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Contamination of toxic metals in Vastral lake, Ahmadabad, Gujarat, India

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Abstract

Present study was focused on the Contamination of Toxic metals in water bodies Of Vastaral Lake Ahmadabad. During drought period the water level decreased and the concentrations of the most Toxic Heavy Metal parameters were increased. Heavy metals parameters include (As, Cd, and Pb). In Water of Vastral lake during January-2009 to December-2009. The minimum and maximum values of surface water As, Cd, and Pb were: 1.02-0.12ppm; 4.0-0-0.0 ppm; 14.25-4.84ppm; respectively.

Key-Words: Vastarl Lake, Water bodies, Heavy toxic metal.

Introduction

The problem and major environmental concerns associated with the dispersal or disposal of industrial and urban wastes generated by human activities are the contamination of the water and soil and Aquatic Ecosystem. Pollution occurs when a product added to our natural environment adversely affects nature's ability to dispose it off. A pollutant is something which adversely interferes with health, comfort, property or environment of the people. Generally, most pollutants are introduced in the environment as sewage, waste, accidental discharge and as compounds used to protect plants and animals. There are many types of pollution such as air pollution, soil pollution, water pollution and oil pollution (Misra, S.G. and D. Mani, 1991). Municipal wastewater effluents may contain a number of toxic elements, including heavy metals, because under practical conditions wastes from many small and informal industrial sites are directly discharged into the common sewer system. These toxic elements are normally present in small amounts and, hence, they are called trace elements. Some of them may be removed during the treatment process but others will persist and could present phytotoxic problems. Thus, municipal wastewater effluents should be checked for trace element toxicity hazards, particularly when trace element contamination is suspected (Pescod, M.B., 1992).

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Controlled and uncontrolled disposal of wastes,accidental and process spillage, mining and smelting of metalliferous ores, sewage sludge application to agricultural soils are responsible for the migration of contaminants into noncontaminated sites as dust or leachates and contribute towards contamination of our ecosystem (Ghosh and Singh, 2005). A wide range of inorganic and organic compounds cause contamination especially when they are exposed to rain, its decomposition produces noxious odour, thereby, constituting a health hazard (Weiss, 1974; *Ogbonna et al., 2006*). Major components of these compounds include heavy metals, combustible and putriscible substances, hazardous wastes, explosives and petroleum products (Adriano, 1986; Alloway, 1990). Soil and sediments microorganisms can degrade organic contaminants, while metals need immobilization or physical removal because metals at higher concentrations are toxic and can cause oxidative stress by formation of free radicals (Henry, 2000) and thus may render the land unsuitable for plant growth and destroy the biodiversity. Soils provide a suitable natural environment for biodegradation of wastes and therefore serve as a sink for the adsorption and absorption of ions and as a medium for the restoration of vegetation and normal land use (Ekundayo, 2003). Because of the shallowness of water table and nature of soil types in Port Harcourt municipality,

Ahmadabad is unique in the whole of India in matter of environmental neatness and flourishing conditions and

it is superior to other cities in the excellence of its monuments. Ahmadabad Urban development Authority (AUDA) carried out a survey of 645 lakes and identified 22 lakes which have been severely degraded. AUDA proposes to undertake works for revival, development of catchments area and beautification of lakes under the present project. Of these, Vastral Lake were studied which are located at Vastral Village its total storage capacity is 77.0 Caore liters. Lake Desalting Area is 5400 m^3 and peripheral development works including landscaping: recreation facilities are such as Amphi children park facilities and percolation wells to recharge ground water table; AUDA has commenced work on this lake also through own resources. In the study area Heavy metal weathering is predominate. Climatic features of Vastral are characterized by dry climate, uncertain rainfall pattern and great variation in higher ranged for toxic metals during January-2009 to December-2009.

Material and Methods

The sampling were Collocated at different Point of the Vastral Lake. The present study is focused on water quality assessment for period of one year i.e January 2009 to December 2009. Month wise sampling is done i.e. January to December) for testing the water samples were collected in different sterile Plastics bottles. After collection of the samples the bottles were tightly capped and were immediately transported to the laboratory to avoid any unpredictable changes in the characteristics. Suitable preservation techniques were adopted as per the standard methods, APHA (1998). Water samples were digested using the method described in APHA (1998) As,Pb and Cd. are determined by Atomic Absorption Spectrophotometer.

Results and Conclusion

The highest concentration of Arsenic was recorded at Vastral lake in June -2009(1.02ppm) and lowest concentration was recorded in January -2009(0.12ppm), during January-2009 to December-2009 Arsenic is a toxic and carcinogenic semi-metal whose sources in nature include mineral dissolution and volcanic eruption (Bhumbla et al., 1994). Surface water (rivers, lakes, reservoirs and ponds), groundwater (aquifers) and rain water. These sources are very variable in terms of arsenic risk. Alongside obvious point sources of arsenic contamination, high concentrations are mainly found in groundwater. These are where the greatest number of, as yet unidentified; sources are likely to be found. This review therefore focuses on the factors controlling arsenic concentrations in groundwater (*Pauline L Smedley and David G Kinniburgh*).Hazardous waste disposal is another major source of arsenic contamination of soil and aquatic systems. Arsenic leaching from a landfill can be transported through soil to ground water and contaminate lake sediments (Lackovic et al., 1997; Hounslow, 1980). Lake sediments can accumulate a significant quantity of arsenic due to arsenic migration in anoxic ground waters (Subramanian et al., 1997).

The highest concentration of Lead was recorded at Vastral lake in February -2009(4.5 ppm) and lowest concentration was in December -2009 (0.0ppm), during January-2009 to December-2009. This is an indication of lead pollution onshore. The water from Lake Vastral had significantly higher lead content than the lake water. This is an indication that there was substantial lead pollution along the Lake course. Lead content in all the water samples from different Point, including Surface water, was above the World Health Organization (WHO) maximum safe limits for drinking water of 10 µg/L.

The highest concentration of Cadmium was recorded at Vastral lake in August -2009(14.25 ppm) and lowest concentration was in February -2009 (4.84ppm), during January-2009 to December-2009. The most important sources of Cd are metal industry, plastics and sewages (Allen, 1989) and some special phosphate fertilizers that contain Cd. Because of its high toxicity and great solubility in water Cd is a dangerous pollutant (Liu *et al*., 2006). It is very toxic to animals and plants and plants' exposure to Cd causes reductions in photosynthesis, water and nutrient uptake (Sanita di Toppi & Gabbrielli, 1999).

Ahmadabad city is situated on the River bank of Sabarmati and in Around Industrial Areas at Gujarat. The Water samples were collected from Different Point of Vastral Lake. The higher ranged of Cadmium , Arsenic and Lead were above BSI and WHO Standards .The Heavy metal Contamination like As>Pb and >Cd Were studied comparatively during January-2009 to December-2009. The results suggested that water was not suitable for Drinking Purpose.

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Table 1: Analysis of Heavy toxic Metals (ppm) in water of Vastral Lake during the year 2009 for comparative study of pollution.

parameters	Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09
As	0.12	0.25	0.3	0.41	0.47	1.02	0.25	0.36	0.87	0.9	0.23	0.28
Pb	0.027	4.5	0.038	1.5	0.059	0.025	0.036	0.017	0.011	0.013	0.015	0
Cd	9.32	4.84	6.36	4.85	7.58	6.45	7.36	14.25	12.36	10.25	8.25	5.61