

ENVIRONMENTAL PARAMETERS FOR WASTEWATER IN LARGE CITIES AND CLIMATE CHANGE

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ABSTRACT

Waste must be regarded as resource for sustainable development. Urban system is to become an ecological system in which waste and resource are the same in the same system. Water management is a broader subject and it covers many areas but reuse of waste water is generally neglected though waste water can be essential part. It is necessary to integrate green and blue agendas. For the first time in Asia WHO prepared a master plan for water supply, sewerage and drainage, in Calcutta, India which gave the concept of drainage basins with guidelines and projects.

Reuse of waste water through recycling is in practice in many Asian countries. This is largest in Kolkata where sewage fed waste water is taken to various wetlands for production of fishes. This helps vegetable production in nearby areas also. The indigenous system is through photosynthesis process in shallow ponds for growth of phytoplankton algae which provides food for fishes and emits oxygen. At present 15000 tons of fish is produced annually and 150 ton/day vegetables.

In Asia urbanization has mostly taken place on or near the coast. Due to climate change and sea level rise vast areas of low land will be submerged and this waste water is to be used with salt resistant crops and aquatic plants. In integrated holistic environmental plan waste water is an important element.

Keywords : Drainage basin, Phytoplankton, Recycling.

1. INTRODUCTION

Water Management is an essential component in sustainable development and it is broader and more complex issue than what is usually considered. Water supply, sewerage and drainage problems and projects are generally dealt with sectoral approach often uncoordinated. In many large cities of developing countries especially in monsoon or dry region water and drainage are not integrated in the landuse. Falkenmark advocates integrated approach by merging water, landuse and ecosystem management (Fallenmark, 2003). Water management is concerned with resources, supply and demand, distribution and disposal watershed and catchment, coordination with other sectors of development, preservation of water bodies, regulatory framework water related disaster mitigation and climate change adoption (Ghosh, 2003)

In the conventional urban development reuse of waste water is almost neglected except minor use in landscaping but there are broader benefits especially in the context of sustainable development and environment.

In the growing urbanization and economy there is more consumption of water with more waste water. The disposal of waste water from large cities is expensive. It creates environmental problems. Kilpatriak Sale calculated that a city of 1 million takes 625000 tons of water every day, 31500 tons of oxygen and puts out enormous quantities of sewage, waste water etc. (Sale, 1991).

There are several lessons :

- (a) Wastewater can be a part of overall water resource plan especially in cities. It has many benefits, one of them is to replace fresh water supply for irrigation, aquaculture, industrial water use, landscape gardening, horticulture etc.
- (b) Instead of expensive wastewater treatment measures, indigenous technology can purify the waste water, with exposure to sunlight and use of aquatic plants.
- (c) Sewagefed wastewater can be utilized by recycle for production of fish and such water can be used with sludge and natural compost for production of vegetables. Increasingly such practice is being used in many countries in Asia, Africa and Latin America.
- (d) It provides employment and poor farmers and fishermen can organize themselves into cooperative society and it can be best practice with multiple stakeholders.
- (e) It improves environment with more oxygen and controls pollution.
- (f) It is cost effective process. It eliminates transport, marketing and other costs.
- (g) It can be a tool of good land management, creates a buffer zone of green and blue between urban and rural areas and leads to sustainable development.
- (h) Health and hygiene aspects will be less after necessary regulation control and standards.

A UN report says that for sustainable environment of cities it is necessary to integrate green and blue agenda i.e. natural environment and human environment i.e. under green agenda besides greenery and forestry, and climate – it is water system that cities use to tap the natural flows for water supply and waste disposal and under brown agenda besides energy, transport and building, 'waste systems to recycle and remove one waste from cities' (UN Habitat 2009).

The urban poor recycle waste water for fish production and solid waste for vegetable production. This is poor's contribution to the cities' environment. The indigenous technology as practiced for recycling of waste water support UN, millennium development goal (a) Eradicate extreme poverty and hunger (b) Ensure environmental sustainability.

Reuse of waste water should be part of comprehensive development plan for the cities. In most of the cities drainage system is inefficient and water logging during monsoon is frequent. Due to climate change that will increase as recent flooding of the European cities.

2. METHODS

(a) Concept of Drainage Basins

Calcutta (now Kolkata) was the first city in Asia for which a Master Plan for water supply, sewerage and drainage, 1966 – 2001 was prepared by World Health Organisation with international experts through UNDP. The plan also gave for the first time the concept of drainage basins. The metropolitan area was divided into 23 basins of different sizes depending on projected population, density and physical configuration. The waste water both from combined and separate system and natural drainage system to take storm water. Some guidelines have been provided for development. Though environmental aspects were not prominent half a century ago, protection of some sensitive or fragile drainage basins were desired (CMPO, 1966).

The renovation, desiltation and construction of pumping stations, outfall channels, mostly effluents from domestic, industrial and other waste water were discussed.

DasGupta writes (DasGupta, 1991) 'Storage of drainage within the community is not envisaged. The object is to lead all such surplus water to large water bodies where it can be absorbed and gradually dissipated without affecting the physical environment'.

The disposal of drainage water into the rivers cannot be done anymore because of the Ganga (Ganges) Action Plan and proposals for diversion of drainage channels to other areas. This is expensive but it gives opportunity to reuse waste water.

(b) Reuse of Waste Water

With population growth and high density development as well as suburban sprawl, the disposal of waste water from large cities has become complex and expensive. But reuse of wastewater is in practice in some Asian countries for a longtime. Waste is considered as a resource by the poor fishermen and farmers who are utilizing this in urban food production. East Kolkata in India is the largest recycling district for sewage fed waste water. This is ecological restoration.

East Kolkata has large number of small wetlands. The city sewage fed waste water is taken to the wetlands ponds by fishermen through channels. The ponds are shallow to allow sufficient sunlight to reach its bottom to promote growth of algae and photosynthetic oxygen. The high production of these sewage fed fish ponds is due to rich nutrient content which stimulates production of phytoplankton plant based microorganism which provides fish food and emits oxygen. Water hyacinth is used to remove dirt, metals etc. The waste water, sludge and also natural compost of solid waste are used for producing vegetables in nearby areas. Production is 15000 tons of fish annually and 150 ton/day vegetables.

(c) Climate Change Impact

Urbanisation in Asia and some other continents has taken place mostly in coastal area and near low land. Some megacities are also located, large areas will be submerged with water due to sea level rise. A study calculates much low elevation land, China 182000 sq km, Indonesia 177000, India 82000 and Vietnam

66000 sq km (McGranahan et al, 2009). The vulnerability of cities is being assessed. Salt water will damage crop. Salt resistant crop and species of fish are suggested for vast quantity of waste water to be accumulated. A large number of aquatic plant also grow in such marsh, water bodies.

3. RESULTS AND DISCUSSION

The concept of drainage basins was not followed in Kolkata in the subsequent urban development programmes. Some drainage canals were closed and some with low land were filled up. The new real estate boom has brought more people and more waste is generated. During monsoon water logging has become frequent. Sooner the Government takes adequate measures in the delineated drainage basin is better for the environment. However the reuse of waste water is providing benefits and more wetlands with waste water are producing food and helping in food security. Reuse of waste water takes new importance due to flooding and water logging due to sea level rise. Despite calamities, it has opportunities.

4. CONCLUSION

Waste water should be part of an integrated and holistic plan for the cities. It requires long term solution and a new vision, for sustainable environment.

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