

PLANNING TO PRESERVE THE EAST KOLKATA WETLANDS:
RECOMMENDATIONS FOR MANAGEMENT PLANNING

by

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Abstract

The East Kolkata Wetlands, just outside the Indian mega city of Kolkata, have been designated “a wetland of international importance” by the Ramsar Convention on Wetlands for its myriad of human and environmental benefits and history of wise-use. The 12,500-hectare area supports tens of thousands of people through agriculture and fisheries, and serves as a “kidney” to Kolkata, receiving 250 million gallons of human wastewater daily. As well, the area is rich in plant and wildlife species, some used for medicinal purposes. However, Kolkata’s intensive urban expansion threatens to destroy critical areas of the wetlands and increasing polluted wastewater and runoff poses a significant risk to human health. These are at the root of many more threats to ecological integrity. Despite decades of use, it is only in the last few years that intentional management actions have begun, and at present, there is no comprehensive policy framework for addressing these and other threats. This report provides a basis for why the East Kolkata Wetlands must be preserved, a review of management action, past to present, and finally, a proposed policy framework and management recommendations, comprehensive in nature to ensure the continued success of this one-of-a-kind natural resource.

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List of Abbreviations

EIA	Environmental Impact Assessment
EKW	East Kolkata Wetlands
GoWB	Government of West Bengal
I&WD	Irrigation and Waterways Department
IWMED	Institute of Wetland Management and Ecological Design
KMC	Kolkata Municipal Corporation
KMDB	Kolkata Metropolitan Development Board
NGO	Non-governmental organization
MAP	Management Action Plan
PUBLIC	People United for Better Living in Calcutta (Kolkata)
SEA	Strategic Environmental Assessment
SPB	State Planning Board
WBPCB	West Bengal Pollution Control Board
WMA	Wetland Management Authority

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Introduction

In the early 1900s, the East Kolkata Wetlands (EKW) were providing local fishermen with an ample food supply. At that time, the wetlands were fed by the tides of the Bay of Bengal. But when natural delta building, aggravated by human activity that increased erosion, clogged the channels with sediment and cut off this water supply, the locals were faced with the loss of their livelihood. In the 1930s, however, it was found that the wastewater from the city could serve as an alternative water source for the fisheries (Ghosh 2005). For the seventy years since, the wetlands have served to sanitize the city's growing wastewater effluent, to the extent that the system can treat the 250 million gallons of wastewater it receives daily in 30 days retention time (Kundu 2005).

There are persistent problems in a system this large, serving so many functions adjacent to a major metropolitan region. Of most concern are issues related to urban development and expansion, industrial pollution, land tenure, siltation, water availability, and, on the horizon, climate change. Increasing levels of siltation and pollution threaten to make the waters unsuitable for fishing and farming. Farmers are hesitant to invest in their operations long term due to uncertainty over property rights. And the forecasted impacts on sea level rise and regional rainfall patterns brought on by climate change could be disastrous for the entire system without some adaptation.

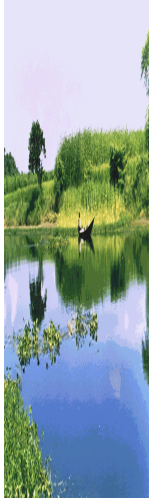
For decades, the pressure of urban development and expansion has run up against the wetland borders. The presence of the wetlands in the east is the reason that Kolkata has grown north and south, sitting on the banks of the Hougli River to the west.

Presently, some 3,500 acres within the EKW boundaries are used for rural, and, to a much lesser extent, urban settlement. The pressure for this growing metropolis to expand is breaking through the protected boundaries of the EKW, established in 1992, exploiting a muddled judiciary and inconsistent litigation (Dembowski 2001).

In 2002, the EKW was designated a “wetland of international importance” under the Ramsar Convention. The Convention on Wetlands, signed in Ramsar, Iran, in 1971, is an intergovernmental treaty, which provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources (Ramsar Convention Bureau, 2002). This brought international attention to the protection of the EKW and rallied local action for active management.

Despite decades of use, it is only in the last several years that intentional management actions have begun. At present there is no comprehensive policy framework for addressing these and other threats. What follows here is a basis for why the East Kolkata Wetlands must be preserved, a review of management actions, past to present, and finally, a proposed policy framework that could be expanded in future management plans. The framework is meant to be comprehensive in nature to ensure the continued success of this on-of-a-kind natural resource.

Vision for the East Kolkata Wetlands



The citizens of the City of Kolkata and State of West Bengal, today and for generations to come, enjoy a greater quality of life because the East Kolkata Wetlands are protected from misuse. Recognized by the Ramsar Convention, the East Kolkata Wetlands (EKW) are a “wetland of international importance” (RAMSAR Convention, 2002) and as such are a critical element of the environment and must be respected,

This vision statement serves as the guiding principle and goal for these planning recommendations. To achieve this vision, the East Kolkata Wetlands Management Planning Recommendations takes a comprehensive, systems approach to land use and water resources planning. The Planning Recommendations:

- (1) presents the history of use and management decisions in the EKW,
- (2) draws on the extensive scientific and social research on the EKW to identify and characterize the benefits provided by the wetland area and the extent to which it is being impacted by urbanization, and
- (3) based in this research, sets forth a comprehensive policy action framework to preserve wetland function in the face of current and anticipated impacts.

A New Planning Approach

This document lays out a comprehensive, strategic and integrated approach to improving the health of the EKW and, in parallel, Kolkata's overall environment. Goals, objectives, and strategies will be aimed at improving watershed and wetland functions across the municipal and EKW area. The management framework is built with tracking and measurement tools to continually evaluate the effectiveness of strategies.

These plan recommendations are based on strong scientific research and will seek to address the source of environmental problems, instead of the symptoms or simply meeting regulatory requirements. The approach relies on cooperative interaction of multiple City bureaus, public participation, academia and outside funding sources. Each of these stakeholders shares a common goal of improved public safety and economic vitality, which this plan can provide.

The framework presented here also represents a paradigm shift from the conventional approach to development, one where natural resources are used to fuel development, to a new, innovative and sustainable principles. This approach to planning and design aims to preserve natural resources for growth and renewal. To succeed in this, it is critical that land and water are managed holistically, in one framework, instead of on individual components, such as drinking water, stormwater and wastewater, or private and public property. Design will seek to produce an urban landscape that mimics, but not necessarily reproduces the land and water processes as they were before human development.

Organization of the Planning Recommendations

This document is made to be interactive and accessible for citizens' and policy-makers' continued use and reference. It is not meant to be just a philosophical study or statement of intent. It is organized into the following parts:

- (1) Introduction to the characteristics and use of the EKW and its interaction with urban Kolkata, past and present.
- (2) Review of past management actions taken by government authorities and other agents and the impacts those actions have had on the EKW and future planning decisions
- (3) Management action framework outlining goals, objectives and strategies to comprehensively address the problems threatening the health of the EKW and dependent populations, consistent with the Ramsar Convention

To better organize the action framework, goals are divided into five themes: land use, wastewater and wetland function, preservation and protection, and education and community involvement. These themes represent both the threats facing the wetlands and the solutions proposed for managing those threats.

State of the East Kolkata Wetlands

The wetland area east of Kolkata has been known throughout the world for its multiple uses. Local people have developed the EKW into the largest resource-recovery system in the world using wastewater from the city to feed agriculture and fish farming. In the process, it cleans the wastewater, acting as the “kidney” of the city. The wetlands have saved the city of Kolkata from constructing and maintaining a wastewater treatment plant. Ghosh has estimated that an investment of 4.5 million dollars or almost 1.4 million rupees would be required to build a conventional wastewater treatment facility. And this would only handle 200 million gallons of the 350 million gallons the EKW receives daily. Meanwhile the nutrient-rich wastewater supports agriculture and fish farming, that in turn supports tens of thousands of local poor populations.

The wetland as it is today is largely human-made, fed by the city’s wastewater through a system of canals. The area is comprised of inter-tidal marshes including salt marshes, salt meadows with significant wastewater treatment areas like sewage farms, settling ponds, and oxidation basins and covers over 31,000 acres. The EKW is situated about 5 km from the eastern edge of Kolkata. It lies within latitudes 22° 25’ to 22° 40’ north and longitudes 88° 20’ to 88° 35’ east. The average elevation is 2–5 meters (m) above mean sea level. The regional climate is hot and humid monsoon climate governed by the Himalayas to the north and Bay of Bengal to the south.

January is the coolest month with temperatures ranging between 10°C to 20°C while May experiences maximum temperature ranging between 30°C and 40°C. Average relative humidity is high between 70 percent and 90 percent approximately. Average annual rainfall is about 1582 mm and is mainly concentrated in the months of June, July, August and September.

The wastewater is, however, both a resource and a hazard to the proper functioning of the EKW. As the city has become more industrialized so has the waste from the city. Toxic pollutants, such as heavy metals and medical wastes, are now present in this effluent and are not easily processed by natural means. Heavy metals in particular can work their way up the food chain by a process termed bioaccumulation, making their way into fish that humans consume. So far, the concentration of these toxins has not reached dangerous levels with proper preparation of fish, but the trend is increasing.

With urbanization comes increasing area of impervious surfaces, such as buildings, roads and parking lots. Natural land cover is able to absorb and infiltrate a large fraction of precipitation into the ground, and filter out much of the pollutants that may be carried with the rainwater. In areas that have a lot of impervious cover, more stormwater runs off into the waterways and erodes soil. Known as sediment, this washed away soil is filling up ponds in EKW, threatening the natural processes that clean the wastewater and destroying habitat for wildlife. It is important that the historical development of Kolkata is understood in basic terms to know how it reached its present form and therefore, how to chart a new direction, conscious of the importance of protecting and preserving the EKW in this new era of growth.

Development of Kolkata

The settlement of Kolkata was established on the western banks of the Hoogly River, the westernmost large river on the Ganges delta. As it grew, the city moved north and south along the river. The low-lying wetlands to the east, much like the Hoogly, presented a natural barrier to expansion. Figure 2 shows how the city has moved north and south and the barriers of the Hoogly river and EKW. But during the 20th century, population growth and urbanization in Kolkata proved too intense to continue progressing north and south, thus the eastern wetlands were reclaimed for new development. The urban growth rate in West Bengal from 1941 to 2001 was a staggering 376 percent.

The land in the wetlands became increasingly valuable for its proximity to the city center and, particularly with the construction of the Eastern Metropolitan Bypass, the area is even more accessible. However, drainage of these areas has been extremely expensive and ineffective in the rainy season. About 80 percent of annual rainfall takes place during the monsoon season from June to mid September and therefore flooding is a nearly everyday occurrence across Kolkata and settlements within the EKW.

Today Kolkata is the most densely populated city in India and one of the most populated and dense cities in the world, with a population of 14 million. Fully one third of the population lives in slums deficient in basic infrastructure and services. Slum improvement has been a critical component in all the city's development efforts and the continued use of the EKW is a large element of these efforts.

The Importance of Wetlands

Wetlands are one of the most critical ecosystems on earth. Wetlands fulfill multiple functions to the benefit of people and the natural environment. Some of these functions include flood control, wastewater treatment, decomposition, ground water recharge, soil erosion control, and habitat for mammals, fish, birds, and countless plant species. The products from wetlands include fisheries, agriculture, water supply, peat and sediment, medicinal plants, and energy resources.

Wetlands are transitional areas, between land and water where the water level is usually at or near the surface. The Ramsar Convention (1971) defines wetlands as “swamps, marshes, billabongs, lakes, salt marshes, mudflats, mangroves, coral reefs, fens, peat bogs, or bodies of water - whether natural or artificial, permanent or temporary. Water within these areas can be static or flowing; fresh, brackish or saline; and can include inland rivers and coastal or marine water to a depth of six meters at low tide.”

The Importance of East Kolkata Wetlands

The East Kolkata Wetlands basically comprise all areas not yet urbanized to the east and south of Kolkata. Boundaries to define an area as the “East Kolkata Wetlands” were established with the EKW Ordinance of 2005. An area covering much of the EKW, called the “Waste Recycling Region (WRR)” has been mapped and is often cited interchangeably with the EKW. A High Court ruling in 1992 first protected the WRR, (see PUBLIC v. The State of West Bengal).

The EKW have an interesting history. The area had been a brackish water lagoon swamp but as drainage water came out of Kolkata it became suitable for raising fish. In the 1930s, the fishing and farming practices we see today began to develop. The first commercial fishing operations, initiated by local villagers began in 1926. For several decades, government authorities were not concerned with what happened to Kolkata's wastewater or the activities in the EKW (Dembowski, 2001). Systematic research began only in the 1980s on behalf of the state government.

Dhrubajyoti Ghosh, a civil engineer, prepared the first report for the Department of Fisheries in 1983. He became the first director of the newly established Institute of Wetland Management and Ecological Design (IWMED) in 1986 that has served as the clearinghouse for scientific research ever since.

Today, there are nearly 300 large fish farms and ponds covering an area of 8,600 acres; some individual ponds extend to 175 acres. Landlords, many of them absentee, let the majority of ponds to commercial managers, some others are managed by the government and some have been given to fishermen's groups and cooperatives.

Vegetable production is a household activity with people renting small plots or sub-letting smaller plots for their own household sustenance and income (Dembowski, 2001).

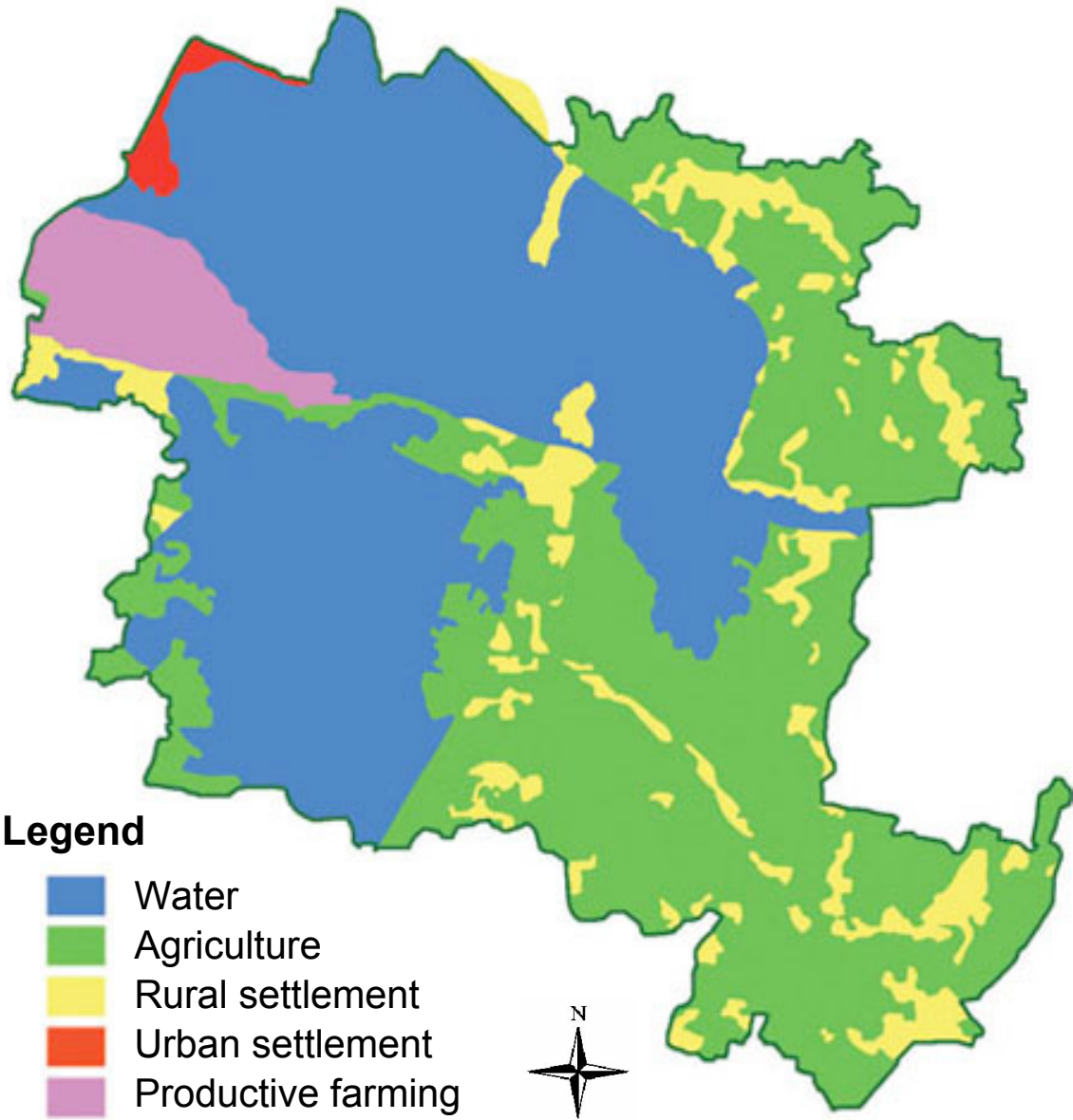
Apart from those people actually raising fish (about 8,000) or growing vegetables, there are porters, auctioneers, traders, retailers and people raising fish seed, making nets, maintaining drainage canals and reinforcing the banks. A great many people, many of them poor, depend on the wetlands for their livelihoods.

It is estimated that some 60,000 residents derive their livelihoods from these and other activities connected with the EKW. Tens of thousands more in the city, depend on the fish and vegetables produced. 13,000 tons of fish are produced annually in the ponds receiving wastewater. This represents 45 percent of all fish protein consumed in the West Bengal region and fully one third of all fish sold in Kolkata markets. 150 tons vegetables per day are harvested from small-scale horticultural plots irrigated with wastewater and fed with compostable garbage from the city (Dembowski, 2001). Figure 1 shows the bounded area of the entire EKW along with the approximate acreage of each land use class in 2002.

Approximately 1,300 million liters of wastewater from Kolkata is pumped through canals into the EKW daily. The flow of water is diligently managed. First, the sewage is left stagnant in shallow ponds of roughly one-meter depth to allow solar radiation to kill bacteria. Then this nutrient-rich water is channeled into ponds, feeding abundant algae and fish. Historically, the consensus among local experts is that the use of this wastewater in raising food for human consumption presents minimal risks to human health. “[Kolkata] sewage contain a low concentration of heavy metals and there is no evidence that normal pond-fish from other places contain fewer pathogens than the sewage-grown-fishes in question” (Ghosh and Sen, 1987: 223).

The EKW is home to a rich biodiversity of plants and animals, approximately 108 known plant species, 20 species of mammals, 40 species of birds and 52 endemic species of fish - of which 32 are now endangered.

Figure 1. Land Uses in EKW (2002)



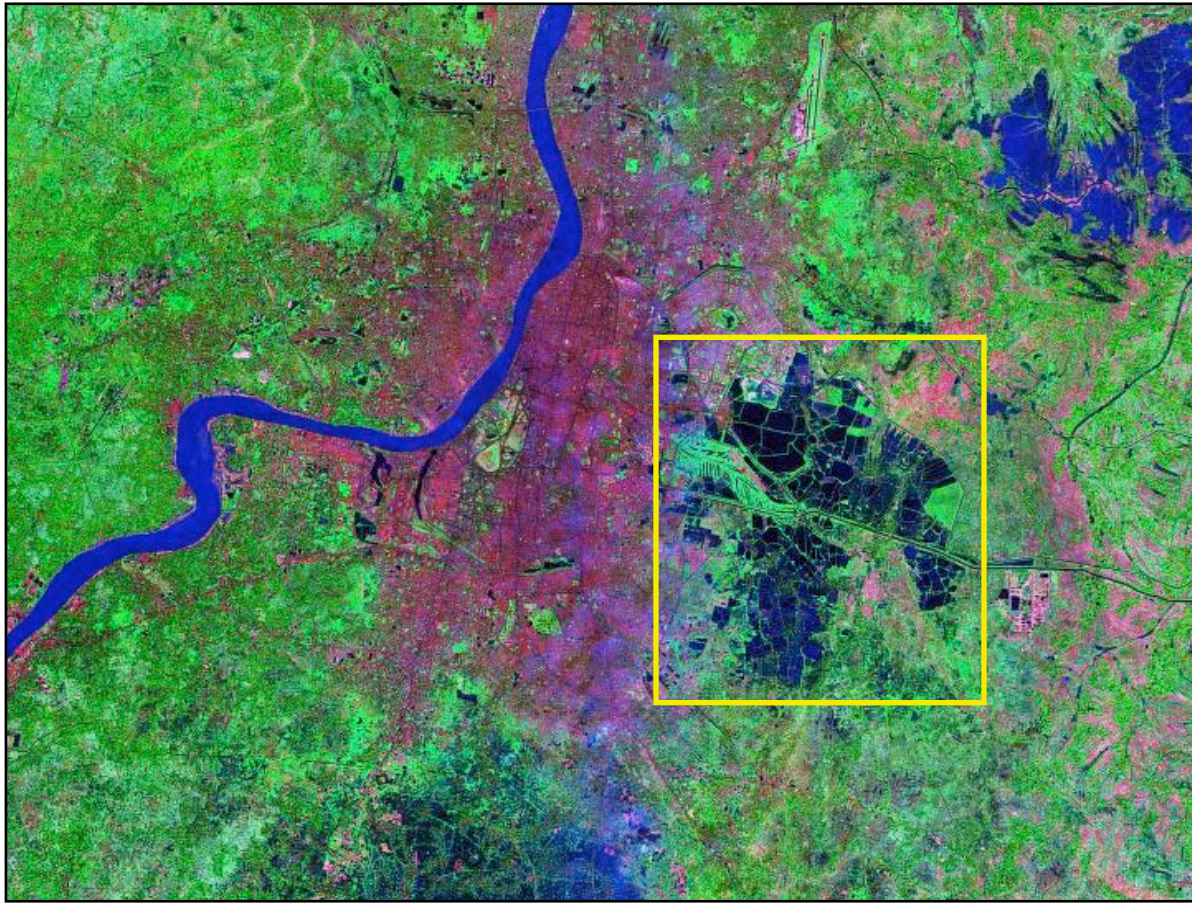
Legend

- Water
- Agriculture
- Rural settlement
- Urban settlement
- Productive farming

Land Use	Area (acres)	Percentage
Water	14460 (9600 for fish farming)	46% (31%)
Agriculture	12256	39%
Rural settlement	3051	9%
Urban settlement	224	1%
Productive farming	1490	5%
Total area	31000	

Source: IW MED

Figure 2. Satellite image of Kolkata metro area and East Kolkata Wetlands



Legend





-  Urban Area
-  Vegetation
-  Water
-  East Kolkata Wetlands



Image from Geology.com. Scale unknown

Challenges and Opportunities

As documented above, the services provided by the EKW over the decades have been invaluable to the development of Kolkata. But the growth of human populations and industrial activity are exerting tremendous pressure on the functioning of this unique system. The EKW faces a number of threats that require a comprehensive, systems approach.

Urban Development

Encroachment of urban settlements has only increased over Kolkata's history, and is one of the largest factors threatening the health of the wetlands. Urban development not only completely replaces wetland area but increases the amount of water, soil, and pollutants flowing off hard surfaces into the surrounding wetlands.

Industrial Pollution

Of immediate concern for human health is the build up of some industrial pollutants, such as chromium in the wastewater. This toxic metal has been discharged by the numerous tannery operations previously located in the EKW. Though many of the tanneries have been relocated some still remain. Leachate into ground water that remains there for decades is also of concern. These toxins are taken into the fish populations, making the fish unsafe for human consumption at higher levels.

Land Tenure

There are over 100,000 people living in the EKW. There are various forms of ownership of sewage-fed fishponds in Calcutta. There is a small cluster of co-operative sewage-fed fishponds in the region.

Owner-managed fishponds are the oldest practice of wastewater-fed pond management in the wetlands. This form of management is, however, dwindling fast on account of the uncertainties that prevail in this area (Ghosh and Sen 1987). Farmers tend to refrain from making significant investments in their lands and operations because of uncertainty about property rights and land holding, given intense development pressure.

Siltation

A widespread problem that affects all farmers in the region is siltation, both of the primary and secondary canals and fishponds. Silt is basically soil and other small solids that get into water. As silt builds up in wetlands, the change in water depth impacts the functions of the wetlands. Water depth is critical to successfully purifying the wastewater. And shallower water threatens the capacity and survivability of fish and crops.

Wastewater Availability

Not only does siltation affect production by decreasing the volume of water in fishponds, it also prevents the effective distribution of wastewater. Uncertain wastewater supplies for aquaculture managers and seasonal water shortages for vegetable and rice growers are significant challenges. Urban drainage water has, in the past, permitted farmers to cope with periods of natural water scarcity and to intensify and extend production into what may otherwise have been fallow periods. The benefits once associated with access to wastewater are being reduced by problems of siltation, and the ongoing conflict between the needs of the urban drainage authorities and the requirements of producers (Edwards, 2001).

Climate Change

Of the many impacts scientists foresee from a small rise in average global temperature, the threat of sea-level rise and altered rainfall patterns are most problematic for the EKW. Sea-level rise of six inches, a somewhat conservative estimate could bring saltwater into wetland areas, dramatically reducing fish and vegetable production. A change in the rainfall pattern, already highly seasonal, could create more, and more intense periods of drought and flooding.

In sum, the East Kolkata Wetlands are a natural habitat with rich but eroding biodiversity. A major part of the area serves as the city's main waste disposal and sewage treatment scheme, on what local experts call a sustainable and appropriate technological basis. The area provides comparatively cheap food for urban markets and employment for thousands of poor people.

Management Action Past to Present

The commercial use of the East Kolkata Wetlands began in the 1926 with a local village fishery. In the 1930s, some communities began using wastewater to feed their fisheries and paddy fields. The British Colonial government was not much concerned with what happened to Kolkata's refuse. Even after India's independence in 1947, no formal policy was directed at the EKW. Attention began to be turned towards the EKW in the early 1980s as the State Planning Board rhetorically discouraged further urban growth on the eastern and southeastern fringes of Kolkata.

The first rigorous scientific study of the EKW began with Dhrubajyoti Ghosh in 1983. Ghosh later would direct the newly established Institute of Wetland Management and Ecological Design (IWMED) in 1986. The IWMED prepared the first map of the "Waste Recycling Region for Calcutta City", a 14,000-acre area (IWMED, 1988).

The Government of West Bengal proclaimed its support for wetlands protection in the legislation of the West Bengal Town and Country (Planning) Act of 1987. Two other documents also favor conservation, the Kolkata Metropolitan Development Board's (KMDB) "Plan for Metropolitan Development 1990-2015" and the State Planning Board's draft of a "Perspective Plan for Kolkata: 2011". The State Planning Board suggested that the wetlands should be kept for pisciculture and nature conservation. The plan also warned that "both in urban and rural areas, water bodies, parks, playgrounds, and other open spaces are being filled up and being used for

building” (SPB 1990: 200). However, as will be discussed here, these documents had no legislative force or mandate for action behind them. So the public took up the cause of pressing for meaningful action.

Growing Conservation Campaign

Local knowledge of the benefits provided by the East Kolkata Wetlands was rapidly increasing throughout the 1980s. Decision makers were also increasingly aware of the threats facing the EKW during this time. But despite this knowledge, and pro-conservation stances taken among the governing authorities, no formal, legal framework was being proposed to address the issues. There were disagreements over just how much of the wetlands area needed protection and advice from experts tended to be inconsistent (Dembowski, 2001).

There is also the issue that the EKW does not fall within even a couple jurisdictions, but actually is carved up among the territories of ten state departments and central government institutions.

The local people of the EKW, though the primary stakeholders for conservation, were unable to take up a cause for more action due to several factors. First and foremost many have not received much formal education and are illiterate. Their voice in government matters has therefore been limited. So several non-governmental organizations (NGOs), alongside some government employees at the central and state level, stepped in to spur action. The involvement of NGOs began intense public debate in the 1990s over wetland conservation in Kolkata. One group had a pivotal impact.

In 1992, the NGO People for Better Living in Calcutta (Kolkata) (PUBLIC) filed a writ petition in the High Court to save the wetlands, incited by plans for a World trade Center located within the Waste Recycling Region (Dembowski, 2001).

The petition argued that the State of West Bengal must legally protect the wetlands in accordance with the West Bengal Town and County Planning Act, 1979, section 46(1). It also asserted that government rhetoric in planning documents and the introduction of the statewide “Save the Wetlands Day” in 1988 should be followed up by comprehensive, concrete action (Dembowski, 2001). PUBLIC conveyed the immediate need for such action, showing that only half the original wetland area remained.

This writ led to one of the most important environmental decisions in Kolkata’s history in the case known as *People United for Better Living in Calcutta (PUBLIC) and anothers versus the State of West Bengal and others* (Matter No. 2851 of 1992).

The decision, coming on 24 September 1992, was a near complete success for PUBLIC and the EKW. The only requests not met were the establishment of expert bodies to review conservation strategies and the appointment of a single administrative institution for the EKW. Judge Umesh Banerjee, presiding over the case, made this illustrative statement in his judgment; “Nature will not tolerate us after a certain degree of its destruction and it will in any event have its toll on the lives of the people...The present day society has a responsibility towards the posterity for their proper growth and development” (Dembowski, 2001).

Despite the legal advances in the High Court advocating protection for the East Kolkata Wetlands, there was not a sufficient, organized institutional structure in place to properly plan and enforce management decisions. Through the 1990s conversion of wetlands areas continued, mostly by small-scale projects. By the end of 1998, the future of the EKW was very much still threatened.

EKW under Ramsar Convention

It was not until the government finally got the international recognition they wanted by being placed under the Ramsar Convention as “a wetland of international importance” in 2002 that positive conservation actions really began to establish. Although not legally binding, the Ramsar Convention designation been an important change in the City’s approach towards the EKW, though even this took a couple years to truly manifest.

Of any other time, 2005 was the year that brought the most sweeping and important political movement for protecting the EKW. After the threat that the site might actually be dropped from the Ramsar Convention due to lack of policy action, the government enacted the East Calcutta Wetlands (Conservation & Maintenance) Ordinance. The act divided the EKW area into four land use classes: (i) mainly water body; (ii) agricultural area; (iii) productive farming area; and (iv) urban or rural settlement. Activities that may be allowed or promoted for the wise use of the wetland have been listed under each land use class. Sewage-fed fish cultivation is extensively carried out in the water body areas and provides a livelihood for a large population.

Two key provisions of this ordinance were its ban converting wetland areas for development and the formation of the Wetland Management Authority (WMA).

The WMA became the missing link for wetland protection in the institutional structure. All projects in the EKW must be approved by the WMA. A technical committee also reviews project submissions before sending them on to the WMA. Principal secretaries of the environment, fisheries, irrigation, forest, urban development, land and land reforms serve on the WMA, along with representatives from NGOs, fishermen's associations, district administration, the Institute of Wetland Management and Ecological Design, the pollution control board, Kolkata Metropolitan Development Authority and Kolkata Municipal Corporation.

The time is now ripe for this plan. The 2005 ordinance set the foundation for specific action and strategies, led by the WMA, to ensure the continual improvement and sustained success of the East Kolkata Wetlands.

The Planning Process

This management action framework is a selection of tools that may best realize the vision set forth in this plan for a healthy and sustained East Kolkata Wetlands. It represents a paradigm shift from the conventional approach to development, (one where natural resources are used to fuel development), to a new, innovative and sustainable philosophy. This approach to planning and design aims to preserve natural resources for growth and renewal. To succeed in this, it is critical that land and water are managed holistically, instead of on the individual components of drinking water, stormwater and wastewater, or private and public property. Design should seek to produce an urban landscape that mimics, but not necessarily reproduces, land and water processes as they were before human development.

The permanency of the printed word belies the fact that a plan should be an ever-evolving document to reflect the need for adaptation to new and/or presently misunderstood obstacles. It is recommended that the plan come under comprehensive review every five years to ensure its active and relevant application.

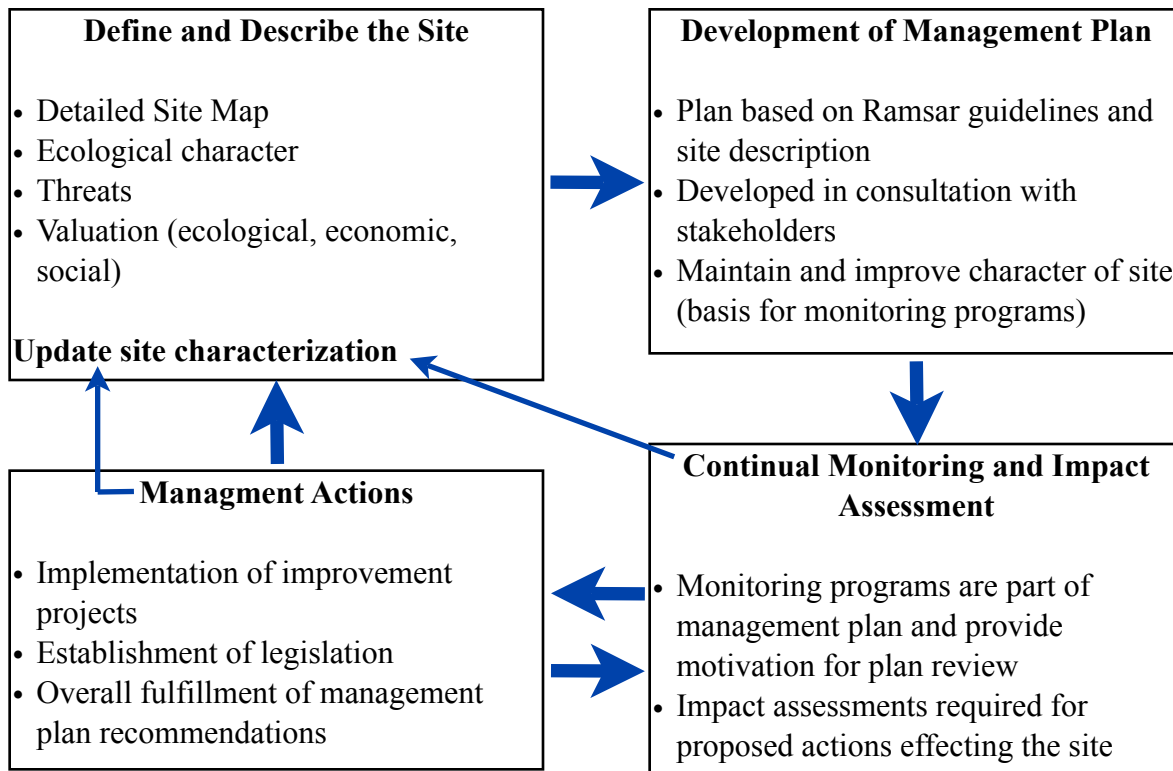
This management framework tries to, and any future plans should, serve several general functions, identified by the Ramsar Convention and other common wetland management guidelines. The most important are:

- *To identify objectives and definitions for management success*
- *To identify factors affecting proper wetland function*

- To resolve conflicts of interest and reach consensus
- To define monitoring schemes
- To design effective management actions and programs
- To maintain continuity of action and purpose
- To secure financial and intellectual resources
- To facilitate communication between all stakeholders
- To show measurable success

Figure 3 shows a graphical outline of the recommended planning process for the development of a more formalized management framework to the one presented here. Much of the information in this document, drawn from the many works that have already been completed on the EKW, represents the first step in this process.

Figure 3. Summary Diagram of Planning Process



Defining and describing the characteristics of the site, including the threats to and values of the area is the entire motivation and basis for subsequent action. The development of the management plan, as begun here in this framework of recommendations must: (1) be linked to the findings of the site analysis, targeting the threats raised and preserving value in the “triple bottom line” paradigm (ecology, economy, society); (2) be developed in consultation with relevant stakeholders; and (3) form the basis for monitoring and impact assessment programming. The continual monitoring of site conditions and the assessment of impacts from project proposals affecting the EKW are critical to overall success of actions and requires a framework of its own (Ramsar, 2007).

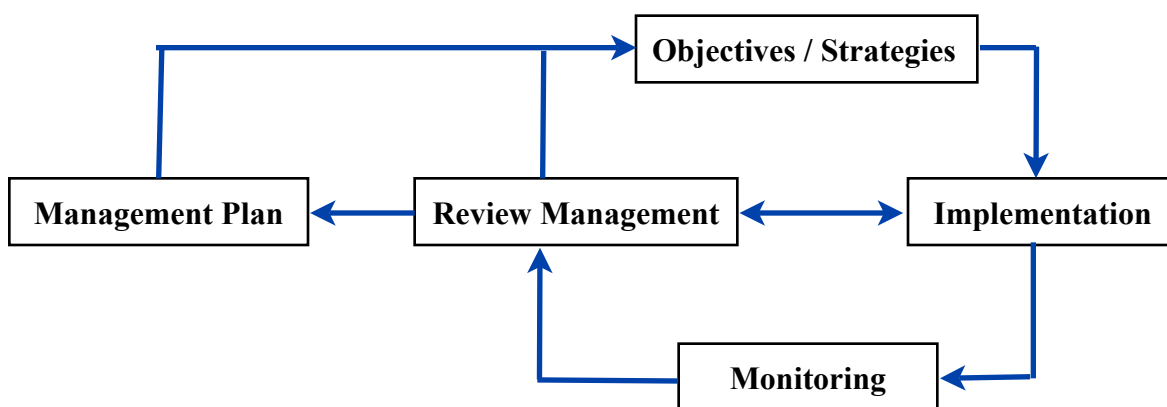
From the management plan itself, and from the results of monitoring programs, will come the actual management actions, ranging from targeted ecological improvement projects and market analysis for wetland products, to the formation of new legislative and financial support structures.

The initial characterization is likely to, and certainly should, change over time. For this reason, both the monitoring programs and management actions should be serving to redefine and update the characteristics of the EKW every three years, at least, in these early stages where uncertainties are more prevalent. This will then inform reviews of the management plan at least every five years.

To achieve this flexibility, an adaptive management approach is presented here. Figure 4 shows the simple structure of such an approach. This approach is what underlies the planning process presented in Figure 3.

Its implementation can allow managers to respond to political conflicts, concerns of stakeholders, environmental variation and change, and the availability of financial resources that are certain to occur.

Figure 4. Adaptive Management Cycle



The adaptive management cycle, or indeed any flexible management approach supports many of the functions listed above. It builds continuity, responds to changing factors, promotes more effective program design, and requires communication between stakeholders.

Inventory, Assessment, and Monitoring

The execution of any wetland management plan or framework entails some design for inventorying wetland areas, assessing and monitoring impacts, natural and human-derived. Principles of such a design include: (1) establishing the location and ecological characteristics of wetlands (baseline inventory); (2) assessing the status, trends and threats to wetlands (assessment); (3) monitoring the status and trends, including the identification of reductions in existing threats and the appearance of new threats (monitoring);

and, necessarily (4) taking actions to address any changes causing or expected to cause damaging change in the natural character (management) (Ramsar, 2007).

The Ramsar Convention presents working definitions for wetland inventory, wetland assessment, and wetland monitoring, asserting that there are substantial differences among each in the management process.

“Wetland inventory: the collection and/or collation of core information for wetland management, including the provision of an information base for specific assessment and monitoring activities.”

“Wetland assessment: the identification of the status of, and threats to, wetlands as a basis for the collection of more specific information through monitoring activities.”

“Wetland monitoring: the collection of specific information for management purposes in response to hypotheses derived from assessment activities, and the use of these monitoring results for implementing management.” (Ramsar, 2007).

Taken together, the information gathered from these investigations represents the basis for setting policies and management strategies to maintain and/or improve baseline conditions. The IW MED and other agents in Kolkata and from abroad have already begun major projects in inventory and assessment. It is that information that informs much of the background information presented in this document. Still, much is unknown. And monitoring systems are as yet lacking.

There are a wide range of different types and methods of wetland assessment relevant to different aspects of implementation, with each suited to, and designed for, different purposes and situations. Two related assessment models are reviewed and advocated here; the Strategic Environmental Assessment (SEA) and the Environmental Impact Assessment (EIA). They follow very closely the same fundamental steps reviewed here.

Strategic environmental assessment is a formalized, systematic and comprehensive process of identifying and evaluating the environmental consequences of proposed policies, plans, or programs to ensure that they are fully included and appropriately addressed at the earliest possible stage of decision-making on a par with economic and social considerations. Strategic environmental assessment covers a wider range of activities over a longer time period than the environmental impact assessment. SEAs help to determine the need and parameters of the Environmental Impact Assessment. It is recommended that a SEA be performed for the EKW region. This would inform many of the strategies recommended here and likely would spur new ideas to formerly unforeseen issues. The SEA will be critical for ensuring the inter-related consistency of a management plan for the EKW (Ramsar, 2007).

Environmental impact assessments are simply a process of evaluating the likely environmental impacts of a proposed project or development, taking into account socio-economic, cultural and human-health impacts, both beneficial and adverse. The fundamental steps of an EIA include: (1) screening, (2) scoping), (3) impact analysis and assessment, (4) identification of mitigation measures,

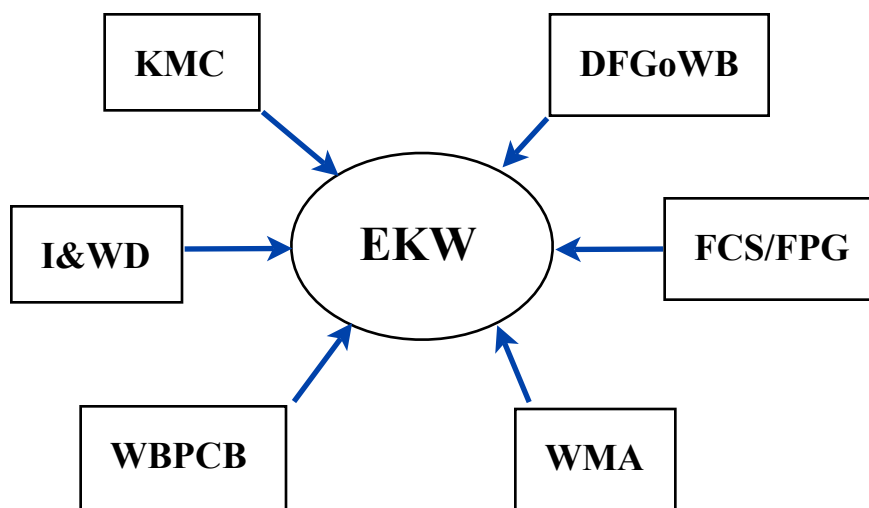
(5) deciding amongst alternatives, and (6) monitoring and evaluation. EIA should be required for all development projects of determined to have particular characteristics, such as investment, square footage, industrial processes, location, etc., effecting the EKW (Ramsar, 2007).

Responsible Authorities

Thoughtful and effective strategies are not of much use without specific assigned responsibilities, implementation arrangements and adequate monitoring systems.

Below is an overview of the institutions having a role in carrying out strategies within this initial plan. Figure 4 identifies each responsible authority within government for the present and future management of the EKW. Not applicable here, but of great importance to all aspect of the planning process, is the active participation of non-governmental organizations (NGOs) and citizens.

Figure 4. Responsible Management Authorities in Government



Kolkata Municipal Corporation (KMC) is the principal body entrusted to provide essential services to the citizens of Kolkata, under the 74th Constitutional Amendment Act of India. 10. Operation and maintenance of bulk services such as water supply, sewerage and drainage, and solid waste management are entrusted with KMC.

KMC is also responsible for the maintenance of heritage buildings, parks, water bodies, and other public spaces or aspects of the city. It also oversees the granting of development work within the Kolkata Metropolitan Area.

Irrigation and Waterways Department (I&WD) is the principal authority for the operation and maintenance of the canals and channels flowing through the state, as well as for the provision and implementation of infrastructure such as pumping stations. Its other primary responsibilities include design, execution, operation, and maintenance of flood control measures and provision of irrigation facilities for agriculture, one of the principal income generating activities in West Bengal.

West Bengal Pollution Control Board (WBPCB) is an independent regulatory agency responsible for pollution control and overall environmental improvement of the State of West Bengal, under the principal guidelines set by the Central Pollution Control Board, New Delhi. Improvement of air and water quality, regular monitoring and addressing environmental pollution from industries and urban wastes are an integral part of the WBPCB's responsibilities. Management of hazardous wastes and substances also fall within the jurisdiction of the WBPCB.

The Department of Fisheries of GoWB (DFGoWB) is the principal authority responsible for the promotion and development of fish cultivation in different types of water bodies across the state of West Bengal. Fish is a major product of this state and the department has the mandate to manage and regulate the sector, and facilitate its enhancement.

EKW Management Authority (WMA). Following the declaration of the EKW as a Ramsar-protected site in 2002, the GoWB formed the EKW Management Authority, chaired by the Chief Secretary of GoWB, under the East Kolkata Wetlands (Conservation and Management) Act 2006, 11 to conserve and manage the EKW. This authority is also mandated to formulate a “wise use” management plan for the protection of the EKW. An outline management plan has been prepared and the detailed management plan is under preparation by the Authority.

Any proposed development in the EKW has to seek prior permission from this authority, and overall management and monitoring responsibilities of the EKW lie with EKW Management Authority.

Fisheries Cooperatives and Associations. There are a large number of sewage-fed fisheries in the EKW area operated by the following groups.

- (i) **Fishermen cooperative societies (FCS)** - for large water bodies (constituted under the West Bengal Cooperative Act 1973, 12 and overseen by the Department of Fisheries, GoWB). The membership varies from 100 to 300.

(ii) **Fish production groups (FPG)** - for smaller water bodies (constituted under the West Bengal Inland Fisheries Act 1984, and overseen by the Department of Fisheries, GoWB).

(iii) **Private individuals** - both large and small sized water bodies.

The FCS and FPG manage and facilitate fishing practices, and the main and secondary fish feeding canals under their jurisdiction. The West Bengal State Fisheries Corporation, an enterprise of Fisheries Department of GoWB, also controls two big fisheries in the EKW area. Officials of the Fisheries Department provide technical support to them on these and related aspects.

Management Plan Recommendations

As described in the Ramsar Convention, “Wetlands are dynamic areas, open to influence from natural and human factors. In order to maintain their biological diversity and productivity, and to permit the wise use of their resources by people, an overall agreement is essential between the various managers, owners, occupiers and other stakeholders.” The management planning process provides the mechanism to achieve this agreement.

Any management planning around the EKW should not be restricted to the defined site boundary, but rather should also take into account the wider context of planning and management. It is for this reason that the Kolkata Municipal Corporation and other metropolitan agencies are given responsibility here. It is important to ensure that the site planning takes into account the external natural and human-induced factors and their influence on the EKW, and also to ensure that the management objectives for the EKW are taken into account in the wider planning processes.

The management plan recommendations presented here are meant to serve as a starting point for the development of a more rigorous set of objectives and strategies.

Land Use Planning

The amount of land Kolkata has is very finite. The proper use of that land is necessary for balancing the human demand for specific land uses and the protection of environmental quality. With regard to the East Kolkata Wetlands, land management systems must be able to protect the integrity and function of the wetlands while also remaining a positive factor in regional development. This plan proposes a new land management framework for the EKW, based on the Ramsar Convention, that will help guide decision-making.

Goal 1. An interconnected network of wetlands managed appropriately based on their specific characteristics.

Objective 1.1. Establish each of the four land use zones: core zones, buffer zones, transitional zones, and natural zones based on the characteristics defined herein.

Strategy 1.1.1. Core Zone. The core zone shall be defined as the area now recognized by the WMA and Ramsar Convention as the “East Kolkata Wetlands”. These areas are fundamental to the continued use of the wetlands and local economy.

Strategy 1.1.2. Buffer Zone. The buffer zone shall be defined areas adjacent to core zones up to maximum width of 1500 feet. These areas, while not being actively used, are critical to the protection of core zones.

Strategy 1.1.3. Transitional Zones. The transitional zone shall be defined as those areas immediately adjacent to urban and suburban development. These areas as at most risk for land conversion and must be proactively monitored for this activity.

Strategy 1.1.4. Delineation and Mapping. The WMA should further define characteristics of each zone. This should be done, initially, using the Asian Wetland Inventory protocol. A concise description of the functions and/or restrictions applied within each zone must be prepared as part of future management plans. Zones should be identified with a unique and, if possible, meaningful code or name. A map showing the boundaries of all zones must be prepared.

Goal 2. EKW is safe from threats of land conversion.

Objective 1.2. As set forth by the EKW Conservation Ordinance, no land in EKW shall be developed without consent of WMA.

Strategy 1.2.1. The WMA and KMC should conduct a land use survey of the EKW area to determine ownership and present use. This survey would inform subsequent planning efforts, shedding light on where future unwanted development could be attracted, as well as a method for enforcing property disputes.

Strategy 1.2.2. The Technical Advisory Committee shall report to WMA and KMC on development project proposals received that are within EKW.

Wastewater and Wetland Function

Wastewater is the lifeblood of this system. It is critical that it remains a resource and not a hazard to human and environmental health. Some of the first projects that must be undertaken are surveying what's out there, mapping impervious surfaces and maintaining maps of canal and drainage systems. Using these maps, some prioritization of infrastructure deficiencies can be made and improvement plans be drafted to ensure efficient distribution of the wastewater. As well, monitoring and tracking pollutant levels in the wastewater to have confidence that the wastewater being distributed, can be handled by the system and does not cross thresholds for human interaction.

Goal 2. Kolkata's wastewater and stormwater are a resource, not a hazard.

Objective 2.1. Increase area of pervious surface and decrease areas of impervious surface to provide more infiltration of stormwater into the ground.

Strategy 2.1.1. Through the use of satellite imagery and land use records, the KMDB should create an inventory of pervious and impervious surfaces in Kolkata metro area and EKW.

Strategy 2.1.2. Encourage the redevelopment of previously developed sites to decrease the demand for land in green areas. Financial incentives for private development of these areas should be made available.

Further, the acquisition of financial assistance could be contingent on meeting certain performance standards of impervious area and runoff.

Strategy 2.1.3. The IW MED should begin working with institutes and universities abroad with expertise in vegetated roof surfaces to access opportunities in Kolkata metro area. Models for this practice can be seen throughout Northern Europe, Germany, and cities in the United States such as Chicago, San Francisco, and New York.

Objective 2.2. Decrease pollution on Kolkata's streets that collects in water during storm events.

Strategy 2.2.1. The Public Works department should implement street sweeping programs. A pilot program approach could be employed to measure quantitative results from selected tracks. Pilot areas should be randomly selected from all municipally managed roadways that could handle the proper cleaning equipment.

Strategy 2.2.2. The Public Works department should upgrade and expand solid waste collection programs. This could include the procurement of primary collection equipment and segregation equipment for solid waste management, as well as vehicles to transport and help in collection.

Strategy 2.2.3. Mark stormwater drains to notify people that water goes to streams and wetlands, to discourage improper waste disposal.

Objective 2.3. Improve Kolkata's existing stormwater management infrastructure.

Strategy 2.3.1. The KMDB should update and ensure best accuracy of stormwater infrastructure maps.

Strategy 2.3.2. Using infrastructure maps, the KMDB should prioritize areas in most need of improvement and maintenance. A new fund for maintenance of critical infrastructure failures should be established. The KMDB should investigate the possibility of imposing impact fees on large projects that contribute to impervious surface area. Collected fees would finance infrastructure upgrades.

Strategy 2.3.3. Encourage use of stormwater collection through innovative, but simple projects, as in the examples of cisterns connected to impervious surfaces, such as rooftops. The WMA should establish a program at a local university, funding the cost-effective implementation of such projects.

Preservation and Protection

There continues to be a need for more policy aimed at protection and preservation. Part of this will come from land use planning, however this is particularly addresses the need for stronger institutional development around management, monitoring, and enforcement. This means having entities that can do meaningful impact assessment and specific policy action for the most sensitive, most critical areas.

Goal 4. The East Kolkata Wetlands remain “a wetland of international importance” and are protected by rigorous policy and legislation.

Objective 4.1. Coordinate and rationalize government programs to minimize their adverse effects on wetlands and encourage wetland conservation.

Strategy 4.1.1. The KMC and WMA should identify all government programs which influence or impact wetlands and assess the influence that such programs, using the framework of Strategic Environmental Assessment (SEA).

Strategy 4.1.2. Remove government funded incentive programs that result in unnecessary wetland diking, drainage or filling.

Strategy 4.1.3. The WMA should ensure that environmental impact assessments, as described in this document, are conducted on major government and non-government projects.

Strategy 4.1.4. The KMC should examine tax relief for protected wetlands, particularly through local voluntary action by landowners and through state, and municipal programs, drawing on successful examples from other jurisdictions.

Objective 3.1. Understand and delineate the spatial characteristics of the EKW and all its parts.

Strategy 3.1.1. Any area within the defined boundary cannot be converted into some function that would create adverse impacts on wetland function.

Strategy 3.1.2. The WMA should prioritize certain areas within the boundaries of the EKW that remain in a natural state, for the purpose of preservation. The IW MED should serve as the central partner, along the environmental science and engineering department at Jadavpur University, for the gathering of ecological data and wetland delineation.

Strategy 3.1.3. The WMA should also prioritize certain areas within the boundaries of the EKW that have potential for remediation into a more functional, natural condition. Prioritization decisions should be based on a decision matrix of factors including availability and reliability of data, cost, political considerations, and biodiversity impacts.

Objective 3.2. Protect sensitive areas with scientifically appropriate buffers.

Strategy 3.2.1. Buffers of at least 100 feet should be established around all priority natural areas. No human activity may occur within the boundaries of these buffers.

Strategy 3.2.2. Existing human activities that would fall within 100 feet of priority natural areas should be relocated to a permissible area.

Education and Community Involvement

It is critical for any management plan to be successful that people from all sectors are continually engaged and valued in the planning, implementation, and evaluation stages. Knowledge of all kinds is needed to create a framework that addresses the wide variety of problems at issue, to foster creativity, and build consensus. This necessarily requires education and capacity building programs, forming partnerships between different sectors, and celebrating successes which helps build feelings common ownership and value for this amazing resource that few places in the world can claim.

Goal 5. Individuals, community groups, governments, and businesses take responsibility for actions that affect the EKW and participate in decision-making.

Objective 5.1. Ensure all interest holders understand the values of the EKW so they can act responsibly.

Strategy 5.1.1. The new Nature and Wetland Interpretation Center (NWIC) should serve as the central point for education on the EKW.

Strategy 5.1.2. The NWIC should provide information on the EKW and the plan to the public and local media via brochures, displays, advertisements, and the Internet.

Strategy 5.1.3. The NWIC should develop educational ecological and historical information signs to be located at selected areas in the EKW and Kolkata metro area.

Strategy 5.1.4. Encourage and facilitate the involvement of women, local communities and volunteers in wetland management.

Strategy 5.1.5. The WMA should work to broaden agricultural, water and other sectoral programs to promote wetland conservation awareness.

Objective 5.2. Close gaps in knowledge that currently exist in wetland classification, inventory, research and evaluation, and ensure the proper synthesis, storage and retrieval needed to access this knowledge.

Strategy 5.2.1. Develop and encourage partnerships with educational institutions for on-going technical studies, education and restoration.

Strategy 5.2.2. Demonstrate and explain the linkages of wise use of natural resources and water quality and quantity issues to wetlands conservation.

Strategy 5.2.3. The WMA Technical Committee should develop exemplary management practices and practical guidelines for protected wetland area management.

Objective 5.2. Foster long-term community stewardship of the EKW and celebrate accomplishments.

Strategy 5.2.2. Support the education of scientific, technical and administrative staff to encourage innovative management mechanisms.

Strategy 5.2.3. The GoWB should recognize World Wetlands Day, annually on the 2nd of February. The NWIC should host an annual summit on this day for the people of Kolkata to celebrate the various efforts working to protect the EKW.

Concluding Remarks

This report has attempted to provide a basis for why the East Kolkata Wetlands must be preserved, a review of management action, past to present, and finally, a proposed policy framework and management recommendations, comprehensive in nature to ensure the continued success of this one-of-a-kind natural resource.

There is a movement today, changing the way that development is viewed by changing the way that natural resources are valued and the way that stakeholder participation is valued. Focused attention on solutions that serve the environment, economy, and society is requiring new approaches to project design and implementation. It is hoped that this report can offer some guidance on how to be successful under this new environment. It necessarily requires flexibility, transparency, collaboration, and rigorous scientific inquiry. Each of those themes has been addressed here, with some recommendation for specific strategies to each end.

The East Kolkata Wetlands represent the prototypical site for applying this new development planning paradigm. It is the cornerstone of a complex system interlocking environmental, economic, and societal issues and its preservation by innovative, comprehensive management can in turn preserve the myriad benefits in each of these themes, reinforcing the foundations for the further development of Kolkata, improving the quality of life for all its citizens.

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