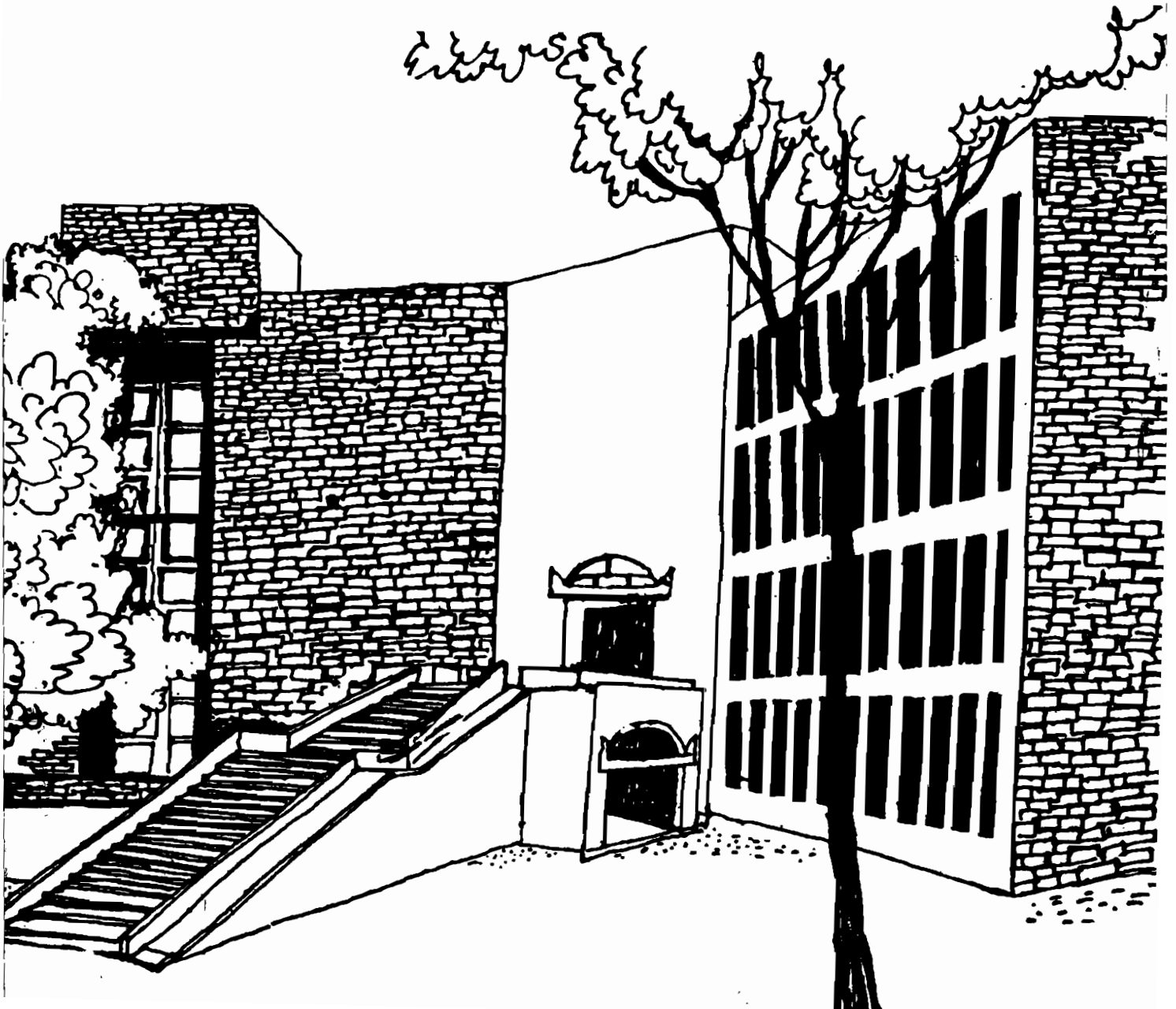




# Working Paper



REDEFINING PROPERTY RIGHTS FOR SUSTAINING  
THE WETLANDS AROUND CALCUTTA

By

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# REDEFINING PROPERTY RIGHTS FOR SUSTAINING THE WETLANDS AROUND CALCUTTA

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## Abstract

By defining sustainable resource use as one with long-term economic viability besides having both ecological and social compatibility, this paper applies the property rights framework and the economics of fish production to bring out a comparative perspective on ownership and use pattern of the vast tracts of wetland around the city of Calcutta. Although these areas have traditionally been used for pisciculture irrespective of ownership by government or private bodies, the post-modern trend towards socio-ecological concern seems to have challenged the earlier wisdom of leaving large tracts of such land under purely government and/or purely private ownership with unstable and sub-optimal property rights. It also challenges the recent commercial trend to convert such open spaces into building constructions for industry and the housing sector.

The paper reviews the legal framework for wetland use and also uses several live cases to highlight the fact that placing such wetlands for pisciculture and related activities and thus building up of 'nature park' with such resources with the help of active fishermen and their user-controlled organisations under a suitable and stable property rights regime is consistent with not only the ecological and social needs of the people, but also with the economics of alternative uses under a fairly realistic conditions. The paper highlights the need for property rights re-engineering alongside, if not preceding, ecological engineering of wetland and details the pre-conditions for evolving sustainable use of the wetlands around Calcutta. (key words: property rights, residual control, residual return, Coase Theorem, complete contracting )

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***“Economic growth will occur if property rights make it worthwhile to undertake socially productive activity” - Douglass C. North & Robert Paul Thomas, *The Rise of the Western World: A New Economic History* (Cambridge, MA: Cambridge university Press, 1973), p.8.***

## **Section 1. Introduction:**

Increasing population pressure on fixed land endowments, on the one hand, and lack of total awareness and fully effective measures to stop misuse, on the other, seem to have led to erosion in both quantity and quality of the vast tracts of the naturally given wetlands in the vicinity of the city of Calcutta. It has not only led to less than optimal level of utilisation of the potentials of wetland but also raised serious doubts about the long-term economic viability and ecological and social compatibility of the current uses of such land. Using a property rights framework and keeping the Coase Theorem for value-maximization of resources, in particular, in the background, this paper critically examines the current trend and the existing legal frame in the look out for institutional mechanisms to improve the value of wetland use.

Instead of attempting to estimate the extent of misuse and underutilisation of the wetlands around Calcutta - a subject on which precise data are not only scarce but also subject to doubts, the next section would provide a short overview of the wetlands around Calcutta in order to bring out the qualitative dimensions of the wetlands problem as well as the potential for their sustainable use. Section 3 reviews the existing policy framework for use of wetland. Section 4 highlights the deficiencies of the current policy frame through description of several live cases and caselets. The next section restates the sustainability problem of wetland within a value-maximising property rights framework. The final section concludes the paper.

## **Section 2. Potential & Problems of Wetlands around Calcutta:**

In common parlance, wetlands represent a transitional zone between permanently wet and generally dry environments, which shares the characteristics of both and yet cannot be classified as exclusively aquatic or terrestrial (Sinha, 1998). The state of West Bengal is rich in endowments of both freshwater and brackishwater varieties of wetland. The floodplain lakes locally known as *beels* and *baors* and *baors* and estimated to be of the order of about 42,500ha. (during winter and summer - the figure is believed to increase by about 200% during the rainy season) in the districts of 24 Parganas (both south & north), Murshidabad, Hooghly and Nadia constitute the riverine wetlands (ibid, 1998). In the deltaic West Bengal, the Hooghly estuary as well as other estuarine inlets and tidal streams located to the east of Calcutta between the River Hooghly on the west and the River Bidyadhari - currently a derelict channel, on the east constitute the estuarine wetland. The Calcutta wetlands, also known as the Calcutta *bheries*, are only a small 42,000 ha. part of a 182 square kilometer network of potentially usable swampy wetland (Sinha, 1998 and Chakravarty, 1998). Over time, the interconnectedness of a vast number of small rivers in this area came to a

standstill and this area ceased to be inundated by the tidal play because of a number of interventions - both natural and human. The large flow of sewage water from the city of Calcutta through this low-lying region started playing an important role in deciding on the fate of this vast freshwater and brackishwater wetlands around the city of Calcutta. In the upper reaches, where salinity incursion is practically nil, sewage-fed fisheries, horticulture and floriculture came up. In the middle and lower reaches (say, beyond 30kms to the south-east of Calcutta), where tidal effects are still not dead, perennial brackishwater pisciculture, sometimes coupled with a seasonal crop of paddy during the *kharif* season in particular, began to be practised. The present paper deals with the potential and problems of this vast region - covering not only the brackishwater wetlands but also a part of the riverine wetlands in the district of 24 Parganas.

The following potential advantages are generally claimed for the wetlands of this region (see, for example, Kundu et al, 1998, for elaboration on some of these points):

1. These provide the chief source of income and livelihood to the vast number of traditional habitants of this region - mostly fishermen and farmers in terms of profession.
2. The wetlands are also important sources of supply of commercial crops and species (e.g., paddy, shrimp, crab and other aquatic products). These provide cheap sources of food and protein to the urban-dwellers, besides being a prominent source of foreign exchange earning - especially through export of shrimp, crab etc.
3. To the extent that some of the produces of these wetlands are agro-processed, those agro-processing facilities provide important source of income and employment to the people living in the urban fringes.
4. The wetlands are extremely useful in sewage and waste treatment, as different plants and algae absorb heavy metal and clean and detoxify polluted waters.
5. The wetlands not only act as buffer zones during heavy rains and floods, but also do store rain water and control sudden run-offs.
6. They also play vital role in ground water recharge and discharge, and thus help irrigation.
7. Mangrove wetlands act as natural barriers against sea intrusion as they break up large storms and thus protect the sea coast from erosion.
8. Wet environment, sufficient water and presence of different types of algae population promote a variety of flora and fauna - thus making wetlands valuable conservators of bio-diversity. Usually, most wetlands are concentrations of wildlife, endangered species and migratory birds.

9. Through maintenance of open space, the wetlands provide the much-needed oxygen and recreation facilities to the fringe population. In his famous judgement on a case between 'people united for better living in Calcutta - public and another' versus the state of West Bengal and others (matter no.2851 of 1992 in the Calcutta High Court), the Hon'ble Justice U. C. Banerjee has noted the following:

*"...in this region 1 square meter of surface water can produce 23.75 gm. of oxygen per minute after meeting the requirement of aquatic animals. Average individual human being needs 2.1 gm. oxygen per minute and per day, therefore, it is 3024 gms and any loss of wetland, therefore, will have tremendous impact on to the living organisms as also human beings on the surface...."*(dated September 24, 1992).

There are three fundamental problems with the wetlands under discussion. First, most of the potential benefits as specified above are in the nature of public goods and hence are subject to 'free rider's problem. The benefits flow to the country as a whole or even to the humanity at large - in fact, both present and future generations. How to make those people who are at present distantly connected to the wetlands pay for the protection, promotion and development of such resources ? The second major problem is that the current yield rate of most wetlands in this region - whether in crops or in fisheries - is awfully small so that they tend to be easily attracted to alternative uses other than pisciculture. Third, the weak economics of pisciculture on wetland and the consequent lack of economic strength of the traditional dwellers on wetland make them very susceptible to various negative externality effects from non-pisciculture activities, which they cannot resist. Here lies the contradictions between the facts and fictions around wetland, which need to be satisfactorily resolved in a property rights framework. The precise question raised in this paper is: Does the current policy frame provide a suitable platform for trading in property rights across the stakeholders on wetland so as to achieve generation of the highest value out of these resources ?

### **Section 3. The Existing Policy Framework:**

While only a part of the wetlands around Calcutta are either privately owned or held as common property resources, a large chunk of these are owned and managed by government departments - both state and central - through issue of leaseholding or licensing rights. The various state departments are: Land and Land Revenue, Agriculture, Forest, Public Works, Irrigation, Animal Resource Development, Municipalities & *Panchayats*, Refugee, Relief and Rehabilitation, Calcutta Metropolitan Development Agency (CMDA) - to mention only a few. The most well-known among the central government departments owning such lands are: Defence, Railways, Civil Aviation, Calcutta Port Trust etc. In order to understand the evolution of property rights on Calcutta wetland, it is therefore necessary to have a close look at the legal provisions determining allocation of fishing and fisheries rights. Laws pertaining to fisheries are of three broad categories: (a) those protecting fish and private right on fisheries, (b) those preventing encroachment of waterbodies, and (c) those permitting

acquisition of fisheries by government Under the first two categories the following enactments have so far been made in the context of West Bengal:

- *The Bengal Act II of 1889 referred to as the Private Fisheries Protection Act (amended by Bengal Act I of 1939 and West Bengal Act XXI of 1959):* This Act for the first time recognised theft or destruction of fish in private waters as a cognizable offence. 'Private waters' in this Act has been defined as waters "which are exclusive property of any person or in which any person has exclusive right in fish".
- *The Indian Fisheries Act of 1897:* This broad-based law, which is also applicable to the sea within a distance of one marine league of the sea coast, was enacted with the objective of supplementing other fishery laws. This Act made use of poison, lime or any noxious material or dynamite or other explosive substances with the intent of catching or destroying fish a punishable offence. It also empowered the state government to frame rules and issue notifications to regulate and/or prohibit (a) erection and use of fixed engines, (b) construction of weirs, and (c) the dimensions and the kind of the nets to be used and the mode of using them. The government was also empowered to prohibit fishing in any specified waters for a period upto two years.
- *West Bengal Inland Fisheries Act of 1984 (amended in 1993):* This Act regulates for the first time the growing trend in general and especially stronger in urban areas and urban fringes to convert water bodies into building constructions, besides conserving different species of fish and also allowing take-over of the management of water bodies under multiple ownership, if the latter implies non-utilisation or underutilisation of the water bodies for the practice of pisciculture. The amendment to this Act puts a restriction on conversion of water bodies larger than 5 *cattahs* or 0.035 hectare in size into uses other than pisciculture. This amendment also allows the government to transfer management and control of water bodies inclusive of embankments and naturally/artificially depressed areas to any competent person or authority in the interest of better utilisation of water bodies. Conversion or destruction of water bodies has been prohibited through a provision by which the owner can be asked to restore within a stipulated period and at his own cost the damaged resource to its original conditions.

The Committee preparing the Master Plan for Fisheries Development in West Bengal in 1975 cited two important flaws of the provisions under the earlier Acts. First, the provisions were not strong enough to protect and conserve estuarine fisheries, believed to be highly depleted due to overfishing and other causes - at least during the breeding season. Second, the existing laws were found 'quite inadequate' in handling present-day pollution of natural resources and the resulting decline in fisheries potential following from discharge of harmful refuse into rivers and other water bodies by the factories, large-scale release of pesticides and pesticide residues into ponds and water reservoirs by practising agriculturists and retting of jute in inland waters. The



fact that such problems still persist raises some doubt about the efficacy of subsequent Acts and provisions in arresting the threats.

For the purpose of achieving better utilisation of privately owned water resources and also to put some curb on private property rights on fisheries, several other acts have been made:

- *Indian Forest Act, 1927*: It empowers the Forest Department to make rules to regulate hunting, shooting, fishing, poisoning of water and setting up of traps and snares within reserved and protected forest areas except in water bodies where tidal effects are there (though the Forest Department in reality restricts fishing operations even in tidal areas in contradiction to the permission given to traditional fishermen to carry on fishing in such waters). All such activities are totally prohibited in Class A forests, which later came to be known as Wild Life Sanctuaries or National Parks. Only under Class B forests (beyond Class A), such activities are permitted as per rules through issue of permits by the relevant Department.
- *The Bengal Tank Improvement Act, 1939 & West Bengal Tank Acquisition of Irrigation Rights Act, 1939*: These Acts enable the government to excavate derelict tanks for irrigation purpose, though these have remained largely ineffective due to certain inherent weaknesses and lack of an overall perspective on utilisation of water.
- *The West Bengal Land Development and Planning Act, 1948*: Authority is given under this Act to the Refugee, Relief and Rehabilitation Department to requisition and acquire land and water bodies against compensation at stipulated rates for the benefit and settlement of the immigrants, who had migrated to the state for reasons beyond their control.
- *The Waste Lands (Requisition & Utilisation) Act, 1952*: For exploiting wastelands to produce food crops or fish or for any other public purpose as defined in the Act, the government can acquire such lands against payment of compensation at stipulated rates. As per the record of rights published under the Bengal Tenancy Act of 1885, wastelands include any land classified as *nutan patit*, *puratan patit*, *layek patit*, *garlayek patit* or *layek jungal* and any land or water bodies which in the opinion of the state have not been adequately utilised for production of crops or fish for a continuous period of more than two years. Such lands however don't include homestead, farm house, burning or burial ground or any place of worship.
- *The West Bengal Estates Acquisition Act, 1953*: It establishes fisheries rights of the state in rivers, the ceiling-surplus *beels* and *baors*, which have been classified as non-agricultural land (as distinct from tank fisheries). It also includes those tank fisheries which are not retained by the owners or where the leasing rights granted earlier to intermediaries had expired. Under this Act 'tank fishery' is defined as "a reservoir or place for storage of water, whether formed naturally or by excavation or

by construction of embankments, which is used for pisciculture or for fishing togetherwith the sub-soil and the banks of such reservoir or place except such portions of the banks as included in a homestead or in a garden or orchard and includes any right of pisciculture or fishery in such reservoir or places". Thus, beels and naturally formed baors, which are used for fishing or pisciculture before the date of vesting, also fall under this definition. As per the estimates of the Master Plan Committee for Fisheries Development in West Bengal, over 95 thousand acres of tanks and beels have been vested under this Act (ibid, p.220).

- *The West Bengal Fisheries (Requisition and Acquisition) Act, 1965*: For the purpose of improvement and development of fisheries and for supplying fish to the public, the government can requisition and subsequently acquire water bodies. In this context fisheries mean any land whereon water is confined naturally or artificially - whether periodically or throughout the year - for pisciculture or for fishing, and include 'tank fisheries' as defined in West Bengal Estates Acquisition Act of 1953.
- *The Town and Country Planning Act, 1979*: It is enacted primarily to control adverse land use change in the Calcutta Metropolitan Areas and their vicinities.
- *The Bengal Canal Act of 1864 and the Bengal Ferries Act of 1885*: These Acts put certain restrictions on use of water bodies in the interest of irrigation and ferry service.

Although the list of relevant Acts and Rules are not exhaustive, it covers the most prominent ones. It is clear from this brief account of the legal framework governing use of wetlands in the state of West Bengal that although the government had initially started protecting the private property rights in wetlands and waterbodies so as to promote pisciculture, later on the thrust shifted towards development under active government ownership and control, so much so that the private or even common property rights earlier extended to promote fisheries were severly cut back and put at the disposal of various government Departments. So, the process, the property rights regime on wetlands seems to have shifted from one extreme to the other, as if private or common property management of these resources were invariably 'bad' (meaning inefficient and/or inequitable) and direct government ownership and/or control constituted a panacea. Two fundamental and interrelated questions arise in this context: First, can pervasive government ownership and control of wetlands meet the growing ecological and social concerns around wetland use ? Second, wouldn't suitable modifications and refinement in private and common property regimes better serve the sustainability issues of wetland resources ? In order to extract possible answers to these questions, we now turn to several live cases from the wetlands around Calcutta in the section which follows.

#### Section 4. Live Cases/Caselets on Wetland Use:

This section proposes to bring out the sustainability problems of the wetlands around Calcutta with the help of five live cases/caselets. The first caselet deals with a representative *bheri* owner, engaged in pisciculture within 5-10 kms. distance from the city. The next two caselets highlight the problems of leaseholding fish farmers who have taken their wetlands on lease from the Railways and from the Indian Defence, respectively, and who are located within the same radial distance. All these three caselets, because of their proximity to the city face severe threat due to competition from possible alternative use of land from industry and housing sectors. The fourth caselet poses the sustainability problem of an outsider operating in a village under Police Station Minakha (located about 45 kms. from the city), who is engaged in pisciculture on wetlands leased in from local farmers, but as his farm is located far from the city, he is not facing any immediate threat from building constructors. The last one, a full-fledged case, details the experiences of one Mudiali Fishermen's Cooperative Society located within 5-10 kms. radius on leased-in lands of the Calcutta Port Trust.

##### CASELET 1: EXPERIENCES OF A PRIVATE BHERI OWNER CLOSE TO THE CITY OF CALCUTTA

This representative *bheri* owner has been functioning since several generations to produce fingerlings. He has been taking urban waste water through inlets twice a week and releases the same also twice a week. The economics of his operations on yearly and per hectare basis are as follows:

<u>Recurring Costs</u>		<u>Revenues</u>	
1. Seeds (IMC, Exotic varieties & <i>Tilapia</i> )	40,000	1. Output (5tonnes. @ Rs.2400/qt)	1,20,000
2. Lime (1ton @Rs.4/kg)	4,000		
3. Feed	10,000		
4. Watch & Ward	5,000		
5. Labor Charges	3,000		
6. Embankment Preparation	2,000		
7. Harvesting Cost	3,600		
8. Local Protection Money	15,000		
9. Total Operational Cost:	72,600	2. Total Revenue:	1,20,000

Hence, the residual remaining with the owner is Rs.47,400 per annum. If he were to pay another Rs.30,000 as annual lease rent at the prevailing rate, his residual earning would be only Rs.17,400. He feels this earning is too meagre to justify all the troubles. He feels he is making a very tight-rope walking and he is quite unwilling to make further investments in view of the following constraints:

- Irregularity in the release of waste water has been on the rise, while pressures are mounting for prompt and regular release of waste water. As a result, the incoming waste water is not getting enough time and exposure to the sunlight to form micro-nutrients as feed for fish.
- He has no control whatsoever on the quality of the water he receives. The extent of heavy metal and toxic elements in water seem to be on the rise.
- The pressure from the labor unions is always on the rise to employ more and more labor at stipulated wages, but he has very little control over the duration and quality of labor. Constant monitoring is a must for him.
- 'Local Protection Money' which is claimed by various powerful elements tends to get arbitrarily increased over the years - much beyond his economics can permit.
- Although there are laws to prevent conversion of wetland into agricultural land and eventually into urban homestead land, such laws are hardly effective in reality. Moreover, the reported moves by the government itself to construct World Trade Center or Leather Complexes seem to be giving danger signals to his profession.

#### *CASELET 2: FISHERIES ON RAILWAYS' LEASED-OUT WETLAND*

Although not a fisherman by caste, Mr. Bose picked up this profession as a means of putting an end to his jobless career and decided to practise fisheries on the fallow wetlands of the Indian Railways around his local railway station in the district of North 24 Parganas. This is how he started his career in the early 1970s. He acquired the knowledge of fisheries from books and friends. When he first seeded the railway ponds in those days, neither did he have any knowledge of the leasing system, nor had there been any competition for leasing in of railway wetlands. So, given his prior knowledge and acquaintance, Mr. Bose had no problem in getting leases when a formal system of leasing out such land was introduced by the Railways in this area in 1978.

Currently Mr. Bose is managing five ponds, including the present one of 1.5 hectares, all on lease from the Railways. The leasing process works as follows. The Railways advertise in important local dailies asking for tenders. The day the bidding takes place on a stipulated date, each participant is required to deposit Rs.500 with the Railways, which is refunded to the respective parties, except to the highest bidder at

the end of the day. This bidding deposit of Rs.500 is refunded as soon as the highest bidder submits the security deposit money currently fixed at Rs.3500, which is supposed to be deposited within a period of seven days from the completion of the bidding process. The memorandum of understanding (MoU) is signed between the highest bidder and the Railways after the security money is deposited. Unlike in the past, when the leases were given for five years, the Railways are currently granting only three year leases. Although informally it is called a lease, the formal documents always refer to the right granted to the highest bidder as only 'fishing licence' on such water bodies. The current yearly economics of Mr. Bose's fishery activities on this 1.5 hectare wetland is as follows:

<u>Recurring Costs</u>		<u>Revenues</u>	
1. Seeds (IMC, Tilapia)	17,000	1. Output (3.5tonnes @Rs.2400/qt)	84,000
2. Lime (one ton @Rs.4/kg)	4,000		
3. Mahua Cake	13,000		
4. Watch & Ward	5,000		
5. Labor Charges	3,000		
6. Embankment Preparation (done every 2nd year @ Rs.6,000)	3,000		
7. Harvesting Cost (every fortnightly except during May-August @ Rs.200)	3,600		
8. Licence Fee (approx)	1,200		
9. Speed Money (approx)	3,400		
10. Local Protection	12,000		
11. Total Operational Cost:	65,200	2. Total Revenue:	84,000

Mr. Bose usually sells fingerlings of 30-40 gms. size. The maximum weight per piece he has attained, if he can wait till the end of the year, varies from 400-500 gms. So, as per his cost and revenue estimates, he is enjoying a very modest return of Rs.18,800 per annum, if he does not suffer from any further untoward contingency. The following are some of the problems, as being confronted by Mr. Bose:

- As he enjoys only fishing licence, he has no right for cutting or modifying the water body. Given the short-term nature of the licence, nor does he have any incentive to go for long-term investments, although he feels certain investments are necessary for achieving higher productivity and returns. With a short-term licence of this type, he cannot approach any funding agency for loan nor any insurance agency for risk hedging. He feels that depending on Indian Railways' long-term Master Plan, wetlands under the Railways can be given on leases of different duration rather than putting all such land only under short-term leases. Such an arrangement, according to him, will also save the Railways the huge administrative cost of handling tenders in short frequencies.
- Although the MOU signed between the Indian Railways and Mr. Bose refers to the size of this water body as 1.5 hectare, in practice he has lost about 10 feet width along the 400 feet length of the water body, i.e., a total loss amounting to about 4000 square feet, as a result of dumping of municipal waste and construction of roads on this plot of land. Protests by Mr. Bose have been of no use. He could not prevent construction of roads and even municipal street lighting on this wetland, which formally belongs to the Railways. Approaching the Railways Protection Force (RPF) or General Railways Protection (GRP) for retaining possession of the wetland licensed to him didn't help him either.
- Not only one National Health Laboratory located on one corner of this wetland, but also the nearby localities release through drains their waste materials and waste water towards this wetland. Neither he has enough money or right to construct suitable safeguards against this nuisance, nor is he aware of any platform where he can rightfully negotiate the terms and conditions for release of the pollutants. Currently, he is only gratuitously accepting these pollutants having severe damaging effects on his pisciculture activities.

### *CASELET 3: FISHERIES ON LEASED-OUT WETLANDS OF INDIAN DEFENCE*

Mr. Roy and his friend, Mr. Sarkar, two unemployed youths of North 24 Parganas turned to fisheries when they failed to carry on their cloth trading business between Ccutta and Madhya Pradesh. An opportunity came to them when the earlier leaseholder of Moti Jheel, who was an outsider to this area, had decided to withdraw his bid for a fresh term of lease from the Defence Department after he had suffered severe losses during the last two terms. The local population pleaded the case of these two unemployed youths and the earlier leaseholder agreed to enter into lease for another term on behalf of these two youths. This happened in June 1986. Mr. Roy and Mr. Sarkar paid the annual lease rent of Rs.33,800 for this recorded area of 13.64 acres (out of a total of 30.16 acres - the rest being already converted into homestead land), besides depositing an equivalent amount in the form of bank fixed deposit documents with the Defence Department as security money. Unfortunately, they didn't succeed in the first attempt, but the extent of loss was not so high as to push them totally

out of the business. Moreover, as they were not getting on well with the formal leaseholder, they decided to bid for the lease this time in their own name. The value of the annual lease rent rose to Rs.51,000 during the next term 1990-91 to 1992-93. As they managed to break-even this time, they continued with the lease during 1993-94 to 1995-96 at an annual rent price of Rs.62,000. During this term they made profits in one year, but lost in the other two years, leading to an overall loss. Nevertheless, they didn't give up and entered into a fresh lease agreement for another term from 1996-97 to 1998-99, this time at a much higher annual rental rate of Rs. 1,26,000. Apparently, the short-term nature of the lease contract has tended to push up the lease rent often in disregard to the technical and economic feasibility considerations - especially in the absence of any information transmission process among the potential bidders).

However, after the present lease-holders came across an official of the Fisheries Department, who incidentally belonged to a nearby locality, things started steadily improving for them. Currently, they are in the last year of their present lease term. The current economics of their operations stand as follows:

Recurring Costs

Revenues

1. Seeds	2,00,000	1. Output(3qts.x150days @ Rs.3000/qt)	13,50,000
2. Lime (1ton @Rs.4/kg)	4,000		
3. Medicine	5,000		
4. Watch & Ward (4 persons)	72,000		
5. Contingent Labor Charges (100 mandays @Rs.50 in rainy season)	5,000		
6. Embankment Preparation	30,000		
7. Bottom Recking (done each month to keep fish active)	36,000		
8. Harvesting Cost (150 times @Rs.600/day)	90,000		
9. Feed Cost (500 kg @ Rs.2.5/kg for 250 days/year)	3,12,500		
10. Lease Rent	1,26,000		
11. Speed Money for getting lease	50,000		

12. Local Protection 70,000

13. Total Operational Cost: 10,00,500      2. Total Revenue 13,50,000

So, as per the current year's economics, they are expecting to make a handsome profit of nearly 3.5 lakhs - the best performance for them so far! After they have started interacting with the District Fisheries Office, they have undertaken the following changes in their approach to pisciculture:

- Instead of applying seeds once in a year, they are now applying seeds in three cycles, which costs them less.
- They have introduced bottom reeking and lime treatment of water, and have reduced their expenditure on medicine already by 50%.
- They are doing netting every third day, although they are not harvesting on all such occasions, in order to maintain activities and movements of the fish population.
- They are performing harvesting with the help of three groups - one outsider and two local - although it costs them more. The underlying gain is that the three fish-catching teams have not only imparted competition among themselves, but also bring with them wholesale traders in fish, who create enough demand for their catches.

Although this group has after this year's experience seems to have seen some light at the end of a long and dark tunnel, they are still very pessimistic about a number of things, which are of serious concern to them. These are as follows:

- The short-term nature of the lease is the most serious constraint according to them, as it does not allow them to go for any investment loan or working capital loan, although both types of loans are vital in their context. They point out that in view of financial shortage, they have applied only 500 kgs. of feed per day as against the norm of 1200 kgs. per day as suggested by experts in their case. They have neither the necessary incentive, nor financial power, nor even the legal authority to undertake occasional desilting operations and embankment demarcation activities. As the Defence Department has no other immediate plan with this water body, this group finds absolutely no justification for annual renewal provisions within a three-year lease contract period. This practice, according to this group, merely adds to the 'opportunistic' tendencies on the part of the Department officials.
- In their view, the lease rents are quite arbitrary and are also changed arbitrarily without regard to the commercial viability of the leaseholder. The information that most past leaseholders have given up after suffering losses does not get conveyed in a transparent manner to the prospective bidders for the lease, and as a result the



9. Through maintenance of open space, the wetlands provide the much-needed oxygen and recreation facilities to the fringe population. In his famous judgement on a case between 'people united for better living in Calcutta - public and another' versus the state of West Bengal and others (matter no.2851 of 1992 in the Calcutta High Court), the Hon'ble Justice U. C. Banerjee has noted the following:

*"...in this region 1 square meter of surface water can produce 23.75 gm. of oxygen per minute after meeting the requirement of aquatic animals. Average individual human being needs 2.1 gm. oxygen per minute and per day, therefore, it is 3024 gms and any loss of wetland, therefore, will have tremendous impact on to the living organisms as also human beings on the surface...."*(dated September 24, 1992).

There are three fundamental problems with the wetlands under discussion. First, most of the potential benefits as specified above are in the nature of public goods and hence are subject to 'free rider's problem. The benefits flow to the country as a whole or even to the humanity at large - in fact, both present and future generations. How to make those people who are at present distantly connected to the wetlands pay for the protection, promotion and development of such resources ? The second major problem is that the current yield rate of most wetlands in this region - whether in crops or in fisheries - is awfully small so that they tend to be easily attracted to alternative uses other than pisciculture. Third, the weak economics of pisciculture on wetland and the consequent lack of economic strength of the traditional dwellers on wetland make them very susceptible to various negative externality effects from non-pisciculture activities, which they cannot resist. Here lies the contradictions between the facts and fictions around wetland, which need to be satisfactorily resolved in a property rights framework. The precise question raised in this paper is: Does the current policy frame provide a suitable platform for trading in property rights across the stakeholders on wetland so as to achieve generation of the highest value out of these resources ?

### **Section 3. The Existing Policy Framework:**

While only a part of the wetlands around Calcutta are either privately owned or held as common property resources, a large chunk of these are owned and managed by government departments - both state and central - through issue of leaseholding or licensing rights. The various state departments are: Land and Land Revenue, Agriculture, Forest, Public Works, Irrigation, Animal Resource Development, Municipalities & Panchayats, Refugee, Relief and Rehabilitation, Calcutta Metropolitan Development Agency (CMDA) - to mention only a few. The most well-known among the central government departments owning such lands are: Defence, Railways, Civil Aviation, Calcutta Port Trust etc. In order to understand the evolution of property rights on Calcutta wetland, it is therefore necessary to have a close look at the legal provisions determining allocation of fishing and fisheries rights. Laws pertaining to fisheries are of three broad categories: (a) those protecting fish and private right on fisheries, (b) those preventing encroachment of waterbodies, and (c) those permitting

With their superior technical knowledge and better access to information as compared to the traditional fishers, this group decided to improve upon the traditional technology in the following ways:

- They did thorough lime treatment of the water bodies. This initial year they applied 5 tons of lime, which they would like to apply at reduced rates in the subsequent years.
- They applied poultry litter as feed to the tune of 2 tons in the initial year, which they would like to increase in the coming years.
- Instead of depending on wild collection of shrimp seeds, they purchased them from distant hatcheries, besides applying IMC seeds instead of mullets alongside in order to achieve balance in pisciculture.

Although they started a bit late this year (the ideal time to get started being February) and are yet to complete one full year, they expect the following economics of their operations:

<u>Recurring Costs</u>		<u>Revenues</u>	
1. <i>P. Monodon</i> Seeds (1.2 lakhs @Rs.1800/1000)	2,16,000	1. Shrimp(1.5tons.@Rs.450/kg)	6,75,000
2. IMC Seeds (one ton	40,000	2. IMC(2tons @ Rs.25/kg) @ Rs.40/kg)	50,000
3. Lime (five tons @Rs.4/kg)	20,000	3. Total Revenue	7,25,000
4. Poultry Litter (2 tons @ Rs.1300/ton)	26,000		
5. Watch & Ward and Labor Charges	1,20,000		
6. Embankment Preparation	20,000		
7. Harvesting Cost (done every fortnight)	10,000		
8. Lease Rent	1,12,000		
9. Local Protection Money	80,000		
10. Total Operational Cost:	6,44,000		

Although these people are expecting only a very moderate profit of only Rs.81,000 this year, they are expecting to improve upon their performance in the coming years. They have the following reasons for their optimism:

- Although they have the advantage of being located very close to the Malancha market, this year they could not enjoy the peak rate for shrimp which rose as high as Rs.650/kg.
- Improvement in soil-water regime coupled with application of higher doses of feed is likely to raise productivity.
- They are planning to apply some scientific test on the seeds before releasing them, so that they can screen out the weaker ones whose chance of survival is low. This will help them to reduce mortality rate and also to economise on use of feed.

Although these people are not confronting any immediate threat from industry and housing sectors for construction on these far-off wetlands, they cite two important dimensions on which the contractual terms and conditions can be improved:

- Pursuing scientific pisciculture means further and long-term on-the-farm infrastructural investments to control the soil-water regimes and also to stop seepage of water. Three year lease term is too short a period to risk such investments.
- Earlier the farmers were growing on the same wetland one *kharif* paddy at a reported annual net return of Rs.1000 per *bigha* and sometimes another *boro* paddy giving an additional net income of Rs.1500 per *bigha*. Now with improvement in the soil-water regime, it is possible to pursue paddy-cum-fisheries, as used to be customarily practised. The revival of the traditional method allows increase in paddy production without application of higher doses of fertilizer and irrigation, thus enabling reduction in production cost and increase in the margin of profit. The leaseholders, however, don't want the owners to continue paddy cultivation on the same land, as it would interfere with pisciculture. Nor are the farmers ready to hand over the right of paddy cultivation to the leaseholders, as that may imply permanent tenancy rights in favor of the latter as per the land reform legislations of the state. In fact, scientifically there is further scope for value creation out of the same resource through introduction of vegetable cultivation and animal husbandry on the embankments. This entrepreneurial group resents that in spite of their contribution to the locally powerful elements in the form of local protection money, nobody is willing to come forward to lend further support to their business plan of integrated eco-friendly farming.

#### **CASE 5: FISHERIES ON LEASED-IN WETLAND FROM THE CALCUTTA PORT TRUST - CASE OF MUDIALI FISHERMEN'S COOPERATIVE SOCIETY (MFCS)**

The MFCS is the product of a long and determined struggle by a group of fishermen from and around the village Amta in the districts of Howrah and Hoogly (West Bengal). They had to migrate probably around 1932, when the Damodar river had dried up, to the wetlands near the Calcutta dock known as Metiaburuj area, in

search of contract jobs. Initially they were employed by one Mr. Sudhir Banerjee, a prosperous businessman, who had leased in the wetland from the Calcutta Port Trust (CPT) primarily for his hobby of fishing. It was his constant effort and consent by which these people formed a cooperative and approached the CPT for leasing out that land. In 1956, the society got about 80 hectares of wetland on lease for three years against payment of Rs. 26,000. The CPT, at that time, looked upon this wetland as unusable and had therefore readily agreed to the lease. Since 1985 the society has been operating as an environmental society rather than as a mere fishery cooperative.

The technical system developed by the MFCS for treatment of waste water works as follows. The average daily loading of sewage water - approximately 23 million litres of which about 70% is from industries and the rest domestic, is passed through the first of eight ponds termed the 'anaerobic tank'(size 125'x100'x11') in which the water is treated manually using either lime or biochemicals. Water hyacinth are usually kept near the anaerobic tank to facilitate absorption of the oil, grease and heavy metals in the effluent. Often the tank is dug in order to reduce sludge deposition. The second tank (125'x100'x9') into which water flows from the first through a narrow passage (culvert in the upper level), is the breeding ground for exotic fish which can survive in harsh conditions. These include omnivorous varieties such as *Tilapia nilotica* and air-breathing categories such as '*singi*'(*Heteropneustes flossilis*), '*magur*' (*Clarias batrachus*), '*koi*' (*Anasbas testudineus*) which can endure even toxic stress. The water then flows into a third pond through a macrophyte canal (1200'x40'x6') and so on, the water quality improving at each stage, and therefore permitting better utilization of the recycled nutrients and mineral contents of the sewage for fish culture. Finally, the water is let into the Manikhal canal system which eventually joins the Hoogli River.

Because of enriched micro-nutrients available from treated water, the nominal direct cost of production of fish of MFCS has declined steadily from Rs. 6.86 to Rs.5.94 per kg. during 1987-88 and 1991-92, while the average price received per kg. rose from Rs.14.98 to Rs. 17.92 during the same period (For details, see Datta and Chakrabarti, 1997). This explains the increasing levels of gross profit enjoyed by the society upto 1992-93 (Table 1). From Table 2 it is clear that the society entered a phase of decline most probably around 1993-94, when not only gross profits started going down, but also indirect costs of production started rising steadily. This decline coincided with the period when the conflict between the society and the Calcutta Port Trust over the leasing rights on the wet land reached a climax and a substantial part of the society's efforts began to be directed towards organising an agitation to create an awareness in the city to protect the wetlands around Calcutta. Although the society had eventually succeeded in influencing a Citizens' Forum to file a suit against the CPT in the Calcutta High Court to achieve an injunction against the latter's plan to take over this wetland for construction purposes, decline seem to have manifested since that time in terms of sharp drops in turnover, working capital and even expenditure on welfare activities, besides apparently jeopardising the society's accounting system and the very basis of the solidarity of the community. Although MFCS could not thus maintain its upward

spiral movement - at least for the time being, the lessons derived from the Mudiali experience do have a long-standing value, which deserve special mention at this stage.

The biological quality of *jheel* water -- phytoplankton and zooplankton as studied by the National Environmental Engineering Research Institute (NEERI) in March 1990 at different sampling points of MFCS water bodies. The waste water quality of the ponds, as reported by NEERI (1990), shows that the extent of removal of biological oxygen demand (BOD) and Coliform through the MFCS bio-engineering system is as high as 80.52 and 99.99 % respectively. This NEERI study has identified fourteen dominant types of fish fauna in the ponds, 20 'weird' (species with unknown scientific names/categories) types (which do not belong to known categories) 3 prawn and crab, 3 snail, 1 sponge and 2 snake fauna. In fact, the MFCS has been quite successful in growing prawns. During the early part of 1991, more than one species of fish, namely *Chanda* (*Chanda rongra*), *Mourala* (*Amblyopharyngodon mola*) and *Punti* (*Pontius sp.*), known to be fresh water varieties of a sensitive nature which unlike carp and *Tilapia* (*Tilapia nilotica*), cannot endure toxic stress, have been found in some of the ponds. This is a positive indication of the level of improvement in the quality of water. Given the characteristics of the different varieties of fish, it is no wonder that air-breathing fish are relatively more abundant in the ponds nearer to the inlet, while carp, prawn and other more sensitive varieties grow in subsequent ponds far from the inlet (where the yield rate is as high as 7.8 tonnes per ha. per year). For biological treatment of waste water, varieties of phytoplanktons (e.g., *Eicchornia* etc.) and algae tend to be incorporated into the ponds which not only absorb heavy metals but also provide feed for fish.

**TABLE 1:GROWTH IN GROSS AND NET PROFITS OVER TIME IN MFCS**  
(Rs. Thousand)

Year	Turnover	Gross profit	Net profit
1985-86	1,862.0	382.0 (20.52)	39.6 (2.13)
1986-87	3,738.0	758.0 (20.28)	-1.2 (0.03)
1987-88	4,147.0	1,193.4 (28.78)	84.7 (2.04)
1988-89	4,799.0	1,773.4 (36.95)	38.6 (0.80)
1989-90	5,923.0	2,946.0 (49.74)	31.7 (0.53)
1990-91	5,810.0	2,957.5 (50.90)	24.1 (0.40)
1991-92	3,815.0	NA	16.0 (0.42)
1992-93	4,732.0	4,219.3 (89.17)	37.0 (0.78)
1993-94	4,604.0	2,279.9 (48.55)	18.0 (0.38)
1994-95	3,776.0	1,462.0 (38.72)	2.0 (0.05)

Note: Figures in parentheses indicate percentages of column 2.

Source: Datta and Chakrabarti (1997).

To exercise full command over the environment and also to extract the maximum possible benefits from it, the society has undertaken a massive afforestation programme in which nearly one lakh saplings of a large number of species are planted, of which 60% have survived. The plantations are done in a scientific manner to include

about 30% plants from the leguminous group (e.g. '*Subabul*' *Leoucaena macrophylla*), 30% dust and chemical absorbing plants e.g., *Akund* (*Caloropis procera*) and *Neem* (*Azadirachta indica*), 30% plants to attract birds and 10% horticultural. The leguminous group of trees have been planted close to water bodies so that their leaf-fall serves as supplementary nutrients to the fish culture. Since the bird-attracting trees include acidic plants such as '*Amla*' (*Embllica officinalis*), these have been planted at a distance from the water bodies. According to a study of the Zoological Survey of India (ZSI) in 1991, the bird fauna observed in this 'Nature Park' comprises of 120 varieties, of which 27 are migratory and flock to the water bodies of Mudiali every winter. Besides growing fish, plants and birds, the society is successfully experimenting promotion of spotted deer, duck and tortoise based on natural nutrients in its 'NATURE PARK'. Thus in a place which was for a long time a dumping ground of urban refuse and not surprisingly, a den of anti-social activities, the MFCS has evolved a nature park which has become a popular recreation sight for a large number of city residents every day.

The members of MFCS are all fishermen by profession and 98 per cent are fishermen by caste as well. There are two types of members: permanent members (whose number is 100) who enjoy voting rights, and associate members (199 in number) who enjoy the same facilities as permanent members except the right to vote. Besides, there is a third group of casual labourers who earn no more than daily wages, and are provided nominal membership. The society's share capital has come from the permanent and associate members only. The society since inception an elected board of six directors.

The society has been placing a lot of emphasis on member training and interaction with the scientific community since 1965. The society started implementing the following long-term plans: (i) sending its members in rotation to the State Fishery Research Station to learn scientific fish culture, (ii) deweeding and desilting of tanks, (iii) intensive fish culture and (iv) scientific training with the help of its own folk laboratory (located in its 'Environment Park') for developing a balanced eco-system. The last-mentioned activity has taken the form of daily evening discussion and debate across the members, whereby the members have learnt how to test the quality of water at any time and take appropriate corrective measures, besides understanding the implications of changes in policy as well as in scientific knowledge all around the world. It has created so much of enthusiasm that some of its members have started visiting the National Library of the city regularly for further consultation.

Although production and sale of fish (of the Indian Major Carps (IMC) variety) continue to be the core activity the society is also engaged in the sale of fishery inputs and consumer goods in the interests of its members and the community. Moreover, as the society has converted itself into an environmental cooperative rather than remaining a mere fishery cooperative, a number of peripheral activities - for example, selective plantation and rearing of animals, capable of generating scale and especially scope economies (i.e. generating mere output/income cost of the same resource/cost), are assuming greater importance over time. Thus a stage has been set for undertaking

in the near future commercial production of horticultural and floricultural products (early experiments in this regard have already brought some awards to the society). Besides rearing of duck, deer and tortoise for commercial purpose, another important offshoot of its current portfolio of activities is offering of consulting service on contract basis to the outsiders badly in need of correcting their environmental problems. The current portfolio of activities of the society is captured in Table 2.

The society is currently selling fish through 80 enlisted retailers who sell in 37 markets of the city and buy fish from the society at the usual 10 per cent discount (for annual transactions between 1000 to 1500 kg) over the prices stipulated as per weight of fish (Rs.15 per kg for IMC fingerlings of 150-250 grams weight, Rs. 18-20 per kg for the same of 250-500 grams weight and Rs.21 for those of more than 500 grams weight). All these retailers are nominal members of the society and receive higher rates of incentives for higher amount of transactions, besides certain other benefits at the time of the annual *Durga Puja* festival. Although the society is yet to achieve further value addition to its production through agro-processing and vertical integration of processing activities, it has started selling processed fish in polyethene packets to selected retail stalls and even cooked fish in its 'NATURE PARK' with the help of the women-folk of its member households. The society is now planning to do the same on a larger scale.

Since its inception this society has attached great importance to member welfare activities. Since early 1965, this society has been providing full reimbursement of educational expenses upto primary level for members' children, a grant of Rs. 2000 in case of marriage of any member's daughter and a grant of Rs.1000 as funeral expenses in the case of death of any member. As the society entered a new era of high productivity and high profits, a number of other welfare activities were initiated in the latter half of the 80s. To an extremely backward community, provision of such facilities which had always been beyond reach, has contributed to strengthening of member loyalty, besides saving on income tax.

**TABLE 2: PORTFOLIO OF ACTIVITIES OF MFCS**

(A) Main Business Activities	
1.Sale of fish through Enlisted Retailers	1961
2.Order supply of Fish to Govt.	1988
3.Sale of Fishery Inputs	1986
4.Sale of Consumer Goods	1980
5. Sale of Catering Services	NA
(B) Peripheral Business Activities	
6.Plantations	1986
7.Rearing of Wild Animals	1988
8.Co-op.Fishery and Environment Training for Members	1987

9.Co-op. Leadership Training	1987
(C) Welfare Activities for Members	
10. Medical Aid (full reimbursement)	1987
11.Education aid (full reimbursement)	1985
12.Old-age Pension and Family Pension (Rs.400 per month to member or member's widow)	1987
13.Consumption Loan (Rs.500 one time)	1986
14.Marriage Grant (Rs.2000 for marriage of Member's daughter)	1965
15.Housing Loan (Upto Rs.35000 without interest)	1987
16.Janta Insurance Policy (coverage of member against accident)	1986
17.Funeral Expenses (Rs.1000 in case of member's death)	1985
18.Drainage, Sanitation and Drinking Water (Service charges for such facilities are borne by society)	1987

Note: Figures in parentheses indicate percentage of total business. Source: Datta and Chakrabarti, (1997).

Given its spectacular performance and ingenious innovation, the society has naturally caught the attention of the scientific community, besides winning the goodwill and sympathy of the local people, the Calcuttans at large and various governmental and non-governmental bodies. The society has won various prizes and awards, the notable among these being National Productivity Award for several years, prizes for horticulture and floriculture show and National Filmfare Award for a film documentary based on this society. Inspired by the Mudili Society, two other sister societies -- namely, Bon Hoogly and Purba Kalikata Fishermen's Cooperative Societies started similar activities on wetlands in their respective areas. Moreover, the society started leading a movement alongside the environment-loving Calcuttans for protecting the wetlands in and around the city.

The economics of the Mudiali experiment is provided in Table 3 in a simple manner, under alternative assumptions. As per 1990-91 data, Mudiali was producing on average a gross surplus of Rs. 72,000 per ha (Scenario 1). Mudiali was devoting most of this surplus to member welfare rather than to lease instalment payment towards purchase of the land. But even in 1990-91 it had the capability to make a maximum lease payment of Rs. 72,000 per ha and could outbid any industrial enterprise. If partial shrimp culture is introduced (Scenario 2), this surplus amount rises to Rs. 1,14,667 per ha, while allowing for product diversification and value-addition further enhances the surplus to Rs. 2,10,534 -- a figure very unlikely to be matched by any bid for lease for industrial purposes. With better technology and better marketing, the scope for surplus generation would be even greater. The most critical constraints to realize these potentials are availability of investment loan, practising of economies in indirect costs (which are found to be quite high by Datta and Chakrabarti, 1997), besides law and order and a favourable policy climate. As most of the wetlands in this state are producing much less and their management systems are much less efficient



as compared to MFCS, such lands would naturally produce much less surplus on average and hence face serious competition from alternative uses.

MFCS and its several sister organisations have important lessons for the low lying cities of Calcutta, Dhaka, Bombay, Jakarta, Bangkok, etc., which are well known for the traditional practice of dumping industrial effluent and urban refuse on their weedy and marshy wetlands or for the recent trend of converting such wetlands into busy industrial and housing complexes under pressures of population growth and development. These lessons are summarised below:

- These societies located on the wetlands of Calcutta seem to have evolved a non-traditional system of wetland management. Using urban refuse and polluted waters of the city, these societies have developed a completely indigenous bio-engineering system to perform three important functions: (1) improving the waste water quality before releasing it into the river Ganges, (ii) using the waste water as input to grow fish and (iii) developing an ecologically balanced system to convert the entire area into a smiling 'NATURE PARK'. The above-mentioned functions have opened up further opportunities for an ever-increasing variety of business activities, besides producing low-cost sanitation, employment, environmental safety and aesthetic value to the city dwellers. So, the evolution of the Mudiali Society over time can be looked upon as a tutorial system to provide lessons not only on economics and environment but also on how the fate of economics and environment can be dictated by exogenously given social and political factors.

**TABLE 3: A SIMPLE ECONOMICS OF THE MUDIALI SYSTEM BASED ON 1990-91 DATA**

	<b>Description</b>	<b>Net Profit/ha</b>
<b>Scenario 1:</b>	The society is engaged in production of only fingerlings as at present at a total cost of Rs. 6 per kg (inclusive of wages at prevailing liberal rates) and selling them through enlisted retailers at Rs. 18 per kg, the yield rate being 6 tons/ha.	Rs. 72,000 (6000 kg @ Rs.12 profit/kg)
<b>Scenario 2:</b>	Allowing for shrimp culture on 1/3 ha of water body at yield rate of 2 tons/ha, at cost of production of Rs. 100/kg and selling at price of Rs. 200/kg. The rest of 2/3 ha is used as in Scenario 1.	Rs.1,14,667
<b>Scenario 3:</b>	Allowing for product diversification and sale of value-added products like processed fish as follows:  a) Horticulture, floriculture and fuel-wood, estimated @ 25% of net profit under Scenario 1.  b) Animal husbandry (rearing of ducks, crocodile, tortoise, deer, etc), estimated @ 25% of net profit under Scenario 1.	Rs.2,10,544  Rs. 18,000*  Rs. 18,000

	c) Recreation facilities in the 'NATURE PARK', calculated @ Rs. 1 per head x 100 visitors per day x 6 days a week.	Rs. 31,200**
	d) Additional income from sale of value-added items, estimated @ 25% of net income under Scenario 2.	Rs. 28,667

Source: Datta, S.K. (1996). Notes: (\*) The society is stated to be currently producing 150 tons of fuelwood whose value at prevailing market price of Rs.3/- kg turns out to be Rs.4,50,000 per year. (\*\*) Moreover, the society is believed to be earning another Rs.1,50,000 per year from eco-tourism.

- Before modern scientific fish culture was introduced in Mudiali in 1985, it was stagnating at a low-level equilibrium – an average 2 ton/ha production, indifferent members enjoying a share of the output which was just enough for their subsistence, the anti-social but politically powerful elements enjoying a lion's share of the output. So, the first confrontation the MFCS had to face was with these anti-social elements. In the process, quite a few members of the society suffered both mental and physical torture. While Mudiali somehow overcame the problem partly through direct confrontation, partly through goodwill building with the local peace-loving population and partly through accommodating some of these elements as associate members of the society, law and order continues to be a major problem constraining production in the vast low-lying areas in the neighbourhood of the city of Calcutta. Irrespective of whether production is organized by a private entrepreneur or by a cooperative of fish-farmers or by a government farm, long-term and scientifically necessary investments tend to suffer. It goes to the credit of Mudiali and one or two similar bodies which for the first time created an awareness about the untapped potential and urged all suffering fishermen to join hands and clamour for an improvement in law and order.
- At first, when Mudiali started, the CPT had no long term plan to convert its wetland area for any construction or expansion, but once the society converted this land into a smiling 'NATURE PARK' to the joy and relief of environment-loving city dwellers, the CPT is alleged to be making attempts to evict the society from that area under one plea or the other. The fish farmers wonder while the tenants on agriculture do have protective rights against arbitrary eviction, why similar rights ought not to be extended to them. They have also questioned the wisdom and rationale of allowing public sector units like the CPT to hold huge tracts of land for unproductive and mindless uses at the cost of the citizens of the country who need such lands for their living and even for their environmental safety.
- Based on the experiences of the Mudiali Society, Datta (1996) has explained the alternative uses of wetland in terms of the prevalent socio-economic-political regimes (Table 4). Before the Mudiali Society came into being and even upto 1985, the relevant wetlands were wholly or partly used as dumping ground of urban and industrial refuse. The underlying socio-economic-political regime favored this wetland use pattern. But once land-labor ratio started becoming unfavourable and creation of employment

became a major goal of government policy, the underlying circumstances paved the way for emergence of the Mudiali Society, although until 1985 scientific techniques were hardly applied for pisciculture and as such the society was economically weak and caught in a low level equilibrium trap. It is only after 1985, the society started applying scientific techniques more vigorously, while at the same time resisted the popular pressure of mindless employment creation and also maintained autonomy of the organization. It was at this juncture the society built up a bridge with sister organizations and environment-loving population to spearhead a environmental movement in the city. At this point the environment-loving population of the city first got organized under the banner of the Mudiali

**TABLE 4: POSSIBLE ALTERNATIVE USES OF WETLAND**

	<b>Underlying Socio-Economic-Political Regimes</b>	<b>Resulting Uses</b>
<b>Alternative-1:</b>	(i) Land-labor ratio favourable, (ii) Technology for productive land use either unknown or prohibitively costly.	Dumping ground of urban and industrial refuge.
<b>Alternative-2:</b>	(i) Land-labor ratio unfavorable, (ii) Technology known/unknown but definitely not applied to the optimum level, (iii) Political system too keen to maximize employment.	Weak cooperative societies caught in low level equilibrium.
<b>Alternative-3:</b>	(i) Land-labor ratio unfavorable, (ii) Technology known and also being applied, though not necessarily at the optimal level, (iii) Political system takes a sensible approach towards employment generation, cooperative autonomy and environmental protection.	Strong cooperative societies with 'Nature Parks'
<b>Alternative-4:</b>	(i) Land-labor ratio unfavorable, (ii) Interests of a compassionate group demanding industrial and/or urban housing more important to the political system and hence existence and application of sustainable land-use technology irrelevant.	Industrial and/or urban housing complexes.

Source: Datta, S.K. (1996)

Society. Such a socio-economic-political regime gave birth to a number of strong independent and well-functioning cooperative societies, which could not only survive and grow without government support, but also challenge government policy. The most recent developments in Mudiali not only expose an internal crack of the system but also provide opportunities for the other interest groups (namely, unemployed local youths, politicians as

well as government bureaucracy besides a powerful lobby of building promoters) to reorganize themselves and provide a serious challenge to the 'NATURE PARK' concept of Mudiali. So, unless such societies can build up a strong front along with the environment-loving population, alternative 3 becomes a short-lived phenomenon and all available signs indicate that the wetlands in and around Calcutta would either be used to build up weak and dependent (on government) cooperatives or simply be leased out in favour of urban and industrial complexes.

## **Section 5. Property Rights Theory & Restatement of the Sustainability Problems of Calcutta Wetlands:**

Two basic ingredients of the property rights theory are: the concept of private ownership and the Coase Theorem conditions for value-maximization of resources. In order to understand the functioning of property rights on wetland, it is necessary to elaborate on these two concepts at the outset.

Perfectly enforceable private property rights mean three essential components: (1) Residual control by the owner, (2) Flow of residual return to the owner, and (3) Perfect pairing between residual control and return. [Milgrom, Paul & Roberts, John (1992)]. When the owner and the users of an asset are different as is often the case with most assets - particularly when the owner does not possess enough capability (including skill) nor enough resources to make fuller use of the asset - residual right means the right to decide on the asset's use that are not explicitly controlled by law or assigned to a person by contract. Ownership means having this residual control. If the owner could freely imagine all possible contingencies that might arise during the contract term, costlessly describe and negotiate with the contractual parties (i.e., the agents) on the necessary terms and conditions of contract corresponding to each possible contingency, the owner could have written and entered into complete contracting with the agents who are being involved in the use of the asset under question. In such a situation, residual rights would mean nothing as no rights would remain unspecified. But perfect contracting being a near impossibility in most real-world situations and with respect to a complicated and multidimensional assets like wetland, residual rights to control agents' behavior under unforeseen contingent situations is a must to the owner. However, this residual right varies over time and space, as most countries regulate the owner's right by law and pre-specified rules (for example, the right to fire an employee).

Residual claim (whether gain or loss) is the entitlement to the owner of "*whatever remains after all revenues have been collected and all debts, expenses, and other contractual obligations have been paid*" (ibid, p.291). The notion of residual claim or return, not unlike the notion of residual control, is closely tied to contractual incompleteness. Had complete contracting been possible, the division of wealth under each eventuality could have been pre-specified as part of the contract, and hence no return could have meaningfully been thought of as residual claim. However, the notion of residual return also becomes fuzzy in cases of complex assets like a firm, where the

residual returns tend to flow to entities (like managers and workers) far beyond the owners - namely, the shareholders. Once the concepts of residual control and residual return are clear, it becomes obvious that only when it is possible for a single individual to enjoy both residual control and residual return, the residual decisions will be the most efficient, resulting in the highest possible generation of value out of the asset. But if only a part of the costs or benefits falls or flows to the decision-maker (i.e., when there is no perfect pairing between residual control and residual gain, and thus the decision maker does not bears the full financial burden of his choices), then that person in his own personal interest will tend to ignore some of these cost-benefit effects and almost invariably undertake inefficient decisions leading to realisation of less than maximum value out of the use of the asset. Unlike the common notion among the devotees of purely private property rights, there is hardly any perfect matching between residual control and residual gain except possibly in case of a small fraction of fairly simple assets/resources, and hence private ownership is hardly a panacea in most real-world situations. By the same logic however one can see hardly any perfect match between residual gain and residual control in case of state ownership of assets, and hence, to the utter dismay of the people who love the opposite extreme of government ownership apart from mere regulation and control, state ownership is not a panacea either. If the market system based on private ownership of resources lacks a time and social horizon because of its over-emphasis on short-term and private gains, there is no obvious way to ensure that a system of government ownership and control will not lead to further erosion in terms of accountability, efficiency and equity.

The celebrated Coase Theorem takes over when the above-stated exclusive ownership system fails to produce the most efficient outcome in terms of usage of resources. This is because the Coase Theorem introduces a dynamic process of adjustment when it argues that if people are able to bargain together costlessly and thus effectively implement and enforce their decisions (thus moving in the direction of having a complete set of markets for taking care of all contingent needs) and if people's preferences are free from wealth effects - that is, no party to the bargain can influence the outcome by virtue of his economic, social or political power (thus trying to restore competitiveness in the markets for all contingent needs), then the most efficient outcome will be arrived at through realignment of property rights including redesigning of contractual agreements. Obviously, it is extremely difficult to fulfil the Coase conditions for attaining the first-best optimum, but as this theorem talks of a process rather than a static situation, there is no reason why a move towards a second-best situation (subject to transaction costs involved in overcoming problems of informational asymmetry, and costly negotiation and enforcement of contracts) cannot be initiated through conscious decision-making on the part of the stake-holders to an asset. The celebrated Coase Theorem, reinterpreted in this manner, thus provides a clue towards development of a much broader-based system of property rights beyond the narrow bounds of outright private or state ownership of resources. This is what the present paper seeks to highlight if one is to promote sustainable uses of the wetlands around the city of Calcutta.

The Swedish Upsala approach has added vital clues towards achievement of this second-best situation, when it proposes a tri-polar institutional framework (brotherhood or handshake forms of organisation beyond the conventional two poles of markets and hierarchical forms of organisations) and highlights the virtues of the third pole vis-a-vis the others. We shall clarify this point briefly following Collin (1993). He provides an excellent structure for understanding the dynamics of goal attainment. He argues that the achievement of a certain goal necessitates constraining of actions. 'Defining control as the constraining of action in order to achieve a goal', he classifies 'different modes of control depending upon when the constraint is imposed'. When a person, or an organisation with rules and plans specifies the appropriate action and directs the actor what to do, we talk of 'action control'. Control based on the consequences of action, on the other hand is termed as 'output control'. Control prior to action is characterised as premise control. Table 5 provides the different possibilities depending on the possibilities of measuring goal attainment and the degree of knowledge of the action necessary to achieve the goals.

**TABLE 5: CONTROL TYPES DEPENDING UPON KNOWLEDGE OF ACTION AND MEASURABILITY**

Knowledge about the action	Goal Attainment	
	Measurable	Not Measurable
High	Action control or output control	Action control
Low	Output Control	Premise Control

Source: Collin (1993), p.74

If the goal to be attained is measurable and one has prior knowledge about the possible actions to be taken, the control may be either in terms of action or output. If the goal is not measurable but there is high knowledge about the actions, Collin suggests an action control, i.e. setting up of a hierarchical institution for the purpose. A market form of control in the form of output control is prescribed when the goal is measurable with a low level of knowledge about the possible actions. In case there arise problems regarding both measurability and knowledge of actions, Collin suggests premise control and argues that "some clan like institution is needed to deal with these conditions..." (ibid, p 74). Such institutions obviously call for collective action. The question then is, whether in the context of our concern for sustainability of Calcutta wetlands, we are promoting such institutions for undertaking the needed collective action across the stakeholders. Needless to add, sustainability means not only long-term economic viability, but also social and ecological compatibility. Obviously, the goals of social and ecological compatibility are hard to measure. Moreover, in case of a complex asset like wetland, many of whose attributes are difficult to measure and have only longer-run and general-type utility (for example, to future generations and to people apparently unrelated to these resources and also living in far-off places), even long-term viability may be quite difficult to define as different stakeholders may view it

differently. Some of the complicated issues inhibiting evolution of a broader-based property rights system in wetlands center around the following complexities:

- Presence of a number of stakeholders with conflicting aims, even though formal ownership is often vested with an individual, a collective body or the government.
- The means of livelihood of traditional fisherman and farmer community are involved.
- All the dimensions of the fishery resources are not yet known, not to speak of their measurability and awareness about them in the minds of the local communities, even though they are believed to have the maximum stake in sustainable use of such resources.
- Most of the resources have alternative uses, each having its own economics - both short-term and long-term, depending upon technology and as well as its socio-political and environmental implications.
- Almost all these resources are both generators and recipients of externality effects, which run across generations, so that in ultimate analysis almost the entire mankind - whether past, present or the future, has a stake in these resources (even the one-way externality matrix prepared by Vass (1998) and displayed in Appendix 1 gives a feel for the implied problems).
- Most of these resources are so vast and indivisible that assigning individual ownership on such resources is not always possible (except in very negligible cases of small tanks and ponds).
- Absence of law and order interferes with the enforcement of private property rights - whether the wetland resource is held by a private individual, government department or a collective body.
- When contracting to an agent to facilitate use of the resource is a must (i.e., when the owner for whatever reasons is not in a position to use the resource directly), reaching of only short-duration contracts or contractual terms which are highly loaded on the side of one party or the other (for monopolistic reasons, thus violating one of the conditions of the Coase Theorem - namely, absence of wealth effects), may severely constrain the incentives for long-term investment in development and research on such lands.

## Section 6: Conclusion

The paper proposes to raise certain issues at this juncture in the light of the discussions in the preceding section and the live experiences cited in section 4. The issues will be raised in the form of questions so as to sensitise the relevant quarters about the possible directions in which one can move for a solution to the sustainability problem of Calcutta wetlands. These are illustrated below.

First, there is no doubt that the means of livelihood of farmers and fishermen traditionally living on wetlands are at stake. They have been subjected to (i) negative externalities on their wetlands from activities totally outside of their control and even beyond their comprehension, (ii) competition from alternative uses of wetland and particularly from the ever-increasing demand for building constructions for industry and the housing sector, (iii) alienation from appropriate technology and technical knowhow, by which they can defend their profession and the traditional uses of wetland, (iv) unequal access to the market for financial capital and information, and (v) instability in law and order conditions, which is affecting productivity and earnings from pisciculture. Isn't it possible to place the traditional inhabitants of wetlands, who have the maximum 'connectedness' with the resources, at the center stage of control of all activities involving wetland use? If the Common Fisheries Policy of the European Union can place the rights of the coastal and traditional fishermen over and above other considerations, can't India do a similar thing in a similar context? Can't we preserve our wetlands as fishery estates? If the legal provisions as discussed earlier which started with protecting the rights of private fisheries, and the recent High Court and Supreme Court judgements highlighting the importance of protecting the environment and the rights of traditional inhabitants in an area, are not the real bottlenecks, which are then the real missing links? Do we really need another Act to protect fisheries from outside pollutants?

Second, while the direct and indirect beneficiaries from wise-use of wetlands are many and diverse, the maximum burden of residual losses falls almost invariably on the local inhabitants, although they may not always enjoy the residual gains nor even the residual control rights on such lands. If the traditional and wise uses of wetland are not commercially viable even though such uses may promote ecology, bio-diversity and a number of non-tangible benefits to the distant communities or to the mankind at large, are the distant communities or the mankind at large prepared to pay to the local communities for the external economy benefits they are generating through preservation of wetlands? Beginning from the Ramsar Convention of 1971 in Iran, the concern for wetland preservation has no doubt been internationalised. But are the distant national communities or the international community at large prepared to pay to the traditional communities for preservations of wetland in consonance with the internationally accepted principles of 'the polluter pays' and 'equitable distribution' of the burden of environmental protection? Is there any local, national or international forum where the suppliers of environmental benefits can charge the beneficiaries as well as the polluters? Although the Aquaculture Authority Bill, 1997 of the central



government had recommended formation of district and state level committees to approve or prevent aquacultural practices, especially in fragile coastal zones, it has four major flaws (for details, see Datta and Chakrabarti, 1997):

- It is yet to be approved by the Indian Parliament and acquire the status of an Act. Although some of the state governments have already introduced similar Acts, this is true of only a handful of the states.
- The role of the Authority as envisaged in the State Acts has been one of a regulator rather than of a facilitator. No doubt, these Authorities can approve or stop an aquacultural activity, but they have no authority over non-aquacultural activities which can jeopardise aquaculture. As a result, they cannot apply the 'polluter pays' principle to non-aquacultural activities, nor can they initiate negotiation between the polluters and the sufferers and thus facilitate the maximum value-creating activities on wetlands.
- This Authority has become another official layer for screening and approving aquacultural projects, without any representation from the local inhabitants (e.g., of the *Panchayats*) as well as their economic organisations - that is, agencies which have the maximum 'connectedness' with the resources being handled by the Authority. A careful look at the various prevailing Acts in the context of West Bengal makes it abundantly clear that if a government has the will, it can jolly well regulate aquaculture - at most by bringing in suitable amendments to the existing Acts to sharpen their teeth. So, looked this way, introduction of another official Authority seems redundant for the purpose in question.
- When intangible environmental goods/bad's to distant communities and even to future generations are involved, what is the value-maximizing activity cannot be unambiguously decided by simply applying the market principles. Obviously, there is scope for debate, discussion and bargaining across the stakeholders to this resource, and for that what is needed most is capability building of the local inhabitant and not merely empowering them through their representation in suitable bodies. So, unless the awareness and capabilities of the local inhabitant are built up alongside their representation in the Authority, the formation of the Aquaculture Authorities will have very little meaning.

Third, wetlands are often subject to serious market failure problems mainly due to lack of supporting services like infrastructure, extension etc. Although the traditional communities are used to application of only environment-friendly technologies, due to the dynamics of population pressure and other related changes, these technologies tend to become commercially non-viable over time, unless adequate tinkering and refinements are done in them and the necessary knowledge is effectively imparted to the traditional communities. While the cases and caselets covered in this paper highlight the importance of technology-dissemination, they also point to the acute deficiencies in the functioning of existing R & D organisations. It is high time that both

the state and the central governments seriously think in terms of providing only a partial financial support to the salary and establishment budget of the R & D organisations and thus forcing them to earn a part of their earning through private provision of these services. Small commercial ventures of artisanal fishermen are also likely to fail unless there are good infrastructures like roads, communication, markets, landing and processing centers etc. An important example based on the field experiences in Calcutta wetlands will clarify this point. At least the progressive fishermen of this area have come to realise the need for pursuing IMC culture alongside shrimp culture in the Calcutta Wetlands in order to achieve ecological balance in pisciculture. Unfortunately, the fishermen at Nazat (about 30 kms from Calcutta) need to procure the seeds from hatcheries near Naihati at an additional surface transportation cost of Rs.5-10 per kg. (beyond the spot sale price about Rs.25-30), those located at Sandeshkhali (about 80 kms from Calcutta) incur further boat transportation cost of Rs.25-30 per kg. and those located at the farthest point to the south of Calcutta at Hingalgunge (about 100 kms from Calcutta) incur yet another Rs.15-20 per kg. on transportation. Similarly, there is no shrimp hatchery nearby; these people are dependent on either wild collection of shrimp seeds (which is not usually looked upon as a sustainable proposition) or distant supplies even outside of the state. So, in order to sustain wise use of these wetlands around Calcutta, it is absolutely necessary to promote certain basic infrastructural facilities, without which the current uses will turn out to be commercially non-viable and these wetlands would tend to move towards other uses, whose environmental implications are suspect.

Fourth, although no precise figures are available, a significant part of the wetlands - especially the freshwater wetlands - around Calcutta seems to be in the possession of various government Departments - both state and central. This is in spite of the fact that cases of outright government take-over are few and far between. Naturally, these vast wetlands and water bodies are leased out to private parties rather than directly used by the concerned Departments. When one talks of a stable and sound property rights regime, it does not mean merely the rights of the owner, but also those of the users, which need to be carefully crafted and protected to sustain the value-maximizing use of the resource under consideration. Frankly speaking, the Bengal Private Fisheries Act of 1889, although itself and its later amendments does not cover protection against environmental pollution, does cover the interests of private leaseholders. Naturally, how can one achieve the maximum value out of the Calcutta wetlands unless the interests of the leaseholders are adequately protected through conscious and judicious application of the various Acts and rules? The following pertinent issues deserve attention for an early solution in this context:

- There is hardly any coordination across government Departments regarding best possible utilization of wetland and water bodies under jurisdiction of these Departments. For example, in the interpretation of the Fisheries Department, the Indian Forest Act of 1927 applies only to those water bodies within forest areas where there are no tidal effects, but the Forest Department restrains fisheries activities even in water bodies subject to tidal effects on the plea that the fishermen

once they get into forests do encroach upon and destroy forests. Nevertheless, the fact is that the Forest Department issues fishing licences on the basis of recommendations from the *Panchayats*. It is further alleged that the *Panchayats* tend to ignore certain blocks and even genuine fishermen, and as the Forest Department-issued licences don't include identification photographs unlike the ones issued by the Fisheries Department for fishermen's insurance purposes, these licenses tend to get into the hands of powerful intermediaries, who sell them off later to fishermen at a much higher cost. The matter has remained unresolved due to lack of coordination. There is similar lack of coordination between the Town & Country Planning Department in charge of release of waste water and the Fisheries Department, which is supposed to be utilising that waste water alongside brackishwater. Theoretically, to promote best possible use, most of the Departments are supposed to transfer water bodies under their possession to the Fisheries Department under long-term leases, and the legal framework discussed earlier also allows the Fisheries Department to approach the relevant bodies for lease. The facts are however totally different, as no Department seems interested in parting with direct control over their wetlands. The government policy is however perfectly unambiguous, as the memo no. 277(1b) - Fish/3M-22/79-I of June 14, 1982 from Deputy Secretary to the State Government addressed to the Collector (given in Appendix 2) reveals. The West Bengal Land and Land reforms Manual, 1991 published by the Board of Revenue of the Government of West Bengal puts it in para 274 of chapter XVII (p.77) as follows:

*"Large tanks or water areas may be temporarily transferred by the District Land and Land Reforms Officer under intimation to the Collector to the Fishery on requisition from them for a specified period not exceeding 20 years. If the requisition is for a longer period, the matter should be referred to for decision to the Board of Revenue through the Commissioner."*

But here again, the fact is not different from the general trend (see, for example, the office memo of the Land & Land Reforms Department, Govt. of W. Bengal no. 410-L.R. of May 24, 1993 to the District Land & Land Reforms Officer, North 24 Parganas). Will it not be appropriate to have a single window for all wetland leasing out arrangements? If the Fisheries Directorate can be placed at the helm of affairs on leasing arrangements, not only can the costly inter-departmental coordination problem be avoided, but also a uniform leasing out system with tied extension service from the same Department can be evolved. Lack of suitable revenue records and demarcations for water bodies can then also be tackled at the same time.

- In spite of the recommendations of the National Commission on Agriculture and the subsequent recommendations of the National Fisheries Board in favor of longer term leases of wetlands and waterbodies in favor of fishermen and their cooperatives, it appears the trend is toward shorter-term leases. The short-term leases cannot be justified except when the Department under consideration has a

long-term Master Plan for development. Interestingly, the prevalence of short-term leases in fisheries is in sharp contrast to the longer-term leases frequently being granted to private industries (upto 30 years) and to NRI organisations (alleged to be upto 99 years) on the same wetlands around Calcutta. Although the New Industrial Policy of the state of West Bengal announced in April 1994 has identified industry, agriculture, animal resources, aquaculture and food processing as five thrust areas, how can aquaculture thrive alongside others unless the duplicity and discrimination of government policy against wetlands are avoided ? The fishermen seem to be quite resentful of the fact that the long-term leases and lease rents in cases of industry are granted irrespective of the size of the forthcoming investment and the resulting income flows, which are quite different from what happen in the case of pisciculture.

- Not only the lease rents are arbitrarily fixed but also these are suddenly raised without reference to the commercial viability of the leaseholder's activities. In case of the district of North 24 Parganas, for example, in view of the prevailing low rents of water bodies leased out to fishermen's cooperatives, a proposal was mooted in 1994 to raise such rents in the subsequent years at an annual rate of 12.5%, though ultimately after detailed discussion, it was resolved to raise it at a moderate 2% rate per annum (see, memo numbers 582/80 and 583/80 both dated 23/08/94 of the District Fisheries Officer, North 24 Parganas). It is important to mention in this context that the Water Body Distribution Committee of this district took a bold step to resolve this issue through trying to fix up the rents of vested water bodies as per the norms prevailing in agriculture (i.e., after taking into consideration the last three years' productivities). A sample of this exercise already performed in one block of this district is displayed in Appendix 3.

To conclude, this paper demonstrates that although the legal as well as the policy framework for wetland management are apparently broad enough to protect sustainable wetland use besides protecting the interests of traditional inhabitants on wetland. (except against outside environmental pollution), pressures arising from geographic changes in the river system, rapid population growth and industrialisation accompanied by 'opportunistic' behavior on the part of certain crucial players in the system made the legal and policy framework virtually ineffective in protecting the wetlands around Calcutta as well as their traditional users. Although the legal framework began by protecting the interests of private fishers, subsequently the system started moving towards a complex system of government ownership and, more than that, towards a fairly widespread government control, which seem to have alienated the traditional as well as the newly emerging entrepreneur-type fishers. The irony is that the world of today is more concerned about the ecological needs of the world community, but fails to see in proper perspective how this ecological imbalance flows from local levels from erosion in property rights over resources and the consequent poverty and deprivation. Contrary to the common and misconceived notion of property rights as merely defending private ownership, this paper argues that property rights ought to be understood in a broader perspective taking into account the interests of all the

stakeholders to a resource and creating a forum for evolving uses that will confer the maximum possible gains to the society. Unfortunately, the existing institutional set-up with too much reliance on government intervention and control is found to be quite inappropriate for a movement in that direction. Given the complex nature of the underlying resource called wetland, on the one hand, and the complexity of government control supported by official secrecy provisions, on the other, the real stakeholders are found to be totally confused, frustrated, and seen to be fighting only a losing battle. When the individual stakeholders are thus found to be quite incapable of handling a complex and turbulent outside environment, this paper following the Swedish School approach recommends formation of broad-based 'brotherhood' organisations of wetland user groups and their associations with appropriate higher tiers at national and even at international levels, which can act as countervailing power to stop the erosion in property rights of the stakeholders in wetland. What is recommended is neither a private body guided by the narrow and short-term dictates of the market, nor a governmental hierarchy often doing something quite different from what it promises and preaches, but a 'handshake' between the two wherein individuals can freely and fearlessly express their concerns and bargain with each other for a better wetland use. To give a very small example, if the Irrigation Department can organise informal water users' associations, why not the same thing cannot be done with respect to the users of waste water ? It appears there is a huge institutional vacuum between the two extremes of the market and state hierarchy. This vacuum needs to be filled in through social re-engineering and strengthening the basis of the civil society, which can act as a hedge against the evils of both the market and the state. The platform needed to achieve this goal must be broad enough to accommodate social and folk engineers and not merely ecological and Government Line Department engineers.

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**Appendix-1: Various Activities Which affect Wetland and its Fisher**

Project Activities	Primary Impact
Change in Drainage Pattern Channelization of River Diversion of Flow Construction of Dam Extraction of Ground/Surface Water	Change in Hydrological Regime
Development of Township Development of Road Network Industrial Activity	Change in Drainage Pattern
Removal of Vegetation from Catchment Harvest of Wetland Products Afforestation Introduction of Alien Floral Species	Alteration of Floral Composition
Harvesting of Fauna Introduction of Alien Fauna	Alteration of Faunal Composition
Removal of Nutrients Addition of Nutrients Compaction Earthwork	Alternation of Substrate
Discharge of Domestic/Industrial Wastewater	Pollution/Eutrophication

Source: Reproduced from Vass , K.K.(1998), p.28.

Appendix-2: Government of West Bengal Memorandum on the Question of Transfer of Khas/Vested Water Areas to the Fisheries Department for Exploitation

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**Government of West Bengal  
Fisheries Department  
Fish Branch**

No:2771(16)-Fish/3M-22/79-I.

Dated, the 14th June 1982

From : Dy. Secy. To the Govt. Of West Bengal  
To : The Collector, \_\_\_\_\_.

Sub: Transfer of Khas/or vested water areas to the Fisheries Deptt. For exploitation - Question of.

**MEMORANDUM**

The undersigned is directed to state that the Board of Revenue West Bengal has opined on a reference being made to them that the Board would have no objection to the transfer of vested/or khas water areas to the Fisheries Deptt. If these are exploited departmentally for the purpose of pisciculture. The Fisheries Deptt. Contemplates to exploit such water areas for boosting up production of fish in the State.

2. He is accordingly requested to furnish to this Deptt. A list containing particulars of all big water areas which have not yet been transferred to the Panchayatiraj Institutions in his district.

3. This may kindly be given topmost priority.

S/d:Secy.to the Govt. Of West Bengal

-o0o-

No:2772-Fish

Dated:14th June 1982.

Copy forwarded to the Board of Revenue, West Bengal for information. This has reference to their notes dt.18.2.82 in the Fisheries Deptt. File No.13P-62/81 regarding the Memorandum submitted by Shri Susanta Haldar, General Secretary, Paschimbanga Matsyajibi Samity, Calcutta.

S/d:Secy.to the Govt. Of West Bengal



-o0o-

No:2773-Fish

Dated:14th June 1982.

Copy forwarded to Shri S. Barma, IAS, Director of Fisheries, West Bengal, 8B, Lindsay Street, Calcutta-16 with the request to instruct all the District Fishery Officers immediately to pursue the matter from their level with the Collector's Office so that particulars of big water areas remaining unutilised can be had without delay.

Copy of the circular is being endorsed to the D.F. Os. From this end also.

S/d:Secy.to the Govt. Of West Bengal

No.2774(16)-Fish

Dated: 14th June 1982.

Copy forwarded to the District Fishery Officer, \_\_\_\_\_, P.O. \_\_\_\_\_  
Dist. \_\_\_\_\_ for information and urgent necessary action.

S/d:Secy.to the Govt. Of West Bengal

Comp.

M.mondal/14682.

**Appendix-3: Reassessment of Lease Rent for L & LR. Department on Water Bodies in Bongaon Subdivision,  
District: North 24 Parganas**

Name of the Fisheries Cooperative Society (F.C.S.)	Leased Water Area (in ha)		Society's Expenditure (Rs.)						Sale of fish (in Rs. lakhs)	Viable Profit (in Rs.)	Reassessed Lease Rent (in Rs.) current rent given in brackets)	Existing Lease Rent (in Rs.)	Remarks
	Recorded	Culturable	Catcher Wages in Rs.	Cultural Cost	Management and other cost	Production of Fish (qt) (yield in kg per ha. in bracket)							
<b>Bongaon Block</b>													
1. Pirojpur Petrapole Ltd	34.72	20	37,500	15,000	15,000	30 (150)	0.75	7,500	750 (721)	721			
2. Kundipur Ltd.	121	110	3,85,000	1,54,000	1,48,500	385 (350)	7.70	82,500	8,250 (8144)	8144			
3. Beledanga Barrackpur Ltd	59.48	48	1,44,000	57,600	45,600	144 (300)	2.88	40,800	4,080 (4000)	4,000			
4. Chumurdah F.C.S. Ltd.	35	32	1,03,000	41,200	36,000	103 (310)	2.06	25,800	2,580 (2542)	2,542			
5. Chamta Ltd.	18.61	18	81,000	32,400	29,350	81 (450)	1.62	19,250	1,925 (1876)	1,876			
<b>Gaighata Block</b>													
6. Angrail Ltd.	77.50	65	1,82,000	72,800	73,400	182 (280)	3.64	35,800	3,580 (3500)	3,500			
7. Gopalpur Ltd.	163.53	1.30	5,20,000	2,08,000	2,59,000	520 (400)	10.40	53,000	5,300 (5142)	5,142			

8. Dooma F.C.S. Ltd.	158.34	128	3,84,000	1,53,600	1,92,000	384 (300)	7.68	38,400	3840 (3571)	3571
9. Jaleswar F.C.S. Union F.C.S. Ltd.	47.86	38	1,60,000	64,000	78,000	160 (420)	3.20	18,000	1800 (1267)	1267
<b>Bagdah Block</b>										
10. Kurulia F.C.S. Ltd.	18.63	16	56,000	22,400	19,600	56 (350)	1.12	14,000	1400 (1325)	1325
Barbari F.C.S. Ltd.	26.95	24	72,000	28,800	28,200	72 (300)	1.44	15,000	1500 (1400)	1400
11. Purdah Baor										
Barbari F.C.S. Ltd.:	54.86	35	87,000	34,800	45,200	87 (250)	1.74	7,000	700 (601)	601
12. Kodla River										
13. Kujarbari Adibasi F.C.S. Ltd.	18.44	14	49,000	19,600	23,400	49 (350)	0.98	6,000	600 (510)	510
14. Hamkura Jagadishpur F.C.S. Ltd.	14.58	14	35,000	14,000	10,500	35 (250)	0.70	10,500	1050 (990)	990
15. Meherani F.C.S. Ltd.	7.45	7	25,000	10,000	9,000	25 (350)	0.50	6,000	600 (530)	530
16. Mustafapur, Malidah, Noapara F.C.S. Ltd.	15.57	15	38,000	15,200	8,000	38 (250)	0.76	14,800	1480 (1476)	1476
17. Chatpatila F.C.S. Ltd.	11.20	10	41,700	20,000	11,700	47 (475)	1.034	30,000	3000 (3000)	3000
18. Chalkathalia F.C.S. Ltd.	12.16	11	28,000	11,200	6,800	28 (250)	0.56	10,000	1000 (920)	920
19. Padma-Beel F.C.S. Ltd.	5.31	5	23,000	9,200	9,000	23 (450)	0.46	4,800	480 (400)	400
20. Hariharpur Chandpara F.C.S. Ltd.	2.82	2.5	12,000	4,800	4,200	12 (480)	0.24	3,000	300 (250)	250

Note: Reassessed Rent = 10% of viable profit.

**PURCHASED**

**APPROVAL**

**GRATIS/EXCHANGE**

**PRICE**

**ACC NO.**

**VIKRAM SARABHAI LIBRARY**

**I. I. M., AHMEDABAD.**