IOSR Journal Of Humanities And Social Science (IOSR-JHSS)
Volume 23, Issue 1, Ver. 2 (January. 2018) PP 01-15
e-ISSN: 2279-0837, p-ISSN: 2279-0845.
www.iosrjournals.org

Climate Change and Its Worst Effect on Coastal Odisha-An Overview of Its Impact in Jagatsinghpur District

Dr. Pragnya Paramita Jena
Corresponding Author: Dr. Pragnya Paramita Jena

Date of Submission: 26-12-2017 Date of acceptance: 11-01-2018

I. INTRODUCTION

Changes in climate not only affect average temperatures, but also extreme temperatures, increasing the likelihood of weather-related natural disasters. Intergovernmental Panel on Climate Change (IPCC), an increase of greenhouse gases in the atmosphere will probably boost temperatures over most land surfaces, though the exact change will vary regionally. More uncertain—but possible—outcomes of an increase in global temperatures include increased risk of drought and increased intensity of storms, including tropical cyclones with higher wind speeds, a wetter Asian monsoon, and, possibly, more intense mid-latitude storms. Even if tropical storms don't change significantly, other environmental changes brought on by global warming could make the storms more deadly. Melting glaciers and ice caps will likely cause sea levels to rise, which would make coastal flooding more severe when a storm comes ashore. In their 2001 report, the Intergovernmental Panel on Climate Change stated that global warming should cause sea levels to rise 0.11 to 0.77 meters (0.36 to 2.5 feet) by 2100. The IPCC report also suggested that in the coming years more extreme weather events will be seen like flood, cyclones, cloud bursts, unseasonal excessive rains and droughts etc. in major parts of the globe. Maldives, China, India, Bangladesh and Srilanka will be the most affected countries in Asia. Thus extreme weather events or natural disaster are observed due to the impact of climate change. Due to Climate Change, frequencies of extreme weather events such as floods, droughts and heat waves are expected to increase in the future.

A disaster, as defined by World Bank Organisation, is any occurrence that causes damage, economic destruction, loss of human life and deterioration in health and health services on a scale sufficient to warrant an extraordinary response from outside the affected community or area. It is naturally occurring, largely environmental hazard which may occur relatively suddenly e.g. cyclone, volcanic explosions and earthquakes, or some degree of regularity in terms of seasonality such as periodic cycles of droughts/ floods as a result of climatic changes (Enarson 1998). Disaster can also be manmade due to prolonged intervention of nature by human beings although it is not visible as natural disaster. UN World Disaster Report 2001 says that India accounted for 24 percent of disaster death in Asia during 1991-2000 mostly due to floods and cyclones. Nearly four crore hectares of land area in the country are flood prone. Given the economic magnitude of these disasters, the 10th Five Year Plan (2002-2007) has for the first time got a separate chapter on the need for disaster mitigation from a development perspective.

Natural disaster, unrelenting in eastern India, has become an annual occurrence and the cause of many economic and social loses. Floods and cyclones, in particular has produced the greatest damage in eastern India, an area contains two great river systems, the Ganges and the Brahmaputra both of which on surge dangerously during the monsoon. Fed by melting snow from the Himalayas and the monsoon rains, these two rivers join in Bangladesh and beyond their confluence empty into the vast delta system of Bengal. Seismic disturbance are common too, especially along the larger fault lines western (Gujarat) and eastern India (Assam) with many predicted earthquakes slated tom occur in the near future.

The most affected by hazards are the poor and socially disadvantaged groups as they are least equipped to cope with the sudden, adverse effects. The life in thatch huts prone to rain and wind damage. Their fields often abut canals and waterways with weakened embankments. Their homes are located in the lowest lands of the village especially prone to the impacts of flooding. In the months which proceed the flooding season, they lack the means to store enough grains to feed themselves or to protect tube wells by raising their platform.

Vulnerability is a condition with both physical and socio-economic causes. Physical vulnerability relates to a family's location and its proximity to potential hazards example weak embankment, dangerously unstable housing

structures, and low land paddy fields. Socio-economic vulnerability relates to the social and economic conditions which block family's coping strategies. People with positions of low social and economic status within communities have less capacity to absorb the impact of natural calamities.

Disaster Management Act, 2005 defines Disaster as a catastrophe mishap calamity or grave occurrence in any area arising from natural or manmade causes or by accidents or negligence which results in substantial loss of life or human suffering or damage to and destruction of property or damage to or degradation of environment and is of such a nature or magnitude as to be beyond the coping capacity of the community of the affected area.

II. TYPES OF DISASTER

The UN has defined a disaster as "a serious disruption of the functioning of a society causing widespread human, material or environmental losses, which exceeds the ability of the affected society to cope using its own resources. By this definition, not every fire earth quake, drought, epidemic or industrial accident constitute a disaster, only those where the losses exceeds a society's ability to cope and external aid is required. Most classification of disaster identifies two main types: Natural and Manmade. Natural disaster may be classified further into three sub-categories:

(1) Sudden impact, which includes floods, earthquakes, tidal waves, tropical storms, volcanic eruption and landslides.
(2) Slow onset disaster, which includes drought, famine, environmental degradation, deforestation, pest infection, and desertification. The disaster are usually the result of adverse weather conditions confined with poor land use.
(3) Epidemic disaster such as cholera, measles, dysentery, respiratory infections, malaria, SARS and HIV.

III. DISASTER IN ODISHA

For over a decade, Orissa has been teetering from one extreme weather condition to another: from heat wave to cyclone, from drought to flood. The state has been declared disaster-affected for 95 years out of the last 105 years: floods have occurred for 50 years, droughts for 32, and cyclones have struck the state for 11 years. Since 1965, these calamities have not only become more frequent, they are striking areas that have never experienced such conditions before. For instance, a heat wave in 1998 killed around 2,200 people -- most of the casualties were from coastal Orissa, a region known for its moderate climate. Since 1998, almost 3,000 people have died due to heatstroke.

The 1999 super cyclone affected places like Bhubaneswar and Nayagarh, which were never traditionally cyclone-prone. While the 2001 drought parched fields in coastal districts, the unprecedented floods of 2001 submerged 25 of the state's 30 districts. Many of these areas had never witnessed floods before. Orissa has experienced around 952 small and big cyclones and 451 tornadoes between 1891 and 1970. From 1901 to 1981 there were 380 cyclones, of which 272 resulted from depressions in the Bay of Bengal. Twenty-nine of these cyclones were devastating.

A conservative study of the effects of natural disasters reveals that between 1963 and 1999, Orissa experienced 13 major disasters, which killed 22,228 people (state government figure; non-government figure puts the toll at around 40,000), and rendered 34,21,000 people homeless.

Odisha has experienced with natural disasters like flood, drought and cyclone in almost all the years since 1965 (Table 1). While flood and drought are common features of in the state, cyclone is not frequently observed. Since 1965, Odisha has experienced flood for 17 years, drought for 19 years and cyclone for 7 years. These natural disasters have not only affected the human beings but also made loss to the property.

Table 1: ODISHA FACING NATURAL CALAMITIES

Year	Natural Calamities	Year	Natural Calamities
1965	Severe Drought	1989	Drought
1966	Drought	1990	Flood
1967	Cyclone, Flood	1991	Flood
1968	Cyclone, Flood	1992	Flood and Drought
1969	Flood	1993	-
1970	Flood	1994	Flood
1971	Severe Cyclone, Flood	1995	Flood
1972	Flood and Drought	1996	Severe Drought
1973	Flood	1997	-

1974	Severe Drought, Flood	1998	Drought
1975	Flood	1999	Super Cyclone
1976	Severe Drought, Flood	2000	Drought
1977	Flood	2001	Severe Flood
1978	Flood	2002	Severe Drought
1979	Severe Drought	2003	Flood
1980	Flood and Drought	2004	-
1981	Flood and Drought	2005	-
1982	Severe Flood, Drought, Cyclone	2006	Flood
1983	-	2007	-
1984	Flood and Drought	2008	Flood
1985	Flood	2009	-
1986	Drought	2010	Drought
1987	Drought	2011	Flood
1988	Drought	2012	Severe Drought

Source: Board of Revenue, Cuttack and Special Relief Commissioner, Government of Odisha, Revenue Department, Bhubaneswar.

IV. DROUGHT

Drought is the slow onset disaster. It occurs mostly due to lack of adequate rain in the dry land areas or even distribution of rainfall during a particular year. About 70 percent of the total cultivated areas in the state are prone to drought. These areas lack not only irrigation facilities but also get scanty rainfall. However, in some areas, even through rainfall is plenty, it is erratic. The severity of drought is measured by crop cutting experiment and accordingly declaration of drought area is made.

It is observed from Table 1 that Odisha has experienced 11 years of drought since 1965. Out of this, the state has experienced seven years of severe drought in 1965, 1974, 1976, 1979, 1996, 2002, and 2012. The frequent occurrence of drought is mostly due to the inability on the part of the state administration to take permanent measures.

Odisha has faced drought in most of the years in the latter half of the 90s as shown in Table 2. Comparing the drought situations of different districts in the State since second half of the 90s, during 1996-97, all districts (except Korapur and Malkangiri) were affected by drought. The drought was so severe that more than 50 percent villages in the state had crop loss of 50 percent or more as shown in Table 2.

Table 2: CROP LOSS OF 50 PERCENT AND MORE DUE TO DROUGHT DURING DIFFERENT YEARS.

Sl. No		Year			
		1996-97	1997-98	1998-99	2000-01
1	No:of districts affected	28 (93.33)	15 (50.00)	26 (90.00)	29 (96.67)
2	No: of blocks affected	263 (83.76)	86 (27.39)	163 (51.91)	216 (68.79)
3	No: of GPs affected	3762 (71.51)	849 (16.14)	1686 (32.03)	2511 (47.74)
4	No:of villages affected	28,837 (55.96)	4688 (9.10)	11,431 (22.18)	16,219 (31.72)

Note: Figures in parentheses indicate percentage share.
Source: Government of Odisha, Revenue Department.

The drought situation in 1997-98 was less severe, but the severity increased thereafter. The severe drought- affected districts in the state during the period were: Boudh, Jharsuguda, Balangir, Sambalpur, Bargarh, Nuapada, Sonepur and Sundargarh in the western part of Odisha; Balasore, Jajpur, Nayagarh and Khurda in the eastern part; Koraput and Malkangiri in the southern part; Mayurbhanj in the northern and Dhenkanal and Angul in central part as revealed from Table 3.

Table.3: DISTRICT CONCENTRATION OF VILLAGE HAVING CROP LOSS OF 50 PERCENT AND MORE

Sl.No	Years	No.of affected districts	Up to 25 percent of total village	25-50 percent of total village	50-75 percent of total village	Above 75 percent of total village
1	1996-97	28	Deogarh,Jagatsinghpur, Nabarangpur,Rayagada, Sundargarh	Bhadark,Cuttack, Gajapati,Kalahandi, Nuapada, Puri	Bargarh, Ganjam, Kendrapara,	Angul, Balangir, Balasore,

					Keonjhar, Khurda, Mayurbhanj, Sonepur	Boudh, Jharsugada, Nayagarh, Sambalpur
2	1997-98	16	Balasore, Bhadark, Jagatsinghpur, Kalahandi, Kendrapara, Mayurbhanj, Nabarangpur, Rayagada, Sambalpur, Sonepur	Gajapati, Ganjam, Malgangiri, Puri	Koraput	Nil
3	1998-99	26	Bargarh, Bhadrak, Deogarh, Dhenkanal, Ganjam, Jagatsinghpur, Jajpur, Kalahandi, Kendrapara,Khandamal,Koraput, Nabarangpur, Puri, Sambalpur, Sundargarh	Angul, Jharsaguda, Keonjhar	Balangir, Balasore, Mayurbhanj, Sonepur	Boudh
4	2001-01	29	Balasore, Bargarh, Cuttack, Gajapati, Ganjam, Kandhamal, Keonjhar, Koraput, Mayurbhanj, Nabarangpur, Nayagarh, Puri, Jagatsinghpur.	Kalahandi, .Kendrapara, Khurda, Rayagada, Sonepur	Denkanal, Malkangir, sundargarh	Angul, Balangir, Boudh, Deogarh, Jajpur, Jharsuguda, Nuapada, Sambalpur

Source: Board of Revenue, Cuttack, Special Relief Commissioner, Government of Odisha, and Revenue Department, Government of Odisha.

More than half of the villages in these districts had crop loss of 50 percent or more. In Odisha drought usually refers to failure of paddy crop, since more than two thirds of the cultivable land is utilized for paddy. Around 1000 varieties of traditional paddy were cultivated in the state in the past. These varieties of paddy were able to face drought, flood and cyclone since they were grown in different methods, in different times and in different climates.

We can say that the successive droughts have brought a number of programmes. Most of the programmes are however, for short term and without any long term perspective. Some of the programmes which are long term in nature consider the community effort, which would be the basis of development.

V. FLOOD

Like drought, flood is also a major natural calamity in the state of Odisha. The unusual rainfall in different district causes flood in all the major rivers system of the state. The state has a number of major rivers, viz. Mahanadi, Brahmani, Baitarani, Rushikulya, Bansadhara, Budhabalanga, Subarnarekha and others. These rivers flow towards the Bay of Bengal. The Coastal district has therefore, the chance of being affected more by flood due to these major river systems. The inland district is also affected by flood.

Odisha has faced flood in most of the years since 1965, but it has faced two severe floods, in 1982 and 2001. Odisha experience of flood for last three decade can be seen from Table 1. The table shows that the number of times of occurrence of flood in the state has increased decade after decade. This indicated that vulnerability due to flood has increased over time; it has made not only human and live stock causalities, but also has affected cultivated areas at an increasing rate. This can also be observed if we compare the severe floods (i.e. 1982 and 2001). During 2001, while the population affected by flood is near about twice that during 1982, the cultivated area affected has become more than six times.

Considering the frequency of flood occurrence in different districts since 1994, it can observe that coastal district is the major sufferers. Among the coastal districts, Bhadrak, Balasore and Jajpur are worst affected by floods. The severe flood in coastal districts is due to the destination of major flooding rivers towards coastal areas.

Odisha is a land of many large and small rivers and due to erratic behavior of the monsoon the state is off and on affected by the problems of floods and droughts. As flood is a perennial problem in the coastal district ever since 1859, it has become a matter of concern for the government at different points of time.

Post disaster management comes into action once the flood has occurred. This includes relief and rehabilitation, health measure, repair and reconstruction of infrastructure facilities etc. (Basu, 1999). A major problem of post disaster management is that there is no community involvement. It is the people in the affected area who can help immediately than the outside agencies. Therefore, their involvement is necessary for timely and better management (Reddy et al, 2000).

VI. CYCLONE

Natural disaster like cyclone is sudden and powerful, though sometimes there is an element of warning. It is often predictable to some degree but it is not seen as countable. A natural disaster causes visible damage to a familiar environment. The extent of natural disaster tends to be limited to the immediate victim such as those made homeless in a particular location. There are economic losses besides psychological disturbance due to bereavement.

When fully developed, a cyclone is a vast whirlwind of extraordinary violence, 150 to 800 kms across and 10 to 17 km high spiraling around a center and progressing along the surface of the sea at a rate of 300 to 500 km a day. The speed of wind within 50 to 100 km of the storm in a mature storm, or an average can be 160 km per hour or more. The winds associated with such storms are among the most violent and the rainfall accompanying them is always very heavy. The cyclonic storm transfers its whirlwind movement of the sea water, and since the storm itself moves comparatively slowly, the winds out for a long time on the water surface producing strong currents of water up to depths of 20 to 25 meters. When the storm approaches a coastal belt, sea level rises rather suddenly to an overwhelming extent causing dangerous inundation over the coastal areas. The sudden rise in the sea level associated with cyclonic storms is called tide or tidal wave. When these storm tides strike the coast, they cause large scale devastation in a later of minutes (Shiva and Emani, 2000). A number of cyclones visited Odisha in the year 1823, 1831, 1832, 1842, 1848, 1850, 1864, 1872, 1874, 1887, 1889, 1890, 1891 and 1893 in the Nineteenth century, causing heavy loss to the standing crops and other property. These cyclones increased the misery and sufferings of the people and resulted in a near total failure of the agrarian economy of the people (Bhatt, 1997b). During the first two decades of the 19th century there was no severe cyclone in Odisha (Bhatt, 1997a). The first major cyclone in the 19th century was in Balasore on 27th May 1823. The sea suddenly rose and penetrated six miles inland carrying with it every living creature in them, not even the vestige of a human habitation being left.

There was a devastating cyclone on 31st October 1831 in Balasore district. The loss calculated was at least around 20,000 of human lives and 50,000 heads of cattle. Balasore district with around 15000 human losses suffered the most. The storm struck Balosore in 1831, 1832 and 1833 and the district of Puri on 30th April. The undivided districts of Cuttack and Puri were also visited by severe storms in October 1842 and October 1848.

In the second half of the 19th century, there was also cyclone, one on 5th October 1864 another on 1st November 1867 and on 1st July 1872, the whole of coastal belt of Odisha was completely devastated due to a severe storm accompanied by tidal eruption.

In the beginning of the 20th century a severe cyclonic storm hit Odisha in November 1901 which resulted in a heavy loss of life and property. Another on 3rd April 1936 ravaged three undivided districts of Cuttack, Puri and Balasore, disrupting the communication system, and destroying crops, houses, property and livestock.

So far the State has faced two severe cyclones since independence: one in 1971 and the other in 1999. The October 1999 cyclone was so severe that it is termed as Super cyclone. During 1999 cyclone surfaced twice in Odisha within a period of two weeks. The first cyclone which surfaced during 17th & 18th October affected mostly two districts viz Ganjam and Gajapati. However, the worst affected was Ganjam. On the other hand, the second cyclone which occurred during October 29-30 affected twelve districts; the most affected being Jagatsinghpur.

The 1999 Super cyclone moving with a speed of about 260 kms per hour hit 12 districts. During this period as many as 97 blocks, 28 urban bodies, 1827 GPs and 15676 villages with 1.26 crore population were affected. Near about 10,000 human lives lost, 15.80 lakh houses damaged and 17.86 lakh hector agricultural land affected. The loss of cattle population was more than three lakhs. Over 90 percent of school buildings, dispensaries, offices, government buildings and roads in rural areas were destroyed.

Thus according to the costal vulnerability index (CVI) study by the Indian National Centre for Ocean Information Services (INCOIS), vulnerability, loss and damage from sea level rise, coastal geomorphology, tidal range, and elevation in the area of Odisha coastline varied from "low" in about 76 kilometres of the coastal stretch of Odisha state, covering parts of Ganjam, Chilka, southern Puri, and Kendrapara, and to "medium" in about 297 kilometres, covering northern Ganjam, Chilka, central Puri, Jagatsinghpur, Kendrapara, southern Bhadrak, and northern Balasore, and to "high" in about 107 kilometres, covering northern Puri, parts of Jagatsinghpur, Kendrapara, northern and southern Bhadrak, and southern Balasore.

VII. JAGATSINGHPUR EXPERIENCE WITH NATURAL DISASTER

The profile of Jagatsinghpur district is like any deltaic fertile flood plain in Odisha. The overall population density is very high in the district. In Balikuda block the number of houses is highest (32103) while there are highest numbers of villages in Tirtol block (248) and next comes the Balikuda block (237).

Jagatsinghpur has been prone to both natural and man-made disaster since long. It has a coastline of 41 kilometers. It is interspersed by Mahanandi and its branches like Devi, Paika and Biluakhai. Cyclone, flood, and drought hit this district every alternative year. It is susceptible to flood very frequently. It is the district, which was worst hit in 1999 super cyclone thousands of human lives were lost due to super cyclone. A small attack by nature tells upon people heavy since they are yet to fully recover from wrath of 1999 super cyclone.

The problem is further accentuated when flood synchronises with high tides. This is because during high tides it becomes difficult for flood water to enter into the sea, thereby affecting coastal areas heavily.

Jagatsinghpur District is experienced deficit rainfall of 553.43 mm in 2002, 311.35 mm in 2004, 61.87 mm in 2007, 8.59 mm in 2009 and 322.83 2010. It has also experienced surplus rainfall with highest in the year 2003, i.e., 201.31 mm during the last decade. In the year 2008 also there is a surplus rainfall deviation 172.38 mm, in the year 2001, 2005, 2006 and 2011 there is surplus deviation of 2.90mm, 106.87mm, 88.03mm and 48.42 mm respectively as shown in Table 4.

Table 4: YEAR WISE RAINFALL ANNUAL REPORT (IN MM) OF JAGATSINGHPUR DISTRICT

	Actual Rainfall	Normal Rainfall	Deviation
2001	1504.2	1501.3	2.9
2002	947.87	1501.3	-553.43
2003	1702.61	1501.3	201.31
2004	1203.25	1514.6	-311.35
2005	1621.32	1514.6	106.72
2006	1602.63	1514.6	88.03
2007	1452.73	1514.6	-61.87
2008	1686.98	1514.6	172.38
2009	1506.01	1514.6	-8.59
2010	1191.7	1514.6	-322.83
2011	1275.34	1226.92	48.42

Source: Revenue and Disaster Management, Special Relief Commissioner, Government of Odisha.

Flood Situation in Jagatsinghpur

Jagatsinghpur district falls within the two deltaic zones of rivers Mahanadi and Devi. The topography is extremely flat. The entire rainfall in the catchment tries to find way into the sea through the delta. The rapid rain water in the upper reaches laden with silt and sand finds it difficult to maintain its velocity because of the flat land in the deltaic plain and consequently deposit the suspended materials in the river bed as well as by the side of the embankments. Repeated action like year after year has raised the river bed in relation to the surrounding area. The state of affairs results in spilling over the banks during rainy season. In very high flood excess discharge of river water inundates the surrounding areas and causes severe damage to life and property.

The flood in the year 2001 is the most severe one which affected all the 8 blocks, 105 GPs and 522 villages. In the year 2003, 2006, 2008 and 2011 there was flood affecting 250, 158, 188 and 126 villages respectively as shown in Table 5.

Table.5: EXTEND OF DAMAGE

Year of flood	No. affected		
	Blocks	GPS	Villages
2011	7	43	126
2010	0	0	0
2009	0	0	0
2008	8	61	188
2007	0	0	0
2006	7	77	158
2005	0	0	0
2004	0	0	0
2003	7	73	250
2002	0	0	0
2001	8	105	522
2000	0	0	0
1999	All	All	All

Source: District Emergency Cell, Jagatsinghpur

During the last two decades, Jagatsinghpur district has experienced major flood causing extensive damage through loss of live stock, human life and property, as well as inundation of agriculture lands, water logging, salt-water intrusion and tidal inundation. During the 2001 flood the number of persons affected was 210378 in comparison to 2011 flood which was also sever one, the number of human beings injured was 91643 while five persons lost their life. In the year 2008, ten persons lost their life, which is highest in comparison to the other years as revealed in Table 6.

Table 6: DEATH, INJURIES AND PERSONS AFFECTED BY FLOOD

Year	No. of persons affected by the calamities	No. of human beings lost	No. of human beings injured
2011	87,661	Nil (one person missing)	55,866
2008	147427	10	38579
2006	105271	01	300
2003	194184	0	86296
2001	210378	05	91643

Source: Revenue and Disaster Management, Special Relief Commissioner.

These natural disasters have not only led to loss of human lives but also resulted in damage to, and loss of property. The value of property lost and damaged due to natural disaster has also been increasing over the decades. During the year 2011 the value of property lost in Jagatsinghpur district due to natural disaster was around Rs 9369.65 lakh which is higher than in the year 2003 (Rs 7819.10 lakh). The increase in property loss shows that natural calamities have become a problem for the poor people. Also they have led to serious fiscal imbalance by placing heavy demands on revenue expenditure, that expenditure on restoring assets and reduction of revenue in terms of taxes and duties because of property loss and crop loss.

In the whole district whenever there is flood it is seen houses are damaged. That is washed away, severely damaged or partially collapsed. Table 7 shows that the highest number of houses damaged was in 2008 flood, i.e. 8072. The flood occurred in 2001 was though sever one but when the number of houses collapsed was compared it is less than that in 2008 flood, i.e. 5486 and the number of huts collapsed was 1354, which is highest in comparison to the other floods.

Table.7: House Damaged

Year	Fully Damaged		Severely Damaged		Partially Damaged	Huts	Total
	Pucca	Kutcha	Pucca	Kutcha			
2011	0	66	2	308	1810	445	2631
2008	1	141	11	1797	5105	1017	8072
2006	2	12	11	94	772	819	1710
2003	0	77	9	32	398	963	1479
2001	5	213	15	1923	1976	1354	5486

Source: Revenue and Disaster Management, Special Relief Commissioner.

Cultivation is the main occupation of the District, followed by employment in traditional rural non-farm sector. Average productivity in Jagatsinghpur district is 22.23 quintal per hectares in kharif season and 25.46 quintal per hectares in Rabi season. But during flood there is submergence of vast area and flooding which damages the crops. Since it is a coastal district it is more prone to water logging and soil salinity especially in rainy season. Area submerged in flood and crop loss is highest in the year 2001, i.e. 25249 hectares, and lowest in the year 2011 (Table 5.8). But area sand cast in that year is highest, i.e. 805 hectares, due to flood. Cattle especially the draft cattle being the backbone of rural agricultural economy has devastated in flood. The below table 8 shows that flood during the year 2001 had caused loss of 31 livestock which is highest in comparison to the other floods, and 29 lost their life in 2008, which is near to 2001. Due to flood and so destruction ruined the eco-environment, many lost their sources of income like agriculture, fishing, live stock rearing, betel cultivation, horticulture etc., rural artisans had been affected causing damages to their equipments and raw materials. In the flood year 2008, about 1210 artisans lost their livelihood for which the poor and vulnerable section of the society suffered. In the other years the number of artisans suffered is less in comparison to this year.

Table.8: loss of livestock, crop damage, loss of livelihood in flood

Year	No: of Live Stock lost	Crop Damaged (Area submerged in hectares)	Sand Cast (Area in hectares)	Loss of livelihood
2011	16	4822.81	805	1190 farmers, 141 artisans
2008	29	15129.00	100	157 farmers, 1210 artisans

2006	05	25000	166	153 artisans
2003	08	23786	121	178 farmers, 134 artisans
2001	31	25249	463	1173 farmers, 146 artisans

Source: Revenue and Disaster Management, Special Relief Commissioner.

(a) Rescue

Immediately after disaster, the rescue operation takes place. The rescue teams were left to fend for themselves during the critical period with any community assistance. People were evacuated to a safer place with rescue boats. During 2001 flood a large number of rescue boats were provided to the affected people since the person evacuated were 41748 (Table 9). After the people are evacuated some are provided with readymade food items and some are fed with free kitchen, where cook food are served to the affected people. The beneficiaries are the affected people, and the number is highest in the 2001 flood (3251), they are provided food through two kitchen centers though 41748 were evacuated. In the year 2003 though 263 people were evacuated but no free kitchen centers were opened.

Table.9: Rescue

Year	Rescue (No: of boats)	Evacuation	Free Kitchen	
			No. of free kitchen centers	No. of beneficiaries
2011	79	7774	1	200
2008	131	38579	2	2150
2006	81	300	1	300
2003	99	263	0	0
2001	279	41748	2	3251

Source: Revenue and Disaster Management, Special Relief Commissioner

(b) Emergency Relief, Health and Sanitation

Immediately after flood, survivors mostly take fruits and vegetables collected from uprooted trees like coconut and papaya. Later on relief materials reach the affected areas. The success and scale of activities of post disaster management activities generally depend on the participation level of the NGOs and government. Local NGOs generally jointly work with national and international NGOs because of their understanding of local dialect, situation and problems of the affected people. Both non-food items and food materials flow to the affected area after the disaster. The non-food items received during the flood were Kerosine, medicine, blankets, polythene rolls and sheets etc. The food items received were pressed rice, biscuit, rice, salt, sugar cane etc.

Table 10 shows that food items distributed in 2008 flood is highest in comparison to the other flood years. Rice (12696.3 quintals), chuda (3934.25 quintals), gur (287.65 quintals) were distributed in large quantities.

As regards non-food items, the relief flow was relatively low compared to that of food materials. Table 5.10 shows that the major non-food items distributed were kerosene oil and polythene sheets and rolls. Out of the five years of flood in two years (2006, 2011) no kerosene is distributed and in 2008 more kerosene is distributed (29250 lit) in comparison to other distributed years. Polythene sheets distributed is highest in the year 2006 (6832 sheets) but no polythene rolls were distributed. In 2011 houses collapsed were more in comparison to 2006, but polythene distributed to protect them in the absence of houses has decreased.

In 2008 the veterinary doctor engaged was highest because the life stock death rate was 29, but in the year 2001 the life stock death rate is highest (31) and the veterinary doctor engaged is only four. Medical team deployed was highest in the year 2003 (44) but medical centers opened was 35. Highest number of medical team was opened in the year 2011.

Table 10: EMERGENCY RELIEF, HEALTH AND SANITATION

Year	Rice in Qt.	Chuda in Qt.	Gur in Qt.	No: of medical team deployed	Medical centers opened	No;of vertinary doctor engaged	Kerosine oil	Polythene in rolls
2011	2386.67	679.91	83.26	34	52	6	-	1356 (rolls)
2008	12696.31	3934.25	287.65	26	43	9	29250	1598 (rolls)
2006	7456.80	488.43	59.45	13	24	4	-	6832 (sheets)
2003	5568	1682.13	171.98	44	35	3	13512	4043 (sheets),568 rolls
2001	9479.52	2986.15	214.86	36	42	4	15342	1463 (rolls)

Source: Revenue and Disaster Management, Special Relief Commissioner.

1999 Super Cyclone

During 1999, two cyclones hit Odisha within a period of two weeks. The first cyclone, which occurred on 17-18 October, affected mostly two districts, viz. Ganjam and Gajapati. The worst affected was Ganjam with 139 human causalities and 3.59 lakh houses damaged. The second cyclone, which occurred during 29-30 October, affected 12 Districts, the most affected being Jagatsinghpur where 8,119 human causalities resulted. Of these two cyclones, the second was much more severe compared to the first one and has been termed as the Super Cyclone.

The 1999 cyclone, with a speed up to 300 km per hour, rained heavily for 36 hours. It hit all the 8 blocks of Jagatsinghpur, affecting 2 NACs, 165 Gram Panchayats (GPs) and 1380 villages with a total population of 1362760. The number of human causality in the Super Cyclone is 6905, about 114863 cattle were lost and over 90 per cent school buildings, dispensaries, offices, government buildings, and roads in rural areas were damaged (Table 11). Furious cyclone with saline inundation has rendered almost a paralysed socio-economic situation.

Table 11: Super Cyclone, 1999- Jagatsinghpur District.

Sl . No		
1	a)Total area of the district	1788.29 sq.kms
	b)Total area affected	1788.29 sq.kms (entire area)
	c)Total population of the district (Nos.)	1362760
	d)Population affected (Nos.)	1362760
2	a)No. of blocks affected	8 blocks
	b)No. of NAC affected	2 NACs
	c) No. of G.Ps affected	165 G.Ps
	d)No. of villages affected	1380 villages
3	No. of human causality	6905
	Kujanga Tahasil	6383
	Balikuda Tahasil	281
	Jagatsinghpur Tahasil	121
	Tirtol Tahasil	120
	Total	**6905**
4	Loss of cattle population (Nos.)	114863
	a)No of household in the District	3lakh
	b) No. of houses damaged	259812
	i) Houses Swept away	12124
	ii) Houses fully collapsed	199365
	iii) Houses partially collapsed	48323
5	Total no. of private houses damaged	2,59,812

Source: District Emergency Cell, Jagatsinghpur

As far as spatial variation of damage within the district is concerned, in comparison to other seven blocks (even to other districts) the Ersama block suffered 20 times more loss in human lives when compared with other GPs of Jagatsinghpur District. As far as damage to agriculture land was concerned the area exceeded one lakh hectares in the district.

The damage to house building in affected areas was extremely high which rendered lakhs of population homeless without shelter. Jagatsinghpur being worst affected district received 100 per cent damage to houses. The Super Cyclone swept away 12124 houses and made many people homeless in the district. Table 12 shows that 199365 houses were fully collapsed, 48323 houses partially collapsed and in total 259812 houses were damaged.

Table. 12: Houses Damaged

Name of the Tahasil	Category of Damage			
	Swept away	Fully collapsed	Partially collapsed	Total
Jagatsinghpur	-	62396	19302	81698
Balikuda	879	65455	14375	80709
Tirtol	82	29774	9248	39104
Kujanga	11163	41740	5398	58301

Total	**12124**	**199365**	**48323**	**259812**

Source: District Emergency Cell, Jagatsinghpur

Super Cyclone inflicted rural economy due to massive agriculture loss. Table 13 shows that out of the total cultivated area of 119043 hectares, 111505 hectares were affected or damaged after cyclone and the estimated loss of yield is 2921510 quintals. Because of saline inundation, heavy torrential rainfall and high speed wind, total damage to agricultural area exceeded 1 lakh hectares.

Table13: Crop Damaged

a) Block affected (Nos.)	8
b) NACs affected (Nos.)	2
c) Villages affected (Nos.)	1308
d) Cultivated area (Ha.)	119043
e) Cultivated area affected (Ha.)	111505
f) Area water logged (Ha)	44473
g) Sand cast (Ha)	8050
h) Damage over 75% (Ha.)	111505
i) Estimated loss of yield (qtls)	2921510
j) Damage after cyclone (Ha)	111505

Source: District Emergency Cell, Jagatsinghpur

The government did a job with regard to controlling the spread of any epidemic after many deaths of human beings and bovine population. In spite of these 2373 number of persons were attacked by G.E. and out of them 39 died, 6804 persons were attacked by bacillary dysentery and 25298 affected by other diarrhea (Table 14).

Table 14: Public Health Activities

1	No.of G.P. affected	123	
2	No.of village affected	1296	
3	No.of population affected	1009626	
4	**Diseases**	**Attack**	**Death (By the end of November,1999)**
	G.E	2373	39
	Bacillary dysentery	6804	Nil
	Malaria	29	Nil
	Snake bite	15	Nil
	Other diarrhea disease	25298	Nil

Source: District Emergency Cell, Jagatsinghpur

After the Super cyclone, 314 doctors both from within the district and outside the district were deployed in medical relief work. 781 paramedical staff also involved in the work, while 73 mobile medical team and 60 temporary treatment centers were opened during that time (Table 15). In spite of all, due to inaccessibility and away from the limelight, Baleipur, Balitutha, Jireilo, Nardia and Pokhariapada panchayats did not receive any health care facilities.

Table 15: Staff Deployed In Medical Relief Work**.**

Sl.no	Type	From district	From out side	Total
1	Doctors	89	225	314
2	Paramedical	429	352	781
3	No.of Medical Team			73
4	No.of temporary treatment center			60

Source: District Emergency Cell, Jagatsinghpur

Loss of cattle

Cattle, especially the draft cattle being the backbone of rural agricultural economy has been highly devastated due to saline inundation, heavy rainfall and adverse weather condition that continued up to 7 days. The blocks close to the coast have lost the maximum number of cattle due to saline inundation. The data collected show that highest loss of cattle is in Ersama bock where near about 38,000 cattle perished due to the killer saline inundation.

Fishery was the one of the important source of livelihood of this district and the cyclone took away lives of 459 fishermen, 6812 numbers of fishermen were affected, 11367 numbers of nets were damaged which hampered the income of the fishermen (Table 5.16). The loss of number of nets and boats is five to seven times more in Kujanga than in Ersama, where 2,095 numbers of nets and 4,762 numbers of boats were lost, while in Ersama 305 nets and 1279 boats were lost followed by Balikuda, with 101 nets and 641 boats.

Table 16: Fishery

No. of fisherman affected	6812
No. of boats damaged	5441
No. of nets damaged	11367
No. of fisherman died	459

Source: District Emergency Cell, Jagatsinghpur

Jagatsinghpur district which was worst affected, the funds requirement for house building for this district was set at maximum (Rs 5236 lakhs) compared to other districts. The amount disbursed for this purpose was Rs 4729.65 lakh. It was 94.4 percent of the assistance required. The 1999 Super Cyclone caused unprecedented loss of human lives, livestock, public and private properties including vital infrastructure and houses. House building assistance was given at the rate of Rs 3,500 for fully washed houses and Rs. 2,000 for fully collapsed houses and Rs 1000 for partially collapsed houses. In Jagatsinghpur district Rs. 4729.65 lakh amount had been disbursed for house building assistance. In the matter of payment of ex-gratia to the next kin of those who were killed was Rs. 2268.8 lakhs. Jagatsinghpur received the entire required amount for paying ex-gratia to next of their kins (Table 17).

Table 17: House Building Grant Disbursed

Name of the Tahasil	Swept Away	Fully Collapsed	Partially Collapsed	Total	Amount Disbursed
1	2	3	4	5	6
Jagatsinghpur	-	60725	18429	79154	139879000
Balikuda	879	61455	13345	75679	139331500
Tirtol	82	29345	8777	38204	67754000
Kujanga	11126	40879	5301	57306	126000000
Total	12087	192404	45852	250343	472964500
Ex-gratia and financial assistance from PMRF sanctioned	251				
No.of cases disposed of at Tahasil level (rejected)	574				

Source: District Emergency Cell, Jagatsinghpur

Rehabilitation Programme of Fishermen

About 50 numbers of fishermen belong to Naugan at Erasama block are rehabilitated by providing net and boat through department of Fisheries.

Aid from various sources poured in after cyclone. Grants received by Jagatsinghpur district in kind is Rs 51.00 lakhs. Rs 2029.75 lakh is received as ex-gratia; financial assistance out of PMNRF for death cases is Rs 3034.50 lakh. The state government provided a number of rehabilitation supports to the cyclone affected households, such as ex-gratia payment for human deaths, financial assistance for damaged houses, financial help for fishing equipments, loss of other income generating assets, subsidized seeds for cultivation, PDS rice at concessional rate, FFW programs and others (Table 18).

Table 18: Allotment Position

Sl. No	**Purpose**	**Amount of Allotment received (Rs.in Lakh)**
1	Grant Received in kind	51.00
2	Transport charges	10.00
3	Ex-gratia	2029.75
4	Disposal of carcasses and cyclone contingency	40.00
5	H.B grant	5270.60
6	Financial assistance out of PMNRF for death cases	3034.50

Source: District Emergency Cell, Jagatsinghpur

Not only relief and rehabilitation measures were praiseworthy, '*Mamta Gruhas*' as rehabilitation centers for women and destitute were also innovative interventions. The destruction caused by the 1999 cyclone left behind a number of orphans and widows in Ersama block with none to take care of them. In 9 GPs of Ersama block Mamata Gruhas were set up in 35 places. As per NHRC direction destitute Orphans were identified for rehabilitation. The 1999 Super Cyclone made 248 children Orphans without father and mother, 388 with single parent that is mother, 450 widows and 209 destitute old people (Table 19).

Table 19: Identification of Destitute Orphan As Per NHRC Direction And Programme For Their Rehabilitation

Sl. No	Destitute/orphans	
1	No. of Orphans (without father & mother)	248
2	No. of Orphans (with single parent that is mother)	388
3	No. of destitute widows	450
4	No. of destitute old persons	209
	Total	1295

Source: District Emergency Cell, Jagatsinghpur

Many international NGOs, national level and State level NGOs were involved in the relief and rehabilitation work in the flood/cyclone affected areas. Many State Governments have been generous enough to extend possible help to cyclone affected area. It is worth mentioning that 17 State Governments out of 25 States of India extended the sympathetic contribution to government of Odisha. A large number of public sector undertakings were assigned the task of relief operation in the affected areas. These are HAL, CARE, LWS, IPCL, Board of Socio Economic Concerns, Church of South India, Diocese of Madras, PPL, Rastriya Ispat Nigam etc. The Non Government Organisations played a vital role in relief operation along with Army and Air Force personnel. Many actively participated in the rescue and rehabilitation of affected people of Jagatsinghpur. They carried out the relief work by supplying the relief material and food grains by providing health services to the affected people and by helping in disposing the carcasses (Table 20).

Disaster Management

Natural disaster cannot be prevented, but their impact on people's lives can be reduced to a considerable extent. Disaster management covers all aspect of preventive and protective measures, preparedness, rescue and relief and rehabilitation operation. It has three phases, viz. impact phase, relief and rehabilitation phase, long term mitigation and preparedness phase. The impact phase has three stages: first stage is pre Impact/Response which includes forecast, early warning, preparedness, tracking/monitoring approach of disaster, alertness; the second stage is the impact stage which includes close monitoring of impact, establishing emergency communication, deploying rescue teams, medical support and other life saving activities, supply/air dropping of food, drinking water and essential items; the third stage is post impact and includes medical care, food, clothing and shelter for rescued people, estimating loss of life and property, disposal of bodies/animal carcasses, preventive of epidemics, repair and restoration of essential services, infrastructure.

The second phase is repair and rehabilitation phase which includes temporary shelter/drinking water/food/clothing/minimum household utility goods for victims, repair of roads, electricity, and communication networks, salvaging damage to agriculture/distribution of seeds, fertilizer etc, restoration of health/educational facilities or temporary alternative arrangements, distribution of ex-gratia relief for those killed and compensation for the losses, building durable houses for victims.

Table 20: Emergecy Relief

Sl. No	Name of Block/NAC	No of GP/Ward	No of Village	Distribution of Relief Materials						
				Rice(bags)	Chuda	Guda	Atta/ Wheat	Milk Power (p2er 3ba4g)	Polythene	Dal
1	2	3	4	5	6	7	8	9	10	11
1	Jagatsinghpur	24	168	10102.01724	501.50	30.00	773.10	769	2478	779.25
2	Jagatsinghpur NAC	20		2762.27504	256.00	45.60	430.20	200	755	551.15
3	Balikuda	24	216	10142.741276	267.00	129.00	731.70	683	3333+2000 pieces+13 bundles	460.00
4	Nuagaon	14	90	5611.30814	253.50	3.20	219.60	653	1771+3456 pieces	466.00
5	Biridi	15	76	5847.681084	562.50	109.86	367.30	887	2825	809.90
6	Raghunathpur	18	75	7130.441296	673.00	131.50	681.40	678	2300	566.90
7	Tirtol	24	249	11213.48846	325..00	259.20	1296.00	710	3463	820.10
8	Kujanga	23	169	12213.854180	314.50	204.36	681.30	560	4149	884.25
9	Paradeep NAC			6060.35663	139.50	4.86	399.60	598	2093	275.00
10	Erasama	24	208	9538.454180	532.99	40.75	499.40	710	3070+6000 pieces	1190.10
11	Sithalo (Niali Block)	1		528.02	70.00	3.15				6.00
	Total	187	1251	81150.591193	3895.49	961.48	6079.60	6448	26237 rolls & 11456 pieces & 13 bundles	6808.65

Source: District Emergency cell, Jagatsinghpur

The third phase, the long term mitigation and preparedness phase, is a crucial period and devoted to long-term development of disaster prone areas to minimize the impact of the hazard and prepare the people as well as all supporting systems in the area to face future disasters. Long term planning for preventive measures are soil conservation/afforestation in river catchments, planting shelter belts/mangroves in coastal areas, new cropping patterns to minimize crop loss, prevent human settlements in low lying areas, relocate settlements to safer places. Long term protective measures include safe construction for houses/strict implementation of safety codes, hazards-proof roads, bridges, canals, water reservoirs, power transmission lines, flood-protection measures, improvement of warning systems, organizing people for counter-disaster activities.

While the government has the duty to help people in distress, the later have a great responsibility to help the government, help them to cope with disasters. Panchayati Raj bodies are the most appropriate local institutions for involving people in natural disaster preparedness. Panchayati Raj bodies have a role to play in all phases of disaster management (Singh, 2008).

A careful analysis of the relief and rehabilitation measures undertaken by different government NGO and donor agencies reveal that there is a lack of focus on the activity of the local people which need special attention. The local village people forming team and working team wise like rescue and relief team will help a lot in listening the impact on the vulnerable groups of that locality like old age, women, widow, handicapped, destitute etc because the local people know everyone of their village. Involvement of local people through groups should be highlighted and addressed to by different disaster management programmes.

Moreover the natural disaster provide an opportunity for woman to come outside and actively participate in the decision making process of disaster management. It is observed that the women lose their inhabitation and engage themselves in manual labour and other earning activities to supplement family income. This will definitely help them in controlling family resources because of their exposure to outer world and their increased access to information. Disaster situation if properly handled can go a long way in reducing gender inequality and creating a more equal society (Swain et al., 2007).

To protect themselves from emergency, communities must organize. They must have good systems for decisions making, good communications to catalyse local resources (both govt. and non-govt.) and the skills to shore up their family and community holdings.

Through SHGs it is found that rehabilitation and reconstruction process has begun. However they can play a vital role in disaster prevention and mitigation. In several countries e.g. in Bangladesh, self-help groups play an important role as two-way information conduits and provide quick transmission of early warnings about natural disasters to their members, and in fishermen's cooperatives provide warnings of the onset of potential extreme weather conditions in coastal areas. This is of course over and above the joint effort they make in tackling the immediate aftermath of an actual disaster. In other countries they play an important role in lessening the impact of disasters such as drought by organizing the trekking of livestock to fresh pasture or storing grain against the possibility of future shortages. The seed cum grain bank programme envisaged the revitalization of existing women's Self Help Groups (SHGs) and formation of new ones to enable preservation and growth of local land races of rice with inputs like seeds, seed bins and skill up gradation in one of the worst affected coastal block of Odisha (Swain, 2002).

SHGs can be found to be relevant at all five stages of the disaster response: cycle, disaster preparedness, disaster mitigation and prevention, rescue and relief, rehabilitation/ reconstruction and development. When responding to disaster situations, in particular in complex emergencies, there will be many pressures and obvious priorities, which arise from the most immediate need to save lives, provide food, water and shelter, and bring back some semblance of normality to the lives of the affected population. Speed of response and the rapid mobilization of the resources required should quite obviously be the focus of attention for those involved. Although in some circumstances it will be possible to call upon the services of existing SHGs, most of the opportunities to be involved in the crisis response cycle will arise at a later stage, especially in pre-disaster planning, as part of a strategic approach to prevent or to reduce the impact of possible future disasters.

In isolation SHGs cannot prevent a national disaster from turning into an emergency for a community. But primary aim to reduce the vulnerability of poor, rural families in disaster- prone communities as historically disaster have dealt their greatest blows to population. So at village level planning SHGs must find themselves together into a coherent system of communication and decision making. Women must not only work together but must also bring in all members of a community.

Natural disasters arrest the process of economic development and often set it back by many years. Disaster can induce policy changes and institutional innovations that are ultimately beneficial not only in reducing vulnerability but also in supporting economic growth and development. Food policy reforms in Bangladesh were directed at preventing a recurrence of the 1974 flood related famine (clay 1985) and then containing the financial costs of subsequent floods (Ahmed et al, 2000). The deregulation of agricultural investment after the floods in 1987 and 1988 encourage the rapid expansion of disaster reducing irrigation. The micro finance revolution was in part a response to the 1974 famine (Yunus 1998). The countries throughout the world can at any time be subject to a variety of natural disasters. Many of these are sudden and catastrophic such as hurricanes, earthquakes and floods, while others are slower in their onset, as in the case of drought and epidemics. The appropriateness of different types of SHGs as a response to such natural disasters will, of course, vary considerably according to the nature of the event.

MFIs were pioneered in Bangladesh in 1976. Currently more than 10,000 NGOs operate micro finance programs and there is substantial public sector investment through government departments, public agencies and banks as part of a broad strategy for tackling poverty. MFIs can play a very constructive role in poverty reduction efforts but they are vulnerable to damaging liquidity problems in times of disaster. Further analysis is needed to explore ways of improving their resilience to disaster, while maintaining responsible attitudes towards debt repayment and ensuring access to credit to those most affected by disaster.

The potential impact of natural hazards on a house hold can be very diverse. The vulnerability of a household is caused by its unsafe conditions and the limited capacities it has in coping with the consequences of the disaster. This is in principle different for each household because the conditions the households are in different and because of their capacity to cope with the disaster are different. World-wide experience makes clear that people with the lowest incomes are the most vulnerable: they generally live in the lowest quality house on the worst location and have the least opportunities to recover from the disaster once it occurs.

Chronic poor can suffer more than non poor; the later may turn to a transits poor die to natural disaster. For eliminating chronic hunger and poverty, two broad strategy-growth media security and support- led security have been followed. A combination of both the strategies is desirable to avoid the contraction in entitlement suffered by vulnerable groups by distinguishing between the measures to prevent transient poverty due to natural calamities, etc

and steps to eradicate chronic poverty which sometimes leads to death arising out of starvation and malnutrition. Relief measure cannot be a solution to ever increasing suffering from hunger and poverty. Prevention of transient hunger nothing but a question of entitlement protection, Recreation of the lost entitlement of vulnerable section through diversification of rural households' protection of environment, development of social security system etc is very essential to stop transient hunger occurring due to flood, drought and other natural disaster (Dreze and Sen, 1990).

In developing countries in Asia have succeeded to a great extent preventing transient hunger by provision of direct public support to the population in times of crisis particularly through food supply management system of early warning, cash support, employment creation, economic diversification and so on.

In post independence period in India, the relief system has become more systematic and expensive to combat transient hunger occurring due to drought, flood, cyclone and other natural disaster. Recreation of lost entitlement through wage based employment opportunities along with conditional relief has made the prevention of transient hunger success to a great extent. Since 1990, the cyclone relief, particularly by NGOs played a role to combat transient hunger as evident in 1999 super cyclone in Odisha.

REFERENCES

[1]. Ahmed, Nuruddin, et al. (2000), 'History of public food interventions in Bangladesh.' In Ahmed,Raisuddin and others (ed.) Out of the shadow of famine: evolving food markets and food policy in Bangladesh. Baltimore: Johns Hopkins U.P.

[2]. Clay, Edward J. (1981), 'Poverty, food insecurity and public policy in Bangladesh' In Clay, Edward J. (ed.).Food policy issues in low income countries. Staff Working Paper 473. Washington D.C.: World Bank

[3]. Disaster Management Act, 2005

[4]. Dreze, Jean and Amartya Sen (1990), "Introduction", in J. Dreze and A. Sen (eds.), The Political Economy of Hunger.

[5]. Enarson, Elaina (1998),"Gender and Disaster. What are issues?" Proceedings of the Conference and recommendations, Emergency Management Division, Justice, Institute of British Columbia.

[6]. https://earthobservatory.nasa.gov/Features/RisingCost/rising_cost5.php

[7]. https://ec.europa.eu/jrc/en/research-topic/hazards-and-risks-climate-change-impacts

[8]. Singh, S, K. (2008), "Role of Panchyat Raj Institution in Disaster Management- A Suggestive Framework.

[9]. Swain, Mamata.(2002),"Impact of super cyclone on life and livelihood of women (An Analytical study of two coastal Districts of Orissa),"NCDS, Bhubaneswar, Orissa.

[10]. Swain, et al. (2007) ,"Gender Perspective in Disaster Management", Serial Publication, New Delhi.PP 3-7.

[11]. World Disaster Report, (1998), "International Federation of Red Cross and Red Crescent Societies", OUP.

[12]. Yunus, M. (1998), "Poverty Alleviation: Is Economics Any Help? Lessons from the Grameen Bank Experience", Journal of International Affairs, 52(1): 47-65.

IOSR Journal of Humanities and Social Science (IOSR-JHSS) is UGC approved Journal with Sl. No. 5070, Journal no. 49323.

Dr. Pragnya Paramita Jena"Climate Change and Its Worst Effect on Coastal Odisha-An Overview of Its Impact in Jagatsinghpur District." IOSR Journal Of Humanities And Social Science (IOSR-JHSS). vol. 23 no. 1, 2018, pp. 01-15.