

Climatic Extremes and Human Displacement: Case Studies from Sagar C.D. Block in South 24 Parganas District of West Bengal

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Abstract : *Historically, humans have always settled in the environmentally most favourable locations. But with the rapidly rising populations, greater environmental hazards due to climate change, and scarcity of usable lands, people have been forced to move to marginal regions, whereby putting themselves at risk. This paper discusses the plight of the people of Ghoramara, a remote and fast depleting island in the Hugli estuary under Sagar C.D. Block of South 24 Paranas district of West Bengal. Those who were displaced by climatic disasters or had to migrate in search of better living conditions moved into the rehabilitation camps in Jibantala on the inner parts of Sagar Island perceived the process of rehabilitation differently than those who live in constant risk zones, but are not ready to change their 'homeland' area. Primary survey data and information is used in this study. The research aims to bring in a general awareness among the planners on the psychological needs of the displaced population as mere safer homes cannot bring in content and security in the minds of the people.*

Key words: *Climate change induced displacement, Climate refugees, Resettlement camps, Psycho-social impacts*

Introduction

Climate change may not directly displace people but may either cause extreme events resulting in unconducive habitations, or frequent climatic disasters that make it difficult for people to survive in their original habitats. Climate change causes an increase in the number and severity of sudden-onset of natural disasters. It has specific long-term environmental effects such as land loss, extreme floods, decreased soil productivity, desertification and other changes in weather patterns, which means that people's livelihoods are no longer sustainable and they are forced to live in vulnerable situations or migrate to other places. It often leads to increased conflict over resources inducing displacements. Climate change affects crop productivity

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through changes in temperature, rainfall, droughts and floods among other environmental degradations. Extreme weather events like tropical cyclones are very common on the coastal regions of West Bengal along with rising sea levels and storm surges that inundate coastal communities. Even the Intergovernmental Panel on Climate Change (IPCC) has recognised climate change as a threat multiplier that has singly caused a significant rise in global climate refugees in the past decade (Haldar et al., 2021). In this context, displacement and climate change are strongly related to each other. Climate change induced displacement (CCID) has an impact on their livelihoods, public health as well as food security. Coastal erosions enhance loss of agricultural lands and food sources initiating competition over limited natural resources and conflict among the population. The IPCC suggested that the gravest effects of climate change may be those on the marginalized who have become homeless. Today, it is accepted that it will affect wide-spread migration now and in the future, and that in many circumstances this will be forced rather than voluntary, precipitated by severe and immediate threats to environmental security and human rights.

Much of the research related to natural disasters and migration has been done in developing countries (Bates 2002; Brown 2008). These studies have focused on the socio-economic factors which influence the decision of migrants following a disaster. The research done by Belcher and Bates (1982) discusses the impact of a disaster as a “push” to leave the area and to see the event as an opportunity creating a reason to move. Oli Brown (2008) stated that migration, even forced migration, is not usually just a product of an environmental “push” from a climate process like sea level rise; however, except in cases of climate events, where people flee for their lives, it does require some kind of “pull” be it environmental, social or economic. Migration is not just the physical movement of self but includes complex emotions of landlessness, forgoing attachments, assets or resources at the origin, social ties and lifestyles. On a global scale migration studies have focused theoretically and empirically on questions related to why individuals move (Guest and Stamm, 1993) or on the question of why some persons stay back facing the adversities. There has to be the hope of a better living elsewhere, however much of a gamble it might be, for people to leave behind their previous life (EJF, 2012). The disproportionately high burden of displacement of the socially and economically vulnerable sections of rural Indian society, suggests that development and displacement are in fact not merely technical, politically neutral decisions, rather reflect the power of economically, socially and politically strong groups and regions to impose sacrifices on the weak (Panigrahi, 2018). Displacement whether driven by development or disasters should essentially focus on human rights and basic opportunities. But rarely the psychology of the marginalized and destitute are heeded

in planning process. Compensation is an even dynamic concept in case of such population. Perhaps this is even less relevant in the present socio-economic scenario in the Sagar Community Development (C.D.) Block because of lack of amenities, financial stability, and quality settlement areas where they can carry on their normal life.

Objectives

The main objectives of the present study are to understand the impact of climatic fluctuations, extremities and resultant environmental vulnerabilities on the population. The study also deals with the low resilience capacities of the people living on the Sagar and Ghoramara Islands within the Sagar C. D. Block, that has led to displacement of the habitations from Ghoramara to Jibantala-Kamalpur Colony and finally a comparative analysis has been made between the lifestyles and opportunities available in these two locations to assess the preferences and perceptions of the climatically displaced people.

Methodology

Information and data from secondary sources were taken from various books, journals and websites apart from in-person data acquired from the offices of Sagar Block Development and Panchayat, India Meteorological Department and Census of India. A structured questionnaire survey for perception analysis was conducted by purposive random sampling of the households in the study area namely the Ghoramara Island and Jibantala colony of Sagar Island during March to June, 2018. 5-point rating scales in perception analysis helped to understand the situations. A total of 54 households were sampled, who consented to the survey, to bring out their attitudes and conditions of living and analysis of data with the help of statistical method. The respondents were mostly of the age group 30-60 years with a higher female percentage due to non-availability of male members during the survey season. Most were educated up to high school while about 20 percent never had formal schooling. The occupational pattern ranged from cultivator households to those, where the male members worked as wage labourers for most part of the year. The decadal changing land use patterns of Ghoramara from 2009 to 2019 was observed from supervised classification of Resourcesat-2, LISS-III, 24m resolution satellite images acquired from ISRO, having path no. 108 and row 57. A SWOT analysis has been computed to distinguish between the living standards of the source and destination regions in the process of migration.

Study Area

Sundarban, the largest network of single chunk mangrove deltaic islands, is almost regularly plagued with climatic severities and extreme events. Many of these islands are disappearing, slowly swallowed by the deep sea and the rising tides.

Ecosystem and human lives in the estuarine and coastal edges of Sagar C.D. Block have become exceedingly vulnerable in the recent decades (Rudra and Haldar 2017, Haldar and Bhattacharya, 2020). Ghoramara (Fig.1.c) extending from $88^{\circ}7'E$ to $88^{\circ}8'E$ and $21^{\circ}54'N$ to $21^{\circ}56'N$, was a part of the larger original island until 1881. Around 1914 the northern tip of Sagar Island was cut off from the rest of the island and subsequently Ghoramara, Khasimara, Lohachara, Suparibhanga, and Bedford were

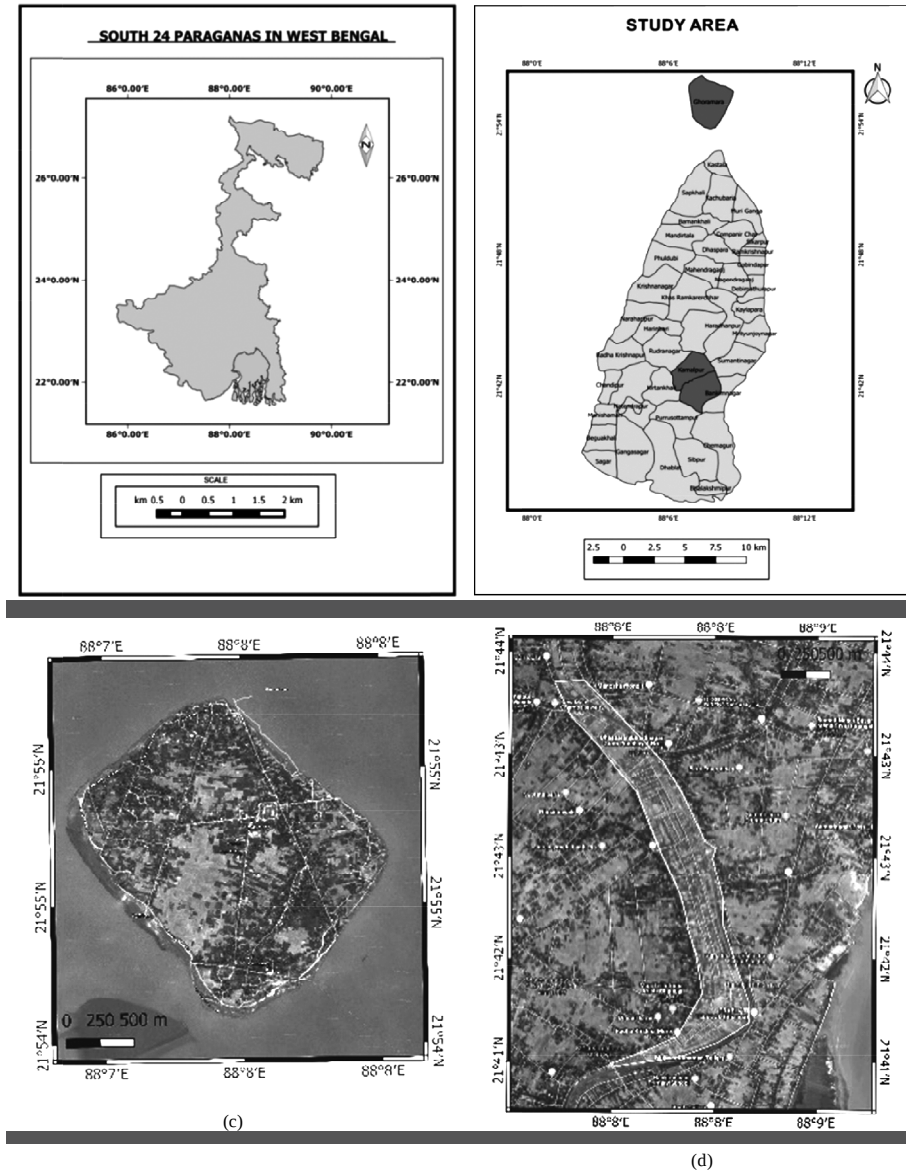


Fig. 1: Location of the study area

formed. Even though the other islands have eroded away, Ghoramara still falls under the jurisdiction of the Sagar Block of South 24 Parganas district. The geomorphological changes observed on Ghoramara are largely the result of changes in estuarine hydrodynamics and rising sea levels. As a result of the changing size and shape of Ghoramara, several villages have already been submerged, including Khasimara Char, Lakshmi Narayanpur, Khasimara, and Baishnabpara. Around 1977, the then Government of West Bengal declared Ghoramara island as a 'No man's land', which meant it was no longer willing to take any responsibility for construction of embankments, or provide other support services like health, drinking water, and education – despite the fact that around 5,000 people still inhabited the island. Jibantala and Kamalpur rehabilitation colony of Sagar Island (21°37'21"N to 21°52'28"N and 88°02'17"E to 88°10'25"E) has been considered in this present study as it is the most important colony created in 1970. Owing to its location within a tidal creek and having a low elevation, the island is very susceptible to severe hazard like cyclonic storms and tidal upsurges. Sagar islands is about 25 km. away in the sea having 245.33 sq.km area with a population of about 206844 persons (Census of India, 2011) (Hazra et al., 2015). Subsequent floods of Kamalpur, 3 Number Colony, in Sagar islands thus became home to many of the climate-affected migrants from Ghoramara and Lohachara islands, known as the Jibantala refugee colony, people have again returned to rebuilding their lives (Fig. 1.d). The displaced people from Lohachara, Ghoramara, and another island, Khasimara - were resettled on other island colonies, including Gangasagar I and II, Kamalpur, Manasadweep, Bankimnagar, South Haradhanpur Colony, Chakphuldubi, and Jibantala, (Kar and Bandyopadhyay, 2014). Recently the government initiative for the resettlement of displaced people from Ghoramara has been stopped due to pressure on resources on Sagar Island. Resettled people are now complaining of degradation of living conditions of these colonies. In Sagar Island, Jibantala colonies are facing severe problems like limited availability of drinking water and poor sanitation.

Impact of Climate on the Displacement of Population

The islands of Sundarban are vulnerable to sea-level rise as well as associated impacts of climate change like temperature change, wind system, precipitation leading to coastal erosion and increasing intensity of tropical cyclone (Hazra et al., 2015). Some of the results of these changes are reduction of resilience of coastal ecosystem, salt water intrusion, greenhouse effect, flood that adversely affect the inhabitants of this region. In case of annual average temperature trend has been shown to analyze increasing temperature in recent years (1991-2016) by statistical analysis (Fig.2). Temperature fluctuations show that from 2001-2016, there was a rapid rise in temperature having strong positive rising trends indicating further rise in the coming years. Annual sea surface temperature also fluctuated between 2003 and

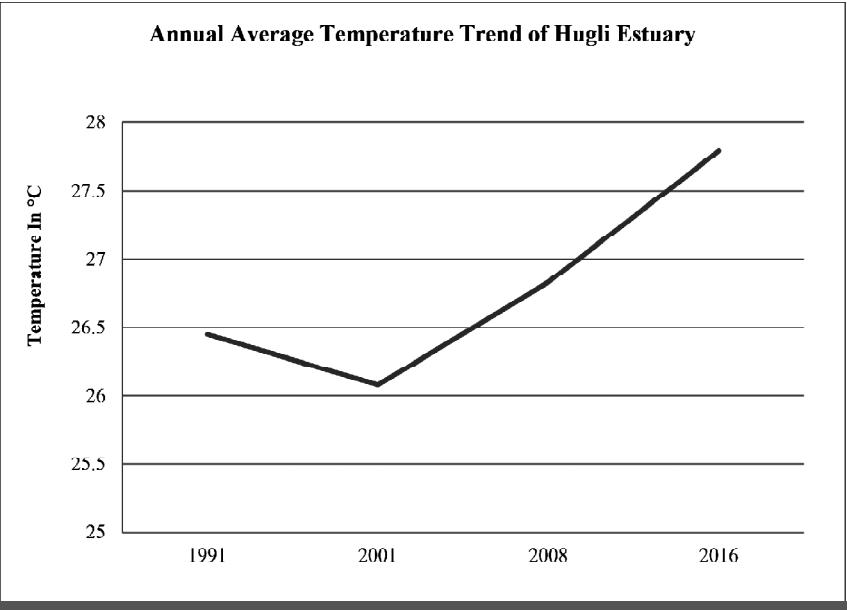


Fig: 2 Temperature Trend

Source: MODIS sea surface temperature data

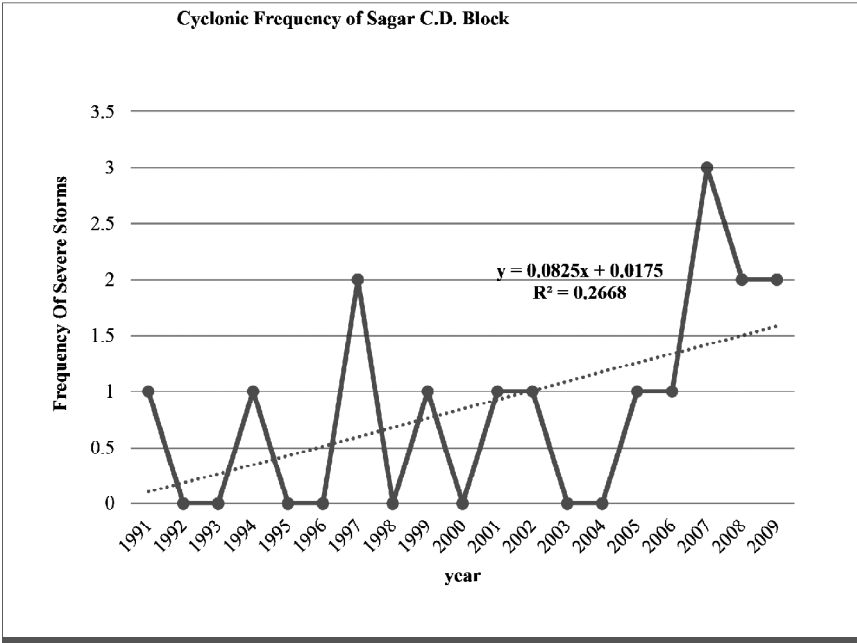


Fig: 3 Cyclonic Frequency

Source: India Meteorological Department

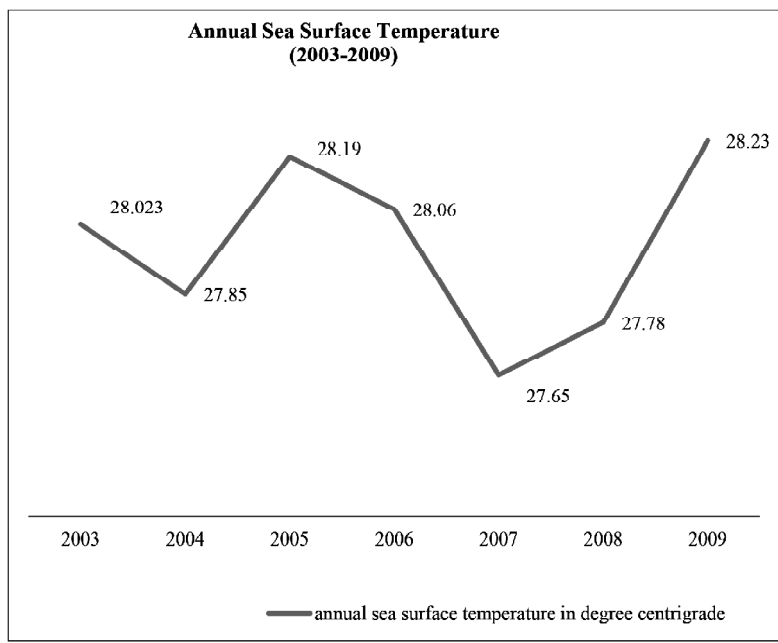


Fig. 4: Sea Surface Temperature

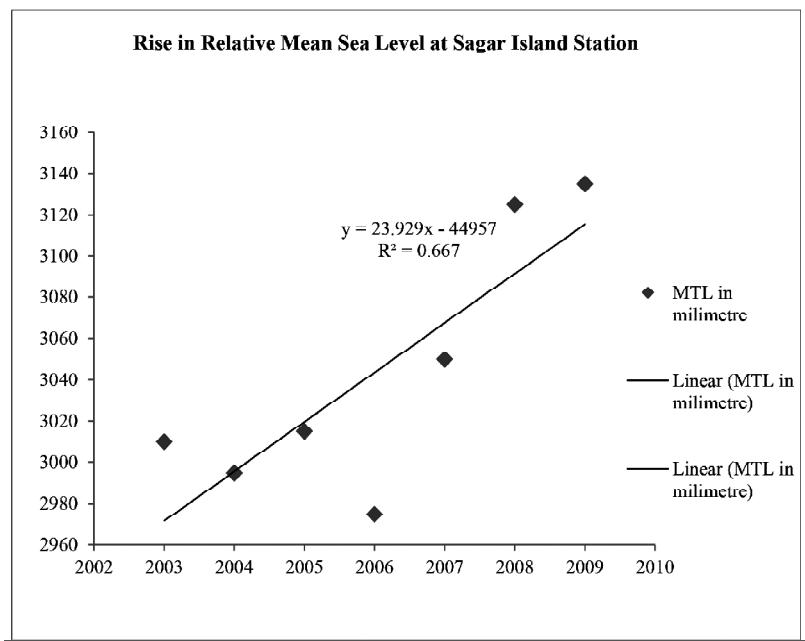


Fig. 5: Mean Sea Level

Source: Census Of India

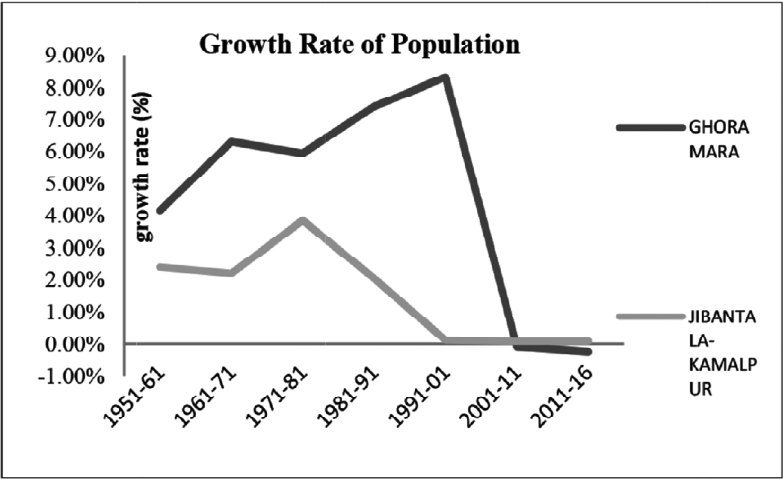


Fig. 6: Growth Rate of Population

2009 leading to change in relative mean sea level (RMSL) (Fig.4). The RMSL of Sundarban was studied by tide gauge situated at the Sagar Island station (Fig.5). The data of Mean Tide Level indicated a rise in RMSL at the rate of 17.8mm/year. In between 1999-2005, there were numbers of severe cyclonic storms have been generated from depressions and increasing frequency during recent years which creates a major threat to Sundarban in the perspective of climate change (Fig.3).

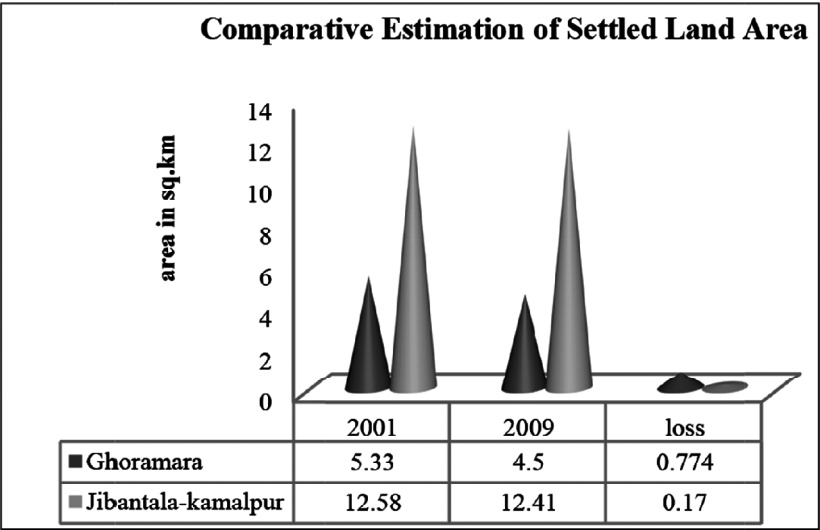


Fig. 7: Land loss (area in sq.km)

Source: Census of India

It has been estimated in government records that about 7000 people had migrated from the Ghoramara island since 1960s who has settled in different rehabilitation camps on Sagar Island. The trend of growth rate of both the study area are at a decreasing rate from the year 1951-61 to 2011-2016, however the curve of Ghoramara indicates rapid decreasing growth rate than Jibantala Colony (Fig.6). It can also be observed that the population of Ghoramara is fast decreasing from 5236 in 2001 to 5193 in 2011 to only 3000 in 2016. However the opposite is the case for the resettlement colony of 12497 in 2001 to 12808 in 2011 to 15001 in 2016. Thus about 2000 people have migrated in the 5-year duration. Likewise the area inhabited spread for the Jibantala-Kamalpur area (Fig.7).

Based on GIS analysis of LISS-III satellite images of 23 November 2009 and 4 February 2019, the total area of Ghoramara Island has reduced from 4.558 sq. km. to 3.917 sq. km. (Fig. 8). As per the census handbook data for the year 2001 to 2009 in Jibantala, agricultural land is decreasing as settlements are rising and others features like vegetated lands, sand beaches, mudflats are reducing. From the results of the land use and land cover (LULC) satellite image classifications it was observed that due to loss of land area both vegetated lands (40.97 per cent to 38.12 per cent) and cultivated lands (59.34 per cent to 40.255) decreased (Fig. 9 and 10). The greater impact on agriculture may be attributed to the loss of inhabitants in Ghoramara island.

The living patterns of 'climate refugees' in Sundarban has highlighted intricate psycho-social characteristics and issues (Haldar et al., 2021). The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, was passed in 2013 by the Government of India. This provides for infrastructural facilities in the new resettled area or colony such as accessible roads within the villages, drinking water, proper drainage and sanitation facilities, cattle grazing land, fair price shops, burial or cremation ground according to caste or religious preferences, electric connections for each household and public lighting, schools, healthcare centers, worship centers/places among others. But the primary surveys represented a grave picture of the facilities, the displaced population was provided in Sagar Island.

From the socio-economic perspective, recent situations of the ratings of living conditions of Ghoramara, as compared to Jibantala, are well depicted through the survey. In the psychometric scale, the rating levels of the 54 responding households were standardized to 1 being in high risk level or in very poor condition while 5 represents the optimum conditions available (Table 1). Thus it can be observed that the issues of bank erosion and salt water intrusion is still a dominant problem, but to a lesser extent, in the rehabilitation camp while the basic amenities still needs

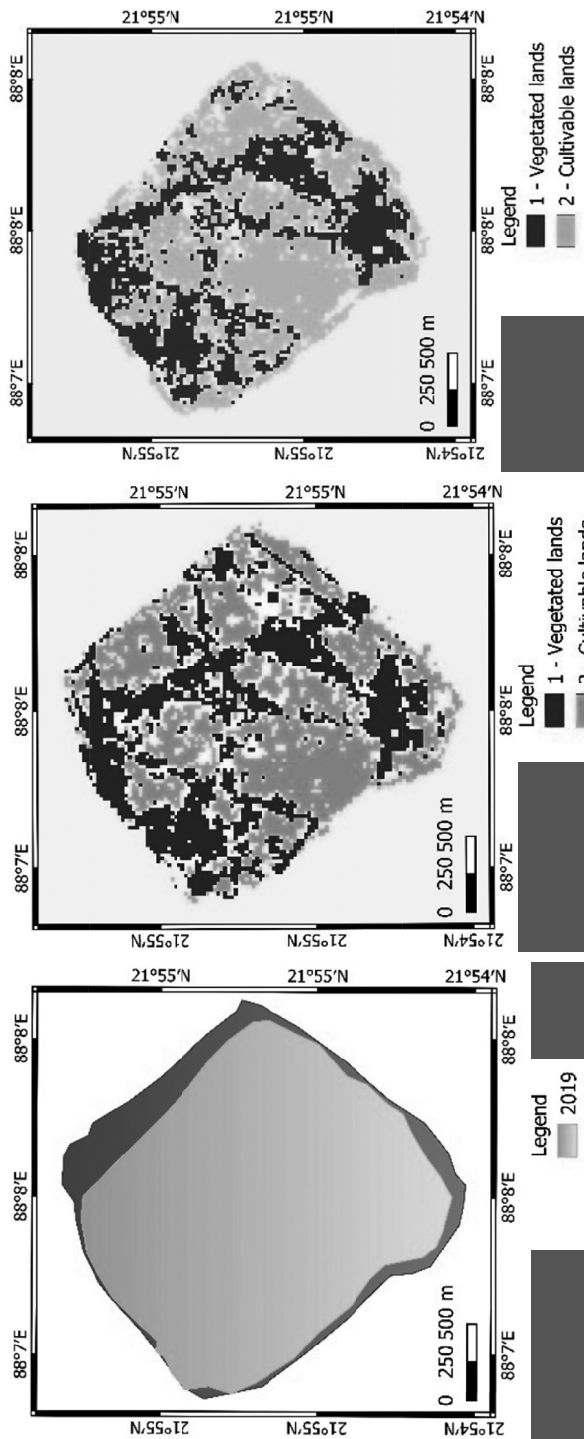


Fig. 10: LULC 2019

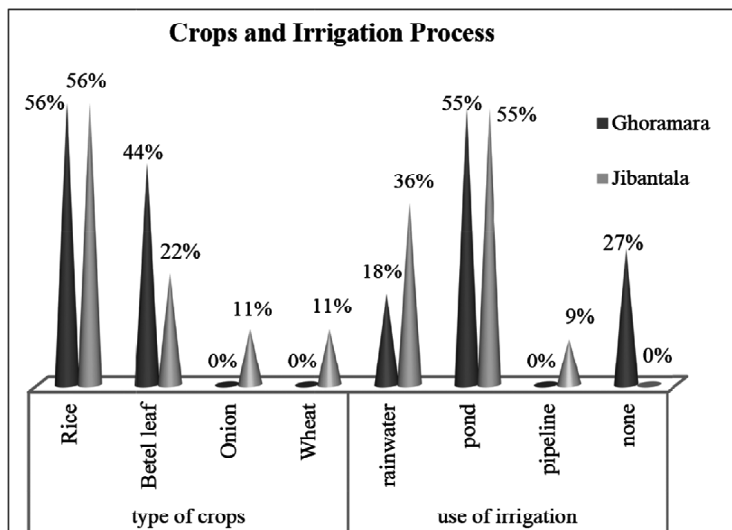
Fig.9: LULC 2009

Fig. 8: Land erosion

Table- 1: Responses on disaster-related amenities and risks by the residents of Ghoramara and Jibantala

Parameters/ Likert Score	Ghoramara					Jibantala				
	1	2	3	4	5	1	2	3	4	5
House Conditions	0	0	45.45	36.36	18.19	0	6.25	6.25	50	37.5
Transport Facilities	0	0	0	36.36	63.64	0	0	18.75	81.25	0
Medical Facilities	0	18	29.09	45.63	7.28	0	0	40	43.75	16.25
Educational Facilities	0	0	9.1	90.9	0	0	0	68.75	31.25	0
Water Supply	0	9.09	0.01	81.81	9.09	0	0	25	75	0
Employment Opportunities	9.1	0	60	18.18	12.72	0	0	25	55	20
Power Supply	0	9.09	45.45	36.37	9.09	6.25	33.75	31.25	12.5	16.25
Bank Erosion	54.54	27.27	18.18	0.01	0	18.75	75	6.25	0	0
Salt Water Intrusion	55	27	18	0	0	40	22	38	0	0

Source: Rating Scale Response, Surveyed in March-June 2018

**Fig. 11**

much improvement. Housing and transport facilities are the two major factors that the people in the rehabilitation camp benefits from. From the perception surveys it can be inferred that the people in Ghoramara even though had poor living standards felt more content with life that those residing in the new resettlement areas.

In Ghoramara, people generally practiced rice and betel leaf cultivation with the help of pond and rainwater but in Jibantala rice, wheat, betel leaf and onions are also cultivated with the help of rainwater, pond and pipeline irrigation (Fig.11). The issue of no proper irrigation is not seen in Jibantala where they are assured of groundwater with the help of shallow pumps.

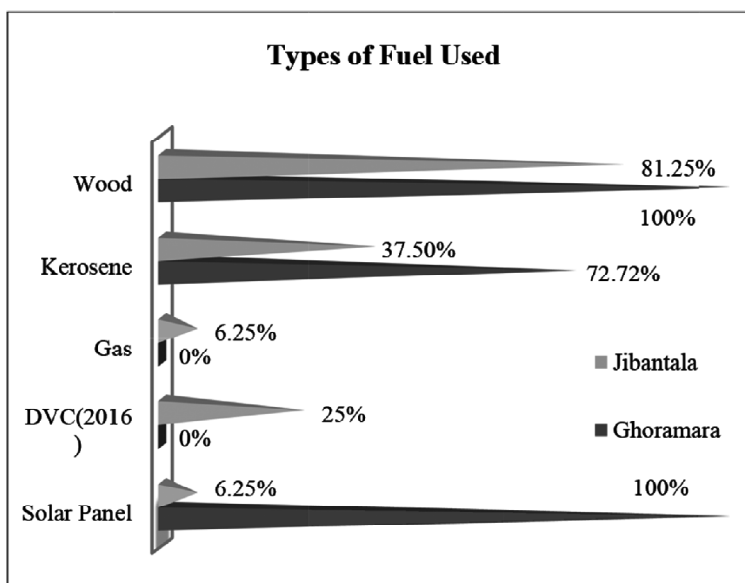


Fig. 12

Source: Prepared by author based on primary survey, March-June, 2018

As per the surveyed data, Ghoramara consists of 99 percent kutcha houses built by the inhabitants, where as in Jibantala, 99 percent are government approved pucca houses for which they had to pay an initial rent. While only 38 percent of the people are literate in Ghoramara, 62 percent people are literate in Jibantala where evening classes are also conducted. Very few people (14 per cent) having sanitation facility in terms of crude community toilets but in Jibantala 86 percent people having attached toilet facilities. Most of the people of Ghoramara are- labourers, farmers, construction workers while in Jibantala a few have become self-employed and have attained skills to join various kinds of services. It was estimated that about 72 percent people of Ghoramara earns below ten thousands whereas near about 60 percent are

below the mark in Jibantala. Their main modes of transport are van and vessel which is highly unsatisfactory for 63.64 percent people of Ghoramara. Both the source and destination regions are facing lack of standard medical facilities and employment opportunities. 72.72 percent people face unsatisfactory job opportunities or are seasonally in a jobless state in Ghoramara. But Jibantala has 68.75 percent inhabitants who have better educational qualification than 90 percent people of Ghoramara, opening up some sources of income. Ghoramara inhabitants use wood, kerosene and solar panel as fuel and energy resources but in Jibantala, people having facilities like gas, DVC current as well as wood and kerosene. Ghoramara depends on solar panel in case of power supply whereas Jibantala has main grid thermal electricity current (locally termed as DVC current) since 2016 which was appreciated by all (Fig. 12).

Water supply for both the regions are in a poor condition. Drainage and waste disposal initiatives are also fully unsatisfactory. There are some problems such as salt water intrusion which is very much important for both the regions which makes the soil and water saline and reduces its fertility. Need of embankment is also necessary. Most of the people of Ghoramara were unsatisfied with the hazard management strategies like relocation as they did not want to be displaced. Even the coastal paving, earthen embankment or flood management and bank erosion related initiatives proved to be a failure every time. Jibantala people are unsatisfied basically on their standard of living after displacement. They want to develop flood preventing measures and erosion of bank prevention techniques. Some awareness programs are being taken up in the recent years through mike announcements during hazards, about grants from Pradhanmantri Gramin Awas Yojana, Banglar Awas Yojana, 100 days work (construction works, tilling etc) in Ghoramara. In the Jibantala colony Government is providing Srama Divas Srista Prokolpo, by providing 1.5 bigha land to each family under Indira Awas Yojana for making pucca houses, and Below Poverty Line cards for free public goods distribution, and electricity supply since 2016. Several schemes related to construction of roads, burning ground project, betel leaf project, free services from Ramkrishna mission, Bharat Sevashram etc. are given across the Sagar Island to increase resilience and better sustenance of the people.

Conclusion

Climate change even though is a debatable term, extreme events are observed to be sharply rising leading to larger rates of destructions. Sundarban area being highly vulnerable to geo-climatic disaster, need special attention towards the CCID populations, mostly the forced sections. Frequent exposures to the risks have degraded their reliance capacities and have greatly affected their psychology along

Ghoramara	Lack of hospitals and proper healthcare institutions. Kutchra roads made with mud prone to collapse and erosion. Ownership of agricultural lands was with the cultivators. Hereditary property rights. All are living in kutchra houses with extensive use of solar electricity. Uses of solar panel and kerosene not satisfactory for large scale energy supply. No manufacturing units can be set up. Land loss cannot be prevented by the commonly used embankments and boulders.
Jibantala Colony	Better medical treatment in Kachuberia or Sagar hospital. Improved accessibility, 90 per cent roads are made with bricks, few concrete roads. Lack of own agricultural land. Occupational shift noticed, now mostly working as wage labourers. Brick cement shelters with government financial assistance. Few are living in kutchra houses. Some are using solar panels brought from Ghoramara, others from main thermal grid electricity. Land loss can be prevented to some extent by making earthen and paved embankment.

Fig. 13: The differences between source and destination regions

Ghoramara	Mode of transportation from other areas is vessel, the frequency being extremely low. Lack of pure drinking water, tubewells are placed far off and one per 10-12 families. Lack of job opportunities and diversity due to no skill development scope. Irrigation facility depends on ponds or rainwater, crop productivity largely hampered. Low income and high poverty leading to poor resilience capacity of life sustenance.
Jibantala Colony	Connectivity to rail or major roads outside is also vessel, but the frequency is relatively high. Two tubewells in entire colony, poor quality and improper drainage or sanitation system. Lack of job opportunities, temporary migration to urban areas, negative impact on sex ratio. Irrigation facility depends on ponds or rainwater along with a small channel of mostly stagnated water. Low income, heavy dependence on grants and aids causing low self resilience to hazards.

Fig. 14: The similarities between source and destination regions

Table 2: SWOT Analysis of the Source and Destination regions

Ghoramara Island (Source region)		Jibantala Rehabilitation Camp (Destination)	
<i>Strengths</i>	<i>Weakness</i>	<i>Strengths</i>	<i>Weakness</i>
• Old settlements, spacious building layout. • Strong social bonding. • Hereditary ownership of large agricultural plots doubles up as assets.	• Extreme poverty leads to low resilience. • Poor occupational diversity. • Lack of infrastructural facilities and security.	• Proper housing and toilet constructed under Panchayat supervision. • Better infrastructural facilities, and access to Block offices when in need. • Improved accessibility and communication.	• Clustered settlements where 8-10 people are accommodating within a 2 room structure. • Poor water quality. • Increasing garbage dumping and pollution rates.
<i>Opportunities</i>	<i>Threat</i>	<i>Opportunities</i>	<i>Threat</i>
• Govt. initiative to rebuilding houses with toilets to prevent migration. • Modern embankment constructions for reducing bank erosion. • Flood shelter creation. • Widespread awareness programs.	• Fast shrinking island at the strategic location of Hugli estuary making it prone to geo-climatic disasters. • Low population density generates poor bargaining power in developmental policy formulations.	• Regular supply of government aid. • Information and job opportunities are more. • Availability of lock gate system to control flood.	• Inhabitants want to move out at first opportunity with even better living conditions and agricultural plots. • The sense of homelessness and rehabilitation camp dwelling lacks social prestige.

with social security. Through this article, the impact of climatic extremes on the socio-economic life of people are well established and a comparative of the opportunities has been done between the place of risk on Ghoramara Island and the area they chose to resettlement with government aid on the Sagar Island. An emphasis has been put on the problems and prospects of the regions which clearly show that even though housing and transport opportunities have become greatly secured in the rehabilitation camps, other infrastructural facilities are yet in need of developmental policies for improved living standards. The psychology of leaving behind social ties and memories in Ghoramara have often created biasness among the respondents who wish to return to their 'homeland' or some other areas with higher opportunities or have a place of their own to retain their lost social honour. However recent governmental and non-governmental programmes have started in these colonies to improve the livelihood of the inhabitants that gives hope for the displaced to lead a better life. With the help of sustainable use of natural resources and developmental initiatives, this region will be more developed in near future.

References

- Bates, D. C. (2002). Environmental refugees? Classifying human migrations caused by environmental change. *Population and environment*, 23(5), 465-477.
- Belcher, J. C., and Bates, F. L. (1983). Aftermath of natural disasters: Coping through residential mobility. *Disasters*, 7(2), 118-128.
- Brown, O. (2008). *Migration and climate change*. United Nations. DOI: <https://doi.org/10.18356/26de4416-en> retrieved in 15 June 2020
- EJF (2012). A nation under threat - The impacts of climate change on human rights and forced migration in Bangladesh. *Environmental Justice Foundation*, London. ISBN No. 978-1-904523-26-0
- Guest, A. M., & Stamm, K. R. (1993). Paths of community integration. *The Sociological Quarterly*, 34(4), 581-595.
- Haldar, A and Bhattacharya A. (2020). Sustainable Energy Development and Participatory Management Scenario in the Sundarban: A Case Study in the Sagar Island, West Bengal, India. *Geocology of Landscape Dynamics*. Sahdev, S., Singh, R. B., Kumar, M. (eds.), Springer, Singapore. <https://doi.org/10.1007/978-981-15-2097-6>. Online ISBN 978-981-15-2097-6
- Haldar, A., Das S., Chatterjee R., and Satpati L. (2021). Environmental Vulnerability and Displacement Due to Land Erosion: Selected Case Studies in West Bengal, India. *Habitat, Ecology and Ekistics: Case Studies of Human-Environment Interactions in India*. Rukhsana, Haldar A, Alam A, Satpati L (eds). eBook ISBN 978-3-030-49115-4. 10.1007/978-3-030-49115-4
- Hazra, S., Ghosh A., and Ghosh T. (2015). Microlevel vulnerability assessment of estuarine islands a case study from Indian Sundarban, *BF-DELTAS, BSPS Conference 2015*-University of Leeds.

- Kar, N. S., and Bandyopadhyay, S.(2014).Rehabilitating the Environmental Refugees of Sundarban:A Study of Jibantala Colony, Sagar Island,West Bengal.Seminar proceedings of *The Horizon and Beyond-Contemporary Research in Geography*.ed.Sil et al. Bhairab Ganguly College and Himalayan Books, Kolkata , pp. 101-105.
- Panigrahi, S. K. (2018). Development, Displacement and Rehabilitation: Indispensably Inter-Related. *Journal of Humanities and Social Science (IOSR-JHSS)* 23 (3. v7), 79-87.
- Rudra, K. and Haldar, A. (2017). *Sundarbaner Bhristir Taratammo: Tathya Bhatiik Bishleshon* (Variability of rainfall in the Sundarban: A factual analysis. in Bengali). *Sudhu Sundarban Charcha* 5(4) 9–15