



## “SOCIO –ECONOMIC VS ECOLOGICAL STATUS OF RAMSAR WETLANDS CHALLENGES FOR SUSTAINABLE DEVELOPMENT”

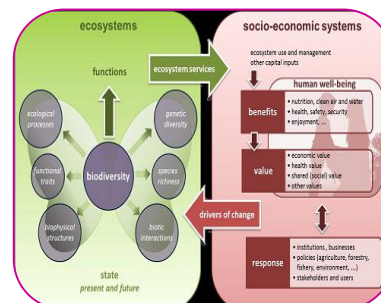
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### ABSTRACT

Wetlands are the “lands transitional zone in between terrestrial and aquatic eco-system. Wetlands are valuable for their goods and services, and the intrinsic ecological value they provide to local populations. The East Kolkata Wetlands(EKW) comprises a large number of water bodies located in the districts of 24 pgs North and south. The Multifunctional Wetland Ecosystem consists an area of 12,500 ha. It comprises 254 sewage fed fisheries, small agricultural plots and solid waste farms. EKW nurtures the world’s largest waste water fed aqua cultural system. Out of the total EKW 15% is occupied by the ‘bheri’. The goods and services provided by this wetlands include. In addition to fisheries, a very cheap, efficient and eco-friendly system of solid waste and sewer treatment system for the city of Kolkata, habitat for water flow and housing for a large flora and fauna. The occupational structure depend on people activities. However, because of increasing pressure of urbanization, change in the quality and quantity of the solid waste and sewer, as also human neglect this Ramsar site is under threat. These sewage fed wetlands are also polluted by aquatic pollution, renovation and large scale of commercial agriculture. EKW , implementation of sustainable policies can maintain the ecological equilibrium of these valuable water bodies, which in turn, can enhance social, environmental and economic security of Kolkata in future. Ecotourism development has been proposed as one of the key strategies for balancing the conservation and livelihood needs of the communities.



**KEYWORDS :** EKW, sewage fed, Ramsar site, sustainable development, ecological balance, economic development, Ecotourism.

### INTRODUCTION

The traditional zone between permanently aquatic and dry terrestrial ecosystem are usually known as wetland. Wetlands are the important source of natural resources upon which rural economic depends. EKW is the unique example of innovative resource reuse system through productive activities. It was designated as “wetland as international importance” under “Ramsar convention on 19<sup>th</sup> August 2002 and as “Ramsar site” in November 2002. EKW is situated in the eastern fringes of Kolkata city approximately between latitude 22°25’ to 22°40’ North and longitude 88°22’ to 88°55’ East (Roy Chaoudhuri et.al, 2012).

EKW , a high performance engineered and managed ecological system that has developed over a century to treat urban waste , produce saleable fish and vegetables create employment and support a local population economy.

### GENERAL INFORMATION OF EKW:

There are four major types of land use patterns, there man made wetlands covering 37 mouzas, primarily Sewage fed fisheries covered 5852.124 ha, Agricultural area-47128.56 ha, Productive farming area-

602.78 ha and urban and rural settlement-12326.52 ha. This wetland is also important for its fishery activity and is now producing about 13,000 tones of fish per year. Generally major craps such as rohu, catla, mrigel, silver carp, common carp and grass crap etc. stocking dencity are generally maintained at 6000-7000 fingerlings per ha but farmers are more interested to stock greater proportion of more tolerant and bottom grazing fishes like tilapia, common carp, air breathing fishes and mrigel to maximize the fish yield.

The EKW supports a population of approximately 1,50,000 and literacy rate of EKW approximately 712.128%. Maximum people belong inn lower income group and they are BPL category people. These wetlands are haven for many biological resources that maintain the ecological equilibrium of this system.

**Urban development and present environmental status of EKW :**

- Firstly:** problem is one of encroaching urban development
- Secondly:** there is a major problem is silt. This fishpond, that was initially six feet deep has silted up to within two feet of the surface, cutting potential fish production by two thirds.
- Thirdly:** the core area of Kolkata city having old combined drainage system.
- Fourthly:** No conventional type of sewage treatment plant was constructed for sewage fed fisheries.
- Fifthly:** during the monsoon period as the DWP(dry weather flow) water is mixed up with storm water flow at the upstream side of Bantala regulator gate, both the interest, come into play simultaneously.
- Sisthly:** the ways of this wetland among the workers is low than the Govt. registered wetland.

**Urban development and environmental degradation of EKW:**

Different Land Use Classes in East Kolkata Wetland

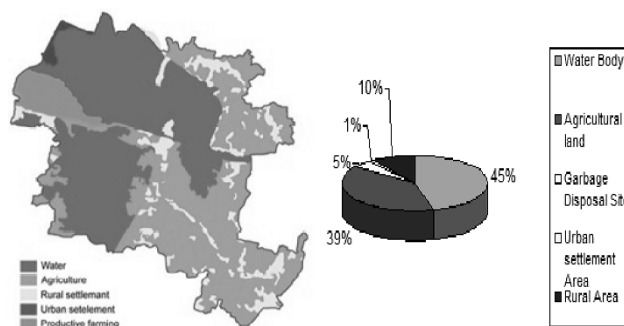


Figure 1: Different Land Use Patterns in East Kolkata Wetland Area

East Kolkata wetland acts as a natural sink of waste water and sludge. Huge amount of sewage and waste water is being discharged daily init. It also receives large amount of garbage. Other than this a huge load of heavy metal released from different industries. This aquatic ecosystem receives toxic and hazardous substances like heavy metals(Cu, Cr,Pb,Hg,As, sulphate, oil, grease etc) through industrial effluents from tanneries and related industries battery industry, small elector plating, metal handicraft industries situated around the wetlands. Agricultural land is also present around the wetland. The vast population play role to the generation of hazardous pollutant like sulphate arising from domestic pollutant and industrial activities(Dasgupta et.al2014, nandi et.al 2013, Mukherjee et.al, 2011).

**Table 1: different pollutants Discharged in EKW:**

|   |                        |                      |
|---|------------------------|----------------------|
| 1 | Sewage and waste water | 600 million lit/day  |
| 2 | Garbage                | More than 2500 tones |
| 3 | Heavy metals           | Cr,Cu,Pb,Hg etc      |

|   |          |   |
|---|----------|---|
| 4 | Sulphate | - |
| 5 | Oil      | - |
| 6 | Grease   | - |

**Table 2: Different Heavy Metals from different industries:**

| Sl.no | Name of the heavy metals | Name of the industries                         |
|-------|--------------------------|--|
| 1     | Cr                       | Tannery and leather industries                 |
| 2     | Cu                       | Metal handicraft and electroplating industries |
| 3     | Pb                       | Tannery and battery manufacturing industries   |
| 4     | Hg                       | Plating and dye industries                     |

Some of the industries which are located in East Kolkata Wetland area like-tannery an battery,small scale electroplating,battery manufacturing,metal handicraft,motor servicing company,dyeing, printing and bleaching,moulded rubber factory and plastic footwear manufacturing company ect.

**Loss of bio diversity:**

Biodiversity is an attribute of an area and specially refers to the variety with and among living organisms, assemblages of living organisms, biotic processes, whether naturally occurring or modified by humans. Biodiversity does not just refer to the biological variation of species and protection of the threatened ones but covers the whole spectrum of the natural environment. A good no. of biological resources of this EKW are used as food, fodder, fuel, vegetables, pulses, oils, paper-pulp, medicine and other wetland based cottage industries. Biodiversity can be measured in terms of genetic diversity and the identity and number of different types of species, assemblages of species, biotic processes and the amount and structure of each. It can range from micro sites and habitat to the entire biosphere. If we go by these concepts then it is clear that variety of living organisms along with their assemblages, biotic process and amount has drastically changed in this highly fragmented wetlands ecosystem of EKW.

**Land use pattern change:**

Rapid growth of urbanization and industrialization EKW lost there recognition of being a Ramsar site-a wetland of international importance. Decrease in the area of EKW would lead to detrimental consequences like changes in ecosystem qualities, loss of livelihood as well as revenue resulting from a reduced wetland area. As we know the east Kolkata wetland is called the green heart of the city due to its greenery and rich wetland resources, Land use changes in east Kolkata wetland over a period of year from 1986-2011 have resembled a distinct changes of a more to less severe pattern.

**Table 3(Area in sq.km)**

| Year | Wetland area | Other land | Total area | % of wetland |
|------|--------------|------------|------------|--------------|
| 1986 | 41.065       | 92.925     | 133.99     | 30.64        |
| 1999 | 35.279       | 98.711     | 133.99     | 26.32        |
| 2011 | 33.082       | 100.908    | 133.99     | 24.68        |

**Table 4(Land use scenario of year 2011):**

| Sl no | Land use   | Area in sq.km | Area in % |
|-------|------------|---------------|-----------|
| 1     | Wetlands   | 33.082        | 24.68     |
| 2     | Vegetation | 11.474        | 8.56      |
| 3     | Canal      | 3.127         | 2.33      |

|   |                          |        |       |
|---|--------------------------|--------|-------|
| 4 | Built up with vegetation | 26.757 | 19.96 |
| 5 | Vacant land              | 6.211  | 4.63  |
| 6 | Road                     | 0.728  | 0.54  |
| 7 | Agricultural land        | 52.611 | 39.26 |

The present land use table of EKW represent the different types of entities which surround this wetland around its near by ambit. This table provides a clear evidence of the decreasing of wetland area has been mechanized primirilly because of increasing concentration of agricultural area whwreby villagers are utilizing this wetland area for crop cultivation.

**Socio- economic Impact of EKW:**

The most important demographic characteristic of population is its age-sex structure also known as population pyramids. Here the age-group of the people has been divided into three broad categories.(Fig.2) shows that the proportion of group 14-60 years is very high, the proportion of elderly people is low when it is compared with the working age group. It is also shows that the proportion of dependency people is medium (Bunting et.al, 2001; Mukherjee,2002).

Education is an important social aspect. Education is the wealth of knowledge acquired by an individual after studying particular subject matters or experiencing life lessons that provide an understanding of something. Fig. 3 shows the level of education at different stages. ( Fig .4). The occupational structure of the wetland dependent people. It also proves that maximum people belong in lower income group and they are BPL category people. Almost 6 to 7 families monthly income exceed Rs. 10000.Table 1. that maximum number of Bheri labourers is employed 12 to 20 years and 8 labourers are employed very early compared with previous labour. So the Bheri is old pronounced Bheri and the span of occupation of the Bheri labour also lengthy. Fig. 6 shows the no of people are ready to contribute their finance for protection of Wetlands. Financial condition of worker’s is denoted by Fig.7.fig8., Fig.9 and Fig.10 show the uses of the said wetland according to the rank priority of bheri worker’s(Roy et.al,2015; Bunting et.al,2001; Mukherjee,2002).

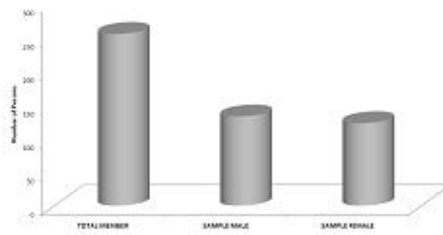


Fig.1:Population Composition of Sample Survey

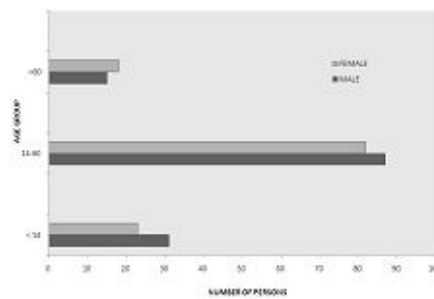


Fig.2:Age-Sex Structure of Sample Population

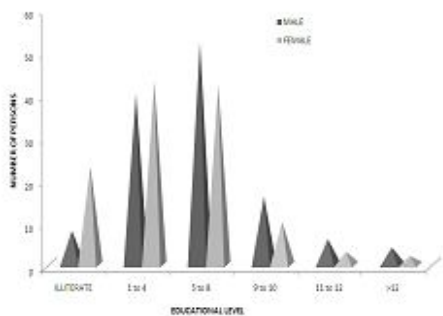


Fig.3:Education Structure of Sample Population

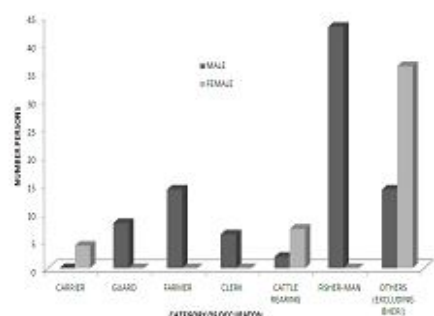


Fig.4:Occupational Structure of Sample Population

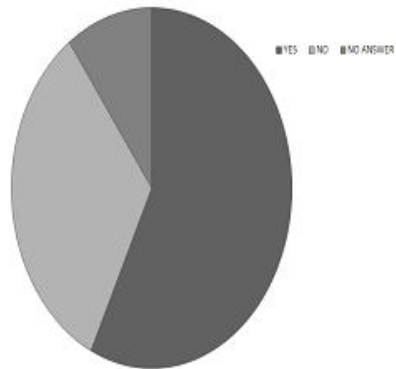


Fig.6: Number Of People Willing To Pay Money

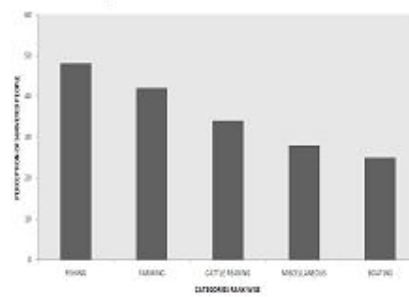


Fig. 10: Uses Of Wetland (Priority Rank)

Table 1. Occupation of the Wetland Labour

| Span of Occupation |                  |
|--------------------|------------------|
| Years              | Number of People |
| <12                | 8                |
| 12 to 20           | 42               |
| >20                | 20               |

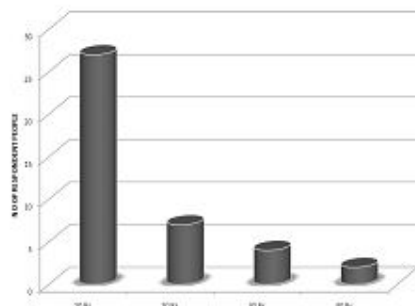


Fig.7: Willingness to pay

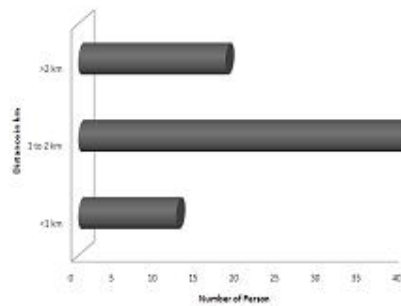


Fig.8: Distance of Houses from Wetland

**Barriers to sustainable development:**

Wastewater canal thought to be the vital component of ecological security to natural water body has lost its efficiency of natural purification. The major causes of this impairment is imprudent watershed management due to poor planning, designing and construction of engineering projects such as roads, housing complex , shopping mall , small-scale industries etc, poor maintenance of wastewater canal (siltation), inadequate trained and organized fish farmers’ group to properly maintain fish pond and lack of institutional support. The other major barriers are lack of implementing appropriate legislation to control at source and lack of environment policy specifically framed to restore this wetland in local level. The most pressing problem is financial constraint and management impassivity in top level officials to implement sustainability programme. One example can authenticate the management impassivity to solve this problem (Robert et.al, 1997). The major problems are non-availability of requisite quantity and quality of wastewater. Government is reluctant to make the canal eco-efficient by removing the sludge at regular interval. The pollutant concentration prior to utilize in aquaculture is reduced by passive treatment (holding in the feeder canals for few hours) but its effectiveness was not evaluated in a systematic manner. Rational design for treatment of variety of contaminant suggested by (Bunting et.al,2007) cannot be implemented in the current socio-economic condition.

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**Possible opportunities to improve ecosystem function:**

The Environmental sustainability is reflected by the fact that societies depend on natural resources and other ecosystem services as for example Nature as a provider of aesthetic services. The system conditions or socio-economic principles coined by( Azar et al and Holmberg et al) gives a good view of the environmental sustainability dimension. Based on these conditions almost all of our environmental problems can be scrutinized. These are examples of how the environmental problems of greenhouse gas emissions, eutrophication, acidification, toxic substances and biodiversity relate to the conditions. Environmental sustainability is sometimes also labelled ecological sustainability. An important aspect of ecology is that it is almost always place dependent (Mukherjee,2011; Robert,2002).

Society needs to be maintained, which is the overarching goal. This goal is to a large extent already covered by the environmental and economic sustainability dimensions. In this context social and economic sustainability are fully interconnected and dependent of the resources delivery and regenerating capacity of the environmental system( Santra et.al, 2003).

**Interaction between socio-economic and ecology for wetlands:**

EKW is a complex, dynamic system, and efforts to freeze and analyze the system in a static state obscure the wetland's continuous fluctuations and balancing mechanisms. Structurally, the disciplines of economics and ecology have much in common. Both analyze and predict the behaviour of complex, interrelated systems in which the behaviour of individual agents and flows of energy and matter are central, and its dynamics are governed by the allocation of scarce resources among competing agents. The dynamics of ecosystems and markets are extremely different, and these differences are reflected in the time steps and time horizons commonly employed in models of ecological and economic systems (Balkema et.al,2001).

According to different scientist's point of view, ecosystems functions can frequently be modelled at a very high level of temporal and spatial resolution. While ecologists frequently adopt high time resolution models, they also are interested in long-time horizons, and it is with regard to long-term implications of human actions that ecologists are frequently concerned. Economists have tended to ignore the very long run, believing that future perturbations to the system are virtually impossible to predict. Other types of boundary conditions differ as well (Balkema et.al, 2001). There is no reason for ecosystem and market boundaries to coincide. As a rule, neither definition nor bounding mechanism subsumes the other. Ecologists think in terms of physical flows such as water, biomass, and energy. Many of these connections have spatial characteristics, and in recent years ecologists have made great advances in the development of spatial modelling techniques. Many differences in the approaches of ecologists and economists occur because the factors in the environment that are the focus of detail for one discipline are often hopelessly aggregated or abstracted from by the other. For example, the ecological model might not distinguish between agricultural crops such as soybeans and wheat, or among wildlife species on recreational lands, for this distinction may not be important in modelling the ecosystem. Yet, in addressing human behaviour and assessing values to humans, these distinctions are significant(Bernstein,1981; Kundu,2008;Costanza et.al, 1993).

The major components of the system are the spatially explicit, dynamic models for the ecological system and the economic decisions, and the mechanism for exchange of information between the two. The results of the interrelated processes produce a new landscape and a new array of values associated with the landscape. Some of these become signals to private individuals and public agents in future decisions. The human activities of importance form an interrelated, dynamic, spatially distributed system in their own right.

**CONCLUSION:**

East Kolkata Wetlands in general and Bheris in particular can be considered as excellent examples of integrated resource recovery systems utilizing traditional knowhow for the benefit of environment as well as society. This wetland is of paramount importance for maintaining of ecological balance and environmental sustainability. It also provides employment and food resource along with treating the waste for the 12

million inhabitants of the city of Kolkata. Apart from environmental protection and economy generation it holds tremendous potential for the fledging biotechnology industry in West Bengal and also India. It is concluded that this Wetland area and its biodiversity is seriously affected by pollution. The characterization of waste water and pond water clearly revealed the strong influence of urban pollution on waste water canal and fish ponds. The determination of water quality in canal and ponds caused irreparable loss of pond ecosystem in terms of poor fish yield, loss of biodiversity and inefficient nutrient recovery. Good quality sewage, which is a critical component for sustainable resource recovery, was practically lacking for fish pond management. Out of the total wetland area in 1986-2011 the area in 1986-2011 the percentage of decreasing wetland is equivalent with the percentages of increasing unclassified data. The East Kolkata Wetland is called the green heart of the city, thus any disturbance in the area can cause total environmental imbalance for the metropolitan zone.

Based on above discussion it is quite understandable that East Kolkata Wetlands need proper conservation and management measures which have been already initiated by the State Government. Preparation of the Management Plan has already been started where focus will be given on: 1) Conservation of biodiversity, 2) improvement of livelihood of local people, 3) Management of wetlands complying the Ramsar Convention Guideline

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