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RESEARCH PAPER

Co-Location, Socioeconomic Status and Perceptions of Environmental Change in the Indian Sundarbans

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Abstract: Research on determinants of collective action in the commons generally focuses on interest-group heterogeneity, implicitly assuming that groups perceive the same problems but have different priorities. This paper changes the focus to the role played by perceptions themselves. Within localities, collective action may be easier if elite and non-elite households have similar assessments of environmental risks. Regionally, collective action may be aided by common assessments among local elites who communicate across village lines. This paper uses regression analysis to explore variations in environmental risk assessments across socioeconomic classes and localities, using new survey data from the Indian Sundarbans. We find that assessments vary significantly across localities. At the same time, assessments among elite households vary significantly more than assessments among non-elite households. Our results, therefore, favour locally-oriented collective action in the region, along with local governance that promotes non-elite participation.

Keywords: Commons, Collective Action, Environmental Perceptions, Sundarbans, India

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1. INTRODUCTION

Collective action in the commons is a complex phenomenon that has received extensive attention in the literature (Wade 1987a; Wade 1987b; Ostrom, Walker and Gardner 1992; Baland and Platteu 1993; Bardhan 1993; Ostrom *et al.* 1999; Ostrom 2003). Interest group diversity plays an important role in these studies, which typically find that heterogeneity makes it harder for communities to agree on arrangements for sharing the benefits and costs of collective action (Kanbur 1992; Baland and Platteu 1995; Alesina, Baqir and Easterly 1999; Poteete and Ostrom 2004). Most research attributes the adverse impact of heterogeneity to the clash of interests among groups that are differentiated by economic status, gender, culture or political affiliation, while implicitly assuming that they perceive the same environmental problems (Baland and Platteu 1999; Bardhan and Dayton-Johnson 2000; Poteete and Ostrom 2004; Somanathan, Prabhakar and Mehta 2007; Ruttan 2008; Araral 2009; Marchiori 2014; Kölle 2015). For example, Bardhan and Dayton-Johnson (2000) cite two Indian cases (Jayaraman 1981; Easter and Palanisami 1986) in which wealth heterogeneity hinders collective action to develop and maintain irrigation systems, despite a common understanding that these systems would be beneficial.

This paper drops that assumption and uses new survey data from the Indian Sundarbans to consider the role played by perceptions themselves, as revealed by residents' assessments of the environmental risks faced by their communities. The stakes for collective action are significant: Within localities, collective action may be easier if elite and non-elite households have similar assessments. Regionally, collective action may be aided by common assessments of local elites who communicate across village lines.

The low-lying delta region of the Sundarbans is inhabited by some the poorest and most vulnerable people in India, who are also among the most affected by growing threats from climate change: increased frequency and intensity of cyclonic storms (Bandyopadhyay *et al.* 2018); increasing fluctuations in temperature and rainfall; and rising salinity as sea level rise continues (Mukhopadhyay *et al.* 2018). Outmigration has increased as households suffer growing losses from climate-related degradation of timber stocks, livestock, fisheries, crops and water quality (Dasgupta, Sobhan *et al.* 2017; Dasgupta, Huq *et al.* 2017).

In the face of these challenges, Sundarbans communities would undoubtedly benefit from collective action in the environmental commons – the set of environmental problems that are shared by numerous households. Effective mobilization requires cohesion, which, as previously noted, may be affected by differences in environmental risk assessment as well as negotiations among groups with different interests. [1] To address the risk assessment question, we conducted a survey of 600 households in three dispersed localities in Sundarbans. For each household, the survey collected extensive information on socioeconomic status, livelihoods, migration behaviour and perceived threats from climate-related factors. The paper's principal objective is to determine the relationships linking co-location[2] and socioeconomic status to environmental risk assessment, and the potential implications for local and regional environmental governance. The paper does not incorporate a study of inter-group negotiations, which would require an entirely different survey exercise. We acknowledge the possibility that higher average levels of assessed risks might enhance environmental governance by providing an additional incentive to negotiate. We believe that this may be a fruitful topic for future research.

2. DATA AND METHODS

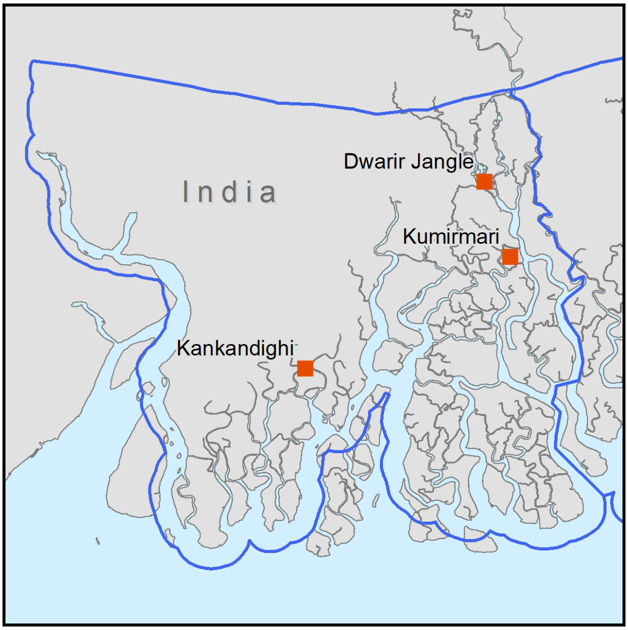
2.1. Data

The 600 households surveyed for the study are distributed across the Indian Sundarbans (Figure 1). We surveyed three localities (mouzas), one in North 24-Parganas District (Dwarir Jangle, Sandeshkhali II Block), and two in South 24-Parganas District (Kumirmari, Gosaba Block; Kankandighi, Mathurapur II Block). The three mouzas were selected after village-level consultations to incorporate the range of current environmental risks and future threats identified by village residents. Within mouzas, households were selected from zones at progressively-greater distances from local rivers that are subject to annual flooding. Two hundred households were surveyed in each mouza from March 2016 to January 2017.

[1] We draw a distinction between provision of a collective good through common effort, or mobilization, and provision of the good by an interested party. In small groups with considerable wealth inequality, Olson (1965) has noted the likelihood that self-interest may dictate the provision of a public good, if it is warranted by the individual's expected gain. In the latter case, which does not entail mobilization, cohesion is not necessary. We are indebted to a reviewer for this clarification.

[2] The term co-location refers to the location of two parties in the same place.

Figure 1: Survey mouzas in the West Bengal Sundarbans



Source: Authors

The survey employed maximum variation sampling (Palinkas *et al.* 2015) to incorporate a broad range of household social, economic, demographic and geographic characteristics.[3] This approach is particularly useful for econometric analyses of relatively small datasets in cases where the core model variables are specified in advance. It focuses on capturing the marginal effects of variables over their full range. Random samples will tend to cluster in the mid-range with limited variation across observations, making it difficult to draw robust statistical inferences about marginal effects. Even with maximum variation sampling, the generalizability of the results will depend on the degree of overlap between samples drawn in this region and the value ranges of model variables in other regions. From this perspective, the broader range afforded by maximum variation sampling may yield more common-range observations than random sampling.

This paper focuses on the relationship between socioeconomic status and differences in assessment of environmental risks. To measure differences in assessment, we asked survey households to rank the importance of changes

[3] Sampling dimensions are tabulated in Appendix A.

in variables grouped into two categories: general environmental conditions and conditions related to livelihood. The environmental risk variables were pre-determined in focus group exercises with villagers in the three mouzas. The categories were pre-designed for analytical purposes, so we did not expect survey respondents to provide any rationale for the groupings. In each category, we asked respondents to rank only those changes that they thought were significant. Some chose to rank changes for all variables in each category, while others limited their selection to small subsets. We did not ask about cyclonic storms, which affect the entire region and are sufficiently rare to make trend identification difficult for individual households.

For general environmental conditions, we asked respondents to identify and rank the importance of significant changes in rainfall (lower or higher annual averages; more drought conditions), temperature (higher annual averages), and increases in salinity. For livelihood-related conditions that involve local environmental variables and associated resource stocks, we asked respondents to identify and rank the importance of changes in timber stocks[4], livestock, fisheries, soil fertility, insect infestation of crops, water pollution, access to drinking water, and forced outmigration of family members.

Using the ranks provided by a household, we computed numerical scores for variables within each change group: 5 variables for general environmental conditions and 10 for livelihood-related conditions. Among ranked variables in each group, the highest-ranking is arbitrarily assigned a score of 10; the next-ranked a score of 9, etc. Unranked variables were assigned scores of 0. For general environmental conditions we formed a dataset that included all pairs of households in our sample. These pairs were drawn from all mouzas to permit a robust analysis of the effect of proximity on assessments of environmental risks. We augmented the dataset for each pair of households by including their scores for the five general environmental variables. Then, for each household pair, we computed the correlation coefficient for the five scores. We repeated this exercise for the ten livelihood-related conditions. The result for each household pair was a scores correlation coefficient for general environmental conditions and another scores coefficient for livelihood-related conditions. The estimated correlation coefficients provided the dependent variables in our analysis of the relationship between socioeconomic status and differences in environmental risk assessment.

[4] Respondents were asked to consider both the immediate village surroundings and nearby forest reserves.

We developed our socioeconomic status indicators from survey-based measures of household wealth and education. We assigned high socioeconomic status (SES) to households whose wealth and education were both in the upper range. To ensure the clearest view of socioeconomic status effects, we assigned low SES to households whose wealth and education were both in the lower range. Identification of SES ranges, while analytically useful, have an unavoidably arbitrary component. We, therefore, chose break points in the data to ensure ample representation in each subgroup.

Table 1: Distribution of household asset counts

Wealth Status	Asset Count	Sample Households
Low	0	4
	1	205
	2	144
Medium	3	104
	4	76
High	5	33
	6	16
	7	6
	8	4
	9	7
	10	1
	Total	600

Source: Authors

We indexed wealth by counting total asset possession from a possible set of 29 assets.[5] Table 1 displays our selection of break points and household representation in each range.

The survey reports the education level of the household head in 8 categories. Table 2 displays our selection of break points and household

Table 2: Education status and reported education levels

Education Status	Survey Category	Count
Low	Pre-Primary (below 1)	51
	Primary (1-4)	118
Medium	Upper Primary (5-8)	152
	Secondary (9-10)	60
High	Higher Secondary (11-12)	24
	Undergraduate (B.A/B.Sc./B.Com.)	35
	Post-graduate (M.A/M.Sc./M.Com.)	8
	Post-Masters (Ph.D./Voc./Doctor/Eng.)	1
	Total	449

Source: Authors

[5] We have used an unweighted count because we do not have reliable information on asset vintages or their market values. Assets queried were own car, taxi, auto-rickshaw, truck/small truck, bicycle, motor bike, gas stove, mixer, refrigerator/freezer, washing machine, iron, geyser, radio/cassette recorder, colour television, bBlack and white television, DVD player, land telephone, mobile, sewing machine, power generator (kerosene), power generator (solar), electric fan, air conditioner, personal computer, motor boat, row boat or sail boat, animal drawn cart, jewelry, other building excluding dwelling.

representation in each range. The lower total representation for education (449, vs. 600 for wealth) reflects non-reporting by some survey households.

2.2 Regression Model Specification

Our research strategy posits that environmental risk assessments reflect a process of consensus formation that has received extensive attention in both the theoretical literature (Dyer *et al.* 2009; Hegselmann and Krause 2002; Hoylst *et al.* 2001; Deffuant *et al.* 2000; Friedkin and Johnsen 1999; Lehrer and Wagner 1981; Wagner 1978) and empirical research (Estrada and Vargas-Estrada 2013; Aral and Walker 2012; Calvó-Armengol *et al.* 2009; Denrell 2008; Yun *et al.* 2008; Childers and Rao 1992). In this research, individuals assign weight to both their own observations and the observations of others with whom they communicate. Residential proximity generally has a significant effect, because communications decline with distance. The same holds for the "social proximity" provided by common cultural identity (e.g., ethnicity). However, the role of socioeconomic status is more controversial (Sun et al. 2019; Phillips and Zuckerman 2001; Aronson 1972; Goffman 1963). Numerous studies find that relatively high-status individuals conform less to majority views than middle-status individuals. The rationale is that the relative security of high-status individuals makes them more willing to demonstrate divergence. For lower-status individuals, however, the evidence is mixed. In some cases, lower-status individuals also conform less than middle-status individuals. In other cases, they exhibit more conformity.

These divergent findings have given rise to two views of the relationship between status and conformity. The "U-shaped" model holds that both high- and low-status individuals conform less than middle-status individuals: the former because their position is secure, and the latter because they have little or nothing to lose in any case. The opposing model, which may have more relevance for developing countries, posits a monotone-increasing relationship between socioeconomic status and non-conformity. In this view, low-status individuals, who may be at the survival margin, are unlikely to risk the costs that may accompany non-conformity.

Our econometric modelling builds on this literature without taking explicit sides in the dispute, although our prior view was that the monotone-increasing model seems more plausible for high-poverty areas like the Indian Sundarbans. We posited a model in which individuals' assessments of environmental risks were formed from their own observations and those of individuals with whom they communicated. We indexed assessment similarity between two individuals using the correlation between their scores for the previously noted environmental change factors in our survey.

For paired individuals from households i and j, we focused on three potential determinants of assessment similarity. The first was frequency of communication, which should be inversely related to the residential distance between the two households. Given that we cannot observe actual communications between surveyed individuals, we used residential distance as an index of the likelihood that they communicate.

The second factor was "social proximity". Ceteris paribus, we expect an individual to assign greater weight to the environmental risk assessments of individuals with the same group affiliation. For this exercise, we used a measure of common ethnicity to index social proximity. The third factor was socioeconomic status. As previously noted, social psychologists disagree that the relationship between socioeconomic status and non-conformity is U-shaped or monotone-increasing.

Our regression model tested the effects of four categorical variables on inter-household score correlations for environmental changes: (1) common mouza; (2) common status in the highest socioeconomic group; (3) common status in the lowest socioeconomic group; (4) common membership in the ethnic categories identified by the survey (scheduled caste, scheduled tribe, OBC).[6]

We specified our regression model at the micro-level to capture the full range of individual variation in the sample, and estimated the following regression equation:

$$\rho_{ij} = \beta_0 + \beta_1 L_{ij} + \beta_2 E_{ij} + \beta_3 HS_{ij} + \beta_4 LS_{ij} + \varepsilon_{ij} \quad (1)$$

Prior expectations: $\beta_1 > 0; \beta_2 > 0; \beta_3 < 0; \beta_4 > 0$, where,

$\rho_{ij} =$ Correlation coefficient of scores for environmental change factors by paired individuals i and j

$L_{ij} =$ 1 if individuals i and j are located in the same mouza; 0 otherwise

$E_{ij} =$ 1 if individuals i and j have the same ethnic category; 0 otherwise

$HS_{ij} =$ 1 if individuals i and j both have High SES, as previously defined; 0 otherwise

$LS_{ij} =$ 1 if individuals i and j both have Low SES, as previously defined; 0 otherwise

$\varepsilon_{ij} =$ Random error term

[6] OBC abbreviates Other Backward Caste, a term used by the Government of India.

The SES dummy variables distinguish pairs of high-SES and low-SES individuals from others in the sample: cross-SES or middle-SES pairings. Our estimation results for HS and LS should be interpreted as deviations from the constant term, which absorbs the effect of the excluded pairings. Although we recognized the divergence of views in the literature, our prior expectation was that the deviation would be negative for high-SES pairs (indicating lower correlation) and positive for low-SES pairs.

Spatial econometric estimation was not needed in this case, since the paired household observations were drawn from all three mouzas. However, we believe that error variance may not be independent of the distance between households in each pair. Accordingly, we augmented standard OLS and robust estimators with a GLS estimator that incorporates standard errors for 10 clusters identified by relative distance between paired individuals. Distances were calculated from the latitude and longitude recorded for each household.

3. RESULTS

Tables 3 and 4 provide information on mean variable scores by mouza and socioeconomic status (SES) group, as well as summary cross-correlations. Table 3a displays mean scores for the 10 environment-related threats to livelihood. As the table shows, there are substantial differences in mean scores across SES groups in each mouza. Nevertheless, the table also suggests more agreement within mouzas than across them. These patterns also characterize the correlation coefficients in Table 3b. The overall distribution of correlations (Table 3c) is roughly symmetric, with one negative correlation (-0.20), first, second and third quartile points at 0.37, 0.51 and 0.64, respectively, and a maximum at 0.97.

Tables 4a, 4b and 4c provide the same information for five changes in general environmental conditions. Here typical correlations are higher, although substantial variation is also evident.

Table 3a: Livelihood-related change - Scores by mouza and socio-economic status

Mouza	(1) Dwarir Jangle			(2) Kumirmari			(3) Kankandighi		
SES	L	M	H	L	M	H	L	M	H
Households	23	61	46	3	15	3	20	43	22
Change									
Tree Loss	7.2	7.4	7.7	6.0	5.2	5.0	7.8	7.2	7.4
Livestock Loss	4.1	5.4	5.9	7.7	7.8	9.0	8.2	7.3	8.1
Crop Damage	6.0	5.7	6.4	6.7	6.9	6.7	5.4	6.1	6.5
Fish Loss	2.1	5.2	6.9	5.3	5.3	7.3	3.8	5.2	4.5
Water pollution	8.4	6.7	6.9	6.3	4.9	5.0	4.7	4.1	3.5
Soil Fertility Loss	5.0	3.5	2.5	4.0	4.3	3.3	6.2	4.6	5.5
Water Loss	3.1	2.8	2.2	6.3	5.0	4.3	6.1	5.6	5.8
Pests and Insects	4.7	2.9	1.9	3.7	5.6	4.7	5.6	4.7	4.2
Animal Diseases	4.1	2.8	2.4	5.0	5.0	4.0	4.0	4.8	4.7
Outmigration	1.3	2.1	1.6	4.0	4.3	5.7	3.3	5.2	4.7

Notes: L indicates Low; M indicates Middle; H indicates High.

Source: Authors

Table 3b: Correlation coefficients - Livelihood-related change scores

Mouza	SES	(1) Dwarir Jangle			(2) Kumirmari			(3) Kankandighi		
		L	M	H	L	M	H	L	M	H
(1)	L	1.00								
	M	0.72	1.00							
	H	0.54	0.97	1.00						
(2)	L	0.33	0.63	0.66	1.00					
	M	0.13	0.38	0.44	0.70	1.00				
	H	-0.20	0.38	0.53	0.60	0.79	1.00			
(3)	L	0.41	0.44	0.32	0.50	0.52	0.20	1.00		
	M	0.04	0.45	0.46	0.61	0.64	0.58	0.72	1.00	
	H	0.09	0.35	0.33	0.60	0.64	0.45	0.82	0.94	1.00

Notes: L indicates Low; M indicates Middle; H indicates High.

Source: Authors

Table 3c: Distribution of correlation coefficients

Min	P25	P50	P75	Max
-0.20	0.37	0.51	0.64	0.97

Source: Authors

Table 4a: General environmental changes - scores by mouza and socio-economic status

Mouza	(1) Dwarir Jangle			(2) Kumirmari			(3) Kankandighi		
SES	L	M	H	L	M	H	L	M	H
Households	23	72	70	29	124	42	29	65	31
Change									
Less Rain	8.2	6.5	5.3	0.0	0.6	1.0	0.3	0.6	2.3
More Saline	7.0	5.2	3.9	5.9	4.0	5.7	5.9	6.3	4.8
More Rain	2.7	5.5	7.4	0.7	0.3	0.0	0.3	0.9	1.8
More Frequent Drought	1.7	2.6	3.0	0.0	0.0	0.0	1.0	1.4	1.2
Higher Temperature	8.4	7.8	7.8	8.1	8.8	8.9	8.9	8.3	7.9

Notes: L indicates Low; M indicates Middle; H indicates High.

Source: Authors

Table 4b: Correlation coefficients - general environmental change scores

Mouza	SES	(1) Dwarir Jangle L	(1) M	(1) H	(2) Kumirmari L	(2) M	(2) H	(3) Kankandighi L	(3) M	(3) H
(1)	L	1.00								
	M	0.82	1.00							
	H	0.29	0.78	1.00						
(2)	L	0.60	0.57	0.33	1.00					
	M	0.65	0.67	0.45	0.96	1.00				
	H	0.69	0.64	0.33	0.99	0.98	1.00			
(3)	L	0.59	0.53	0.28	0.99	0.98	0.99	1.00		
	M	0.57	0.50	0.24	0.99	0.96	0.98	1.00	1.00	
	H	0.71	0.71	0.45	0.97	1.00	0.99	0.97	0.96	1.00

Notes: L indicates Low; M indicates Middle; H indicates High.

Source: Authors

Table 4c: Distribution of correlation coefficients

Min	P25	P50	P75	Max
0.24	0.56	0.71	0.98	1.00

Source: Authors

Table 5 presents the distributions of correlation coefficients for paired individuals. The correlations for both change groups are distributed in the range [-1,1], with thousands of positive and negative values. Above the median, percentile points are substantially higher for the general environmental change factors. This is consistent with the cross-correlation patterns displayed for mean scores in Tables 1c and 2c.

Table 5: Distribution of interpersonal correlation coefficients

Environmental Change Factors	N	Min	P10	P25	P50	P75	P90	Max
Livelihood-Related	23,871	-0.94	-0.30	-0.07	0.15	0.37	0.62	1.00
General	109,278	-1.00	-0.40	-0.01	0.49	0.67	1.00	1.00

Source: Authors

Table 6 reports our estimation results for the econometric model specified in equation (1) above. The dependent variable is the correlation coefficient of environmental change variable scores for paired individuals. The independent variables are categorical variables for common mouza; common status in the highest socioeconomic group; common status in the lowest socioeconomic group; and common ethnicity.

The estimates indicate that common mouza has a highly significant positive impact on the interpersonal score correlations for both general environmental conditions and environment-related threats to livelihood. Conversely, high SES has a consistently negative impact on the correlation — marginally for threats to livelihood and with high significance for general environmental conditions. Low SES has a consistently positive impact that is marginally significant for threats to livelihood and highly significant for general environmental conditions. While common ethnicity has a positive impact, it is both small in size and statistically insignificant in all cases.[7]

[7] To check the robustness of our results, we identified a separate group whose members have elite status in wealth or education, but not both. The econometric results for elite status are equally strong when a dummy variable was introduced for the group with partial elite status. These results are available from the authors on request.

Table 6: Regression results - determinants of common environmental risk assessments **(**Dependent Variable: Inter-individual correlation coefficient)						
	Environmental Threats to Livelihood			General Environmental Conditions		
	OLS	Robust	GLS	OLS	Robust	GLS
Individuals Have Common Mouza	0.136	0.136	0.137	0.089	0.089	0.094
	(29.76)**	(28.32)**	(5.49)**	(27.25)**	(26.99)**	(4.21)**
High SES	-0.002	-0.002	-0.018	-0.080	-0.080	-0.074
	(0.10)	(0.09)	(0.54)	(3.95)**	(4.22)**	(2.59)*
Low SES	0.029	0.029	0.027	0.040	0.040	0.031
	(1.96)	(2.08)*	(1.41)	(3.22)**	(3.33)**	(2.15)*
Ethnicity	0.005	0.005	0.004	0.006	0.006	0.004
	(0.94)	(0.91)	(0.23)	(1.88)	(1.88)	(0.13)
Constant	0.095	0.095	0.093	0.277	0.277	0.285
	(28.86)**	(33.29)**	(7.84)**	(123.40)**	(123.36)**	(9.84)**
Obs	23,871	23,871	20,503	109,278	109,278	96,141
R-squared	0.04	0.04	0.04	0.01	0.01	0.01

Notes:

1. Absolute value of t statistics in parentheses

2. * significant at 5%; ** significant at 1%

Source: Authors

Tables 7 and 8 display predicted correlations from the GLS regressions by mouza of residence and SES.[8] Middle SES is assigned to paired status for individuals who are neither high SES nor low SES. Both tables display the highest correlations for paired individuals with low SES in a common mouza. Conversely, paired individuals with high SES in different mouzas have the lowest correlations. Typical correlations are higher for general environmental changes than for livelihood-related changes, but livelihood-related changes have greater relative effects. From highest to lowest case, the correlation falls by 69% for livelihood-related changes and 49% for changes in general environmental conditions.

[8] Ethnicity has no meaningful effect on these results; the table entries are calculated for paired individuals who do not have common ethnicity.

Table 7: Livelihood-related changes: Predicted interpersonal correlations by co-location and SES			
	Common SES		
Common Locality	Low	Intermediate	High
Yes	0.26	0.23	0.21
No	0.12	0.09	0.08

Source: Authors

Table 8: General environmental changes: Predicted interpersonal correlations by co-location and SES			
	Common SES		
Common Locality	Low	Intermediate	High
Yes	0.41	0.38	0.31
No	0.32	0.29	0.21

Source: Authors

4. DISCUSSION

Cost-effective adaptation to climate-related changes will require increased public investment, but it will also depend on local support for appropriate collective action. There is extensive literature on the determinants of effective collective action at the village level, with a major focus on the problem of interest-group heterogeneity (Vedeld 2000; Kurian and Dietz 2013). Relevant factors include differences in wealth, education and patterns of resource tenure and ownership (Beck and Nesmith 2001; Gaspart 2003). While such studies generally find that greater homogeneity is a positive factor, they have also explored important differences that are attributable to outside intervention modes, the presence of intermediating institutions, and the role of "policy entrepreneurs" in forging and sustaining collective agreements among heterogeneous actors (Myers 1997; Kurian and Dietz 2007). More generally, the policy literature on commons problems explores the implications of heterogeneity in income, education and ethnicity for support for environmental regulation (Jones and Dunlop 1992; Wang *et al.* 2018; Chen 2017; Janmaimool 2017; Chakraborty *et al.* 2017; Liu and Mu 2017). The principal focus is transactional, on the implicit assumption that agents have common assessments of the problems but different priorities for addressing them.

This paper attempts to contribute by addressing another aspect of heterogeneity that has received less attention in the literature: the role played by differences in environmental risk assessments. Within localities, collective action may be easier if elite and non-elite households have similar assessments of critical environmental problems. At the same time, extensive research indicates that regional governance is dominated by economic and educational elites who communicate across locality lines (Khan 2008; Ghertner 2011; Oyono 2004; Lucas 2016; Piabuo *et al.* 2018). By implication, regional environmental governance is likely to be more effective if elites in different localities have common assessments of the critical problems. Several other possibilities emerge from this line of inquiry, depending on comparative conditions at the local and regional levels. In the weakest scenario, environmental governance is hindered by heterogeneity of assessments within and across localities. Local governance may be strengthened, if local elite and non-elite households share common assessments; regional governance may dominate if local-level assessments differ, but elites share assessments across localities.

We conducted a survey of 600 households in three mouzas of the Indian Sundarbans that is threatened by several environmental factors related to climate change and explored the impact of location and socioeconomic status on patterns of environmental risk assessment. Our findings had three noteworthy features: for the broad middle group, we found a positive, highly-significant correlation of assessments across all mouzas;[9] common mouza adds a highly-significant increment to the correlation; another increment is added for low SES households — in contrast, high SES subtracts a significant increment.

Given the complexity of collective actions in the commons, it is widely acknowledged that systems of governance need to be flexible to allow adaptation of management regimes to local conditions (Adhikari and Lovett 2006). In the literature on the environmental commons, attention focuses primarily on class-related interests that affect the prospects for local or regional action. Our results suggest that socioeconomic status may also operate through assessments of environmental change that become more varied as socioeconomic status increases. While our results suggest that the strongest foundations for action in the commons are local, they also indicate that disagreements about environmental risks may undermine the leadership potential of local elites. By implication, village-level governance based on widespread participation in decision-making seems likely to promote the most effective environmental measures in the Indian Sundarbans. This is a key message for development partners, policy makers and practitioners working on management of environmental resources in the Indian Sundarbans.

[9] These are the constant terms in the regressions.

We should also note that our results may have broader geographic implications. Our research methodology can be replicated in other places and, as we have noted, our findings are consistent with previous research on consensus-building that finds more divergence among individuals with high socioeconomic status. Although more research is clearly desirable, we believe that these results may provide more relevant insights for collective action on environmental problems.

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APPENDIX

Table A: Survey dimensions for household selection

Household Characteristic	Dimensions
Address	Panchayat
	Village
	Within village
Location	Close to the river
	Intermediate location
	Interior village
Ethnicity	Scheduled caste
	Scheduled tribe
	OBC
	Other
Religion	Hindu
	Muslim
	Christian
	Other
Education	Highest level
Occupation	Agriculture
	Fishing
	Forestry
	Service
	Other
Income and Employment	Permanent
	Seasonal
Migration	Permanent Seasonal
Housing Details	Housing type
	Distance from amenities
	Household assets