# Sustainable Eco-Management: Participatory Mechanisms and Institutions


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Participatory approach in managing development projects and programs in poor countries has emerged in response to global demands for greater individual and societal control over the activities of state and private agencies, and especially to the overt failures of traditional 'top-down' management systems in LDCs (Brett 2003). Beneficiary participation is a special form of decentralized development management where the development projects are locally implementable and the micromanagement is coordinated with the macro-priorities to ensure long-term sustainability. Here, not only do the local authorities take decisions at the local level but there is a harmonious interaction among the provider, regulator and the service recipient (Chopra and Kadekodi 1991; Paul 1989). In fact, it is a cooperative management approach where all stakeholders would take up an active role and enjoy equal status in the process of decision making and execution. The programs are motivated mostly by livelihood approach with high values attached to an enhanced access to social capital. Drawing examples from Canadian inland small-scale fisheries, it has been shown by Berkes (2003) that instead of a top-down experts-know-best type control-oriented management strategy, a participatory approach can guarantee better sustainable livelihood where social and ecological combination of governance practices through coping, learning and adaptation is capable of delivering more resilient outcomes.

However, it has been shown by many social scientists that though the participatory approach is conceptually more democratic, its success potential is highly dependent on the local conditions. Experience shows that co-management regimes can set into motion new conflicts or cause old ones to escalate. Instead of contributing to local empowerment, such arrangements may further marginalize communities and resource users (Castro and Nielsen 2001). Sarkar and Sinha (2015) proposed an exploratory framework to study development management from the perspective of strategic interventions where the specific requirements for the success of the

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participatory approach have been nicely schematized. The participatory approach commonly fails in contexts where local conditions make cooperative and collective action very difficult, or where it is manipulated by implementing agencies to justify their own actions and/or poor performance. In practice, the result may not be power sharing but rather a strengthening of the state's control over resource policy, management and allocation. Instead of contributing to local empowerment, such arrangements may further marginalize communities and resource users and make the program non-viable.

This chapter draws on a number of studies conducted by the present author and her co-researchers between 2007 and 2014 on different rural, peri-urban and urban pockets of the state of West Bengal, India, focusing on ecologically sustainable management of natural resource and environment like social forestry, wetland fisheries and municipal solid waste disposal in a co-management framework with active beneficiary participation.[1] Since the contexts are distinct, there was variation in the notion of sustainable management itself and in the composition of the stakeholder groups. The design of instruments was innovative at times, involving intensive use of local wisdom and specificities with active cooperation between local people and the regulatory authority, but sometimes the planning and management processes faced bottlenecks due to conflict of interest among the members of the stakeholder group leading to insurmountable stalemates. All these studies were conducted to explore the context-specificity of the success probability of co-management practices in different situations. We documented, particularly, two different situations where otherwise suitable projects for participatory resource management failed to attain the intended result due to some peculiarities related to the cases related to the presence of some built-in contradictions either in the composition of the stakeholder group leading to a deviation in the equal participation norms or in the regulatory setup comprised of multiple authorities with inherent jurisdictional conflicts.

In most cases, managing development involves multiple objectives and long-run sustainability is only one aspect, though a very important dimension. When the stakeholders are pursuing these objectives with similar (relative) priorities, the situation is more manageable. However, in case of different priority rankings, defining a feasible and mutually agreeable core itself becomes a problem. There the voice of some particular group starts dominating the others and the entire philosophy of participatory co-management gets defeated. To illustrate this situation, we have taken up a study on the joint forest management practices in Birbhum Forest Division of West Bengal, India, in 2012.

Another problem creating hindrance in smooth functioning of participatory development management practices was identified as the overlap of administrative jurisdictions of different regulatory authorities (Gilbert 2006). For example, the city of Kolkata is facing rapid east-bound expansion over time leading to conversion of

[1] The study on social forestry was undertaken jointly with Jayita Bit, St. Xavier's College, Kolkata; the study on wetland fisheries was taken up with Debanjana Dey of Adamas University, Kolkata, and the collaborators for the study on municipal solid waste management were Prasenjit Sarkhel of Kalyani University, Nadia, and Somdutta Banerjee of the Institute of Economic Growth, New Delhi.

wetlands into urban settlement. These wetlands generally play a very important role in providing the city an option of natural sewage treatment and absorbing its excess rainwater run-off. Besides that, the sheer existence of this wetland provides livelihood support to a large number of fishermen and helps to maintain the ecological health of the entire southern Bengal through a series of wise use practices adopted by the local residents by using their traditional knowledge. So, the direct benefits of land conversion need to be balanced against the huge loss of eco-system services involved in this decision. The problem with that type of assessment mostly emanates from the non-market nature of this loss where the price of lost ecological balance is really difficult to measure as it would be realized only in the long-run when the service would no longer be available. So, the land-use pattern in this area needs to be controlled judiciously and a number of administrative authorities are working toward that end. It has been observed through a series of field surveys conducted in the East Kolkata Wetlands over the period 2012–2014 that because of the active involvement of Kolkata Municipal Corporation (KMC), Kolkata Metropolitan Development Authority (KMDA), West Bengal Housing Infrastructure Development Corporation (WBHIDCO), NGOs, Fishermen cooperatives, local residents, eco-tourism resort owners, real estate developers, and finally wetland institutes like the Institute of Wetland Management and Ecological Design (IWMED), East Kolkata Wetland Management Authority (EKWMA) with definite hierarchy in their administrative power, the grass root level organizations have very little say in the ultimate decisions leading to an unintended alienation of the direct users and therefore, direct victims/beneficiaries from the planning and management process.

A third situation attracting our attention is related to the provision of an urban amenity service like solid waste management where beneficiary participation unfolded some interesting dimensions related to their perception about service quality that was otherwise unknown to the provider and which played a strategic role in enhancing the success probability of such co-managed projects. On the onset of the adoption of the Municipal Solid Waste Management and Handling Rule (2000) in urban West Bengal intending a separation of biodegradable and non-biodegradable waste at the household level and encouraging public–private partnership in solid waste management, a primary survey was conducted in the Bally Municipality of West Bengal in 2006. After partial implementation of the Rule, a repeat survey was carried out on the same set of households in the year 2011. In both cases, the household's willingness to pay toward the project cost was estimated by applying a contingent valuation method. Though most of the households admitted an improvement in the environmental condition of the locality after the implementation of the Rule, there was an overall decline in the willingness to pay for this service. This apparently contradictory finding indicates the role of service quality in making the project a success. In the pre-project days, the WTP quotes depend on the notional service quality expected to be provided and in the post-project days the WTP was revised in terms of the actual service quality received. The decline in the WTP is an indicator of this dissatisfaction on the part of the benefit recipients. The following paragraphs are elaborating on these studies.

## 1 Study I: Joint Forest Management[2]

Forest resource represents a partly open access common property resource serving different ecological, social and economic purposes in the immediate-run as well as distant future involving multiple stakeholders with variedly different objectives and preferences regarding the efficient management of the resource. These stakeholders pursue different and sometimes mutually conflicting objectives like sustainable forest development, expansion of livelihood support, enhancement of economic opportunities and have different expectations from the efficient management of the forest resource. In appreciation of this inherent tension, a participatory approach to forest management has gained wide acceptance all over the globe. It started in India since the inception of Joint Forest Management (JFM) program through National Forest Policy in 1988. However, low levels of involvement, unwillingness among stakeholders to participate in forest planning processes and general dissatisfaction are a commonly observed picture over the past few years.

A successful forest management plan is essentially a multi-objective-programming involving multiple stakeholders where the preference ranking among different objectives varies across stakeholders and the existence of a core in terms of mutually agreed feasible solution may be difficult to ensure (Kangas and Kangas 2005). Multi-criteria decision making technique is considered a suitable framework for program-evaluation in this context as it has the potential to incorporate both conflict and multidimensionality within a single integrated structure. To assess the suitability of participatory approach for social forestry, a study was taken up in 2012 on the functioning of the Joint Forest Management scheme in the Birbhum district of West Bengal, India.

*Birbhum Forest Division*: The field survey was conducted during September–November, 2012 in the district of Birbhum. From the administrative perspective, this district is divided into 7 forest ranges (Bolpur, Md. Bazar, Rajnagar, Rampurhat, Sainthia, Dubrajpur and Suri) containing 19 beat offices. Among them, 6 beats under 5 ranges were randomly selected for the present study to cover 10 locations with presence of active Forest Protection Committees (FPC) and representing variations in topographical properties, cultural heritage as well as nature of forest biodiversity. Ranges with limited forest cover were excluded from the sample. The prospects and problems of participatory forest management were assessed in terms of response to three basic queries: (i) whether the forest-dependent people have benefitted from the present policies; (ii) whether the new form of plantations are enough to meet the needs of forest-dependent people; (iii) whether all the stakeholders take active interest in forest and its biodiversity conservation.

In all, ten FPCs have been surveyed maintaining variations with respect to the percentage of tribal members, proximity to township, quality of FPC performance, etc. From each of the locations, ten households were randomly selected having at least one family member in FPC and to isolate the impact of this FPC participation on

[2]The discussion presented in this section draws heavily from Bit and Banerjee (2015), re-used here with due permissions.

forest-dependent livelihood, conservation of traditional knowledge and sustainable forest management, similar information was collected from ten households having no FPC member. Information pertaining to personal details of household members, condition of the nearby forest area, general awareness regarding the role of forest in supporting livelihood, importance of conserving traditional knowledge, etc., was collected from a total of 204 households. The questionnaire for Forest Department and Biodiversity Board solicited information about the objectives, concern and process of the present forest management practice. Similar questionnaire was designed for the FPC groups. Gram Panchayat members and eco-tourism developers were interviewed about the roles they play in forest conservation, and there were open group discussions with all groups. Finally, the group specific perception of social, economic and ecological importance of forest has been attempted to be assessed through ranking of preferences over wide range of qualitative responses.

## *1.1 Stakeholder Analysis: A MCDA*

Forest resource planning is about multi-objective programming. It addresses the issue of optimizing several objectives perceived with different relative importance, subject to a set of constraints. Given any conflict among the set of objectives, which is rather commonplace, not all of them can be simultaneously optimized. Instead of searching for a nonexistent optimizing solution, it is considered better to search for a consistent solution which would be efficient in the sense of Pareto-optimality where no other feasible solution can improve one objective without degrading at least one other (Diaz-Balterio and Romero 2008). In making plans and managing natural resources, multi-criteria decision analysis helps to consolidate the multiple views and knowledge of stakeholders to support decision making in complex environments. Criteria and indicator provide a common framework to describe, conceptualize, organize and interpret information related to sustainable forest management. The hierarchical structure of defining indicators allows a complex problem to be broken down into manageable elements that can lend themselves to formal analysis (Mendoza and Prabhu 2005; Mendoza and Martins 2006; Khadka and Vacik 2012). In this context, the methodology of analytical hierarchy process (AHP) is a robust, ratio-scaled MCA method for analyzing complex decisions with multiple attributes (Saaty 1980).

Sustainable forest management usually involves the use of criteria and indicators (C & I) allowing the monitoring, reporting and assessment of management activities at national, regional and forest management unit levels. From the official documents of the Forest Department in India, three important objectives or criteria of forest management can be identified as (a) environmental concern like conservation of forest, (b) social concern like protection of livelihood and (c) economic concern like extraction of marketable benefits. The strategic instruments available for forest conservation are (i) enhancement of canopy cover, (ii) protection of biodiversity and (iii) conservation of soil and water, which can be taken as three indicators. Similarly, for livelihood support the most important indicators are (i) collection of non-timber-

forest-products (NTFP), (ii) conservation of medicinal plants (via transmission of the flow of local knowledge and traditional wisdom) and (iii) expansion and protection of forest-dependent livelihood options. Finally, to enhance economic benefits interventions can be designed (i) to raise revenue from timber sales, (ii) increase the supply of logs and timbers and (iii) promote the development of eco-tourism, and these can be taken as indicators of economic usages of forest resources. So, in all, there are three criteria and nine indicators of forest development which are considered to be of strategic importance to achieve the goal of sustainable joint forest management.

In this situation, six different stakeholders can be identified as (I) the Forest Department (FD) at the national level, (II) the Gram Panchayat (GP) at the block level, (III) the members of the Forest Protection Committee (FPC) at the local level, (IV) the households where there is no member of the FPC (non-FPC), (V) the Eco-tourism Developers/Resort Owners (ETD) and (VI) the Timber Merchants (TM). In our field survey, the different types of stakeholders are asked to rank their preference for each indicator of forest development in a 5-point rating scale of [1–5], where 5 indicates the most important and 1 indicates the least importance. We have interviewed 10 officials of the forest department, 6 office bearers of the GP, 73 members of the FPC, 52 households with no FPC member, 3 resort owners and 3 Timber merchants. Depending on all these 147 responses and by combining a group decision making (GDM) approach with that of multi-objective programming (MOP), a multi-criteria decision model (MCDM) has been developed to assess the consistency and compatibility of the stakeholders' attitudes necessary to make the joint forest management program sustainable. Our specific objectives are twofold:

(a) To assess the relative importance of a proposed set of C&I with respect to sustainable forest management by elicitation of stakeholders preferences;
(b) To evaluate perceptions of the overall performance of community forest management strategies by the use of AHP.

*Criteria–Indicator Analysis*: The stakeholders were asked a qualitative assessment of alternative indicators under each criterion using a five-point scale, and the average response in each case has been estimated by taking the geometric mean (GM).[3] If $P$ is the number of *stakeholder types* indexed by $k$, $n_k$ is the number of *observations* in group $k$, $M$ is the number of *criterion* indexed by $i$, and $N$ is the number of *indicators* under criterion $i$, indexed by $j$, then:

$GMI_{kij} = \left[\prod_{n_k} I_{kij}\right]^{1/n_k}$, which represents the average ranking for the $j$th indicator of criterion $i$ for stakeholder type $k$. Combine these $GMI_{kij}, \forall j$ by taking the GM for criterion $i$ as

[3] In order to allow a synthesis of the individual group priorities with the analytical hierarchy process at the subsequent stages, the judgments have to be combined in a manner so that the reciprocal of the synthesized judgments is equal to the synthesis of the reciprocals of these judgments (Saaty 2008). Among the commonly available measures of average, geometric mean satisfies this requirement (Forman and Peniwati 1998).

**Table 1** Ranking-based preference ordering for different criteria and indicators

| Goal: sustainable forest management | | | | | | | |
|---|---|---|---|---|---|---|---|
| Stakeholders → / Criteria/indicators ↓ | FD | GP | FPC member | Non-member | ETD | TM | All |
| *C1: Forest conservation* | **4.45** | **4.14** | **3.91** | **4.23** | **5.00** | **3.76** | **4.08** |
| I-1.1: Canopy cover | 4.89 | 4.47 | 4.89 | 4.64 | 5.00 | 5.00 | 4.79 |
| I-1.2: Biodiversity | 4.05 | 4.82 | 3.81 | 4.36 | 5.00 | 4.64 | 4.11 |
| I-1.3: Soil and water | 4.44 | 3.30 | 3.20 | 3.74 | 5.00 | 2.29 | 3.46 |
| *C2: Livelihood support* | **3.55** | **3.93** | **3.56** | **3.94** | **4.50** | **3.40** | **3.62** |
| I-2.1: Collection of NTFP | 3.40 | 3.84 | 4.59 | 4.48 | 4.22 | 3.42 | 4.39 |
| I-2.2: Conservation of medicinal plants | 3.88 | 4.31 | 3.08 | 3.81 | 5.00 | 3.68 | 3.30 |
| I-2.3: Enhancement of livelihood options | 3.40 | 3.66 | 3.20 | 3.59 | 4.31 | 3.11 | 3.27 |
| *C3: Economic opportunity* | **3.07** | **3.20** | **2.82** | **2.32** | **2.96** | **4.50** | **2.79** |
| I-3.1: Revenue from timber | 3.15 | 3.20 | 3.70 | 3.42 | 2.29 | 4.64 | 3.63 |
| I-3.2: Supply of log & timber | 3.19 | 3.14 | 2.32 | 2.13 | 3.30 | 5.00 | 2.55 |
| I-3.3: Ecotourism development | 2.89 | 3.26 | 2.62 | 1.73 | 3.42 | 3.91 | 2.35 |

*Source* Bit and Banerjee (2015)

$GMC_{ki} = \left[\prod_j^N GMI_{kji}\right]^{1/N}$, to get the average ranking of criterion $i$ for the stakeholder group $k$; and finally, combine these $GMC_{ki}$, $\forall k$ by taking the GM across $k$ as

$GMC_i = \left[\prod_k^P GMC_{ki}\right]^{1/P}$, to get the average *overall* ranking of criterion $i$ across all stakeholder groups. The ranking-based preference ordering is reported in Table 1.

Except for the timber merchants, for all other stakeholders, forest conservation enjoys higher ranking compared to the livelihood support and livelihood support enjoys higher ranking than economic benefit. However, the magnitude of average differences is not uniform across both indicators and stakeholders. This heterogeneity of average response will influence the relative preference ordering of each group across alternative choice criteria. That would be evident from the matrix developed on the basis of pair-wise comparison (PWC) to obtain the priority ranking.

## *1.2 Analytical Hierarchy Process*

This is a kind of value function approach to assign weights to different criteria by defining suitable priority functions, i.e., different criteria and indicators for different stakeholders are arranged in a hierarchical structure. Preference for any particular criterion (indicator) of any particular stakeholder has already been elicited in a 5-point preference scale with 1 representing the worst and 5 representing the best. We have to derive a relative scale by using the judgments expressed in terms of this standard scale by carrying out pair-wise comparison of different criteria (indicators). Relative priorities of criteria with respect to the overall goal and those with respect to alternative indicators are to be calculated from the corresponding pair-wise matrices.

As an illustration of the methodology of deriving the relative scale, let us consider three forest management-related criteria $C_1$, $C_2$ and $C_3$. Define $a_{ij}$ as the value of the difference in the average rating of $C_i$ and $C_j$, i.e., the relative importance of $C_i$ over $C_j$ to stakeholder $k$ in achieving the goal. The difference will vary between [0, 4], and it can be mapped into a 9-point scale starting from equal importance, moderately preferred, strongly preferred, very strongly preferred and extremely preferred. If it is 0, then both the objectives are equally important and the decision-maker is indifferent between the two alternatives. If the difference is 1, then it is moderately preferred and a numerical value of 3 will be assigned to represent this relative priority. Similarly for difference of 2, the assigned value would be 5, for 3 it would be 7, and for 4 it would be 9. The in-between values like 2, 4, 6 and 8 would be considered as intermediate values between two adjacent judgments when compromise is needed.

Three important consistency conditions that the assigned values need to satisfy are as follows:

(a) A comparison of criterion $C_i$ with itself is equally important, $\rightarrow a_{ii} = 1$.
(b) Since $a_{ij}$ represents the relative priority of $i$ over $j$, $a_{ji}$ will represent just the reverse and will be represented by the reciprocal of the original value.

$$\rightarrow (C_i - C_j) = a_{ij} \& (C_j - C_i) = 1/a_{ij}.$$

These two conditions confirm reflexivity axiom of preferences.

(c) The relative scale should satisfy the transitivity property in a cardinal way, i.e., if $C_i$ is 3 times preferred to $C_j$ and $C_j$ is 3 times preferred to $C_k$, then $C_i$ is ($3 \times 3$) 9 times preferred to $C_k$; $\rightarrow a_{ij}.a_{jk} = a_{ik}$. Transitivity along with reflexivity ensures that the consumers are rational and consistent in their preferences.

Let $w_i$ denote the true value of selecting a criterion $i$ out of $M$ alternatives. Then, the relative weight to be assigned to $C_i$ is $a_{ij} = \frac{w_i}{w_j}$. So, $a_{ij}\frac{w_j}{w_i} = 1 \& \sum_j a_{ij}\frac{w_j}{w_i} = M$; or, $\sum_j a_{ij} w_j = M w_i$; $j = 1, 2, \ldots, M$; which is the $j$th row of the system of equations $Aw = Mw$;

$$Aw = \begin{bmatrix} 1 & a_{12} \ldots & a_{1M} \\ a_{21} & 1 \ldots & a_{2M} \\ . & \ldots\ldots & \ldots \\ a_{M1} & \ldots\ldots & a_{MM} \end{bmatrix} \begin{bmatrix} w_1 \\ . \\ . \\ w_M \end{bmatrix} = \begin{bmatrix} \sum_{j=1}^{M} a_{1j} w_j \\ . \\ . \\ \sum_{j=1}^{M} a_{Mj} w_j \end{bmatrix} = \begin{bmatrix} Mw_1 \\ . \\ . \\ Mw_M \end{bmatrix} = Mw$$

Since $A$ is an $(M \times M)$ matrix, $w$ is an $(M \times 1)$ vector, and $M$ is a scalar, the system represents a typical characteristic equation with M as the (maximum) eigen value and the priority weights for different criteria given by the components of the associated eigen vector $w$. This condition is very useful in verifying the consistency of the pair-wise comparison matrix $A$ when the true value $w_i$'s are not known but estimated on the basis of the elicited stated preferences.

For this constructed matrix $A^*$, calculate the maximum eigen value $\lambda^*$ and consider the difference between $\lambda^*$ and $M$. Define Consistency Index $CI = (\lambda^* - M)/(M - 1)$ and allow for some random deviations for a given $M$. Denote this Random Index by $RI(M)$. Combining $CI$ and $RI$, the consistency ratio $CR$ can be obtained as $CR = \frac{CI}{RI}$.. A value of $CR \leq 0.1$ is acceptable.

## *1.3 Discussion*

Table 2 reports the results from an application of AHP in our context of sustainable management of forest in the district of Birbhum, West Bengal, India. It is apparent from the table that all calculations of weights are consistent and except for the timber merchants forest conservation is the most important purpose of forest management to all other stakeholders followed by Livelihood Protection and Economic Opportunities. However, the pair-wise comparison techniques are applied to the indicators of forest conservation and it turned out that the protection and expansion of canopy cover is the most important concern for the Forest Department, FPC members, non-members as well as the timber merchants. Here, Gram Panchayats and the resort owners (eco-tourism developers) are revealing slightly different behavior; while the former considers biodiversity conservation as a very important component of forest conservation, the latter assigns equal weight on all the constituent indicators. In case of livelihood protection, collection of non-timber-forest-products (NTFP) enjoys very high weight from the household sector, both FPC members and non-members.

The remaining groups of stakeholders are more inclined to protect the medicinal plants and thereby the flow of traditional knowledge. Finally, for economic benefits both FPC members and non-member households value revenue earning from timber the most. In the overall rating, the indicator weight of this component is 50% of the total. For timber merchants, this economic benefit is the most important criterion

**Table 2** Priority weights generated by AHP

| Stakeholders -> /Criteria, indicators | FD | GP | FPC member | Non-member | ETD | TM | All |
|---|---|---|---|---|---|---|---|
| Forest conservation | **0.62** | **0.43** | **0.52** | **0.56** | **0.57** | **0.30** | **0.54** |
| Canopy cover | 0.54 | 0.32 | 0.62 | 0.54 | 0.33 | 0.56 | 0.56 |
| Biodiversity | 0.16 | 0.56 | 0.24 | 0.30 | 0.33 | 0.36 | 0.32 |
| Soil and water | 0.30 | 0.12 | 0.14 | 0.16 | 0.33 | 0.08 | 0.12 |
| *Livelihood protection* | **0.24** | **0.43** | **0.33** | **0.35** | **0.33** | **0.16** | **0.30** |
| Collection of NTFP | 0.25 | 0.25 | 0.67 | 0.55 | 0.21 | 0.31 | 0.40 |
| Protection of medicinal plants | 0.50 | 0.50 | 0.17 | 0.24 | 0.55 | 0.49 | 0.40 |
| Expansion of forest-dependent livelihood | 0.25 | 0.25 | 0.17 | 0.21 | 0.24 | 0.20 | 0.20 |
| *Economic opportunity* | **0.14** | **0.14** | **0.14** | **0.09** | **0.10** | **0.54** | **0.16** |
| Revenue from timber | 0.40 | 0.33 | 0.62 | 0.66 | 0.14 | 0.30 | 0.50 |
| Supply of log & timber | 0.40 | 0.33 | 0.14 | 0.21 | 0.43 | 0.54 | 0.25 |
| Ecotourism development | 0.20 | 0.33 | 0.24 | 0.13 | 0.43 | 0.16 | 0.25 |
| $\boldsymbol{\lambda_{max}}$ | **3.02** | **3.01** | **3.07** | **3.05** | **3.02** | **3.01** | **3.02** |
| $\mathbf{CI} = \frac{(\lambda \max - M)}{(M-1)}$ | 0.01 | 0.01 | 0.03 | 0.03 | 0.01 | 0.01 | 0.01 |
| $\mathbf{RI(M) = RI(3) = 0.58}$ **&** $\mathbf{CR} = \frac{CR}{RI}$ | **0.02** | **0.01** | **0.06** | **0.05** | **0.02** | **0.01** | **0.01** |

*Source* Bit and Banerjee (2015)

where there concern is more focused on regularity of the supply of logs and woods from the forest.

## 2 Study II: Wetland Fisheries[4]

The natural gradient of the city of Kolkata is toward southeast and, therefore, the 12,500-hectare-wide wetlands in the Eastern fringe of the city, popularly known as the East Kolkata Wetlands (EKW), are providing the city a unique opportunity for natural treatment of its wastewater and flushing out of its excess rain water. Through

[4]The discussion presented in this section draws heavily from Dey and Banerjee (2013a, b, 2015, 2016a, b, 2017) and Banerjee and Dey (2017); Re-Used Here with Due Permissions.

the algae-bacteria symbiosis process, the wastewater is getting converted into clean water, rich with nutrients congenial for fish production. The freshwater aquaculture and garbage farming help to maintain the low-cost supply chain of fish, vegetables and other food items to the city and keep its Cost-of-Living Index (CLI) the lowest among all metro cities of India. The sewage-fed fisheries are operating in this area for more than a century, and the wise use practices emerged through close interaction with nature created a number of vocations and livelihood practices which are not only inter-temporally viable but also socially and economically sustainable. That is why the EKW has been declared as a Ramsar site in 2002 and it got the recognition as a wetland of international importance. The sustenance of the city of Kolkata and that of the EKW are inter-connected through a circular flow of mutual benefits.

## *2.1 Strategic Importance of Sewage-Fed Fisheries*

When the sewage water arrives in the pond network through the inlet channels, it is kept standing in the sun, which results in biodegradation of the wastes through an algae-bacteria symbiosis. In fact, retention of wastewater in the ponds before the initial stocking of fish for a considerable period allows bacteria to work upon the organic waste. The algae that thrive in these shallow ponds under the ample sunshine support the growth of these planktons. However, the overgrowth of planktons becomes a problem for aquatic environment as they lead to algal bloom. At this critical stage, the integration of wastewater treatment and sewage-fed fisheries creates a win–win situation. Fish plays an important role by consuming this extra plankton as food under a very balanced practice of aquaculture. From their traditional knowledge gathered through years of experience, the local fishermen know exactly how to excavate the ponds to the correct depth, clean the water by spraying kerosene, lime, etc., mix the right quantity of sewage, allow optimal time for conversion of the waste into fish feed, the right time to add spawns, protect the embankments through water hyacinths, and finally, through their livelihood practices support the wastewater treatment and support their own living at one go (Dey and Banerjee 2013a). Waste recycling in EKW involves four principal resource recovery practices, viz. sewage-fed fisheries, paddy cultivation by utilizing fish pond effluents, organic waste-based farming of vegetables and freshwater aquaculture. Thus, the cumulative social and economic gain from such sustainable management in an eco-friendly way is crucially contingent on the livelihood dependence of the local people on these traditional vocations, especially fisheries (Yan et al. 1998).

However, since the development of Salt Lake Township and the construction of Eastern Metropolitan Bypass, the connectivity of EKW with the main city has improved and the pressure of urbanization is leading to conversion of some of the water bodies into urban settlements. In fact, the land-use pattern has changed significantly over the last two decade, especially in areas with close proximity to the city of Kolkata. Three broad types of changes can be easily identified: (i) from small water body to settlement, (ii) from agricultural area to settlement and finally and

(iii) from open spaces to settlement areas. Vulnerability is highest in case of mouzas with high population density and small *bheris.* This practice is disturbing the age-old eco-balance and the eco-system-based livelihood in the area and unleashing a dynamically unstable spiral where approach roads are obstructing wastewater canals through newly developed culverts, making the sewage water pisciculture less profitable, creating a number of new vocations related to the process of land speculation, land transfer and urban living. Consequently, the speed of land conversion increases creating big environmental threat for both the city of Kolkata and EKW. If the fisheries lose their pivotal importance in the local livelihood pattern, then the continuity of this ecologically subsidized sewage treatment facility (Ghosh 2005) may no longer be available to the city of Kolkata. So, the influence of urban invasion from the growing city of Kolkata on the vocational choice of the local people could be of serious concern for continuity of this option of natural sewage treatment facility for the city dwellers.

As a protectionist measure, any further change in the pattern of land use in the core area has been legally prohibited. Conserving the landscape of the wetlands does not necessarily ensure the sustenance of its eco-characteristics until and unless people can retain their dependence on the system for their livelihood practices. In fact, the delicate chain of interdependence, once disturbed, will affect the whole system through a multiplier sequence and the initial eco-balance will be almost impossible to regain. In spite of legal strictures, a significant change in the pattern of land use has been observed in the buffer area which has expanded the set of vocational options to the residents of the EKW and encouraged them to go for vocational switching.

## *2.2 Vocational Transition: Evidence from Field*

Two factors are simultaneously influencing the vocational choice, which is a direct offshoot of this change in land-use pattern: The push factor is creating incentive for the local people to move away from the traditional vocations as it is becoming less remunerative, and the pull factor is attracting them toward alternative modern vocational options created in the newly urbanized neighborhood, which are relatively more intensive in modern skills but generating higher return as well. To investigate the real situation, three vocation-related surveys have been conducted in EKW between 2012 and 2014. The first survey was conducted in 2012, only on the randomly picked up workers spread over 17 mouzas, out of which 10 experienced significant change in land-use pattern but not the remaining 7. Total sample size was 325, out of which 42% reported engagement in traditional vocations and the remaining 58% in modern vocations. As expected, within the traditional vocation, fisheries dominate (67% of traditional type) and that again concentrate mostly in the low-change areas. However, what appears to be the most striking observation is that irrespective of the extent of land-use change, for all selected mouzas more than 50% of the respondents were engaged in their present vocation for a period less than 10 years (Dey and Banerjee 2013b). So, either they were new entrants in the labor market or they

had switched their vocation. This is indicative of the fact that the pull effect that is likely to be uniform for all mouzas is dominating the push effect, which should be more prominent in the high-change areas only. To verify that hypothesis with greater analytical rigor focus was laid on the low-change and no-change mouzas and two subsequent surveys had been undertaken to study the socioeconomic and demographic factors influencing the likelihood of vocational switching.

One problem encountered in conducting a survey on vocational engagement and its pattern of change is the incompleteness of the responses. During the field visit, it was observed that generally people are engaged in multiple vocations and in reporting their occupation they are mentioning their major engagement only. Instead, if the respondent could be asked to choose the types of work he/she carries out from an exhaustive list of possible engagements, then the response bias could have been controlled better. In a tradition-bound society, especially for unpaid work provided by the members of the family, it is difficult to distinguish between work and economic activities. Most of the unpaid economic activities are carried out as routine chores, and they themselves cannot consciously recognize all these activities as 'work.' Households have been identified from the low-change and no-change mouzas[5] with literate members in 2013, and all adult members have been requested to fill in time diary for 10 consecutive days during the peak season (August–September) of fish cultivation. This time diary survey helped to generate an exhaustive list of economic activities carried out by the residents of EKW. By mapping those activities on vocational scheme, an exhaustive vocation listing has been generated where vocations have been classified as TRADITIONAL, containing(a) fisheries and related [F], (b) agriculture and related horticulture [A], (c) duck rearing, poultry and animal husbandry [H] and (d) traditional shops and services [S] and MODERN, containing (a) own business [OB], (b) self-employed including professionals[SP] and (c) workers including salaried persons [WS]. Under all these 7 types of vocations, 4-digit codes were generated to capture the precise nature of job at the best possible level of disaggregation (Dey and Banerjee 2016a, b).

With this exhaustive list of vocations generated from the second survey, a third survey has been conducted in January–February 2014 on the 240 households selected from these same 19 mouzas experiencing LOW or NO change in the pattern of land-use, to especially explore the nature of pull factors. An additional control was given to the average size of water bodies, which has an observed inverse relation with the possibility of change. Only those households were considered where at least some members are engaged in traditional activities. These 240 households supplied information on 980 individuals out of which 434 were engaged in some kind of economic activity according to the classification scheme prepared on the basis of the second survey. Information was collected on the socio-demographic background of the household members like age, education, their major and minor occupations, status of employment, adequacy of earning (at both individual level and the household level), willingness to switch vocation and the level of environmental awareness regarding the uniqueness of this eco-system. The average size of the

[5] 19 mouzas in all;

household turned out to be 4, 76% of working population is male, 30% of working members are within 30 years of age (younger), and 52% is either illiterate or having education up to primary level (low education). Coming to the type of vocation, 69.25% are solely engaged in traditional activities, 14.75% involved in purely modern vocations, and out of the remaining 16% engaged in mixed vocations the dominance of traditional vocation is noted in roughly two-third of the cases.

## *2.3 Vocation Switching Tendency*

From the analysis of survey data, it is found that young age and formal schooling enhances the likelihood of vocation switching (Dey and Banerjee 2017). So, an in-depth investigation needs to be carried out into the likely process of shifting. If people find income inadequate for living, they are likely to diversify into other jobs and the switching process would be gradual. From water-based vocation like fisheries, they may avail initially other land-based options like agriculture, animal husbandry and finally move to services, both traditional and modern, of course, subject to their preparedness at the individual level. Four different types of traditional vocations have already been specified as F, A, H and S. In all 85.25% of the working population is engaged in traditional vocation with the relative share of A being 45.16% and that of F is 26.97%, H is 11.98% and S is 17.74%. Out of 26.97% engaged in F, 20.74% is engaged in pure F and the rest 6.23% is mixing vocation with other traditional activities. Similarly, for A the breakup is 31.34 and 14.82%. The duck rearing, poultry and animal husbandry (H) is generally taken up as a subsidiary engagement in conjunction with other major activities, both traditional and modern. Those who are in S are rarely mixing with other traditional vocations with almost a singular exception for A (only 4.38%). In fact, when people are diversifying to newer vocations and pursuing combination packages, they prefer modern alternatives. This result lends supports to the surmise of vocational transition from wetland or water-based livelihood practices to land-based activities, which would eventually break the correspondence between sewage water treatment and wastewater aquaculture. The presence of 64 individuals in purely modern vocation (14.75% of total working population) was not expected as the sample observations were purposively collected from households with engagement in traditional activities.

If this propensity continues and especially, if fisheries stop dominating the livelihood pattern, then that will not only affect the low-cost supply chain available to the city dwellers, will challenge the continuity of the waste management practice as well. Multiple agencies are active here with multiple stakes, which are at time working at cross-purposes leading to a classical case of coordination failure. An elaboration on this precise nature of agency conflict would be interesting to discuss.

## 2.4 Legal Initiatives to Protect EKW

The position papers of Calcutta Metropolitan Planning Organization (CMPO)[6] and that of the West Bengal State Planning Board (WBSPB) are evidence of strong objection to the eastward expansion of the city since early 1960s (Banerjee 2012). Filling up of water body was prohibited under the Town & Country Planning Act in 1979. In spite of that, the Salt Lake City was extended and the Eastern Metropolitan Bypass was constructed on reclaimed wetlands during the 1980s, making the core wetland area more accessible as well as vulnerable (Dembowski 1999). The Institute of Wetland Management and Ecological Design (IWMED)[7] was set up in 1986 with the primary objective of carrying out studies related to wetland; however, it was never given the statutory powers needed to play the role expected from it.

Thus, during the 1970 and 1980s there was a drastic shift in position at the level of urban development authority whereby the eastern fringe of the city suffered from a pre-dominance of unplanned, uncoordinated urban growth. The first major resistance came from the civil society in the year 1992. A pressure group called PUBLIC (People United for Better Living in Calcutta) filed a writ petition in the High Court to protect the EKW from urban encroachment. On September 24, 1992, High Court Justice Umesh Chandra Banerjee delivered the first major judgment on the matter in favor of protection of the core area of EKW. He ruled that *the wetlands were a gift of nature* and it is the court's job *to strike a balance between development and environment*. Court also mentioned that the wetlands were *too precious to be sacrificed for a mere township*. The exclusive protection of the core wetland area has one major drawback. Those eastern fringes of the city not covered by the High Court's order have since been exposed to rapid, inadequately planned urbanization. The buffer area to the wetland seems to have no control over encroachment, and this particular problem was first highlighted by a public interest litigation (Surojit Srimani vs. the State of West Bengal), which was filed in May 1995 to control Calcutta's eastern sprawl.

A landmark in the history of EKW conservation is its recognition as an international Ramsar site on the 19th of August 2002 (http://www.ramsar.org/pdf/sitelist.pdf). According to the Ramsar Information Sheet, '*the EKW is one of the rare examples of environmental protection and development management where a complex ecological process has been adopted by the local farmers for mastering the resource recovery activities.*' Following this international recognition, in the year 2006 East Kolkata Wetlands Conservation and Management Bill was passed and 12,571 hectares of land was brought within the wetland boundary. According to this bill, not only any new construction within EKW will be severely penalized but all existing constructions within this area would have to be demolished with immediate effect. In spite of these legal barriers, the attempt to encroach has become a perennial problem for EKW and the East Kolkata Wetlands Management Authority (EKWMA) was formed under the provision of the East Kolkata Wetlands (Con-

[6]Later merged with Kolkata Metropolitan Development Authority (KMDA);

[7]Later it was renamed and extended as Institute of Environmental Studies and Wetland Management (IESWM) in 2005;

servation and Management) Act, 2006, to resist these attempts. In 2011, the state government has developed a management plan and in 2012 a high-powered committee has been appointed to look into the matter.

However, the legal authority failed to understand the crucial role played by the buffer area (area between the main city and the wetlands) for the protection of the core area. For a metropolitan city which is growing leaps and bounds in the eastern side, the fringe area enjoys an enormous socioeconomic significance. If there exists no legal binding on the land-use pattern in buffer areas, it is practically impossible to resist any attempt of encroachment in the core area. The core area will experience different covert attempts of land conversion, and at a micro-level majority of small pond owners/fish growers will find the offer of land transfer financially lucrative enough to be acceptable. The problem lying in the legal sanction of this practice may be avoided by adopting different illegal practices. The procedure will follow a surreptitious path, but the ultimate outcome would be observable and overt. Whether a mere legal protection to wetland alone is adequate for preserving the eco-system-based livelihood in EKW is our primary concern. What is most important in this context is the perception of the local residents. If the local people are confident about the strength of this legal protection, then they would like to continue in their traditional vocation and the livelihood would be protected. However, when the legal standing is only a formal façade which is not backed by public confidence, everyone would be interested in switching to the modern vocation to reap the advantage of the newly created opportunities. Here, legal provisions alone would fail to protect the eco-system.

## *2.5 A Story of Coordination Failure*

The regulator is enacting different legal provisions for the protection of land-use pattern, which are creating confusion among the local people and in the absence of strong political will nothing is getting enforced with appropriate thrust. There is not much coordination between KMC and KMDA, where the former relies on EKW for cost-free natural treatment of wastewater and the latter is in charge of urban expansion and development. In fact, multiple stakeholders starting from KMC, KMDA, HIDCO, NGOs, Fishery cooperatives, local residents, eco-tourism resort owners, real estate developers, and finally wetland institutes like IWMED, EKWMA, with their multiple agenda regarding the wetlands are not working in harmony. An absolute coordination failure occurred due to this complicated web of associations among stakeholders documented in Table 3.

The lack of understanding and transparency is hindering the system to achieve its intended sustainability. Everyone is contemplating corrective moves from his/her own perspective, and in the process, the retarding influences on others nodes are passing unnoticed. Though the East Kolkata Wetland Management Authority has evolved to manage this complex and challenging issue, the institution does not enjoy any statutory power till date to ensure effective coordination. The effective interven-

**Table 3** Identification of stakeholders and the coordination problem

| Body | Perspective | Dept./party | Purpose/ responsibility | Challenge | Instrument | Problems |
|---|---|---|---|---|---|---|
| Govt. | Public management | Irrigation & waterways | Maintaining canals which carry the sewage water into the wetlands | Maintenance | Routine Govt. budget | Dredging done for main canals only, smooth flow of wastewater *(input in fishery)* into branch canals hampered |
| | | KMDA | Decentralized planning & development across the urban and rural areas | Development | Planned expenditure | Planning did not take the sewage management issue that may arise from urban invasion into the wetlands |
| | | HIDCO | Plans and executes development projects in the entire Rajarhat Area, Kolkata, West Bengal | | | Urban expansion at an immediate vicinity<br>i. changed the landscape<br>ii. Stakeholders of EKW Ramsar conservation site in no way received benefits of New Kolkata Township, either by selling out their property or in terms of getting improved urban amenities |

(continued)

**Table 3** (continued)

| Body | Perspective | Dept./party | Purpose/ responsibility | Challenge | Instrument | Problems |
|---|---|---|---|---|---|---|
| | | Panchayat | Pivotal agency for unleashing comprehensive rural development | Local governance | West Bengal Panchayat Act, 1973 | Non-specific |
| | | KMC | Manage wastewater of Kolkata | | West Bengal Municipal Act, 1993 | KMC has no administrative power<br>i. to maintain canals and sub canals<br>ii. to protect fishery-based livelihood, crucial wastewater treatment<br>No sufficient financial provision for sewage treatment available so far |
| | Wetland management | EKWMA | Maintain the existing land-use practices along with its unique wise use practices (According to Ramsar Guidelines) | Conservation and protection | East Kolkata wetlands (Conservation and Management) Act, 2006 | Lack of statutory power to stop land conversion |
| | | IWMED | Carrying out studies related to wetland functions & its ecology, wetland mapping etc. | Awareness building | Documentation & research | Carry out research only, no role in protection |

(continued)

**Table 3** (continued)

| Body | Perspective | Dept./party | Purpose/ responsibility | Challenge | Instrument | Problems |
|---|---|---|---|---|---|---|
| Non-Govt. | Civil society | NGO | Mobilization of local awareness at grass root level | Conservation & resistance | Awareness camps and formation of local groups | Have some opinion regarding the conservation issue; however, the legal authorities can take action in 'curative' way not 'preventive' |
| | | Local residents | | Conservation and protection | | |
| Economic group | Income generation | Local residents | Livelihood protection | Protection of private property right | Enhanced transparency in documentation | Newer generations not inclined to traditional livelihood are keen on sale of protected land though illegal means |
| | | Fishery cooperatives | Siltation & lease renewal | Stop land filling & ensuring profitability of fishermen | Cooperative resistance | Irregularities in registration procedure |
| | | Real estate developer | Land conversion & acquisition | Land filling, changing signature of landscape & profit earning via sale of protected land | Illegal means | Land transfer & sale of land which is apparently protected area |
| | | Eco-tourism | Commercial interest by protecting the landscape | Prevent land filling & siltation in respective eco-tourism hubs | Promotion of waterfront activities | Only the landscape can be protected; however, protecting '*wise use*' in a holistic manner is not possible |

*Source* Dey and Banerjee (2015)

tion and related design of implementation mechanism on the part of the designated high-powered committee on the conservation of the EKW is yet to claim any strategic move. Of course, time is still young to take any conclusive position in this regard.

The impression that we have gathered from the foregoing discussion is that EKW is about to lose its ecological integrity, which mainly refers to the long-term health of the system in terms of interactions among the physical, chemical and biological elements of the eco-system creating favorable social conditions for sustaining ecological basis of human life. Here, none of the stakeholders are approaching the problem from an integrated, comprehensive perspective.

The civil society is expressing concern over protection of wetland, where that step alone would be insufficient for the conservation of the eco-system.

## 3 Study III: Solid Waste Management[8]

Recognition of the social costs associated with traditional practices of urban waste management in India led to the formulation of Municipal Solid Waste Management and Handling Rules (2000). However, compliance with the proposed collection and disposal involves higher commitment in terms of both time and money on the part of the residents, local bodies as well as the state and the central government. This is an interactive framework where each stakeholder has some definite role to play. If the beneficiaries decline to play the role expected from them, then the entire approach will fall flat. So, some information about the city dwellers' perception regarding the value of the environmental improvements conferred upon them through the implementation of the new rule would be important for the planners to know. If the residents do not consider the project worthy and decline to separate waste at source, the subsequent processing plan will not work. Given the non-market characteristic of waste disposal services, we infer about beneficiaries' perceived demand for the proposed service by means of Double-Bounded Dichotomous Choice Contingent Valuation Survey conducted in 2006 in the Bally Municipality of the district of Howrah, West Bengal, before the adoption of the waste management program proposed by the MSWMHR. We estimate the average WTP by controlling for anchoring bias and use the annualized value of cost to examine the feasibility of the proposed system. The system turned out to be feasible. It was introduced in 2008, and part of our survey area was covered by it.

An attempt has been made next to identify the factors that influence perception of program benefit of the recipients when a hypothetical public program is implemented, at least partially. When the hypothetical program becomes real, actual experience of program features is likely to update the information set of the recipients. In fact, the recipients would now have a clear assessment of the benefits associated with each component of the waste management program like garbage collection and disposal.

[8]The discussion presented in this section draws heavily from Sarkhel and Banerjee (2010) and Sarkhel et al. (2015); necessary permissions for re-use have been obtained.

The perceived net benefit that influenced his WTP in the pre-program stage would accordingly get revised. Furthermore, the recipient's level of satisfaction with the service delivery is likely to play an important part in this respect. We compare pre- and post-program willingness to pay (WTP) estimates for improved waste management in Bally Municipality, India, by conducting another survey on the same set of households in 2011. Surprisingly, it was found that the post-program predicted WTP falls by more than 50% even when there is a common perception about substantial improvements in the quality of urban environment. Reasons behind this apparently puzzling situation were studied from two angles: In the demand side, there is a possibility of revision in the actual cost of sacrificed leisure needed to participate in the improved waste management program. Another explanation may come in terms of a mismatch between expected and offered service attributes causing disutility to dampen households' perceived value of the program benefits. In the supply side also this reduction in WTP signals some important messages: It might act as an indication to the local bodies regarding the required quality of service and the scale of outreach as the expansion of the program needed to finance the operation and maintenance expenses by supplementing the property tax bases through user fees. If outreach expands the average unit cost would fall and with lower WTP, the program will break even.

## *3.1 Bally Municipality*

The Bally Municipality with a population over 0.261 million is located in the Gangetic plain of West Bengal in the district of Howrah in India. Traditionally, Bally developed as an industrial area along the river plain of Ganges. As a result, it has a large number of migrant populations from other states of India. These people mostly worked in informal industries as well as formal ones like jute and metal industries. In fact, there has been a significant growth of population in Bally during 1991–2001 amounting to more than 40%, and this has intensified the congestion in the municipal area spread over 11.81 $km^2$. The provisioning of waste management services in Bally Municipality displays all the traits that are typical of an urban agglomerate of developing countries. According to official estimate, 150 tons of waste is generated per day in the Bally area most of which comes from the residential households. The collection activity is irregular and the uncollected waste putrefies in roadside vats imposing severe health and aesthetic cost on the inhabitants. According to municipal officials, door-to-door collection of household waste is partially implemented covering a little more than 30% of the total population.

On the disposal side, the local body is fast running out of its existing dumping ground and given the fact that Bally has the highest decadal urbanization rate in the district, the cost of setting up new grounds is bound to escalate in future. The scarcity of land necessitates the adoption of alternative disposal practices along with landfill that would divert maximum waste from the dumping ground and at the same time would be less land intensive. Here, composting is considered to be one such feasible

option. However, one major impediment toward its successful adoption is the fact that people separate only those parts of the waste stream that they can trade with the itinerant buyers. This removes components like paper, glass and even batteries from the daily waste but may leave out harmful contrary materials like paints, expired medicine and soggy plastics that might prohibitively increase the sorting cost of organic waste needed for the production of standardized quality of compost. However, from the point of view of the municipality, composting seems to be the most relevant option for other reason also: There is a potential for converting waste into wealth and consequently a scope for cost recovery as the sale of organic manure can also bring in some revenue. With all the preconditions in favor of launching the project, the long-run sustainability of the proposed garbage disposal scheme crucially hinges on the perceived benefits of the households from the same.

## *3.2 Contingent Valuation Survey*

With improvement in the quality of living environment, our sense of well-being enhances. It is quite common to observe individuals to express strong preferences for clean water, fresh air, wider road, quiet neighborhood and so on. Some of these amenity services are marketed and some are not. The goods for which there is no well-defined market, one way to understand the preference of the potential beneficiaries is to make use of survey instruments and ask them directly to state their preference regarding the provision of the good. Contingent Valuation Survey is one such stated preference method where in the absence of any possibility of market signal to reveal the stakeholder's preference for the service in question, direct bids are elicited to assess people's willingness to pay(WTP) for it. In our context, municipal solid waste management is an urban amenity in the sense that with proper management practices significant benefits in health and aesthetics can accrue to the city dwellers. As a result, welfare of society at large increases. Hence, CVS method can be applied hereby projecting the possible improvement in the living condition of the respondents and asking her about the extent of contribution she is willing to make to enjoy the benefits of such change.

A particular feature of Bally Municipality is the abundance of slum population in the area, that is, 27% of the total population, and their inclusion in the hypothetical market is vital for offering them the opportunity of a better quality of life from the public policy point of view. Keeping this in mind, we allocated the 29 wards in three different strata with wards having high, medium and low slum population. From each stratum, 2 wards are selected with purposive randomness. Bally Municipality has three broad administrative zones, viz. Bally, Belur and Liluah. Hence, we picked up wards from all three zones and three categories. From each ward, we randomly selected households on the basis of household list provided by the municipality that came to a total of 570 survey respondents. Out of these 570 households, only 496 could be identified five years later, at the time of the repeat survey.

Typically, a Contingent Valuation Survey concocts a hypothetical market for the good to be valued and elicits the amount that an individual is willing to trade in exchange of that. In the process, there are three important design issues that are to be dealt with (1) accuracy in the program description that is to be offered, (2) constructing market institutions that involves informing the respondent clearly about the service provider and the payment vehicle and (3) designing value elicitation questions for estimating average WTP of the sample respondents. So far as the program description is concerned, we emphasized on two aspects: replacement of open dumps by sanitary landfills and initiation of compost production by utilizing the biodegradable portion of daily household waste. However, it was also mentioned that for the latter daily collection of source-separated waste would be introduced whereby households would be required to segregate the dry and wet waste in containers provided by the municipality. Respondents were informed that the subscription for the offered program would be collected as a monthly tax along with other utility bills by the Municipal authority. We designed a double-bounded dichotomous choice framework that posed an initial and follow-up question to the respondents. Three starting bids of Rs. 5, 10 and 20 were randomly allotted to the sampled households: 'Yes' response was followed by a doubling and 'No' response by a halving of the asked bid.

## *3.3 Findings of Interest*

Out of 496 surveyed households, only 62% received the new package where the households are provided red and green disposal bins, and there was doorstep collection of source-separated wastes. The remaining 38% continued with an arrangement where there are no source separation requirements. Thus, there is a scope to observe variation in both WTP and attitude of the households over time as well as across groups. However, descriptive analysis across program recipient and non-recipient reveals that even the program non-recipients engage in waste segregation and recycling and there is no statistically significant difference between them in terms of time required for the segregation or number of items recycled. This indicates a strong presence of information externality within the locality.

After program implementation, both the recipients and the non-recipients report enhanced usage of municipal disposal service. There has been an overall increase in tendency to dispose garbage in municipal vans (an increase from 44.85% in 2006 to 81.45% in 2011). In keeping with this, almost 88% of the sampled households ($n = 436$) in 2011 agreed to avail the service against a monthly payment. In fact, 84% of households who denied accepting the paid service in 2006 have now agreed to subscribe even when they are not the direct program recipient. Even across recipients and non-recipients, the WTP for the current service is more or less the same. Against this huge support for program continuance and adoption, the stated WTP has gone down, on an average, in the post-program period (from INR 17 per household per month in 2006 to INR 12 per household per month in 2011), and here also no

significant difference is noted in the average bid amount for program recipient and non-recipient. In fact, segregation time per unit of garbage has fallen in the post-program period. This confirms our hypothesis that assessment of time requirement was prone to be an over estimation in the hypothetical stage. In the later round, the program has actually been launched and the respondents are more certain about the actual time commitment for in-house source separation and recycling of wastes. The reassessment of time requirements is also associated with significant changes in recycling levels in the post-program period. A representative household now recycle almost twofold number of items than he used to do in the pre-program period, and there is an increase in both extent and intensity of recycling. Thus, in the post-program phase there are concrete evidences that benefit accrue via two channels: First, there had been improvements in the overall cleanliness in the area, and secondly, recycling activities have increased substantially, which contributes toward reduction in net increase in the final waste generated per unit of household consumption even when the actual level of consumption (in terms of monthly expenditure) has gone up significantly.

Finally, we look at households' satisfaction with the components of waste management services that have been implemented. We take into consideration the households' choice about four specific program components like storage of garbage, time of collection, preference of service provider and method of disposal. Satisfaction indicators have been constructed as: (i) satisfied with status quo, (ii) dissatisfied with any one dimension, (iii) dissatisfied any two dimensions and (iv) dissatisfied with more than two aspects. The households' distribution over these four categories indicates that most of the households differ from status quo in respect of one dimension, and only 28% of the sampled households prefer status quo with respect to all attributes. Estimates of predicted WTP reveal that average WTP in 2011 (INR 12) is substantially lower than average WTP in 2006 (INR 34). The post-program predicted WTP is even less than half of its value in the pre-program phase. Apparently, the lower values of WTP come as a surprise as net benefit of the households has most likely increased due to overall improvement in the municipal environment as well as private benefits accruing due to enhanced cleanliness of his immediate neighborhood.

## 4 Overall Assessment

Three studies related to micro-level intervention toward participatory development management have been presented here, and the only common point among them is some unexpected outcome produced by the process. The contexts are widely different though the problem faced in each case is indicating a bottleneck in ensuring some attainable non-empty core. Our experience is not singularly different from that of other researchers in the field. By analyzing the cases from West Africa and India, it has been shown by Beck and Nesmith (2001) that instead of economic success in managing common property resources to provide support to the local people focus should be laid on sustainable livelihood. This approach would protect their identity and cul-

ture, and would help to organize the development projects on more equitable basis, both socially and economically. Kumar (2002) has shown strong 'have'-preference of India's JFM over the last 40 years leading to further marginalization of the 'have-nots.' In fact, the most serious critique of participatory approach to development in terms of some built-in conceptual paradox has been advanced by Mohan and Stokke (2000) and Cleaver (1999). The former one indicates the inductive localization of development interventions in case of participatory management, which is overshadowing the holistic approach in a broad macro-theoretic perspective. The latter one highlights the possible snags faced by these project centric micro-development initiatives. Participation is claimed to enhance efficiency of outcome (economic gain), leading to greater equity and empowerment of the vulnerable group (social gain) and through the conservation of local resources, traditional knowledge and culture makes the development outcome more resilient to ecological shocks (environmental sustainability). For economic and environmental gains, participatory management is a *means*, whereas for the social gain it is an *end* in itself. If these three aspects work in synergy, there is no problem. However, such instances are rare and exceptional, not rules.

The success of the participatory approach crucially depends on the evolution of appropriate social institutions that would help to formalize mutual expectations of cooperative behavior and reduce the cost of individual transactions by working as an insurance against the problem of opportunism and free riding. So, the effective institutions are necessarily formal, whereas the traditional institutions are essentially informal in nature. They are not governed by contracts, associations, committees and clearly defined property rights which are generally considered as effective instruments for reducing transaction costs.

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