

A review on the significance of East Kolkata Wetland: A Ramsar Site with integrated resource recovery activities

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ABSTRACT

East Kolkata Wetland (EKW) is a significant Biodiversity rich Ramsar Site in West Bengal, India. It has a significant Ecological and socio-economic importance and plays a vital role in biodiversity conservation, eco-restoration, environmental protection and pollution control. It harbours world's largest wastewater fed aquaculture system. It acts as a great resource recovery system by utilizing the city sewage and therefore reduces huge expenditure towards running expenses of a waste treatment plants. The Wetland generates employments and provides valuable edibles like vegetables, fish and acts as lifeline of approximately 1, 50,000 peoples. It has diverse group of flora and fauna and harbours different types of microorganisms. It is a great natural resource and needs to be conserved for the welfare of society. The aim of the present review is to highlight the ecological, socio-economic importance and resource recovery activities of the East Kolkata Wetland and need of its conservation.

Key words : East Kolkata Wetland, Significance, Ramsar Site, Resource recovery.

Introduction

Wetlands are the intermediate zone between terrestrial and aquatic ecosystems and cover almost six percent of total earth surface (Williams, 1990). Wetlands are some of the most productive ecosystems in the world (Mitsch and Gosselink, 1993). Dr. Dhrubajyoti Ghosh first introduced the name East Calcutta Wetland. The East Calcutta Wetland is also known as the East Kolkata Wetland that contains both natural and man-made wetlands. East Kolkata Wetland was considered as 'Wetland of International Importance' under 'Ramsar Convention' on 19th August, 2002 and designated as Ramsar Site (Ramsar Site No. 1208) in November, 2002 (Dasgupta and Panigrahi, 2014). East Kolkata Wet-

land is the only Ramsar Site in the West Bengal. The East Kolkata Wetland is situated at 22°25' to 22°40'N and 88°20' to 88°35'E (Figure 1) (Dutta and Chakraborty, 2017).

East Kolkata Wetland contains multiple water bodies which are distributed across the districts of South and North 24 Parganas and covers more than 12,500 hectares containing 37 mouzas (Mandal and Bandyopadhyay, 2018). The East Kolkata Wetland bears almost 364 sewage-fed fisheries, agricultural land, solid waste farms and some built up areas (Ghosh *et al.*, 2018). The four major types of land use patterns of East Kolkata Wetland are: a) Wetlands area of 5852.14 hector, b) Agricultural area of 4718.56 hector, c) Productive Farming area (garbage dumping, Dhapa) of 602.78 hector, d) Urban and

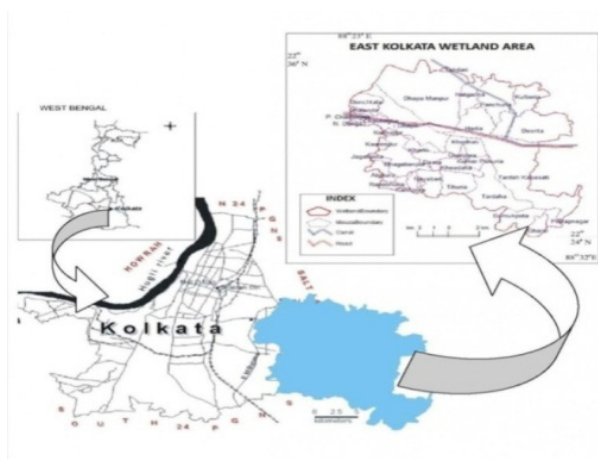


Fig. 1. Map of East Kolkata Wetland

Rural Settlement area of 1326.52 hector (Table 1) (Ghosh *et al.*, 2018 and Bhattacharyya *et al.*, 2007). Wetlands area and Agricultural area constitute about 47% and 38% of the East Kolkata Wetland whereas Productive Farming area and Settlement area cover 5% and 10% of the East Kolkata Wetland respectively (Figure 2).

Table 1. Land use pattern of EKW

Land use pattern	Area (hector)
Wetlands area	5852.14
Agricultural area	4718.56
Productive Farming area	602.78
Urban and Rural Settlement area	1326.52

East Kolkata Wetland is considered as the kidney of Kolkata and surrounding areas because it utilizes waste water from the city and acts as great resource recovery system.

Significance of East Kolkata Wetland

East Kolkata Wetland has great socio-economic values. It is also very important from ecological point of view because it plays importance role on resource recovery, environmental protection, and biodiversity conservation and pollution control through phytoremediation.

Socio-economic importance of East Kolkata Wetland: East Kolkata Wetland plays an important role in environmental protection and provides a stable urban fringe to the expanding metropolis of Kolkata and acts as a lifeline of approximately 150000 peoples (Bhattacharyya *et al.*, 2007). The East Kolkata Wetland harbours the world’s largest

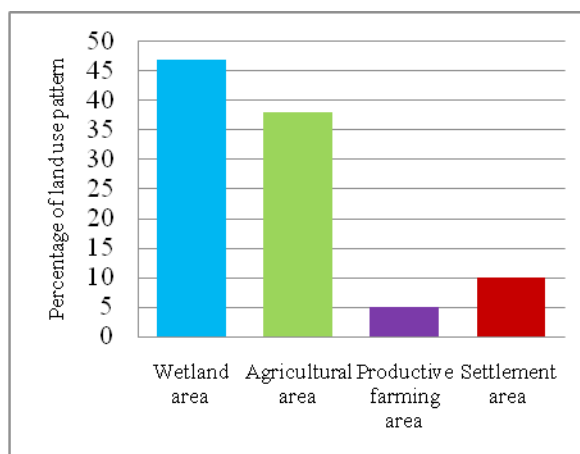


Fig. 2. Relative percentage of different land use pattern of EKW

wastewater fed aquaculture system. Sewage from city are sent to the East Kolkata Wetland and treated to solar purification followed by natural oxidation and therefore, water become suitable for algal and phytoplankton’s growth which act as producer of an aquatic ecosystem (Chaudhuri *et al.*, 2012). East Kolkata Wetland has 272 bheries which spread over an area of 4000 hectares (Chaudhuri *et al.*, 2012). The sewage sent to the East Kolkata Wetland through DWF channels (Bantala gate) reaches the bheries through several secondary canals having dense vegetation of water hyacinth (*Eichhornia crassipes*) which plays vital role in phytoremediation of city sewage. (Chaudhuri *et al.*, 2008 and Sanyal *et al.*, 2015). The bheries with shallow depth (0.7 meter to 3 meters) act as big natural oxidation pond that favours extensive purification of waste water along with integrated resource recovery. The oxidation pond overflows water which is used in agriculture area where paddy is cultivated and finally the excess water from the paddy fields is collected at the far end of

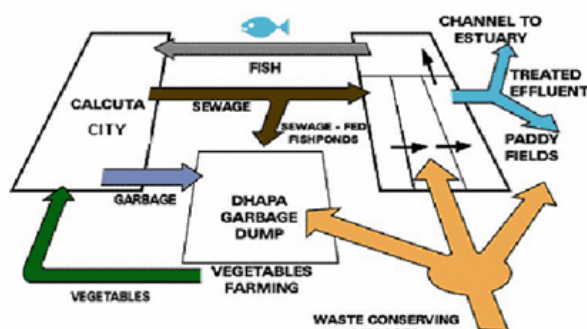


Fig. 3. Wastewater treatment of East Kolkata Wetland, UNEP 2000

DWF and finally released in Kultiriver (Chaudhuri *et al.*, 2012). The process of waste water treatment is shown in Figure 3.

The shallow basin favours full vertical circulation of water to the surface and thereby allows algal growth. This depth plays vital role to maintain a better ratio between pond volume and pond surface as compared to deeper pond therefore, making the water bodies suitable for photosynthesis (Pradhan *et al.*, 2008). East Kolkata Wetland saves an expenditure of USD \$22.04 million towards running expenses of a waste treatment plants everyday by utilizing about 3,000 tons of municipal waste a day through dumping ground and vegetable farms (Chaudhuri *et al.*, 2012). East Kolkata Wetland utilizes the city sewage for four traditional resource recovery practices which involves waste water fed pisciculture, sewage fed brackish water aquaculture (outside the East Kolkata Wetland region), garbage farms for cultivation of vegetables and paddy cultivation utilizing fish pond effluent (Kundu *et al.*, 2007). Almost 980 million litres of raw sewage is treated every day in East Kolkata Wetland which is on an average about 16% of the total treated in India per day (Chaudhuri *et al.*, 2012). East Kolkata Wetland provides livelihood to about 80000 wetland dwellers and 84% of them are underprivileged category (Chaudhuri *et al.*, 2012). Fish production in East Kolkata Wetland ranks highest among the dif-

ferent resource recovery activities and the productivity of East Kolkata Wetland is 2-4 times more than other rain water ponds in any other part of this country (Ghosh *et al.*, 2005). East Kolkata Wetland saves approximately USD \$0.56 million by utilizing treated effluent and water for irrigation (Ghosh *et al.*, 2005). Eastern Organic Fertilizer and Excel Industries Ltd. produce 225 tonnes of biofertilizer by utilizing solid waste of East Kolkata Wetland. This biofertilizer is utilized in tea gardens, sugarcane and maize cultivation within India (Chaudhuri *et al.*, 2012). East Kolkata Wetland produces 15000 tonnes of fish in every year (Ghosh *et al.*, 2018). It also produces 16000 tonnes of paddy in a year and about 150 tonnes of vegetable daily (Roy *et al.*, 2013). The economic benefit is about USD \$38.54 million which is reported from the traditional practices at East Kolkata Wetland (Chaudhuri *et al.*, 2012).

Ecological importance and resource recovery activities of East Kolkata Wetland : East Kolkata Wetland is rich in biodiversity and harbours about 104 plant species, about 20 important mammalian species, more than 40 bird species, 52 endemic varieties of fishes and a diverse group of microbial populations (Ahmad and Kalam, 2017). It is rich in diverse group of aquatic macrophytes. Water hyacinth (*Eichhornia crassipes*) plays significant roles in phytoremediation through rhizofiltration (Chaudhuri *et al.*, 2008 and Sanyal *et al.*, 2015).



Fig. 4. a-b. Some bheries of East Kolkata Wetland, c-d. Some canals of East Kolkata Wetland, e. Previous waste dumping ground of East Kolkata Wetland, f. Recent waste dumping ground of East Kolkata Wetland

Phytoplanktons play important roles in phytoremediation by metal accumulation, degradation of several aromatic hydrocarbons, herbicides and insecticides (Chaudhuri *et al.*, 2012). East Kolkata Wetland provides several aquatic plant resources which are used as green manure and compost, herbal medicine, vegetables, paper pulp, rhizofiltration and fodder etc (Mandal and Bandyopadhyay, 2018). East Kolkata Wetland is now facing high environmental stresses because it receives toxic industrial effluents which contain hazardous pollutants like heavy metals (Pb, Cr, Cu, Ni etc.), oil grease etc (Dasgupta and Panigrahi, 2014, Dutta and Chakraborty, 2017).

Conclusion

The East Kolkata Wetland utilizes the waste water and solid waste of Kolkata and surrounding areas and plays an important role in resource recovery. It also produces vegetables, fishes and provides employment of many peoples. East Kolkata Wetland is rich in flora and fauna and it also harbours diverse group of microorganisms. East Kolkata Wetland is now facing various environmental stresses due to anthropogenic and chemical pollution. East Kolkata Wetland provides very important natural resources and deemed as a national wealth, hence must be sustained for both ecological welfare and economic prosperity of the country.

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