drainage basin, with its own assemblage of endemic organisms, most notably the cichlid fish species-flocks. Each lake differs substantially with respect to limnology, catchment dynamics and human impacts (Hamilton 1982).

For the purpose of GIWA assessment, the following lakes that are characteristic of most of the transboundary water bodies in the region were selected for the exercise: Lake Turkana, Lake Victoria, Lake Tanganyika and Lake Malawi. These are the largest of the East African Rift Valley lakes and are among the oldest lakes in the world. All these lakes are extremely sensitive to climate change.

Lake Turkana, the largest closed-basin lake is up to 115 m deep, moderately saline and alkaline, and lies in a topographically closed basin located in the arid northwestern part of Kenya, though the delta of the Omo River, the principal affluent, lies within southwestern Ethiopia. Lake Victoria is, by area, the second largest lake in the world and the largest in Africa, though relatively shallow, with a maximum depth of 80-90 m. More than 80% of its water input is derived directly from rainfall on the lake surface, and about 7% flows from the western side of the basin through the Kagera River. It is drained by the Nile River from Owen Falls on its northern rim. Lake Tanganyika is the longest lake in the world (673 km) though only 12–90 km wide. Its average depth is

570 m, with a maximum depth of 1 470 m, making it the world's second deepest lake. The lake drains westwards through the Lukuga River into the basin of the Congo River. Lake Malawi is long and narrow, the fourth deepest inland water body in the world (700 m) and the world's fourth largest body of freshwater. It drains southwards via the Shire River to the Zambezi Basin.

Lakes Victoria, Tanganyika and Malawi are famous for their endemic species flocks of cichlid fishes. Lake Tanganyika hosts a large flock, estimated to include more than 700 cichlid fish species (Snoeks 2000). Lake Malawi's total fish fauna comprises some 800 species, more than any other lake in the world, and nearly all of its cichlids are endemic (Ribbink 2001). Lake Victoria's formerly rich cichlid fauna has become drastically reduced in recent decades.

The EARVL region is home to some of the poorest communities in the world. Most of the Lake Turkana Basin is populated with pastoralists, mostly nomadic, but a few are fishermen. The lower Omo Valley supports subsistence agriculturalists in the north and agro-pastoralists in the south extending to the Kenya border. In the catchment area as a whole, the population is estimated at 15.2 million out of which 12.3 million live in the Ethiopian part of the catchment. The Basin is the poorest and has the lowest population density and economic activity of all the other large lake basins of the region. The Lake Victoria Basin is the most heavily populated basin, and supports one of the densest rural populations in the world. An estimated population of roughly 30 million people whose incomes are estimated to lie within the ranges of 90-270 USD per capita per year live in the Basin. The catchment is mainly agricultural, though most of the population living along the lakeshore relies directly or indirectly on the fishing trade. An estimated 10 million people reside in the Lake Tanganyika catchment (UNDP 2000); outside urban centres, subsistence and small-scale commercial fishing and farming dominate people's livelihoods (Quan 1996, Meadows & Zwick 2000). In the Lake

Malawi Basin, Malawi's land area is densely populated at 116 persons per km² (UNEP-IETC 2003) representing 80% of the total lakeshore population (World Bank 2003).

It is only during the past 10 years or so that the East African countries have instituted, at government level, policies on the environment that adopt an integrated and sustainable approach to environmental management. New national environmental policies/acts have been enacted in both Ethiopia (1997) and Kenya (1999), and environmental authorities have been set up to implement the policies which seek to promote sustainable environmental management and development. The new Kenya Water Act (2002) provides for the establishment of Water Resources Management Authorities that will have wide-ranging powers to manage and protect water resources at river or lake basin scales. International conventions and agreements that Kenya, Uganda and Tanzania are signatories to, or subscribe to, include: Technical Cooperation for the Promotion of the Development and Environmental Protection of the Nile Basin (Tecconile), Initiative for Nile Basin Management, the Convention for the Establishment of the Lake Victoria Fisheries Organisation (LVFO), the Agreement on the Preparation of a Tripartite Management Program for Lake Victoria, and the Treaty establishing the EAC. The international conventions and agreements include: the Convention on Wetlands of International Importance (Ramsar), the Convention for International Trade in Endangered Species of Wild Fauna and Flora (CITES), the Convention on Conservation of Biological Diversity, and the Code of Conduct for Responsible Fisheries (CCRF).

The assessment identified the priority GIWA concerns for Lake Turkana as Habitat and community modification and freshwater shortage; for Lake Victoria the priorities were Pollution and Unsustainable exploitation of fish and other living resources; and for the lakes Tanganyika and Malawi the priority concerns were identified as Unsustainable exploitation of fish and other living resources and Habitat and community modification.

The Lake Victoria Basin was chosen for Causal chain and Policy options analyses on account of the diverse, linked issues and complexities that have contributed to its environmental degradation, as well as the interventions that have been initiated in order to address and mitigate the environmental degradation. Because of the similarity of environmental problems affecting the East African Great Lakes, as well as similarities in the socio-political, economic and health status of the various riparian countries, the Lake Victoria Causal chain and Policy options analyses presented in this report are considered to be applicable to the other basins of the region. For Lake Victoria, under

the concern Unsustainable exploitation of fisheries and other living resources, overexploitation and destructive fishing practices were identified as key issues; under the concern Pollution, the important issues identified were microbiological, eutrophication, chemical and suspended solids. It was, however, noted that the issue "suspended solids" had several components that were interrelated with the microbiological, eutrophication and chemical issues, having both synergistic and cumulative effects in their association. The suspended solids issue was, therefore, nested in the microbiological, eutrophication and chemical issues.

In the Causal chain analysis for Lake Victoria, the root cause of Unsustainable exploitation of fish resources was identified as the existence of a market for fish, both domestic and, more importantly, export. Other root causes are inadequate regulation, poverty, poor institutional and legal arrangements, low civic education and awareness, low management capacity by communities, availability of market for undersized fish, and corruption. Whereas these root causes lead to unsustainable exploitation practices for subsistence fishing, in most cases profit is the main factor driving the process. The environmental degradation of the Lake Victoria Basin over the last three decades (due to high population, massive algal blooms, water-borne diseases, water hyacinth infestation, oxygen depletion, introduction of alien fish species etc.) has been determined as placing a present value of 270–520 million USD at risk to the lake communities, if the large export fishery for Nile perch was lost (World Bank 1996). The collapse of the Nile perch fishery may become a reality sooner rather than later in the event that things are left in a "business as usual" scenario.

The principal causes of Pollution in Lake Victoria lie in its catchment areas in both urban and rural settings. The role of the Kagera River as a main contributor of suspended solids, nutrients and water hyacinth is an extremely important consideration when evaluating policy options for sustainable management of the Lake. Untreated industrial and municipal effluent together with agricultural run-off are the main contributors of microbiological and chemical pollution and are a source of nutrients contributing to eutrophication, while suspended solids are derived from erosion of degraded catchments, riverbanks and lake-edge environments due to poor agricultural practices and high grazing intensities. All these contaminants make the Lake water unfit for recreation, consumption and other uses, unless a huge processing cost is incurred. Pollution destroys habitats for freshwater life forms while at the same time making them unavailable for nutritional purposes. For the majority of people living by the lake shore and subsisting by fishing, this implies that malnutrition and health problems will entrench themselves and exacerbate the deepening poverty among their ranks.

The feasibility of policy options in the Lake Victoria is looked upon in conjunction with the establishment of the regional integration of the East African Community (EAC 2000). The East African Community offers a good prospect for the success of the proposed policies, in that it provides a conducive environment for Kenya, Uganda and Tanzania to work together towards common goals. Some means are required in order to incorporate both Burundi and Rwanda in the management structure of the Lake since, even though they do not share the lake shore, they form a significant part of the Lake's catchment area and are a principal polluter, being the source of the highest sediment load and the original entry point for water hyacinth.

Policy options that address overexploitation of fish are:

- Quota for fishing
- Quota for processing
- Review of the rules and regulations and existing policies
- Civic education and awareness

Policy options that address destructive fishing practices are:

- Strengthening monitoring and enforcement of restrictions; enforcing the rule of law;
- Provision of civic education and awareness; empowering and involving more communities in management;
- Imposing size restrictions on fish processing factories;
- Provision of credit to artisanal fishers.

Policy options that address the issues of pollution are:

- Accreditation of analytical laboratories for standards enforcement;
- Liberalisation of waste disposal activities to involve the private sector and communities;

- Revision of regulations in urban planning that have not taken into account environmental issues, and improvement of monitoring and enforcement;
- Improvement of natural resource management and farming practices through training, governance and agricultural technology;
- Stronger vetting of technology promoted by national and international agencies;
- Strengthening enforcement of regulations for mandatory effluent treatment in municipalities and industries;
- Incorporating all stakeholders in the drafting of regulations and in monitoring and enforcing agreed regulations;
- Integration of institutional framework, regulations and laws at two levels: national and regional;
- Creation of a public complaints institution with powers to investigate and recommend prosecution;
- Enforcing compliance with international conventions e.g. Ramsar, CITES, and the Biological Diversity Convention of Agenda 21;
- Strengthening the capacity of National Environmental Protection Authorities to enable a more effective enactment of legislation by providing trained manpower and sufficient funding.

The successful implementation of these policy options will never be achieved without involving, in a participatory manner, the communities living on the lake shores who depend on fishing as a source of subsistence livelihood and income generation. Capacity building in terms of civic education and leadership and management skills will enhance this empowerment.