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Mitigating the effects of pollution on aquatic ecosystems: Spotlight on the Weija Reservoir in Ghana

Overview: Aquatic ecosystems (lakes, reservoirs, rivers, streams, wetlands and lagoons)serve various functions; as drinking water sources, provide water for agriculture and industry, help prevent floods, reduce levels of pollutants, and are an important link to natural world, and provide recreational opportunities (Ugochukwu and Nukpezah, 2008). Besides, they provide important social and ecological functions while storing water and supporting significant aquatic biodiversity. Globally however, aquatic ecosystems face serious environmental threats arising from 1) Eutrophication 2) Sedimentation, 3) Water Level Reductions and 4) Toxic Waste degradation. These degrade the water quality and eventually render the water unfit for their various purposes. Worldwide, over 1 billion people still lack access to clean water, with Africa having the lowest access. Ghana, in West Africa has also suffered from deterioration of her waters. The Densu river, Odaw river and Weija reservoir in south-eastern Ghana are such ecosystems suffering various degrees of degradation.

Threats faced by water bodies: Simply put, eutrophication is a process of increasing nutrient (phosphorus and nitrogen) input into water bodies. When this happens, tiny plant material called algae make use of the nutrients to grow and spread. This results in an "algal bloom". The consequence of an algal bloom is that the algae use the oxygen in the water body for its respiration. The result is that oxygen is not made available to other aquatic organisms and may result in "fish kill". The whole water column may then present a dead appearance. Sedimentation is the tendency for particles in suspension to settle out of the fluid in which they are entrained, and come to rest against a barrier. Sedimentation is due to a lot of sand particles being transported into water bodies. This may be due to human activities in the catchment of a water body such as sand winning and erosion.

High sediment loads block light from penetrating the water body and this affects the ecological balance of the aquatic ecosystem since light is needed for photosynthesis which drives food web interactions and promotes ecosystem health. Often, sediments may be contaminated with pesticides and other toxic substances and affect organisms including heterotrophs and other organisms up the food chain including man. High sedimentation rates also reduce water clarity as well as leads to a reduction in the volume of lakes and reservoirs. This results in problems with water quantity and availability for irrigation as well as other domestic and commercial purposes.

Fig. 1: Polluted stream with oil, plastic and sediment

Spotlight on the Weija Reservoir: The Weija reservoir on the Densu river in southern Ghana is a major drinking water resource. It has a surface area of about 300ha and mean depth, 7m. It was constructed in 1977 as an impoundment to satisfy the increasing demands for water for industrial, agricultural and domestic purposes (Ansa-Asare and Asante, 1998). In recent times its water quality has deteriorated and 80% of the phytoplankton found in the Weija reservoir are bloom forming blue-green algae (Oduro-Koranteng, 2003). Symptoms of water quality problems including algal blooms, low transparency, and rapid loss of volume in the reservoir have been reported (Akuffo, 1989). Eutrophication of the Weija Reservoir has implication also for the treatment cost of potable water.

It is believed that eutrophication due to high levels of nutrient input into the Weija reservoir has resulted in high treatment cost of water. The consequences of algal bloom associated with eutrophication include the following:

- Reduction of water clarity
- Inhibition of the growth of other plants
- Depletion of oxygen and causes fish kills
- Can cause taste and odour problems in water
- which is due to death of algae
- Destroys aesthetic pleasure of viewing a water body

Critical Issues facing the Weija Reservoir

- Encroachment of reservoir shoreline and catchment by estate developers
- Clogging of cyanobacteria (blue-green algae) to filters at water works
- High loads of Total Suspended Solids (reservoir silting up quickly)
- Potential unpleasant taste and odour to water supply
- Reduction in daily production capacity from 70 to 42million gallons
- Extra cost of treating water supply ($200,000/ month)

Interventions

Interventions can be made at the policy level by national government and local authorities as well as at a personal level through change of attitude and greater discipline in society. The following interventions should be undertaken by both government and individuals.

What Government can do

- Government can legislate by creating legal buffers- a defined distance from strategic aquatic resources where no one is allowed to encroach
- Enforcing the existing laws
- Providing funds for Installation of waste water treatment plants at point sources
- Dredging to get rid of contaminated sediment and prevent internal loading of nutrients from the sediments; however full diagnostic feasibility study should be undertaken to understand fully the root causes of the reservoir problem before attempt is made at restoration
- Moratorium on building in the immediate catchment of the lake and the Densu river catchment.

What <u>YOU</u> can do

- Stop polluting water bodies
- Stop building in water ways
- Report abuse of water bodies to relevant authorities
- Limit human activities in the catchment of water bodies
- Don't throw litter or defecate in water bodies
- Avoid building on shorelines and immediate catchment of water bodies.
- Plant trees along shorelines to serve as buffer zones
- Farmers are encouraged to plant cover crops to help stabilize soil and reduce erosion
- Interspersing of crops by farmers can create buffer zones such that potential nutrient losses [into water bodies] facilitated by harvest of one crop are trapped by another. The basic philosophy of such planting plan is to minimize bare soil and create buffer zones that have economic as well as ecological value.
- If you are a homeowner, you are encouraged to plant vegetation on your property to reduce nutrient runoff into water bodies.

References and Further Reading

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Author: Dr. Daniel Nukpezah

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Institute for Environment and Sanitation Studies (IESS), University of Ghana, P.O. Box LG 209, Legon, Accra, GHANA
Tel: + 233 302 962 720 (Secretariat)
Tel: + 233 302 512 819 Fax: + 233 302 512 681
e-mail:infoiess@ug.edu.gh

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