

Conflict of Resource Use Among Different Livelihood Group in Coastal Villages of South-Western Bengal Delta, Bangladesh



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ABSTRACT

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People, ecosystems and resources are three crucial components for understanding resource use conflicts. This study examines resource use conflicts in two coastal villages of south-western Bangladesh, where access to resources are essential to rural livelihoods. Resource utilization conflicts can emerge when interests and needs of different users groups are incompatible or denied by each other. Considering these issues, this study has taken as an effort to explore the issues, reasons, stage, scale and impact of conflicts. Relevant data were collected through questionnaire survey, Focus Group Discussions (FGD) and Key Informant Interview (KII). The study found that rapid encroachment of crop land into shrimp farming, contrasting dynamic occupational practices, human made over use or overstrain of natural resources combined with environmental degradation and climate change, pose serious threat to human security. These rapid, and mostly unexpected changes provoke conflicts among the dominant resource user groups. Moreover, driver of conflicts and typological classification were addressed to make them comparable in the sense which one requires the most attention according to the predicted scale and urgency of impact. Conflict management strategies were discussed by four building blocks which might be a remarkable part of conflict prevention in the study area.

1. INTRODUCTION

Conflicts over resource use is a part of everyday life of the coastal people where competition over natural resources, degradation of habitats and loss of Biodiversity affect human welfare [1-3]. Hellstrom [4] illustrated that competitions for finite natural resources, divergent attitudes, relationships and interactions among the stakeholders as well as institutional weakness underpin the rural livelihoods. This context is supported by several authors where competition over resources were highly focused for human made over extraction or overstrain of resources that may upsurge the risk of conflicts [1, 5-7]. Generally, access to renewable natural resources become highly contested when parties disagree about the management, allocation, use or protection of natural resources [1, 3, 6].

Coastal region is extraordinarily rich in terms of diversified ecosystem services and livelihood activities but conversely vulnerable due to its geographical shape and location [8, 9]. The south-western coastal region of Bangladesh is a part of an active delta of lower Ganges-Brahmaputra-Meghna (GBM) drainage basin [10]. This is one of the most complex estuarine ecosystems of the world where the people govern their livelihood by diversified land use and occupational pattern [11]. This region is the home of millions of people but the coastline is mostly irregular and consist of a series of river and canal network which continuously changing their courses, flow velocity and natural land formation [12-14]. Conversely, this area is the hub of recurrent hydro-climatic disasters, erratic rainfall and temperature change, water logging, salinity

intrusion, diverse land use changes [15, 16] and competitive resource consumption pattern [17-19].

Pattern of interactions among land, water and other natural resources refer to the bargaining processes among stakeholders in the pathway they extract resources, formulate new rules and demand action from other stakeholders [20-22]. Hence, the management of land, water, fisheries and forests resources are highly contrasting and challenging. This phenomenon is more prominent in coastal zone where access to and control over common-pool resources are essential to rural livelihoods [11, 18, 23, 24]. In addition, wide array of environmental stresses from inefficient natural drainage systems, waterlogged floodplains, salinity intrusion, large scale *polderization* (coastal enclosures) provoke violent conflict by increasing socio-economic vulnerability, reducing soil and water quality and thereby impact on agricultural diversity and productivity [10, 14, 25-27]. When ecosystem and resources are mostly challenged by weak institutions, fragile political systems and divisive societal complexities may fuel the spiral of violence or conflict. Therefore, this paper endeavors to assess the cases of disagreement and decipher the resource use conflicts among different livelihood group in coastal villages of south-western Bangladesh.

2. MATERIALS AND METHODS

2.1 Study area

The villages *Bara Kupot* and *Henchi* - preselected as they

are peripheral to the coastline situated on the bank of *Khalpetua* river in Atulia Union of Shyamnagar, Satkhira in the southwestern coastal Bangladesh (Figure 1) around latitude 22°18' N to 22°22' N and longitude 89°08' E to 89°14' E. The study area is included in *Polder 15*. These villages were severely affected by cyclones *Sidr* during November 15, 2007 and *Aila* during May 25, 2009 in recent past. The *Atulia* union is on the periphery of the *Sundarbans* – the largest single tract mangrove forest globally - being separated by the river *Malancha* and 30 km from the coast. *Bara Kupot* is closer to the *Kholpetua* and is separated from *Henchiby* a canal, locally called *Arpangashia-Henchikhal*, originated from the river *Kholpetua* [28]. These two coastal villages were selected as study area because natural disasters such as: cyclones, tidal surges, storms, saline water intrusion and water logging are prominent occurrences of this region [29]. In addition, land use and land-cover change is another major concern of their resource use pattern within the study area [30]. The livelihood and economy of Shyamnagar's inhabitants are based on shrimp culture, crop farming and the natural resources of Sundarban. Since the implementation of the polders, no large-scale government projects and management approaches have been implemented there apart from some roads constructed by the Local Government Engineering Department and minor support provided by the local NGO.

2.2 Geological and hydro-geological setting

Physiographically this area lies in the *Ganges Tidal Floodplain* as a broad bend of very low land – barely a meter above the sea level – and biophysically may be termed as *immature delta* [31]. Geochemically the soils are mostly non-calcareous grey floodplain and acid sulphate soils (saline) [32]. Lithologically, the area is composed of coarse to very fine sand, silt and silty clay up to a depth of 300 m with peaty soil and calcareous as well as non-calcareous soil at the top. The surface lithology of the area is of deltaic deposits which are composed of tidal deltaic deposits, deltaic silt deposits, and mangrove swamp deposits [33, 34].

The region experiences subtropical humid weather conditions and the maximum temperature reaches up to 35.5°C during summer and the minimum temperature is 12.5°C during winter [35]. The regional temperature shows a maximum decreasing trend of 3.1°C per hundred year whereas the minimum increasing trend is 1.9°C per hundred year for the period of 1960-2011. The average annual rainfall is around 1710 mm [36] and 78% of the total rainfall is received between July to October – the monsoon season [37-39]. It is important to know geological and hydro-geological setting of a region because occupational and livelihood pattern in a coastal agrarian society primarily depends on geological location and climatic conditions of that region.

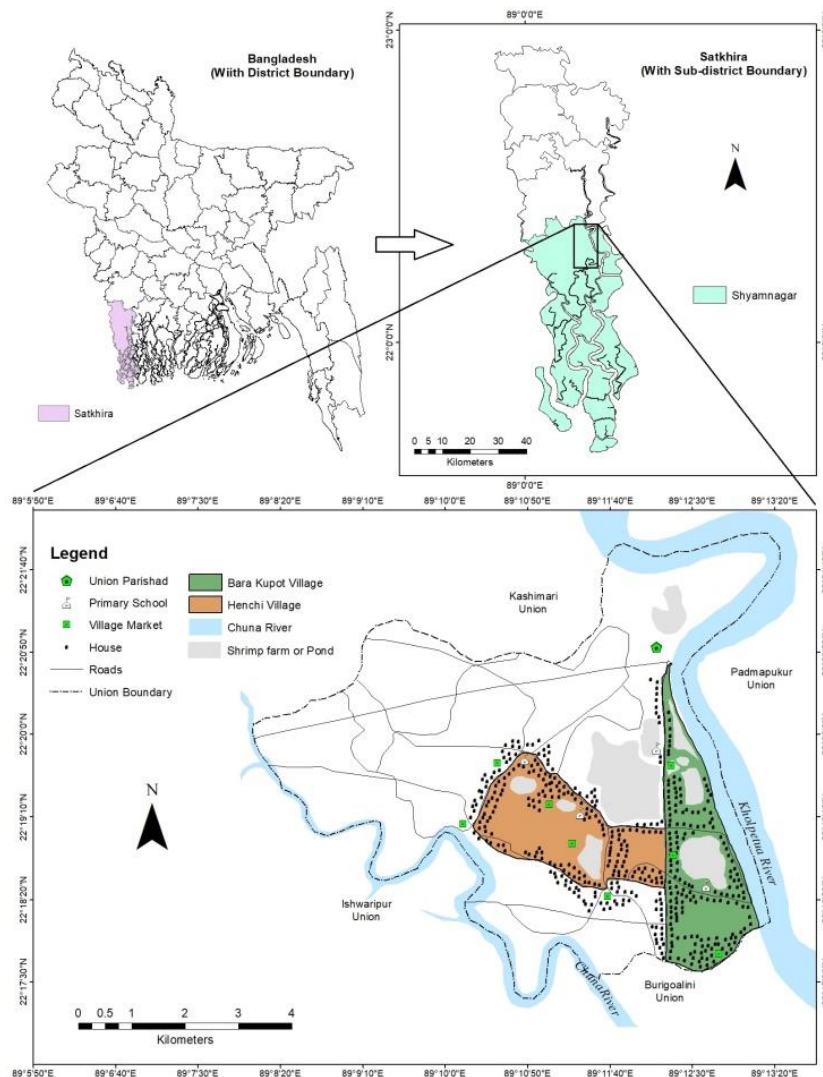


Figure 1. Location map of the study area

2.3 Sample size determination

A total of 948 households (HH) were recorded in *Bara Kupot* and 158 in *Henchi* where the people are involved in 29 different types of primary and secondary occupations. Correlation matrix of the primary socio-economic attributes of *Bara Kupot* and *Henchi* are performed and best relation were found between cultivable land area and total income of households. Since both these parameters are determinants of occupation the households were stratified accordingly where 12 households in *Bara Kupot* and 22 households in *Henchi* are lying outside the cluster and have not been considered here. The sample size (n) for the rest of the households (936 for *Bara Kupot* and 136 for *Henchi*) was determined following Kothari [40] at 99% confidence level:

$$n = \frac{z^2 \cdot p \cdot q \cdot N}{e^2(N - 1) + z^2 \cdot p \cdot q}$$

where, N = population size; n = sample size; p = sample proportion; $q = 1 - p$; z = standard variation at a given confidence level; and e = acceptable error (the precision). At 99% confidence level, $z = 2.5758$; $p = 0.1$; $q = (1 - 0.1) = 0.9$; $e = 0.05$.

Here, estimation shows that household sample size (n) for *Bara Kupot* is 190 households and for *Henchi* it is 86.

2.4 Data collection

The study investigated and analyzed socio-economic attributes and conflicting issues of the south-western coastal villages. Primary data were collected using a combination of semi-structured questionnaire, Focus Group Discussion (FGD), Key Informants Interview (KII) incorporated in Table 1. Other methods such as: transect walking, community visioning etc. were also conducted to explore local knowledge, livelihood activities and coping strategies of the villagers. The field visit was done purposively in two coastal villages under Shyamnagar Upazilla. Also, these villages are situated at the periphery to the Sundarbans. Along with agro and shrimp farming, a majority of the population of these villages sustains their livelihoods directly or indirectly on the Sundarbans.

Table 1. Methods and techniques used for data collection

Methods	Purpose	Time
Questionnaire survey	To collect information on socio-economic and livelihood attributes.	January, 2017
FGD	To identify risk, livelihood, climate change impacts, major disaster impacts etc.	February, 2017
	To explore the cases of disagreement and resource use conflicts	
KII	To know about the biophysical-livelihood strategies, respective challenges, conflicting issues and probable solutions.	March, 2017

2.4.1 Questionnaire survey

A total number of 190 households for *Bara Kupot* and 86 households for *Henchi* were purposively selected for questionnaire survey from the baseline data. Questionnaire

survey was performed to explore some general information (e.g. primary and secondary occupation, education, age etc.), observation of local environmental condition (e.g. changes of water and soil salinity, rainfall, temperature etc.), land type and land use changes (e.g. before and present situation and associated factors that govern their land use pattern). The questionnaire survey also focused on their farming pattern, natural phenomenon they observed for the last 10 years, health and sanitation etc.

2.4.2 Focus group discussion (FGD)

A focus group discussion was arranged with local inhabitants between age 25 years and 60 years with 35% female participants. There are ten FGD was conducted in the study villages (5 for *Bara Kupot* and 5 for *Henchi*). More than 50% participants are literate and belong to lower economic group. Majority of the participants are involved with shrimp farming, agriculture and manual labor. The female participants are mainly housewives but a good number of them also partially engaged with agriculture and homestead vegetation. Often forced displacement takes place when resource is scarce. At present, most of the participants do not own livestock because of the lack of grass lands. Potable water is scarce and they have to collect water either from Pond-Sand-Filter or from ponds travelling a long distance. A vast majority of the participants are eager to go for alternative occupation rather than depending on the natural resources. To derive important illustration and statement regarding conflict between user groups, topological classification of resource use conflicts and how the management approaches look like, focus group discussion method are used in the study.

2.4.3 Key informant interview (KII)

Key Informants Interview was performed on those who are knowledgeable, willingness to share information, communicative, impartial and have a role in the community or understanding of the phenomenon deeply. Thus, to know about background information, occupational disagreement and issues, management strategies, Resource use conflict: nature and causes, there are 10 number of KII were interviewed (Upazilla agriculture and fisheries officers (2); Teachers and researchers (2); NGO Executives and their representatives (2); Civil society and Media personnel (2) and 2 grass root people).

3. RESULTS AND DISCUSSIONS

3.1 Socio-demographic profile

The BBS (2011) recorded the population of *Bara Kupot* and *Henchi* together as 1698 where the total households residing in *Bara Kupot* is 269 with a population of around 1320 while in *Henchi* the total number of households is 93 with a population size of 378.

However, our study differs from that of BBS [28] and the study record represent that total households living in *Bara Kupot* is 948 with the average household size is 4.9. The *Henchi* accommodates a total number of 158 households with the average household size is 4.1. The percentage of male and female ratio, different age group such as children and their school attending, representing age group, literacy rate and the demographic status of *Bara Kupot* and *Henchi* are mentioned in Table 2.

Table 2. Socio-demographic profile of the study area

Demographic parameters			Bara Kupot	Henchi
Total household			948	158
Household density			4.9	4.1
Total population			1320	378
Male- female percentage	Male		46.89%	47.08%
	Female		53.10%	52.91%
Children (0-18)			33.70%	36.60%
Working force (15-64 years age)			66.20%	61.10%
Education	Formal		75%	80%
	Non-formal		25%	20%
Major representing age group			27- 35 years (37%)	22- 33 years (40.1%)
Literacy rate			54.80%	65.80%
HH members in occupational group	Agro- based	Max	8	5
		Min	3	3
	Non-agro Based	Max	10	8
		Min	3	3
Farmers	Male		25.20%	31.10%
	Female		28.30%	36.10%

(Source: Household survey, 2017)

3.2 Existing resources

Livelihoods in the coastal zone are varied, often influenced by different resource use pattern. Almost 80% of coastal villagers depend on agro and aquaculture based activities to govern their livelihood. As consumption increases, the villagers face growing shortages of vital natural resources such as freshwater, cropland, forests, fisheries and other wildlife. Thus, a significant number of people are directly or indirectly

or indirectly dependent on the resources of the Sundarbans for their livelihood support. Fishing and crab collection from the small creeks in the Sundarbans are the primary occupation for those depended totally on the Sundarbans. The local people also collect timber, fuel wood, honey, *goran* and *golpata* from the Sundarbans when opportunity arrives. Table 3 provides an outline about the key resources that play a major role in the livelihood of the coastal villagers.

Table 3. Natural resources in the study villages

Resource	Features	Utilization Pattern
Land Resource	Landforms formed from the huge amount of alluvial sediments	Household construction, Fish culture, Crop production
Water Resource	Aquaculture based saline water for shrimp farming, Pond and river water used for agriculture, Drinking water- pond, tubewells and PSF	Aqua culture, Agriculture, House construction, Brick production, Roads and communication
Food Resource	Cow, Goat, Crab, Shrimp, Fruits, Rice, Vegetables	Provide food, Meet nutrition, deficiency
Forest resources	Mainly social forest, Heterogeneous mixture of plants is observed, Small timber for building huts and houses and grass for grazing and small feeding livestock.	Provide oxygen, Used as fuel wood, Medicinal plants, Provide fruits to people
Energy Resource	Fuel wood, bushy plants and solar energy.	Collection of fuel wood, Utilization of solar energy but not significant.

(Source: Household survey, FGD and KII, 2017)

3.3 Preface to occupational and land use shift: resource use conflicts

After the construction of coastal embankments in 1960, the people were heavily engaged with the agriculture activities. Though they have got only one season crop but that agro based activities were more environment friendly (95% people's perception). In addition, it supported their housing materials as well as daily fuel and livestock rearing (88% people's perception). This agricultural practice was highly profitable for 10 or 15 years but after a particular time period, severe water logging due to higher siltation on river bed and sudden flooding in the rainy season posed a great threat to the agro production.

In the meantime, some elite people started shrimp farming outside the embankment along both side of river and canal through grabbing *khash* land in 1980. At that time, it was completely natural based farming and there was no need

shrimp fry, fertilizer and other water treatment chemicals. As it was highly profitable than agro farming, significant number of people engaged with shrimp farming inside the coastal enclosure (embankment) intentionally to gain benefit (35% people's perception) whereas other people involved without getting any alternative sustainable land use practices (65% people's perception).

After 1990, the people were heavily engaged with extensive shrimp farming which has become a major export industry in this coastal zone. A large number of agro fields were converted into aquaculture chiefly shrimp farming. Thereafter, big *gher* were converted to small *gher* area through the involvement of small agro farmer in the shrimp farming (95% people's perception). Although shrimp farming was highly profitable for 10 or 15 years but at present it already appeared as vulnerable occupational practices. Table 4 insights the vulnerability and problems of three resource dependent livelihood group.

Table 4. Current problematic issues are faced by dominant resource dependent stakeholders

Agro cultivators	Shrimp cultivators	Mix cultivators
<ol style="list-style-type: none"> 1. The support system is not favorable for crop production. 2. Leaching saline water into agro field from the surrounding shrimp farm land. 3. High investment cost for seed, chemical, fertilizer and low market price. 4. Water logging, sudden flooding, tropical cyclones. 5. Low production 	<ol style="list-style-type: none"> 1. Limited water exchange facilities due to netting, illegal grabbing- sluice gate, canal, river. 2. Lack of natural shrimp fry and sudden death of shrimp 3. High investment for land leasing, food, chemical. 4. High water and soil salinity 5. Uncertain production 	<ol style="list-style-type: none"> 1. The support system is not favorable except few areas. 2. Salinization of soil and water is a major concern. 3. High investment cost for land preparation, food, chemical. 4. Water logging and flooding. 5. Production vulnerability.

(Source: Household survey, FGD and KII, 2017)

3.4 Stakeholders involved in conflicts

Although the people are involved more or less 15 kinds of occupational activities but 90% stakeholders and community people conflict with each other under three major livelihood groups to support their livelihood processes. Among diversified occupational livelihood processes agriculture,

shrimp farming and mix cultivation are three major dominant livelihood practices that govern the livelihood of 80% coastal people. In both villages conflicts are caused by disputes among the group of stakeholders involving one or more of the following root causes corresponding their interests, goals, relationships, positions and capacities in decision making process (Table 5).

Table 5. Description of stakeholders involved in the conflict

Livelihood Groups	Sub groups	Livelihood process	Goals	Position	Decision making capacity	Governing interests
Shrimp Farmer	Big farmer	Shrimp & crab culture	High profit	In favor of shrimp farming	Strong	Economic solvency
	Small farmer	Shrimp, white fish & crab culture	Adapt with the condition	Majority want back to agro or mix cultivation	Medium	Economic solvency and livelihood support
Agro farmer	Mono cropper	Crop Farming	Sust. agro farming	Fully against current shrimp farming	Low	Env. & cultural protection & people's health
	Mixed cropper	Crop & vegetable farming	Supportive env.		Medium	
Mix cultivators	Crop & white fish farming	Both crop cultivation & aquaculture	To adapt with the env. & human induced changes	Neither support mono cropping nor current shrimp farming	Low	Economic solvency & livelihood support
	Crop & Bagda/ Golda farming				Medium	

(Source: FGD and KII, 2017)

3.5 Fundamental drivers of conflict over resource use

Conflicts related to resources and its management is now more troublesome than ever earlier due to stressed environmental condition [41]. Growing shortages of vital renewable resources, combined with environmental degradation and climate change pose fundamental threats to livelihood security. Separately or in combination with other factors it causes competition over scarcity of natural resources termed as Driver-1. Conflict itself is not a negative phenomenon until it remains under proper management around their ownership, allocation and control. However, under socio-economic and environmental fragile state, poor governance (Driver-2) over environmental and resources management lack the dimensions to resolve disputes or depletion of natural resources, can lead to violent conflict. Under Driver-3, conflict becomes challenging depending upon rate of use, who should have access to and control over resources, and who can influence decisions regarding their allocation and sharing of benefits. Although, there are some other sub drivers may influence resource use conflict but conflict prevention strategies must often take into these three major driver as these three drivers can interact with and reinforce each other

Driver-1 refers to competition over scarcity of natural resources. Nearly three quarter of the participants think that when the supply of renewable resources such as land, water,

croplands and forests are not adequate to meet the local demand then it creates a situation which forces the inhabitants to compete over resources. Both two coastal villages are very close to periphery of Sundarbans and open to the Bay of Bengal. The study suggest that the *Bara Kupot* villagers are more competing than that of *Henchi* due extensive shrimp farming and high level of water and soil salinity in the cultivable land. Competition starts when different groups in a society face unequal resource access (structural scarcity) and therefore causes imbalance between supply and demand when the scarcity arise for a specific renewable resource (demand induced scarcity) as the demand cannot be met by the existing supply (supply induced Scarcity).

Driver-2 indicates poor governance over environmental and resources management. In the study villages there is no proper planning and implementation strategies that keep pace between their socio-economic processes and ecological processes. The study suggests that conflict over resource use caused not only increasing scarcity and competition between groups but also be the sense of injustice, inequity and marginalization. The land and water use is mainly controlled by the big shrimp farmers, elite and powerful political groups in absence of good governance and effective land use zoning.

Driver-3 denotes trans-boundary natural resource dynamics and pressures. Trans-boundary natural resource dynamics and pressures are mainly caused by four types of trans-boundary dynamics and pressures that emerge conflicts among paddy,

shrimp and mix cultivators- 1) unequal or inflexible use (13% people's opinion); 2) environmental degradation (27% people's opinion); 3) land use changes (50% people's opinion) and 4) illegal exploitation of resources (10% people's opinion). This is generally caused by unclear boundary disputes and

growing demand for resources. Finally, river and canals of the study villages are grabbed by different beneficiary and powerful group that may act as the stimuli of resource use conflict.

Table 6. Resource use remarks and conflicts over different user groups

Governing livelihood	User group	Problematic remarks	Livelihood threat
Shrimp farming	Big farmer	Get enough river water and suitable for shrimp culture but sometimes conflict with the sluice gate operator, LG and illegal occupier of common pools of resources	Uncertain production
	Small farmer	Get less water. Conflict with sluice gate operator, LG and big farmer	Production and income vulnerability
Agro farming	Mono farmer	Get less water and faces salinity intrusion, water logging. Conflicts with shrimp farmer and LG	Yield reduction, vulnerable livelihoods
	Mixed farmer	Get less water and faces salinity intrusion. Conflicts with shrimp farmer and LG	vulnerable livelihoods
Mix cultivating	Crop and white fish farming	Face difficulties in land and water management. Conflicts with both agro and fisheries communities	Short term sustainability
	Crop and Bagda/Golda farming		Short term sustainability and production
Households	Poor	Scarcity of food, fresh water, cultivable land etc. Collect resources from common pools and forest. Conflict with lease holders	Resource scarcity and livelihood vulnerability
	Rich	Purchase most of their food items from market	High price rate and resources scarcity

(Source: Household survey, FGD and KII, 2017)

3.6 Different resource use groups in the study villages

In the study villages, socio-economic condition of the coastal community is mostly depending on paddy, shrimp and mix cultivation practices. The study has found four major resource user groups who are predominantly conflict upon each other due to dissimilar demand, varied perception, occupational and livelihood threats. Each user group predominantly seeks their personal gain and tries to dominate other user group based on their capacity and capability to control over the resources. Competing interests over natural resources can be a source of conflict and transform both inter and intra user depending on livelihood responses, the mix of drivers, existing governance assemblies and the level of conflict intensity incorporated in Table 6.

3.6.1 Shrimp farming group

Shrimp farmers are divided into two groups: big farmer (Big *gher* owner: cultivate more than 10 acre land) small farmer (small *gher* owner: cultivate less than 10 acre land). The number of big *gher* owner is comparatively higher in *Bara Kuptan* than that of *Henchi*. They are the leading group and control almost whole water and land resources expressly in *Bara Kuptan* village. They are the occupier of major cultivable land and use direct saline water for shrimp farming. They involve both illegal and legal fishing and always compete with small shrimp and agro farmers. Both big and small farmers are responsible for gradual increase in soil and water salinity which negatively impact on crop production, home stead vegetation and even the whole biodiversity over the regions. Most of the big shrimp farmer think that no other farming could be successful except shrimp while the small farmer is divided in their opinion because they don't know which farming practices should be adapted for long term

sustainability.

3.6.2 Agro farming group

They are two types of agro farming group found in study villages. The mono croppers are mainly depending on paddy cultivation but they prefer at least two times crop production over the year round. They are victimized by the shrimp farmers, sluice gate operators and so called legal occupier of common pools resources. In fact, they are facing the harsh reality biophysical and environmental changes (e.g. increasing water and soil salinity). Most of the agro farmers think that sustainable agricultural practices are badly needed to protect the environment and uphold ecosystem services. Although it is less profitable but it can support other livelihood facilities such as fuel, food, livestock, more employment opportunities and also favorable support system for home stead vegetation, floral and faunal enrichment.

3.6.3 Mix cultivator group

The mix cultivators are principally divided in two part-one who seek to cultivate both paddy and white fish and another who seek to both cropping and *bagda* or *golda* culture according to seasonal variation all the year round. Both group of people prefer environmental protection along with economic solvency to support their present and future livelihood. Except few cases their land and water management are not in favor for such combine culture. Most of them believed that sustainable mix cultivation practices can open a new pathway of coastal people.

3.6.4 Household group

The communities who are rich are largely service holder or businessman. They lead their life depending on the purchasing capacity which is chiefly income based. The poor households

are the principal resource collector from common pools and forest resources. Competition among different livelihood groups (e.g. farming, livestock, fishing etc.), variation in resources availability and sudden contraction of natural resource supply may impact on household group whereas commercialization of common pools resource may escalate the violence of disputes.

3.7 Social coalition formation over resource uses

At present, good numbers of people want back to traditional ago-based farming or environment suitable mix cultivation practices. But most of the resources are under so called legal

occupies and elite or powerful group of the society still now. The existing socio-economic vulnerability contributes to occupational instability when they overlap with other interactive factors such as vulnerable livelihood, demographic pressures, natural calamities, socio-ecological changes and climate change threats. Figure 2 depicted how natural resources play a central role in coastal livelihood and have a critical role in legitimizing and shaping of the resource conflict. In coastal social setup, the relationship between the supply of resources and the number of resource users, which even in normal conditions is problematic concerning who should have access to and control over resources.

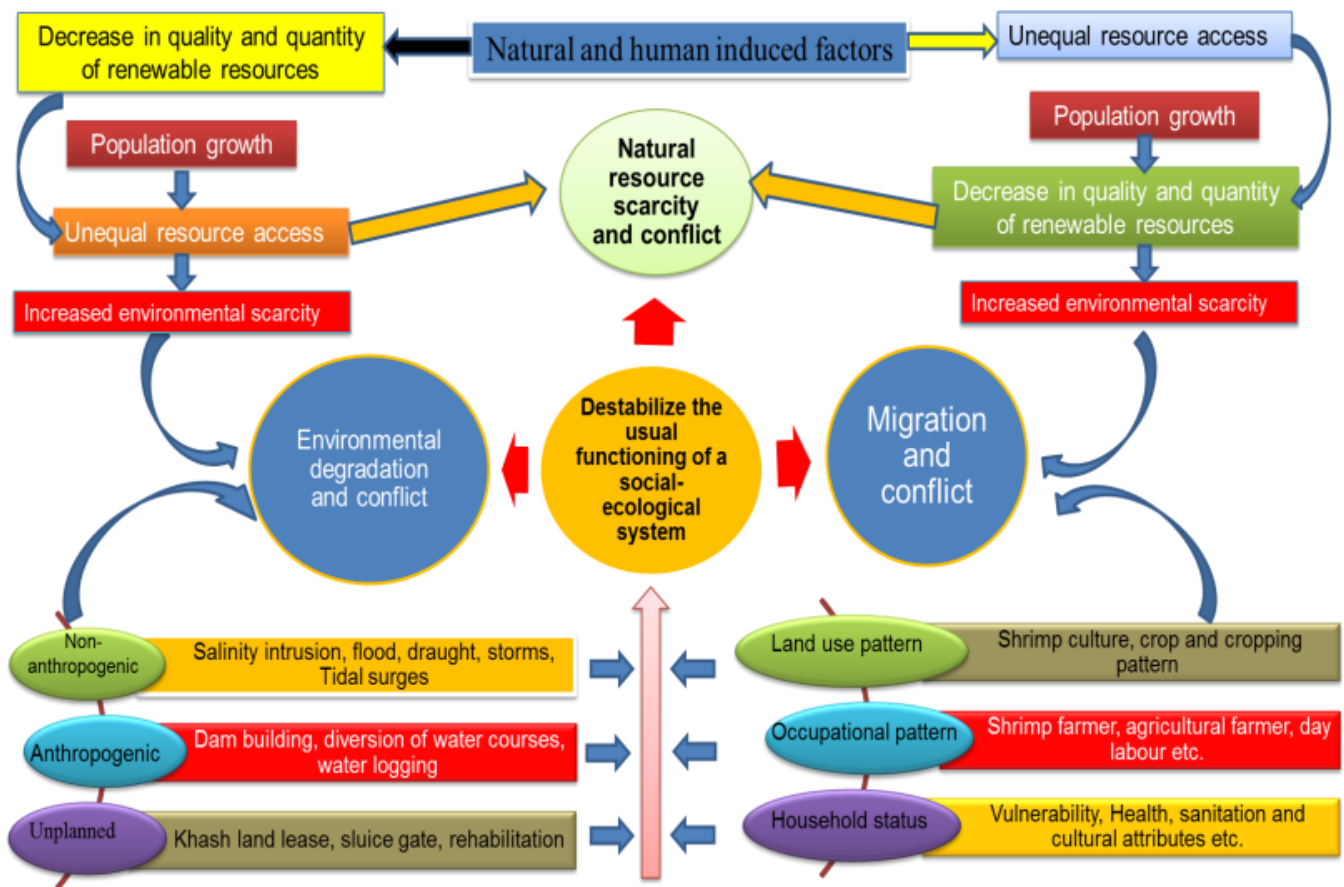


Figure 2. Social networks in coalition formation over resource use cases in coastal livelihood

Climatic variability (e.g. salinity intrusion, flood, cyclones etc.); human made interventions (e.g. dam building, embankments etc.) and larger struggle over political, economic, cultural, ownership etc. issues destabilize the usual function of social ecological system. In this context, scarcity of livelihood essentials, growing demand, unequal resource access and decrease in quality and quantity of resources are alleged the ways of conflict formation among the resource user. An intuitive interactive pictorial view can be found from the following figure where people, environment and natural resources interact in combine that have provoked wide-spread concerns over environmental resource scarcity and social impacts.

3.8 Typological classification of resource conflicts

Typological classification is a systematic differentiation of conflicts which is very significant for comparative analysis

and assessment of environmental conflicts [42, 43]. It is mainly used for labeling the resources use conflicts. Although their characterization involves several factors, actors and dimensions but possible future evolutions can be obtained from classification, comparisons and generalizations of the conflict on the basis of objective of analysis and characteristics. Based on the abovementioned, a combination of Cadoret [44], Skutsch [45], Rupesinghe [46] and Warner [47] classification were used for typological classification of resource use conflicts.

3.8.1 Classification by dynamics/manifestation over time

This category of typological classification is based on [44], who labeled the conflict's manifestation over time as chronic, anticipation, hushed or deferred and hybrid. Form the conflict classification it is found that both villages are under chronic and anticipation conflict. Chronic in the sense because it is spread over a relatively long period of time (+10y) and which

is characterized by several crises. It is anticipation conflicts because majority of the people express a form of fear about their future how their future look like! They also anticipate the consequences of change, without having a clear vision of infrastructural development continuing the change in practice, in landscape or in the function of ecosystem [44], The classification only varies in case of forest resources where it is only under anticipation types (as shown in Table 7).

3.8.2 Classification by underlying cause/substance

This typological classification is based on Skutsch [45], which provides an idea of what the underlying cause is: conflicts over access; conflicts due to change in resource quality and availability; conflicts regarding authority over resource; conflicts that are value based; conflicts associated with information processing and availability; and conflicts occurring for legal/policy reasons. This classification is very complex because each resources conflict is related to a different cause/reasons from which a certain type act upon principal under-lying cause. The following table (Table 8) provides an overview about the underlying causes of different resource conflicts.

3.8.3 Classification by scale

Warner's [47] classification used to typify the different resource conflict at conventional scale and the respective inter / infra and trans-variations in natural resource conflicts. He proposes a typology that is more relevant for environmental and natural resource conflicts and distinguishes them.

Conflicts over land and water resources scaled under infra micro-micro conflicts (boundary disputes, elite capture of benefits, community differences) and micro-macro conflicts which is related to environmental problems and contradictory resource needs. Typological classification for food and energy resources are also under micro-macro conflicts scale whereas forest resources conflicts scaled under inter micro-micro categories. The above table (see Table 9) gives an overview of the typological classification of resources conflicts in the study villages.

3.8.4 Classification by stage

Typological classification of environmental conflicts by stage allows discerning the evolution of the conflict and its present situation according to Rupesinghe [46], who distinguishes the five different 'stages' of conflict, or 'cycle of conflict'. An evolving conflict can be subject to a new negotiation process that provide an insight on how far the conflict is evolved and shows how it can be resolved.

Table 10 gives an overview of the resource use conflict cases by stages which reveals that in case of water and land resources conflicts over resources use are in transformation stage which urgently need new environment friendly management and institutional development. In case of food resource conflicts, it is under endurance stage and to minimize this conflict community empowerment and/or mediation processes already have taken. Conflict over forest resources is under formation stage and properly addressing at this stage conflict may not escalate and manifest itself.

Table 7. Typological classification of resource conflict cases by dynamics/manifestation

Types Cases	Chronic		Anticipation		Flushed or deferred		Hybrid	
	Bara Kupot	Henchi	Bara Kupot	Henchi	Bara Kupot	Henchi	Bara Kupot	Henchi
Water resources	1	1	1	1				
Land resources	1	1	1	1				
Food resources	1	1	1	1				
Forest resources			1	1				
Energy resources	1	1	1	1				

N.B.: 1 represent the type of resources conflicts in the study villages

Table 8. Typological classification of environmental conflict cases by underlying cause

Types Cases	Change in res. quality & availability		Infringements over access		Conflicts that are value based		Authority over resource		Availability of legal / policy reasons	
	Bara Kupot	Henchi	Bara Kupot	Henchi	Bara Kupot	Henchi	Bara Kupot	Henchi	Bara Kupot	Henchi
Water resources	1	1	1	1			1			
Land resources	1	1	1	1			1			
Food resources	1	1			1	1				
Forest resources			1	1					1	1
Energy resources	1	1			1	1				

N.B.: 1 represent the underlying cause of resources conflicts in the study villages

Table 9. Typological classification of environmental conflict cases by scale

Types Cases	Infra micro-micro conflicts		Inter micro-micro conflicts		Micro-macro conflicts		Conventional scaling: local, regional, national etc.	
	Bara Kupot	Henchi	Bara Kupot	Henchi	Bara Kupot	Henchi	Bara Kupot	Henchi
Water resources	1	1			1	1	Local vs. national	
Land resources	1	1			1	1	Local	
Food resources					1	1	Local vs. regional	
Forest resources			1	1			Regional vs. national	
Energy resources					1	1	Local	

N.B.: 1 represent the underlying scale of resources conflicts in the study villages

Table 10. Typological classification of resource conflict cases by stage

Types Cases	Conflict formation		Conflict manifestation		Conflict endurance		Conflict management		Conflict transformation.	
	<i>Bara Kupot</i>	<i>Henchi</i>	<i>Bara Kupot</i>	<i>Henchi</i>	<i>Bara Kupot</i>	<i>Henchi</i>	<i>Bara Kupot</i>	<i>Henchi</i>	<i>Bara Kupot</i>	<i>Henchi</i>
Water resources									1	1
Land resources									1	1
Food resources					1	1				
Forest resources	1	1								
Energy resources			1	1						

N.B.: 1 represent the stage of resources conflicts in the study villages

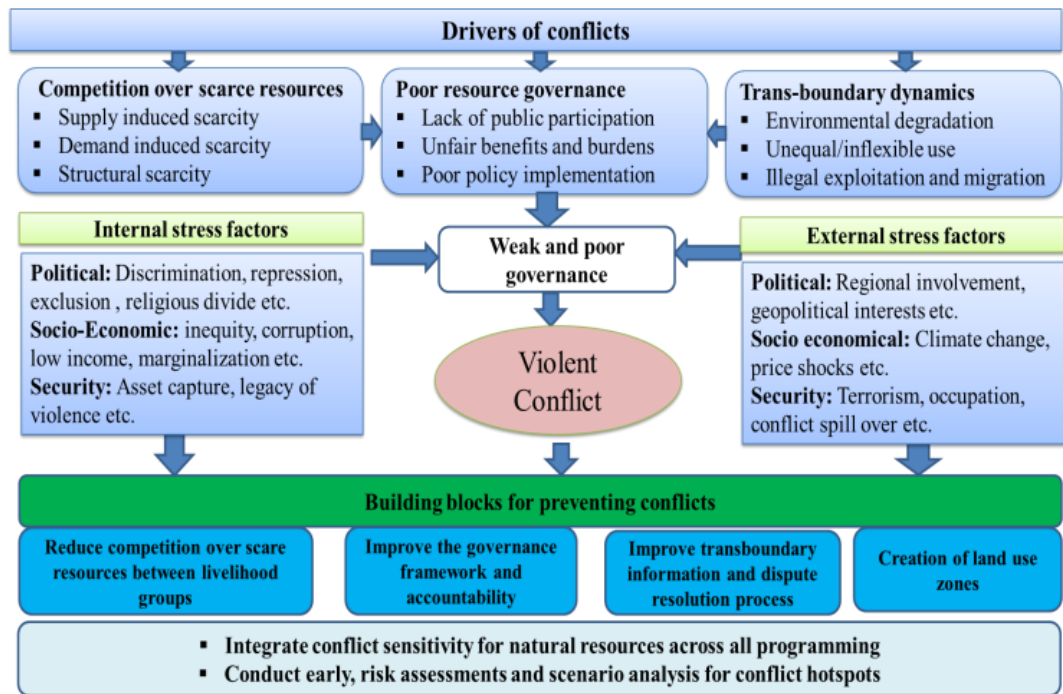


Figure 3. Drivers and stress factors of environmental strategies for preventing conflicts over natural resources (Adopted from *UNDP* [48] and *UNICEF* [49])

3.9 Conflict prevention strategies

In most cases, conflicts over renewable resources interact with existing political, socio-economic and stress factors, requiring a response on multiple levels derived from bottom-up, cross-sectorial participation and collective action at micro to macro levels [48]. Disputes and grumbles over natural resources act as the sole cause of conflict when they overlap with other factors. To abate these types of conflicts, most respondents put emphasis on effective inlet and outlet water exchange along with homestead buffer zoning to save the home gardening from salt intrusion. In addition, to recover occupied water channels from illegal or so-called legal occupiers need good governance. Competition over scarce resources between livelihood groups, poor resource governance and trans-boundary resource use scheme are the fundamental drivers of conflicts. When internal stress factors (e.g. political: discrimination, exclusion, religious divide etc.; socio-economic: inequality, corruption etc. and social security: asset capture, legacy of violence etc.) overlap with external stress factors such as political (e.g. geopolitical interest, regional involvement etc.), socio-economical (e.g. climate change) and occupational security, determine whether the conflict becomes violent or not.

The conflict prevention program must consider four main building blocks and supporting interventions (see Figure 3).

The first one is reduced competition between livelihood groups over scarce resources by supporting the coastal livelihood through management of biophysical attributes and by increasing the resource availability through preventing environmental degradation. Secondly, establishing adaptation framework, strengthening capacity of civil society and engaging them in the decision making processes can secure the livelihoods by ensuring good governance, accountability and dispute resolution.

Although the third one is very complex but resource-sharing agreements and joint institutions can contribute to minimize conflict over trans-boundary management and cooperation. The last one is proper land use zoning over risk assessments and scenario analysis would be a significant part of conflict prevention strategies.

4. CONCLUSION

Natural resources critically govern the livelihood of two coastal villages, namely *Bara Kupot* and *Henchi*. Diversified interests, goals, position and relationships of different resource user group contribute to instability and conflict when they disagree about the management, ownership, distribution, use and safeguard of natural resources. Competition over scarcity, poor governances and trans-boundary resource dynamics

under increasing pressures act as the sole cause of conflict. This is exemplified by the large scale occupational shifting, abrupt land use changes and illegal resources capturing, which in turn challenge the livelihood dependencies and minimum access to basic right to those resources. The main focus in this study was to find out the combine ranking which express the overall assessment of conflicts and make a comparable sense about "which conflict requires the most attention". With such constraints and complexities it is very difficult to ensure resources availability and minimizing the risk of conflicts. For these reasons, minimizing conflicts over resources require a set of approaches which include improved resource governance and sustainability, better responsibility, more community participation, stronger mechanisms for dispute resolution, improved trans-boundary resource management and so on. Further study is needed for taking strategic action and it's implementation in preventing resource use conflicts.

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