CHAPTER VI

NATURAL DISASTER- INDUCED DISPLACEMENT IN ASSAM

About 42 million people were forced to flee their homes due to a series of climate change related natural disasters around the world in 2010. Global data from the last few decades shows that the number of people displaced by natural disaster is on the rise. The first global estimate on the scale of displacement caused by extreme natural hazard events was produced in 2009 by IDMC and the UN’s Office of the Coordination of Humanitarian Affairs (OCHA) covering events in 2008. Displacement triggered by geophysical events like volcanic eruption, earthquakes and tsunamis affected 1.5 million people in 2009 and four million in 2010.¹

Asia is the continent where largest number of people have been displaced due to natural disaster. According to an Asian Development Bank Report titled ‘Climate change and Migration in Asia and the Pacific’ says China, Bangladesh, Pakistan, India and Maldives face the greatest risk while Philippines, Indonesia, Thailand, Vietnam, Japan, China and South Korea are also specially vulnerable.

The United Nations International Strategy for Disaster Reduction defines a disaster as a serious disruption of the functioning of a community or a society causing widespread human, material, economic or environmental losses which exceed the ability of the affected community or society to cope, using its own resources.² Thus only those events would be recognized as disaster where the losses exceed a society’s ability to cope and external aid is required. In the working definition of the United Nations identifies two main types of disaster: natural and man-made.
Natural disaster may be divided into three sub-categories—sudden impact, slow-onset, and epidemic diseases—while human-made disasters include two sub-categories—industrial or technological disasters and complex emergencies.

1. Sudden impact disasters include flood, earthquakes, tidal waves, tropical storms, volcanic eruption, and land-slides.

2. Slow-onset disasters include droughts, famine, environmental degradation, deforestation, pest-infestation, and desertification.

3. Epidemic diseases such as cholera, measles, dysentery, respiratory infections, malaria, HIV etc generally do not trigger large-scale displacement even during a severe outbreak although they often threaten displacement of population when clustered in overcrowded and unsanitary conditions following a major disaster.

4. Industrial technological disasters result from a society’s industrial and technical activities that lead to pollution, spillage of hazardous materials explosions, and fires.

5. Complex emergencies are usually human-made with multiple contributing factors and are marked by large-scale displacement, food insecurity and human rights violations.\(^3\)

In India Northeastern region specifically Assam is prone to natural disasters like earthquake, floods, landslides, cyclone and occasional drought. Particularly in Assam people subjected to perennial floods, river-bank erosions, landslides and occasional earthquakes. While flood is a perennial disaster and aggravated by human interference, the earthquake is a natural disaster that occurs occasionally. A brief account of some of the disasters in Assam is given below:
1. Natural disaster and Assam

1.1. Occurrence of earthquake

Northeastern region is one of the most seismically active region of the world. The complex tectonic and geology setup of the region and intense continental convergence of the northward moving Indian plate can produce earthquakes of magnitude of eight in the Richter scale every few hundred years. The two great earthquakes of 8.7 magnitude in 1897 and 1950 are memorable events in history of Assam. These earthquakes had been so intense that the rivers changed their courses and ground elevations also immensely affected. Further, as many as twenty destructive earthquakes rocked the region in the last century. The independence day earthquake in 1950 was the ninth largest earthquake of the 20th century. Though the epicenter was located in China, but it was in the Brahmaputra valley that the most extensive damage was experienced. Over 1500 people were killed and the drainage of the region was greatly affected. The resultant floods were the cause of most of the fatalities aftermath of the earthquake.

The most dramatic feature of 1950 event was landslides. The occurrence of landslides in the mountains and extensive liquefaction in the alluvial plains caused severe damage to the building, roads and rails etc.

1.2. Occurrence of flood and erosion

The recurrence of flood and erosion is the burning problem of Assam. Not only the two main rivers Brahmaputra and the Barak but also their small and medium sized tributaries cause havoc in Assam in the shape of floods, bank erosion and drainage congestion. Nowhere in India, problem of flood is more acute than in the flood plains of Assam. There were innumerable references to floods which occurred even during the reigns of Ahom dynasty. However, in the past floods were considered to be boon rather than a problem,
because it deposited fertile soil annually, which helped peasants in agricultural productions. Since the earthquake of 1950, the fury of flood damage has been on the rise. The river once identified with the life process and culture of people of Assam, is now considered as menace. The 2,906 km. long Brahmaputra is one of the Asia’s longest river, traversing its first stretch of 1,625 km. in China’s Tibet region, the next 918 km. in India and remaining 363 km. through neighbouring Bangladesh before converging into the Bay of Bengal.\(^6\)

The intensity of flood, riverbank erosion and landslide has increased substantially over the years in terms of area and victims. It would be pertinent to point out that the plight of the victims of erosion is much more severe than the victims of flood. The victims of flood at least can go back to their original land once the flood water recedes. But the riverbank erosion-induced displaced population cannot go back to their land as their land becomes part of the river. The river Brahmaputra has wiped out nearly 4,000 sq. km. of area at a rate of 80 sq. km. per year destroying more than 2500 villages and affecting more than five million people in Assam.\(^7\)

Usually Assam experiences incessant rainfall during the monsoon season, which normally continues from the month of May till mid October. The National Flood Commission had estimated the area vulnerable to floods in Assam has as 31.60 lakh hectare, against 335.16 lakh hectares for whole India. Assam thus accounts for 9.4 per cent of total flood prone area of the country. Due to flood problem, the state has not been able to achieve the desired progress and prosperity despite having vast natural resources.\(^8\) An official report of the State Water Resource Department states that 3,88476 hectares of land was lost to erosion between 1954-2002 at an annual rate of 8,000 hectare. It means the displacement of 90,700 families living in 2534 villages.\(^9\)
Saving the two hills districts, the entire Assam is severely prone to annual flood and erosion but, there is no proper official records containing realistic account as to how many people have faced displacement both seasonal and permanent. When the displacement is due to erosion, it results total loss of livelihood land, houses, livestock, educational institutions, healthcare services, administrative and commercial establishments and all other development activities. Whenever the intensity of flood becomes severe, it destroys infrastructure, crops etc. and additionally deposits infertile sand on the fertile floodplain, rendering them unfit for cultivation.

Due to floods, Assam suffers a loss of Rs. 3,100 crores in the past five decades. According to a report of National Flood Commission out of 31 lakh hectares of vulnerable land only 16 lakh could be protected from floods in 53 years.  

According to SDMA in September, 2012 flood situation in 20 districts of Assam worsened to such an extent that 29,14008 lakh people in 3,354 villages have been affected by flood and caused extensive damage to cropland, infrastructure including roads and bridges. About five and half lakh people took shelter in relief camps or in the raised platforms. Thousands of marooned people were rescued and evacuated to safer places by the NDRF.
TABLE 3, Flood Damage (2000-2004)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Unit</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Area affected</td>
<td>Hactare</td>
<td>966053</td>
<td>239511</td>
<td>674148</td>
<td>932113</td>
<td>314268</td>
</tr>
<tr>
<td>2. Population affected</td>
<td>Nos.</td>
<td>3888385</td>
<td>542634</td>
<td>755058</td>
<td>565195</td>
<td>134933</td>
</tr>
<tr>
<td>3. Human lives lost</td>
<td>Nos.</td>
<td>36</td>
<td>4</td>
<td>65</td>
<td>52</td>
<td>497</td>
</tr>
<tr>
<td>4. Loss of cattle</td>
<td>Nos.</td>
<td>19988</td>
<td>15</td>
<td>4294</td>
<td>4319</td>
<td>65967</td>
</tr>
<tr>
<td>5. No. of Villages</td>
<td>Nos.</td>
<td>5090</td>
<td>1277</td>
<td>6807</td>
<td>7565</td>
<td>12235</td>
</tr>
<tr>
<td>6. Area eroded</td>
<td>Hactare</td>
<td>NA</td>
<td>5348</td>
<td>429657</td>
<td>12589</td>
<td>7829</td>
</tr>
<tr>
<td>7. Value of Crops lost</td>
<td>Rs. in</td>
<td>17351</td>
<td>835</td>
<td>14559</td>
<td>14700</td>
<td>NA</td>
</tr>
<tr>
<td>8. Value of houses</td>
<td>Rs. in</td>
<td>1648</td>
<td>259</td>
<td>4118</td>
<td>1869</td>
<td>NA</td>
</tr>
<tr>
<td>9. Total Value of</td>
<td>Rs. in</td>
<td>19000</td>
<td>1095</td>
<td>18678</td>
<td>16569</td>
<td>NA</td>
</tr>
</tbody>
</table>

Source: Water Resource Department, Govt. of Assam (GOA)

According to the State Government long term planning is required to control Brahmaputra. There is a need for early creation of North East Water Resources Authority for proper study of the rivers flowing through the
Northeastern states. Water Resource Department is facing a major problem in dealing with erosion as according to the guidelines for the utilization of the calamity fund, money from it cannot be utilized to control erosion. Under the present policy there is no provision for sanction of rehabilitation grant for erosion affected people under State Disaster Response Fund (SDRF) guidelines prepared by the Union Ministry of Home Affairs.

2. Causes of occurrence of flood and river-bank erosion

There are several natural and human factors responsible for flood recurrence in Assam. The unique geographic setting of the region, high potent monsoon rainfall regime, easily erodible geographic formation in the upper catchment, seismic activity, accelerated rate of basin erosion, rapid channel aggradation, massive deforestation, intense land use pressure, high population growth especially in flood prone belt and adhoc type of temporary measures of flood control are some of the prominent factors that cause floods in Assam. In addition to these factors filling up of low lying areas for the construction of buildings and reckless urban developments are also responsible for flood in Assam.

The Brahmaputra is one of the major sediment transporting river of the world. Its annual sediment load is estimated to be about 397 million tones with a flow of 477 billion cubic meters during 1978-2003 at Pancharatna. The river has the highest sediment yield next only to Yellow River in China. Its tributaries also carry high sediment load, which is more than 1,000 tonnes per square kilometers per year. The high sediment load in the river leads to reduction in the carrying capacity of river and it results in overtopping of banks and inundation of surrounding land, causing flood. Further, glacier retreat in greater Himalayas and changes in precipitation pattern has increased flash flood and flood flows which results greater inundation and river bank erosion in Brahmaputra basin.
The valleys of Brahmaputra, Barak and Manipur grades very gently towards their downstream. Therefore excessive rain and snow-melt water flows down very slowly. This high rate of water yield together with the limited width of the valley and gently flattened gradient lead to tremendous drainage congestion that cause flood in the plains. The river Brahmaputra itself occupies a width of six to ten km. at most places. Both the Brahmaputra and Barak plains are surrounded by high hills and mountains. Whenever there is rainfall in the hills and mountains water rushes down to limited plains from extensive catchment areas, causing flood in the plains. In addition, short term ad-hoc type of flood protection measures adopted in case of river Brahmaputra, specially the extensive network of earthen embankments has contributed to the abnormal rise of the river beds due to accumulation of sediments. This has increased the severity of floods once an embankment is breached or overtopped.

Deforestation has been another cause of flood becoming an annual feature in Assam. Indiscriminate deforestation has led to massive amount of top soil coming loose during rains. The soil flows into river and in turn causes the river bed of Brahmaputra and Barak and their tributaries to rise. In Assam, deforestation is mainly caused by farmers who need land to grow crops and by timber merchants. When trees are cut down their roots can no longer bind the soil and soil erosion occurs.

After the 1950 earthquake there has been a general rise of the low water level by three meters of the river Brahmaputra at Dibrugarh.\(^{18}\) The Dihing river silted up by six meters near Sadiya. The extreme braided nature of the river coupled with silt and sand strata of the banks is the main cause of erosion.\(^{19}\)

Encroachment on the riverine areas is another major cause of aggravating the flood problem in the Brahmaputra valley. Encroachment of large number of wetlands by migrants that serve as natural reservoirs like beels, swamps and marshes has also reduced the retention capacity of drainage system.
During second half of the twentieth century there has been a steep rise in population due to geographic, political and other reasons resulting in encroachment of the riverine and wet lands accentuating the flood problem in the valley. Intensive deforestation reduces the forest cover of the catchment areas of the rivers. As a result the top soil retaining capacity of the catchment areas has decreased and the loose soils wash down by the streams and rivers are deposited in channel beds in the plains making the channels shallow. The steep slopes of the Himalaya hills are also responsible for the flash flood and erosion in the plain reach of the northern tributaries of Brahmaputra.

Snowmelt is another cause of flood. However, snowmelt is a gradual process and does not always cause floods. But when glaciers holding large quantity of bounded water melt suddenly, that causes severe flooding. The rivers originating from the Himalayas in the north are fed by snowmelt from glaciers.

In addition to that, the development and improperly planned various infrastructures in the catchments areas such as roads, railways, embankments, settlement areas and land use policies obstruct the natural drainage in the catchment areas resulting in flood.

The tributaries of Brahmaputra River region originate in Arunachal Pradesh, Meghalaya, Mizoram, northern parts of West Bengal, Manipur, Sikkim, Tripura and Nagaland. The catchments of these rivers receive large amount of rainfall ranging from 1100 mm. to 6350 mm. per year which occur mostly during the months of May/June to September. As a result of this, floods in this region take place very often and are severe in nature. These tributaries carry exceptionally high silt discharge to the river Brahmaputra. The highly productive and fertile soils of Assam are now facing the serious problem of soil erosion. It is estimated that nearly 3.2 million hectares of land in the plain districts of the State are vulnerable to topsoil erosion with varying
intensity. Terrain deformation through mass movement is another type of soil degradation, which is primarily confined to the hill districts of Karbi Anglong and N.C. Hills covering an area of 1.53 million hectares.\textsuperscript{21}

TABLE 4, Land utilization

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Land utilization classes</th>
<th>Area in hectares</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Cultivable land</td>
<td>7,70,000</td>
</tr>
<tr>
<td>2.</td>
<td>Forest land</td>
<td>8,83,000</td>
</tr>
<tr>
<td>3.</td>
<td>Pasture and grazing land</td>
<td>74,000</td>
</tr>
<tr>
<td>4.</td>
<td>Non-agricultural land</td>
<td>1,82,000</td>
</tr>
<tr>
<td>5.</td>
<td>Barren land</td>
<td>3,08,000</td>
</tr>
</tbody>
</table>

Source: Soil Conservation Directorate, Govt. of Assam

There are a number of natural constrictions at various locations along the Brahmaputra river which influences the drainage pattern. The constrictions are at:
- Murkonselek - - 4.8 km.
- Disangmukh  - - 5.1 km.
- Dhansirimukh  - - 4.4 km.
- Tezpur       - - 3.6 km.
- Pandu        - - 1.2 km.
- Sualkuchi    - - 2.4 km.
- Pandu        - - 2.4 km.\textsuperscript{22}

3. An overview of erosion-induced displacement in some parts of Assam

Within the 722 km. long stretch of river Brahmaputra in Assam, there are several stretches where there are serious threat of erosion. Erosion becomes
more acute in the downstream of Goalpara, Palasbari—Gumi, Mariahola and Maiahola and Mathola on the south bank and Mathmara, Majuli, Sonarighat, Airingmara, Tezpur and Mukalmua on the north bank. Morphological studies conducted by the North Eastern Council (NEC) on erosion of the Brahmaputra in 1993 recognized the following sites of the valley where active erosion is going on.  

South Bank:
Nagaghuli Oakland area near Dibrugarh.
Maijan Mathola.
Hatisaal Nemati area near Jorhat.
Marihala near Bokakhat.
Lahorighat—Mairabari area near Morigaon.
Palashbari town area.
Gumi—Kalatoli area.
Fakiganj South Salmara area.
Sukhchar Bazar area.

North Bank:
Sonarighat area at Sonarighat.
Matmara area at Dhemaji.
Gamirighat area near confluence of Subansiri.
Bhoirabpad and Bihaguri Mauza.
Howlighat Mukalmua area.
Baghbar to Bohori near Barpeta.

23

24
TABLE 5, Significant Erosion Reaches of Assam

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Description</th>
<th>Area in ha.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Rahmoria</td>
<td>298</td>
</tr>
<tr>
<td>2.</td>
<td>Nemati (near Jorhat)</td>
<td>328</td>
</tr>
<tr>
<td>3.</td>
<td>Majuli</td>
<td>42000</td>
</tr>
<tr>
<td>4.</td>
<td>Kareng Chapori/ Arne Chapori/Matmora/Baligaon etc. (Dhemaji)</td>
<td>10000</td>
</tr>
<tr>
<td>5.</td>
<td>Laharighat-Bhurapara-Maisalu (Morigaon District)</td>
<td>15000</td>
</tr>
<tr>
<td>6.</td>
<td>Palashbari-Gumi area (Kamrup) including old Palashbari township area</td>
<td>10000</td>
</tr>
<tr>
<td>7.</td>
<td>Mukalmua area (Nalbari District)</td>
<td>80000</td>
</tr>
<tr>
<td>8.</td>
<td>Bahari-Baghbar area</td>
<td>8000</td>
</tr>
<tr>
<td>9.</td>
<td>Goalpara area (Chamari-Hazirghat) including South Salmari township.</td>
<td>40000</td>
</tr>
<tr>
<td>10.</td>
<td>Dhuburi Patarmari area</td>
<td>2500</td>
</tr>
</tbody>
</table>

Source: Website on Disaster Management by GOA

3.1. Kamrup District

In Kamrup district Palashbari and Chhaygaon revenue circles specially Dakhin Sarubongsar and Pub-Chamaria Mauzas are badly affected by the river-bank erosion. It is worth mentioning that some of the eroded villages of both Palashbari and Chhaygaon circles have been transformed into riverine char. It may be noted that the villages in those circles are thickly populated as it is fertile floodplain. As per government records, the number of affected families in the Palashbari and Chhaygaon circles are 5,521 and 871 respectively. This is clearly an underestimation of the affected people. There is no data on the number of affected population in various eroded villages of both the circles. Between 1954 and 2012, over 40 villages of South Kamrup
have been eroded resulting in loss of several thousand hectares of land and making the people living in the areas paupers. According to an unofficial report more than 2000 landless families are living in a 15 km. stretch of the Palasbari-Nagarbera embankment in Goroimari and Palasbari Revenue Circles in Kamrup district of Assam.

In 1997, Government of Assam proposed to rehabilitate 342 families of four villages of Palashbari revenue circle and forwarded to the revenue department. Ironically the proposal turned out to be unfeasible one because the earmarked land was too swampy for rehabilitation of people. The displaced people refused to accept it. A few families who decided to settle in the government-allotted land had to abandon the idea because of stiff resistance of other villagers of the area. Again, the government proposed to rehabilitate about 1,000 families on the reserve land of Jorsimli village that also met the same fate due opposition coming from other villagers of the area. A number of proposals for rehabilitation of displaced persons of this area is now under consideration.

However, the most unfortunate fact is that in some of the new areas where erosion victims were settled were eroded again leading to multiple displacement. For instance, some families of Khalihamari rehabilitated at Makhiabill had to abandon their new habitation due to erosion caused by mighty Brahmaputra. It reflects the plight of the people affected by erosion. Those families whose members are in service, could manage to set up their habitats at new places. But the marginal farmers and labourers have to depend on government aids. The state of the thousands of people who have not been rehabilitated yet is beyond description. These people have been taking shelter in the embankment and living under most unhygienic conditions.
3.1. (i) Case study

52 year old Simina Latifa Bibi of Simina village with her six children is living on the Palasbari-Gumi embankment for the last 30 years. As the family does not possess any land, they could not avail the IAY houses as IAY houses were not allotted for the landless. The family is living in the filthy thatched house which gets wet in the every rain. They are also not getting any benefit of the government schemes. Another resident of Futuri village Bhuyan Ali, 50 years old stated that his family had shifted to the Palasbari-Nagarbera embankment about 35 years ago when their land were eroded away by the river Brahmaputra. They lived there for about 10 years and then again had to shift to another part of the embankment as that portion was also eroded away by the river.

Poor children of these downtrodden people have been denied education by the head of the families as they cannot afford to provide uniform, fees, pen, pencils and other essential items required by a student. The Assam Sarva Siksha Abhijan Mission has failed to reach out to these children. Over 30 per cent of the total children do not have access to basic primary education The situation is more depressing in case of the girls are concerned.

3.2. Nagaon, Morigaon, Barpeta, Goalpara and Dhuburi Districts

A vast area of Nagaon district a block of eight mauzas from Laokhowa in the east to Mayong in the Morigaon district in the west is facing erosion. These areas are largely inhabited by so-called immigrants who were settled in those areas during early years of colonization. In the last decade of 19th century when Assam was losing population, Bengal was being over-burdened with high population growth. Therefore, colonial rulers adopted the policy to increase the population of Assam by bringing more and more people from erstwhile East Bengal. These new entrants were mainly settled in the riverine areas according to a new system of settlement known as the’ line
system, which was first implemented in Nagaon in 1920. Today erosion mostly occurs in these riverine areas affecting these immigrants. However line system was ultimately treated with contempt. The Government of Assam, in the name of grow more crops had introduced a new scheme known as ‘Development Scheme’ in 1941. For implementation of the scheme cultivators were brought in from erstwhile East Bengal and settled in the tribal inhabited places, which ultimately resulted in influx of countless number of people into the region.

Till the 1930s, the villages on either side of the Brahmaputra did not experience much erosion and naturally they did not offer any resistance to the line system. However, in the latter part of the 1930s and early part of the 1940s the nature in the form of erosion started claiming their land. In the 1930s, a vast riverine area of the then Barpeta sub-division was eroded and a large number of people of that area came to Kawoimari and settled there, apparently violating the line system. Consequently, the houses of many erosion-affected families at Kawoimari were rancorously torched on the ground that they were made in violation of the line system. As the violation of line system was considered to be an indefensible offence, no time was given to the dwellers of the houses to remove their household articles.

The historic Moirabari- Hadirachuki area of West Barpeta, which witnessed the last battle between the Burmese and Ahoms in 1822, is under constant threat of erosion and now on the verge of extinction.

In the Morigaon district of Assam erosion has caused displacement not only of Muslims but also tribals. The increasing tribal pressure on Muslims for vacating the lands they once possessed and the Muslim peoples’ resolve to be in possession of the lands creates a tense situation opening up for ethnic conflict between the communities.
In the districts of Dhuburi and Goalpara, a sizeable section of the erosion affected people live on the nearby hills in the area. Erosion victims of these two districts have moved to Meghalaya, Tripura and other places of Assam earn their livelihood as rickshaw-pullers, labourers and hawkers. The coal mines in Meghalaya and at Margherita in Assam are also attracting a section of job seekers.\textsuperscript{41}

3.3. Erosion in Majuli

The Majuli island is the largest inhabited riverine island in the world. But the very existence of Majuli, is on the verge of extinction because of severe erosion and unpredictable nature of the river Brahmaputra. The severity of the erosion might be understood from the fact that the area of the island has reduced from 1,250 square kilometers in 1950 to 421.65 sq. km. in 2001.\textsuperscript{42} Destruction dossier of Majuli can be gauzed from the fact that between 1972 to 2011 10 Satras (Vaishnavite monasteries) and 8699 houses have been destroyed. Moreover about 8000 people are staying in embankments during this period.\textsuperscript{43}

The destructive erosion in Majuli first began with the topographical changes in the Brahmaputra caused by the earthquake. Over the years hundreds of villages have disappeared from the landscape as a result of erosion. Majili’s landmass is eroding at roughly seven sq.km. per year and about 1.70 lakh inhabitants of the island are fast loosing their lands and livelihood.\textsuperscript{44} Affected people are mostly Mising, Deori and Sonowal Kachari tribals. Organic agro-farming is the main economic activity and pisciculture, boat making, dairying, pottery, sericulture etc. constitute other economic activities.\textsuperscript{45} Prosperous landed farmers have been reduced to penury and farmers with meager landholdings have been deprived of their livelihood altogether.

In the month of July-August 2010, erosion by the river Brahmaputra has caused severe destruction to the Majuli. Within a period of five days as many
as 35 families of Dakhinpat, Kumargaon, Chunoimari, Kankan Chapari, Pohardia and Sat Ati, Ahatguri, Dakhin Ahatguri and Jengrai areas had been left homeless due to erosion.\textsuperscript{46}

Several cottage industries which were the means of livelihood of large number of people are now in the bosom of the river. The people of Chunoimari village had taken shelter after their village was eroded away by the river. But the very embankment in which affected families have been taking shelter is also under the threat of erosion. Salmora village of Ujani Majuli, famous for the art of pottery is also under the threat of erosion.\textsuperscript{47} It is important to note here that flood and erosion have threatened the existence of the ancient pottery industry of Majuli which supports more than 300 families.\textsuperscript{48} Archaeologists say that the pottery industry in Majuli has been a missing link between Mohenjodaro and Harappan civilizations during which the pottery industry flourished.\textsuperscript{49}

On the northern side of Majuli, erosion by Kherkatiya Suti – a stream of Subansiri has endangered the existence of Jengaimukh, the hub of tribal culture in the upper part of the river island. In the year 2010 about 70 families have been shifted to safer places from their due to erosion.\textsuperscript{50}

In the first week of October 2010 nearly 15 families became homeless on lower Majuli island. According to Jorhat district administration around hundred families have been shifted to government land at Panikheti on the Assam-Nagaland border and areas under Teok revenue circle.\textsuperscript{51}

Recently with the aim of ensuring protection to the sattras, the Union Government has sanctioned investment clearance for implementation of the phase II and III of the anti erosion project at an estimated cost of 115.99 crore. The project aims at protecting 22 sattras and public private properties, as well as ensuring economic development and social uplift after
reconstruction of roads and bridges usually destroyed during flood. 52 Hearing a PIL on the protection of Majuli from flood and erosion, the Gauhati High Court issued show cause notices to 15 departments of both Union and State Governments for failing miserably to protect the lives and property of the people of Majuli because of flood and erosion over the years. The court observed that the Planning Commission and the Government of India have absolutely no concern for the problems faced by the people of the State due to flood and erosion. 53

3.3. (i) Case Study

Jamini Payeng of Upper Sonowal village of Majuli lost her three bighas of farmland to erosion after two waves of flooding in 2088. She and members of her family are now earning their livelihood as farm labourers. Back in 2000, the Brahmaputra eroded away five bighas of land belonging to Muktinath Saikia of Salmara—Besamara village. His family now survives on his petty job at Char Area Development Office. Payeng and Saikia are only two examples. With the land mass shrinking and numbers of landless increasing, people all across the island seek out odd jobs for a paltry income. Between 2000 and 2008 as many as 9027 families have lost their homes and cropland to erosion. 54

3. 4. Erosion in Dibrugarh District

The mighty Brahmaputra continues to swallow huge patches of land at various points at Dibrugarh district. Erosion in Dibrugarh district started mainly after great earthquake. 55 Specially in Dibrugarh town erosion was so devastating that the then Prime Minister Jawaharlal Nehru had rushed to Dibrugarh to take stock of the situation. To protect the town 9.1 km dyke was constructed from Maijan to Mohonaghat. But the construction of the dyke took its toll on Nagaghuli, at a distance of about three km. from Dibrugarh
town, and Rahmoria, about 30 km. away. It may be mentioned here that in the past one and half decade, many revenue villages, tea estates, several holdings of small plantation, schools, one and wide stretches of agricultural land went to the bosom of the river Brahmaputra due to erosion in the district.

According to Prof. Nayan Sarma, Dibrugarh Town Protection Dyke has become weak due to encroachment, dumping of garbage, and building of huts and shops. Another significant matter highlighted by professor Sarma was that rats have made the dyke their home. There are rat holes in the lower portion of the dyke that give way for water seepage when the river is in spate.

Nagaghuli is an area on the eastern part of the Dibrugharh town facing severe erosion by river Brahmaputra. The river has threatened to wash away the entire area. It also threatens to wipe out Dinjan Army base, Mohonbari Airport and Assam Medical College.

The Brahmaputra began eating into Rohmoria after it changes its course in the fifties. Since then the river wiped out more than 28 revenue villages, a government sericulture project, sattras, a police station, a post office, seven schools and four tea estates.

Erosion affected Gorpara Kosuoni area of Rohmoria under Chabua revenue circle in Upper Assam’s Dibrugarh district had lost a large stretch of land within a span of ten days in the month of July 2010. According to an official estimate altogether 23 families had lost their settlement, lands, properties, cultivable paddy fields and orchards to the erosion. However, local residents have said that more than 50 families had been displaced during that period. Over the years because of the Government apathy 70 families had to take refuge in a crematorium.
3.4.1 Case Study

Mukunda Chetia a 48 year old farmer who has a family of nine, lost four bighas of fertile land. Similarly Kunti Chetia, Kameshwar Chetia, Pradip Senapati, Prabhat Gohain and many others have also lost their land. Kameshwar Chetia had a two bigha plot of land full of bananas all had been lost to the river. These families have been put up in a school which is too small to accommodate hundreds of people.61

Perennial flood and erosion are serious problems in Assam particularly during monsoon season that defies any solution so far. Economic damage resulting from flood is on the rise every passing year. Flood wipes out decades of investment in infrastructure and production systems thereby seriously affecting the economic prosperity and also resulting in death and epidemics. The majority of deaths associated with such disasters happen to take place within the most vulnerable members of the society—the poor and the women and children.

4. International community and disaster management

At the global level, there has been considerable concern over natural disasters in recent times. Even though substantial scientific and material progress has been made, the loss of lives and property due to disasters has not decreased. It was in this background that the United Nations General Assembly in 1989 declared the decade 1990-2000 as the International Decade for Natural Disaster with the objective to reduce the loss of lives and property and restrict socio-economic damage through concerted international action, especially in developing countries. Since the 2004 Indian Ocean tsunami, the international community has made significant progress strengthening the frameworks for protection of people affected by natural disaster who are displaced within their own country. United Nations has developed a number comprehensive and complementary framework for the

The threat from natural disaster was not adequately addressed in Agenda 21 at Earth Summit in Rio de Janeiro. It is the World Conference on Natural Disaster Reduction that recognized the rapidly rising worldwide toll on human lives and economic losses due to natural disaster. It was also recognized in that conference that sustainable development cannot be achieved in many countries without adequate measures to reduce disaster losses, and that there are close linkages between disaster losses and environmental degradation.

The United Nations International Strategy for Disaster Reduction (UNISDR) was created in 1999 and is the successor to the secretariat of the International Decade for Natural Disaster established with the purpose of ensuring the implementation of the International Strategy for Disaster Reduction.62

As the flood continues to pose significant and complex challenges throughout world in both developing and developed countries, international community makes an effort to cope with the situation. The concept of Integrated Flood Management (IFM)63 has been evolved which is within the broader concept of Integrated Water Resources Management (IWRM)64.

The International Conference on Flood Management (ICFM) is the only conference that wholly focused on flood related issues. The conference was held 27-29 September 2011 in Akihabara, Tokyo. The conference provides an opportunity for various specialists to come together to exchange ideas and experiences. Prior to this the first International Symposium on Flood Defence was held in Kessel Germany in 2000, which emphasized flood defence measures and successive events held in Beijing in 2002, Nijmegen
in 2005 and Toronto in 2005 evolved integrated approaches including risk, vulnerability and capacity building.

5. Disaster management in India

Flooding is a major natural hazard in India that inflicts sufferings to millions, specially poor and vulnerable sections of the society. According to Central Water Commission (CWC) under Ministry of Water Resources, the annual average area affected by flood is 7.563 hectare. On an average, floods have affected about 33 million persons between 1953 -2000 and there is every possibility that this figure may increase due to population growth. Several approaches to alleviate flood misery have been pursued in the past but with limited success. Clearly a fresh approach is needed. In this respect credit goes to Geneva based World Meteorological Organization (WMO) which has taken initiative in exploring a new approach, namely Community Approach to Flood Management.

Disaster management is a complex series of activities that include risk assessment, preventive measures, preparedness to cope with future disasters, emergency response to disaster, recovery and reconstruction. Good development and community preparedness can reduce the impact of disaster especially for the most vulnerable group such as those living in hazard-prone areas with few financial resources to help them recover if they lose their means of livelihood.

Over the past couple of years, the Government of India has brought a paradigm shift in the approach to disaster management. The new approach proceeds from the conviction that development cannot be sustainable unless disaster management is built into the development process. Another cornerstone of the approach is that mitigation has to be multi-disciplinary spanning across all sectors of development. The new policy also emanates from the belief that investments in mitigation are much more cost effective than
expenditure on relief and rehabilitation. Another significant change is to move from Government to public private partnership, and community disaster management.

The Government of India’s approach towards the disaster management involves a natural disaster framework covering institutional mechanisms, disaster prevention strategy, early warning system, disaster mitigation, preparedness and response, and human resource development. Mitigation, preparedness and response are multi-disciplinary functions involving a number of Ministries such as Departments of Health, Water Resources, Environment and Forest, Agriculture, Railways, Atomic Energy, Defence, Chemicals, Science and Technology, Telecommunication, Urban Development and Poverty alleviation, Rural Development and India Meteorological Department as members.

In India earlier national five year plans did not mention about disaster management. The tenth five year plan (2002-2007) for the first time had a detailed chapter entitled Disaster Management. Disaster mitigation and prevention were adopted as essential component of development strategy. During the eleventh five year plan (2007-2012) disaster management has emerged as a high priority to the country.

The repeated occurrence of different types of disasters compelled Government of India to establish many different committees and commissions to suggest for measures to deal with the problem. The most important one was the High Power Committee (HPC) on Disaster Management established in 1999. The Committee’s main function was to make recommendation on the preparation of disaster management plan and suggestions for effective mitigation mechanism. The HPC made its recommendation in 2001 including a draft of disaster management act, a national response plan, move from disaster response to disaster
preparedness, and establishment of National Disaster Management Authority.

On December 2005, the Government of India took a remarkable step by enacting the Disaster Management Act, 2005 which made it mandatory to establish a National Disaster Management Authority (NDMA), under the chairmanship of the Prime Minister with a National Executive Committee to assist it. The Act provides for the establishment of disaster management authorities through the states and district levels and down to the village committees. The structure at state and district levels follows the national level structure. NDMA has authority to lay down the policies, plans and guidelines to be followed by Ministries and Departments of the Union Government. NDMA can take such measures for prevention of disaster, mitigation of its effects, or for preparedness and capacity building to deal with disaster situation. The National Institute of Disaster Management constituted under the Act of 2005 has been entrusted with the nodal national responsibility for human resource development, capacity building, training, research, documentation and policy advocacy in the field of disaster management. The definition of disaster is given in section 2 (d) of the NDMA. However, imminent disaster necessitating large scale, urgent movement of people is not specifically covered in the definition.

The Disaster Management Act, 2005 has mandated constitution of National Disaster Response Force (NDRF) for the purpose of specialized response to natural and man-made disasters. This force has to function under the Disaster Management Authority which has been vested with its control, direction and general superintendence. The force will be a multi-disciplinary, multi-skilled and high-tech force for all types of disasters capable of insertion by air, sea and land. These NDRF battalions are located at nine different locations in the country based on vulnerability profile to cut down the response time for their deployment.
In addition to National Disaster Response Force and National Institute of Disaster Management, the Act has made provision to set up National Disaster Response Fund\textsuperscript{74} and National Fund for Disaster Mitigation (NFDM)\textsuperscript{75}. In case of NDRF funds are made available to the National Executive Committee (NEC), which meets the expenses towards emergency response, relief and rehabilitation. On the other hand NFDM is to be directly managed by the National Disaster Management Authority.

### 5.1. Disaster management in Assam

As disaster management is a multidisciplinary process, all Central Ministries and Departments have a part to play in the field of disaster management. However, the primary responsibility to tackle disaster lies with the States. The Disaster Management Act mandates the State Government to take measures for preparation of disaster management plans, integration of measures for prevention and mitigation of disaster into development plans, allocation of funds, setting up of early warning systems, assist the Union Government and other agencies in various aspects of disaster management.\textsuperscript{76}

At the district level, the Act provides for establishment of District Disaster Management Authorities (DDMA) for planning, coordinating and implementing for disaster management.\textsuperscript{77}

The devastating flood in 2004 and 2012 in Assam has once again proved that the past approach of addressing flooding and erosion was in non-systematic manner and as such is not successful. Recognizing the need to have a wider investment program the Government sought the assistance of Asian Development Bank (ADB) and it is in this context that the Northeastern Integrated Flood and Riverbank Erosion Management is proposed by the Government of Assam. The project intends to improve infrastructures, including embankments, riverbank protection and flood proofing work along
In order to respond effectively to floods Assam State Government has decided to set up disaster management mechanism to tackle the natural calamities caused by flood. A seven member disaster management authority has been constituted in every district headed by the Deputy Commissioners. Fund would be available to DDMA from the State Disaster Respond Fund. The Government of Assam has constituted the Assam Integrated Flood and Riverbank Erosion Risk Management Agency to execute the Assam Integrated Flood and Riverbank Erosion Risk Management Project that aims to promote economic growth and poverty reduction by enhancing the security against flood and riverbank erosion damages across the State with the aid of Asian Development Bank (ADB). This is pursued through provision of comprehensive structural and non-structural flood and riverbank erosion risk management programs. Structural measures will primarily focus on areas with vital economic and national interests in the Brahmaputra river. Non-structural measures such as flood and riverbank erosion forecasting, warning and management systems, disaster prone area zoning, and safety net to the most vulnerable segment of people are to be effectively combined with structural measures. The Agency will focus on improving protection for people in three sub-project areas—Palashbari, Dibrugarh and Kajiranga that cover 90 km along the Brahmaputra and where around one million people earn their livelihood.

Under the program over 40 km. of existing flood embankments is to be renovated, river-bank erosion is to be addressed using cost effective and environment friendly technology and taking steps to put infrastructure maintenance on a more sustainable footing. The project will also establish community based disaster management committee and support flooding
awareness campaigns improved warning systems, community shelters and hazard maps.  

5. 2. Expert Committees on flood and erosion problem

Experts are now trying to determine the factors which are responsible for river-bank erosion in Assam particularly in the Brahmaputra valley. Water Resources Department of Assam has identified 25 vulnerable and very severe prone sites and estimated that the Assam Valley portion of the Brahmaputra has lost approximately 7.4 per cent of its land area due to river bank erosion and channel migration. The mighty Brahmaputra has wiped out nearly 4,000 sq. km of area at a rate of 80 sq. km. per year, destroying more than 2,500 villages and affecting more than five million people.  

A group of experts from Assam and USA formed a committee to find out a solution to the menace of erosion. The name of the committee is the Committee for Developing Mitigation Strategies for Brahmaputra River Basin Flood and Erosion Problem. The Committee is constituted by retired professor of civil engineering University of Alaska Arvind Phukan; Senior Project Manager of Wool Pert, Virginia Deva Baruah; Chairman of the Surface Water Hydrology Committee of the American Society of Civil Engineers Ananta Nath; Assam Water Resources Department’s senior engineer Rajib Goswami; and Professor of Civil Engineering in IIT, Guwahati, Chandan Mahanta.  

The expert committee has recommended phase-wise solution for the mitigation of erosion by adopting a combination of measures including strategic dredging, protection of erodible bank materials with anchored bulkhead or tie back sheet piles, spurs, toe and bank revetments. The experts further recommended development of advanced and efficient computational tools capable of utilizing the detailed hydro-meteorological data and predicting real time flooding and hydraulic characteristics of the
river for planning and designing effective flood and erosion control measures.\textsuperscript{87}

The Committee has also suggested to take advantage of modern technologies such as satellite image-based morphological study, studying of successful erosion control measures in major rivers of the world and feedback from international experts to stem the erosion in the Brahmaputra.\textsuperscript{88}

A European Commission sponsored project called Brahmatwinn was carried out by Prof. Wolfgang Albert Flugel of Friedrich-Schiller University, Germany and Prof. Nayan Sharma\textsuperscript{89}. A concept paper was drafted by them for development and application of sustainable river management options for the Brahmaputra. The study has significantly laid stress on taking into consideration the impact of climate change on the hydrological and hydraulics of the Brahmaputra river while developing mitigation management strategies regarding the process of flooding and bank erosion.\textsuperscript{90}

6. Flood control and Assam

There are two different ways to mitigate floods—(i) structural and non-structural. Structural measures are in the nature of physical measures and help in keeping the water away from people, while non-structural measures are in the nature of planning and help in keeping the people away from water.

India adopted the National Water Policy in 1954-1955 to control floods in Assam. The government first started constructing embankments to streamline the excessive water of the rivers under the national policy. Most of the embankments in the state were constructed during 1950s and 1960s. There are total 423 embankments in the state and total length of the embankment is about 4,463 km.
A river bank usually has a life span of 25 years, and most of the river embankments in Assam have crossed this limit. As a result, strength of the embankments has weakened over the years and embankments now cannot withstand the strong currents during monsoon season. Cases of embankment breaching have also increased due to termites, rats and even roots of big trees. Breaching of embankments has become a major problem due to which sudden flood wash away villages.

The Brahmaputra Board was constituted with the objective of planning and integrated implementation of measures to control flood and erosion in Brahmaputra and Barak valley. However the role of the Brahmaputra Board in controlling flood had come under severe attack from various quarters in Assam as no appreciable achievement has done so far till date. Therefore, a nodal group has been constituted by the Union Water Resources Ministry to look into all aspects regarding restructuring of the Brahmaputra Board with a wider mandate as a basin level authority.

Over the years a substantial amount of money has been spent in the name of controlling flood and erosion. However due to lack of proper scientific study and planning these projects and measures fail to bear fruit. The scientific community believe that embankments often cause abnormal rise in the riverbeds and add to the severity of flood once embankment is breached or overtopped.

6.1. Government machinery involved in flood management

There are a number of Government departments and agencies that are directly involved in flood management.

(i) The Planning Commission has the task of assessing the national resources, augmenting deficient resources, formulating
plans for the most effective and balanced utilization of resources and determining priorities.

(ii) The Ministries of Development of North Eastern Region (DONER) was set up to accelerate socio-economic development of North Eastern Region and assists in designing policy affecting development in the region.

(iii) The Ministry of Water Resources, which is responsible for policy, programmes development and regulation of the country’s water resources.

(iv) The Central Water Commission manages hydrometeorological data collection, prepares flood forecasts, undertakes surveys, analyses data and prepares detailed project reports. The Central Water Commission has 13 regional offices, one of which is located in Shillong.

(v) The Brahmaputra Board has a range of responsibilities including: (a) conducting surveys and investigation in the Brahmaputra valley;

(b) Preparing a master plan for the control of floods and bank erosion And improvement of drainage in the Brahmaputra valley; (c) Preparing detailed project reports and cost estimating for dams and other projects proposed in the master plan; (d) Constructing multipurpose dams and related infrastructure as proposed in the master plan, and maintaining and operating them with the approval of Central and State Governments; (e) Preparing phased programs for the construction of all projects proposed in the master plan in consultation with the concerned State Governments.
Hearing a PIL filed by a resident of Majuli, the Gauhati High Court has pulled up the Brahmaputra Board and the Ministry of Water Resources for a complete lack of interest to tackle problems faced by residents of Majuli.  

6.2. Flood management assets

The existing infrastructure in Assam include about 4,500 km of embankments including about 700 km. along the Barak river, 85 major regulators (sluices), 850 km. of drainage channels and more than 680 structures to manage erosion, including spurs, porcupine fields, and revetments.

6.2.1. Structural measures

(i) Embankments

After 1950, the State Government started building embankments as one of the short-term measures for flood control. Embankments are generally constructed around cities or other economically important infrastructure. The embankments extend along substantial lengths on both banks of the Brahmaputra, as well as along selected reaches of tributary rivers flowing from both north and south.

However, most of the embankments have deteriorated over the years for want of maintenance. Embankments in many locations need repair. At many places embankments along the Brahmaputra river have been subjected to river erosion. Where the erosion has led to breaches, the embankments have been constructed farther from the riverbank, in some cases numerous times resulting in land acquisition and consequent displacement of affected population and impoverishment. The embankments are also susceptible to erosion from rainfall and from settlement due to inadequate compaction during construction. Embankment stability is further threatened in many places by dense human settlement on the embankment crest.
(ii) Spurs

Two types of spurs are used in Assam to direct current away from the riverbanks and thereby protect the embankments. These are locally referred to as land spurs and river spurs. Land spurs are constructed on the flood plains and riverbank down to the low-water level, perpendicular to and usually tied into the flood embankment. River spurs are rock-filled protrusions that extend well into the river perpendicular to the bank and are protected with aprons at their outer ends.

Experience with spurs in Assam has been positive. Reportedly, there has been no failures of spurs since 1954. The success of spurs constructed by the Assam Water Resources Department is attributable to a combination of factors, especially the use of rock in their construction and of rock-filled crates to form elements of sufficient weight and density to resist erosion. Moreover, stockpiles of rock are maintained at spur sites. When spurs have been threatened by erosion, they have been aggressively defended by dumping this rock where and when needed.  

6.2.2. Non-structural measures

(i) Flood plain zoning

Flood plain zoning imposes restrictions on the use of land on flood plains that can reduce the cost of flood damage. Local government can pass laws that prevent uncontrolled building or development on flood plains to limit flood risks and to protect nearby property.

(ii) Flood forecasting and warning

Some natural events may be anticipated even if accurate prediction may not always be possible. Flood warning system is a system that can release warning in advance i.e. 72 hrs. 48 hrs. and 24 hrs. This kind of advance
warning can help the authorities for better flood preparedness, mitigation, control, planning and management. These warnings are issued by the Central Water Commission/ Meteorological Department and by State Irrigation/Flood Department.

7. Human rights of internally displaced persons affected by natural disaster under international law.

All member states of the United Nations have the obligation to ensure human rights standards to their people set out in the United Nations Charter and the Universal Declaration of Human Rights. In recent years, particularly since the 2004 Indian Ocean tsunami, international community has made important progress strengthening the frameworks for protection of people affected by natural disaster, especially women and children displaced within their country.\footnote{101}

In addition to the other documents for the protection of internally displaced persons, the IASC adopted Operational Guidelines on Protection of Persons in Situations of Natural Disaster in June 2006. It has been seen that often in situations of natural disaster human rights violations are not intended or planned. Sometimes they result from insufficient resources and capacities to prepare and respond to the consequences of the disasters. The Guidelines aim to help international and non-governmental humanitarian organizations to ensure that relief and recovery efforts are conducted within a framework that protects and furthers the human rights of affected persons.

The Guidelines may also be useful to government actors, such as disaster management institutions and can also be used to formulate national laws and policies. These guidelines can provide guidance on how to ensure the protection of key human rights in situations of natural disasters such as protection of life and physical security; rights related to essentials of life that includes food, shelter, education and health; rights relating to housing, land,
property\textsuperscript{102}, and livelihoods; and civil and political rights such as freedom of movement and expression\textsuperscript{103}

In order to provide guidance on how to protect the rights of individuals affected by natural disasters, UN Inter-Agency Standing Committee adopted operational Guidelines on Human Rights and Natural Disasters. These guidelines became necessary because existing guidelines on humanitarian action in emergencies, as well as standards for protecting human rights in armed conflicts, did not specifically deal with human rights concerns emanating from natural disasters. These guidelines are addressed to inter-governmental and non-governmental humanitarian actors. They focus on what the humanitarian actors should do in order to implement a human rights based approach to humanitarian action in the context of natural disasters. To complement these guidelines there is also a Manual on international Law and Standards Applicable in Natural Disaster Situations published by International Development Law Organization (IDLO)\textsuperscript{104}

7.1. The Hyogo Framework for Action

A world conference on disaster reduction was held in Hyogo, Japan, in January 2005 which is the first plan to explain, describe and detail the work that is required to reduce disaster losses. Its goal is to substantially reduce disaster losses i.e. loss of lives and social, economic and environmental assets when hazards strikes. The 168 delegations adopted the framework calling on states to put disaster risk at the centre of political agendas and national policies. The Hyogo Framework for Action: 2005-2015. Building the Resilience of Nations and Communities to Disaster (HFA)\textsuperscript{105} is aimed to strengthen the capacity of disaster-prone countries to address risk and invest heavily in disaster preparedness. In the HFA there are five priority areas for action\textsuperscript{106} The National Meteorological and Hydrological Services (NMHSs) and the World Meteorological Organization (WMO) have crucial contributions
to the implementation of HFA. Thus without being a binding instrument HFA does affirm the duty of States to try to reduce the risk of disasters.

Comment

Disasters especially natural disaster like flood, earthquake, tsunami cannot be stopped or eliminated but their effect can be minimized if proper disaster preparedness plan is formulated. To cope with the recurrence of flood and erosion proper scientific study along with a long term approach involving different components of flood control such as afforestation, canalization of rivers, sharing of flood prediction intelligence with neighbouring states and countries is an urgent need. As the entire Northeastern region is highly vulnerable to seismic activities, therefore while undertaking large development projects all aspects are needed to be considered carefully. Otherwise these projects may cause havoc in the region. Community participation is also essential for successful implementation of relief activities because it helps to understand the need of the affected people and also increases transparency between the relief provider and recipient. It also reduces the corruption level and teaches the people to fight for survival.
END NOTE

   The report was prepared by Michelle Yonetani, IDMC senior adviser on natural disaster. The compilation and cross checking of data was conducted in large part by independent consultant Robert Sousa, Regina Below, Centre for Research on the Epidemiology of Disasters (CRED) and Frederic Zanetta of the International Federation of Red Cross and Red Crescent Societies.

2 Ibid, p.6.

3 Supra, Note 2, Ch. V.


5 In Geology, liquefaction refers to the process by which saturated, unconsolidated sediments are transformed into substance that acts like a liquid.


14 Aggradation is the term used in geology for the increase in land elevation due to the deposition of sediment. Aggradation occurs in areas where supply of sediment is greater than the amount of material that the system is able to transport.


18 Govt. of Assam, Report of Centre for Natural Disaster Management, Background Material on State’s Susceptibility to Disasters, Coping Mechanism of the Community and the Administration, p. 6.

19 Id.


23 Goswami, Aparna, and Das, Baneswar, “Riverbank Erosion Affected People in the Kamrup District”, in Das, Samir Kumar’s (ed), Blisters on Their Feet: Tales of Internally Displaced Persons in India’s North East, New Delhi, Sage Publications, 2008, pp. 86-87.

24 Id.

25 One of peculiar features of the river Brahmaputra in Assam are Chars (riverine silt islands). Char develop over a period of ten to twenty years in the channels of the river. The river changes its course and start eroding old chars thus entailing displacement of the inhabitants and loss of livelihood.

26 Das, Samir Kumar (ed), op.cit., p. 89.


28 Id.

29 Das, op.cit., pp. 97,100.

30 Id.


32 The Assam Tribune, 12 June 2012, loc.cit.

33 Id.

34 Id.

To protect the indigenous people from undesirable impact of large number of land hungry immigrants, the Nagaon district authority introduced a new system of settlement known as line system according to which immigrants were mainly settled in riverine areas. As these new comers from East Bengal were exclusively confined to the riverine areas and any crop cultivated or any hut built outside it was liable to be burnt or demolished by the authorities.


Jana, Ibid, p. 112.


Id.


Id.

The Assam Tribune, 21 Apr. 2011, loc.cit.


Choudhuri, Monideepa, loc.cit.

Supra, p. 204. Ch. VI.

Nayan Sarma is a professor at IIT Roorkee and a member of Core Professional Group (CPG). CPG is a group of professionals of residents and non-resident North East Indians formed under Friends of Assam and Seven Sisters. The mission of the group is to study and understand the problem and to seek meaningful solutions to the flood and erosion problem of the river Brahmaputra.


Das, Ripunjoy.,"More Erosion-Hit Families Shift to Crematorium', The Telegraph, 10 July 2010, p. 16.

Id.

Id.

Id.

UN Res. No. 219/54 adopted on 3 Feb. 2000, UNISDR is a part of United Nations Secretariat and its function involves in the Development and humanitarian field. Its core areas of work includes Disaster Risk Reduction (DRR) is applied to climate change adaptation, increasing investments for DRR, building disaster resilient cities, schools and hospitals, and strengthening the international system for DRR.

Integrated Flood Management is a concept that calls for a paradigm shift from the traditional, fragmented and localized approach, and encourages the use of the resources of river basin as a whole, employing strategies to maintain or augment the productivity of floodplains, while at the same time providing protective measures against losses due to flooding.

Integrated Water Resource Management (IWRM) has been defined by the Technical Committee of the Global Water Partnership (GWP) as a process which promotes the Coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystem.


To minimise the damages caused by disasters the international community has focused communities and people who live in them. Unless the disaster management efforts are sustainable at individual and community level, it is difficult to reduce the losses and scale of the tragedy.

Sec. 3 (1), Disaster Management Act, 2005.

Ibid, Sec. 3 (2).
National Disaster Management Authority has been constituted with the Prime Minister of India as its Chairman, a Vice Chairman with the status of Cabinet Minister, and eight members with the status of Ministers of State. Each of the members has a well defined functional domain covering various states and also disaster specific areas of focus and concern.

Ibid, Sec.42.

A catastrophe, mishap, calamity or grave occurrence in any area, arising from natural or man made causes, or by accident 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.

Ibid, Sec. 44(1).

Ibid, Sec. 45.

Ibid, Sec. 46.

Ibid, Sec. 47.

Ibid, Sec. 38.

Ibid, Sec. 25.


Id.


Id.

Anchored bulkhead consists of a row of interlocked sheet piles, stiffened across the face by walls and restrained from moving away from the fill by tie-rods connected to anchors. Bulkheads protect banks by completely separating land from water.

A revetment is a erosion protection measure constructed on and parallel to a sloping riverbank or embankment in order to keep the bank from receding landward due to erosion. A revetment may consist of broken rock, boulders, sand bags, concrete etc. However a revetment does not protect against flooding. Furthermore, a revetment
is often a supplement to other types of protection such as seawalls and dykes

87 The Hindu, 4 Feb. 2010, loc.cit.

88 Id.


92 The Brahmaputra Board was set up under an Act of Parliament called the Brahmaputra Board Act, 1980 under the Ministry of Water Resources. The Board consists of 21 members with four full time and seventeen part time members representing the seven states of the Northeastern states, North Eastern Council and concerned ministries viz. Ministry of Water Resources, Agriculture, Finance, Power, Surface Transport and related Departments of Government of India, India Meteorological Department, and Central Electricity Authority.


96 An artificial passage for water fitted with a valve or gate for stopping or regulating the flow, a water gate of flood gate.

97 Spur is an erosion protection structure, constructed more or less perpendicular to a riverbank or embankment.


100 Ibid, p. 34.


103 OHCHR, Discussion Paper 2011, pp.3-4, op.cit.
The IDLO is a non-partisan international organization that promotes legal, regulatory and institutional reforms to advance economic and social development in post crisis situation. Established in 1983 IDLO is one of the pioneers of rule of law advocacy and uses its expertise to create opportunity for those who need most.


1. Ensure that disaster risk reduction is a national and local priority with a strong institutional basis for implementation.
2. Identify, assess, monitor disaster risks and enhance early warning.
3. Use knowledge, innovation and education to build a culture of safety and resilience at all levels.
4. Reduce the underlying risk factors.
5. Strengthen disaster preparedness for effective response at all levels.