



[Water. Power. Conflict.](#)

Big Lake, Big Problems

Is There Still Time to Secure the Water
Resources Lake Victoria Provides?

[Daniel El-Noshokaty](#)

Lake Victoria is essential to the lives of over 30 million people. Water pollution, resource exploitation and a lack of regional cooperation are threatening its ecological balance. The situation is exacerbated by the high population growth rate. There are justifiable doubts as to whether the future of the essential water resource provided by Africa's largest lake is secure.

The sustainable utilisation of the transboundary water resources presents a particular challenge to developing countries. This is illustrated very strikingly by the example of Lake Victoria. Any changes affecting the lake – and therefore water resources – directly impacts the three countries bordering its shores, namely Kenya, Tanzania and Uganda. Indirectly, Burundi and Rwanda also play a role, as important tributaries to the lake originate from these countries. Developments relating to the lake also indirectly affect the three countries of South Sudan, Sudan and Egypt, as they are located on the only river emerging from the lake, the White Nile. The water of Lake Victoria is consequently not only of local and regional but also transregional significance. If the sustainable management of water resources in this region fails, this will have serious repercussions for all the people, animals and plants depending on the Lake Victoria ecosystem.

Significance for the Environment, People and the Economy

Lake Victoria is Africa's largest lake and the second-largest freshwater lake in the world. It lies within the borders of Kenya, Tanzania and Uganda and covers an area of 68,800 square kilometers. Its total catchment area extends over some 500,000 square kilometers. Lake Victoria is of outstanding significance, both from an ecological and a socioeconomic perspective. It is the defining element of the region's ecosystem and essential to the lives of the people living in the lake's vicinity. It is estimated that the lake supplies some ten million people in towns and villages on its shores with drinking water. In addition, the water is needed for livestock and to irrigate farmland.

Purely on account of its size, it comes as no surprise that Lake Victoria is of significant importance for the climate system of eastern Africa. It has a direct impact on the amounts of rainfall in the region. Simulations indicate a direct correlation between the lake surface temperature and the amount of rainfall in the surrounding area.¹ A permanent change in lake temperature would lead to unpredictable changes in the amounts and locations of precipitation. Even very small climatic changes can have huge repercussions for the region's agricultural production and therefore people's livelihoods. A shift in the precipitation pattern would also have a significant impact on the amount of water present in the lake, as over 80 per cent of its water comes directly from rainfall.

While the average water temperatures of Lake Victoria fluctuate little throughout the year, they have been increasing steadily over the last few decades. The average surface temperature on the Ugandan side of the lake increased by an average of 0.5 degrees Celsius during the period from the 1960s to the late 1990s. This may not appear dramatic at first sight, but it puts a highly complex regional climate system under pressure to change. Models show that a 1.5 degree rise in temperature can result in some areas in the lake's surroundings receiving up to 100 per cent more average annual rainfall, others therefore correspondingly less.²

Lake Victoria also represents one of the essential economic factors of the riparian countries. According to estimates by the East African Community (EAC), over three million people in the

lake's surrounding areas depend directly or indirectly on fishing and the fish-processing industry for work. As a large proportion of the Lake Victoria perch caught in the lake is destined for export, the fishing industry represents a means of generating foreign currency revenues. Particularly for Tanzania, it is a significant economic factor and source of employment. But decades of over-fishing and worsening environmental pollution are leading to steadily declining catches and consequently impacting negatively on people's economic situation.

Lake Victoria is essential to the livelihood of millions of people.

The lake is also used for electricity generation, particularly in Uganda. The hydroelectric power stations at the dams on the White Nile in Nalubaale, Bujagali and Kiira generate up to 630 megawatts of electricity a year. A further two power stations are under construction at Isimba and Karuma, with a joint planned capacity of 780 megawatts of hydroelectric power per year.³ Consequently, the Ugandan energy generation from renewable sources depends to a considerable extent on water from Lake Victoria. Uganda generates by far the greatest amount of electricity from hydropower out of the three riparian countries. While Kenya also uses hydropower commercially to some extent, it increasingly uses water from the tributaries and from the lake for its expanding agricultural production.

Lake Victoria is not least an important transport route, as the road infrastructure does not provide an adequate and reliable means of linking the most heavily populated towns situated on the lake and the industrial centers. Most of the transportation of goods as well as passenger traffic in the region take place across the water.

The Numerous Problems Affecting Lake Victoria

There are a number of different reasons why the lake's ecosystem and therefore the livelihood of the people living around it have come under pressure. The water quality has deteriorated steadily over the last few years, partly because the urban infrastructures have not been able to keep pace with the rapid population growth. Establishing adequate wastewater disposal systems in particular represents a huge challenge, which is why large amounts of wastewater are still being fed into the lake untreated.

One of the consequences of the untreated wastewater is the spread of water hyacinth. While it is still unclear how it got into the lake in the first place, it has developed into a massive problem over the last 30 years. The plant was discovered for the first time in the Ugandan part of the lake in 1988 and then spread massively in several waves. Its growth is greatly promoted by the fertilisers and manure in the wastewater from agriculture. The water hyacinth covers the lake surface and prevents light and oxygen from penetrating. Besides fishing, its spread also hinders shipping and hydroelectric power generation. In 2000, the World Bank put the economic losses caused by the first cross-border spread of the weed in 1997 at up to ten million US dollars. The plant spread so rapidly that the trade conducted at the port of Kisumu in Kenya, which ships had problems reaching, shrunk by 70 per cent.⁴

Direct as well as indirect pollution represent the greatest problem for Lake Victoria. Wastewater from industrial plants, which is generally treated inadequately, is discharged into the lake.⁵ Particularly in the larger urban centers of Tanzania, this is still the case to date. Besides wastewater from industry, wastewater from private households and livestock farming exacerbates the situation further. Up to 80 per cent of the phosphorus ending up in the lake originate from untreated or insufficiently treated wastewater. Although there have been some efforts made over recent years to reduce the volume of untreated wastewater, the existing pollution

abatement facilities are not even remotely sufficient to stop the increasing pollution of the lake's water. There is also a lack of reliable data quantifying the problem in such a way that the number of additional pollution abatement facilities required could be determined. The water pollution also carries serious health risks for the people living around the lake. Up to 70 per cent of the local population use water from the lake unfiltered either directly as drinking water or in farming, for irrigation or for watering the livestock.⁶

At around 75 per cent, wastewater from agriculture is the main source of the lake's increasing nutrient pollution load. Wastewater from the region's agriculture is subject to virtually no treatment. Although fertiliser use is still relatively modest, the United Nations already found over ten years ago that the increasing professionalisation of the cultivation of coffee, cotton, rice, sugarcane and tobacco was resulting in an increase in fertilisers and other chemicals in the water.⁷ The soil erosion resulting from improper soil utilisation, deforestation and drainage of wetlands has further increased the nutrient load through sediments carried into the lake. As a consequence of this overloading with nutrients, the amount of algae in the water is now five times of what it was in the 1960s. The most telling proof of this becomes apparent by the fact that visibility in the water is now one metre at the most compared to around five meters in the 1930s.⁸

Furthermore, waters in tropical climate zones generally exhibit a lower oxygen content than those in moderate latitudes and are therefore more vulnerable to pollution by an excessive nutrient content. Areas of wetland, of which there were a great many around Lake Victoria, were able to counteract this by binding nutrients and sediment and thus acting as important filters. With the expansion of agriculture, the growth of settlements, falling water levels and the transformation of wetlands into land suitable for cultivation, this filter system is steadily losing the ability to perform its job. And so, the nutrient load continues to increase.⁹ If

this development cannot be reversed, the problem of nutrient overload in the lake will continue to deteriorate.

The increasing nutrient overload from fertilisers also represents a risk to food security as it affects fish stocks. For people living around Lake Victoria, the local fish is an essential source of protein. Changes in catch sizes and the quality of the fish therefore have a direct impact on the food security of the local population and consequently also on their health.

Increasing soil erosion is another of the many problems to be mentioned. Estimates vary greatly in part, once again due to the lack of reliable empirical data. However, even the most conservative estimate puts the amount of fertile soil lost to erosion each year at some 20 million tonnes. And the situation does not appear to be getting any better. To be able to satisfy the needs of the ever-growing population, new land is being developed continuously in all three riparian countries, putting further pressure on the lake's ecosystem.

Where the threats to the region's environment are concerned, one must also mention that there are substantial reserves of mineral resources in the region, particularly on the Tanzanian side of Lake Victoria. Tanzania is one of Africa's major exporters of gold, the extraction of which has steadily increased over recent years.¹⁰ Besides the mines operated by international mining companies, there are many small-scale operations mining for gold in the direct vicinity of Lake Victoria. Many mines do not apply the environmental standards that would prevent the gradual pollution of the groundwater. While the extent of water pollution through mining is relatively limited for now, there are some signs of negative impact on the ecosystem.

Another serious problem is Lake Victoria's falling water levels, having reduced by an average of more than two meters since 2002, a development that has very serious repercussions for water quality and for the lake's fauna. Falling water levels intensify the concentration of the

Fig. 1: Lake Victoria and Surrounding Area



Source: Own illustration based on Natural Earth ©.

nutrient load and pollution. Many fish species need the protective wetlands on the lake shores to spawn. The lake water's decrease has also meant that fish can no longer reach the previously accessible breeding grounds of mosquito larvae and thus control their population. This has led to an increase in the numbers of these insects and a rise in cases of malaria.¹¹ In addition, the problem of falling water levels has negative consequences for the daily lives of the people living near the lake shores and for their economic activities. The water supply for Mwanza, the largest city on the Tanzanian lake shore, thus had to be temporarily restricted because one of the three waterworks could no longer pump sufficient water from the lake. Trade routes are also affected as ships can no longer enter all the harbours or only do so with a reduced load on board.

To explain the falling water levels of Lake Victoria, most studies point to the correlation between lower rainfall, higher temperatures and increased evaporation as well as changes affecting the rivers feeding the lake. The water levels of most inland bodies of water are to a large extent dependent on the quantities of water that flow into and out of them. This is not the case for Lake Victoria. Inflowing water only contributes some 15 per cent of the lake's water, while over 80 per cent comes from rainfall. That makes the water levels highly vulnerable to changes in precipitation or lack of rainfall. However, the studies don't agree on how much rainfall has reduced over the last few decades and on the extent to which the lack of rainfall has affected the water levels in concrete terms.¹² The experts similarly disagree about whether and, if so, to what extent temperatures have risen in the region. While the EAC has concluded that the average temperature at the lake rose by up to one degree Celsius in the period from 1960 to 1990, later studies could detect no further increase. Once again, there is a glaring lack of reliable data and studies for the region, which makes it difficult to come to any generally accepted conclusions on the basis of empirical and scientifically analysed data.

But meteorological factors alone cannot be solely responsible for the falling water levels. In 2008, the Global Environment Facility (GEF) found that the falling water level was at least partly due to the high volume of water being extracted.¹³ Since the first hydroelectric power station in Uganda was completed in the mid-1950s, the water flowing out of Lake Victoria has been fully controlled. As Egypt's water supply relies exclusively on the constant water level of the Nile, the North African country and Uganda concluded an agreement in 1954 after the construction of the first hydroelectric power station, that has become known as the Agreed Curve. This states that the natural conditions of Lake Victoria should have priority over energy generation. The agreement therefore allows Uganda to generate electricity from hydropower provided that the lake's water level maintains its natural balance. In practice, this agreement did work until the beginning of the 2000s, but there has been increasing doubt of late whether Uganda is still adhering to it. There is sufficient data available for the period between 2000 and 2006 indicating that the water level should have remained constant in view of the amounts of rainfall in this period.

Uganda's failure to adhere to the Agreed Curve could be an explanation for the drop in the lake's water level. Although the Ugandan side refuses this, the country's continuously rising demand for electricity and the steady expansion of the hydroelectric power stations suggest that the need to generate power in Uganda exceeds the scope determined by the Agreed Curve. The few data and studies that do exist also indicate that there is a correlation between the extraction of water exceeding the volume limits under the agreement and the falling water levels in Lake Victoria.¹⁴

High Population Growth All Around the Lake

While the above-mentioned problems are serious enough for themselves in driving the negative developments, the continuing high rate of population growth in the region is exacerbating

the situation further. With a constant growth rate of three to four per cent in rural areas and five to ten per cent in urban areas, the population around the lake in 2020 is likely to be twice as high as in 2006.¹⁵ This applies equally to Kenya, Tanzania and Uganda, because while their growth rates differ slightly, growth in the vicinity of Lake Victoria is twice as high as the national average in all three countries.¹⁶

The high rate of population growth in the region is considerably exacerbating the problems affecting Lake Victoria.

Despite the high growth rates in the urban centers, the majority of the population continues to make their living from agriculture and the fishing industry. The relative poverty of the people living off agriculture makes them dependent on water from the lake while simultaneously acting as something of a catalyst for the above-mentioned environmental problems.

The massive growth of the urban and rural population places considerable pressure on the three riparian states.¹⁷ Providing basic services alone takes them to the limits of their capabilities. And the situation forces them often enough to choose short-term economic gain over long-term solutions for sustainable resource use. Due to the prioritisation of energy generation from hydropower and the exploitation of the natural resources, the natural balance at Lake Victoria, which was already under great pressure, has become even more precarious over recent years. If this development is not stopped in the near future, it will lead to a scarcity of usable water in the long term.

Multilateral Approaches

As a transregional organisation, the EAC has a particular interest in developing multilateral approaches that include all member states and





Source: © Alec Jacobson.

can contribute to solving the described problems. One of the key elements of the EAC's strategy is the so-called Lake Victoria Environmental Management Project (LVEMP). This is the first project to involve the government departments of all three countries dealing with the relevant topics and to get personnel from Kenya, Tanzania and Uganda to collaborate. The aim of the project established in 1992 was to cast a vision for the sustainable management of the lake basin as well as finding compatible and individual solutions to the existing problems.¹⁸

The most important projects of the LVEMP include the development of a database for the fishing industry by the member states, the setting up of three laboratories for performing quality inspections on the fish catches, taking

measures to curb the spread of the water hyacinth by 85 per cent, monitoring water quality, reforestation measures as well as maintaining the wetlands. In addition, the project has established the first reliable database to monitor and track the lake's water quality and initiated the enhancement of wastewater treatment plants.

The first nine-year phase of the LVEMP was concluded in December 2005. The EAC and its member states, which now numbered five,¹⁹ had recognised the need for further harmonisation of national and regional environment policies and improved cooperation and so a second project phase was started in August 2009 – with support from international donors. This phase, scheduled to run until the end of 2017, focuses on three key areas. Firstly, a multilateral agreement




Source: © Alec Jacobson.

on the sustainable use of water resources and of fishing in Lake Victoria was to be prepared. Secondly, the pollution of the lake through wastewater from industry and agriculture was to be reduced while simultaneously establishing an effective network of wastewater treatment plants in the urban centers. Thirdly, the local population as well as local administration staff were to be sensitised and informed about the approaches to solve the existing problems.

The first phase of the LVEMP can be considered a success insofar as the national efforts made in the riparian countries of Kenya, Tanzania and Uganda were bundled under one umbrella for

the first time to devise joint solutions for problems that the countries cannot overcome by themselves. Thanks to the project, it has been possible to take cross-border measures for battling the water hyacinth and to conduct the first studies on fishing in the lake, making a direct positive impact on the lives of large numbers of people living in the lake's vicinity. Achievements of the second phase of the LVEMP to be mentioned include a reduction in soil erosion and in the influx of nutrients from the most important tributary, the protection of some wetlands and the sensitisation of parts of the local population.



for the region's future development. If this cannot be remedied, there is a risk that people living around Lake Victoria will no longer be able to use its water. While the affected countries have held various discussions about these two points, bilaterally and within the EAC, they were not able to come to an agreement, let alone any implementation, and to effect a noticeable improvement of the situation.

National Approaches

Besides transregional efforts, each of the three riparian countries is pursuing its own national approach involving various activities to try and address the problems. In Kenya, the National Environment Management Authority (NEMA) plays a crucial role in matters relating to environmental protection in and around the lake. In addition to the national implementation efforts relating to the LVEMP, NEMA conducts a programme for the rehabilitation of the rivers flowing into the lake, which contribute just over 38 per cent of the entire inflow. To this end, protection zones are being established at the rivers' shores and measures are being taken to encourage the renaturing of wetlands. The enhancement of local solutions for wastewater purification is given particular priority. NEMA also works in the area of waste prevention and proper waste disposal. It further makes efforts to sensitise the local population to the problems and has established regional environment committees that have a say in environmental matters.

Nevertheless, the two most significant deficiencies of the LVEMP have also become very noticeable over the course of the two project phases. First of all, the involved countries cannot seem to make common cause in matters where they are in competition with each other or maintain that only their own interests are affected. This can be seen particularly clearly in connection with the two described problems of falling water levels and overfishing, which were not included in the agenda of either the first or the second project phases. Then there is the issue of the efforts made by the LVEMP being inadequate in view of the size of the problems. The failure to address these two deficiencies has direct repercussions

In Tanzania, there has been national legislation on environment management in force since 2004. But this is widely ignored – particularly where fishing, agriculture and mining are concerned. Environmental protection also does not receive much attention at a political level, as the relevant sets of rules are often regarded as obstacles to the country's development. Tanzania loses some 300,000 hectares of forest every year to the creation of new arable land as the demand for wood and charcoal for domestic cooking purposes is constantly rising. This also affects the region around Lake Victoria. The few environmental measures are conducted almost exclusively as

part of the LVEMP. They focus on the rehabilitation of the country's most important tributary, the Mara River. A 60 metre protective corridor was set up along its banks where agriculture is now forbidden. But there is still no comprehensive environmental policy or national initiative for sustainable fishing in place in Tanzania.

The majority of the Ugandan environmental protection measures in the Lake Victoria region are connected with or complement projects conducted as part of the LVEMP. Besides the efforts aimed at harmonising local standards and regulations, one key area being addressed is proper waste disposal in the urban settlements bordering the lake. At the same time, work is being done on improving wastewater treatment and making the population aware of sustainable and ecologically compatible possibilities of generating an income. This involves awareness campaigns conducted in rural areas and in schools. Finally, there are also some reforestation projects to counter the continuing soil erosion.

All in all, there is little appreciation of the magnitude and urgency of the existing problems evident at the political level in all three riparian countries. Environmental policy does not receive priority, and funding is consequently low. Nor does the topic feature to any large extent in the political discourse between government and opposition. It is therefore mainly international donors, but increasingly national NGOs as well, that address the issue and demand, and achieve, changes at the local level.

Conclusion

The described challenges relating to Lake Victoria are diverse, complex and interlinked. Deteriorating water quality and levels, increasing nutrient loads and pollution, shrinking wetlands, decreasing biodiversity and the spread of water hyacinth pose a number of risks to the lake's ecosystem and the health of currently 30 million people who depend on its water and resources. The rapid population growth adds to the difficulty in producing an accurate forecast of the region's future.

To put in place long-lasting and sustainable measures to resolve the problems, Kenya, Tanzania and Uganda must in the first instance considerably increase their national environmental policy efforts – also in terms of funding – as well as collaborating more closely to develop effective solutions. While the LVEMP programs of the EAC have made some headway in the fight against the water hyacinth and the compilation of baseline data, progress has only been made in the areas where the three countries have overlapping interests. Politically sensitive issues have not been addressed. Particularly where the rapidly falling water level and the problems from overfishing are concerned, effective multilateral cooperation to protect the resource of water has proved impossible. National efforts have also been inadequate.

Overcoming the problems in the long term will require closer cooperation between Kenya, Tanzania and Uganda.

In the worst-case scenario, failure to meet the above-described challenges may lead to a situation where the falling water levels exacerbate the environmental pollution in the region, the supply insecurity where clean water is concerned deteriorates and, as a result, the economy suffers. In the long term, a lack of the resource of water may lead to mass migration and to conflicts among the region's population, estimated to rise to around 60 million people. In the best-case scenario, the successful LVEMP projects will encourage better cooperation between the three riparian states, which may then put the crucial points on the agenda of a third phase of the programme to be set up in 2018 or of the EAC's programme and which could implement sustainable proposals to solving the problems. This would illustrate the capability of these countries to prioritise securing the livelihoods of their populations and protection of the environment in the entire region for the long term over short-term commercial interest.

The way things are currently, however, suggests that not enough efforts are being made to protect the water resources Lake Victoria offers.

Daniel El-Noshokaty is Head of the Konrad-Adenauer-Stiftung's office in Tanzania.

The images in this article are part of the photo project "End of Frenzy" by photographer Alec Jacobson. They depict the difficult everyday life of fishermen at Lake Victoria. The entire photo series is online at: <http://alecjacobsonphoto.com> and http://instagr.am/alec_jacobson.

- 1 Cf. Anyah, Richard O./Semazzi, Fredrick H. M. 2004: Simulation of the sensitivity of Lake Victoria basin climate to lake surface temperatures, in: *Theoretical and Applied Climatology* 79, pp. 55-69.
- 2 Cf. *ibid.*
- 3 Cf. Wakabi, Michael 2013: New hydro projects to ease Uganda's power costs, *The East African*, 12 Oct 2013, in: <http://bit.ly/2y2jl9i> [9 Aug 2017].
- 4 Cf. Mailu, Andrew M. 2001: Preliminary Assessment of the Social, Economic and Environmental Impacts of Water Hyacinth in the Lake Victoria Basin and the Status of Control, in: Julien, M. H./Hill, M. P.: *Biological and Integrated Control of Water Hyacinth*, pp. 130-139, <http://bit.ly/2h5OTHS> [15 Sep 2017].
- 5 Cf. Kiwango, Yustina A./Wolanski, Eric 2007: Papyrus wetlands, nutrients balance, fisheries collapse, food security, and Lake Victoria level decline in 2000-2006, in: *Wetlands Ecology Management*, Dec 2007.
- 6 Cf. Lubovich, Kelley 2009: Cooperation and Competition: Managing Transboundary Water Resources in the Lake Victoria Region, Working Paper No.5, p.7, in: [http://bit.ly/2y2\]btF](http://bit.ly/2y2]btF) [9 Aug 2017].
- 7 Cf. United Nations Environmental Programme (UNEP) 2006: *Africa Environment Outlook 2*, in: <http://bit.ly/2eZTaIL> [9 Aug 2017].
- 8 Cf. Lubovich, n.6, p.8.
- 9 Cf. Kasime, Frank/Saunders, Matthew J./Loiselle, Steven A. 2007: Functioning and dynamics of wetland vegetation of Lake Victoria: An overview, in: *Wetlands Ecology and Management* 15:6, pp. 443-451.
- 10 Cf. Mdee, Ombedi John 2015: Potential of artisanal and small-scale gold mines for economic development in Tanzania: A review, in: *Academic Journals* 7:2, pp. 11-18, <http://bit.ly/2ybph0u> [9 Aug 2017].
- 11 Cf. Minakawa, Noboru/Sonye, Gorge/O Dida, Gabriel/Futami, Kyoko/Kaneko, Satoshi 2008: Recent reduction in the water level of Lake Victoria has created more habitats for *Anopheles funestus*, in: *Malaria Journal* 7, p.119.
- 12 Cf. Awange, Joseph L./Ogalo, Laban /Bae, Kwang-Ho/Were, Paul/Omondi, Philip/Omute, Paul/Omullo, Monica 2008: Falling Lake Victoria water levels: Is climate a contributing factor?, in: *Climate Change* 89, pp. 281-297.
- 13 Cf. Lubovich, n.6, p.14.
- 14 Cf. Kiwango/Wolanski, n.5.
- 15 Cf. Lubovich, n.6, p.9.
- 16 In Kenya, it was 2.56 per cent in 2016, in Tanzania 3.09 per cent and in Uganda the population grew by 3.29 per cent in 2016. Cf. Google Public Data 2017, 21 Jul 2017, in: <https://goo.gl/gGPhE3> [9 Aug 2017].
- 17 Cf. also: Michailof, Serge 2016: Programmed Explosion? The Potential Consequences of the Rapid Population Growth in Sub-Saharan Africa, *International Reports* 4/2016, in: <http://kas.de/wf/en/33.47597> [9 Aug 2017].
- 18 The first phase of the project, scheduled to run until the end of 2005, was funded by the United Nations (37 million USD), the World Bank (48 million USD) and the three member states (10 million USD).
- 19 Rwanda and Burundi joined the project in 2007.