An assessment of Redistribution of Population in Majuli Island due to river bank erosion

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Abstract: Majuli, the world's largest inhabited river island has been shrinking in size over the years due primarily to the phenomenon of river bank erosion leaving only 421.65 sq.km of the island by the year 2001 rendering hundreds homeless especially during floods. An important dimension of the problem relates to redistribution of people on account of the loss of villages, agricultural land and other economic support base. The present study aims at assessing the magnitude of the problem of redistribution in the island both within and without. Using data available from successive census enumeration at the village level; from the year 1971 till 2001, the study measures the extent of population redistribution through an analysis of changes in the number and size of settlements, changes in settlement structure and changes in population distribution, density patterns and growth of population. It is hypothesized that the rate of shrinkage in the size of the island is directly related to an accentuation in the process of internal redistribution of population and/or out-migration of people and changes in settlement structure leading to greater proportion of large sized villages.

Introduction

River bank erosion which is a fundamental and complex natural process but often influenced by human activities such as land clearance, agriculture, forestry, construction and urbanization, is not merely a physical process of serious consequences but also has important demographic, social, cultural and economic implications for the vulnerable section of the people. The problem gets magnified when it involves a captive people such as those residing in a river island. It is a perennial problem in Majuli-the river island in Brahmaputra River in Assam. The situation worsens during floods, rendering hundreds homeless and many more affected indirectly. The island has been shrinking in size over the years due primarily to this phenomenon of bank erosion. River bank erosion can cause complete loss of farm and homestead land and leave the poor in a totally helpless state without a source of income and livelihood, or even a house. It destroys the existing modes of production and ways of life, affects kinship and community organization and networks, causes environmental problems and impoverishment and threatens cultural identity of the people. Displacement due to river erosion continues to create impoverished families. People living in the marginal lands are severely affected and have to develop mechanisms to cope with this reality. They however cannot escape the prospects of displacement and rehabilitation when the situation goes beyond their control. Forced resettlement tends to be associated with increased socio-cultural and psychological stresses and higher morbidity and mortality rates. Population displacement therefore disrupts economic and socio-cultural structures. People who are displaced undergo tremendous stress as they lose productive resources – land or otherwise in the adjustment process. Resettling the displaced poor and economically disadvantaged is not always an easy task. Majuli, one of the inhabited fresh water river island in the world happens to be a major seat of rapid social, demographic, cultural and economic change due to flood induced river bank erosion which is taking place at an alarmingly increasing pace year after year. Erosion is likely to submerge the river island in next 15–20 years. At stake is the glorious heritage of Assamese culture (already 29 out of 65 *satras* have vanished). Ironically population is increasing in spite of exodus due to displacement and per capita cultivable land holding is diminishing. It is a problem region and is a region perceived as highly "vulnerable".

An important dimension of the problem relates to redistribution of people on account of the loss of villages, agricultural land and other economic support base. The present study aims at assessing the magnitude of the problem of redistribution in the island both within and without. Using data available from successive census enumeration at the village level; from the year 1971 till 2001, the study measures the extent of population redistribution through an analysis of changes in the number and size of settlements, changes in settlement structure and changes in population distribution, density patterns and growth of population. It is hypothesized that the rate of shrinkage in the size of the island is directly related to an accentuation in the process of internal redistribution of population and/or out-migration of people and changes in settlement structure leading to greater proportion of large sized villages.

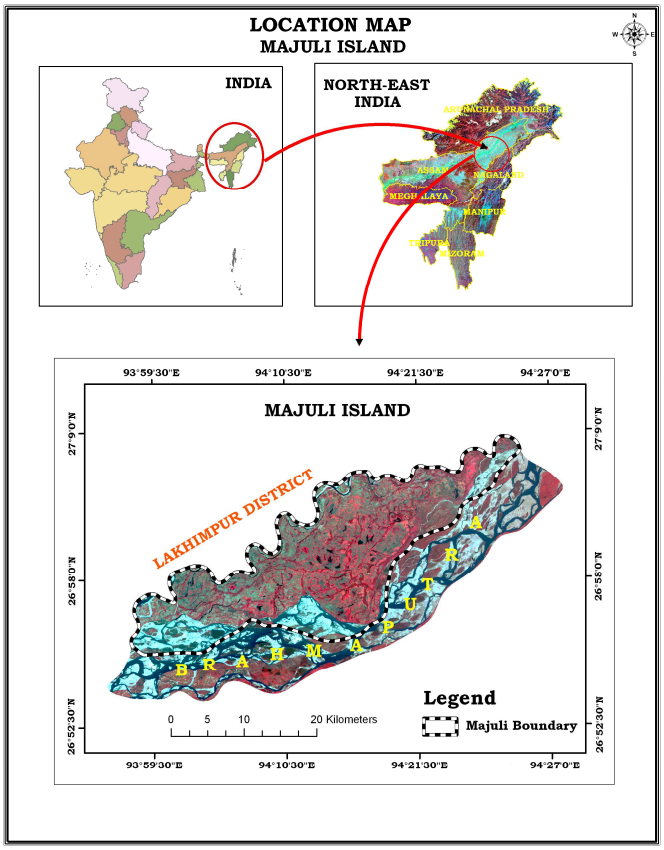

Figure 1: Location of Majuli

The Study area

The mystical isle Majuli is known to be one of the inhabited freshwater river island in the world, a subdivision of Jorhat District, lies between 26^0 45' N and 27^0 15' N and between 93^0 45'E and 94^0 30' E (Figure-1) which is facing extinction from two most serious problems notably from gradual loss of land area due to severe bank erosion and flood inundation. The end result of these twin processes is mostly migration out of the area where people and their forefathers have been living for ages and internal redistribution of population leading to greater proportion of large size villages changing the settlement structure. Over the years rural people have migrated to urban areas not because they were fascinated by the glitters of urban life but mainly for not having any other option to keep them alive in the rural setting.

The great earthquake of 1950 brought about astounding natural and geographical changes to the island and to the Brahmaputra, the lifeline of Majuli. The river-bed swelled up due to the

deposition of silt and alluvium which resulted in intense erosion, thus fracturing some fertile areas of the island. Average elevation of the island from the mean sea level is about 84.50 metres. It is a second sub–division of Jorhat district of Assam with its headquarter in Garamur, 4 km north of Kamalabari township. The sub–division consists of 3 mauzas namely Aahatguri, Kamalabari and Salmora, 20 *Gaon* (village) *panchayats* (councils) and 248 villages.

Objective

The main objective of the paper is to analyze the pattern of population redistribution within the island in the wake of progressive diminution in the size of the island.

Data and methods

The data required for this paper is based primarily on secondary data. The data has been collected from successive census enumeration, Agricultural Office (Garamur, Majuli), the Statistical Office in Garamur, the Block Development Office (Kamalabari, Majuli), District Commissioner Office, Brahmaputra Board (Guwahati), Flood Control Board (Guwahati), S.D.C. Office (Kamalabari, Majuli) and information available at North Eastern Council. Census data has been used to analyse the number of population dislocated and the villages submerged from the Majuli island. Besides, data has been generated to supplement information available from the secondary sources such as relevant books, historical reports, journals, different maps, satellite images and toposheets of the region.

The study considers a time span of about 30 years, *i.e.* 1970 to 2001 while making use of secondary sources of data available mainly from census to understand changes that have taken place in the socio-economic, demographic and cultural spheres. This time period has been taken because the great earthquake of 1950 brought about astounding natural and geographical changes to the island and to the Brahmaputra which resulted in intense erosion. It is expected that the information available from the year 1971 would reflect the impact of the accelerated process of erosion on socio-economic, demographic and cultural life of the people. This would provide the much required temporal dimension to the changes in the demographic composition of the population, the redistribution process of the population within and outside the island.

Analysis

Available data on displacees are very scanty. This is even more so when the displacement is due to natural disaster/environment induced. Next in order is data on development-induced displacement. However it is relatively easier to find data on conflict-induced displacement mainly due to the role of media interested largely in political event. Data or no data, the problems are enormous associated with displacement of all kinds in Northeast India and in Assam in particular. There has been continuous environmental degradation, flood and riverbank erosion in the plains of Assam which has become endemic.

Intensity of flood, riverbank erosion and landslides has increased over the years in scale and extent. The plight of riverbank erosion-induced displacees is more severe than victims of flood. Victims of floods may go back to original land once the floodwater recedes whereas riverbank erosion-induced displacees cannot do so as their land forms part of the river's new/extended bed. It is not only Brahmaputra but innumerable small and medium-sized rivers that also cause havoc in the plains of Assam.

The case of Majuli Island is significant from the point of view of displacement arising from bank erosion. Dramatic decline in land area has taken place since 1950 leading to displacement. Life is uncertain for most of the 1.70 lakh islanders, mostly belonging to *Mising, Deori and Sonowal Kachari* tribes. The loss of livelihood to a majority of the people living in this island has rendered them to the status of environmental refugees. Even prosperous landed farmers have been reduced to penury while small holders have been deprived of their livelihood altogether. Incidence

of landlessness has increased manifold. Nearly 5000 families have been forced to work as agricultural labourers, daily wage earners and fish sellers though these too are increasingly becoming difficult over the years.

It is argued that the capacity of the people to respond to environmental threats is a function of not only the physical forces which affect them, but also of underlying economic and social relationships which increase human vulnerability to risk. Hazard analysis and mitigation can be more effective when it takes into account such socio-economic, demographic and cultural dimensions to disasters. The most important problem that threatens the very existence, the life and properties of the people of this island is the continuous and extensive bank erosion by the mighty Brahmaputra, the Subansiri and the Kherkatia Suti rivers.

Available records suggest that the average annual rate of erosion of the island was 1.77 sq. km during the period 1917 to 1972; 1.84 sq. km during the period 1972 to 1996 and 6.42 sq. km in a span of five years preceding 2001, indicating an accelerated rate of erosion of the island in more recent years. According to the earlier official data, in 1901 the island covered an area of 1325. 51 sq.km; in the year 1941, the island had an area of 1324 sq.km which gradually shrunk to 564.01 sq.km by the year 1966-1972; and to 453.76 sq.km in the year 1996. The island's total area has reduced to only 421.65 sq.km by the year 2001 (Sharma and Phukan, 2003). Needless to mention, this accelerated rate of shrinking in the size of the island cannot be without its impact on the society, economy, demography and culture. The consequences of bank erosion and shrinking size of the island over the years ranges from acute pressure on the existing land to population redistribution, out-migration, changes in occupational structure, increasing levels of poverty etc. The consequences of these are never uniform either spatially or socially. People living in the hazard prone areas are affected more by the process of erosion than those living far away. Likewise people with poor economic base face more adverse consequences of the bank erosion than those with better access to resources and income.

If an analysis of satellite imagery, undertaken by researchers at the Regional Research Laboratory in Jorhat District and the Department of Applied Geology of Dibrugarh University in Dibrugarh District in the eastern state of Assam is to be believed, Majuli may soon 'fall off' the world map due to intense land erosion effecting its unique culture and people's lives which is the cultural capital of Assamese civilization since the 16th century, based on written records describing the visit of Sankardeva–a 16th century social reformer. Mahanta (2001), Goswami (2002), Bhaumik (2003) and Ghosh (2006) noted with concern that the island is facing extinction as it is shrinking rapidly due to excessive flood and erosion, bringing misery to the people and shattering the fragile agro-economic base of the region (Figure 2)

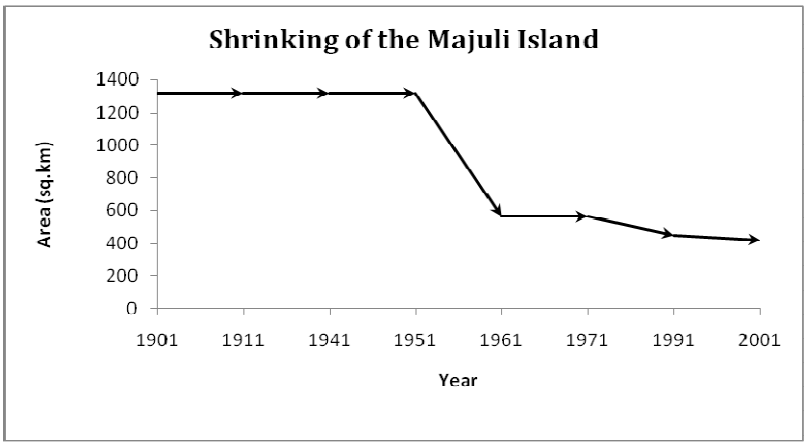

Figure 2: Shrinkage of the Majuli Island from 1901 – 2001

Till the year 2001 around 78 revenue villages of Majuli had been affected by severe erosion and hundred sq.km area suitable for agricultural land and residential area had submerged into the Brahmaputra River. Many of the villages had to be relocated in the neighbouring Darang district, Titabar and Jorhat circle. A deemed uncertainty prevails in the perception of the people to hazards in the region. They do adjust with the hazards by rescheduling their crop calendar, rescheduling their crop practice using conventions of physiography etc. They take shelter temporarily at relatively higher places like roads, high mounds at flood times. They use country boat *bhur* (made of banana trees) for emergency evacuations and are generally good swimmers and use this art for rescue and other works. But when these efforts fail, they migrate elsewhere or suffer losses. The flood protection works and anti-erosion spurs are not only insufficient but also not up to the mark and the flood water generally breach up or wash away them easily. Therefore this region has become a playground of flood, bank erosion and channel shifting not only in the active floodplain zone, but also very often heavily destroy the normal flood-free area bringing great threat to the whole region.

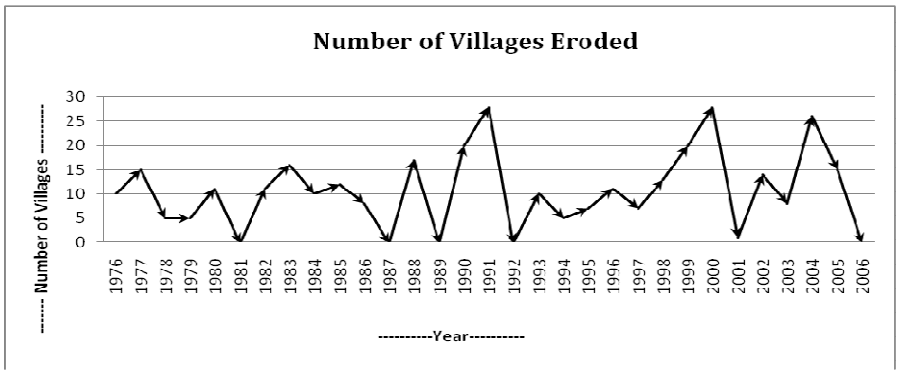

Fig-3 : Number of Eroded Villages 1976 – 2006
Source: S.D.C office, Kamalabari, Majuli

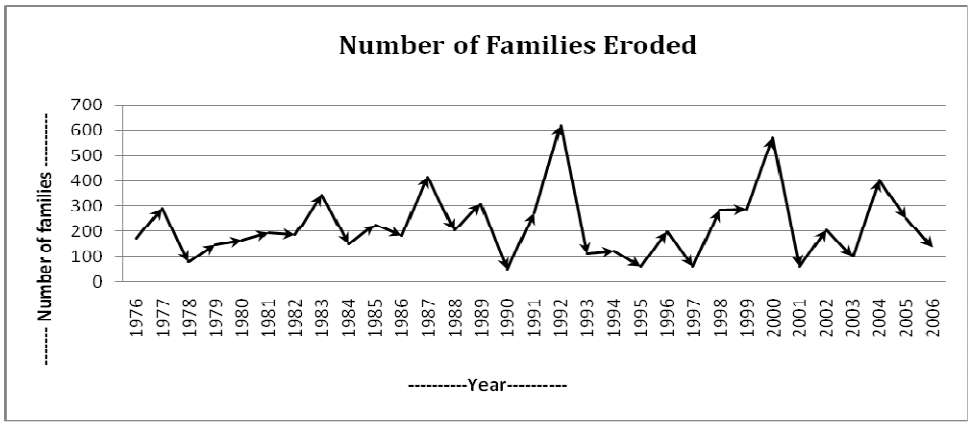

Fig.-4 Number of Eroded Families 1976 – 2006
Source: S.D.C office, Kamalabari, Majuli

The island did not experience much dislocation of its villages due to bank erosion only on a few years in 30 years preceding 2006 (fig. 3). The years 1977, 1983-85, 1988, 1990-91, 1998-2000 and 2002-2005 were particularly devastating as scores of villages were fully or partially eroded leaving hundreds of families without a home (fig.4). That the frequency of devastation to villages and families has only increased in recent times is clearly brought out by fig. 3 and fig.4.

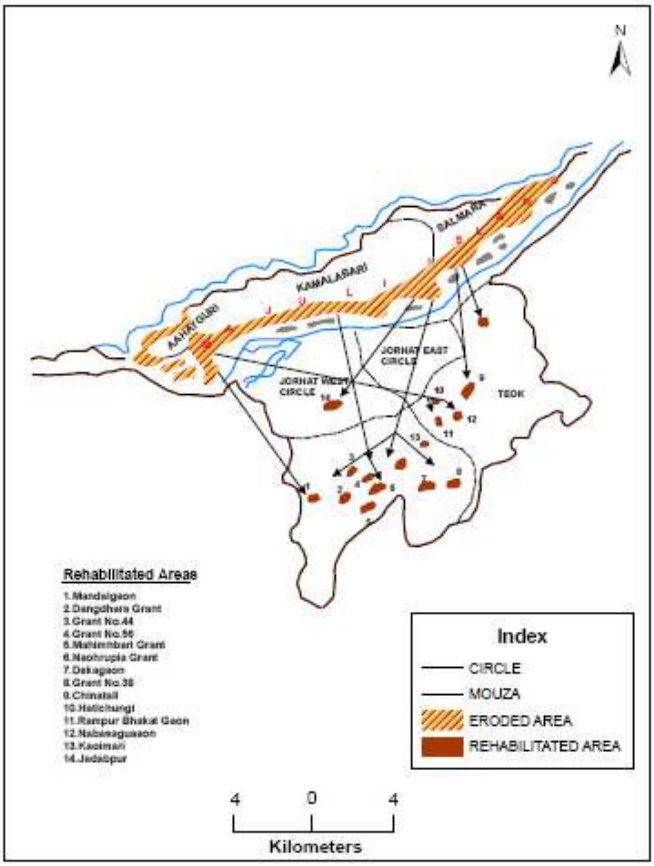

Fig. 5 Redistribution of the population outside the island

A number of major floods caused extensive damages and losses after 1950 with different magnitude in different years depending upon the intensity of the flood and the erosion it follows. In the year 1977 it eroded about 15 villages taking 292 families with them who had to relocate themselves. This situation continued unabated during 1979–1982. In 1972 seven villages from Aahatguri Mauza got shifted due to high intensity of erosion to Darang district, where 458 families and 4000 people of two Panchayats got rehabilitated. Those villages are– Raomari, Gojpuria, Kutumbgaon, Saraibari, Baligaon, Bahumari and Pisola Dakchapori. The intensity was quite high in the year 1983, 1987 and 1992 which left its impact on 622 families. The damage of floods was much more in 1998, 1999 and 2000 which severely affected 569 families and causing immense loss to crops, properties and human lives. From 1971 till 2001 around 7361 families were redistributed. 167 families have been rehabilitated in Rampur (Jorhat), 53 in Kaliyapani (Teok) 62 in Tatibari (Majuli) and 201in Panikhati (Titabar) (Fig 5). Every year the flood inundation and gradual loss of land area due to bank erosion leave a trail of destruction, washing away villages, submerging fields and drowning livestock, besides causing loss of human life and property, stopping any kind of developmental activities in the island.

Recurrent flooding and bank erosion in the last five decades or so has left large number of people completely homeless surrendering their villages, farmland and the cattle to ever enlarging river bed of Brahmaputra on its southern bank. Fig. 5 shows the rehabilitation of people severely

affected in the adjoining Jorhat circles. Evidently these people had no option but to seek government support in getting rehabilitated. While these sections could move out of the island at great social and economic as well as emotional cost, many continued to cling on to the island by moving into areas within the island furthering a process of redistribution that is internal to the island itself. The increasing density of population and population growth in spite of dwindling size of the island is testimony to this process that is an ongoing affair year after year.

Demographic Changes

The people of Majuli represent varied ethnic forms of cultural heritage with a total population of about 1, 53,362 persons with a sex ratio of 929 females per 1000 males as per 2001 census with a population density of 364 persons per sq.km as compared to the total population of 1, 35,378 in 1991 with a population density of 300 persons per sq.km (Table-1).

In spite of increasingly falling available land area, during the period between 1901 and 2001 the population of Majuli went up from 31, 219 to 1,53, 362. Table-1 makes it clear that the land-man ratio increased phenomenally after 1951 as the size of the island decreased significantly on the wake of 1950 earthquake that submerged a large chunk of Majuli's available land. From a meager and sustainable density of 61 persons per sq. kilometer in 1951, the density figure jumped to a whopping 165 persons supported by just one sq. kilometer of land area- an increase of more than twice in just a decade. This density remained largely unaltered till 1971 but increased to 297 and 364 in 1991 and 2001 despite significant outmigration, resettlement of affected people outside the island or relocation of villages in the neighbouring circles. The increase in density post 1971 can only be attributed to natural increase in population in a progressively shrinking island as evident from diminution in land area every successive decade albeit at a pace lower than what had happened during 1951-1961 decade. Evidently the increasing density of population in the island despite outmigration suggests tremendous redistribution of population within the island for those people who had no option but to remain in the island faced with loss of land, villages, houses, crops and turning into environmental refugees.

Table 1: Area and population density

Year	Area (sq.km.)	Population	Population density	Growth Rate (%)
1901	1325.51	31219	24	
1911	1325.51	40420	31	29.5
1941	1324.00	75040	57	85.6
1951	1323.48	81001	61	7.9
1961	565.01	93541	165	15.5
1971	564.01	95618	170	2.2
1991	455.76	135378	297	41.6
2001	421.65	153362	364	13.3

Source: The Statistical Office, Garamur, Majuli

The growth rate of the population living in Majuli depicts a similar story. The population growth was relatively high until 1951 after which there has been great slow down in the rate of population growth. With the exception of the decade 1941-51 when the island's population grew at a rate less than 8 percent, the pre 1951 period saw good rise in population owing to large natural increase of around 30 percent every decade. But the post 1951 period saw a decline in the growth rate to below 15 percent per decade with 1961-71 decade experiencing insignificant rise in the population. This decline in growth rate of population in the island can easily be attributed to the rapidly falling land area on account of bank erosion and heavy outmigration and/or resettlement of people suffering loss of villages to river Brahmaputra. However, the population is still increasing

albeit at a slower pace in spite of grave threat to the very existence of this unique river island. Increase in density is a result of progressive decline in the size of the island itself reflecting increasing man-land ratio in the fragile island.

Settlement structure

An inevitable outcome of this internal redistribution of population is manifest in rapidly changing settlement structure of the island. In 1971 no census survey was done for Aahatguri mauza, since the mauza in the western part of the Majuli Island experienced flood in most part. This is one area that has borne the brunt of floods and bank erosion and consequent loss of villages to the river bed. Most of the villages affected by flood are located along the southern bank of the island where the influence exerted by the Brahmaputra River is the greatest which forces the people to move out to relatively safe areas. Large chunk of population are concentrated along the central part of the island and if the erosion took place further which will wash the villages located along the southern bank, then movement of the people is likely to take place further northward where density of population is much lesser with more land unaffected by flood. Due to erosion of the land by the Brahmaputra River combined with inundation of villages for long period results in the rise in water level. The main factor influencing the settlement patterns in Majuli is the frequent floods which drive the people to select high lands like embankments and other flood free areas for settlement.

Table 2 shows an ironical situation where the number of villages in all the Mauzas has declined from during 1991-2001 decade, but the population and households has indeed increased. It is Kamalabari Mauza which has seen maximum rise in its population during 1971-2001 period, but during 1991-2001 decade it is Aahatguri Mauza that has experienced phenomenal increase in its population.

Table 2: Inter-Mauza variation in population distribution, 1971 - 2001

Year	Aahatguri Mauza			Kamalabari Mauza			Salmora Mauza		
	Number of villages	Number of households	Total population	Number of villages	Number of households	Total population	Number of villages	Number of households	Total population
1971	-	-	-	93	6697	49617	86	5971	43993
1991	50	1322	8701	102	10932	71523	92	7889	55154
2001	27	1768	10947	89	13728	80687	79	10240	61736
Growth Rate (%)									
1971-1991			-			44.15			25.36
1991-2001			25.81			12.8			11.9
1971-2001			-			62.61			40.33

Source: Census report of 1971, 1991 and 2001

As per the 1971 census records there were in all 179 villages of which total number of inhabited villages and uninhabited villages were 158 and 21 respectively. Inhabited villages registered an unprecedented increase to 248 in 2001 due largely to the emergence of new villages which resulted after affected people resettled in the island as splinter groups. Significantly 53 villages were uninhabited which are the areas heavily affected by erosion and floods. These were inhabited villages as per 1971 villages but not shown in 2001 census. Aahatguri Mauza consists of 50 villages in 1991 census but reduced to 27 in 2001which reveals that the mauza is the most affected by river bank erosion. Out of 135378 people inhabiting the island in 1991 census only 8701 people were living in Aahatguri mauza. Kamalabari Mauza in the central part of the island has the highest number of villages (102 villages) with the least number of villages affected by flood. It also has the largest concentration of population residing in the island with a growth rate of 44.15 from 1971-1991 while Salmora mauza in the eastern part of the island shows a growth rate of 25.36 from

1971-1991. But the growth rate drastically declined to 12.8 and 11.9 percent in Kamalabari mauza and Salmora mauza respectively in more recent times i.e.1991-2001. By the year 2001 there was decrease in the number of villages in each mauza but an increase in the number of households and population (Table 2). Interestingly, the growth of population has been the highest in Ahatguri Mauza during 1991 and 2001 decade that has experienced severe erosion of villages and a drastic fall in the number of inhabited villages in this Mauza. Population growth and distribution has undergone changes through the years and will continue to do so in the years to come. Since Majuli island has been subjected to frequent flood during monsoon period, many part of the land and inhabited area are not only washed away but also inundated for a long period of time. This necessitates the movement of large number of population from place to place eventually becoming a landless.

Table 3 clearly reveals drastic changes in the settlement structure of the island.

Table 3: changes in settlement structure, 1971 - 2001

Population size	1971		1991		2001	
	Number of villages	Percentage to total inhabited villages	Number of villages	Percentage of population	Number of villages	Percentage of population
Uninhabited villages	*21*	*11.73*[1]	*38*	*15.57*[1]	*53*	*21.37*[1]
<500	87	55.06	108	52.48	87	44.61
500-1000	43	27.21	59	28.64	58	29.74
1000-1500	21	13.29	19	9.22	23	11.79
1500-2000	3	1.90	12	5.82	12	6.15
2000-2500	2	1.26	3	1.22	7	3.60
2500-3000	1	0.63	2	0.97	5	2.56
>3000	1	0.63	3	1.46	3	1.53
Total inhabited villages	158		206		195	
All villages	**179**	**100**	**244**	**100**	**248**	**100**

Source: S.D.C. Office, Kamalabari, Majuli

[1]*percentage from total villages including uninhabited ones.*

The most noteworthy feature of the settlement structure is a drastic increase in the number of uninhabited or abandoned villages over the three decades. Such villages were only 21 in the year 1971 but increased to 38 in 1991 and to 53 in 2001 accounting for 11.73, 15.57 and 21.37 percent of all villages in 1971, 1991 and 2001(Table 3). Number of villages with small population size (less than 500) accounted for well over half of all inhabited villages in 1971, but show drastic fall in subsequent years to constitute only around 44 percent of all inhabited villages in the year 2001. On the other hand villages with greater population size are increasing in their population particularly in the category of 1500 to 3000 population size. This shows that the settlements are becoming larger over the years as more and more villages are abandoned. The process of internal redistribution has induced such changes in settlement structure as many small sized settlements are becoming larger with additional people. It is evident that more and more villages are abandoned due to bank erosion and the redistribution of population is creating conditions for large sized villages to emerge.

Conclusion

The study revealed that the rate of shrinkage in the size of the island is related to (a) an accentuation in the process of internal redistribution of population and/or out-migration of people (b) changes in settlement structure leading to greater proportion of large sized villages. Evidently there has been a fall in the carrying capacity of the island with decrease in resource availability particularly that of agricultural land forcing a section of the people to migrate outside the island. A

section, largely unable to find alternate source of livelihood elsewhere, however still remain within the island by shifting to another location within the island itself engendering the process of internal redistribution. It is likely that the poorer segments are generally confined to the most vulnerable parts of the island and it is this segment which is less likely to find opportunities outside the island. The better off sections however, find economic opportunities outside the island. Shrinking of the island is coterminous with increasing poverty and marginalization with falling economic base of the island. Rapid decrease in the size of the island does not provide adequate time for the affected people to adapt themselves to the changed economic condition, nor does it permit quick diversification of the economy. The net result may be increasing poverty and marginalization of a large segment of the population.

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