

# Preventing urban runoff into lake victoria environmental sciences essay



**ASSIGN  
BUSTER**

## **Abstract**

Lake Victoria covers a surface area of 68, 800 km<sup>2</sup> and is the world's second largest freshwater lake in the developing world. Lake Victoria is important for the bordering countries for transportation, water supply, fisheries, waste disposal, recreation and tourism. Despite this, the Lake has been facing environmental problems caused by; untreated sewage, human and animal waste discharged into the lakes, maritime transport waste and direct contamination of lake water by human activities on the shore line. Lake Victoria also suffers from urban runoff carrying pollutants from industrial and domestic wastes leading to Sediment loading and siltation of the lake. This paper analysed the causes, effects of urban run off as well as mitigation measures to combat the problem. To this end, the DPSIR Framework and Stakeholder Rainbow Diagram were used. Based on the DPSIR Framework the causes of urban run-off were found to be population growth, poor infrastructure, increased industrial activity, increased urban agriculture and policy gap. These leads to pressures such as disposal of wastes, emission of fertilizers and pesticides, emission of expired medicines, etc. These resulted in increase of the cost of purification and treatment, loss of potential revenue from tourists and transportation, health risks for the communities due to water borne diseases and shortage of clean water for domestic and industrial use. The stakeholder Rainbow Diagram result showed that different types of stakeholders are involved with varying interest and influence. Finally mitigation measures were suggested as per the involved stakeholders. Key Words: Lake Victoria, DPSIR framework, Stakeholder Analysis, urban runoff

## **Definition of terms – Acronyms**

Algal bloom: " is a relatively fast growth of the population of (usually) phytoplankton and algae in an aquatic system." (www. biology-online.

org)Contamination: " the process of making something dirty, polluted, or poisonous by adding a chemical, waste, or infection." (www.

macmillandictionary. com)DPSIR: " Drivers- Pressures - Impacts - Responses"

Eutrophication: " The process by which a body of water acquires a high concentration of nutrients, especially phosphates and nitrates, it is a natural, slow-aging process for a water body, but human activity greatly speeds up

the process." (Art, 1993)Sediment: " Any particulate matter that can be transported by fluid flow and which eventually is deposited as a layer of solid particles on the bed or bottom of a body of water or other liquid." (www.

sciencedaily. com)Siltation: " The deposition of finely divided soil and rock particles upon the bottom of stream and river beds and reservoirs."

(http://en. mimi. hu)Viable: " Capable of success or continuing effectiveness"

(www. thefreedictionary. com)

## Table of Contents

**Abstract** .....  
..... **i**

### Definition of terms –

**Acronyms**.....  
..... **ii**

## Introduction

### Background information

Lake Victoria covers a surface area of 68, 800 km<sup>2</sup> and is the world's second largest freshwater lake in the developing world (Ntiba et al., 2001).

According to Ntiba et al., (2001), the three East African countries of Tanzania, Uganda and Kenya share Lake Victoria and its resources controlling 49%, 45% and 6% of the lake surface respectively. According to Odada et al., (2006) Lake Victoria Basin (LVB) is endowed with favourable conditions for agriculture; fishing and other economic activities making it the main source of livelihood for one the most densely populated rural area.

Lake Victoria is overexploited by the surrounding countries for transportation, water supply, fisheries, waste disposal, recreation and tourism (Odada et al., 2004 and Scheren et al., 2000). The Lake Victoria Basin is situated in one of the most populated and poorest rural regions in Africa. Nowadays 30 million people reside by Lake Victoria in its surrounding countries, Kenya, Uganda and Tanzania (Odada et al., 2006). According to Ntiba et al., (2000) the economic profits from the basin are generated by different activities, such as agriculture, livestock, forestry, tourism,

hydropower generation and transport where as the most important crops grown in the water parting including maize, cotton, sisal, tobacco, beans,  
<https://assignbuster.com/preventing-urban-runoff-into-lake-victoria-environmental-sciences-essay/>

sugarcane and coffee. He also cites a considerable escalation in industrial growth in the main urban centres near the lake such as Kampala and Entebbe in Uganda, Mwanza and Bukoba in Tanzania and Kisumu in Kenya contributing to pollution.

## **Problem statement**

As described in the introduction, Lake Victoria gives numerous ecosystem services to its beneficiaries. However, despite all these significant functions Lake Victoria has been facing environmental problems caused by; untreated sewerage, human and animal waste disposed into the lake, waste from boats and direct pollution of the lake water by human actions on the coast areas (Lake Victoria Basin Commission, 2008). According to Ogari (2001) urban and industrial wastewater, solid wastes, sludge from soil corrosion in the catchment area, wastes from agriculture and atmospheric deposition are the main nutrient sources to the lake. Lake Victoria is "international water" that is also affected by interlinked human activities such as overfishing, siltation from the erosion of deforestation of the watersheds, industrial pollution, eutrophication, and introduction of Nile perch which caused the extinction of 200 fish species (Odada et al., 2006 and Scheren et al., 2000). Water quality decline (oxygen depletion) was caused by the pollution from urban, industrial and agricultural activities which had an impact to the fish quantity of the lake (Ochumba and Kibaara, 1989 as cited in Scheren et al., 2000). The environmental degradation of LVB due to the unsustainable use of natural resources, massive algal blooms, waterborne diseases, water hyacinth infestation, oxygen depletion, introduction of alien fish species, etc., has led to economic decline of the significant sector of fish production (Odada et al.,

2006). The insufficient catches and the competition between the fish factories lead to severe problems in fish supplies. Lake Victoria also suffers from urban runoff caused by construction sites and solid waste from urban centres leading to high sediment concentration and siltation of the lake (Ntiba et al. 2000). Therefore, our aim will be to analyse the problem and propose viable solutions to be undertaken by the different stakeholders to prevent urban runoff to Lake Victoria.

## **Problem Assessment**

### **Results from DPSIR analysis**

#### **DRIVERS**

##### **Poverty**

The economy in the three surrounding countries, Kenya, Uganda and Tanzania is in a very bad state. According to the International Monetary Fund facts gross domestic product/capita was less than \$1000 for 2010 in all three of them. As a result infrastructures that characterize modern cities in terms of land use and sanitation systems are mostly absent. Characteristically, in the municipality of Kisumu, Kenya, where half a million people reside, only 10% have access to a conventional sewerage system, the rest use pit latrines and septic tanks (Mireri, C. et al, 2007). Untreated waste is diverted directly inside the lake leading to the disturbance of its ecological balance.

##### **Policy gap**

Poor economy results to an almost complete lack of structures in all levels technical, political and personnel. Elected politicians are not eager to enforce environmental laws that are probably not likeable to their voters

(Ooesterveer, 2010). Furthermore according to Tukahirwa (2010) the combination of too many collaboration plans between the public and the private sector regarding sanitation and waste treatment, corrupted politicians and insufficient funding has only escalated the problem. Finally, basic public services lack of elementary equipment, staff, staff evaluation, discipline, training and organization (NWSC, 2009).

### **Industrial growth – Urban agriculture**

The lake is home to a vast variety of marine organisms and also provides suitable conditions for the cultivation of many plants. Therefore, a growing number of industries and factories are already situated in the surrounding cities, such as Kambala in Uganda, Mwanza in Tanzania and Kisumu in Kenya (Scheren et al, 2000). However as there is no planning for industrial and agricultural zones or implementation of environmental laws, many industries and farms have inadequate, if any, waste treatment system. Consequently organic and inorganic waste is deposited untreated in the lake.

### **Overpopulation**

The developing industrial sector and the rich natural scenery have attracted many people to migrate there as unemployment percentage in the countryside is still very high. Because of the high rate of urban-rural migration (Mireri et al, 2007) the lake supports one third of the combined population of the three countries.

## **PRESSURES**

### **Emission of pollutants**

Pollution pressure has increased tremendously around the lake basin over the years. Pollution pressures are increasing and pollution impact by municipal and industrial discharges is visible in some of the rivers feeding the Lake and along the shoreline, such as the shallow Winam Gulf (Kisumu) and near Mwanza and Kampala in Tanzania and Uganda, respectively (Awange & Ong'ang'a, 2006). Source of pollution are the many industries dotting the lake shore urban centers namely fish processing, breweries, tanning, sugar and coffee processing industries abattoirs. Small-scale gold mining is increasing in parts of the Tanzanian catchment leading to mercury contamination of the waterway (Awange & Ong'ang'a, 2006) which affects the fish. He explains that the Lake receives sewage from a number of larger towns and small fishing villages dotting its shoreline. These compounds are known to cause cancer and genetic defects which in turn affect the human population after consumption through the endocrine disruptors that disrupt human processes that are controlled by hormones, including development, growth, and reproduction (American rivers).

### **Disposal of expired medicines and pesticides**

Toxic chemicals are discharged from urban and industrial areas surrounding the Lake: these are Kisumu and Homabay in Kenya, Mwanza and Musoma in Tanzania and Kampala, Entebbe and Jinja in Uganda (Scheren et al., 2000). He further points out that in Tanzania and Uganda, industrial wastewater treatment facilities are generally absent while in Kenya most factories operate treatment plants. It is worthwhile to note from experience that most



of the industries do not treat their waste water to the required levels before release to the lake. Other than urban and industrial areas, agricultural lands neighboring the Lake also contribute pesticides to the Lake. Indeed, the abundant sugar, coffee, cotton, maize, tea and rice plantations that surround the Lake contribute heavily in this regard as use is made of agro-chemicals(Awange & Ong'ang'a, 2006). These chemicals are toxic to water life and humans too.

### **Disposal of waste water and solid waste**

The World bank report of 1996 show that the lake basin is a natural source of food, energy, drinking and irrigation water, shelter, transport, and as a repository for human, agricultural and industrial waste (World Bank, 1996).

The populations around the lake have increased tremendously over the years and have increased pressure to the lake as a waste sink. About 90% of the municipalities rely mainly on pit latrines for the disposal of human waste with serious risk of water and soil contamination (Mireri et al., 2007). This has led to contamination of ground water as cross contamination of wells by pit latrines can occur through both underground seepage and overflow making it unsafe for both human consumption and livestock. Further, due to weak waste management urban rivers are exposed to risks of pollution by storm water (Mireri et al., 2007). During the rainy season the water table rises further and pit latrines fill up leading to overflow and underground seepage of human waste, thus contaminating water and soil asserts as very few household in the Lake Basin.

## **In appropriate land use**

Land around Lake Victoria is under continuous land use change. Most of the land owners around urban centre are change the land use of their mainly agricultural land to Commercial use to accommodate the expanding towns. According to a study by Musamba et al, 2011 " more land was used for various types of land use in Musoma Municipal in 2008 of which might be attributed to conversion of wetland areas to some land use type such as settlement and farms. This can be confirmed by the observed overall decrease (temporal and spatial) in wetland area at the average rate of 6. 45 ha per year (2001 to 2008) while areas of farmlands and settlements were increased by 12. 85% and 32. 76% respectively". This shows that land that initially used for protection of the lake is being converted to other land use for human settlement and economic gain.

## **STATE**

### **Amount of nutrients (Eutrophication)**

The continuous sedimentation and nutrient disposal to the lake from the urban and industrial run-off and also the deforestation in the water catchment areas over the last fifty years, have caused the severe eutrophication of Lake Victoria (Awange & Ong'ang'a , 2006).

### **Water quality**

Because of the eutrophication, Phosphorus and Nitrogen concentrations were increased and the coverage of algal blooms became five times larger than in the 1960s (Awange & Ong'ang'a, 2006). " A shift of algal flora composition

towards blue-green algae is causing deoxygenation of water" (Awange & Ong'ang'a, 2006).

### **Fish quantity & variety**

According to Awange & Ong'ang'a (2006), deep-water fish species have sharply declined and periodic upwelling of hypoxic water has caused massive fish kills. As a result, the fish variety (biodiversity) of the lake declines and the quantity of available fish to the fishermen are diminished.

### **Water hyacinth infestation**

The sedimentation problem of the lake in combination with erosion, caused by deforestation and destruction of the wetlands which normally act as sieves, cause ambient conditions in the lake (Awange & Ong'ang'a, 2006). These conditions are in favor of the dominance of Nitrogen fixing cyanobacteria and the extended spread of water hyacinth (*Eichornia crassipes*) (Awange & Ong'ang'a, 2006).

## **IMPACTS**

### **Water quantity and quality**

An increase in water hyacinth in lake Victoria leads to water shortage e. g. the water supply in Kusumu (Kenya) decreases from 20, 000 m<sup>3</sup> to 10, 000 m<sup>3</sup> leading the people to look for other water sources which is mainly untreated (Mailu, 2001 as cited in Odada et al., 2004). According to Mireri (2007) " Major industries in the municipality such as Kisumu Cotton Mills, Kenya Breweries, Kenya Matches and Fish Processing have closed down, while Miwani and Muhoroni Sugar industries have scaled down their operations due to lack of water to run their operations. According to Awange

<https://assignbuster.com/preventing-urban-runoff-into-lake-victoria-environmental-sciences-essay/>

& Ong'ang'a (2006) " Blocked intakes and loss of production at urban and industrial water supply systems is hindering the operations of small-scale horticultural irrigation schemes which had been implemented to help improve the incomes of women in Lakeshore areas." According to Odada et al., (2004) water hyacinth also affects the quality of water leading to high treatment cost.

### **Increased Health problems (water borne diseases)**

As it is indicated most of the people around the lake live below poverty, which is an indication for lack of alternative source for clean water, forced them to use the contaminated water. The increase in health risks for human beings from diseases such as malaria, bilharzia, typhoid, dysentery, and cholera is resulted from polluted water (for example Cholera kills 547 people in Kenya province Odada et al, 2004).

### **Economic decline**

Fishing is an important sector for the people around the lake. It serves as source of livelihood for the community, input for the fishing industry, means of revenue for the government and also food for the local community (Odada et al., 2004). Therefore a decrease in fish quantity implies loss of employment, revenue, shortage of input and food for those who depend on the lake. According to Awange & Ong'ang'a (2006) there is also loss of revenue from tourists since they avoid to come to the polluted lake. Increase of water hyacinth also affects transportation of inputs and outputs for the consumers as well as for the producers which significantly affect the economy of the bordering countries. According to Awange & Ong'ang'a (2006) commercial transportation, movement of people from one shore to <https://assignbuster.com/preventing-urban-runoff-into-lake-victoria-environmental-sciences-essay/>

other shore becomes riskier, costly and regularly delayed. High treatment cost also implies high cost of production and low profit for industries which may force them to reduce employment. Because of the water borne disease the countries also loss productive labor force which negatively affect the economy.

## **RESPONSES**

Lake Victoria and its surrounding areas have many problems, which must be treated properly in order to be solved. In relation to this, there are many measures that can be taken.

### **Cooperation between the stakeholders**

The administration and cooperation of Kenya, Tanzania and Uganda, the countries surrounding the lake need to be improved, by creating so called "consumer cooperatives", a model proposed by the World Bank. It involves different kinds of specialists, such as engineers, sociologists, and financial analysts etc., who need to work with the cooperatives, especially with those who have low income, so they can understand and help their water and sanitation needs and in a sympathetic and professional way. These cooperatives can also work to build capacity for better working ecosystem management of Lake Victoria (Mara, 1996). In addition to that, the local councilors may be supported by the people of the area, in order to be capable to make decisions which will be salutary to the environment of the area (Oosterveer, 2010)

## **Harmonization of the intergovernmental programs**

On a national level, efforts must be made to harmonize the intergovernmental programs to achieve the most extended reversal process of the increasing environmental degradation of the lake. (Mara, 1996). Also, an important part of the harmonization process is the adequate policy making and the establishment of a new institutional framework at municipal, as well as at national level, in order to build an integrated relation between the urban agriculture and the permissible use of the land at the urban regions (Mireri et al, 2007).

## **Rehabilitation of Lake Victoria`s ecosystem**

This purpose can be fulfilled in many different ways. For example by conserving and developing the wetlands (Mara, 1996). This job is done by the NEMA – The Uganda National Environment Management Authority, who is under the jurisdiction of the legislation of the country. The organization uses statutory instruments to achieve suitable management of the drainage systems of the Ugandan wetlands, violation of which is considered a criminal act. This measure will decrease dramatically the use of those important areas for all other purposes except the ones they are intended to serve, and which usually require a special use permit (Mbabazi et al., 2010).

## **Policy regulation of effluent disposal to the Lake**

Other measures can be: reduce of the leakage of nutrients and sludge, especially Phosphorus, in the water of Lake Victoria, diminish the municipal sewage output, establish regulations for the industrial waste water, define the current defilement of the fish population and take preventive measures

of its future expansion (Mara, 1996). Other sphere of action must be the combat with water borne diseases. That includes provisioning the sanitation facilities with clean water, toilets and proper sewage. The amelioration of the sewerage system handling and disposal, and also the recycling of the waste material into useful products, are also vital parts of the process, as well as the developing of communal programs, which provide information to the people how to assure their households with fresh water, through different systems as water pumps and drillings. Measures could be taken also to improve the water conservation planning of the villages along the shores, which main occupation is fishing (Awange & Ong'ang'a, 2006).

### **Community initiatives/interventions and awareness programs**

On communal level, there are also some changes that can be made. For example, the authorities have to work on campaigns, which will help to increase the public awareness about the state of the lake, its sanitation problems and the risks they take, by using the water for their agricultural needs. (Mara, 1996; Mbabazi, 2010). One of these campaigns, organized by UN HABITAT, took place in March 2004, and it was supported by the governments of Uganda, Tanzania and Kenya. As a result, they issued a document, which was called " Lake Victoria Region Water and Sanitation Initiative" (LWATSANI). The main purpose of this initiative was to manage the water quality and sanitation issues of the small urban centers in the region. LWATSANI intends also to provide the poor population with effective and long lasting benefits (NWSC-External Services, Uganda, 2009). Actions also can be taken to reduce the exposure of the local population to the harmful chemical

pollutants, which outflow into the lake. Those actions can include monitoring of the exposure, creating community based education programs, which give information about the pollutants and their impact on human health, and also replace the old, harmful chemicals with new, sustainable ones (Awange & Ong'ang'a, 2006).

## **Biological control**

On last place, there has to be a response of the problem with the water hyacinth infestation of the lake. This can be achieved by rendering biological control of the distribution of the plant, using specific natural enemies of this species, to reduce the population of the pest (Awange & Ong'ang'a, 2006).

## **Conclusion**

The assessment identified that the driving forces of urban run-off are poverty, growth of population, urbanization, industrialization, lack of cooperation and compliances, urban agriculture. These factors put several pressures to the Lake such as emission of pollutants, disposal of expired medicines and pesticides as well as untreated wastewater and solid wastes. These pressures affect the ecological state of the Lake (water quality, amount of nutrients, fish quality & quantity, population of water hyacinth). These changes of the ecological state of the Lake lead to significant impacts to the economy of the area (loss of income, loss of potential revenue from tourists) as well as the society as a whole (health problems, transportation & shipping problems). The responses to the problem should be focused on policy implementation, collaboration between stakeholders and sanitation improvement.



## **Stakeholder identification**

### **Governments**

#### **The East African Community (EAC) and Government Line Ministries**

The East African Community (EAC) is the regional intergovernmental organisation of the Republics of Burundi, Kenya, Rwanda, the United Republic of Tanzania, and the Republic of Uganda, with its headquarters in Arusha, Tanzania (EAC, 2013). The EAC was formed in 1999 and became functional from 2001 for Kenya, Uganda and Tanzania while Burundi and Rwanda joined in 2007. The EAC constituted the Lake Victoria Basin Commission (LVBC) that is mandated to coordinate the sustainable development of the Lake Victoria basin (LVBC). The respective EAC member countries have the following ministries as stakeholders in the lake: Ministry of water: works through the Water Services Boards that provide general infrastructure while the Water Service Companies are responsible for delivering the services to the Lake Victoria South Water Services Board (LVSWSB). It also has a mandate of ensuring efficient and economic provision of Water and Sanitation Services in its area of jurisdiction. Ministry of environment and mineral resource Ministry of fisheries development

### **Benefits from the Lake**

The lake is a unique natural resource that is heavily utilized by the bordering countries for transportation, water supply, fisheries, waste disposal, recreation and tourism (Odada et al., 2004). The communities around the lake utilise it to fulfil their basic needs of food and water both for domestic and industrial use. It is a source of raw material for fish, breweries, sugar and

tanning industries that dot the lake shore towns/urban centres. The municipalities that govern these towns and the industries use the lake as a waste sink for all the waste that they produce leading to massive pollution of the Lake.

## **Issues**

### **Policy gap**

The existing policies pertaining to water resources, agriculture, livestock, and forestry within the three riparian countries do not pay particular attention to the issues of lake management or trans-boundary water resources management (Odada et al., 2004). The line ministries in each of the neighbouring countries are supposed to enforce the water and waste treatment regulations; however they are relaxed or lack the resources to enforce compliance to these regulations. Odada et al., (2006) explains that besides the fishery sector, other aspects of lake management are national based and uncoordinated and this has hampered uniformity of data upon which managerial decisions could be taken. Policies on industrial pollution of the Lake for instance differs in the member countries and makes it difficult to make any considerable steps towards conservation of the Lake.

### **Lack of sanitation infrastructure**

The treatment works in municipalities are either inadequate, using old and obsolete technology, have ageing components, or have simply ground to a halt (Odada et al., 2004). All the towns around the lake have not been able to expand their sanitation infrastructure since what was planned in the colonial days. The populations have expanded tremendously overstressing

the available sanitation and social infrastructure. They have also not been able to expand to keep pace with the increasingly larger populations (Odada et al., 2004). The municipal by-laws, such as those of Kisumu City, did not predict the growth and type of industries existing today and so there is no capacity to manage the waste from these industries. Industries flout the by-laws and regulations as there is no monitoring and enforcement mechanism.

### **Lack of planning**

Poor planning, maintenance, and inadequate investment in municipality wastewater-treatment systems have contributed to the increased untreated effluent discharge as explained by Odada et al., (2004). This is a responsibility of the governments, which they have neglected. Developments in the towns are unplanned and there is rapid change of user from agricultural land to commercial land use as the town expand from their core to the peripheries which are mainly agricultural zones. This means that the Lake's riparian land and wetland ecosystems are no longer protected and are face by rapid extinction as the towns continue to grow.

### **Mitigation measures**

The EAC is currently spearheading harmonization in policies regulating the fishing sector, thanks to the stringent regulations laid down by the European Union on fish export from Lake Victoria (EAC, 2011). Private sector participation in waste disposal activities is obviously important in order to fill the void left by the public institutions which have failed to render these services (Odada et al., 2004) the feasibility and effectiveness of this policy option is that it is a business venture with the capability of generating income. Governments are collaborating with international organizations to <https://assignbuster.com/preventing-urban-runoff-into-lake-victoria-environmental-sciences-essay/>

address the water and sanitation in small urban centres. Attention is given to drainage and solid waste management as an integral part of environmental sanitation (NWSC, 2009). In a recently held conference in Kisumu the Director for East African Regional Resource centre at the African Development Bank (AfDB) asked the EAC States agreed to cooperate in the areas of water supply and sanitation, Integrated Water Resources Management (IWRM), natural resources, environmental and ecosystems management, land use practices, capacity building, data and information sharing, research and development (LVBC, 2013). The following recommendations are possible actions that governments can put in place to deal with the situation in Lake Victoria: Imposing environmental tax on industries responsible for polluting the Lake which should then be invested back to infrastructure and rehabilitate the damages caused; and enforce Internalization of external cost: environmental of costs should be included in the price and compensated to those who bear the cost (the price should also reflect the cost of the environment); Put in place market-led incentives to enhance compliance to laws in EAC partner states; Institutionalize science-policy dialogue to bridge the gap between policy makers and research scientists; Governments and NGOs should form partnership specifically in planning and implementation of intervention projects to avoid duplication of projects/efforts in the same region/area as witnessed in prior sanitation projects around the lake basin; Liberalization of waste services: governments should outsource some of the services to local residents and establish a wage as additional income for the people who carry them; Imposing environmental tax on industries responsible for polluting the Lake which should then be invested back to infrastructure and rehabilitate the damages

<https://assignbuster.com/preventing-urban-runoff-into-lake-victoria-environmental-sciences-essay/>

caused; through the internalization of external cost by industries: environmental of costs should be included in the price and compensated to those who bear the cost (the price should also reflect the cost of the environment): The government to adopt low cost improved waste management interventions, continuous awareness campaigns, and educational programmes to help reduce lake pollution and improve sanitation in the LVB by the local communities and The Governments should work together with the NGOs to draw physical plans for the towns especially within the informal settlements specifying the resettlement plans for the project affected persons, compensation for land/property lost and affect it within the specified time plans.

### **Local authorities**

The local authorities of the settlements in the three countries, which hold the rights over the Lake Victoria, Kenya, Tanzania and Uganda, formed an organization, named Lake Victoria region local authorities cooperation (LVRLAC). This is an organization under the form of a network with regional secretariat in Entebbe, Uganda. It was established in 1997 in order to provide coordination and to enforce the efforts of the local authorities of the Lake Victoria basin to collaborate better. (Lyala, 2011; [www.lvrlac.net](http://www.lvrlac.net)) LVRLAC is created on the initiative of the mayors of Entebbe (Uganda), Mwanza (Tanzania and Kisumu (Kenya). The main goal is to ameliorate the network between the local communities and to respond easily to their concerns of sustainable management. Today LVRLAC is a network who is rapidly developing, and it connects over 81 local authorities of the Lake Victoria Basin (Lyala, 2011)

## **Benefits of Lake Victoria for the local authorities**

The benefits that Lake Victoria provides for the local authorities are mostly socio-economical. The people from the Basin area use actively the water of the lake for their needs: like irrigation and fishing. They produce goods and sell them. The money and the benefits from this production and trade enters the economy of the municipalities for which the authorities are responsible. This also benefits the local labor market by creating workplaces and diminishing the poverty and the unemployment. (www. lvrlac. net )

## **Current role of the organization**

Currently LVRLAC is developing some projects, which are meant to develop the region and to ensure the lake`s sustainable future. Therefore, it focuses on building a harmonized network between the local authorities and providing sustainable management of the natural resources of the lake, which the three countries of the basin share. The organization also is also aiming to decrease the poverty, to preserve the environment in the region and to provide the sustainable development of Lake Victoria. (www. lvrlac. net )

## **Future role**

As a stakeholder, the local authorities have both negative and positive impact on Lake Victoria. They are responsible for part of the urban runoff, which pollutes the water of Lake Victoria through the poor treated sewage system of the municipalities along the shore and the bad sanitation measures. But on the other hand, they are making efforts, in collaboration with the government and the NGO`s, to ameliorate the state of the lake.

(www. lvrlac. net; Lyala 2011) In order to fulfill its goals, LVRLAC aims to create an effective and harmonized network between the local authorities for sustainable management and development of their shared resources, and to establish better communication and relations between the local communities. This can be achieved by increasing the education and knowledge levels of the people, building partnerships to exchange good practices. Other very important measure, that the local authorities could take, is the amelioration of their sewerage and sanitation infrastructure. Like this, they will be able to control and monitor the outflow and the contamination levels, and diminish the pollutant waste, running into the lake. They can also adopt specific local policies to prevent and decrease the overpopulation of the coast line. This measure can help to reduce the overexploitation of the lakes resources, and also the harmful runoff, which comes from the poor houses with no sewage systems and bad hygiene. Moreover, the local authorities, as one of the least affected stakeholders, have to cooperate effectively with the others to provide better life standard to the people of the region and opportunity to implement the principles of the sustainable development in Lake Victoria Basin. (www. lvrlac. net)

## **Local Communities**

The three surrounding countries of Lake Victoria in East Africa Kenya, Uganda and Tanzania are among the poorest in the world, forcing many people to migrate there in search of a job and a better living. In fact, the population around the lake increases in a very fast rate, one of the fastest in Africa (Odada et al, 2009) and is estimated to reach 50 million by the end of

the decade (UN, 1995). Local communities consist mainly of fishermen and farmers, both natives and immigrants.

### **Benefits of Lake Victoria to local communities**

Lake Victoria is a unique natural treasure that offers to people a variety of services, from fish and fresh water to leisure activities (Odada et al, 2009). Most importantly different activities around the lake have created many job opportunities. People find work mainly in the fishing factories, which is followed by agriculture, tourism and small manufacturing industries (Mireri et al, 2007). There is also a number of people that work in the public sector.

### **Problems caused by local communities**

However the ever rising population has caused severe problems to the lake's ecosystem threatening its vital functions. There is a significant downgrading caused by the on-going, intensive activities such as the unplanned expansion of settlements and agriculture, livestock breeding and burning of biomass (Machiwa, P. K., 2003). Moreover small farms and land plots make their management as well as the co-operation between the neighboring municipalities more challenging (Odada et al. 2009).

### **Effects of urban runoff to local communities**

In 1990 water hyacinth appeared in the area and caused severe and many problems that include difficulties to transportation and fishing, malfunctions to the sewerage system (clogging of pipes) and finally health problems from water borne diseases (Odada et al, 2009). Furthermore the ecological characteristics of the lake have changed dramatically. Scientists have observed depletion of oxygen, eutrophication and algal blooms and loss of



biodiversity (Global Environment Facility, 1996). Finally, the fishing industry is also affected as fish quality and quantity have decreased (Global Environment Facility, 1996) and big factories have shut down (Mireri et al, 2007). Therefore, job positions are lost in an already underexposed area.

## **Contribution**

According to Mireri et al, a little more than 60% of farmers recycle solid waste for agricultural use and water waste for irrigation. This is a good example of reuse of organic waste. Instead public workers in sanitation services are often inadequate and undisciplined at their job, causing severe malfunctions (NWSC-External Services, Uganda 2009). None the less as only the implementation on an international, lake-wide level regarding land management and establishment of strict limits to nutrient flows can face the degradation of the lake's ecosystem (Verschuren et al., 2002) local communities don't appear to have a significant amount of power and authority to contribute to any measures taken. However an advantage of the final success of the policies followed will be the acknowledgement by local people that sustainability cannot be achieved, without their support and involvement as well as the fact that a chance for a better life is vital for both present and future generations (unhabitat. org).

## **Non-Governmental organizations**

The local NGOs concerning Lake Victoria are mostly nongovernmental organization with a decentralized function of promoting environmental awareness, biodiversity conservation, waste management (NAPE) or they aim at mobilizing communities around Lake Victoria for proper use of the lake resources, to eradicate poverty for communities (JIMDA). The <https://assignbuster.com/preventing-urban-runoff-into-lake-victoria-environmental-sciences-essay/>

international NGOs such as Global Nature Fund (GNF) which is a non-profit, private, independent international foundation for the protection of environment and nature and UN habitat whose main function is to promote socially and environmentally sustainable human settlements development. These particular NGOs were chosen to be described because they are more active in the region and specifically responsible for the conservation and management of Lake Victoria. They were also chosen because they set high goals and they are currently more intensively working on projects regarding Lake Victoria. This will be shown in the next paragraphs.

## **Current role of the NGOs**

### **NAPE- current role and main interests**

The set goal of the NGO called "NAPE" is working towards conserving of the lakes Victoria, Kyoga, Albert and others in Uganda. The current role of this NGO is to promote environmental awareness, biodiversity conservation, water management and waste management. Also the role of this NGO includes enhancing community participation. The primary activities and the strategies which are currently used by the NGO are awareness raising, lobbying and advocacy. (OSIENALA, 2004) The NGO's activities include as well carrying out of research, publications and dissemination of information, lobbying and advocacy, net-working and promoting professionalism.

### **JIMDA- current role and main interests**

The NGO "JIMDA" is a non- governmental organization. The current role of JIMDA is to mobilize communities around Lake Victoria for proper use of the lake resources, to eradicate poverty for communities around the lake and to

conserve and effectively manage natural resources of the lake. The current role of this NGO is also to empower communities around the lake and to manage small business. Another important role of this NGO includes primary activities such as: Fish farming, Tree planting, Vegetable growing, Business skills training. The communities which are served by the NGO are Rural and urban youths, women and others around the lake. The geographical scope is Busoga region - Uganda. (OSIENALA, 2004)

### **GNF- current role and main interests**

The Global Nature Fund is a non-profit and self-governing international foundation. Its major goal is to work towards protecting the environment. The main role of this NGO is to commence nature/environment protection projects as well as the protection of migrating species which includes their habitat and their migratory routes. The role of this NGO referring to Lake Victoria is to develop model projects for the endorsement of sustainable and non-destructive way of the usage of Lake Victoria in order the healthy ecosystems in the lake to be persevered. Another role is writing publications and promoting the use of applied sciences and technologies towards the conservation of these ecosystems of Lake Victoria, supporting educational programs and cooperation with local communities.

### **UN habitat- current role and main interests**

The other international NGO is called UN habitat. The role of UN Habitat is to endorse socially and environmentally sustainable human settlements development and the accomplishment of sufficient shelter for the communities around Lake Victoria. Its current role is to carry out sanitation improvement projects for Lake Victoria. Also UN habitat is carrying out <https://assignbuster.com/preventing-urban-runoff-into-lake-victoria-environmental-sciences-essay/>

regular assessments and water and sanitation initiative on Lake Victoria with the help of the Governments in Kenya, Tanzania and Uganda. UN habitat is currently building institutional and human recourse facilities at local and regional level for the sustainability of better sanitation services as well as decreasing the environmental impact of urbanization in Lake Victoria Basin (UN habitat, 2006)

### **Future role and Mitigation Measures:**

The establishment of sustainable productivity of fish in the Lake Victoria through control of pollutants is essential future task for the NGOs. NGOs should strengthen their cooperation in order to generate opportunities and build partnerships. They should collaborative with institutions and stakeholders and consolidate the relationships with mutual programs focused on the health of Lake Victoria's ecosystem for sustainable fisheries resource but in such way that no duplication of projects in the same area takes place because this has been witnessed before. Moreover NGOs should cooperate with other stakeholders to have dialogue on important matters affecting environmental quality. The NGOs should work together with the Government to draw physical plans for the towns especially within the informal settlements specifying the resettlement plans for the project affected persons, compensation for land/property lost and affect it within the specified time plans. In addition more awareness creation campaigns should be organized to promote environmental awareness, biodiversity conservation, water management and waste management.

## **Industries**

There is a fast growing industrial development in the region with most industries located in the larger towns bordering Lake Victoria such as Kampala and Jinja in Uganda, Mwanza and Musoma in Tanzania, and Kisumu in Kenya (scheren et al., 2000). The total number of industries in the catchment area is 68, of which 16, 34 and 18 industries are in Kenya, Tanzania and Uganda, respectively (Cowi, 2002). According to Odada (2004), most of the industries include dairy factories, fish factories, sugar factories, Breweries, Distilleries, leather tanneries, soap factories, cotton mills, etc. Fish processing plants have been established which target the international fish markets of Europe and Asia.

## **Benefit of Lake Victoria for industrial sector**

Lake Victoria provides valuable services for a number of industries (both locally and internationally). For example, it serves as water source for most industries and particularly for gold mining (LVBC 2011). Lake Victoria, Africa's single most important source of inland fishery production, is also useful for fish processing industries (Balirwa et al., 2003). Moreover the lakeserves as a bridge connecting major towns(Tanzania, uganda and Kenya) ( (Lubovich, 2009) facilitating the transportation of industrial goods. And also it serves as a sink for industrial wastes for those industries directly discharging either untreated or partially treated wastes in uncontrolled manner (Odada et al., 2004).

## **Impact of Industries on lake Victoria**

According to Ntiba et al., (2001) a significant rise in industrial development in the major urban centers near the lake has greatly contributed to the pollution of the lake. He also added that pollution from point and non-point sources has contributed to the degradation of lake water for habitat and drinking use. Breweries, sugar cane factories, pulp and paper production, tanning, fish processing, soap and oil factories discharge the largest amount of untreated industrial wastes to the lake (Scheren et al., 2000; Odada et al., 2004). According to Odada et al., (2004) and Ntiba et al., (2001) there was uncontrolled waste disposal by the industries due to lack of monitoring and enforcement mechanism, lack of awareness concerning environmental, lack of sewer treatment plant and too few technical personnel. Moreover, attempts to install recycling facilities by some industries in urban areas have not had enough incentive from the regulating authorities. The poorly developed sewage infrastructure also contributed to poor handling of industrial waste products (Odada et al., 2004).

### **Impact of the pollution on industries:**

Poor water quality resulting from urban run-off implies high treatment cost and hence high cost of production for industries. In addition, deterioration of fish stock due to low water quality would led to shortage of inputs for fish processing industry (Odada et al., 2004). Moreover transportation of industrial inputs and outputs by means of water transport is hindered by the water hyacinth. Shortage of water supply also affects those industries dependent on the lake.

## **Mitigation Measures**

Some industries have taken crucial measures to tackle the problem such as use of treatment plant in and clean technology Kenya (Odada et al., 2004). However, much remains to be done by those industries to reverse the negative impact on the environment. The establishment of effective and efficient waste treatment plants by polluting industries should be a norm. Industries should also contract out solid waste handling and recycling to private firms or under take it by themselves. In addition awareness creation campaign for employees would facilitate proper waste handling. Industries should strengthen inter- industrial cooperation to create opportunities where by the jointly-finance some of the treatment plants for common use. Although the initial investment in treatment plants might be costly the industries could benefit in the long run as the negative effect of pollution would be reversed. Moreover industries should cooperate with other stakeholders to have dialogue on important matters affecting environmental quality.

## **Research Institutes**

The research institutes concerning Lake Victoria are mainly fisheries-oriented [Lake Victoria Fisheries Organization (LVFO), Kenya Marine & Fisheries Research Institutes (KMFRI), Tanzania Fisheries Research Institutes (TaFiRI) and Uganda National Fisheries Resources Research Institute (NaFiRRI)], but there are also research projects running that have a more decentralized function [The Lake Victoria Research (VicRes) Initiative, Lake Victoria Environmental Management Project (LVEMP)] and they aim to a sustainable

development (VicRes) and to an integrated management of the ecosystem of Lake Victoria (LVEMP).

## **Current role**

Urban and industrial run-off from large cities (Kisumu in Kenya, Mwanza in Tanzania, Jinja in Uganda) causes problems to the fisheries (Awange & Ong'ang'a, 2006) and puts pressure to fisheries research institutes. To tackle this pressure, the fisheries research institutes (LVFO, KMFRI, TaFiRI, NaFiRRI), in coordination with the Ministry of Environment and Natural Resources (Department of Fisheries) and the Lake Victoria Environmental Management Project (LVEMP), aim to the formulation of a sustainable development plan for fisheries in Lake Victoria (Awange & Ong'ang'a, 2006). VicRes is in pursuit of new knowledge breakthrough on sustainable development of the Lake Victoria region, based on development-oriented research projects (Muyodi et al., 2010). LVEMP aims in finding ways to rehabilitate the already degraded lake's ecosystem in order to be able to support the several human activities in the lake catchment in a sustainable way (Machiwa, 2003). LVEMP's main interest is on water quality management, industrial and urban waste management, land-use management, fisheries and fisheries research management, and biodiversity conservation in the lake and its catchment (Machiwa, 2003). The program focuses specifically on the water quality management and sustainability (Machiwa, 2003).

## **Future role - mitigation measures**

The future actions of the research institutes could play an important role in the solution of the Lake Victoria's problem. Some already running projects could vastly contribute to solution and in the future could be adapted as <https://assignbuster.com/preventing-urban-runoff-into-lake-victoria-environmental-sciences-essay/>



measures for the improvement of the lake's situation. One of the already running projects focus on the sustainable organic farming and preservation of Lake Victoria's ecosystem basin by producing organic fertilizers from the water hyacinth ([www. vicres. net](http://www.vicres.net)). A second one focuses on the increase of the sustainable productivity of fish in the Lake Victoria via pollutants control ([www. vicres. net](http://www.vicres.net)). Also, actions are taken for the improvement of the collaboration management of the natural resources, shared by the countries that surround Lake Victoria Basin (LVB), for the common good of the EAC Partner States ([lvemp2kenyas. org](http://lvemp2kenyas.org)).

## **Tourism**

The tourism as a stakeholder is presented by the The Lake Victoria Cultural Tourism Association (VICTA). This is the organization that is made to promote the local tourism around Lake Victoria. It is still in a phase of building and developing ([http://www. world-unite. de/en](http://www.world-unite.de/en)).

## **Current state and role of the tourism**

Lake Victoria is situated at the heart of the continent of Africa and it is the beginning of one of the greatest rivers in the world- the river Nile. This mighty water body attracts tourists from all over the world with its unique habitats and species, but also with the local food and culture. This brings major economic benefit for the local community and also creates workplaces for the people from the surrounding area ([http://www. world-unite. de/en](http://www.world-unite.de/en))The tourism itself does not have a big impact on the state lake, mostly indirect from the people who come and stay in the hotels and lodges around the shore. The pollution on the other hand, has a big impact to the tourism, because the foreign visitors are informed for the risks of diseases, caused by <https://assignbuster.com/preventing-urban-runoff-into-lake-victoria-environmental-sciences-essay/>

the polluted water, and they are afraid to risk their own health and wellbeing. This results in low tourist visits and low foreign income for the region.

### **Future role and mitigation measures**

The tourist industry of Lake Victoria Basin, as one of the least affected and affecting stakeholders could make efforts to maintain its positions in the global tourist market. In the same time it could try to attract more foreign capitals to the local economy, which can help in the combat with the pollution of the lake. In order to respond adequately to problems and to help the development of the sector is created the The Lake Victoria Cultural Tourism Association (VICTA). It aims to popularize the culture and traditions of the local communities among international tourists, to provide the people and the cities around the lake with the benefits from the tourism. This is accomplished by organizing excursions on which local guides present the most typical activities of the region, by demonstrating the local handcrafts and habits. They also make tours of the most significant spots of the region and organize other activities to entertain the tourists. ([http://www. world-unite. de/en](http://www.world-unite.de/en))In the future, the tourist sector could have an important economic role for the development of the basin of Lake Victoria. If they are many tourists and a big demand of accommodation, the local communities and authorities will be motivated to improve the quality of their environment and of their lifestyle. The financial profits will be an additional stimulation for improvement.