

COMMON POOL RESOURCES AND CONTEXTUAL FACTORS

EVOLUTION OF A FISHERMEN'S CO-OPERATIVE IN CALCUTTA

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Acknowledgements

The field survey was part of an Indira Gandhi Institute of Development Research, Mumbai project funded by the Ministry of Environment & Forests under the World Bank Environment Management Capacity Building Project. Nathalie Steins, Policy Advisor to the Dutch Fisheries Board, deserves thanks for providing an alternative perspective on the commons. We are also grateful to two anonymous reviewers for their comments and suggestions.

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Abstract

The CPR school has successfully rebutted Hardin's pessimistic Tragedy of the Commons model. However, in recent years, critics have focussed on the inward orientation and lack of contextual analysis characterising the writings of the CPR school.

Oakerson (1986) and Ostrom (1990) have detailed the list of variables that have to be studied to understand the mechanics of collective action. But these factors are internal to the community. Recent critics' point out that the actions of individual agents are also influenced by the alternatives embedded outside the system. These variables are collectively labelled contextual factors.

In our paper we have analysed the case of a fishermen's co-operative in the Calcutta Metropolitan District to show how the historic and economic context shapes targets of resource users and affects the feasibility of alternative courses to achieve the target by determining opportunity and transaction costs of actions. This indicates the importance of contextual factors in explaining the formation and evolution of the resource regime.

Key Words: *Collective Action, Common Pool Resources, Co-operative, Fisheries, India, Asia.*

Word Count: *11,199 words*

1. Introduction

Common pool resources (CPR) are resources jointly used by a group of persons, referred to as resource community. Although appropriation of the benefits of CPRs is rival, it is difficult and costly to apply the exclusion principle - like in the case of public goods - to potential users of such resources. Early writers on common pool resources (notably, Hardin, 1968) believed that joint use and the difficulties in excluding resource users would dissipate responsibility for maintaining the resource. This would lead to the inevitable over-exploitation and degradation of the resource (the 'Tragedy of the Commons'). Now, as pointed out by Ciriacy-Wantrup and Bishop (1975), this approach failed to make the conceptual distinction between the resource and the property rights governing its use. As a result, Hardin wrongly equated common pool resources with open access resources – resources owned by no one, and which any one could use. They argued that common pool resources were not necessarily open access, but could be managed jointly by the resource community. Such resources were called common property resources.

The acceptance of common property as a distinct form of property rights led to the rejection of Hardin's pessimistic proposition concerning the inevitable ruin of the commons. Starting from the 1970s, scholars from different disciplines have examined the different rules governing resource use, the features of successful institutions, and the conditions conducive to the emergence of collective action. Their work has been collectively referred to as 'CPR Theory' (Steins, Edwards and Rölling, 2000). However, recently, this approach has come under closer scrutiny. In particular it has been argued that the focus of the CPR school has been restricted to characteristics of the resource and factors operating within the community (McKean, 1997). It is necessary to extend the traditional method of analysis by incorporating

contextual factors in the form of historical, political, socio-cultural, economic and ecological processes into the framework of the CPR school.

In our present paper, we shall examine the importance of contextual analysis in explaining the origin and evolution of resource regimes. We first review the recent criticism of CPR theory highlighting the lack of contextual analysis. In the subsequent sections we turn to a study of a fishermen's co-operative in the city of Calcutta, India. 'Traditional' studies of fisheries (Acheson, 1998; Pinkerton, 1989, 1994; Pinkerton & Weinstein, 1995; Townsend & Pooley, 1995) have focussed on identifying the appropriate resource regime and explaining its success in terms of cost benefit analysis (CBA). This approach borrows from the rational choice models of decision making. Our approach, on the other hand, attempts to examine the context of rational choice. This allows us to appreciate more fully evolutionary changes in the resource regime.

2: Contextual Analysis and CPR Theory

The CPR school uses a common framework suggested by Ostrom (1986, 1990). This framework argues that researchers should focus on four sets of attributes or variables that can be used to describe typical CPRs. These variables are: physical attributes of the resource and the appropriation technology, decision making arrangements that govern relationships among users, mutual choice of strategies and consequent patterns of interaction among decision-makers, and consequences of the resource regime. Based on this framework, writers of the CPR school have tried to identify the features of successful resource regimes, referred to as 'design principles' (Ostrom, 1990). Wade (1987), Ostrom (1990), Pinkerton and Weinstein (1995), Hanna et al (1995), and Balland and Platteau (1996) have suggested alternative sets of design principles, with many common elements. These principles

have been adopted upon by policy makers, NGOs and multi-lateral aid agencies as tools for crafting institutions for co-managing resources. In recent years, however, there has been a re-examination of the objectives and foundations of the CPR school; this has led to a questioning of their approach. In particular, it has been argued that CPR researchers tend to ignore the contextual background of the resource regime in their analysis (Klooster, 2000; McCay & Jentoft, 1998; Singleton & Taylor, 1992; Steins, Edwards & Rolling, 2000)).

2.a: Absence of Contextual Analysis

Contextual factors are defined as “*dynamic forces constituted in the user groups’ social, cultural, economic, political, technological and institutional environment*” (Edwards & Steins, 1999a: 207). Such factors can influence each of the internal variables of Oakerson’s framework as well as interaction processes between them.¹ These forces can be divided into two categories: local and remote. Local contextual factors are endogenous variables having an immediate impact on the choice set of the resource community. They may affect terms of access to the resource itself, or some suitable alternative, or the demand for the resource by consumers. Examples of such contextual factors include characteristics of the local ecological system, cultural characteristics of the community, extent of development of transport facilities linking the community to nearby markets, etc. Remote factors, on the other hand, are exogenous variables beyond the control of the resource users. They affect the CPR system by influencing the ability of the resource system to produce benefits and by influencing demand for the benefits from the resource. Instances of remote contextual factors include changes in world market prices, government policy relating to resource use, developments in labour market outside the community, etc. It should be noted that this categorisation is made for the purpose of analytical convenience only. In reality we have what Edwards & Steins (1999b) calls a

‘contextual factors continuum’. This refers to the series of relationships linking remote with local contextual factors, and the entire set of contextual factors with the individual choice set. The conceptualisation of a continuum implies that remote and local contextual factors may mutually reinforce changes in the resource system; further, the interplay of contextual factors and variables internal to the resource community affect cost-benefit calculations of the resource users in complex ways. Resource appropriators have to learn to cope with such complexities. Simultaneously, researchers have to appreciate how such changes affect the rates of exploitation and the nature of the property regimes.

However, CPR theorists have treated communities as islands, isolated from the influences of the external world. They have ignored the role of contextual factors like ecological settings, changes in the economic system and linkages to the external world (like commercialisation and globalisation), and dynamic remote factors outside the control of the community (like demographic expansion and urbanisation) in moulding collective action at various institutional levels. Instead cases of ‘success’ are described and attributed to the internal characteristics of the management regime.

An example of the lack of contextual analysis can be seen in Ostrom (1990). Ostrom argues that institutional provisioning is feasible only if the benefits of institutional provisioning exceed the costs. However, when she considers the factors influencing costs and benefits, she focuses exclusively on variables related to the resource and neglects contextual factors.

Insert Table 1 here

This is a serious shortcoming, as the resource community will base their actions not only upon alternatives embedded within the CPR system, but also upon alternative

options present in the external world. Similarly, dynamics of the external world can consciously or unconsciously initiate changes in the rate of exploitation and in the property regimes. For instance, the process of commercialisation and integration of local communities with State or national economies can affect the value of CPRs. This can lead to changes in their rate of exploitation. Exogenous influences if at all introduced into their analysis were treated as sources of uncertainty responsible for degradation of the CPRs. For instance, Goodland, Ledec and Webb (1989; 151) argues that "*changes causing breakdown of traditional common-property systems (are caused by) ... increased participation in market economies...breakdown of traditional value systems...population growth... technological change...(and) increasing centralization of power*". Similarly, Angelson (2001) points out that creation of infrastructure reduces the net costs of agricultural expansion and fuels local deforestation. Such studies ignore the numerous cases where indigenous and other groups have responded to market pressures and demographic expansion to create a sustainable outcome (Richards, 1997).

The lack of contextual analysis by the CPR writers can be traced to their central concern and their conceptual foundations. The objective of the CPR school has been to refute Hardin's pessimism and establish common property as a viable alternative to privatisation or State ownership. This has led them to concentrate on cases of success and identify common characteristics of such regimes. Focussing on design principles and on local factors has led them to ignore that "*what is local is often created in conjunction with external and non-local factors*" (Agrawal, 2002: 58). Even though empirical literature is mainly based on the case study method, there has been few attempts to specify the contextual and historical factors relevant to the study (Agrawal, 2002). Instead of examining the process of *evolution* of CPR

institutions through the interaction of local variables with the contextual backdrop, the CPR school has persisted in snapshot views of resource regimes.

The reason why the CPR school has failed to emerge from this stasis is that it lacks the necessary conceptual foundations to incorporate contextual analysis into their study. The traditional school is characterised by methodological individualism and use of the rational choice model (McCay & Jentoft, 1998; McCay, 2002). Methodological individualism implies that, taking the individual as the decision-making unit, analysts attempt to examine the base for co-operation. The reliance on the rational choice model implies that this base is sought in the incentive structures determining the outcomes of cost benefit analysis (CBA) that, in turn, affect individual decisions to free ride or undertake collective action.

Now, resource decisions are generally undertaken against the backdrop of uncertainty and absence of information. Coase (1937) has argued that the complexities and uncertainties embedded in the operating environment may create transaction costs that limit the ability of the individual to choose the optimal course of action. In such situations rationality becomes bounded – that is, individuals are rational, but only in a limited sense (Simon, 1955). Instead of being guided by *actual* costs-benefits, behaviour is influenced by *perceived* costs-benefits. This may lead to short run opportunism – even at a long run cost (Williamson, 1985, 1994). Consequently, it becomes necessary to understand how perceptions are formed and identify the variables and processes shaping these perceptions.

2.b: Introducing Contextual Analysis

This calls for a shift in the conceptual foundations of the CPR school from the rational choice model to a ‘situated’ rational choice model (McCay, 2002). This model

argues that the situation or context in which the choice has to be made determines the rationality of a choice. For instance, social psychologists (O' Riordan, 1976; Fishbein & Ajwen, 1977; Hill, 1981) have shown that response of resource users to an environmental resource problem will be conditioned by the interaction between information flows, experience, awareness, concern for others, norms, etc. Simultaneously socio-political forces both mould cognition and define the set of behavioural responses. O'Riordan (1976) suggests that a plausible behavioural model should conceptualise some sort of a transactional arrangement in which the individual negotiates with the environment in a symbiotic manner, each influencing the other. Responding to a resource problem then becomes somewhat like a game in which the individual is constantly testing both the environmental response and the reaction of the socio-political system to which he belongs to realise the limits of his abilities and the social and institutional constraints on his reactions.

McCay (2002) puts forward a three stage situated choice model, that is similar to the Darley-Latane scheme for helping behaviour (Darley-Latane, 1977), to appreciate the influence of context on rational choice. The stages of this model are as follows:

- a) Cognition of the problem
 - i) Awareness of the problem
 - ii) Acknowledgement of the problem as permanent and serious²
- b) Determination of the cause of the problem
- c) Choice of an appropriate action
 - i) Conceptualisation of alternative solutions
 - ii) Undertaking cost-benefit analysis of alternative solutions to determine the rationality of action
 - iii) Undertaking action

As can be seen from Figure 1, contextual variables can affect each of the components or stages of this process.

Insert Figure 1 here

For instance, in Mexico forest users incorporated notions of legitimacy, justice, group identity, livelihood rights in justifying the pattern of forest use (Klooster, 2000). This implies that social forces and culture may affect understandings of the human-ecological interaction (Klooster, 2000; McCay, 2002). There may be political or socio-cultural constraints in the ability to communicate with policy makers or other groups of appropriators (particularly when each group is affected differently). Even if a problem is acknowledged, cultural bias may affect perceptions of cause and effect (Douglas & Wildavsky, 1982). For instance, Ponam Islanders of Papua New Guinea tend to attribute declines in marine resources to divine causes rather than over-exploitation (Carrier, 1987).

Contextual variables may play a role even in the course of choosing the appropriate action and undertaking it. Attitudes like egalitarianism, individualism, fatalism may create a generic bias towards particular reactions (Alcock & Mansell, 1997; Benedict, 1959; Douglas & Wildavsky, 1982);³ such biases may also be created by economic conditions, notably poverty (Brenda-Beckman, 2000). The economic context determines the alternatives available to the resource appropriators *outside* the realm of the resource and hence the costs-benefits of collective action. For instance, in Connemara Island, supply of labour in maintaining a collective shellfish farm was affected by the possibility of earnings from tourism (Steins, 1999). History, too, may play a major role in the selection of a particular outcome and determining the transaction costs associated with it (Cleaver, 2000; Greif, 1994b; Mosse, 1997; Pillutla & Chen, 1999).⁴

The institutional context is also important. Agrawal & Gibson (1999) argue that players behave strategically. Thus, incentives to each player and the distribution of power between players and groups become important determinants of behaviour as they try to bypass institutional constraints and renegotiate new ones. At the same time, institutions remain the primary mechanism to “mediate, soften, attenuate, structure, mould, accentuate, and facilitate particular outcomes and actions” (Agrawal & Gibson: 637). Socio-political processes and institutions may facilitate collective action by reducing the transaction costs of collecting and processing information, co-ordinating actions and expectations, determining availability of information and defining the limits of coercion (Grief, 1989, 1992 and 1993; Ostrom, 1990).⁵ The political structure also determines the incentive of decision-makers to encourage collective action (Grief, 1994a) and complement informal co-ordinating mechanisms (Milgrom et al, 1990).

Thus context determines the information set that the individual considers relevant in making decisions, the costs of collecting the information, the reliability of the information and the processing of the information at each of the stages (North, 1990). The above model visualises the resource appropriator as a social entity (Steins et al, 2000) whose relations with his ecological settings are mediated through his history, socio-culture and political settings (Cleaver, 2000; Mosse, 1997). Consequently, the boundaries of analysis of collective action are expanded to include the contextual factors that determine the nature of individual preferences, incentive structures, and perceptions about outcomes of CBA.

However, it is not enough to conclude that the context influences resource-related behaviour; researchers have to identify the key factors that are mainly responsible for a particular outcome. This is not an easy task in view of the multiplicity and

'invisibility' of contextual variables. Alternative methods have been suggested (Edwards & Steins, 1999b):

1. Starting with local contextual factors and working backwards along the contextual continuum to remote factors;
2. Focus on mutual interdependence between contextual variables using matrices; and,
3. Conceptualise contextual factors in terms of concentric circles surrounding a resource situation.

The third method has the advantage that it can simultaneously capture the mutual interdependence between different contextual factors and makes some distinction between local and remote contextual factors. However, 'back solving' remains the most convenient method of identifying relevant contextual variables and examining their impact.

3: History of the Co-operative

The resource studied by us was a water body (or rather a group of three water bodies) in the locality of Bon Hoogly within the Calcutta Metropolitan District. A Co-operative formed in 1974 manages these water bodies. At present there are 72 members of this co-operative, of whom 48 are active.

We started our survey by undertaking focus group interviews of senior members and officials of the co-operative to learn about the history of the co-operative and its functioning. This was followed by interviews of 37 randomly chosen members to identify their socio-economic characteristics and learn about their association with the co-operative. We also held two group discussions with 6 members in each group. These members were also randomly chosen (without replacement). Finally we analysed the audited financial records of the co-operative.

3.a: Origin of the Co-operative

The co-operative was founded by migrants from East Pakistan (currently Bangladesh). The traditional occupation of the migrant households varied – but a dominant section (16 households) were fishermen by caste. The fishermen had settled near Dumdum and Bongaon, though a few of them also settled in Noahpara-Bon Hooghly areas. They used to catch fish individually, or in small groups. Around about 1972, Jamuna Bhowmick, wife of one of these fishermen, Gobinda Bhowmick, heard a radio program extolling the benefits from a fishermen's co-operative established at Mudiali, Calcutta. Deeply impressed, she informed her husband and Biren Sarkar, tutor of their children, about the program. Gobinda Bhaumik and Biren Sarkar talked the issue over with other refugees and decided to form a co-operative based on three water bodies. One of them was the lake at Noahpara, where these refugees traditionally caught fish; the other two were adjacent lakes at Bon Hooghly, near the Indian Statistical Institute. All these lakes had been degraded because of eutrophication and did not generate any significant benefit to the neighbourhood. The Co-operative was finally set up in 1974 under the name of Bon Hooghly Fishermen Co-operative Society.

Initially the catch was low as the founding members lacked skill. Therefore, the members contacted some traditional fishermen who had settled in the suburbs in Calcutta and invited them to join the co-operative. The total number of members increased to 78, of whom 6 members have since died. Heirs inherit membership; membership can also be transferred to persons nominated by the member. No new individual from outside the community can otherwise be inducted into the co-operative. Some of the original members have grown old and are no longer active. A

few have left Calcutta. Their membership has not been terminated out of sentimental reasons.

3.b: Functioning of the Co-operative

Initially, the activity of the co-operative was confined to fishing. Later on, in the early 1990s, boating was introduced to supplement revenue. Gross revenue from fish sales have increased steadily, especially from the late 1980s. Though there was a decline in 1997-8 and 1998-9, revenue again picked up in 1999-2000. Boating has also been providing steadily increasing returns. The Co-operative has operated at a profit; in the last decade, especially, net profit has been quite high.

The primary activity of the co-operative is, as said before, fishing. The fish is cultured in sewage water. A nearby battery-manufacturing factory also releases effluents into the water. Normally this should be passed through buffer tanks where the heavy elements settle as sediments. Financial constraints have prevented the use of this technology. In its place, the Co-operative uses an indigenous technology. The water is released into an area fenced off from the main water body. Water hyacinth is cultivated in this area. This specie absorbs oil, grease and heavy metals from the sewage water. Large quantities of lime are added to the main water. In addition, the fishmeal contains di-calcium phosphate – which also helps in purifying the water. This has reduced the level of Biochemical Oxygen Demand (BOD) from 100-150 mg/l to 10 mg/l.⁶

There are 3 Office Staffs (an Accountant, a Farm Manager and a Sales Manager) and a peon whose duties are fixed. The duties of the remaining members are allocated at periodic meetings held at either fortnightly or monthly intervals. These members are either placed in one of the 2 teams of fishermen (each team is

composed of 12 members each), or are given the responsibility for maintaining the boats and pond, and repairing the nets. They may also be given the task of acting as Night Guards. In addition, a West Bengal Civil Service (WBCS) Officer supervises the functioning of the co-operative.

Initially workers were paid a commission on daily revenues. In the 1990s, a system of differentiated wages was introduced. Members are paid a salary on the basis of days worked depending upon their allotted duty. Only the Office Staff (Managers, Accountant and Peons) is paid on a monthly basis. In addition, co-operative members also get a bonus out of profits accrued during the year. Members are provided post-retirement security. On one hand, they receive a one-time gratuity of Rs.10000, or a monthly pension.⁷ Simultaneously, the co-operative has opened monthly recurring deposit accounts in the names of each member. Each member has to contribute Rs.20 (deducted from his salary), while the co-operative contributes Rs.50. This is equivalent to a Contributory Provident Fund Scheme. This implies that economic incentives to supply labour to the co-operative have been high.

However, this income is not enough to cover the needs of the members. As a result the members have to seek employment in the local informal sector – they work in small-scale production units, as porters, engage in petty trade, and seek work in similar low paid and insecure occupations. We had attempted to estimate the relative importance of these two sources to total household income of the members. However, respondents were reluctant to reveal any details concerning their occupation outside the co-operative or income from such jobs. Our researches in similar co-operatives reveal that this share is about 50% or even more.

Members also get some benefits like educational aid for their children, medical allowance, advances, discount on fish purchase (normally, at the rate of 10%; but this is increased to 25% in the case of a ceremonial need⁸). Interest free advances up to Rs.20000 are made to a member in case of ceremonies or emergencies. This has to be repaid in 10 equal monthly instalments, which are deducted from his salary. Members also derive utility from various activities organised by the Co-operative. For instance, recreation facilities are provided by the Co-operative, members organise Puja, annual picnics, cultural programmes, etc. This provides members with recreational values. The sum of all the benefits (direct and indirect) is therefore quite significant.

3.c: Sustainability

Sustainability can be checked in two ways. One index of sustainability is the Closing Stock.⁹ A declining closing stock of fish would normally mean that the resource is being over exploited. However, these figures are of dubious value and are manipulated by the Co-operative officials.

As a result fishermen rely on direct observation of the condition of the fish caught. Fishes may exhibit signs of injuries, their eyes are opaque, etc. In that case, the fishermen shift to the other lake. Just before our survey (March 2000) the co-operative members used to catch fish in two shifts. Heeding signs of over exploitation, they stopped fishing completely for a fortnight allowing the fish time to recoup.

3.d: Conflict Resolution

Coming to conflict resolution, we note that there are two dimensions – internal (between the co-operative members) and external conflict (between co-operative

members and the neighbours). We summarise the main issues of conflict and the method of resolving them below:

1) **Internal conflict:** Conflict can occur between co-operative members in two ways.

a) *Allocation of work:* Since the wages paid and responsibilities of each category of work are different, there is conflict between members over allocation of work. By and large, respondents were reluctant to reveal signs of conflict; however, 14 of the respondents admitted that there was conflict over the allocation of work. Specifically, as the pay of fishermen was highest, co-operative members generally wanted to be allotted to fishing. Rotational allocation of work does reduce the extent of conflict. In addition, arbitration by the Executive Council helps to arrive at a decision. Nevertheless, some amount of bitterness remains. Economic pressures and the absence of any alternative source of employment and income, however, prevent dissidence from breaking up the co-operative.¹⁰

b) *Shirking:* Conflict can also emerge if co-operative members tend to avoid carrying out their allotted responsibilities (shirking). According to 83.78% of the members, shirking is negligible or absent. This is because of supervision of activities and group monitoring.¹¹ At the same time, the pressure of part time jobs does affect the ability of the members in supplying effort. Members, and even the supervisors, admitted this. It is generally felt that this sort of shirking could not be avoided. Hence, the load of secondary jobs is taken into account while allotting duties. We can argue that this corresponds to a threshold level of defection. As long as members do not shirk their duties up to this limit, allowance is made for them. If shirking crosses the critical level,

then the mutual tolerance breaks down and measures are taken against the erring member(s).

2) **External Conflict:** Conflict can occur between the co-operative members and neighbouring residents and factories in three ways.

- a) *Poaching:* Local residents may secretly catch fish from the lakes. Realising this possibility, the co-operative arranges for night guards and day guards to patrol the lakes. In spite of this, there is some amount of poaching during the monsoon when the water overflows from the lake.
- b) *Use of the lake:* The local residents used the lake for bathing and washing (of clothes and utensils) purposes. This will affect the quality of the water and reduce growth of fish. On the other hand, excluding them from using the lake would generate conflict. The cost of this will be immense, given the legal structure and practical realities – this is a case of a Pareto irrelevant externality (Buchanan & Stubblebine, 1962). Therefore, the co-operative members accept this damage and pays for it in the form of adopting an abatement technology.
- c) *Effluent:* Effluents from the neighbouring factories enter into the lake. In particular, the effluent of a battery factory at the Noahpara has made grass carp cultivation impossible at the lake. However, the Co-operative has not attempted to enter into any Coasean bargaining with the factory owner, as the water will soon be redirected elsewhere.

On the other hand, the activities of the co-operative generate positive externalities for the neighbourhood. Firstly, of course, fishing purifies the sewage water. Secondly, neighbours can purchase fish at a low price. Third, the co-operative offers recreational benefits (in the form of paddleboats). Fourth, the co-operative organises

socially beneficial activities like blood donation camps, and also repairs the banks of the lake and roads.

4. Cost-Benefit Analysis, Contextual Factors and Collective Action

The traditional CPR framework argues in favour of analysing the success of collective action in terms of costs and benefits to free riding. However, as we had argued in Section 2, in situations characterised by uncertainty and imperfect information, there are limits to the ability of the individuals to collect and process the relevant information. In such cases, collecting and processing the information required for efficient decision making is influenced by the context in which the agent acts. In this section we shall examine the interaction between the cost-benefit analysis undertaken by the co-operative members and their contextual background. This will help us to analyse the dynamics of the co-operative – its origin and evolution over time.

4.a: Origin of Collective Action

Initially, the water bodies were State owned resources. But the absence of interest of the Government implied that the water bodies became *de facto* open access resources. The water bodies were utilised by different groups and in different ways.¹² Such appropriation was rival. Release of effluents by producers affected the consumers and the fishermen; on the other hand, bathing, washing, etc also affected fish stock. Similarly, eutrophication (in the absence of maintenance) reduced water quality. However, such externalities were apparent only in the long run. Thus, short run reinforcements (in the form of immediate benefits to resource use) were guiding them into a state with adverse long run repercussions. To emerge from the trap it was necessary to establish property rights. The possibility of such a transition

depended upon the feasibility of applying the exclusion principle and on the nature of the boundaries of the resource.

The boundaries of the resource were both fixed and static. This meant that it was possible to identify the group of agents appropriating the benefits from the resource. However, it is also necessary to consider the feasibility of excluding particular members of the community who do not either conform to the rules or contribute to the conservation efforts. The large size and heterogeneity of the resource community meant that transaction costs of any regime (in the form of establishing property rights, monitoring and sanctioning) would be high. This effectively ruled out the imposition of property rights.¹³

Nor was there any corresponding sense of responsibility towards maintaining the water quality for future users. This can be interpreted as an example of disinterest in the common pool resource generating private benefits referred to earlier (see ft. nt. 3). As a result of this disinterest, there was no pinning down of responsibility of degradation of the water bodies on any group(s). Simultaneously, the absence of a suitable collective choice arena¹⁴ implied that there was no platform through which the resource users could communicate with each other.

This led to a Nash equilibrium where all players were interlocked in a pattern of mutual defection. Such equilibrium might have been equitable in an intra-generational sense, but it was neither efficient nor equitable across generations. The establishment of the co-operative in the 1970s resolved the inefficiencies in the system by creating a new equilibrium. This was characterised by choice of a different set of strategies by the players leading to a higher level of co-operation.

If we consider the history of the water bodies it is clear that the physical attributes of the resource and decision-making arrangements emphasised by Oakerson had remained unchanged; what had changed was the mutual choice of strategies and consequent patterns of interaction among decision-makers. On an obvious level, this change can be attributed to cost-benefit ratios. Specifically, it was the presence of a group of resource users with a common experience leading to the formation of mutually consistent expectations (see Table 1, bottom cell) that created a situation where benefits of creating the regime outweighed costs. However, it is necessary to understand why this factor did not operate before the 1970s, and why it operated after the 1970s.

The initial reluctance to undertake collective action can be explained in terms of bounded rationality referred to earlier. The fishermen were not aware of the potential benefits of collective action. They tried to choose rationally, but their cost-benefit exercise was undertaken in the absence of perfect information and did not evaluate all possibilities. It was only when Jamuna Bhowmick heard about the co-operative, that the fishermen became aware of the potential benefits from collective action. Seen in this light, the evolution of the co-operation can be interpreted as an instance of learning in the absence of perfect knowledge. However, these benefits were only possibilities;¹⁵ their realisation depended upon whether benefits to collective action exceeded costs. Now, as pointed out earlier, it is not actual costs or benefits that matter, but the perceived values of such parameters. While actual costs-benefits to forming a co-operative were the same to all neighbouring fishermen, the *perceived* benefits were greater than *perceived* costs to only a subset, who eventually formed the co-operative. The reasons for this phenomenon depended upon the history and culture of the members and the larger economic backdrop in which their choices were embedded.

We had pointed out that most of the members of the co-operative originally hailed from East Pakistan (currently Bangladesh).¹⁶ About half of the households (14 households) had migrated to India before 1960 and the rest after 1960. Of these, 9 households had migrated between 1960 and 1969, while 9 households migrated after 1970.¹⁷ Only two households had migrated before 1947.¹⁸ The main reason for migration was political and communal disturbances (21 households). Search for employment was another motivating factor (7 households). Arriving in India, the refugees had initially settled in North and North-East Calcutta, and in the suburbs. Over time, they came to Bon Hooghly to seek employment, in search of land for housing, keep near relatives, and other such reasons. About 10 households settled in Bon Hooghly between 1960 and 1970, while 15 households settled after 1970.

The trauma of partition leading to displacement created a 'culture of the disposed' among the migrants. This culture was characterised by rootlessness, feeling of alienation from the mainstream culture,¹⁹ greater community sense,²⁰ and a combative spirit. This shaped the perceptions and attitudes of the migrants and gave them a socio-cultural identity different from that of local residents. The migrants were able to communicate with each other easily, were willing to suffer great hardship, plan over a longer time period and discount sacrifices for group welfare to a greater extent than the local population. As a result, mutually consistent expectations – what can be called a collective consciousness - was created within the members, and gave them their collective identity. This created a sense of community amongst the members and served to reduce the transaction costs of collective action.²¹

Louderdale et al (1984) have shown in a game theoretic framework that the perception of a common threat may increase group solidarity. The creation of a

group identity encourages co-operation because members of a social group tend to regard other members favourably and believe them to be trustworthy, honest and co-operative. Other members of the same group are expected, therefore, to reciprocate co-operative behaviour. In addition, inclusion within a social group reduces social distances between members so that they make less distinction between their own and other's welfare.

Now leasing a water body and establishing a co-operative is not an easy procedure. It is difficult for a not so literate class to overcome the red tape involved in this process. However, the support of the bureaucracy and the Rehabilitation Department of the State Government – who realised that a successful co-operative would reduce the vulnerability of the group and their need for support – was also important in reducing the transaction costs of this process.

In addition to this historical and socio-cultural context, the economic opportunities outside the domain of the resource were another important variable affecting perceptions about costs and benefits. The labour market was extremely 'tight' – in the sense that unemployment was high, and employment and income insecure. The uncertainty and risk of loss of livelihood created a complex situation where transaction costs in the form of search costs and insecurity of job reduces the efficacy of the labour market as an allocative mechanism. Individuals can no longer be guided by market principles (in the form of seeking sectors with highest returns) in allocating labour. Preferences of agents are moulded by the economic context in such a manner that, instead of choosing 'optimally' on the basis of actual costs-benefits to maximise income, agents 'satisfice' by attaching greater weightage to security of income. In this economic context, the water bodies became more than a common pool resource – it became an asset whose well-being was essential for the

survival of the group. This aroused interest in management of the water bodies and in the dynamics of the ecosystem leading to an appreciation of the causes and effects in the system. Thus, the economic context in which the choice of the members was embedded in (difficulties in earning their livelihood) created the base for collective action by creating a common problem and mutually recurrent expectations. Simultaneously, it was the co-operative that provided the means to solve the common problem collectively.

Empirical literature on collective action provides several instances of such happenings. Acheson (1988) reports one such case in the lobster fisheries of Maine. In Criehaven, after the Second World War, some local war veterans jointly decided to revive interest in lobster fishing. Their common lineage and background - all of them were facing the problem of rebuilding their life after having gone through the same experience - provided the basis on which the trust necessary for an informal property regime could be developed. Similarly, in the case of the Villa Santa co-operative reported earlier (Stanley, 1991), the shared historical experience in undertaking collective action played an important role in imparting collective identity amongst the members.

The formation of the co-operative is thus explained if we supplement the cost-benefit analysis of the feasibility of institutional change with an examination of contextual factors in the form of the historical and economic background of the resource users. Now, over time, there may be changes in the internal characteristics of the resource regime – changes in appropriation methods, for instance. These changes can affect the actual costs and benefits of collective action in either way. However, once again, it is more relevant to examine how the interplay of context and internal variables

determine the *perceived* cost-benefits. This may provide quite different results and shape the course of collective action in unexpected directions.

4.b: Analysing Dynamic Changes

Initially, the sole source of revenue of the co-operative was fishing. In the early 1990s, however, the WBCS Officer supervising the Co-operative, Mukut Roy Chowdhury, suggested the members introduce boating facilities in the water body. The members were averse to this change, as they were uncertain of the effects of diversifying their activities on profit. However, Roy Chowdhury convinced them that paddling would have a favourable effect on growth of the fish stock, and would also supplement their income. Boating facilities were finally introduced in 1993-4 and proved to be a financial success. All members with whom we discussed this issue strongly supported boating.

Now the introduction of boating facilities can be interpreted as a change in the technology to appropriate benefits from the common pool resource. If we consider the effect of this change in isolation we would expect the co-operative to be able to strengthen its financial position. This occurs as follows:

1. Paddling augments revenue of the co-operative without any corresponding increase in operating costs.
2. Paddling represents diversification of income. This increases expected revenue.
3. Paddling promotes fish growth through better oxygen circulation and fast movement of the fish. This increases net revenue from fish sales.

The effect of these factors is to increase the benefits from the co-operative, thereby strengthening the base for collective action.

The above analysis is in line with the traditional CPR school's focus on the effect of 'internal' variables on cost-benefit analysis of institutional provisioning. If, however, we re-work the cost benefit analysis against the backdrop of the economic context in which collective action takes place, the interplay of internal variables with contextual factors may affect the alternatives to collective action and pattern of dependencies between co-operative members. This may produce unanticipated results.

The relevant context variable here is the labour market where co-operative members supply labour to supplement their wages from the co-operative. As discussed in the previous sub-section, the condition in this market is very tight. The lack of sufficient employment opportunities – especially to relatively uneducated and unskilled individuals - has meant that the co-operative members are forced to depend on the co-operative as a buffer providing a steady income flow. Uncertainty in the labour market and the risk of loss of livelihood has led to retention of the economic pressure curbing potential free riding.

However, this results in considerable strain on the workers. During group discussions, and even breaking into our structured interviews of individual members, respondents repeatedly emphasised the hardness of their lot and the difficulties in combining two jobs. Now shirking is not possible in the labour market, as the nature of the contract is generally casual. Shirking will create a bad reputation for the worker whose search cost of employment will increase in future periods. Respondents revealed that the strain of working in two organisations simultaneously was relieved by reducing their commitment to the co-operative up to a level mutually acceptable to all members and the management. This implicit defection does not, however, attract sanctioning so long as the threshold level is maintained. This is because the choice is mutual, based on reciprocity.

This raises the question as to why the members do not mutually raise the threshold level of defection. The problem with such a strategy is that increasing collective defection (i.e. a reduction in labour supply to the co-operative by all members simultaneously) will lower the revenue to the co-operative and endanger attainment of the primary target of collective action – ensure a secure income flow. An alternate means of defection is to effect a change in the technology for resource appropriation by switching over to a less labour-intensive technology. This will release labour from the co-operative; this can be diverted partly to the labour market (to increase income) and partly to leisure, without reducing income from co-operative. The introduction of paddle boating in Bon Hooghly enabled this transformation. Paddle boating required only that the guards double as ticket collecting agents. So only an insignificant increase in labour would result in a steady increase in revenue.

This revenue increase allows the threshold level of defection to be raised. That is, the members could mutually reduce supply of labour to fishing activities – the fall in net revenue from fishing would be compensated by revenue from boating, maintaining (or even increasing – as in our case) profits so that payment of wages was not endangered. The labour thus released from the co-operative could be diverted to the labour market to increase household income. Note that time series data on importance of income from secondary occupations is necessary to validate (or reject) our proposition. In the absence of our data, however, our hypothesis remains an educated speculation.

However, there is some striking support for our claim from the financial records of the co-operative. In Table 2 we have shown the profit from pisciculture. This is obtained by subtracting revenue from boating from the net profit.²² Prior to the

introduction of boating facilities, fishing was profitable. What is interesting is that after boating is introduced, profits to fishing becomes a negative figure (except in 1993-4 and 1994-5), even though revenue from fish sales is increasing. Thus, the introduction of boating facilities has converted a previously profitable line of activity to a loss making line. This result is more surprising when we consider the fact that boating generates positive externalities for pisciculture.

Insert Table 2 here

Focus group interviews explained the above situation. With the introduction of boating, profits of the co-operative increased. The members perceived that collective effort was less important to maintain a secure income flow; thus, they could increase the threshold level of defection and reduce labour supply to the co-operative. This reduced revenue from fish sales in 1995-96, but was partly compensated by revenue from boating. To maintain fish catch and hence revenue from pisciculture, the co-operative thereupon increased the use of hired labour from 28 workers to 43 in the next year; this increased the wage bill and costs of fishing.²³ In other words, the co-operative is now paying two sets of fishermen: members, who are shirking, and hired labourers, who actually catch the fish. This explains how the co-operative is able to increase revenue from fish sales and profits - even though members are shirking and high wage bills have resulted in fishing becoming a loss-making activity. Whether this is sustainable in the long run is not easy to say. The experience of another fishing co-operative in the East Calcutta Wetlands shows that it may be difficult to remain a financially viable organisation in such circumstances for long. Delays in wage payments may occur after a time; this may lead to further shirking setting up a vicious cycle.²⁴

4.c: Context, Objectives and Dynamic Changes in Resource Regimes

In the short run, however, this situation is acceptable to the members who are assured of a secure income flow from the co-operative even after supplying less labour. The labour released from the co-operative can be diverted to the labour market to augment their meagre household income. This can be interpreted as a shift in interest away from the original collective action (fishing) generating private benefits (income) to a 'non-collective action' means (paddling) providing the private benefits.

As seen earlier, the objective of collective action may not always be to obtain a collective benefit, but a private benefit that is enjoyed by each agent. Over time, parametric changes may affect the efficacy of collective action to provide the private benefit. This also affects the CBA of collective analysis and the success of collective action. A dynamic view of common pool resources must also take this into account. Once again, context cannot be ignored. It may be contextual factors that have led to the parametric change – as in the shellfish-tourism example (Steins, 1999). Alternately, for parametric changes caused by internal variables, it is necessary to consider the alternative means of securing the private benefit outside the resource system.

This process can be analysed for our case study by using a simple framework. The co-operative members have a specific objective Y , which is *not* resource conservation, but maximising a secure income flow. This objective can be attained with the help of sustainable utilisation of the water bodies with effort (X), or by working in the labour market (Z). The relation between Y and the two instruments to attain Y can be expressed in functional form as follows:

$$Y = f (X, Z) \text{ with } f'_i > 0 \quad i = X, Z \quad [1]$$

Suppose that:

$$Y_t = g(X_t) \quad \text{for } X_t \leq X_T \text{ and } C_t^X \leq C_t^Z \quad [2]$$

$$Y_t = h(Z_t) \quad \text{otherwise;} \quad [3]$$

when C_t^i is the cost of using instrument i in period t .

Given,

$$C_t^X = C^X(X_t); dC^X/dX_t > 0 \quad \text{and} \quad C_t^Z = C^Z(Z_t); dC^Z/dZ_t > 0 \quad [4]$$

Here T is the switch date from X to Z .

In the initial stages of the co-operative ($t \leq T$), the state of the labour market was such that only the co-operative offered a means to earn a secure income. Therefore, they relied on sustainable management of the fish stock with effort X_t as an instrument to attain this objective. Over time, the introduction of boating facilities led to a situation described as $t > T$. In such a situation, boating (associated with some fishing) generates enough revenues to ensure a secure income flow. The marginal returns to labour supplied to the co-operative is much less than marginal returns to labour supplied in the secondary job market. In other words we have $C_t^X \leq C_t^Z$ – so that it becomes rational to rely on the secondary occupation (Z) as the major source of income. The compatibility between the primary objective of the co-operative and sustainable management of the fish stock breaks down with the introduction of boating facilities.

What does this imply for the sustainable management of the water bodies? Boating has increased the amenity value of the water bodies. If the co-operative wants to increase income from this activity, they will have to beautify the surroundings through planting trees and flowers, and offer additional facilities like food stalls. All these will further increase recreational and aesthetic values of the water body. The effect on the fish stock will obviously be adverse. The non-amenity use value of the water

body will decline to some extent. Note that the fish species cultivated are of the ordinary varieties; hence, their reduction does not imply a loss in bio-diversity. But pisciculture does generate revenues to pay for the considerable wages of the members. Loss of interest in this line of activity may well reduce the ability of the co-operative to meet this expenditure – as seen in the case of Captain's Bheri mentioned earlier. In that case, the factor cementing collective action will lose its binding power.

5. Conclusion

To sum up, contextual factors influence perceived consequences from collective action; this determines the success and evolution of collective action. In the community studied, historical conditions in the form of partition moulded a community out of a group of individuals and influenced mutual choice of strategies. Simultaneously, the economic context and the cultural characteristics of the community operated to shape the patterns of dependencies between members and create mutually recurrent expectations; this reduced the transaction and opportunity costs of collective action. In a dynamic context, the impact of changes in technology (or other 'internal' variables) on collective action is not as simple and deterministic as framed in the Oakeson model, but was observed to be mediated through the economic context. This influenced the evolution of the co-operative by determining the optimality of alternative means to attain the target.

These conclusions are significant in the light of the recent challenges faced by CPRs. With the integration of local communities to regional, national and global economies, and an increase in the value of CPR-based products, the CPR systems are being characterised by greater complexity, as the relation between the resource and its users is altering with changes in the economic context. Directing the

successful evolution of CPRs, therefore, becomes more challenging. To appreciate how CPR systems can respond to such challenges we have to modify our method of analysis to allow the incorporation of contextual factors and their interaction with the internal characteristics of the regime into our framework. On the theoretical side, this will help researchers to understand the evolution of CPRs. On the practical side, it will enable us to learn to analyse the impact of State intervention on CPR systems and direct such intervention to make them more meaningful.

Table 1: Factors Affecting Cost-Benefit of Institutional Provisioning

<i>Benefits of Making the Change</i>	<i>Costs of Making the Change</i>	
<ol style="list-style-type: none"> 1. Number of appropriators; 2. Size of the CPR; 3. Temporal and spatial variability of resource units; 4. Current condition of CPR; 5. Market conditions for resource units; 6. Amount and type of conflict; 7. Availability of data about the above; 8. Status quo rules in operation; and, 9. Proposed changes in rules. 	<p style="text-align: center;"><i>Costs of Changing Rules:</i></p> <ol style="list-style-type: none"> 1. Number of decision makers; 2. Heterogeneity of interests; 3. Rules in use for changing rules; 4. Skills and assets of leaders; 5. Proposed rule; 6. Past strategies of appropriators; and, 7. Autonomy to change rules. 	
	<p style="text-align: center;"><i>Monitoring and Enforcement Costs:</i></p> <ol style="list-style-type: none"> 1. Size and structure of the CPR; 2. Exclusion technology; 3. Appropriation technology; 4. Marketing arrangement; 5. Legitimacy of current rules; and, 6. Proposed new rules. 	
	Assessment of Costs and Benefits	
	Norms and Discount Rates:	
	<ol style="list-style-type: none"> 1. Proximity of the resource community to the CPR; 2. Resource users share recurrent experiences leading to the formation of mutually consistent expectations; and, 3. Information about availability of substitutes to the CPR that are available elsewhere. 	

(Based on Ostrom, 1990)

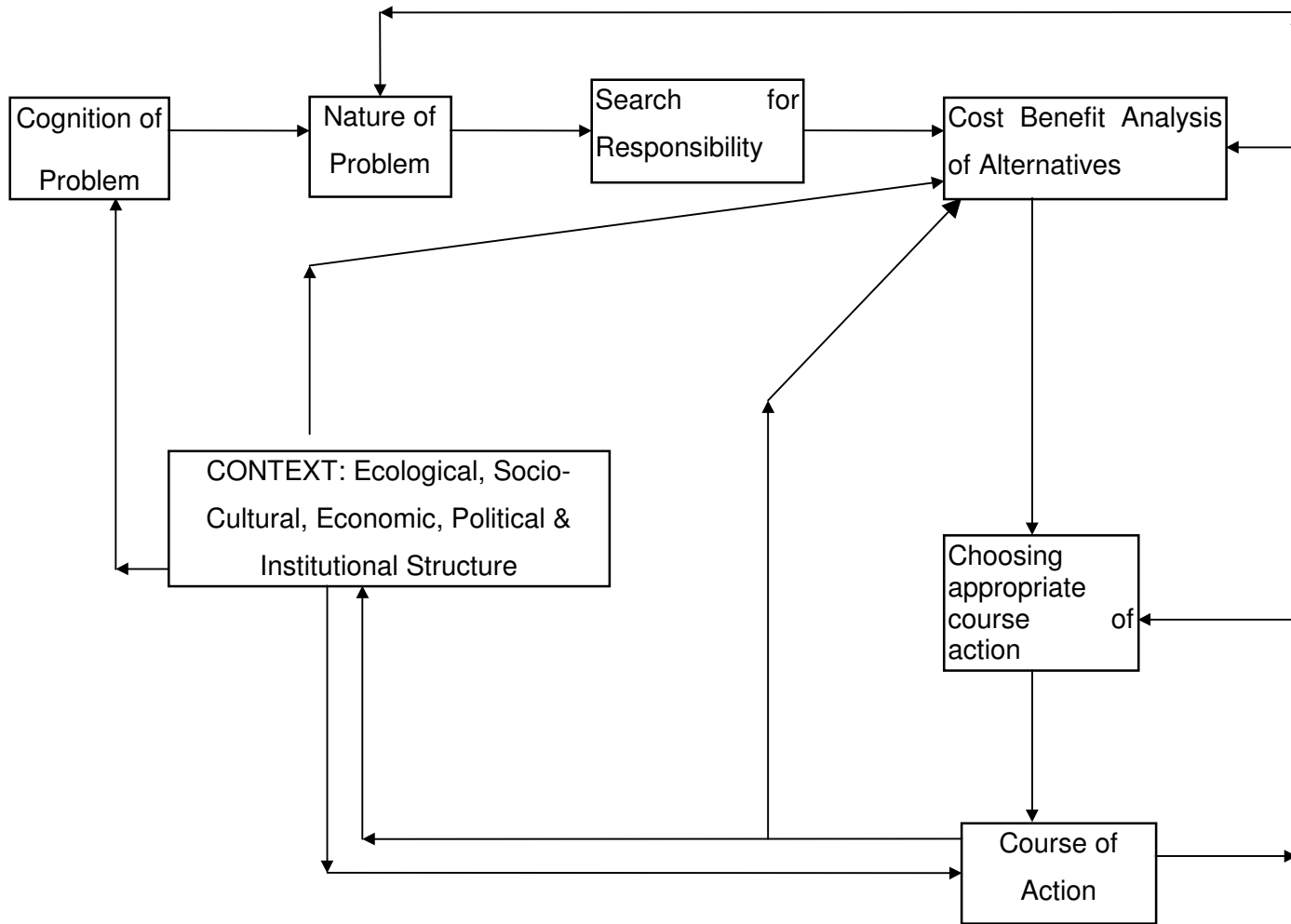


Figure 1: Contextual Variables and Staged Choice Model

Table 2: Impact on Boating on Net Profit and Pisciculture (in Rupees)

Year	Net Profit	Revenue from Fish Sales	Revenue from Boating	Wages to Hired Workers	Profit to Pisciculture
1993-94	58011	1507050	20348	41775	37663
1994-95	64730	2117682	30247	40500	34483
1995-96	25310	1831720	98325	38775	- 73015
1996-97	54841	1989203	89050	752585	- 34209
1997-98	46298	1951512	63720	738878	- 17422
1998-99	4421	1667995	72155	682532	- 67734
1999-00	2196	2288275	82910	898414	- 80714

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- 1 For a more exhaustive discussion see Edwards & Steins (1999b).
 - 2 However, we are not subscribing to 'brink of disaster' models (Basu & Mishra, 1993, for instance).
 - 3 For instance, resource users may not be interested in the public goods associated with their private uses (Gibson & Becker, 2000).
 - 4 Stanley (1991) reports that in the Villa Santa co-operative of resin trappers in Honduras, the shared experience of having migrated together from Southern Honduras and having successfully taken part in a strike to stop expansion of a sawmill created cohesiveness amongst the members and facilitated collective action.
 - 5 For instance, Grief (1993, 1994a) has shown how the deliberate maintenance of a distinct social identity from the Jewish trading community served as a cementing factor in the formation of coalitions by Maghribi traders.
 - 6 The description of purification method and estimates of BOD are based on Rahim (ns).
 - 7 The Indian currency is Rupees – currently one US \$ is equivalent to about Rs. 48-50.
 - 8 This rule gives rise to an interesting practice. Neighbours requiring fish in large amounts satisfy their requirements through co-operative members who pretend to purchase the fish for themselves. This facility is not extended to all neighbours, but only to those with whom they have a link (i.e. such relations form part of a broad social network).
 - 9 Closing stock is the value of the fish stock at the end of the year.
 - 10 35 respondents admitted that they would never be able to leave the co-operative, even if its functioning deteriorated, as they did not have any alternative source of steady income.
 - 11 Activities are organised on the basis of groups, and not individually. Shirking by one member will increase the load of other members. On the other hand, if all members of the group shirk together, their output falls noticeably, and draws the attention of the Executive Council.
 - 12 Washing and bathing by the neighbouring slum dwellers, fishing (directly from the water bodies, or when the waters over ran the banks during the monsoon), releasing of effluents by surrounding factories were the alternative methods of appropriating benefits from the water body.
 - 13 Privatisation was not possible under the existing laws.
 - 14 Arena where the rules governing resource use are framed (Ostrom, 1990).
 - 15 Edney & Harper (1978) has show in an experimental setting that information about the optimal strategy does not lead to co-operation – information about the resource and, especially, communication between members are necessary prerequisites.
 - 16 We found that 29 out of 37 respondents had migrated from East Pakistan.
 - 17 1971 is a cut-off year in the history of Bangladesh as it marks their independence from Pakistan. In this period, there was a significant influx of refugee from Bangladesh to

neighbouring West Bengal in search of political asylum. Some of the refugees joined the Bon Hooghly co-operative.

18 Another important year is 1947 when India became independent. Independence was accompanied by the partition of the country into India and Pakistan (comprising two segments - East Pakistan, or modern Bangladesh, and West Pakistan). Partition also led to a massive migratory movement between the two countries. However, this important historical event does not seem to have directly affected the evolution of the Bon Hooghly co-operative to any significant extent as only 2 members migrated in 1947. The dislocation caused by splitting the social-ecological-economic state of Bengal into two countries (West Bengal, in India and East Pakistan, in Pakistan) along religious lines, however, led to further migration, mainly from East Pakistan to West Bengal. These were partly due to religious riots, partly due to the need to seek employment.

19 The local population (colloquially called *Ghoti*) looked down upon the migrants from East Bengal (called *Bangal*) as culturally inferior.

20 Community exists among individuals who share "*common interests, common identification... growing out of shared characteristic*" (Ascher, 1995: 83).

21 The fact that most of the members were fishermen by caste was also important as the collective action was consistent with their natural skills.

22 Actually, the figure obtained is [Revenue from Pisciculture – (Costs of Pisciculture and Boating)]. However, the operating costs of the latter include painting of boats and wages of attendants. Now, painting costs are insignificant, while the attendants double up as guards. So we can ignore Costs of Boating and approximate the figure thus obtained as Surplus from Pisciculture.

23 Note that prices of fish and other inputs (like lime, seed, etc.) were stable over the period of study.

24 University Grants Commission financed project "Evolution of CPR Institutions: A Systemic View" undertaken by the first author. The co-operative referred to is the Captain's Bheri Fishermen's Co-operative, the oldest surviving co-operative in India. This co-operative was a successful co-operative in the late 1980s; it won 4 National Productivity Awards from 1989 to 1992. This, and the introduction of boating, affected the perceptions of the members who increased the threshold level of defection. Profits, and the ability to meet wage liabilities, declined; this led to further defection and by the mid-1990s the co-operative was in shambles. In the last few years, with the abolition of boating and strong disciplinary measures to prevent shirking, the co-operative has achieved a turn around.