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## RESEARCH ARTICLE

# Effects of Changes in Wetland Ecosystem: Experiences from Chuchura-Magra, Singur and Serampur-Uttarpara Blocks of Hugli District, West Bengal

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### ABSTRACT

Transformation of land is relatively a rapid process determined by the local users through the policies to be proved more beneficial in economic terms which sometimes do not consider such transformation on holistic basis. In riverine plain areas, there is a close inter relationships between agriculture, settlements, natural channels and wetlands. In recent times the degradation and loss of wetlands is more rapid than the past. The determinants of wetland ecosystem degradation include construction of infrastructural facilities, conversion of land, eutrophication and pollution, and excessive water harvesting from surface and subsurface sources to meet the increasing human needs. Transformation of natural land to agricultural land and agricultural to commercial or industrial land has a direct impact on the wetlands which is very crucial in terms of both economic and ecological values. Chinsurah-Magra, Singur and Serampur-Uttarpara Blocks of Hugli District of West Bengal are endowed with fertile agricultural lands, industrial complexes and wetlands rich in biodiversity which are facing adverse effects of short run development policies related to land transformation particularly for the wetlands. This paper is an attempt to explain the degradation and loss of wetland ecosystem, essence of change in the strategies in policies of land transformation and development and reclamation of wetlands with necessary primary and secondary information and their analysis and interpretation.

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## INTRODUCTION

Wetland ecosystems have been defined in a variety of ways by researchers, resource managers, and regulatory authorities, depending on their specific needs and objectives (Mitsch and Gosselink 1993). In the applied world of regulation, planning, and management, wetlands are usually defined in terms of their physical, chemical, and biological characteristics such as hydrologic regime, soil type, and plant species composition. Cowardin (1979) defined wetlands as "...lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water..." that are characterized by the presence of hydrophytic vegetation, hydric soils, and surface water during the growing season. Wetlands are often biodiversity 'hotspots' (Reid *et al.*, 2005), as well as functioning as filters for pollutants from both point and non-point sources, and being important for carbon sequestration and emissions (Finlayson *et al.*, 2005). The value of the world's wetlands are increasingly receiving due attention as they contribute to a healthy environment in many ways. Wetlands perform a wide variety of functions in a hierarchy from simple to complex as a result of their physical, chemical, and biological attributes. At the highest level of this hierarchy is the maintenance of ecological integrity, the function that encompasses all of the structural components and processes in a wetland ecosystem. Wetlands are one of the most productive of all ecosystems, and carry out critical regulatory functions of hydrological processes within watersheds. Even small wetlands are extremely important to the conservation of biodiversity because they provide critical breeding habitat where dispersed populations can exchange genetic material, reducing the risks of extinction (Semlitsch and Brodie 1998). The present review is aimed at providing in a nutshell, the distribution of wetlands, the value of Wetlands, the causes and consequences of the loss of wetlands and their conservation status.

## Importance of wetland under study

The wetland under study plays a vital role in maintaining the overall cultural, economic and ecological health of the ecosystem:

- 1) It has much more value to the public for flood mitigation, aquifer recharge and water quality improvement through removal of organic and inorganic nutrients as well as toxic materials.
- 2) It influences regional water flow regimes.
- 3) It serves a critical habitat for wildlife including a large percentage of plants and animals of endangered species.
- 4) It provides a critical breeding habitat for some populations that can exchange genetic material to sustain themselves from extinction, and
- 5) Allows cultivation (rice, jute and a number of vegetables), fishing and other economic activities that are the spruces of earnings of the local people for their livelihood.

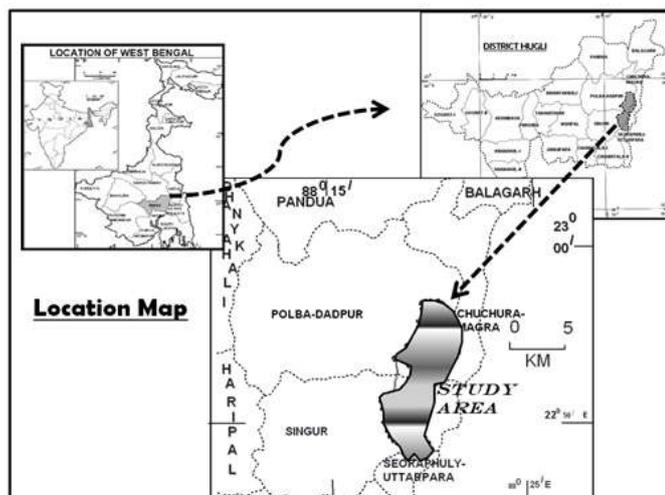
## Objectives

The objectives of the present work are: to investigate the value of wetland on environment; to find out the factors of wetland losses; to identify the condition and trends in wetland-dependent species; to probe into the consequences of wetland losses on natural ecosystem; and to suggest remedial measures for a balanced environment favoring ecology and economy, regarding the wetland of the area concerned.

## The Study Area

The study area is composed of the parts of three CD Blocks of Chuchura-Magra, Singur and Serampur-Uttarpara of Hugli District. The area under investigation is bounded by Panduah and Balagarh CD Blocks on the north, Chanditala-I and II CD Blocks on the south,

the river Hooghly on east, and Haripal CD Blocks on the west. The area is located within 22°48'02"North latitude to 22°56'53"North latitude and between 88°17'42" East longitudes to 88°22'30"East longitude. The area under study measures for 6614.83 hectares.



### Present Status of Wetlands in the Study area

The area under study has two distinct rainfall seasons that are, south west monsoon and north east monsoon resulting in near water-logged conditions in almost 60% of the total geographic area. Thus as much as 1/5<sup>th</sup> of its total landmass is true wetland totally covered by water loving plants, swamps and bushes. There is also a sizable portion under manmade large and small type of ponds.

Area Scale	Area under Wetlands (ha)
India	1450861
West Bengal	291963
Hugli District	20152.77

Source: DOF, 1986

Wetland Classes	Wetland Types
Natural wetland (930.13 hectare)	Fresh water swamps, lakes with and without water-loving plant cover and bushes, mud flats and flat low lands
Manmade wetland (105.82 hectare)	Large and small scale ponds and aquaculture ponds

### Major management Issues

The wetland under study is currently subject to acute pressure owing to rapid development activities and indiscriminate utilization of land and water. The major issues facing the wetland are mainly related to shrinkage of area, pollution, eutrophication, encroachment and reclamation, construction of settlements by fulfilling the water bodies, loss of biodiversity and collapse of the ecological setup.

### Shrinkage of the area under Wetland

Between 1962 (SOI Toposheet) and 2012 (Google Map), the study area lost 537 hectares of natural wetlands, which is almost more than 65% of the total natural wetland area. The biggest causes of such shrinkage are residential encroachment, followed by conversion to agriculture and rapid growth of the dairy farming locally known as *khatal*s. The Howrah-Bandel railway line that has gone across this wetland threatened the wetland initially by making a north-south running separation and the spill water from the Baidyabati *Khal* (Canal) could not able reach the eastern portion of this wetland region resulting continuous shortage of water and drying up of the wetland. The dry wetland is therefore a newly originated land for settlement or other cultural uses.

### Impacts on population, Ecosystem; Diminution of Bio-resources

Many developmental activities like construction of huge buildings, roads, railways and other infrastructure and township development has largely destroyed the biodiversity in the wetland areas. Destructive fishing, poisoning, habitat alteration for urban sprawling also result in impairment of natural habitats of the wetland area under study. The effects of industrial pollution are clearly seen in the form of depletion of biota, especially the species living in the water and presence of high ammonia in water. The large doses of heavy metals and plastics in the wetland water are biologically non-degradable and remain in the food chain of plants and animals. Dead plants settle to the bottom resulting in shoaling of the water body. As a result of biodegradation of plant debris, anoxic conditions develop, which is deleterious to aquatic life. Only those aquatic species, which can withstand below par water quality conditions, can survive and biologically rather environmentally many important species disappear.

### Species Loss

Aquatic ecosystems of the very wetland are usually looked down upon as wastelands and are being reclaimed for various development needs; the flora and fauna living in those wetlands are on the verge of extinction. The encroachment, and reclamation in many locations (near Baidyabati, Bandel and Bhadreswar) lead to loss of biodiversity as well as make changes in the ecosystem functioning. Destructive type of fishing and pollution, excessive weed growth and algal blooms caused by eutrophication, the cumulative deposition of macrophytic biomass by lotic communities due to the disturbance in their food chain, dumped wastes of plastics cause blockage, stagnation of water, changes in ecosystem and related problems in the wetland system leading to loss of biodiversity. The loss of biodiversity has directly affected the fish diversity as well as the avifaunal diversity especially the migratory birds, snakes, tortoise, frogs, different types of insects and molasses, annelids and arthropods group of fauna. The entire wetland has turned to be an endangered one due to shrinkage, pollution and habitat loss.

### Food Toxicity and Waterborne Diseases

The aromatic hydrocarbons like benzene associated with oily lubricants are the severe poisons to the aquatic flora and fauna. The poisonous hydrocarbons subjected to bio-accumulation and bio-magnification in the body of the organisms is stable and remains in their body without chemical alteration for a long time. Anesthesia, cell damage etc. are the possible effect of this very food toxicity. There are also some another toxic effects like cadmium concentration, concentration of mercury in mono or di-methyl form by causing some dangerous disease to the floral community like skin cancer. There are a number of untreated sewage and latrines along the banks of wetland mostly found in the slum areas of Baidyabati, Bandel, Mankundu and Bhadreswar which are responsible for water-borne diseases. The domestic sewage containing chemical waste, infecting waste, organic chemicals and minerals affect the quality of the wetland water. The water-borne diseases like typhoid, cholera, desentry etc. are widespread and acute during monsoon months in most of the habitations of the wetland.

Pollutant or Toxic Elements	Human Problems	Environmental Problems
BOD (Biological oxygen demand)	Drinking water quality, malodours	Fish kills, slime production
Nitrate	Blue baby disease, lake use	Eutrophication, avian botulism
Particulate-N/P	Lake use	Water clarity
Phosphorus	Lake use	Eutrophication
Heavy metals (Cu, Pb, storm run-off)	Drinking water standards	Toxicity
Pesticides	Food chain toxicity, cancers	Nontargets organism deaths
Trace organics (chlorinated organics, estrogen mimics)	Major objection to human water reuse	Subtle toxic effects

### Decrease in Agricultural Productivity

Decrease In last two decades, the cultivable land is reduced considerably because of the conversion of the agricultural land into settlement and other constructional purposes. The productivity of the agricultural land is also reduced due to loss of soil fertility by pollution and soil erosion. The reduction in agricultural productivity has automatically been affected the economy of the people living with agriculture mainly in the villages like Khalisani, Sugandha, Kodaliya, Garulia etc.

### Flood and Draught Effect

The conversion of land from low land to settlement and other construction has been leading to excess flooding of the area mainly during monsoon period. Weeds hamper runoff and choking of drainage channels has amplified siltation by affecting the drainage capacity of the channels. Flash flood therefore, is a common feature in this area even after a light shower at any season. On the other hand, the uncontrolled runoff of the water and reduced ground water recharge is leading to drought condition during the summer period.

### Major Sources of pollution

- Domestic wastes, sewage and garbage.
- Agricultural wastes, pesticides, insecticides and fertilizers.
- Industrial effluents from different industries, mills, and cottage industries.

### Basic Strategy in the Task of Wetland Planning

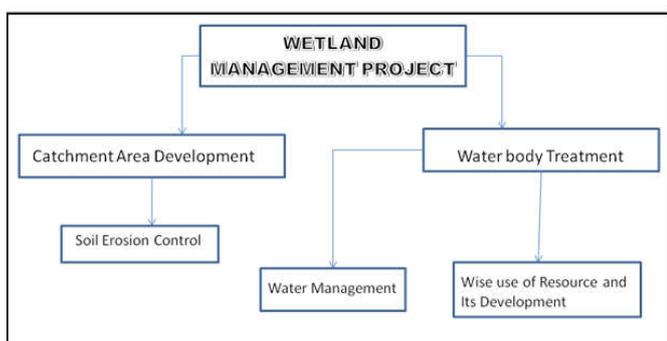
To ensure a management approach towards the wetland under study, the basic strategies to be outlined first viz., co-ordination, training and campaigns. The task of specialized co-ordination incorporates the major components of co-ordination being

- Advanced scientific and technical information,
- People's perception, and
- Development agencies active on wetlands.

### Management action Plan

A booming wetland management action plan be prepared by addressing the following aspects into a proper way;

- Protection of the wetland and its associated environment
- Catchment area (the wetland) development
- Control of siltation
- Control of pollution
- Biodiversity conservation and wise use of resources
- Generating awareness and community participation
- Monitoring, evaluation and micro-level research



'Wise use' wetland management plan

### Findings

The findings of the present investigation are as below:

- Deterioration of Wetlands in the area concerned has been caused mainly by rapid increment of population.

- The process of the extension of settlement is mainly horizontal
- The people living on the Wetlands by encroaching the area are dumping their solid and liquid wastes, which is enhancing the rate of drying up of the wetlands. These will ultimately invite the destruction of the total ecosystem.
- The plant and animals living in the wetland are facing profound troubles in terms of their sustainability and marked to be endangered because their number of population is decreasing at alarming rate.
- Shortage of surface water due to its over-utilization has forced the resident community to pull out huge amount of ground water. This has direct effect upon the surface water bodies which are gradually drying up at an abnormal rate.
- The small cultivators or fisherman who are dependent upon production from the wetland, that is, agriculture and fishing, are now facing profound economic hardships. Particularly in the time when water is absent in the rivers and agricultural fields are gradually reduced in area by residential encroachment.
- Building up of houses on the outlets of water courses have slowed down the speed of surface runoff causing quasi natural flood which is responsible for prolonged stagnation of water.

### Conclusion

Wetlands are among the most productive ecosystems due to their functions and attributes. They are essential to the well being of the district Hugli as well as the whole India, as they contribute significant economic and social benefits to the society. Despite of their high productivity and provision of many benefits, wetland ecosystems in the study area are still facing serious threats, while these wetlands have the potential of contributing significantly to the socio-economic development. These threats include among others inappropriate human activities within the catchments and in the wetlands, lack of coordinated and holistic policy guidelines, and climate change. The threats have induced changes that have eroded the ecological and socio-economic values and services derived from these wetlands. Wetlands have been regarded as "wastelands", which mentality has led to large-scale drainage and conversion for alternative uses without regard to ecological and socio-economic values.

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