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Social and economic considerations in conserving wetlands of indo-gangetic plains: A case study of Kabartal wetland, India

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Abstract The Kabartal wetland situated in the upper Indo-Gangetic flood plains in northern India is significant because of its hydrological and ecological services, and the socio-economic and cultural values that it represents. Despite being designated as a wildlife sanctuary, this wetland is under threat from anthropogenic pressures. As in the case of most wetlands, the reason is incomplete information on its ecological services and functions, breakdown of traditional management structures and the lack of appropriate and recognized property rights. Our study assesses the economic linkages between the Kabartal wetland and the local people living around it, through socio-economic surveys and Contingent Valuation Method (CVM). The major objective of the study was to determine the importance of this wetland to the local people and to give an indication of the distribution of the benefits among various stakeholders. The people in the region are poor, have low literacy levels and high dependence on Kabartal and more than 50% want that the wetland should be drained and the land used for agriculture. However, they are willing to participate in collaborative management initiatives with the state. The willingness of people to accept compensation, as an alternative to access to Kabartal wetland, regressed on various socio-economic and attitudinal parameters, gave an estimated mean value of US $27,500 per household over a period of 60 years. This value is a pointer of the total value of access to Kabartal wetland to the surrounding villagers and would be useful when decisions to compensate people for lost access to Kabartal are made.

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1 Introduction

Natural flood plain wetlands are the most biologically productive and diverse ecosystems on earth however, they are among the most threatened (Mitsch and Gosselink, 2000). Flood plain degradation is closely linked to the rapid decline in freshwater biodiversity; the main reasons for the latter being reclamation (Vitouesk et al., 1997; Ravenga et al., 2000) habitat alteration, flow and flood control, species invasion and pollution (Tockner and Stanford, 2002). The Indo-Gangetic flood plain *c* 4.23 million km^2 in area (Rodgers and Panwar, 1988) is one of the world's largest and most productive river flood plain having great cultural and economic value. In the last millennium the over-exploitation of the natural resources of this flood plain has caused serious concerns for the sustainability of natural resources as well as the livelihoods of the 440 million people living below the poverty line. Agriculture is the most important source of livelihood for the people in the basin, however due to over-exploitation of groundwater, declining water tables, inefficient use and low productivity of surface water and rainwater resources, pollution, weak and inadequate water governance institutions and inadequate integration of crops, fisheries and other production sectors there has been continuous degradation of land, water and biotic resources.

With the loss of wetlands to agriculture, settlements and development, all the above problems have been aggravated in the entire Gangetic plains. The few wetlands left in the region are protected as wetland sanctuaries, but in spite of this intervention these wetlands are under increasing anthropogenic pressures. This is largely because the services provided by wetlands often are undervalued (Turner et al., 2000). The major causes of wetland conversion have been recognized as incomplete information on their ecological services and functions, the high opportunity cost of their maintenance, the structural causes associated with who bears the costs and enjoys the benefits from their maintenance or conversion, and the lack of appropriate and recognized property rights (Adger and Luttrell, 2000). The multi-resource characteristic of wetlands influences the structure of resource-tenure and management regimes that often leads to conflicts. In a situation where the ownership and management of these wetland resources is under state controlled formal institutions, the traditional management structures have become marginalized. The existing protected area system in India allows for little involvement of local communities in resource management. The resultant conflict between different social groups and between the state and civil society precludes setting up of sustainable resource management systems. Moreover, a proper valuation of the goods and services provided by most wetlands in India has rarely been carried out. In the absence of valuation studies the conservationists have been unable to articulate the importance of conserving this ecosystem in the face of development activities that promise higher turnover (Badola and Hussain, 2003). Thus, there is an urgent need to quantify and demonstrate the importance of wetlands at regional levels in order to stop further degradation, and to restore them where it is still possible (Filion, 1995).

Recognizing the implications of many of the above factors, an attempt was made to assess the economic linkages between the Kabartal wetland situated in the upper Gangetic plains in India and the local people living around it, through socio-economic surveys and Contingent Valuation Method (CVM). The major objective of the study was to determine the use and non-use values of Kabartal wetland and to give an indication of overall net gain to society particularly to the people living around the wetland and the distribution of the benefits among various stakeholders, besides providing information on the efficiency of various uses of the wetland resource use. Since, there are competing stakeholder groups using the resources from this wetland for their livelihood and the land rights are not yet settled in the area, such studies may prove to be helpful in management decision by linking the CVM values obtained with socio-economic conditions of the people as well as their attitudes towards this wetland.

2 Study area

Kabartal wetland situated at 25° 35′ N, 86° 10′E is the largest freshwater lake in Northern Bihar, and is one of the most important wetlands of upper Indo-Gangetic plains (Rodgers and Panwar, 1988). The Kabartal has been classified as wetland type 19 (i.e. rice paddies) by Scott (1989). Kabartal is formed by a meandering of the River Budhi Gandak, a tributary of the River Ganges and is a residual oxbow lake encompassing an area of 6,737 ha. During the year of average rainfall, it gets connected with the River Budhi Gandak and with the nearby water bodies to form a lake of about 7,400 ha (Fig. 1). The Kabartal plays significant hydrological and ecological role in the surrounding landscape, besides being one of the most important staging grounds for migratory waterfowls. Traditionally, the wetland has been used for water supply for irrigation and domestic purposes, fishing, netting of migratory waterfowl for sale, harvesting of wild fruits and wild rice, and gathering of the edible mollusk, *Pila globosa*. Some 2,800 ha of the lakebed are cultivated for rice during the dry season (Scott, 1989). It thus plays a significant role in lives of local people. More than 41 species of commercially valuable fish have been recorded from here (Anon, 2004). The lake is known to support a rich and diverse aquatic flora. The terrestrial vegetation along the shoreline is characterized by *Shorea robusta* forests, swamp forests dominated by *Syzygium cumini* and *Barringtonia accutangula*, wooded grassland and marshes dominated by *Phragmites karka, Sclerostachya fusca, Saccharum munja* and *Arundo donax*. In spite of its biological and ecological significance, this wetland is under threat because of reclamation of land for agriculture, changes in the hydrologic regime resulting from construction of dykes and excessive removal of biomass by the burgeoning human population. By late summer the water remains confined to the deeper depressions, and only about 300–400 ha of Kabartal remains flooded and cutoff from the adjacent floodplains. As the water level recedes, the draw down areas are converted into rice paddies and during high flooding the whole area is used for fishing (Scott, 1989).

In 1986 the Kabartal was declared a protected area under Section 37 of the Indian Wildlife (Protection) Act, 1972. As per the provisions of the Land Acquisition Act (1894) all land right holders within the wetland areas should have been compensated

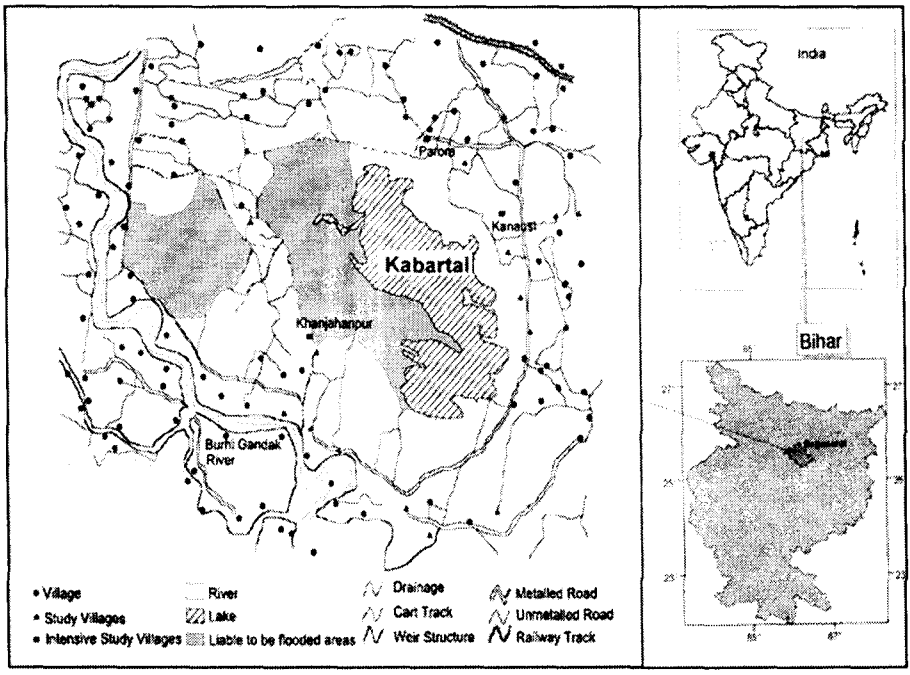

Fig. 1 Map of Kabartal wetland showing its location in India and location of the study villages

for the value of land lost before declaring it as protected. However, the rights of different groups of people and the ownership of land have yet to be ascertained under the provisions of the Indian Wildlife (Protection) Act, 1972.

3 Methods

A rapid survey of 21 villages located within a distance of 5 km from the Kabartal was done. On the basis of demography, their distance from the sanctuary and educational facilities available three villages (Kanausi, Parora and Khajahanpur) were selected for the study of socio-economic aspects and their dependence on Kabartal wetland. For assessing the values that the local people placed on the goods and services provided by Kabartal, causes of their dependence, their view regarding alternative management possibilities and their Willingness To Accept (WTA) compensation in return for the good and services from Kabartal, household surveys were carried out in the three sampled villages.

For valuing both use and non-use value of Kabartal wetland, the Contingent Valuation Method (CVM) was used. The referendum format used was open ended but based on a response range schedule as given in Table 1. This was done to avoid the high percentage of protest bids, faced by early contingent valuation surveys (Mitchell and Carson, 1989). Two such schedules were designed, one for the people having land within Kabartal wetland and others who do not have land. The highest bid category for the non-landholders overlapped with the lowest bid for the landholders' category.

Table 1 The bidding schedule used for elicitation of Willingness To Accept (WTA) values for two groups of stakeholders of Kabartal wetland, India

Sl. no.	WTA for landholders (per katha[a]) in Indian Rupees (Rs[b])	WTA for landless in Indian Rupees (Rs[b])
1	<10,000	<100
2	10,000–20,000	100–500
3	20,000–50,000	500–1,000
4	50,000–100,000	1,000–10,000
5	>100,000	<10,000
6	Final bid...	Final bid...

[a] 1 katha = 0.015 ha.
[b] US $ 1 = Indian Rs. 47.23.

The respondents were asked to agree to a single bid value and then a final question was posed asking why they could not accept less money. Questions were also asked to determine whether they would like to take the amount in lump sum or on a monthly or yearly basis, and for how long in case of the latter two.

The Willingness To Accept (WTA) amount asked related to the compensation which would make the villagers well off without access to resources in Kabartal (including acquisition of all landholdings falling within the boundaries of the declared sanctuary) as with continuing access. This implied that in their statements concerning their WTA, the respondents would be eliciting their use as well as non-use values. The approach was to make the respondents aware about the various values and functions of the wetland such as groundwater recharge, nutrient recycling, and environmental amelioration through an attitude questionnaire and then getting them to elicit their true preferences.

4 Results

4.1 Socio-economic status of local villagers and their dependence on Kabartal wetland

The villages are distributed uniformly in all directions around the submergence area and are not very close to the Kabartal bird sanctuary since the area becomes flooded during the monsoons. They were mostly distributed in the range of 2 to 5 km from Kabartal. The majority of population had small land holdings, per capita land availability being only 0.14 ha/person and people had to take to other occupations during the lean seasons mainly as laborers. The area is fertile and intensively cultivated with crops such as maize, paddy and wheat, 74% of the area being under cultivation.

The number of households in the intensively surveyed villages ranged from 266 to 1012 with the family size ranging between 5.4 to 6.3. The literacy level ranged from 17 to 34%. Parora had the lowest number of cattle owning families as well as the least number of cattle head per family. Khajahanpur had the highest number of houses made of brick and electrified but the lowest per capita income (Table 2). The number of unemployed people was highest in Khajahanpur (41.4%) that had the smallest size

Table 2 Socio-economic characteristics of the three intensively surveyed villages situated around Kabartal wetland, India

Village characteristics	Kanausi	Parora	Khajahanpur
Distance from Kabartal (km)	1.25	1.5	3
No. of households	266	645	1012
Mean family size	6.3	5.4	5.5
Female/1000 male	0.893	0.956	0.886
Literacy %	33.8	16.9	26.6
Human density(persons/km^2)	1014.6	1329	534.9
Cattle owning families (%)	72	47.5	67
Houses made of brick (%)	35	45	70
Houses electrified (%)	1.89	3.87	9.49
Per capita income (Rs./annum)	2518.9	2977	1748.1
Mean family income (Rs./annum)	15869.6 ± 2948.2 (n = 23)	16016.1 ± 2574.7 (n = 56)	9667.3 ± 1287.7 (n = 77)
Mean cattle population/family	2 ± 0.3 (n = 25)	0.9 ± 0.15 (n = 61)	1.4 ± 0.15 (n = 94)
Average land holding/household (ha)	1.6 ± 0.3 (n = 25)	1.4 ± 0.5 (n = 61)	0.9 ± 0.2 (n = 94)
Unemployed people (%)	20.7	24	41.4
Agriculturalists (%)	48.3	48.5	30.4
Fishermen (%)	6.9	7.2	1.5
Agricultural laborers (%)	17.2	10.1	16.4
People engaged in services (%)	6.9	5.1	2.7

Table 3 Dependency of the three intensively surveyed villages on the Kabartal wetland, India

	Kanausi	Parora	Khajahanpur
Fodder (No. of head loads/annum/family)	117.6 ± 33.27	47.049 ± 13.79	37.55 ± 6.53
Fuel wood (No. of head loads/annum/family)	12.6 ± 5.8	8.1 ± 1.8	5.9 ± 0.8
Construction materials (No. of head loads/annum/family)	6.0 ± 1.3	4.9 ± 0.8	3.8 ± 0.5
Fish caught (kg/day/family)	4.7 ± 0.9	5.5 ± 2.2	3.0 ± 0

of land holdings (0.9 ha) as well as the percentage of fishermen (2.7), agriculturalists (30.4) or people employed in the services sector (2.7) (Table 2).

The dependence of the people on the Kabartal wetland appeared to highest in village Kanausi followed by Parora and Khajahanpur (Table 3). This is in accordance with the distance of the villages from Kabartal. The highest dependence was for fodder followed by fuel wood and construction material. Village Parora had the highest number of fishermen families followed by Kanausi and Khajahanpur. Fish catch per day varied from, 3.0 to 5.5 kg/family in the study villages (Table 3).

4.2 Attitude and perception of local people towards Kabartal wetland

As many as 98.2% of the people interviewed were aware of the existence of the Kabartal Bird Sanctuary. When asked about the best alternative use of the wetland in their opinion, more than 54% of people were in favor of draining out the water from the

Table 4 Attitudes of the local villagers towards conservation of Kabartal wetland, India

Questions	Positive responses (%) ($N = 55$)
Awareness about the existence of Kabartal Bird Sanctuary	98.18
View regarding Kabartal wetland	
Maintain *status quo* (use for agriculture and fishing)	54.54
Drain out the water and put the land to agricultural use	18.18
Develop the site for fisheries and tourism	5.45
(a) Leave it entirely for birds banning all other activities	21.81
Birds should be protected	83.63
If the government. formulates any such plan which takes care of you as well as birds, then will you like to cooperate	80
Loss perceived due to Kabartal wetland	
(a) Inundation of crop fields	41.82
(b) Crop depredation by birds	31.18
(c) Mosquito menace	23.64
(d) Diseases	16.0

Table 5 Priority ranking by local people regarding the use value of Kabartal wetland, India

Parameters	Rank 1 (%)	Rank 2 (%)	Rank 3 (%)	Rank 4 (%)	Rank 5 (%)
Fishing	14.55	23.64	25.45	25.45	10.9
Agriculture	63.64	18.18	7.27	9.09	1.81
Tourism	3.64	5.45	16.36	12.72	61.82
For birds	5.45	18.18	18.18	27.27	30.91
Religious/Historical	5.45	16.36	20	18.18	38.18
Ecological functions	7.27	18.18	12.72	7.27	54.54

area by making the old drainage system operational again which stopped functioning properly after 1987. About 84% people were in favor of protecting the birds and 80% were willing to participate in collaborative management initiatives (Table 4). When asked to rank the various functions and benefits accruing from Kabartal the agricultural value received the highest priority (63.6%) followed by fishing (14.5%). The ecological functions such as groundwater recharge do not score very high as only 7.5% people gave first ranking to these (Table 5). *c* 45% people also reported losses due to the presence of Kabartal wetland. These were largely associated with agricultural losses due to submerged fields, crop damage by birds and the prevalence of mosquitoes and diseases (Table 4).

4.3 Outcome of contingent valuation

The Willingness To Accept (WTA) amount for each respondent was obtained by multiplying the land holding of the respondent with the compensation amount. Similarly, another range was obtained for those who were asking compensation in terms of job or for means of regular annual income, in order to bring the amounts of compensation to a common standard. The values thus derived were pooled to prepare the summary model. The WTA amount started from a zero value and extended to a maximum value of Rs. 28.65 million (US$ 0.6 million) for a period of 60 years. About 34.6% of the

Table 6 Distribution of WTA amount response values of households across the response range schedule derived by aggregating the WTA values

Willingness to accept (Rs.[a])	%
0 (no money demanded)	10.91
>0–<100,000	34.55
>100,000–<500,000	27.27
>500,000–<25,000,00	16.36
>25,000,00	10.91

[a]US $ 1 = Indian Rs. 47.23.

Table 7 Definitions of variables used in the initial regression model for estimating compensation amount that villagers are willing to accept for not using Kabartal wetland, India

Variables	Definitions
EDU	Educational level of respondent
SIZE	Household size
INCOME	Family income of the respondent
LD	Total land possessed by the household
KLD	Land of the household falling under the declared Kabartal sanctuary
ARCULK	Area cultivated by the household in Kharif season
PADDYK	Total paddy production in Kharif season
MAIZEK	Total maize production in the Kharif season
ARCULR	Area cultivated under Rabi season
WHEATR	Total wheat production in Rabi season
MAIZER	Total maize production in Rabi season
TOTCATTL	Total cattle owned by the household
FKQTY	Head loads of fodder brought by the family/annum from Kabartal
OTHK1	Head loads of fuel wood brought by the family/annum from Kabartal
OTHK2	Head loads of construction materials brought by the family/annum from Kabartal
OTHK3	Units of other biomass products brought from Kabartal
AWARE	Awareness of the respondent of the existence of a bird sanctuary 1 = aware; 0 = not aware
PROTECT	Is the respondent is in favour of protecting the birds 1 = yes; 0 = no
COOPER	Would the respondents cooperate with the government for developing a co-management plan 1 = yes; 0 = no
FISHING	Rank the respondent gave to fishing as a use value of Kabartal scale 10–60
AGRI	Rank the respondent gave to agriculture as a use value of Kabartal scale 10–60
TOURISM	Rank the respondent gave to tourism as a use value of Kabartal scale 10–60
BIRDS	Rank the respondent gave to the birds and avifauna as a value of Kabartal scale 10–60
RELIGIOU	Rank the respondent gave to religious value of Kabartal scale 10–60
ECOFUNC	Rank the respondent gave to ecological functions of Kabartal scale 10–60
LTKMTD	Ability to maintain livestock if Kabartal was not in vicinity 0 = yes; 1 = no
REACOTH	Reactions if the rights are ceased scale 10–50
REAC1	30 if agitation, 20 if compensation, 10 for demand for land

households surveyed had asked for compensation in a range of no compensation to Rs. 100,000 and 27.3% in the range of Rs. 100,000 to 500,000. *c* 11% respondents did not ask for any compensation (Table 6).

4.4 Linear regression model

In the regression equation the WTA amount elicited from the respondent was taken as the dependent variable. Initially twenty-eight variables were taken as independent

variables from which 75% of the variables were sacrificed and only seven variables were retained while estimating the final regression equation. The variables included initially have been described in Table 7. The discontinuous and qualitative variables were ordered into categories ranging from a low to high scale in relation to the WTA amount. Highest values were given to the options which represented the greatest degree of loss, which was revealed in the form of most extreme reactions. Rankings for the use values and functions were similarly converted, and the highest value of 60 went to the function most valued by the respondent.

The model obtained initially for contingent valuation was also a good fit to the model. Twenty-eight variables explained 94.1% of the variability in WTA amount. This model was however, over-determined. Hence, a final regression equation including only seven variables but still explaining 91.1% of the variance was derived (Table 8). The model developed had high-adjusted R-squared values (0.805) indicating that the estimated equation was a good fit to the data. The value of F-statistic was also quite high for the regression viz. 32.783 with a significance of $p < 0.005$ indicating that the estimated equation was statistically significant.

4.5 General form of regression equation

The regression equation is given by:

$$\text{WTA} = \text{f(CONSTANT, EDU, SIZE, KLD, ARCULK, ARCULR, OTHK2, OTHK3)}$$

$$\text{i.e. WTA} = a + b \times \text{EDU} + c \times \text{SIZE} + d \times \text{KLD} + e \times \text{ARCULK} + f \times \text{ARCULR} + g \times, \text{OTHK2} + h \times \text{OTHK3}$$

Where a = Constant, and all other variables are same as given in Table 7. The variable, KLD representing land in Kabartal was the most significant variable with $p < 0.000$ and a t-statistic of 6.382 indicating that those who had more land falling under the sanctuary's boundaries had significantly higher WTA amounts. The coefficients of

Table 8 Coefficients of variables included in the final regression equation for deriving estimated compensation amount that villagers are willing to accept (WTA) for not using Kabartal wetland, India

	Unstandardized coefficients		Standardized coefficients		
	B	Std.	Beta	*T*	Sig.
Constant	2064205	955427.1		2.161	0.036
EDU	−312038	230841	−0.094	−1.352	0.183
SIZE	−102369	108935.2	−0.062	−0.94	0.352
KLD	392297.4	61467.19	0.725	6.382	0.000
ARCULK	−538871	217415.7	−0.383	−2.479	0.017
ARCULR	682246.1	274161.3	0.525	2.488	0.016
OTHK2	−66632.2	47181.77	−0.101	−1.412	0.164
OTHK3	254.548	328.962	0.052	0.774	0.443

Table 9 Descriptive statistics of the variables included in the final regression model

Parameters	Mean	SE
EDU	1.11	0.17
SIZE	7.00	0.34
KLD	1.44	1.04
ARCULK	2.21	0.40
ARCULR	2.07	0.43
OTHK2	7.35	0.85
OTHK3	425.45	115.82
WTA AMOUNT	140,1441	561,767.93

Table 10 The estimated and actual sample Willingness to Accept (WTA) amount obtained during the Contingent Valuation Method (CVM) study

US $ 1 = Indian Rs. 47.23.

WTA values	Mean (US$)
Sample mean	29,672.7
Sample mean after removing outliers	11,437.2
Huber's M-estimate	3,858.3
Estimated mean	27,482.3

Table 11 Basis of compensation amount and mode of payment suggested by the villagers living around Kabartal wetland, India

Mode of payment of compensation amount	% ($N = 55$)	Reasons for demanding the amount asked for	% ($N = 51$)
Monthly	21.81	Value of land	31.37
Yearly	38.18	Sustenance purpose	49.02
Lump sum	29.09	Other benefits (ecological functions and amenities)	7.84
No compensation asked	10.91	No compensation asked	11.76

final regression equation and descriptive statistics of the variables included in the regression model are given in Tables 8 and 9 respectively.

The estimated WTA amount was the one obtained by taking the average values of the variables and deriving the amount with the help of the regression equation. The estimated mean based on the regression equation designed was *c* Rs. 1.3 million household (US$ 27, 482.3) over a period of 60 years and this was nearly equal to the sample mean of *c* Rs 1.4 million/household (US$ 29, 672.7) obtained directly (Table 10).

The compensation amount asked by people was based on value of land (31.4%), amount required for sustenance (49%) and for forgoing ecological services derived from the Kabartal (7.8%). *c* 22%, 38.2% and 29% people suggested that the compensation amount should be paid on monthly, yearly or lump sum amount respectively and *c* 11% people were willing to forgo compensation amount (Table 11).

5 Discussions

Conservation in densely populated areas with high dependency on natural resources is always difficult because of the complicated decision involved in resource allocation. Policies and measures to conserve biodiversity in such situations have ranged from policing and protection to involving the same resource dependent communities

in conservation and management. The efforts have met with varying degrees of success, few of them having sustained (Badola and Hussain, 1999). For the sustainability of conservation efforts it is imperative that conservation be linked with mainstream economic development and the prevailing paradigm in integration of conservation and development read conservation is development and *vice versa* (Badola, 2000). Economic valuation places natural resources on the agenda of both conservation and development decision makers. By expressing people's preferences through the CVM, valuation aims to make natural goods and services directly comparable with other sectors of the economy when land or resource use decisions are made. Although a better understanding of the economic value of the natural resources does not necessarily favor their conservation and sustainable use, it at least permits them to be considered as economically productive systems alongside other land uses (IUCN, 2003).

The area surrounding the Kabartal wetland is densely populated, the population density being higher than the state and national average of 402 and 307 persons per km^2 and underdeveloped, the CMIE Index (Centre for Monitoring of Indian Economy) for the district being 39, as compared to 43 for the state and 100 for India. Literacy rate is much lower as compared to the national average of 52.2%. Majority of the people were earning their living from agriculture in draw down areas and fishing related actives, both dependent on their access to Kabartal wetland. State induced socioeconomic and a policy change particularly declaration of the areas as protected has restricted access of the local people to this wetland and has increased the vulnerability of their livelihoods and traditional institutions of resource management.

An important conclusion of this study is that in spite of such restrictions around 83.6% of the local people are willing to protect birds and are willing to cooperate with the State for co-management. Many studies have emphasized that the attitude of local people is one of the ultimate factors determining the improved management and conservation effectiveness of the protected areas (Struhsaker et al., 2005). There is a need to improve the strategies that address this aspect so that human attitudes, value systems and behavior can be influenced to the benefit of this wetland. Land being a scarce commodity in the densely populated and highly productive Gangetic plains determined the people's perception of the wetland values. Hence, though the non use values were well recognized, use values such as agriculture tend to influence the WTA amount to a large extent. Linking economic benefits to conservation is difficult in this region as there are many stakeholders and there is high pressure on limited resources. In such a situation a sustainable approach would focus on finding out the non use values of the Kabartal wetland and relate it to the economic benefits derived by the local people from such values. The economic and welfare losses to people, estimated using the CVM in this study are a pointer of the total value of the access to Kabartal wetland to the villages. Though the WTA amount derived seems high due to lack of a budget constraint (Cummings et al., 1986), it has been found that responses to WTA compensation provide a more accurate reflection of the values (Bathla and Perwaiz, 1999). In the case of protected areas, where the property rights of the communities in the resources are at stake or there is fear of losing access to natural resources in the area, WTA is a better measure than WTP (e.g. Mitchell and Carson, 1989; Randall et al., 1995).

For long term sustainability of Kabartal wetland institutional and governance structures that ensure and promote wise use need to be in place. The Ramsar guidelines for

managing wetlands suggest an overall agreement among the stakeholders, to maintain the ecological character of wetlands and permit wise use of the resources. For maintaining the ecological integrity and biodiversity value of the Kabartal the entire wetland was declared as a bird sanctuary under the provision of Indian Wildlife (Protection) Act, 1972. However, the major stakeholders, in this case the agriculturalist, were neither consulted nor other options for their livelihoods explored/implemented prior to declaration of the area as a sanctuary. As a result several claims were made by the local people for the land notified under the Kabartal Bird Sanctuary. This has resulted in non-settlement of land tenure by the government, hazy use rights and unsustainable resource extraction by the resident people.

There is an immediate need for intervention on the part of management to counteract the increasing pressure from local people and politicians for draining of the wetlands of Gangetic flood plains. Kabartal wetland, despite being a proposed Ramsar site since 1987, was not included among the 13 others declared as Wetlands of International Importance by Government of India at the 8th meeting of Convention of Contracting Parties held in November 2002 at Valecina, Spain. There is a need to generate policy alternatives that are more acceptable to the local people by ensuring adequate representation of the stakeholders in decision making process (Hearth, 2004; Grimble and Chan, 1995) and to avoid a tragedy of commons' outcome in the absence of property rights, poorly defined 'rights to access and use' and a breakdown of traditional institutions that define these (Berkes, 1994; Schlager and Ostrom, 1992; Udaya Sekhar, 2004). The economic linkages between dependence of local population on common pool resources and the consequent degradation can be mediated upon by initiating appropriate institutional framework in the form of well defined property rights of locals in resource use (Bromley, 1991; Kothari et al., 1996).

At the surface it may appear that the wetlands in the Indo Gangetic plain are facing threat of extinction due to high human pressures, however at a deeper level these are being destroyed because of fundamental economic forces i.e. because of information, market and policy failures as a result of which the products, attributes and functions of these are not adequately recognized by the policy. Studies such as the present provide information about people's impressions and opinions that might be useful in targeting education and public awareness programs or in shaping policy (e.g. Streever et al., 1998). It provides an opportunity to highlight the importance of these wetlands to the livelihoods of the local people and the urgent need to sustain these through diversification and strengthening the resource base.

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References

Anon: 2004, *Management Action Plan for Kanwar Lake 2004–2005 to 2008–2009*. Department of Environment & Forests, Government of Bihar.

Adger, W.N. and Luttrell, C.: 2000, 'The Values of Wetlands: Landscape and Institutional Perspectives,' *Ecological Economics* **35**, 75–89.

Badola, R. and Hussain, S.A.: 1999, 'Collaborative Management of Protected Areas: Approach, Evolution and Success,' in Background paper presented at the International Technical Consultation on Protected Area Management and Sustainable Rural Development-How can they be Reconciled, Oct 26–29, 1999. Harare, Zimbabwe.

Badola, R. and Hussain, S.A.: 2003, 'Valuation of Bhitarkanika Mangrove Ecosystem for Ecological Security and Sustainable Resource Use,' Study Report. Wildlife Institute of India, Dehra Dun, India.

Badola, R.: 2000, 'Local People Amidst the Changing Conservation Ethos: Relationships Between People and Protected Areas in India,' in T. Enters, P.B. Drust and M. Victor (eds.), *Decentralization and Devolution of Forest Management in Asia and the Pacific*. RECOFTC Report No. 18 and RAP Publication 2000/1, Bangkok, Thailand, pp. 187–204.

Bathla, S. and Parwaiz, A.: 1999, *User's Analysis of Protected Areas—a Case Study of Binsar Wildlife Sanctuary in Kumaon*, Institute for Social and Economic Change, Bangalore.

Berkes, F.: 1994, 'Co-Management: Bridging the Two Solitudes,' *Northern Perspectives* **22**, 18–20.

Bromley, D.W.: 1991, *Environment and Economy: Property Rights and Public Policy*. Basil Blackwell Inc., Cambridge, UK, p. 247.

Cummings, R.G., Brookshire, D.S. and Schulze, W.D.: 1986, *Valuing Environmental Goods: An Assessment of the Contingent Valuation, Rowman and Allanheld*. Totowa, New Jersey.

Filion, F.L.: 1995, 'Towards an IWRB Specialist Group on the Economic Value of Wetlands,' Keynote paper Presented at the International Conference on Wetlands and Development, Selangor, Malaysia.

Grimble, R. and Chan, M.K.: 1995, 'Stakeholders Participation for Natural Resources Management in Developing Countries: Some Practical Guidelines for Making Management More Participatory and Effective,' *Natural Resources Forum* **19**(2), 113–124.

Hearth, G.: 2004, 'Incorporating Community Objectives in Improved Wetland Management: The Use of Analytic Hierarchy Process,' *Journal of Environmental Management* **70**, 263–273.

IUCN: 2003, *'Valuing Wetlands in Decision Making: Where are we Now? Integrating Wetland Economic Values into River Basin Management', Wetland valuation issues paper# 1*, IUCN-The World Conservation Union, Gland, Switzerland.

Kothari, A. Singh, S. and Suri, S.: 1996, *People and Protected Areas –Towards Participatory Conservation in India*. Sage Publications Pvt. Ltd, London. 276 pp.

Mitchell, R.C. and Carson, R.T.: 1989, *Using Surveys to Value Public Goods: The Contingent Valuation Method. Resources for the Future*. Washington D.C.

Mitsch, W.J. and Gosselink, J.G.: 2000, Wetlands, 3rd edn. John Wiley and Sons Inc., New York.

Ravenga, C., Brunner, J., Henninger, N., Kassem, K. and Payne, R.: 2000, *Pilot Analysis of Global Ecosystems. Freshwater Systems*. World Resources Institute, Washington DC.

Rodgers, W.A. and Panwar, H.S.: 1988, 'Planning Wildlife Protected Area Network in India,' Report Prepared for the Department of Environment, Forests and Wildlife, GOI, Wildlife Institute of India, Dehra Dun, India.

Schlager, E. and Ostrom, E.: 1992, 'Property-Rights Regimes and Natural Resources: A Conceptual Analysis,' *Land Economics* **68**, 249–262.

Scott, D.A.: 1989, *A Directory of Asian Wetland*. IUCN. Cambridge, U.K.

Randall, A.K., Sharma, N. and Munasinghe, M.: 1995, 'Valuing Tropical Forests: Methodology and Case Study of Madagascar,' World Bank Environment Paper Number 13, The World Bank, Washington D.C.

Streever, W.J., Callaghan-Perry, M., Searles, A., Stevens, T. and Svoboda, P.: 1998, 'Public Attitudes and Values for Wetland Conservation in New South Wales, Australia,' *Journal of Environmental Management* **54**, 1–14.

Struhsaker, T.T., Struhsaker, P.J. and Siex, K.S.: 2005, 'Conserving Africa's Rain Forests: Problems in Protected Areas and Possible Solutions,' *Biological Conservation* **123**, 45–54.

Tockner, K. and Stanford, J.A.: 2002, 'Riverine Flood Plains: Present State and Future Trends,' *Environmental Conservation* **29**(3), 308–330.

Turner, R.K., van den Bergh, J.C.J.M., Soderqvist, T., Barendregt, A., van der Straaten, J., Maltby, E. and van Ireland, E.C.: 2000, 'The Values of Wetlands: Landscape and Institutional Perspectives,' *Ecological Economics* **35**, 7–23.

Udaya Sekhar, N.: 2004, 'Fisheries in Chilika Lake: How Community Access and Control Impacts their Management,' *Journal of Environmental Management* **73**, 257–266.

Vitouesk, P.M., Mooney, H.A., Lubchenco, J. and Melillo, J.M.: 1997, 'Human Domination of Earth's Ecosystem,' *Science* **227**, 494–499.