

## Assessing the Vulnerability and Adaptation to Climate Change in South-Western Water Logging Coastal Bangladesh

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### Abstract

South-western coastal Bangladesh is characterized by low-lying topography, high productive mangrove ecosystem and unique biodiversity. The objective of the study was to assess the vulnerability, causes of the vulnerability, and impact of water logging due to climate change on livelihoods of different communities of the locality. Adaptations made by the community people in response to climate change were also explored. The study was conducted in Surulia and Kumira unions under Tala upazila of Satkhira district on November 2010. Data were collected through focus group discussions (FGDs), consultative meeting with various stakeholders also used secondary data of Bangladesh Meteorological Department of Ministry of Defence, GoB. The major vulnerabilities were water logging, scarcity of safe drinking water, lack of housing and sanitary latrines, submergence of crop land, lack of fodder and keeping place for livestock and poultry, and lack of employment opportunity. The water logging is becoming worsened due to faulty plan of embankment made by the government in 1959. The major adaptations were dredging river, drilling of elevated tube wells and sanitary latrines, raising homesteads, re-construction of embankments, linked canal re-excavation, and transfer of technology for fish culture.

**Keywords:** *Water logging, vulnerability, climate change, impact, adaptation*

### Introduction

Bangladesh is the most densely populated country in the world. The south-western coastal Bangladesh is characterized by low-lying topography, high productive mangrove ecosystem and unique biodiversity. This tidal wetland is comprised of rivers, estuaries, the largest mangrove forest in the world, and brackish water regime. It is barely one meter above from the mean sea level. There are one million people of 7 upazilas (Abhoyanagar, Monirampur, Keshobpur, Dumuria, Tala, Phultala and Daulatpur) under Khulna, Jessore and Satkhira districts are the victims of water logging for the last 35 years (Kabir, 2006).

South-western coastal Bangladesh receives significant fresh water flow from the mighty river Padma with few trans-boundary rivers. The government of Pakistan constructed

embankments in wrong design in 1959 for increasing crop production by protecting saline water intrusion. Though the crop productivity was increased initially, but construction of Farraka Barrage on the Ganges and unilateral diversion of its water by India from 1973, started to reduce the flow of upstream water, siltation making the river beds higher than the nearby localities. As a result, permanent water logging is created in the area.

Both human interruptions upon nature and climate change are responsible for the water logging. Tala Upazila of Satkhira District is located in Kabodak river catchments. Historically the Kabodak river has affected by regional and political decision which was, in most cases, detrimental to the hydrological condition of the region. Kabodak has flown almost middle of Tala

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upazila and lost its flowing capacity for sedimentation as the nearby locality is higher. This sedimentation is made due to sea level rise on climate change. The water logged situation is remained 6-9 months of year from 8-9 years. At present, the problem of Kabodak's siltation is severe than any other previous problems. Climate change will exacerbate the problem more in coming year.

This study has focused on the vulnerabilities and adaptations with changing water logging of the selected

area. The assessment provides information the vulnerabilities, impacts and adaptation measures to climate change at water logged coastal community in south-western coastal Bangladesh. The objective of the study was to assess the vulnerability, causes of the vulnerability, and impact of water logging due to climate change on livelihoods of different communities of the locality. Adaptations made by the community people in response to climate change were also explored.

### **Methodology**

Assessment was made in Tala upazila having an area of 3,858 sq. km. with a population of 1.8 million, under Satkhira district, the most vulnerable southwest coastal district in terms of water logging.

The study was conducted applying a mixture of both primary and secondary qualitative and quantitative data. The study was conducted in Surulia and Kumira unions under Tala upazila of Satkhira district on November 2010. Data were collected through four focus group discussions (FGDs), consultative meeting with various stakeholders also used secondary data of Bangladesh Meteorological Department of Ministry of Defence, GoB. Sixty one (61) households including 16 women from 4 villages under Tala upazila were sampled for the study. Group comprising of 15-16 members were selected based on their personal history as well as pertinent knowledge of the locality.

The purposes of these discussions were to clearly gather different opinions of vulnerabilities and practical solutions. Prior the conduction of focus group discussions (FGDs), related various template such as vulnerability, cause, impact and adaptation strategies were prepared for collection of more authentic information from the participants using day long fruitful discussion. The lists of participants have also been selected prior to FGDs conduction. Two workshops were also conducted at union levels ensuring the participation of respective chairmen and members of union council, personnel of government line departments, local NGOs representative, teachers, students and religious leaders. These discussions were conducted to justify, validate and further improve the findings gathered from village levels discussion.

### **Findings and Discussion**

The causes of vulnerability and its impact and adaption by the affected communities

have been assessed and presented in Table 1.

Table 1 Vulnerability, causes of vulnerability, impact and adaptation

<b>Vulnerability</b>	<b>Causes of vulnerability</b>	<b>Impact of vulnerability</b>	<b>Adaptation</b>
Water logging	River beds filling by siltation, excessive rainfall, lack of drainage systems and embankments	Damaged housing, roads, crops, latrines and tube wells.	Dredging river, construction of embankments and re-excavation of canal.
Lack of safe drinking water	Less tube wells, arsenic contamination and water logging	Submerged tube wells and increase water borne diseases	Drilled tube wells in raised place, removed arsenic by establishing arsenic free plants, and rain water harvesting.
Problems of fish culture	Inundation, lack of technology, lack of fry and high price of fish food.	Less income and increased malnutrition	Culture fishes by elevating the edge of ponds, pen culture and cage aquaculture
Lack of agricultural equipments	High price of equipments and beyond of purchased capacity.	Hampered cultivation	Arrangement of loan in affordable condition and increased technical knowledge
Problem of rice cultivation	Problems of irrigation and quality seeds	No land based production	Distribution of quality rice seeds among the farmers
Problems of vegetables cultivation	Lack of quality seeds, technical knowledge and capital	Decreased income and increased malnutrition	Supplied quality vegetables seeds, cultivation of vegetables in floating beds and baskets.
Damaged Housing	Destroyed mud housing	Problems of living and livestock rearing	Construction of raised housing and cowshed with plinth pavement
Damaged latrines	Water logging and lack of awareness	Increased diseases, immature death and health hazards	Construction of elevated sanitary latrine and awareness building
Arsenic problems	Created naturally	Threatened of health	Construction of arsenic free plants
Problems of health treatment	Insufficient experienced doctors	Increased diseases and death	Activation of community clinic and ensured medicines
Hampering education	Submerged and damaged of educational institutions	Attitude becoming worsen	Construction of institution in raised place and ensured quality of education
Communication problems	Submerged and damaged roads	Excessive rainfall and water logging	Construction of elevated roads

Vulnerability	Causes of vulnerability	Impact of vulnerability	Adaptation
Problems of employment opportunity	No task in the locality as no land based crop production	Increased food scarcity	Generation of alternative income sources
Lack of boats and nets	No capital and less income	Decreased the sources of income	Distribution of boats and nets with thread
River bed filling	Siltation	Water logging	Dredging river
Increased the disease of trees	Water logging	Dead trees	Plantation of water tolerant trees

Based on opinion of farmers, observation and literature review the following adaptation options were suggested as appropriate in water logging area: Cultivation of flood tolerant rice such as BRRI dhan51 and BRRI dhan52, can survive 10-15 days and 12-14 days respectively in submergence condition and short duration of early maturing rice, BRRI dhan33 (118 days in transplanted, and 100 days from seed to seed for early harvesting (BRKB, 2004). BINAdhan-7, a short duration early maturity high yielding transplanted Aman variety (110-120 days from seed to seed) in flood and water logging areas can be cultivation. Floating agriculture is a possible local knowledge based technology which would help in attaining sustainable livelihood security in the vulnerable water logged areas in Bangladesh (Hossain, 2010). Adri *et al.* (2010) reported that late varieties of local Aman rice e.g. *Kazalshail*, *Rajeshail*, *Chapraish*, *Kartikshail*, *Dholamota*, *Leiccha*, *Nazirshail* are cultivated with

water logging condition. Rice seed beds are prepared by raising the piece of land with mud. In many areas as a precautionary and safety measure, the levees (sides) of the fishing ponds are raised up to a certain level so that fish cannot leave the ponds. Farmers can be cultivated vegetables of sweet gourd, bottle gourd, bitter gourd, cucumber etc. in the *dhup* (heaps) method prepared by water hyacinth adding some clay on it. Vegetables can also be cultivated in hanging, sack, pyramid and heap methods. Water tolerant vegetables such as arum, water spinach, and kang kong can be cultivated. Elevated community seed bank may be made along with fodder cultivation in raised lands, duck culture, flood tolerant trees plantation, construction of flood proofing raised housing in individual and clusters. *Killas* constructions for sheltering livestock, re-excavation of canal, installation of homestead, rehabilitation of vulnerable providing loan, fish culture providing boats, nets and arrangement of small business, and fish cultivation in cages.

## Conclusion

Affected communities did not have much knowledge on technologies to adapt with vulnerabilities of water logging. They have very poor adaptive capacities on cropping practices, livestock and fisheries. The adaptive capacities on non-farm livelihood

aspect were also unsatisfactory. Others adaptive capacities were very poor as well. Hence, the overall adaptive capacities on water logging by the communities were not satisfactory. Adaptive technologies on water logging should be available for the

communities. At the same time, some specific programs to be launched for crops, livestock, fisheries and other aspects. Proper training should also be arranged on adaptive technologies and other issues. Technologies dissemination various departments inclu-

ding NGOs should come forward to solve the mentioned problems. Government along with communities should jointly step forward in a holistic way to develop more adaptive technologies for minimizing the losses, because of water logging.

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