Living with Climate Change Future At Present Times

The Saga of One Million Water Imprisoned People in the SW Coastal Region of Bangladesh who are the victim of development relay race of International Financial and Aid Institutions

S. Jahangir Hasan Masum

Coastal Development Partnership (CDP)
Bangladesh

Living with Climate Change Future at Present Times

The Saga of One Million Water Imprisoned People in the SW coastal Region of Bangladesh

S. Jahangir Hasan Masum

Around one million people are living in a water imprisoned condition as a consequence of waterlogging in the SW coastal region in Bangladesh. Moreover, five million people along with Biodiversity of the Sundarban ecosystem are also in endangering state due to increasing trend of water logging and salinity encroachment. Water-logging has been consistently reducing control of the coastal poor over wetland resources, both in terms of access and use. Most of the water imprisoned people were part of the wetland community. Water-logging has created an avenue for the outsider rich people for monoculture of shrimp depriving the community access to wetlands. Even to keep the wetland community away from the wetlands, some of the corrupted government officials re-classified the wetlands to water-body and leased those out to outsider riches for shrimp farming which is unethical and illegal (Water-body is lease-able common resources as per the government policy but the natural wetlands can not be leased out). As a consequence, it is intensifying the livelihood vulnerability of the 6 million rural poor of the SW coastal region in Bangladesh.

Introduction

Any broad environmental change like climate change can be a significant factor that undermines human well-being and marginalized people are likely to vulnerable for such environmental change (McCarthy et. al, 2001[1], Matthew, 2001[2] and Najam, 2003[3]). Climate change may also undermine capacity of the government to support people to sustain livelihoods (Barnett, and Adger, 2005[4]). Climate change may undermine human security by reducing access to, and the quality of, natural resources that are important to sustain livelihoods.

[1] McCarthy, J., Canziani, O.,Leary, N., Dokken, D. and White, K. (Eds). 2001. Climate Change 2001: Impacts, Adaptation & Vulnerability. Cambridge University Press: Cambridge.
[2] Matthew, R. 2001. 'Environmental Stress and Human Security in Northern Pakistan', Environmental Change and Security Project Report 7: 21-35
[3] Najam, A. 2003. 'The Human Dimensions of Environmental Insecurity: Some Insights from South Asia', Environmental Change and Security Project Report 9: 59-74
[4] Barnett, J and Adger, N, 2005: Security and Climate Change: Towards an Improved Understanding, Paper presented at an International Workshop " Human Security and Climate Change" Holmen Fjord Hotel, Asker, near Oslo, 20–21 June 2005

Many researchers have recognized that due to financial limitations, research output in developing countries often remains unpublished and consequently "lost" from the international knowledge bases (Gibbs, 1995[5]). The temperatures of the last half century are unusual in comparison with those of at least the previous 1300 years. Over the last 100 years (1906–2005), global temperature has increased by 0.74°C. The global average temperature is expected to increase by about 0.2°C per decade over the next two decades[6]. The atmospheric concentration of carbon dioxide is now far higher than in the last 650 000 years and has been growing faster in the last ten years than it has been since the beginning of continuous measurements around 1960[7].Global average sea level is expected to rise by 18 to 59 cm by the end of the 21st century.

The Food and Agriculture Organisation (FAO) has estimated that climate change could cost 65 developing countries about 280 million tons in lost cereal production, equivalent to about 16 percent of agricultural output[8]. Across the developing world, climate change could potentially reduce the amount of rain-fed land by 11 percent by 2080. A United States Department of Agriculture study indicates that initially staple crop yields may rise but, as temperature increases beyond 1.2 degrees, yields will begin to decrease[9].

The UNFCCC recognizes that the concerted efforts of nations are essential to slow climate change. While an estimated 1.6 billion people in developing countries do not have access to electricity, do not enjoy modern energy services[10] and do not emit large amounts of greenhouse gases (in stark contrast to communities in industrialized nations), their energy and development needs still need to be met.

Climate change impacts can be considered as a function of severity and importance of the affected resource, timing of significant or noticeable impacts and certainty of climate change or the pattern of the climate change itself. Climate change will have a great impact on food systems and jeopardize food security in many regions. Climate change will disproportionately affect the world's poor, approximately two thirds of whom are women.[11] Women and children are most vulnerable to hunger related deaths and illness which would be indirectly exacerbated by climate change through increasing food and water shortages. The United Nations Environment Program estimate that climate change related disasters could be costing the world US$300 billion within a few decades[12]. Climate change presents significant threats to achieving all of the Millennium Development Goals, particularly those related to eliminating poverty and hunger and promoting environmental sustainability[13].

[5] Gibbs, W.W. 1995. Lost Science in the Third World. Scientific American 273, 76-83
[6] IPCC, 2007: *"Fourth Assessment Report (AR4),* Intergovernmental Panel on Climate Change (IPCC), 2007
[7] http://www.greenfacts.org/en/climate-change-ar4/index.htm
[8] http://www.planetark.com/dailynewsstory.cfm/newsid/31554/story.htm
[9] http://www.ers.usda.gov/publications/aib765/aib765-8.pdf
[10] International Energy Agency (2002) World Energy Outlook 2002: Chapter 13, Energy and Poverty, Paris.
[11] Friends of the Earth Australia, 2003, "Changing the future of the world's poor?" http://www.foe.org.au/download/future_poor.pdf
[12] http://www.unep.org/Documents.multilingual/Default.asp?DocumentID=192&ArticleID=2758
[13] http://www.undp.org/climatechange/adap01.htm

Climate change is anticipated to have far reaching effects on the sustainable development of developing countries including their ability to attain the United Nations Millennium Development Goals by 2015 (United Nations 2007[14]). The best estimates indicate that the Earth could warm by 3° C by 2100. Projected sea level rise could flood the residence of millions of people living in the low lying areas of South, Southeast and East Asia such as in Viet Nam, Bangladesh, India and China (Wassmann *et al*. 2004[15], Stern 2006[16], Cruz *et al*. 2007[17]). In Asia, the principal impacts of climate change on health will be on epidemics of malaria, dengue, and other vector-borne diseases (Martens *et al*. 1999[18]). Throughout Asia one billion people could face water shortage leading to drought and land degradation by the 2050 (Christensen *et al*. 2007[19], Cruz *et al*. 2007[20]). 30 percent of coral reefs could be lost in the next 10 years (Cruz *et al*. 2007[21]). The loss may be as high as 88 per cent (59 per cent of global) in the next 30 years (Sheppard 2003[22]; Wilkinson 2004[23]).

Climate change may have a negative impact on the State's ability to create opportunities and provide important freedoms for people, as well as its capacity to adapt and respond to climate change itself. As the incidence and magnitude of events such as droughts, floods and island inundation increase, there could be large scale demographic responses, such as increased migration and threats to the sovereignty of some small island States.

Generally, water logging occurs due to continuous rainfall for several days. The reasons of the water logging are poor drainage system, siltation of the river, excessive rain or tidal bore. However, the waterlogging condition in the coastal region manifests the intellectual anarchy in the name of policy, The waterlogged areas of the SW coastal region could be considered as the ideal natural laboratory for realizing post-holocaust life after sea-level rise situation as a consequence of climate change. Although the term 'waterlogged" is used in existing literatures, we used the term "water imprisoned" because the waterlogging situation mainly evolved through and still maintained by the anthropogenic factors in the name of so called "national development" by IFIs (USAID, World Bank, ADB and IMF etc) prescriptions.

---

[14] UN. 2007. The Millennium Development Goals Report, United Nations. New York. http://www.un.org/millenniumgoals/pdf/mdg2007.pdf

[15] Wassmann R, Nguyen Xuan Hien, Chu Thai Hoanh and To Phuc Tuong. 2004. Sea Level Rise Affecting the Viet Namese Mekong Delta: Water Elevation in the Flood Season and Implications for Rice Production, *Climatic Change*. 66(1-2): pp. 89 –107.

[16] Stern N. 2006. The Stern Review on the Economics of Climate Change. HM Treasury, UK. Cambridge University Press. http://www.hm-treasury.gov.uk/independent_reviews/stern_review_economics_climate_change/sternreview_index.cfm

[17] Cruz R V, Harasawa H, Lal M, Wu S, Anokhin Y, Punsalmaa B, Honda Y, Jafari M, Li C and Huu Ninh N. 2007. Asia. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Parry M L, Canziani O F, Palutikof J P, van der Linden P J and Hanson C E (eds). Cambridge University Press. Cambridge, UK. pp. 469 – 506.

[18] Martens P, Kovats R S, Nijhof S, de Vries P, Livermore M T J, Bradley D J, Cox J and McMichael A J. 1999. Climate change and future populations at risk of malaria. *Global Environmental Change*. 9: pp. S89 –S107.

[19] Christensen J H, Hewitson B, Busuioc A, Chen A, Gao X, Held I, Jones R, Kolli R K, Kwon W-T, Laprise R, Magaña Rueda V, Mearns L, Menéndez C G, Räisänen J, Rinke A, Sarr A and Whetton P. 2007. Regional Climate Projections. In: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change *[Solomon S, Qin D, Manning M, Chen Z, Marquis M, Averyt K B, Tignor M and Miller H L (eds)]*. Cambridge University Press. Cambridge, United Kingdom and New York, NY, USA

[20] Cruz R V, Harasawa H, Lal M, Wu S, Anokhin Y, Punsalmaa B, Honda Y, Jafari M, Li C and Huu Ninh N. 2007. Asia. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Parry M L, Canziani O F, Palutikof J P, van der Linden P J and Hanson C E (eds). Cambridge University Press. Cambridge, UK. pp. 469 – 506.

[21] Cruz R V, Harasawa H, Lal M, Wu S, Anokhin Y, Punsalmaa B, Honda Y, Jafari M, Li C and Huu Ninh N. 2007. Asia. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Parry M L, Canziani O F, Palutikof J P, van der Linden P J and Hanson C E (eds). Cambridge University Press. Cambridge, UK. pp. 469 – 506.

[22] Sheppard C R C. 2003. Predicted recurrences of mass coral mortality in the Indian Ocean. *Nature*. 425: pp. 294 – 297.

[23] Wilkinson C. 2004. Status of Coral Reefs of the World: 2004, V. 1. Australian Institute of Marine 5 Science. Townsville, Australia. 302pp.

Coasts of Bangladesh: Global Significance and climate change risks

Climate change is a global problem that affects us all. But communities in developing countries are likely to suffer most from the negative impacts of climate change[24]. In Global context, Bangladesh holds **the longest natural beach of the world** (the southeast coast of Bangladesh) and the Sundarbans; the **largest single block mangrove ecosystem in the world, UNESCO world heritage site, Ramsar Wetlands** (the southwestern coast of Bangladesh). In the case of Bangladesh, IPCC projections warn of increasing temperatures (Table 1), greater rainfall variability, stronger and more frequent cyclones and sea storms, enhanced sea-level rise, and coastal erosion for Bangladesh. Any impact on these coasts could have dramatic consequences for the Bangladesh economy and also for the global ecological heritage.

Table 1: Climate Change Scenarios for Bangladesh in 2030 and 2050

Year	*Sea Level Rise*	*Temperature Increase*	*Precipitation Fluctuation Compared to 1990 (%)*	*Changes In Evaporation*
2030	30	+0.7 in monsoon +1.3 in winter	-3 in winter; +11 in monsoon	+0.9 in winter +15.8 in monsoon
2050	50	+1.1		

All the previous Intergovernmental Panel on Climate Change (IPCC) impact assessments recognized Bangladesh as one of the most susceptible to the negative impacts of climate change. According to IUCN, the case of Bangladesh is unique in the climate change context as this country will eventually face the multidimensional appearance of climate change such as flood, cyclone, sea level rise, drainage congestions, salinity, drought etc. Although UNESCO has recognized long age about the importance of assimilation of scientific and technological information as well as communicable form of knowledge is prerequisite for socio-economic development in developing countries (UNESCO. 1982[25]), the rate of progress on such context is yet very slow in Bangladesh.

Table 2: Impact of Changes in Climatic elements and sea-level Rise on Bangladesh

Changes in Climatic elements and sea-level Rise	**Vulnerable region of Bangladesh**	**Primary Change**	**Impacts**	
			Primary	***Secondary***
0.5^0 C - 2^0 C (10 -to- 45cm sea-level rise)	Bangladesh Sundarbans	Inundation of about 15% (~750 km^2) Increase in salinity	Loss of Plant species Loss of wild life	Economic loss Exacerbated insecurity and loss of employment
~2^0C (5 to 10% rainfall; 45cm sea-level rise)	Bangladesh Lowlands	about 23-29% increase in extent of inundation	Change in food depth category Change in monsoon rice cropping pattern	Risk of life and property Increased health problems Reduction in rice yield

Source: IPCC 2001, Climate Change 2001: Impacts, Adaptation and Vulnerability, Technical summary. A report of working group II of the Intergovernmental Panel on Climate Change (IPCC)

The coastal region of the country where mean elevations are within 1 to 3 meter are identified as the most vulnerable part due to climate change. Coastal area encompasses majority of the heavy industries, sea ports, and major tourist spots in Bangladesh.

[24] Jarraud, M (2003) Climate change and global energy needs: A 21st century perspective, World Meteorological Organization in Renewable Energy 2003, World Renewable Energy Network (affiliated to UNESCO), Sovereign Publications Ltd., London.
[25] UNESCO. 1982. Draft medium-term plan (1984-1989). Second part, VII. Information systems and access to knowledge. General Conference Fourth Extraordinary Session, Paris.

In the last 4-5 years, people have been experiencing change in rainfall pattern, such as excessive, irregular and prolonged heavy rainfall in the beginning of monsoon and reduced rainfall during the peak season (IUCN, 2003[26]). UNDP's Comprehensive Disaster Management Program (CDMP) lists climate change as a serious component of Bangladesh's vulnerability to natural hazards. Approximately 20 percent of the country and millions of people experiences normal annual flooding. A 67 cm sea level rise could inundate all of the Sundarbans. Even a 25 cm sea level rise would result in a 40% mangrove loss (Smith, Rahman, & Mirza. 1998[27]). A 1 m rise in sea level would inundate 20% of Bangladesh's total land, directly threatening 14% of the country's population with inundation (IPCC 2001[28]). A study has shown that Bangladeshis are aware that the climate is indeed changing, they may not understand why, but they are interested in learning how to adapt (IUCN Bangladesh 2004[29]).

According to UNFPA's report "State of the World Population-2005", Bangladesh's population is about 141.8 million and projected to grow to 242.9 million by the year 2050. The per capita availability of land, particularly for agricultural production is .07 hectares (2001 estimate). It is anticipated that the consequences of climate change will increase livelihood insecurity, malnutrition, unemployment, lack of safe drinking water and water-borne diseases in Bangladesh and about one third of the population would be vulnerable to climate change and sea level rise. Given the contribution of agriculture to the livelihoods of general people of the country and its dependence on climate regime, any significant change in climate regime can have far reaching impacts on the overall socio-economic system of Bangladesh.

Global and national Significance of the Southwest Coastal Region of Bangladesh

The Southwest coastal region of Bangladesh is a flat, low lying, deltaic tidal flood plain having an elevation of one meter or less above sea level and encompasses 6 southwest coastal districts which are Khulna, Satkhira, Bagerhat, Gopalgonj, Narail and Jessore. This region covers approximately 10.5% (15118 km^2) geographic entity of the Bangladesh and more than 10 million people lives in this region.

Table: 3: General Information of South West Coastal Region of Bangladesh

District	Upazilla/Thana	Union	Population	Area (Square. Km)
Khulna	14	71	2357940	4032.5
Bagerhat	9	77	1516820	3238.2
Satkhira	7	79	1854120	3207.7
Jessore	8	92	2469680	2315.9
Narail	4	37	694900	901.3
Gopalgonj	5	68	1151800	1422.7
Total	47	424	10036260	15118.3

Source: Flood 2004: South West Coast also Flooded, CDP, 2004, Page-14

The Sundarbans, the single largest block of mangrove forest in the world, is situated here. Mangrove forests across the world are not particularly diverse in terms of their floristic composition. However, Sundarban Mangrove Forest is the largest national natural museum of

[26] IUCN Bangladesh, 2003: Bangladesh National Dialogue on Water and Climate: Local Consultative Report.
[27] Smith, J.B., A. Rahman, and M.Q. Mirza. 1998. Considering Adaptation to Climate Change in the Sustainable Development of Bangladesh. Report to The World Bank by Stratus Consulting Inc. Boulder, CO.
[28] IPCC 2001, Climate Change 2001: Impacts, Adaptation and Vulnerability, Technical summary. A report of working group II of the Intergovernmental Panel on Climate Change (IPCC)
[29] IUCN Bangladesh 2004: Strategy for Adaptation: Coping With Climate Change and Climate Variability. Dhaka, Bangladesh.

the biodiversity and internationally significant ecosystem rich in bio-diversity especially compared with rainforest ecosystems.

According to International Union for Conservation of Nature (IUCN), no other mangrove ecological alcove in the world offers such a variety of associate mangrove vegetation as the Sundarbans does. It is the largest remaining habitat in the world for the Royal-Bengal Tiger.

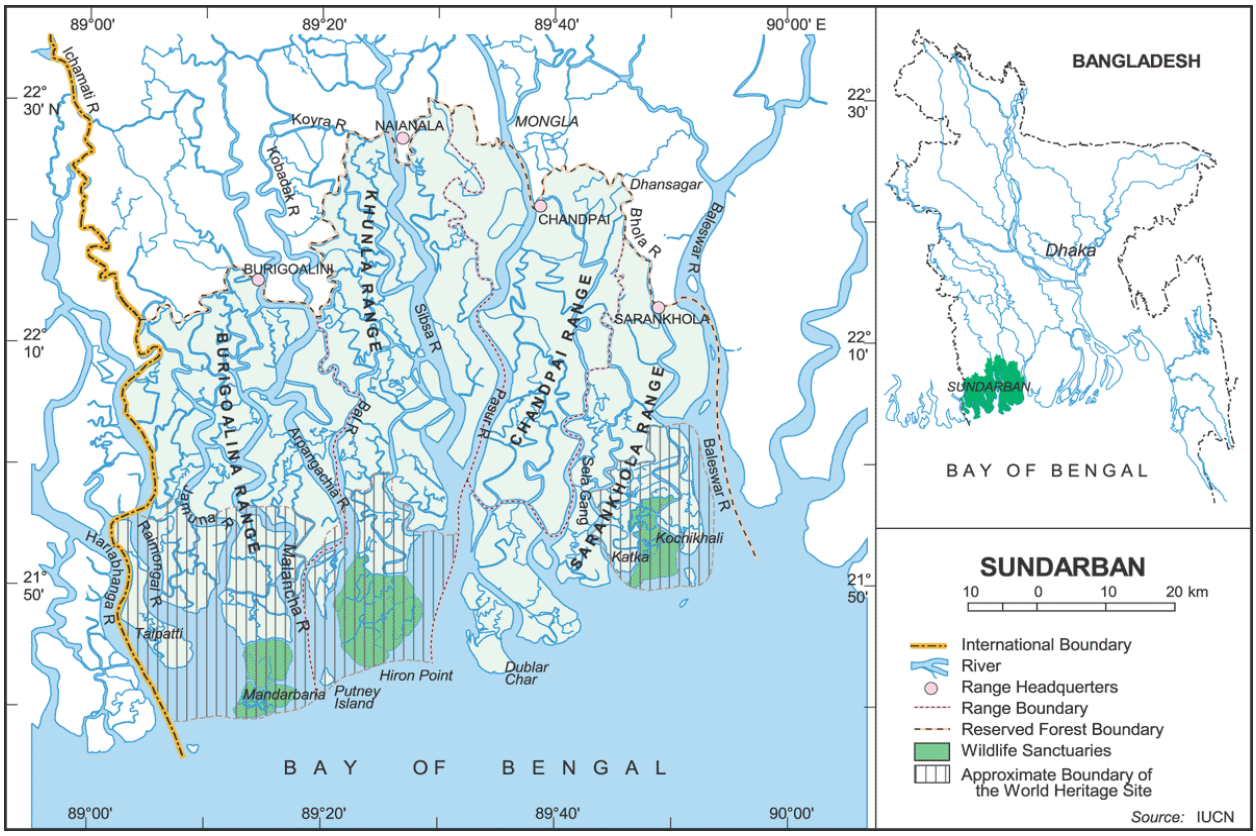


Table: 4: Direct economic contribution from Sundarban in Bangladesh

Production	Taka (in million)	USD (in million)	**Contribution of forest resources in terms of total products (in %)**
Production from major forest resources	103785.00	1504.13	**65.28%**
Other Production from other forest resources (Land, Rive, canal, animals and others)	55202.80	800.04	**34.72%**
Total	158987.80	2304.17	**100.0%**

Source: Calculate from data in Badaban, February-2006, Page-54

According to Ramsar convention, the wetland of Sundarban area in very complex and it is recognized as on of the most organic productive area in the world. For outstanding natural value, the World Heritage committee of UNESCO inscribed the Sundarban of Bangladesh in the 798th World Heritage list by their 21st session in 6 December, 1997 and accordingly the Government of the People's Republic of Bangladesh declared the Sundarban as World Heritage Site in 1999.

Table: 5: Statistics of Fully dependable peoples on Sundarban

Types of Works	**Identity of people**	**Number of people**
Collection of Fuel wood, Golpata and other forest resources	Baowali	150000
Collection of honey and candles	Mouwali	8000
Snails collection and makes lime	Chunari/Jongrakhuta	3000
Boat repairing and Making	Sutor/Mistry	2000
Sewing wood	Sutor	1000
Depending labors on the Sundarban resources	Sutor	15000
Depending business man on the Sundarban resources	Fisher Man and others	115000
Other labors	-	10000

Source: Women Life in the Sundarban Impact Zone, CDP, 2003, Page-20

Water imprisoned people: the victim of development relay race of International Financial and Aid Institutions

Climate change is now getting as "talk of the world". Every corner of the world is busy to anticipating what would be the impact and how people would cope with the predicted scenario of the climate change regime. The policy paradigm is consistently stressing on finding climate change adaptation strategies, though the importance of mapping the baseline status and situation analysis based on community knowledge base have not yet received the deserved attention. Policy makers are debating on what strategies and policies are required to adapt to Climate Change.

Table: 6: Measurement of decreased wetland because of establishing shrimp firm

Name of the Districts	Name of the Upazilla	Decreased wetlands in hector
Khulna	Batiaghata	18
	Dumuria	2,238
	Rupsha	400
	Koyra	217
Jessore	Paikgasa	4,440
Bagerhat	Mongla	20
	Morelgonj	590
	Rampal	16,750
Satkhira	Debhata	110
	Shyamnagor	90

Sources: CDP Field Research in 2003.

Women and men often are forced to change their families' dietary practices when soil fertility has been drastically reduced due to over cropping, overgrazing, or erosion, or where there is a lack of fuel wood and potable water. Nutrition suffers when fuel wood shortages force households to economize on fuel by shifting to less nutritious foods that can be eaten raw or partially cooked, by eating partially cooked food that could prove toxic, by eating leftovers that could rot in a tropical climate, or by skipping meals altogether[30]. Although these nutritional changes affect all household members to some degree, women and female children bear the greatest burden in places where they eat last and least. Climate change will disproportionately affect the world's poor, approximately two thirds of whom are women.[31] Women and children are most vulnerable to hunger related deaths and illness which would be indirectly exacerbated by climate change through increasing food and water shortages. Among the people who die from climate-induced disasters, more than four-fifth (85%) of are women.[32]

The free trade market economy in the name of globalization has created scope for the exploitation of local wetland resources & products (shrimps) to the broader market through privatization of services. Unfortunately market economy through various business ventures already has shown potential threat to the needs and aspirations of future generations of the local water imprisoned community. If such trend continues, the sustainability of the future generations will also be endangered. Since the control over resources is strongly linked with power relationship, greater empowerment of water imprisoned communities is very much essential.

In the south-west coastal region of Bangladesh, at least 1 person out of 10 is either permanently or seasonally (average 6 months) water imprisoned. Based on amount of income 52% of the households are absolute poor and 24% of the total households are extreme poor in this region.

[30] Bina Agarwal, "Environmental Action, Gender Equity and Women's Participation," *Development and Change* 28 (1997):1-39.
[31] Friends of the Earth Australia, 2003, "Changing the future of the world's poor?" http://www.foe.org.au/download/future_poor.pdf
[32] Mirza, MMQ (2003), Climate Change and Extreme Weather Events: can developing countries adapt? Climate Policy, vol 3, Issue 3

It took only 3 decades to make 12,000 hectares of land into permanently water-logged: The Coastal Embankment Project (CEP) of the 1960's to protect the low lying lands as well as the lives and property of the inhabitants from the tidal surges had squeezed the floodplains of the tidal rives, stopped entry of tides (incoming tides cannot be washed out fully during ebb tides) and blocked silts in the wetlands, limited grazing and breeding ground of the marine fisheries. Through this project, 4000 km of high embankment were built, out of which 1566 km were in Khulna region alone, with 282 sluices, enclosing all the land within 37 polders. The period coincided with the introduction of High Yielding Varieties (HYV) of rice. But in the meantime, the heavy loads of floating soil sediments carried by the tides could not enter into the polders to enrich the land with decomposed organic material or compensate for the natural subsidence of the loose delta soil with the soil sediments. Gradual siltation on the riverbeds have resulted drainage congestion of the wetlands and waterlogging occurred in the coastal wetlands as the monsoon water could not be drained out through rivers. This resulted in permanent water-logging of nearly 12,000 hectares.

Permanent Waterlogging has decreased social power of the small land holders: Most of the agricultural lands in the region are the low-lying areas and historically these lands are inundated to variable depths during monsoon season. Farmers generally used to grow a single crop of rice occasionally followed by some rabi crops locally where possible. But the crop yields were often used to be damaged by early and or late floods. But the ancestors of the wetland community used to live with eco-harmony. It has to be noted that in rural Bangladesh land is the major source of power besides kinship, family status, income and education. The ownership, access and control over land very often determine the economic and social position and power relation of individuals and family. In view of this fact, permanent waterlogging has also decreased social power of the small land holders.

Role of International Actors to make people as water imprisoned: Since 1980 a vast area of the southwest region became waterlogged and coastal communities have been facing the compulsion for discarding their key livelihood option- agriculture. Wetlands were turned into water logged areas due to unplanned shrimp firming. However, shrimp cultivation began to expand in response to rising market demand from the developed world and the World Bank and IMF guided policies. Since the mid-1980s Bangladesh's development strategy was broadly defined by, and closely guided under, the economy wide framework of *reform, stabilization and structural adjustment policies* advocated by the World Bank and the International Monitoring Fund. Throughout the 1980s and early 1990s, Bangladesh also obtained policy conditionality based structural adjustment credits from the WB in support of sectoral reform packages. Incidentally, the World Bank extended a credit amounting to SDR[33] 20.6 million in 1998 to Bangladesh for "Shrimp Culture Project". Commercial shrimp farming in Bangladesh also got a crucial break with the implementation of the World Bank/UNDP investment programme of Tk. 1000 million (US$ 30.0 million) in the late 1980s and early 1990s which helped furnish

[33] SDR: special drawing right is an international reserve asset created by the IMF; one SDR = 1.33 US$ in 1998

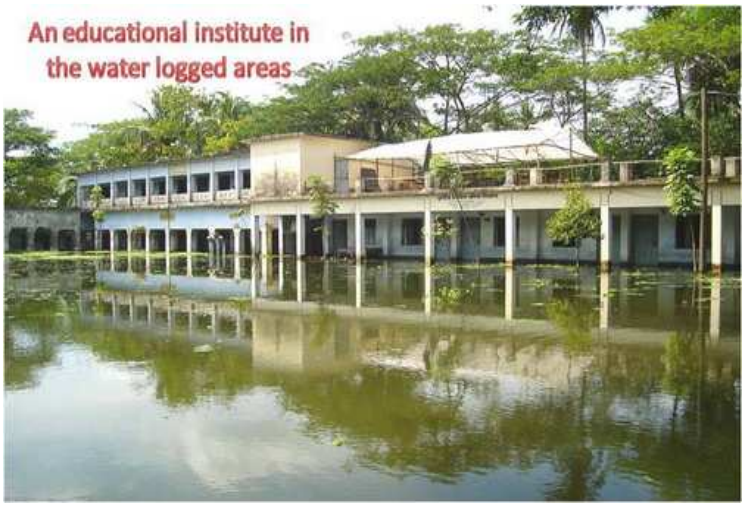
Bangladesh's prawn industry with infrastructure, technology and foreign advice. The government also contributed with a number of incentives covering amendments to land-lease laws, subsidized credit and a nine-year tax holiday.

The Khulna-Jessore Drainage Rehabilitation Project (KJDRP) is a classic example of how IFIs in the name poverty reduction, increased production and employment creation jeopardize the sustainability of natural resources and endanger the livelihood of the millions of people who are dependent upon those resources. ADB used a complex and climate-sensitive ecosystem as their natural laboratory in the name of poverty reduction and employment creation. Moreover, the project did not address the fundamental problem of water logging, agricultural development navigation of rivers as the plan was faulty as that of WPDA in early 1960s.It has created more problem rather than solution. The KJDRP Project was designed to allow brackish water shrimp culture in the lower southwest part34 to promote export oriented growth in aquaculture production to support global shrimp trade. The practice of shrimp has drastically reduced the mangrove forests and destroyed the breeding habitat for many fishes within the Sundarban Impact Zone (SIZ). The rapid growth of the unplanned practice of shrimp farming has been causing a great harm to the local environment, extinction of the traditional livelihood practice as well as creating social conflict among the local communities within the Sundarban Impact Zone.

An Active process of transforming poor coastal people into water imprisoned people is ongoing: The process of transforming poor coastal people into water imprisoned people is still very active and accelerating through the free trade market economy. The free trade market economy in the name of globalization has created scope for the exploitation of local wetland resources & products (shrimps) to the broader market through privatization of services. Unfortunately market economy through various business ventures already has shown potential threat to the needs and aspirations of future generations of the local water imprisoned community. At present, the unplanned and externally controlled mode of shrimp cultivation is the key root cause of current environmental degradation and livelihood insecurity in the southwest coastal region of Bangladesh. Although shrimp aqua-culture might be projected as beneficial in the national economic context, in the local sphere, shrimp cultivation has thrown an evil shadow over the lives of the people of the region. The negative impact of shrimp culture on the land is manifested through salinisation and water logging. Water logging promoted Shrimp farming and now shrimp firms are promoting water logging. This envisages that the process of making poor coastal people into water imprisoned people is still very active and accelerating. The net effect of salinity in water and water logging is land degradation through a loss of soil fertility, which leads to reduction in agriculture production, irreversible damage to traditional economic activities and at the end making livelihood endangered.

[34] ADB, 2004: Project Completion Report on The Khulna-Jessore Drainage Rehabilitation Project (Loan 1289-Ban[Sf]) In Bangladesh, PCR: BAN 21087, Asian Development Bank, September 2004

Living with climate change future: Struggles of the water imprisoned people for minimal human security



The SW coastal region has already been identified as one of the most vulnerable geographic entity of the world due to global climate change. Although a few of the NGOs have initiated some work on climate change, the Government of Bangladesh has not yet adequately realized the consequences of climate change in terms of environmental governance.

The need for a National Policy on Climate Change has been expressed time and again by the civil society of the country since early 1990s. However, till to date, no national policy measures or strategic action plan are in place to comprehensively address climate change. The representative Government departments or extension offices have not yet adapted any innovative approaches to combat the likely climate change threats.

The current population in the south-west coastal region of Bangladesh is about 10 millions. The rural-urban population ratio is close to 84:16 except Khulna district. Percentage of immigrants in this part of coastal zone is close to 6 percent for each district (except Khulna district, where immigrants are about 33 percent of total population). Agriculture based traditional festivals and fairs are commonly found in this zone. Nabannya (festival in harvesting season when various types of sweet meats are made from new rice grains), Ambabaty (festival of making the earth fertile with plantation) etc are common festivals here. The natural resource base provides coastal people with materials for building houses, cooking fuel, raw materials for handicrafts, etc.

In the south-west coastal region of Bangladesh, at least 1 person out of 10 is either permanently or seasonally (average 6 months) water imprisoned. Based on amount of income 52% of the households are absolute poor and 24% of the total households are extreme poor in this region.

Water imprisoned people are living without human security (food insecurity, health insecurity, domestic water insecurity and so on). Water imprisoned people in southwest coastal region of Bangladesh are highly dependent on the natural resource base in the sustaining their livelihoods. Consistent income, food security, drinking water, health, and housing are considered as the important wellbeing issues by the water imprisoned poor people in waterlogged areas. Their aspects of quality of life is guided by the very existence of human security, not mere a question of better accessible or availability rather a question of continuity.

If we see the security of life of the water imprisoned poor people in the water logged areas, we will feel that their income is affected due to consequences of salinity, waterlogging and/or siltation through reduced livestock, lack of home gardening, less fishes in rivers, etc. Their food security is affected by salinity, waterlogging, and loss of biodiversity. Their agricultural lands have been transformed into shrimp ponds. Shrimp culture has adversely affected the potential crop-mix, cropping intensity, crop calendar and the overall cropping pattern in the areas. Polders and shrimp culture has cut off traditional dry season activities such as grazing cattle and goats, home gardening etc. Shrimp farming need saline water round the year and gradual expansion of shrimp farming (annually 7% of the total landmass) expanded saline area simultaneously.

The shrimp farmers have forcibly occupied the agricultural lands of the poor and disrupted the traditional livelihood occupations of the poor people consequently marginal farmers have now turned to the forest in search of an alternative source of livelihood, thus increasing pressure on the steadily depleting resources of the Sundarbans. The surplus labor force of the former agriculture sector is not accumulated in the shrimp farming. Thousands of farmer families, both with land and land-less, were rendered destitute due to permanent water-logging. Social harmony has disrupted by the inland mass-migration, and many people who lost their occupations resorted to extraction of forest resources from the Sundarban. This large influx of new people caused much damage to the bio-diversity in the Sundarban. One study has reported that long term inundation has destroyed the traditional fish population of the coastal regions.

Food is affected by salinity, waterlogging, and loss of biodiversity. Access to food has been adversely affected because of the reduced food, livestock and fish production as explained in earlier section. In addition, the reduced employment opportunities have reduced the people's capacity to buy food on the market. Increasing salinity, waterlogging, scarcity of fresh water and unavailability of nutritious foods affect public health and personal safety. Salinity has been changing the harvesting process, crop production, plant diversity and severe scarcity of food in the coastal regions of Bangladesh. Salinity has already encroached 21% of the cultivated land in the North-west coastal area within last three decades. Around 56% of the rivers in this area are contaminated by salinity. Drinking water is mainly affected by the increasing salinity in the coastal region. The fresh water shallow aquifers are contaminated by saline water. Housing affected due to function of salinity. Mud houses are mostly vulnerable to saline water. Also tidal surge and waterlogging wash out the mud houses.

The struggle of water imprisoned people is not only limited to protest but also intellectual towards innovation. Water imprisoned community use their traditional techniques, knowledge and the conventional wisdom to cope with the flood and submerged condition.

Surveys conducted in villages and rural areas clearly show that Bangladeshis are aware that the climate is indeed changing, they may not understand why, but they are interested in learning how to adapt. Apart from natural disasters, other indicators of climate change are manifested themselves in the form of erratic weather patterns such as prolonged fogginess, changing temporal and spatial pattern of precipitation are among a few that are observed. Also, floods are occurring in unusual places and during unexpected times of the year, putting greater strains upon traditional coping and adaptation strategies.

Source: IUCN Bangladesh 2004, *"Strategy for Adaptation: Coping With Climate Change and Climate Variability".* Dhaka, Bangladesh.

The poor farmers who are now water imprisoned are unable to bear the cost and risk shrimp cultivation though it is consistently promoted by the government and IFIs. Daily expenditure to cultivate shrimp is beyond the capacity of the coastal poor. Even if they do it, they do not get any profit after bear the expenditure as they have no control over market. Instead of shrimp firming, the poor farmers and water imprisoned people are working to adopt the Sundarban ecosystem and wetland friendly alternative livelihood options such as mele and soil-less floating cultivation.

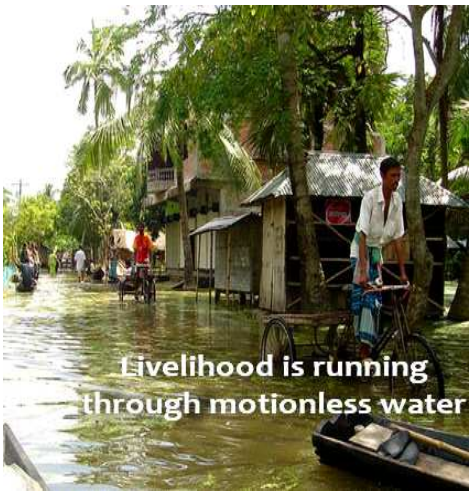
Lessons learned from the alternative livelihood approach of the water imprisoned people: the local knowledge for addressing global climate change future

The SW coastal region has already been experiencing the effects of rising sea levels, water logging, flood, cyclone, poor drainage through river systems, siltation and saline intrusion. As a result, farming systems have been seriously disrupted with few coping mechanisms available to local people to adjust to the new situation.

Table 6: Comparative yields per acre in soil based and floating bed agriculture

Crop	Soil-based	Soil-less
Beans	5 tons	21 tons
Beets	4 tons	12 tons
Potatoes	8 tons	70 tons
Cabbage	13000 lb	18000 lb
Cucumbers	7000 lb	28000 lb
Tomatoes	5-10 tons	60-300 tons

Source: Haq, Rezaul, A.H.M. et al, 2002, Soil less agriculture in Bangladesh, Grameen Trust, Bangladesh.



The current shrimp practices did not enhance social equity rather imposes soaring social costs (conflicts, fragmenting and dividing community) through disputes between local and outside landowners over land tenure and user rights, and conflicts between paddy farmers and shrimp cultivators. Indiscriminate conversion of the mangrove forests into shrimp farms has resulted in the destruction of marine breeding grounds and the erosion of shorelines.

The destruction of the mangroves has far-reaching ecological implications for the whole of the region. A large number of local varieties of fish have disappeared and nutrient content of the soil has diminished, resulting in drastic reductions of land productivity. Viral contamination in shrimp

farms has also brought about tremendous losses not only to the shrimp, but also to the biodiversity in areas under cultivation by semi-intensive methods. Social forestry is no longer possible in many areas which have been under shrimp cultivation for relatively long periods of time. Case studies, using a "before-after" approach, carried out in villages of southern Bangladesh show important changes in local occupation structure subsequent to introduction of shrimp cultivation in the region.

The floating agriculture firms could be an effective coping mechanism for small farmers to adapt with climate induced sea level rise.

Coastal Development Partnership (CDP), a national environmental & human rights activist organization in Bangladesh, have recognized that the agriculture based on Floating Firming (FF) of the water imprisoned people could be the most effective way to cultivate any crops in the wetlands and waterlogged area without disturbing ecological process.

Table: 05: alternative livelihood approach of the water imprisoned people

Adaptation Items	Strategy	Present Situation
Innovation	Floating Cultivation	Getting Popular
	Fish cultivation in cages	Getting Popular
Adaptation for Alternative livelihood	Mixed fish and duck firming	Getting Popular
	Duck firming	Getting Popular
Mitigation/Reduction of the losses /damages	Tree Plantation to the surroundings of the waterlogged area	Not yet popular
Adaptation/ Changes in traditional practice	Carry water from far	Social Problems are creating
	Carry fuel wood from here and there	Social Problems are creating
Migration	Force to leave the region	numbers are increasing

Source: Water logging in the South West Coastal region of Bangladesh, CDP, 2004, Page-49

Community Float Firm (CFF) could be an effective alternative option for fisher folk community though it is not yet explored. Government Fisheries Department barred fishermen for not catching fish in the rainy season (3 or 4 months). During this period, as the fisher folk community is not having any alternative livelihood option, floating cultivation could support their livelihoods. The Floating Vegetables Garden (FVG) involves the cultivation of vegetables on floating beds of water hyacinth, a weed that grows prolifically on ponds and rivers. CDP with the support from Action Aid are doing a participatory action research on "Hanging Vegetable Garden (HVG) with the water imprisoned community in the SW coastal region to promote cultivation of vegetables and fruits on homestead plots for household consumption and market in water logged and highly saline areas. The techniques are yet to be adapted to the specific conditions of different areas SW region; it already showed very potential and received popularity to the beneficiary area. In HVG, vegetables are planted in earth pots and irrigated with their own system in the saline areas by the supervision of the women. Mele is a reed (Cyperus Tagetiformis, sedge-like marsh grass in wetlands) that is used to produce mats that are widely used for sitting and sleeping on, and can be grown under waterlogged conditions. Mele cultivation is economically viable for the local communities but there are some local problems in this sector like lack of capital, lack of water availability, lack of seeds etc.

If we see the security of life of the water imprisoned poor people in the water logged areas, we will feel that their income is affected due to consequences of salinity, waterlogging and/or siltation through reduced livestock, lack of home gardening, less fishes in rivers, etc. Their food security is affected by salinity, waterlogging, and loss of biodiversity. Their agricultural lands have been transformed into shrimp ponds. Shrimp culture has adversely affected the potential crop-mix, cropping intensity, crop calendar and the overall cropping pattern in the areas. The net effect of salinity in water and water logging is land degradation through a loss of soil fertility, which leads to reduction in agriculture production, irreversible damage to traditional economic activities and at the end making livelihood endangered.

Due to inadequate communication system in the waterlogged area, the farmers are bound to sell their products in the local markets where usually market is very small. If they would get scope to send their products in bigger market, then they would get good price and might increase the production. This imposes that marketing strategies for community products also have to be devised to make community based alternative livelihood options successful.

Traditionally in the monsoon season when salinity is low, one cycle of paddy cultivation is possible for people. Rest of the year due to salinity the land is left fallow. In this period cultivation of saline tolerant non-rice crops like maize, grass etc. can provide fodder for cattle that encourages local people to raise livestock along with other benefits. Ultimately the livelihood options increase. Saline tolerant non-rice crops like maize, grass as fodder etc can be promoted to increase crop rotation along with retention of Nitrogen and other nutrients in soil for a longer time than usual. This enhances rice production by supplying necessary nutrients to soil.

The floating cultivation system: is it the agriculture of climate change future?

Floating cultivation system is perhaps the only way to continuing the livelihood within the wetland without any change of natural environment. As a poor country Bangladesh will be more vulnerable by the effect global climate change. The floating agriculture firms could also be an effective coping mechanism for small farmers to adapt with climate induced sea level rise. The advantage of saving crops in floating method of agriculture during flood situation at community level has been observed. It has to be noted that the southwest coastal zone of Bangladesh is identified as the most vulnerable zone if the sea level rises. It is very easy to production more crops from a single land by floating cultivation and irrigation is not needed to floating cultivation. The floating cultivation can help to women for develop her self-employment. Women usually take care of the crops and cut the crops in floating cultivations. Besides, this floating cultivation provides more production with far less expenditure than traditional agriculture. Moreover, the residue of the floating cultivation can be used as good natural fertilizer for normal cultivable land.

Conclusion

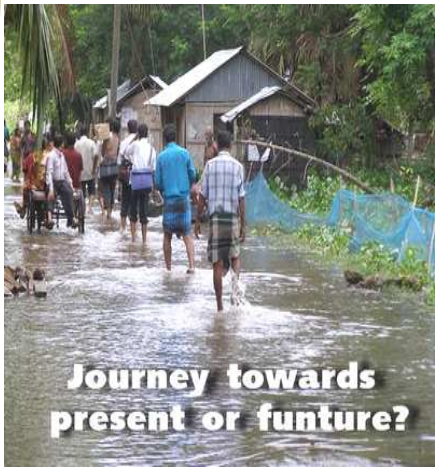
More than 70 percent of the lands of the SW coastal region in Bangladesh are barely one meter above mean sea-level and below high-tide level. The predicted impacts of climate change will not only increase the difficulties for water imprisoned people but also in securing their livelihoods, maintaining health and safety and achieving sustainable development.

A few NGOs are working on the introduction of saline-tolerant varieties of chili, mustard, maize and potato. However, the long-term impact of such introduction to the Sundarban ecosystem has to be thoroughly researched. Experts have recommended that if traditional knowledge on floating system is properly mapped, then it could be extended and popularize as profitable cultivation by the join collaborative effort of GO, NGOs and local farmers Besides, the process of transferring traditional knowledge and technology of floating (soilless) cultivation from "Farmer to Farmer" has to be initiated.

The protected Sundarban ecosystems and its dependent populations are getting fragmented and unwise practice of resource exploitation is ongoing. An urgent intervention effort is required to strengthen community involvement and redirect development interventions towards conservation and wise management of the natural resource base of the Sundarban Mangrove Forest. As the productivity and the capacity of the Sundarban Ecosystem have greatly been reducing, the livelihood insecurity of the rural poor is increasing. The 6 million rural poor, who are directly dependent upon the Sundarban, would face greater food insecurity and vulnerability in future. It is axiomatic that there is no way except to explore the process that could be reversed for ecosystem degradation as well as to empowering the large section of people economically and politically through their increased access to resources, institution, transfer and adoption of new technology, and diversification of livelihood options.

The literate community or civil society, whatsoever we call ourselves,

Are we ready to learn from the illiterate poor to adapt our lifestyle with climate change future?



The one (1) million water imprisoned coastal people in Bangladesh is living such a way which is only possible through the transgression of coastline towards inland. They are not only imprisoned by surrounding water but also facing salinity problems which is increasing alarmingly. Strong solidarity & proactive role from the global civil society is required because, the problems of the "water imprisoned community" is local but the power players are global and linked with the existence of the largest single block of mangrove forest in the world, Ramsar wetland and world heritage site-the Sundarbans.

Wetlands in the southwest coastal region of Bangladesh are turning into water logged areas due to unplanned shrimp firming. Simultaneously, shrimp farming has been expanding in response to the rising market demand from the developed world and the World Bank and IMF guided policies. It is axiomatic that there is no way except to explore the process that could be reversed for water logging as well as to empowering the large section of people economically and politically through their increased access to resources, institution, transfer and adoption of new technology, and diversification of livelihood options. Ironically, the learning's of water imprisoned community about how to ensure livelihood security might offer how to adapt the climate induce sea-level rise situation for maintain human security. But the question is; the literate community or civil society, whatsoever we called ourselves, Are we ready to learn from the illiterate poor to adapt our lifestyle with climate change future?

We believe that if traditional knowledge on livelihood survival mechanism, practices and innovations of a region which is vulnerable to climate change is properly mapped, many untapped livelihood options could be identified, extended and popularized as sustainable livelihood option. However, such initiative requires the collaborative effort to work with the local community, not merely providing service delivery to the targeted beneficiaries.