

DRAFT



2013

# Reverse Engineering: 2009 Cyclone AILA



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## **List of Acronyms**

BDRCS - Bangladesh Red Crescent Society

BMD – Bangladesh Meteorological Department

CCA- Climate Change Adaptation

CDMP - Comprehensive Disaster Management Program

DM – Disaster Management

DRR – Disaster Risk Reduction

FAO – Food and Agricultural Organisation

GO- Governmental Organization

HFA – Hyogo Framework Actions

IAY - Indira Awas Yojna

IMD– Indian Meteorological Department

INGO – International Non-Government Organization

IPCC- Inter-Governmental Panel on Climate Change

IUCN - International Union for Conservation of Nature

IVR - Interactive Voice Response

MDMR - Ministry of Disaster Management & Relief

MoFDM- Ministry of Food and Disaster Management

NGO – Non Governmental Organization

NPDM - National Plan for Disaster Management

PWD - Public Works Department

TK – Taka (Bangladesh Currency)

UN – United Nation

UNCT – United Nation Country Team

VGd - Vulnerable Group Development

WASH - Water and Sanitation Hygiene

DMB – Disaster Management Bureau

MFDM – Ministry of Food and Disaster Management

WDB - Water Development Board

## Executive Summary

Hazards do not discriminate or differentiate – they cause havoc and distress. They strike both rich and poor countries, men and women and cause destruction leaving behind a trail of devastation and irreplaceable losses. The communities are the first to react, irrespective of profession, status, cast or culture. Therefore, the GOs, NGOs and INGOs individually or jointly assist in the immediate and long term relief programs to help people recover their losses.

Figure 1: Track followed by Cyclone Aila  
(Source: Relief Web, 2009)

### Forensic Investigations of Disasters (FORIN)

conducted a study that investigates the events that have occurred in the past with less serious or high consequences to accumulate evidence of good practices (IRDR, 2011). The examination of good practice and low impact can be compared with bad practices and high impact to improve future activities. To understand what needs to be done in the future; we should step back and reflect what was done and achieved. The main objective of the research is to examine the behaviour of relevant institutions in relation to recent disaster, through a process of “reverse engineering” approach and also assess the social, economic and cultural factors affecting the vulnerability of affected people<sup>1</sup>. We have chosen *Cyclone Aila (2009)* as our case study; where we assess the availability and quality of data, reports and other resources related to cyclones in order to analyse the disastrous effects of the cyclone; its root causes and impacts; its preparedness measures and; finds ways to reduce the after-math of disaster by having programs that can reduce the adverse effects.



The research explores the coping strategies of the people of coastal communities in the wake of a cyclone *Aila*; and the use of Disaster Risk Reduction (DRR) to reduce vulnerability. In the first part we look at the quantitative and qualitative damages caused by cyclone *Aila*, its major causes and impacts and how different agencies helped the survivors. The second part concentrates on the

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<sup>1</sup> CDKN, 2012

<http://cdkn.org/2013/06/opinion-how-did-indias-monsoon-produce-a-disaster/>

DRR and poverty reduction techniques taken by the organisations and government to be better prepared. DRR requires the government of developing countries as well as the donor community to learn from the local people's knowledge in identifying the place-specific risks and measures to mitigate them. Disaster management strategy has been shifted from response to risk management and resilience which has secured a prominent space in every development planning. The analysis suggests that the main reasons for the delay in the reconstruction work on the damaged polder in the cyclone-hit region is lack of ready fund for emergency and governance.

In addition, we try to find ways to match priorities of DRR institutions and those of ordinary people in hazard prone areas by considering Climate Change Adaptation (CCA) options in the disaster prone regions in Bangladesh and India<sup>2</sup>. People must be taught alternative ways to livelihood so that they can re-start their lives and are better prepared. Furthermore, steps must be taken to establish baseline hazard conditions, scenarios and in developing and providing training to different levels of stakeholders (local through to central level) to help them understand and interpret climate modelling and impact study results. The paper will conclude by suggesting some of the lessons learnt post *Aila* in disaster risk reduction and what can be done to reduce the vulnerability.

Cyclone *Aila* caused enormous loss of lives and livelihoods in 11 coastal districts in Bangladesh and parts of West Bengal in India. The recovery was very slow; even 3 years after the cyclone, many villagers still struggle to overcome the losses incurred due to the cyclone. The damage caused by the cyclone could have been averted by better preparedness. The major damage was caused by the embankment which was not properly repaired for 20 years; it was broken by the tidal surges causing over-flooding and inundation of saline water. People had to wait for the monsoon to end before they could return to their homes; moreover had to face hunger and diseases without their livelihoods. Several disaster management policies have been undertaken in Bangladesh and West Bengal in India since then that concentrates on building climate resilient livelihood.

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<sup>2</sup> CDKN, 2011. <http://cdkn.org/project/getting-climate-smart-for-disasters/>

## 1: Introduction

The *Aila* cyclone was the second tropical cyclone to form within the Northern Indian Ocean during 2009. The disturbance that started on 21<sup>st</sup> May'09 later intensified into a cyclonic storm on 25<sup>th</sup> May'09. Hitting during high tide, *Aila* furiously impacted Sagar islands in Sundarbans causing enormous damage to life and assets in Bangladesh and Eastern India. The cyclone brought with it tidal surges up to 6.5 meters, affecting 11 coastal districts in Bangladesh. The sustained wind speed of the Cyclone *Aila* was about 65-75 mph and thus it is defined as the category-1 cyclone (74 mph is the lowest threshold for Cat-1 hurricane). The Cyclone *Aila* had adverse effect on the Satkhira and Khulna Districts of Bangladesh, entrancing immediate death of approximately 300 lives, leaving 7,100 injured. In all, it affected over 3.9 million people and caused massive infrastructure damage including 1,742 kilometres breach in the embankment network. Embankment network is the only protection available to people along the coast against cyclones and storms<sup>3</sup>. The storm lingered over the coast of Bangladesh for a comparatively longer time than Cyclone Sidr (2007), which further increased its impact. In addition, the cyclone flattened mud houses, uprooted trees and tidal surges hit the country's coastal areas displacing millions<sup>4</sup>.

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<sup>3</sup> IFRC, 2010. <http://ifrc.org/docs/appeals/09/MDRBD004fr.pdf>

<sup>4</sup> Financial express, 2009. Cyclone *Aila* and environmental refugee. Available <http://www.thefinancialexpress-bd.com/2009/11/12/84063.html>

## **2: Risk profile – Bay of Bengal**

The loss of life, property and human suffering caused by tropical cyclones in coastal areas in various parts of the globe are well known. These disasters are on occasion, particularly severe in the Bay of Bengal region - the northern part of the Bay of Bengal is known for its potential to generate dangerous high storm tides a major killer when associated with cyclonic storms. In the past, out of 10 recorded cases of very heavy loss of life (ranging from about 40,000 to well over 200,000) in the world due to tropical cyclones, 8 cases were in the Bay of Bengal and the Arabian Sea (5 in Bangladesh and 3 in India)<sup>5</sup>.

Bangladesh is a low-lying deltaic country in South-Asia. Along with these, more than 230 rivers and tributaries flow through this country for which this country is called a land of rivers. Bangladesh is highly vulnerable to the impacts of climate change and is exposed to natural disasters due to its geographical location, configuration and plenty of water bodies. Therefore, it is currently ranked as the most climate-vulnerable country in the world. This majorly affects the livelihood of coastal residents as they are exposed to coastal flooding, tsunamis and cyclones which is one the most recurrent natural hazard (Wisner et al. 2004). The residents are not only at the risk of losing their lives but they constantly strive to regain their normal routine post extreme events.

Historically, Bangladesh has faced several calamities in the form of cyclones and floods. In recent years, efficient early warning systems and preparedness measures have significantly reduced the number of lives lost. The cyclone of April'1991 claimed 140,000 lives and caused colossal losses displacing millions<sup>6</sup>. The number of severe cyclonic storms in the Bay of Bengal has reduced from 22 to 7 between the decades of 1981-1990 and 2001-2008 respectively<sup>7</sup>. On

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<sup>5</sup> Indian Meteorological Department (IMD). (2011). Forecast Demonstration Project: Bay of Bengal Tropical Cyclone Experiment. Available: [http://www.imd.gov.in/SciencePlanofFDPs/Cyclone\\_Science\\_Plan.pdf](http://www.imd.gov.in/SciencePlanofFDPs/Cyclone_Science_Plan.pdf).

<sup>6</sup> Climate Change Cell (2007) Government of Bangladesh. <http://www.climatechangecell-bd.org>

<sup>7</sup> Indian Meteorological Department (IMD). (2011). Forecast Demonstration Project: Bay of Bengal Tropical Cyclone Experiment. Available: [http://www.imd.gov.in/SciencePlanofFDPs/Cyclone\\_Science\\_Plan.pdf](http://www.imd.gov.in/SciencePlanofFDPs/Cyclone_Science_Plan.pdf).



average, a severe cyclone hit Bangladesh every three years<sup>8</sup>. However, according to the projection of the Inter-Governmental Panel on Climate Change (IPCC), the frequency and intensity of cyclones in the Bay of Bengal are likely to increase. This will have significant implications across all sectors (such as agriculture, housing, transport) and consequently on economic development and poverty. Additionally, the likely consequences of sea level rise can cause economic losses of an unprecedented magnitude in low-lying Bangladesh.

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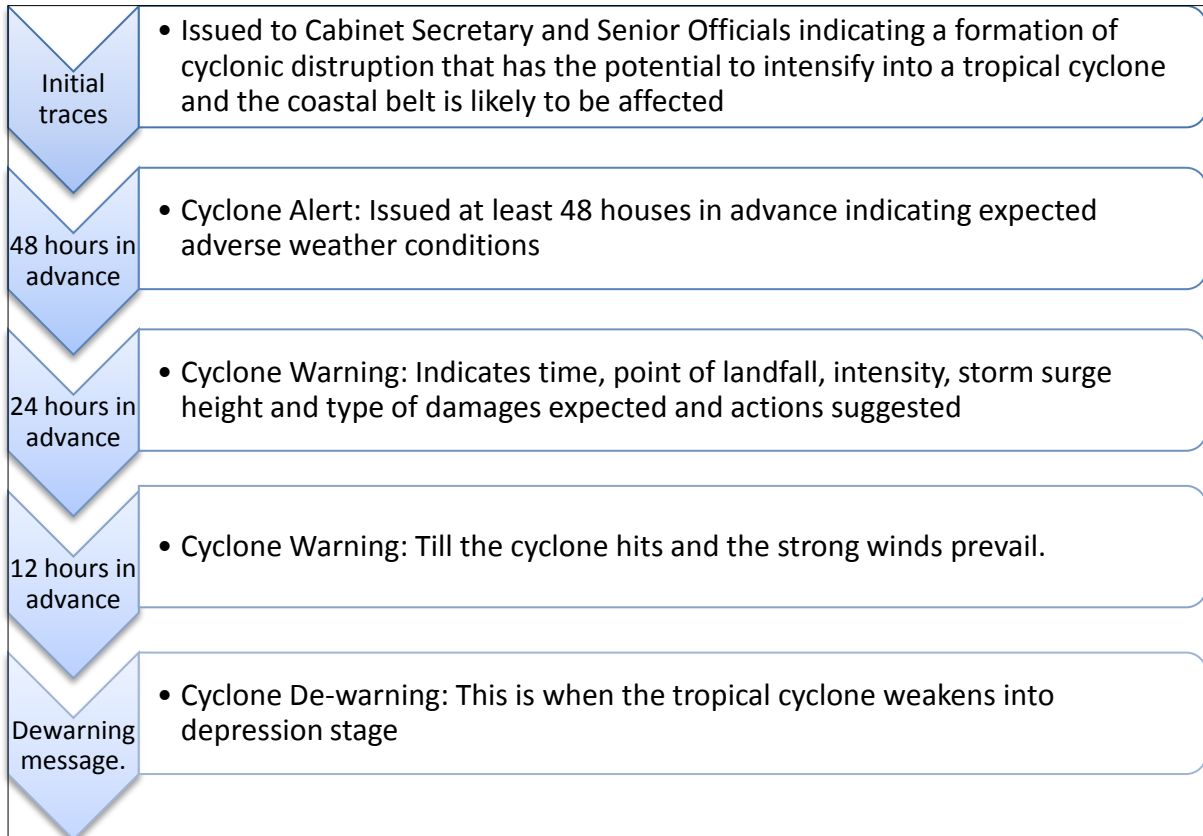
<sup>8</sup> MoEF (2008) Bangladesh Climate Change Strategy and Action Plan. Ministry of Environment and Forests, Government of the People's Republic of Bangladesh, Dhaka, Bangladesh.



### 3: Forecast

The warning process followed for cyclone warning is a five-stage process:

**Figure 2: 5-stage warning process; (Source: IMD)**



The cyclone *Aila* was well warned by BMD (Bangladesh Meteorological department) whereas IMD (Indian Meteorological Department) failed to give adequate warnings. West Bengal Chief Minister Buddhadeb Bhattacharjee slammed the IMD for its failure to inform the state government about the direction of Cyclone *Aila*<sup>9</sup>. “The Met department on 24 May’2009 could not give us the right forecast about Cyclone *Aila* that lashed north and south Bengal on 25 May’2009. On May 24, it just warned us that the cyclone would pass by 100 km east of the Sagar Islands on May 25 and for that only the coastal areas of the districts of North 24-Parganas, South 24-Parganas and East Midnapore will be affected. And it was on May 25 that the state government

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<sup>9</sup> The Indian Express. (2009). CM slams Met office for Aila info. Available: <http://www.indianexpress.com/news/cm-slams-met-office-for-aila-info/484451>.

was informed that the cyclone was moving to Kolkata,” the statement said<sup>10</sup>. This failure in early warning system caused a lot of loss in terms of lives and injuries that could have been easily avoided.

On the other hand in Bangladesh, BMD issued a Local Cautionary Signal Number 3 on 23 May'09 for marine ports and informed fishermen to not go into deeper seas. Later on the 24th May'09 they hoisted Signal Number 4 and announced cyclonic storm *Aila*<sup>11</sup>. This gave a chance to evacuate four hundred thousand people of five southern districts of Bangladesh to cyclone shelter and school<sup>12</sup>. However initially, it ignored the lunatic position and forecasted that the storm may not harm the localities. For that reason, people were not ready to take shelter in a safer place with their valuable belongings and they lost all when the saline water washed out their homes.

Relief distribution, the strategic management of information is critical variable in all the stages of the disaster response process. The people who were affected by the cyclone *Aila* were familiar with the consequences of heavy rains and winds but in no way could they have known that the cyclone will cause such an extensive damage to the embankment network. Moreover, they had not experienced storm surges as high as 6.5 meters for nearly two decades; making them less prepared. In the interviews conducted by Jamsedji Tata Centre for Disaster Management with the communities in West Bengal, India it was found out that the nature of warning given over the radio was inadequate due to following reasons; first they were not informed about the specific details of the cyclone; second the warning failed to raise urgency in the people to evacuate to safer locations<sup>13</sup>.

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<sup>10</sup> Indian Express, 2009

<sup>11</sup> Government of Bangladesh, 2009

<sup>12</sup> Financial Express, 2009

<sup>13</sup> Sinha,S; Bhattacharyya, P. (2009). TISS. *Cyclone Aila in West Bengal: A Report by Jamsetji Tata Centre for Disaster Management, TISS*. Available: [http://www.iagwestbengal.org.in/downloads/archives/Aila\\_2009/Aila\\_TISS.pdf](http://www.iagwestbengal.org.in/downloads/archives/Aila_2009/Aila_TISS.pdf).

## 4: Impacts of Aila

### 4.1: Quantitative and Qualitative Impacts

The Ministry of Food and Disaster Management (MoFDM) Relief Control Room of Government of Bangladesh reported on May 27, 2009 that 829,000 people took refuge in cyclone shelters and that 610,000 houses had been damaged or destroyed. As of the June 4, 2009 it was reported that the death toll reached 180 people, 318,000 acres of cropping land had been damaged with a total of 4.8 million people affected<sup>14</sup>.

*Aila* was described by several stakeholders as a “creeping emergency”. It was found by the Government of Bangladesh and United Nations Development Program that the majority of people affected by *Aila* were able to recover on their own. At the same time, 150,000 people residing in the worst affected part lived on embankments and roads till 2009 end<sup>15</sup>. The table below shows the proportion of houses damaged or destroyed in affected union. It is worth noting that the damage was extremely high in those areas.

**Table 1: Assessment of damages in terms of households and lives in 2 worst affected districts – Satkhira and Khulna (Source: IFRC, 2009)**

District	Upazila	Worst Affected Unions	Most Affected Family	Most Affected People	Dead and Missing	Household Damaged
Satkhira	Shyamnagar	Gabura	6,007	30,034	24	100%
		Padmapukur	4,432	22,163	10	100%
		Burigoalini	4,289	26,810	5	80%
		Atulia	4,621	28,879		50%
	Assasuni	Protapnagar	3,750	15,000	1	100%
		Sreeula	2,250	9,000		80%
		Khazra	2,000	8,000		70%
Khulna	Dacope	Baradal	1,875	7,500		50%
		Kamarkhola	3,200	16,000	4	90%
		Sutarkhali	8,000	40,000		100%
		Tildanga	8,000	24,000		80%
	Koira	Banisanta	2,800	14,000		60%
		Uttar Betkashi	4,050	8,000	1	100%
		Dakhin Betkashi	5,000	15,000	47	100%
		Moharajpur	5,000	20,500		80%
		Koira Sadar	6,204	25,000	5	50%
		Maheshwaripur	5,000	20,000		70%
<b>Total</b>			<b>76,478</b>	<b>3,29,886</b>		

<sup>14</sup> Ellery. S.W. (2009). IFRC. A Review of the Cyclone Aila Response 2009 IFRC-led Emergency Shelter Coordination Group . Bangladesh . Available: [http://www.ifrc.org/docs/evaluations/Evaluations2010/Asia%20Pacific/Bangladesh/Review\\_of\\_cyclone\\_Aila\\_Response\\_22%2003%2010SWE.pdf](http://www.ifrc.org/docs/evaluations/Evaluations2010/Asia%20Pacific/Bangladesh/Review_of_cyclone_Aila_Response_22%2003%2010SWE.pdf).

<sup>15</sup> IFRC, 2009

## **4.2: Livelihood – Disaster Management**

Prior to cyclone *Aila*, the majority of people in the affected areas were self-sufficient and largely depended on nature for their livelihood. Following the cyclone, several farmers and fishermen were left jobless as most of the agriculture land was inundated with saline water that destroyed crop area of 9,712 hectares. Department of Livestock Services said that cyclone destroyed 80% of livestock<sup>16</sup>. Agricultural land cannot be used until the level of salinity is reduced in soil, fisheries and will require repair and reconstruction of ponds. The onset of monsoon post *Aila* slowed the recovery process and all measures that were to be taken.

NGOs and GOs initiated cash for work program that would engage people for 40 days but after that their income will be uncertain. However, a major problem in employment seeking behaviour for middle class families is that they can neither seek relief nor can engage themselves into cash for work program due to their social status and psychological barriers. This leads to increased vulnerabilities that generally goes unnoticed.

## **4.3: Household Relocation**

The government issued a report on 11<sup>th</sup> Jun'2009 that indicated that almost 250,000 houses were completely destroyed and approximately 370,000 were damaged by the cyclone. It became clear that while severely affected parts were confined to south-west of the Bangladesh, the extent of damage was quite intense<sup>17</sup>. In the affected areas, 85% of the traditional houses are made of mud and thatch that collapse due to excessive flooding and inundation caused by the broken embankment<sup>18</sup>. Damaged houses forced 829,000 people to take temporary shelter in the nearby high roads while several relocate to cyclone shelters or temporary shelters (made of bamboo and plastic - the material provided by immediate relief organisations). Only a few were able to go back to their household after completing minor repairs. The communities cannot return to their villages

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<sup>16</sup> United Nations (2010). Cyclone Aila: Joint Un MultiSector Assessment & Response Framework. Available: [http://www.lcgbangladesh.org/derweb/Needs%20Assessment/Reports/Aila\\_UN\\_AssessmentFramework\\_FINAL.pdf](http://www.lcgbangladesh.org/derweb/Needs%20Assessment/Reports/Aila_UN_AssessmentFramework_FINAL.pdf).

<sup>17</sup> IFRC, 2009

<sup>18</sup> United Nations, 2010

until standing water is treated and the damaged embankments were repaired. Furthermore, people did not have enough resources to repair their homes; which led to migration.

#### **4.4: WASH**

Post cyclone *Aila*, the affected areas experienced significant water scarcity with high saline levels in ground water; making them depended on surface water bodies. The cyclone intruded saline water in surface water bodies making them unfit for use. The WASH assessment in May-Jun'09 found that 50% of water supply that consisted of 4,000 protected ponds, 1,000 pond-sand filters and 13,000 tube wells were damaged<sup>19</sup>. Affected communities dewatered 10% of ponds to harvest rain water but the breach in the embankment contaminated it with saline water<sup>20</sup>. Women had to walk 2-3 kilometers to reach to the nearest safe water sources. Cyclone *Aila* had tremendous negative impact on the livelihood of people; and they were forced to drink unsafe water. People had to pay double or sometimes even triple the actual amount for safe drinking water. The cost of purchasing safe water pre-cyclone *Aila* was 4-5 TK but post-*Aila* people had to spend 15-20TK<sup>21</sup>.

Moreover a large number of public latrines were damaged which caused many problems for the victim. The latrines that were not damaged by the cyclone were not enough; making it very unhygienic to use. The children and women are at higher risks of contracting diseases and other reproductive diseases. UN and several local and international organizations jointly initiated rehabilitation of ponds and canals for increasing access of safe drinking water and complement to irrigation facilities. In addition, they repaired and reconstructed the latrines for the survivors to access.

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<sup>19</sup> United Nations, 2010

<sup>20</sup> <sup>20</sup> In-depth Recovery Needs Assessment of Cyclone Aila Affected Areas. International Agencies Supported by ECHO, 2009. Available at <http://www.lcgbangladesh.org/derweb/Needs%20Assessment/Reports/In-depth%20Recovery%20Needs%20Assessment%20of%20Cyclone%20Aila%20Affected%20Areas> ECHO%20funded.pdf

<sup>21</sup> ECHO, 2009

## **4.5: Education**

The educational institutes and centres due to poor construction were damaged by the cyclone *Aila*. Many high school students did not get the chance to sit public exam at secondary level due to a lack of money and some even migrated to other places in search of livelihood opportunities (International Agencies, 2009). Several children's future was compromised by a reduction in household income, disruption to education and loss or sickness of family member on whom they depend. Such severe hardships forced many adolescent girls for early marriage or prostitution while the adolescent boys were drawn into delinquency<sup>22</sup>. The government and the relief organisations must ensure that emergency relief reaches everyone in order to avoid such situations.

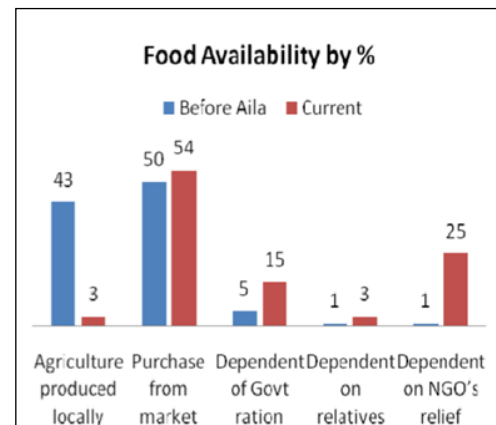


Figure 3: Food availability by percentage before and after cyclone Aila. (The bar on left for each is 'Before Aila' whereas the right being 'Current'.)

## **4.6: Food and Security**

Cyclone *Aila* significantly reduced the local production of shrimp and rice. Evidence suggests that local agriculture production of one of the major source dropped from 43% to 3% post-*Aila* period. Price hike of essential materials, less purchasing capacity, bad roads and less capital to invest were among the reasons for less availability of goods from local market.

In addition, the land used for agriculture post cyclone *Aila* dropped to 10% (approx) from 47% (approx); due to 18 month long inundation period of saline water. High salinity stops the crop from growing; thus those relying solely on agriculture have no livelihood and are meant to start over.

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<sup>22</sup> Turnbull.M, Sterrett.C.L, Hilleboe.A. Toward Resilience: A Guide to Disaster Risk Reduction and Climate Change Adaptation. Available: <http://www.ecbproject.org/resources/library/341-toward-resilience-a-guide-to-disaster-risk-reduction-and-climate-change-adaptation>. Last accessed 09/02/2013

## 5: Major Causes & Secondary Disasters

One of the major reasons for the extensive damage post-*Aila* was the breach in the embankment network. Residents residing in the south-western Bangladesh depend on the 7,500 km long network of flood embankment that protects them from storms, cyclones and tidal surges. Outrageous cyclone *Aila* damaged 1,743 kilometers stretch of embankment network leading to excessive sea-water flooding and soil erosion. Embankments were built in 1960s and had sustained several floods and cyclones. It had weakened as they were not properly repaired for previous 15-20 years due to government's negligence and successive disasters; thus were at risk. The failure of government to repair these contributed to greater impact and delayed recovery. Large regions of land were submersed in water for several months due to embankment damage.

**“Every night we go to sleep in fear as our house is just on the edge of the dam and that may disappear with a surge of water anytime, especially in the monsoon.”**

**-Saleha, 40, who lives with her family on an embankment in Gabura, Shatkhira district in Bangladesh**

In addition, embankments were made vulnerable by the numerous pipes that were put through them for the purpose of bringing saline water from the sea into the shrimp farms in the polders. It is illegal to do such work, and nobody except the Water Development Board (WDB) is officially allowed to do any construction work on the embankments. Yet this illegal piping into the embankments had not been effectively controlled. It had been overlooked due to the importance of income earned by exporting shrimp production.

With the onset of monsoon (i.e. more water) the repair of the embankment was slow and thus this section of affected population was unable to bring quick recovery<sup>23</sup>. The natural process of infrastructural weakening was accelerated by such illegal activities that resulted in the breach of embankments and following inundation, which delineated as the secondary disaster.

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<sup>23</sup> IFRC, 2009



Moreover, the increasing degree of siltation on the bed of rivers around the polders had the effect of intensifying the force of tidal surge. The problem of river siltation has been long prevailing in the region for more than 20 years. It had been caused by the lack of sufficient velocity of water flow in the river. That has been obstructed both by the polders themselves and by the upstream water diversion at *Farakka* in India. WDB's failure to solve this caused severe drainage congestion.

On the other hand, Cholera outbreaks are very common after the cyclones and the same was the case after cyclone *Aila*. A block in Sunderban area called Gosaba in West Bengal, India, reported increased number of diarrhea cases in May'2009 which later were found to be the cholera cases. The outbreak of cholera was due to poor sanitation and health hygiene practices. The villagers near their house broke the pipelines for an easy access to water. However, the piped water and stored drinking water specimen showed faecal contamination which was the main reason for the outbreak of cholera. In total there were 1076 probable cases of cholera out of which 14 died. The outbreak started in the fourth week of May, with two peaks in second and fourth weeks of June'09 and lasted until August'09<sup>24</sup>.

Another major impact of the *Aila* cyclone was migration. Disaster impacts in developing nations are potentially severe as they affect agriculture, health and lack of water and food supplies creating a semi voluntary move to area that are more sustainable for human life. Migration can help reduce risk to lives, livelihoods and ecosystems contribute to income diversification and enhance overall capacity of households and communities to cope with the adverse effects of environmental degradation and change.

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<sup>24</sup> Bhunia R, Ghosh S. (2010). Department of Health and Family Welfare, South 24 Parganas District, West Bengal, India. Waterborne cholera outbreak *following Cyclone Aila in Sundarban area of West Bengal, India, 2009*.. Available: <http://www.ncbi.nlm.nih.gov/pubmed/21353273>. Last accessed 27 Feb' 13.

## **6: Relief and Rehabilitation and Recovery - Short term recovery:**

### **Emergency Humanitarian Responses and Relief**

As an immediate response for recovery, GOs and local, national and INGOs initiated relief interventions by providing basic material (such as food, clothes and relief kits) to reduce sufferings of *Aila* affected people (Kamal, 2012). Moreover, Cash for Work programs were introduced at initial phase that aimed for quick recovery. Programs such as kitchen garden and pond cleaning had an excellent impact on household food and nutrition security (ADRA, India 2011).

Under the Bangladesh government's Vulnerable Group Development (VGD), 4,195 households in two upazillas of Khulna district and 4,720 households in two upazillas of Satkhira district received 30kg rice per month that continued till Dec'10. The Government of Bangladesh also undertook some emergency repair of embankments to stop sea water inundation, particularly in high tide.

### **6.1: Livelihood recovery and diversification**

NGOs worked parallel with the national government to help repair and maintenance of infrastructure such as local roads and embankments. This could have been a massive employment opportunity for the people to regain their livelihood. They introduced 40 day cash for work programme where 6,637 households in two upazillas of Khulna and 19,330 households in two upazilla of Satkhira received TK 120 per day for day labour work. It started in March'10 and ended in May'10.

However, people complained about the unfairness in employment opportunities in terms of selection process. In addition, Department of Fisheries and FAO estimated that the shrimp production was drastically reduced from 2,350 kg/h to 470 kg/h<sup>25</sup>. Prior to cyclone *Aila*, the fisherman of Shamnagar upazilla earned 100TK per day; but presently earns 50TK per day for digging and carrying boat<sup>26</sup>. This reduced opportunity stopped many from being self reliant and

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<sup>25</sup> United Nations, 2010

<sup>26</sup> Tada, S. (2011). Issues For Effective International Assistance For Post-Disaster Reconstruction: The Case Of Cyclone 'Aila' In South-Western Bangladesh. Available: <http://www.ritsumei.ac.jp/acd/cg/ir/college/bulletin/GSIR2011-1.pdf>.

regain normal lives. On the other hand, those who were given a chance worried about what they would do after rehabilitation program.

In addition, before cyclone Sidr, the livelihood of many depended on the forest resources found in the mangroves of Sundarban. However, post cyclone Sidr Government of Bangladesh restricted their entrance only during March to May to protect the mangroves (Government of Bangladesh, 2010). This situation continued after cyclone *Aila*. A villager from Koyra Upazilla said that his income has increased from 2000TK a month to 100-200TK a day. His main occupation before the cyclone was honey collection but after *Aila*, he has been operating boat<sup>27</sup>. He clearly benefited from the present situation by earning more than before. However, the opportunities are very few as quite a lot of boats have been destroyed due to the cyclone *Aila*. Therefore, people migrate to towns and seek of livelihood. Women engaged themselves in income-earning activities to cope with the disaster and recover their livelihood along with performing their household activities (Kamal, 2012).

Moreover, cash grants or free of interest (or low interest) micro-credit for professional such as farmers, forest dependents, small traders etc to restart their professions and thus livelihoods.

The UN country team (UNCT) in Apr'2010 conducted a joint multi-sector assessment after a year of cyclone *Aila* and found that nearly 14,000 families even after a year lived on the embankments in slum like state. This was due to continuous inundation in most unions<sup>28</sup>. Moreover, on discussions with various stakeholders of different level they found that on-farm livelihood recovery is restricted due to inundation and off-farm livelihood opportunities are difficult as the affected people live in a rural-slum like state. They believe 60% of households will be able to recover by themselves while 40% will need shelter assistance<sup>29</sup>.

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<sup>27</sup> Tada, 2011

<sup>28</sup> United Nations, 2010

<sup>29</sup> Tada, 2011

## **6.2: Education**

The educational institutes and centres due to poor construction were damaged by the cyclone *Aila*. They were repaired or refurbished; and were provided with the school material so the students can get back to their studies and recommence their lives. Formal and non formal institutes tried to reach the affected areas. Moreover, help from Save the Children-UK is one of the main reasons that helped children's in continuing their education and back quickly to the school<sup>30</sup>.

"Children are especially vulnerable to the threats posed by natural hazards. At the same time, they can be powerful agents of change, provided they are well armed with knowledge about how to prepare in advance, how to act on warnings and how to reduce at home and in their communities. It is essential, therefore, to make disaster-risk education a component of national school curricula, and to ensure that children understand how natural hazards interact with the environment"

Mr Kofi Annan's message on the  
International Day for Disaster Reduction

## **7: Disaster Risk Reduction, Climate Change Adaptation and Poverty Reduction**

**Disaster risk reduction (DRR)** is multi faceted (political, social and economic) and should be based around three independent issues: climate change adaptation, DRR and poverty reduction. It is inevitable to reduce poverty and affects a climatic disaster it can have on people to work on disaster risk reduction. The basic needs of the people in rural area must be answered first. People cannot worry about future security when they are starving from hunger today. For them, adaptation is about finding solutions to these problems. In order for them to adapt, we must start by addressing basic and immediate needs like water and sanitation, food security and livelihood strategies, while at the same time reducing the risks of extreme weather events. In reality, people are so excruciatingly poor that they have very little surplus to think about adapting for the future. Adaptation can only happen through addressing poverty.

On the other hand, climate change in itself is not a problem, but it is also interwoven social, cultural and environmental factors that puts extra strain on people who are already extremely poor, socially excluded and disadvantaged. It should therefore be managed with other problems that are caused by climate change are a combination of overpopulation, environmental degradation and poor governance of resources. Increase in climate change has led to increase in

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<sup>30</sup> Echo'2009

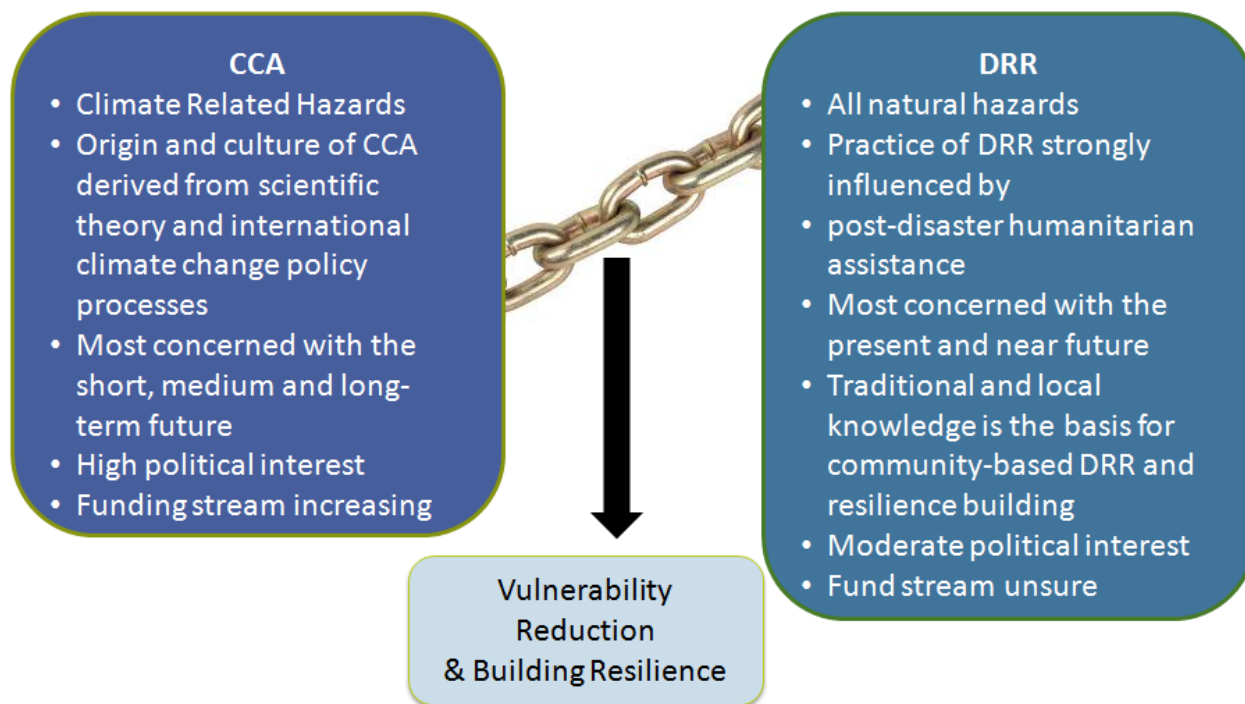
natural disasters intensity and frequency. Trends suggest that the frequency of cyclone has increased from 20 to 39 in Bay of Bengal between 1991 to 2000 and 2001-2009 respectively according to Indian Meteorological Department<sup>31</sup>. Despite of this very little is done in response to be prepared. This is due to lack of resources, infrastructure and resistance to change seen in the coastal communities. Thus, a disaster management approach is inevitable.

Climate change is going to make matters difficult to handle if not prepared. Rapid-onset disasters and the slow-onset impacts of glacial melt will add other environmental stressors displacing a growing number of people estimated by the government to reach at least 20-30 million by 2050. Increased salinity is disrupting the rural economy of coastal areas and is already generating displacement. In addition, estimates suggest that a 1.0m sea-level rise will inundate 15 to 20% of Bangladesh, which means more floods, increased salinity and constant threat to livelihood and life. Rehabilitation of such a large number of people will be an enormous undertaking. Rehabilitation is often regarded as the process that links relief and development of which the implicit aim is to return to former, supposedly stable and desirable states of affairs<sup>32</sup>. Climate Change adaptation and livelihood concepts in disaster risk reduction must be used as a top down approach and should prevail when it comes to project design and implementation. The involvement of the private sector is at its initial stage and offers a lot of opportunities.

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<sup>31</sup>IMD, 2011

<sup>32</sup> Longley, C. (2006) Overseas Development Institute. Agricultural Rehabilitation: mapping the linkages between humanitarian relief, social protection and development. HPG Research Report, London.



Bangladesh formed a basic model to guide disaster risk reduction and emergency response management efforts in line with the Hyogo framework. The government aims to establish a mechanism that coordinated disaster related activities on national, state and local level. Its model includes three key elements (i.e. Risk reduction, Emergency Response and feedback) and ensures that it is moving towards a risk reduction culture remains central to all efforts (National Plan for disaster management, 2010-2015). Bangladesh has improved its ability to manage disaster risks (particularly floods and cyclones). Evidence from Bangladesh’s Poverty Reduction Strategy paper suggest the lives claimed *Aila* cyclone (2009) has drastically reduced to less than 500 deaths from 140,000 in 1991 cyclone. The cyclones that hit in the recent years, although devastated large areas, the human casualties were relatively low. This has been the result of a gradual shift from an approach of response after the disaster to a strategy incorporating elements of disaster risk management along with risk mitigation.

### **7.1: Cross Cutting Issues**

Gender issues are recognised as a cross cutting issue which must be incorporated into all disaster risk management policies, plans and decision-making processes, including risk assessment, early warning information and education and training. This is because of the gender inequality in some Asian countries. Other cross cutting issues includes multi hazard approach; cultural diversity, age and vulnerable groups as considered in disaster risk reduction planning; community and volunteer

participation. Moreover, promotion of the culture of prevention in coherence with national efforts can help everyone to reduce risks from the poorest and most marginalised to the wealthy<sup>33</sup>.

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<sup>33</sup> Action Aid International. (2006). *Disaster Risk Reduction: Implementing the Hyogo Framework for Action (HFA) An Action Aid International Briefing Paper*. Available: [http://www.preventionweb.net/files/8847\\_AAimplementinghyogo.pdf](http://www.preventionweb.net/files/8847_AAimplementinghyogo.pdf).



## **8: Long Term Recovery for Aila Cyclone**

### **8.1: Early Warning System**

One of the major sub goals of the National Plan for Disaster Management (NPDM) 2010-2015 is the establishment of effective early warning and evacuation system; and a development of national disaster insurance can compensate for the physical and property damage. Ministry of Disaster Management & Relief (MDMR) includes the Upazilla (the local level) in disaster risk reduction.

For early warning systems, mobile phone network provider like Grameenphone (private) and Teletalk have initiated to use Interactive Voice Response (IVR) to support the early flood and cyclone warnings. It is very important that the early warning percolates down to the micro level through panchayats even in situations when individuals do not have access to cell phones, radio or television.

Therefore, MDMR has also installed Pole Fitted Megaphone Siren at 35 Upazillas of 12 coastal districts. It is implementing US\$8.0 million to support for enhancing the risk and vulnerability assessment capacities and for improved response preparedness<sup>34</sup>. In addition, the communities must be convinced with the warning system and respond to the situation in terms of evacuation.

### **8.2: Recovery and Rehabilitation Programs**

Bangladesh has been constantly employing its resources for post disaster recovery and reconstruction programmes in *Aila* affected areas. The MDMR will design multipurpose shelters and provide all the necessary information and advice in an event of disaster. DRR element is embedded in all social safety nets and rehabilitation programmes of MDMR.

### **8.3: Education**

As a part of HFA priority 3, MDMR through Comprehensive Disaster Management Programme (CDMP) is piloting joint projects with 13 departments of 12 sectoral ministries and several other technical institutes to support and assist DRR. Moreover, it is organising several training, awareness and research programs at local and national levels. Several other graduation courses are

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<sup>34</sup>Government of Bangladesh, 2012

introduced for disaster management by universities such as University of Dhaka and training institutes. National Institute of Mass Communication has organized training on DRR for Media personnel. In addition, a project is initiated to increase the capacity of staff of Public Works Department (PWD) on disaster-resistant techniques of construction and retrofitting for public buildings (Government of Bangladesh, 2012). However, the number of undergraduate and post graduate courses on DRR is still very limited and there is a lot of gap in the transfer of knowledge from theory to practical implementation. Moreover, Networking on a regional level among universities and scientists could also be improved<sup>35</sup>. Despite of these efforts the people are not aware of the importance of such courses, the opportunities and growth people have in their career.

#### **8.4: Efforts for Long term Recovery**

Bangladesh has one of the largest NGO communities in the world. Many post disaster response and rehabilitation operations are carried out by government and these NGOs such as Oxfam, Care and Action Aid etc. International agencies have their main focus on pre-disaster awareness and preparedness. They also have initiated programs like Disaster Forum (by Oxfam) and Nirapad (by CARE) to spread DRR awareness. IUCN (International Union for Conservation of Nature)

Table 2: Summary of International Donor Assistance

Summary of International Donor Assistance		
Donor	Amount (USD)	Sector(s)/Activity(ies)
ECHO	11.93 million	Food Assistance, Health & WASH
EU	6.63 million	Shelters
DFID	1.58 million	NFIs, Settlement Support (through IOM)
SDC	1.31 million	Livelihoods & WASH
Government of Spain	.66 million	Food Assistance (through WFP)
WFP	18.5 million	Food Assistance
UNICEF	1.5 million / .54 million /.75 million	WASH / Education/Health/Nutrition
FAO	.5 million	Agriculture
UNDP	.25 million	Livelihoods
WHO	.10 million	Emergency Medicine & WASH
<b>TOTAL</b>	<b>44.25 million</b>	

Date: 26 May 2010

promotes awareness and education on the impacts and adaptations of Climate Change and variability. NGOs like World Vision and BRAC are involved in the construction of cyclone and flood shelters<sup>36</sup>.

For long term recovery, the platforms of tube-wells

were raised; introduced disaster proof ponds and low cost rain water harvesting systems. NGOs

<sup>35</sup> Swiss Agency for Development and Cooperation (SDC), 2010

<sup>36</sup> Swiss Agency for Development and Cooperation (SDC), 2010

such as Muslim Aid and Save the Children, UK were involved in dewatering ponds, installing deep and shallow tube wells. It reconstructed and repaired several houses; for which they promoted cash for work opportunity. To address the sanitation problems many organisations such as Save the Children, Muslim Aid and BRAC among others repaired and constructed latrines. They tried to increase community awareness on safe water, sanitation and hygiene by distributing leaflets and folk music (Wash cluster, 2009). Several international agencies helped Bangladesh recover from the cyclone *Aila* as shown in the Table 2<sup>37</sup>. Catholic Relief Services an INGO in partnership with Caritas Bangladesh spent USD 2.55 million in building disaster resilient shelters. They have repaired 1100 houses and build 1,500 transitional shelters. In response to cyclone Sidr, 2,800 disaster resistant houses were built which withstood the strong winds of 100km/hour and tidal surges of *Aila* cyclone. However, the main challenge for them is the recurring nature of disasters causing land submergence leading to less available land to construct houses. A similar disaster resilient shelter construction program was undertaken by an NGO Sabuj Sangha in a state of West Bengal, India that reduced losses.

### **8.5: Political Barriers of Implementing DRR**

Bangladesh has a long-term response involved political commitment for adaptation to climate in all the relevant sectors including fishery, forestry, livestock, water resources, communication, disaster management etc. It worked to employment for communities, having disaster risk reduction as their main objective, developing stronger micro credit loans, disaster insurance; WASH (Water and sanitation hygiene) contingency plans and food storage system. Not only this, but the most exposed groups and others were introduced to the alternative livelihood training<sup>38</sup>.

Bangladesh is a disaster prone country due to its location, which is why the people have learned to cope with the disasters in their own way. They all adapt well different livelihood strategies despite of severe disruption from reoccurring natural disasters. However, they have to depend on the government and other bodies to help them financially. Risk reduction strategies therefore need to capitalize on the inherent social and cultural capacities of the communities.

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<sup>37</sup> United Nations, 2010

<sup>38</sup> ECHO, 2009

Bangladesh has limited natural resources and a large population, and thus the recovery after recurring disasters is difficult putting a lot of burden on the socio-economic life of Bangladesh. The livelihoods of affected areas are mainly dependent on agriculture and natural resources, the inhabitants of these areas are extremely vulnerable to weather-induced shocks and stresses. The death toll from *Aila* cyclone has reduced in the recent years due to the construction of cyclone shelters, improved warning systems. According to Global Climate Risk Index 2010, the tremendous climatic condition has caused damage over USD 2 billion per year and; 1.8% GDP loss between 1990 and 2008(Harmeling, 2007). This limits the growth and development of Bangladesh. Over last three decades the government has invested USD 10 billion to make country's climate less vulnerable.

Despite of all these efforts, immediately after the disaster the community people met local government representatives for support who had no independence for any decision making as funding is centrally controlled. Many confirmed that local government was controlled by political parties and they were reluctant to coping and recovery processes. Several were not given help as they either belonged to the opposite political party or voted them. Government jointly worked with NGOs and international organisation to provide help but failed to coordinate. The fact that national climate change policy has not reached local government levels is highly problematic. Several local politicians and government officials complained that policies are made centrally, with very limited knowledge about the local problems they are meant to address, as this quote from an Upazilla Chairman illustrates: "Our government is sitting in Dhaka developing adaptation policies in an air-conditioned room. This will not help. Government should come to the root level, see the problems and then decide what to do. But they do not bother to come to the root level. There is lack of communication between national and local level."Climate change may be a global phenomenon, but its impacts are felt locally, and adaptation will have to happen locally.

Post disaster relief interventions are prone to corruptions because of the swift inflow of resources. There was unfairness in the way help was given out by local leaders and government. Some claimed that extremely poor households were not given relief material facilities at all while some households benefited from more help than others as they supported the ruling party or knew the local leaders (Kamal, 2012). The chairman and the members of Union Parishad were alleged due to such misappropriation of disaster relief in *Aila* affected upazillas. Moreover, several people were affected and lived under very poor condition until last year due to less help. They

compromised their food consumption by having fewer meals or by consuming less food per meal (UN, 2010). We can thus conclude that there is inequality spreading help; also no initiatives were taken to address the root causes of household vulnerability (Kamal, 2012).

Therefore, national policies matter and that politician must listen to the people. Local government are dependent on national government and thus it is essential to prepare a comprehensive national climate change policy to accommodate the issue into national development planning. When planning the government must not only build expert driven documents that reflect the scientific models but also consider of how climate change affects local contexts. Standardised solutions are not appropriate in different contexts, even within the same geographical region. There must be space and flexibility in planning and budgeting to find solutions suited to the local context, and local people must be included in policy-making processes so that they can contribute their extensive knowledge about local circumstances.

### **8.6: Social Barriers of Implementing DRR**

There were several social variables such as gender, ethnicity, religion and social economic statuses that had different impacts and acted as barriers. Firstly gender Issues, in several Asian countries women are treated differently and are particularly at risk. The impact of disasters on women can be very different from the impact on men. In general, disasters hit women harder. One study of the cyclone that killed 138,000 people in Bangladesh in April 1991 found that mortality amongst females over ten years of age was three times as high as amongst males of the same age (John Twigg, 2004). Often women lack power to interact with men and vice versa which must be taken into account. In Bangladesh, several women hesitated to enter mixed gender shelter. Moreover, several are handicapped in escaping floods as they cannot swim (learning swimming being a taboo), and/ or because they are weighed down by heavy clothing to ‘preserve their modesty’. The root causes of women’s vulnerability often lie in unequal power relation that denies women from basic rights, access to education and participation in community governance. Yet it is not always women who are hit the hardest. Men who have to work away from the home may be more vulnerable to certain kinds of hazard: for example, deaths from cyclones are often particularly high among those who go fishing at sea (John Twigg, 2004).

Second, disabled people or people with limited cognitive are particularly vulnerable to rapid-onset hazards. For example, they may have a limited understanding of what an early warning of a

disaster and wouldn't be able to react on time. This problem can be solved by setting up a neighbour support network to assist the ones with physical or mental disability.

Third, in some cultures children are not encouraged to share their views with elders out of respect. Also, they do not encourage their family members to take part in disaster risk reduction projects as that could put them in danger. Therefore, it is a practical consideration that includes designing activities to fit in with, or around, children's school schedules, work and domestic duties.

### **8.7: Other Barriers:**

1. There are challenges on the ground to ensuring the protection of internally displaced persons. This is because the affected countries are sometimes unable to protect the displaced people, and in some cases even deny the entry of international protection and assistance agencies, referring to the principle of national sovereignty and non-interference.
2. The international migration policies do not adequately support the protection of environmental or climate migrants. As the numbers of climate or environmental migrants are expected to rise in coming years due to climate change and sea level rise, developed countries may face demands to accept climate refugees from vulnerable and affected countries
3. Quantification: One inherent failure of the disaster warning system, according to the locals, is the nature of warning, its language and content. For example, many islanders claimed that a mere announcement of a storm of a certain speed (which is a regular phenomenon in the region) does not mean anything to them. "How much damage a storm of a speed of 100 km per hour can cause needs to be explained in real terms to people. Otherwise people don't pay heed to the warnings even.
4. Lost in communication: The communication must be clear and concise and in a language that people understand. Many reported that the government had resorted to short messaging services (SMS) through mobile networks in 2010; a year after Aila, for another storm warning that was named 'Laila'. But since the SMSs were in English, it was of virtually no help for the people. No wonder people find warnings issued in Bangladesh radio much more user-friendly! However, this may change overtime.

5. Long- lag periods: Aila could have been a great lesson towards the systemic failures that plague our disaster management system. The cyclone alert was generated on the Sunday of May 24 by Indian Meteorological Department in Kolkata and passed on to the state government. Being a holiday, no one received the message at the state secretariat or made a plan how to respond to the crisis, vital time was lost<sup>39</sup>.
6. Jurisdiction: Between central relief agencies such as the army, coast guard and the state agencies, there is often a problem of ownership and responsibilities. Absence of infrastructure: No roads, no electricity, absence of shelters, boats – all leads to a detrimental effect on the capacity of people to withstand risks from extreme weather events. In an ecosystem vulnerable to such events, it seems to be an insurmountable challenge to address all the areas effectively.

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<sup>39</sup> IMD, 2010



## 9: Disaster Preparedness

In order to reduce risk of the population in the coastal zone, the government of both countries aims to incorporate preparedness and emergency in disaster management strategy (Kamal, 2012). Children and women are particularly vulnerable to disasters and therefore disaster management in Bangladesh and India is being mainstreamed in every policy planning and development processes in order to address all these components of vulnerability of children and women. It is impossible to prevent natural events such as cyclone *Aila* from occurring, governments should significantly reduce their impacts by being well prepared. The Bangladesh government and international humanitarian and development agencies must reduce vulnerabilities in disaster prone areas and ensure that communities are involved in disaster-preparedness strategies at all levels.

The Comprehensive Disaster Management Program (CDMP), under the Ministry of Food and Disaster Management (MoFDM) is undertaking a number of interventions aimed at strengthening and improving disaster management and risk mitigation capacities at various levels and in promoting and implementing the national strategic priorities and plans set out by the government. Its main goal of Comprehensive Disaster Management Program (CDMP) Phase II (2010-14) is to increase national capacity of disaster management to reduce the risks and vulnerability of people to adverse natural events through improved awareness, empowerment, climate adaptations and preparedness (Zimmermann et al, 2012).

Following are the two examples of two organisations in Bangladesh and India respectively that have initiated preparedness activities.

Bangladesh Red Crescent Society (BDRCS) with the financial and technical support of German Red Cross initiated a preparedness program between 1996 and 2002. The overall aim of the programme was for cyclone-related disaster risk reduction to become an integral part of people's way of life. It focused on training the communities living within the area around Cox Bazaar in Bangladesh to be better prepared. The project benefited 90,000 people directly and 120,000 indirectly. The key activities included working with disaster preparedness committees and disaster preparedness squads who are responsible for early training, evacuation to cyclone shelter, providing first aid and search and rescue. On household level, the individuals were established in micro-groups who were trained to take preventive measures such as constructing platforms to protect livestock. Moreover, the shelters were built that could easily accommodate 800 people and

more if required. They were alternatively used as schools when it was not an event of an emergency (International Federation of Red Cross and Red Crescent Societies, 2010).

Post cyclone *Aila*, an eight-member German Red Cross evaluation team visited 30 cyclone shelters and communities who were originally involved in interview, group discussions and physical observation. The evaluation found that the main purpose of the program had been achieved. Disaster risk reduction had become an integral part of the people's way of life and the communities remembered the program and its main activities. Moreover, they understood the benefits of disaster risk education and practised it regularly. After the warning for cyclone *Aila* in 2009, people reported having: listening to the radios regularly; fixing loose pillars, shelves and roofs in the house; making a raised platform for livestock; gathered valuables, dry food and important documents to carry in an event of evacuation. However, the evaluation team found out that the disaster preparedness fund was a useful way of increasing interest in the program and developing a sense of ownership. However, only few donated money after the program stopped as they did not trust the committee members. Moreover, only men knew the balance of funds and women did not. Some women said they felt it would be disrespectful to ask about it.

In India, a community based organisation called Sabuj Sangha in West Bengal took steps for preparedness by shelter reconstruction. In 2007, post cyclone Sidr several houses were destroyed as they are made of mud and thatch. Sabuj Sangha initiated the shelter reconstruction program that fulfilled the needs of the dwellers. The cost of each house was INR 25,000 that equalled to the grant provided by Indira Awas Yojna (IAY). Sabuj Sangha built 250 disaster resistant houses by adapting traditional techniques and materials to mitigate disaster risks. The structures built were low cost, vernacular and were accepted among locals. These factors when combined with disaster resilience are ideal for replication in several other places. The houses were checked by an evaluation team of Sabuj Sangha post cyclone *Aila* in 2009 and reported for very minor damage; whereas as the mud and thatch houses in the area were swept off by the cyclone.

## 10: Lessons Learnt and Conclusion

As we have seen in the report, Bangladesh and coastal states of India has to cope with a wide range of environmental threats from sudden onset events such as cyclones and floods to slow-onset processes of environmental change and degradation. In combination with these factors, the people are not prepared well to deal with these shocks and thus are highly vulnerable. There have been several problems to establish the disaster management model in effect. Due to absence in broad based ownership of the disaster risk reduction action plans, every stakeholder implements a different strategy to overcome risks. The government aims to establish a mechanism that coordinated disaster related activities on all levels, however in most of the cases these were non-functional or they functioned only in times of crises. Many people are not aware of the information about policies that hinders them from implementing them at national level.

Coping and recovery strategies based on local strategies have been significantly successful than external assistance. Due to limited livelihood options post disasters, people are increasingly searching alternative options to adapt to reality without any severe disruption in their lives. It is difficult for people due to limited financial and human resources; however the governmental and non-governmental organisations can jointly help the communities.

The actual damage caused by *Aila* cyclone was much more than the threat perceived by the communities. Since, the intensity was much lesser than the previous Cyclone Sidr in 2007, the community did not take the warnings very seriously and hence the level of preparedness was low. The community believes that although *Aila* did not claim as many lives but destroyed most of their livelihoods options. Thus, the recovery was slow and took longer than anticipated.

The following are the learning of the case study:

1. **Systematic integration of disaster risk reduction into development planning and programming** at all scales is necessary. The Bay of Bengal is the breeding place of catastrophic cyclones; therefore there is a dire need to move our focus from relief and response to disaster to disaster preparedness activities<sup>40</sup> (Swiss Agency for Development and Cooperation, 2010). A paradigm shift in disaster management from conventional

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<sup>40</sup> Zimmermann M, Glombitza, K. F and Rothenberger, B. (2010) Swiss Agency for Development and Cooperation (SDC) Disaster risk reduction Programme for Bangladesh 2010–2012.

response and relied practice to a more comprehensive risk reduction culture is slowly taking place; however more needs to be done in the sector. Local people need to increase their awareness on both pre-disaster risk identification and reduction and post-disaster reconstruction process. They need to be involved in identifying the risk of embankment breach and of drainage congestion. Moreover, involvement of locals in post-disaster will give them a chance both to learn to handle such situations and earn a livelihood (Tada, 2011).

2. The way we are approaching disaster risks are not enough to meet tomorrow's challenges. Each of the sectors must thrive to be climate smart in order to avert the adverse effect of disasters and recovery efforts must involve **Convergence of Disaster Risk Reduction, Development and Climate Change Adaptation**. In addition, shifting risks that are associated with climate change must be taken into account to ensure that measures do not increase vulnerability to climate change in the medium to long term in order to have an impact (ADRA, 2011).
3. **Technical capacity** must be developed to manage risks and disasters within the government system at all levels including having courses at university level to strengthen the flow of information between scientific institution and practitioners<sup>41</sup>.
4. There should be a special **focus** given to the needs of **women** before, during and after natural disasters. The main idea is to empower women so that they can take decisions in formal as well as informal political decisions.
5. **Improvement of governance infrastructural and resource management**. The destructive behaviour of illegal piping into the embankments by locals should have been controlled in order to reduce the risk of secondary disaster. Furthermore, the quality of post-disaster reconstruction work by the government contractors should be tightly monitored by the local stakeholders. Therefore, information disclosure is inevitable (Tada, 2011).
6. It is found that local CBOs and NGOs have better knowledge about the actual situation. Therefore **coordination between government and non-government organisation** was visible at the state level where as the same was not present at the district level. It was also

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<sup>41</sup> Swiss Agency for Development and Cooperation (SDC), 2010

noticed that though the government had already started withdrawing from immediate relief and response phase stating the situation is back to normal, actual situation was far from normal. A lack of information flow was clearly visible at every level. This has resulted in duplication of relief materials provided and uneven distribution of relief<sup>42</sup>.

7. River management is an integral part to remove siltation on the river bed that will reduce the risks of drainage congestion (Tada, 2011). The development of new approaches is influenced by a number of emerging trends in the water and environmental sectors. This includes; a) the exhaustion of options for technical, engineering solutions to problems. For example, it is not possible in many cases to construct new infrastructure to meet growing demand for water; b) the recognition of the importance of functioning ecosystems and the rapid decline in the health of freshwater ecosystems; c) the increasing costs associated with water supply and waste management; d) a desire for more decentralized management and greater stakeholder engagement in river surrounded areas.
8. Implementation of agricultural and fishery risk reduction strategies: Research on the development of improved and saline tolerant crop for coastal region in terms of salinity tolerance and yield. Moreover, innovation of few other new crop varieties that can survive under submerge conditions; and identifying the variety of crop that can be harvested 15 to 10 days earlier than those currently grown. On the other hand for fisheries, the government must control the over consumption by making some policies and adhering to them. In addition, the fishermen must be taught alternative ways of livelihood through on/off job training to both reduce over fish farm and to survive the shocks when a disaster hits.
9. This issue is well recognised by humanitarian agencies. Constant efforts need to be made in coastal areas of Bangladesh and India for DRR practices that demonstrate integration of CCA. Holistic management of disaster risk requires action to reduce impacts of extreme

**“Interventions which integrate social protection initiatives (such as regular transfers) with climate change adaptation (alternative livelihoods such as saline tolerant rice) and risk reduction measures needs to be expanded.”**

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<sup>42</sup> TISS, 2009

events before, during and after they occur, including technical preventive measures and aspects of socio-economic development designed to reduce human vulnerability to hazards. Approaches toward the management of climate change impacts also have to consider the reduction of human vulnerability under changing levels of risk. A key challenge and opportunity therefore lies in building a bridge between current disaster risk management efforts aimed at reducing vulnerabilities to extreme events and efforts to promote climate change adaptation.

10. Since most of the people have lost their primary source of livelihood that is agriculture, measures should be taken to generate alternative disaster resilient livelihood options in the area. Moreover, family disorganization is a defining feature in the current situation due to large scale migration, it is an ideal time for human traffickers to spread their net and lure women and children to migrate with them out of the State. In addition, the children are forced into child labour and some adolescent girls into prostitution. Preventive strategies must be implemented at the earliest to avoid escalation of human trafficking in post-disaster situation<sup>43</sup>. Early recovery efforts by different agencies at right time with right duration will help to avoid increase in such cases.
11. Risk transfer mechanism should be promoted at large scale in relation with recovery. For example, introduction of micro-insurance against disasters for the poor will help them to recover their losses quickly. Without insurance, the poor who are also the most vulnerable are forced to use all their savings or have to take up new loans at higher rates of interest. Micro-insurance will help to break this cycle by providing them with the post disaster liquidity. Insurance can become an important adaptation and risk management tool, climate change will always present us with new challenges and disaster impacts continue to grow. Lack of such efforts in Aila has made the communities vulnerable and unprepared for future disasters.

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<sup>43</sup> TISS, 2009

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