

CEDRA Assessment: Bangladesh Nazarene Mission – Adaptation in a Coastal Area

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PART 1a: Background information - Science

Introduction

BNM works in Mongla Upazila, which is in Bagerhat District, in the South of Bangladesh. It is a low-lying coastal zone close to the Bay of Bengal. In order to gather scientific information for this CEDRA Assessment, temperature and rainfall records from the Meteorological Department of Mongla were reviewed. Various Government Departments in Mongla Upazilla were consulted, including the Departments of Agriculture, Fisheries and Forestry. Reports and publications of these Departments were reviewed and other NGOs working in the area were also consulted. Several key documents were accessed from the internet, including the Government of Bangladesh's National Adaptation Programme of Action (NAPA) and various reports from global institutions.

Rainfall

- Annual rainfall in the area is decreasing. Data from the last 20 years shows a consistent reduction in rainfall, particularly in more recent years. In 2007, the total rainfall in the area was 2,058 mm and in 2009, it was 1,721 mm. (Records from the Mongla Upazila Meteorological Department and discussions with the Senior Observer Mr. Rakibul Hasan)
- More than 80% of the annual precipitation that falls on Bangladesh comes during the monsoon period (June to November). Most of the climate models estimate that precipitation will increase during the summer monsoon because they estimate that air over land will warm more than air over oceans in the summer. This will deepen the low pressure system over land that normally occurs in the summer and will enhance the monsoon. (OECD)
- Bangladesh is projected to experience a general increase in the intensity of heavy rainfall events in the future. (IPCC, AR4)
- The erratic nature of rainfall has increased in Bangladesh. As yet it is difficult to project rainfall changes for the Ganges River flood plain, with some models projecting wetter and others projecting drier conditions. (World Bank)

Cyclones

- There has been a significant increasing trend in the cyclone frequency over the Bay of Bengal during November and May. (Bangladesh's NAPA, 2005)
- The frequency of tropical cyclones in the Bay of Bengal may increase and, according to the Intergovernmental Panel on Climate Change's Third Assessment Report, there is "evidence that the peak intensity may increase by 5% to 10% and precipitation rates may increase by 20% to 30%" (IPCC 2001). Cyclone-induced storm surges are likely to be exacerbated by a potential rise in sea level of over 27cm by 2050. (World Bank)

Temperature

- Minimum average and maximum average temperatures in the area are increasing. Data from the last 20 years shows a rise in temperature in more recent years, and particularly in the last 5 years. In 2006, the highest temperature in this area was 38 °C; in 2010, it was 42.5 °C. (Mongla Upazila Meteorological Department)
- Average monsoon-season maximum and minimum temperatures show an increasing trend annually at the rate of 0.05 °C and 0.03 °C, respectively. An increasing trend of about 1 °C in May and 0.5 °C in November during the 14 year period from 1985 to 1998 has been observed. (World Bank)

- According to one study, for the period of 1961-90 there has been an increasing trend of mean maximum and minimum temperatures in some seasons and a decreasing trend in some others. Overall the trend of the annual mean maximum temperature has shown a significant increase over the period of 1961-90. (Bangladesh's NAPA, 2005)
- Since 1960 there has been widespread warming over Bangladesh during both the hot season (March to May) and cool season (December to February). There has been a reduction of the number of cool nights and an increase in the number of warm nights over the period 1970-2000. (UK Met Office)
- In terms of projections, in a study of climate models by the OCED, all (seventeen in total) estimate a steady increase in temperatures for Bangladesh, with little inter-model variance. Somewhat more warming is estimated for winter than for summer. (OECD)
- According to the World Bank, mean temperatures across Bangladesh are projected to increase by 1.4°C by 2050 and by 2.4°C by 2100. This warming is expected to be more pronounced in the winter months (December-February). According to the UK Met Office, for the IPCC's A1B emissions scenario projected temperature increases over Bangladesh are in the region of 3 to 3.5°C by 2100.

Sea Level Rise

- A study of sea level rise in the Bangladesh coast using 22 years of historical tidal data at three coastal stations showed that the rate of sea level rise during the last 22 years is many times higher than the mean rate of global sea level rise over 100 years (4.0 mm/year at Hiron Point, 6.0 mm/year at Char Changa and 7.0 mm/year at Cox's Bazar). (The study does point out, however, that the rise in sea level includes that due to regional tectonic subsidence as well as to climate change). (Bangladesh's NAPA, 2005)
- Sea level rise is projected for Bangladesh, although there is disagreement on what the degree of sea level rise will be. One study suggests an increase of 30-100cm by 2100, while the IPCC Third Assessment gives a global average range with a slightly lower values of 9 to 88cm. (World Bank)

Salinity

- There is clear evidence of increased saline intrusion in the coastal zones. (Bangladesh's NAPA, 2005). Many people say this is due to increased shrimp farming - dredging and water channel diversion.
- From 1973 to 2000 the salinity of soil increased 15.9 percent in Bagerhat District. In recent years, salinity has become even more severe. (SRDI)
- The salinisation of soil is very high - recorded at about 22 DSPM on the day of research (May 17, 2010). In this level of salinity, it is not possible to grow crops of any kind. (Upazila Agricultural Officer)
- The salinity of the river water is increasing. It was almost 16 PPT (parts per thousand) when research was done in May 2010. Fresh water fish can only survive in the range of 8 PPT. On May 25, 2009, on the day of cyclone Aila, the PPT of water was 20. Overall, the situation of the area is very vulnerable. (Upazila Assistant Field Officer (fisheries))

Health

- Health in the area is being, and will continue to be, affected in the following ways: increased illnesses caused by degrading water quality; increased ill health, and in particular miscarriages, due to salinity of soil and water; and malnutrition due to food insecurity. There are no detailed studies on the future impacts of these but as Bangladesh's NAPA states: 'one can safely assume that the poor will suffer much more disproportionately than the non-poor and more so in the coastal and rural areas than elsewhere.' There is also an increased risk to human health from increased flooding and cyclones. (Bangladesh's NAPA)

Food security

- Bangladesh is currently a country with moderately high levels of undernourishment. Global-scale studies generally suggest that parts of Bangladesh could face worsening food security over the next 40 years. National-scale studies show that Bangladesh's food security is highly vulnerable to the impact of future flooding. (UK Met

Office)

Deforestation

- The number of trees in the locality and also in Sundarban is reducing. (Discussions with the Upazilla Department of Forestry)

Documents referenced:

Inter-Governmental Panel on Climate Change (2007) *AR4*

Ministry of Environment and Forest, Government of the People's Republic of Bangladesh (2005), *National Adaptation Programme of Action*, Final report, November 2005

OECD Environment Directorate and Development Co-operation Directorate (2003), *Development and Climate Change in Bangladesh: Focus on Coastal Flooding and the Sundarbans*, OECD

Records from the Mongla Upazila Meteorological Department

SRDI (2003) Soil Salinity in Bangladesh 2000, Resource Development Issue, Ministry of Agriculture, Government of People's Republic of Bangladesh

UK Met Office (2011) *Climate: Observations, projections and impacts - Bangladesh*, <http://www.metoffice.gov.uk/media/pdf/1/q/Bangladesh.pdf>

World Bank Climate Portal -

http://sdwebx.worldbank.org/climateportal/home.cfm?page=country_profile&CCode=BGD

Experts consulted:

Senior Observer at Mongla Upazila Meteorological Department, Mr Rakibul Hasan

Upazila Agricultural Officer, Sheikh Mohammad Shohiduzzaman

Upazila Assistant Field Officer (fisheries), Mr Shonkor Biswas

PART 1b: Background information – Community experiences

Research was done in 3 villages (Joymoni, Haldibunia and Kanainogor) in Mongla Upazila. This represents approximately 10% of BNM's project area. Several tools were used to gather information from communities: observation, seasonal calendars, community and resource mapping, focus group discussions with groups of men, women and children, and interviews with various stakeholders including health workers.

Rainfall and temperature

- The rain pattern has been irregular and it is difficult to predict. Last year (2009), it rained very little which meant that people could not plant rice, their major crop.
- The temperature is increasing. People of all ages testified to this, but elderly people are suffering the most as a result of increases in temperature. This is because they are weaker and less able to cope with the strain that increased temperatures bring. Many said that at times in the year when it was most hot, they were suffering from tiredness and dehydration due to the heat.
- After 1988, the frequency and severity of small storms increased. When storms happen, there is a huge amount of rain that can cause damage and flooding. For men, a major concern was the problem of fields being flooded, and seeds and crops washed away. For women, the impacts on crops was also a concern, but another key issue for them was the impact on fresh water sources. Children talked about damage to school buildings and how walking to school is difficult during storms.
- The winter period has become shorter but the severity of the cold has increased. Again, the change in temperature affects elderly people the greatest. During the winter, there is sometimes thick fog which leads to an increase in pests which attack vegetables in the area. This is affecting people's nutrition and having a particularly bad impact on young children.

Cyclones

- The area is vulnerable to cyclones and was badly affected by Cyclone SIDR in 2007 and Cyclone AILA in 2009. During these cyclones, high tides caused mud roads in the area to be washed away. Ponds were silted, and crops, cultivation land, community and school grounds were destroyed by the salty sea water.

Sea water rise and salinity

- It is estimated by elderly people that the water level has risen by about 2 feet since 1988. A few years ago, during high tides, sea water did not reach the villages. Now, however, water often comes into the village when there is a high tide. Many people in the community are adapting to this change by relocating their houses onto artificial raised embankments and platforms.
- Since 1988, about 250 feet of the river embankment has fallen into the river, including the local market of Chila. According to the communities, the reasons for this are:
 - More water in the river in some of the seasons, and stronger currents,
 - People using bamboo posts when fishing,
 - People cutting mud away from the river banks.
- Salinity is increasing in the river water. A few years ago, the fresh water stayed in the river for at least 6 months, but now the fresh water remains in the river for only 2-3 months.
- There is an increase in salt water logging due to the cultivation of shrimps. Before the shrimp cultivation began, salt water would enter the river during the high tide and reduce during low tide. Now there is salt water most of the year because the shrimp cultivators break the dams so that salt water enters the fresh water sources.
- Salinity is increasing in the soil, leading to crops and plants dying. Vegetables cannot grow in the salt water. The land in this area is generally fertile but the soil fertility is decreasing due to salinity.

- People are drinking pond water and using filters to try to clean it. The quality of the drinking water is a problem most of the year, but the severity increases from November to June. This leads to increased workload for women as they have to walk further to try to find fresh water.
- Pests have increased but pesticides are expensive. People used to use wood ash when growing vegetables but now they cannot use ash because it kills the vegetables. This is because the firewood people are using for cooking grows in salt water and the salt in the wood ash kills the vegetables. Ash from burnt cow dung is effective for pest control, but livestock numbers are decreasing.

Environmental degradation

- Some people use chemicals and pesticides in the river for fishing. Many eggs and small fish are being destroyed. Fresh water fish such as Koi, Bowal, Shol, etc are disappearing.
- The biodiversity has greatly reduced with species of wild animals such as guiana, snake, fox, mongoose, squirrels, tortes, etc disappearing.
- Deforestation is increasing

Socio-economic and health impacts

- Household income is decreasing due to crop failures and reduction of fish in the river. Men, women and children are suffering.
- Men are moving away from the villages in order to find work elsewhere. Sometimes they are re-marrying and this is leading to family breakdown and social problems.
- Health problems are increasing, including skin diseases, diarrhoea and urine infections, from bathing in and drinking salty water. Children and pregnant women in particular are badly affected. Pregnant women are giving birth to low-weight and ill babies as a result of the increased salinity. Many pregnant women are also suffering from miscarriages.

Conclusion

It is clear that the community experiences and scientific information agree on certain key aspects, in particular: increasing temperatures, increasing frequency of heavy rainstorm events, and increasing salinity of soil and fresh water. There appears to be some confusion in communities as to the cause of some impacts (for example, increased salinity), but it is clear that both climate change and environmental degradation are impacting these villages. Our responses will need to address adaptation, disaster risk reduction, livelihoods and governance otherwise the communities will remain vulnerable. There was some confusion within communities, as well as disagreement between the community experiences and the science, with regard to the impacts of shrimp farming on increased salinity. More research is needed in this area. We will include this in our Action Plan.

PART 2: Project risk assessment

Sig = Significance of impact: (4= high; 1= low) **Lik**= Likelihood of impact: (4= high; 1= low) **Rsk**= Risk = Significance X Likelihood (Multiply figures D and E)

A Location or sector(s)	B Projects (by sector)	C Climatic and environmental impacts	D Sig	E Lik	F Rsk	G Possible adaptation option to strengthen projects and communities
Water, Sanitation and Hygiene (WASH)	Water	Increased demand for fresh water as a result of large dams being built or rivers diverted.	3	3	9	<p>Implement integrated water resource management.</p> <p>Advocate for poor communities to have access to clean water.</p> <p>Maximize water capture and storage through rainwater harvesting using roof tops and tanks.</p> <p>Develop 'lined ponds' – using plastic to line the base of ponds that collect rain water.</p>
		Tidal surges and sea level rise leads to increased salinity of fresh water systems and soils affecting drinking water.	3	4	12	<p>Maximise water capture and storage through rainwater harvesting using roof tops and tanks.</p> <p>Develop 'lined ponds' – using plastic to line the base of ponds that collect rain water.</p>
Food security	Sustainable agriculture	Poverty and increased vulnerability due to failure of agricultural livelihoods and food shortages.	4	3	12	<p>Support the diversification of income generating measures.</p> <p>Demonstrate year-round homestead vegetable gardening.</p> <p>Introduce salt-resistant vegetables.</p> <p>Drip irrigation/ pot gardening.</p> <p>Farmer Field Schools</p>

A Location or sector(s)	B Projects (by sector)	C Climatic and environmental impacts	D Sig	E Lik	F Rsk	G Possible adaptation option to strengthen projects and communities
		Increased salinity of soil due to sea level rise and shrimp farming.	3	3	9	<p>Introduce salt-resistant vegetables.</p> <p>Raise the plots for vegetable cultivation so that the salt water cannot affect them as much.</p> <p>Advocacy on impacts of shrimp farming on crop farming.</p>
		Tidal surges destroy crops.	3	3	9	Build mangroves to provide a natural barrier between the sea and land.
		Loss of biodiversity due to salinity.	4	2	8	Planting salt-resistant trees and plants.
Livelihoods	Sustainable livelihoods and fishing	Increased salinity of fresh water and the reduction and degradation of fish habitats, affecting fish stocks.	4	3	12	Introduce salt-resistant fish farming (such as Monosex Talapia and Pangash)
		Salinity in soil leads to less grass growing, which, along with increased salinity in animals' drinking water, leads to loss of livestock and reduced livestock production.	3	3	9	<p>Support the diversification of income generating measures.</p> <p>Rainwater harvesting for drinking water for animals.</p> <p>Planting salt-resistant crops for animal fodder.</p>
		Food deficiencies among communities reliant on costal fishing leading to increased poverty and illness.	3	3	9	<p>Introduce different livestock production such as goat, duck and poultry rearing.</p> <p>Support the diversification of income generating measures.</p> <p>Self Help Groups</p>

A Location or sector(s)	B Projects (by sector)	C Climatic and environmental impacts	D Sig	E Lik	F Rsk	G Possible adaptation option to strengthen projects and communities
Health	Preventative Health Care	Less availability and decreasing quality of food leading to malnutrition and sickness, particularly in children.	4	3	12	<p>Ensure communities have access to and understand information on climate change, environmental degradation and, in particular, increased salinity.</p> <p>Awareness-raising and training on nutrition and cooking.</p> <p>Demonstrate year-round homestead vegetable gardening.</p> <p>Drip irrigation/ pot gardening.</p> <p>Introduce salt-resistant vegetables. Raise the plots for vegetable cultivation so that the salt water cannot affect them as much.</p> <p>Train communities on good hygiene and sanitation practices.</p>
		Lack of access to safe water for drinking and washing resulting in the rapid spread of waterborne diseases such as diarrhoea, cholera, skin diseases, and respiratory infections.	4	3	12	<p>Maximize water capture and storage through rainwater harvesting, using roof tops and tanks.</p> <p>Develop 'lined ponds' – using plastic to line the base of ponds that collect rain water.</p> <p>Train health workers and others to respond to the increases in waterborne diseases.</p> <p>Train communities on good hygiene and sanitation practices.</p>

PART 3: Any decisions made to work in new zones or with new beneficiaries

We do not currently work in the area of ante-natal care nor specifically target pregnant women in any of our projects. However, both the scientific information and the community experiences highlighted the vulnerability and suffering of pregnant women and their unborn babies in the face of increased salinity of water and soil. We are therefore going to ensure that our WASH programme and our preventative health programme jointly increase their focus on ensuring pregnant women are able to access clean fresh water and adequate nutrition.

We are also going to develop a new advocacy project addressing the issue of shrimp farming. This will need to start with further research into the issue to identify all the stakeholders involved and the impact it is having on communities. As this is a new project, there is a risk assessment applied to it below.

A Sectors/ Locations	B Projects (group by sector)	C Climate Change and/or Environmental Degradation impacts	D Sig	E Lik	F Rsk	G Ways to strengthen these projects
Governance	New project: Advocacy on shrimp farming	This new project may fail to resolve salinity impacts on crops and freshwater because other CC and ED are also causing salinity.	3	3	9	Ensure detailed research is done to fully understand salinity causes and impacts and how they related to each other. Address these in the advocacy strategy.

PART 4: CEDRA Action Plan

Proposed Action	Who	Where	When	How
Proposed strategic / organisational actions				
Develop an Environmental Policy	Deputy CEO	Head Office	By end of year	Appoint an Environmental Policy Steering Group. Develop and implement ToR for researching and writing policy. Write communications plan.
All staff to receive basic training on climate change, environmental degradation and the results of this CEDRA Assessment	Head of Programmes	All office locations	Head office – by May 2011 Field offices – by August 2011	Inform all managers at quarterly SMT meeting. Write training plan and resources. Time table training roll-out.
CEDRA findings inputted into next year's organisational strategic review	CEO	Head office	Next financial year	Write into the review TOR (to be developed in January)
Proposed project actions				
Begin an advocacy programme on shrimp farming	Governance Programme Manager	Head office	Beginning in May 2011	Research to understand the full extent of shrimp farming, the stakeholders involved, causes and environmental impacts. Research to understand other factors causing salinity. Develop project proposal. Apply for funding.
Ensure WASH and preventative health programmes include a focus on pregnant women	WASH and Health Programme Managers	Throughout all programmes	From January 2011	In all new project proposals, ensure pregnant women are a named target group. Community consultations for how best to develop this focus.
Maximize water capture and storage through rainwater harvesting using roof tops and tanks.	WASH programme manager	All project locations but beginning in Mongla Upazilla	June 2011 – June 2013	Buy materials. Train communities in principles of RWH and how to make storage tanks. Also ensure training in water safety and hygiene.
Develop 'lined ponds' – using plastic to line the base of ponds that collect rain water.	WASH programme manager	To be piloted in 2 locations and if successful, extended	August 2011	Research the most appropriate locations for piloting. Research and buy appropriate plastic. Awareness-raising in, and mobilisation of, communities. Implement pilot project.
Support the diversification of income generating measures. (NB, this is felt to be so important that we are going to develop a	Livelihoods programme manager	All project locations but beginning in Mongla Upazilla	March 2011	Do further community consultation on the potential for income generation, which skills women and men would like to learn, and what other resources are needed.

new project focussing on this)				Develop a project proposal for income generation diversification. Send to donors.
Demonstrate year-round homestead vegetable gardening.	Food Security Programme Manager and Agriculture Field Staff	All Food Security project sites	April 2011 onwards	Identify demonstration sites (schools, churches etc). Train people at demonstration sites to teach and inform about the vegetable gardening methods. Provide seeds and tools for demonstration purposes.
Introduce salt-resistant vegetables.	Food Security Programme Manager and Agriculture Field Staff	All Food Security project sites	Start research immediately	Research appropriate varieties – including community consultations. Introduce into existing food security and agriculture programmes
Raise the plots for vegetable cultivation so that the salt water cannot affect them as much.	Food Security Programme Manager and Agriculture Field Staff	All Food Security project sites.	January 2012 – January 2013	Research best practice and advice. Develop plan to train communities in how best this is done. Train communities.
Rainwater harvesting for drinking water for animals.	Livelihoods Programme Manager	All project locations	August 2012 – August 2013	Provide training for farmers in using locally available materials to harvest rainwater.
Planting salt-resistant crops for animal fodder.	Agriculture Project Officer	Livelihood project locations	July 2012	Research most appropriate varieties – including community consultation. Introduce at planting season.
Awareness-raising and training on nutrition and cooking.	Nutrition project officer	All project locations	From July 2012 – July 2013	Develop training plan in consultation with women's groups. Training of trainers workshops in communities.
Train communities on good hygiene and sanitation practices.	Sanitation and hygiene project officer	All project locations	From June 2012	Research Community-Led Total Sanitation (CLTS) and Participatory Hygiene and Sanitation Transformation (PHAST) training materials. Develop training programme and resources. Develop plan to roll-out the training
Train health workers and others to respond to the increases in waterborne diseases.	Health Project Manager	Current health project locations	November 2012 – August 2014	Develop training plan and materials. Roll out training throughout project locations alongside other training that is already planned.
Proposed office actions				
Every team to appoint an environmental champion	Team Leaders	All Teams	Immediately	CEO to meet with all Team Leaders. Team Leaders to ask for volunteers. EC's to meet monthly to discuss and decide further office actions.
Provide labelled bins in kitchens and offices so that materials for recycling can be kept	Office Managers	In all offices	By June 2012	Bins to be clearly labelled. Put notices up in kitchens and offices. Staff informed via emails.

separate to other waste				
Staff prayer meetings to include prayer about climate change	PA to CEO leading on this – all staff take responsibility	All locations	Immediately	Develop short briefing and list of prayer points and send to all staff who lead prayer meetings.
Proposed community actions				
Self Help Groups	Field staff and communities	All project locations	From May 2011	Staff to use Tearfund resources to mobilise communities to set up SHGs.
Communities to have better access to and understanding of information on climate change, environmental degradation and, in particular, increased salinity.	Field staff and communities	Starting in 3 villages (to be decided) and then rolled out throughout project locations	May 2011-May 2013	Communities to identify information officers. Training of information officers who will inform and build capacity of communities. Develop 'Centres of Knowledge' within communities to retain and gather new information.
Proposed personal actions				
Ensure all materials that can be recycled are placed in the correct bins.	All staff	All offices	Immediately	Provide bins. Environmental champions to encourage individuals to do this.
Ensure no wastage of fresh water through, for examples, letting taps run for longer than is required.	All staff	All offices	Immediately	Put signs above all taps as a reminder. Staff to encourage one another.
Proposed district actions				
Planting salt-resistant trees and plants.	Local authorities or other NGOs	Throughout District	As soon as possible	Research appropriate varieties, including consultation with communities. Provide seeds and sapplings, and mobilise communities to plant.
Build mangroves to provide a natural barrier between the sea and land.	Local authorities or other NGOs	All settlements along the coast line of the District	As soon as possible	Assign staff and budget. Develop Action Plan for mangrove building. Implement Action Plan.
Proposed national or regional actions				
Ensure views of vulnerable coastal communities are represented in global climate negotiations	Ministry of Environment	Consultations throughout Bangladesh	In time for next global negotiations	Ministry of Environment to invite briefings and reports from NGOs and CBOs documenting communities' experiences. Ensure all negotiators are briefed on these experiences and views. Politicians and negotiators to visit vulnerable communities.