

MINIMIZING NON-POINT POLLUTION IN A WORLD OF RAPIDLY GROWING FOOD NEEDS: Lake Victoria Catchment.

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Lake Victoria is the largest fresh water lake in Africa (68,800 km²) with a catchment of 194,000 km². The lake is a shared resource between Kenya (6%), Uganda (43%) and Tanzania (51%) and is very important for the riparian communities. It is providing food, freshwater for domestic, livestock, agricultural and industrial use, transport, recreation, tourism and biodiversity conservation. With the population of riparian communities growing at a very high rate, the multiple anthropogenic activities in the lake basin have increasingly come into conflict with the environment. This has contributed to rendering the lake environmentally unstable. As a result water quality in the lake has deteriorated among other lake resources.

Main Issues

Water quality in Lake Victoria has declined in the past few decades, owing chiefly to eutrophication arising from increased inflow of nutrients into the lake. Nutrients (mainly nitrogen and phosphorus) inputs have increased two to three-fold since 1950. This is evident by periodic algal blooms and mass fish kills in the gulf (Ochumba *et al* 1989). The recent infestation of the lake by water hyacinth (*Eichhornia crassipes*) is a further indication of highly eutrophic lake, and is threatening biological productivity of the lake and impedes lake transportation (OSIENALA, 1996).

Preliminary estimates suggest the increased nutrient inflows are coming largely from rich agricultural zones upstreams. Since many of the farmers in the area particularly those very close to the lakeshore use no fertilizer or use very small quantities, hence are unlikely to be a major source of the nutrients in the lake today. (See Table 1). Rather the nutrients may be released from soil particles washed or blown off the land surface by erosion, from burning wood-fuels, and from human and animals waste surrounding the lake. From urban areas, the main source of nutrient is untreated sewerage discharges and effluent. Thus, the deteriorating water quality problem of Lake Victoria arises from without that is watershed and not from within, the immediate environs. Its therefore, in the Lake Victoria catchment or watershed that the solution to its deteriorating water quality must be found. See Table 2.

Intensification of agriculture to meet the fast growing population, have created many environmental problems, such as large-scale clearance of forests, drainage of land, and destruction of floodplains and riparian zones. These have resulted in increased **soil erosion** and high loads of silt and nutrients being transported through rivers into the lake. Wetlands bordering the lake are being converted into agricultural land or land for industrial use and are therefore, increasingly unable to act as natural filters for nutrients and silt.[Osienala, 1996]

Fertilizer usage in the three countries compared.

COUNTRY	FERTILIZERS [ton/year]	
	Nitrogen - N	Phosphorus- P
Kenya	2480	1500
Uganda	126	15
Tanzania	110	9

Table 1. Source: [Scheren *et al.* 1995].

From the figures, concentration of use of fertilizers is highest on Kenyan part of Lake Victoria catchment area and Kenya seems to be the only country in the Lake Victoria catchment area where the present use of fertilizers can form a pollution problem. Source: [Scheren *et al.* 1995].

Estimated Total Nutrient Inputs to Lake Victoria by Source

Source	Total N		Total P	
	(kg/yr)	%	(kg/yr)	%
Urban	8,900,000	7.5	1,100,000	7.9
Rural	35,600,000	30.2	4,200,000	30.1
Agricultural	59,004,845	50.0	7,826,723	56.1
Rainfall	14,462,700	12.3	826,440	5.9
Total	1.18 x 10⁸	100.0	13,953,163	100.0

Table 1 Source: Hydromet (1979-80)

Agriculture is the main source of both nutrients (N&P) contributing about 50 % of the load.

Feasible Solutions

The long term viability and success to minimizing non-point pollutant fluxes from land-based agricultural sources require **implementation of holistic, ecosystem-based, watershed-wide, stakeholder-driven strategies** in order to sustain the water courses. A more efficient and holistic solution would be to focus on reducing the original nutrient inputs to rivers rather than trying to restore the lake by physically remove accumulated sediment and nutrients. Already, some of these catchment positive changes are taking place naturally within the catchment. For instance, the number of cattle reared in the catchment has dropped recently due to combination of economic changes and privatization of land. Similarly, amount of fertilizers and pesticides applied to the land has dropped as their prices have increased beyond the reach of the small-scale farmer

Measures that need to be pursued to minimize non-point pollutant fluxes in the Lake Victoria catchment include:

◆ Control of hydrological cycle and soil erosion by:

Afforestation in upstream areas; installation of bufferzone/buffer strips between agricultural land and the watercourse or lake; contour cropping, mulching and fallowing; practising Agroforestry ; and maintaining wetlands and ponds along the shores of the lake/river respectively to function as traps for nutrients coming from non-point source.

◆ **Land use regulation by:**

Stringent regulation on land use i.e ban of reclamation of wetlands for agriculture; ban of use of phosphate based detergents, Lake Michigan, USA; Other ways being stressed by both governments and NGOs for proper land use are encouraging organic farming instead of chemical fertilizers; and zero-grazing in place of free range. With free range more manure ends up on the field and it is impossible to reduce the nutrient load during periods with high rain and run off.

Policy and Legislation.

Hitherto, environmental laws in the three East African riparian states (Kenya, Uganda & Tanzania) have been sectorial, weak and non participatory (not involving stakeholders) reducing their effectiveness. However, review of environmental laws is taking place in all the three countries. For instance, the Kenya Government's policy on conservation is set out in the charter of the Permanent Presidential Commission on Soil Conservation and Afforestation (PPCSCA) which was established in 1981. There are several other Acts and Policy in the country, notably the Chief's Authority Act and Forest Act. The Agriculture Act, which has new "Agriculture (Basic and Usage Rules" promulgated in 1981. It prescribes strict rules for cultivation of land, treated of gullies, rivercourses, and protection of pastoral land and perennial vegetation. These rules are an excellent statement of general standards of land husbandry necessary for conservation of land in agriculture, and are the basis of good extension work.

Each of the three governments has begun to undertake National Environmental Action Plan (NEAP) highlighting the importance of integrated environmental management. The NEAPs focus on problem such as water pollution, biodiversity loss, land degradation, deforestation and damage to wetlands, all of which are central concerns of the lake and its catchment. In Uganda the national sewerage and water corporation is supporting the construction of papyrus swamps and other wetlands in the Kampala area because of the role that they play in nutrient absorption. Uganda and Canada are the only two countries in the world which have developed National Wetlands Policy. Kenya and Tanzania are in the process of formulating a similar National Wetland Policy to safeguard the management of their wetlands. But absence of a regional management framework would render efforts taken by individual riparian governments useless.

In response to this need, the three governments, through a Tripartite Agreement on the preparation of a Lake Victoria Environment Management Programme(LVEMP), have recently established a regional co-operation mechanism for joint preparation and management of a comprehensive programme for the lake. The programme which is being funded by World Bank, will implement strategic projects for Fisheries Management, Control and Monitoring of Water hyacinth, Management of Water Quality and Land Use including Wetlands. It would become the heart of wider investments, a holistic approach needed in the lake basin to reduce nutrient inflows from both point and non-point sources as it incorporates government, international organizations and NGOs for example OSIENALA (Friends of Lake Victoria) for the first time.