

# RUDGS

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# 熱帯デルタにおける生存基盤条件としての生活用水の再検討

## Reconsideration of Water for Daily Domestic Use as Existence Condition in Tropical Delta

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### Abstract

Bengal delta is considered as one of the largest tropical deltas. This Bengal delta has a contribution of formation of at least 60% of the total coastal area of Bangladesh. The safe water for daily domestic use is an issue to the coastal people of Bangladesh. This study tried to identify the daily domestic use and sources of water in both coastal and non-coastal area. The study also revealed the physical characteristics of water and major diseases occurred in the selected area. It has been found that most of the people were using tube well water for drinking and bathing purposes whereas in coastal area the pond water was also used for bathing and cooking purpose to some extent. Among diseases, occurrence of diarrhea and pneumonia in children was found more in coastal village than that of non-coastal village. There might have been a relation between use of water for daily use and occurrence of diseases.

**Key words:** Coastal area, daily water use, diseases, Bangladesh

### 1. Introduction

Delta regions occupy 1% of the earth's land area and are home to more than 500 million people (Foufoula-Georgiou et al. 2011). Because deltas constitute "rice bowls" of the world, deterioration of the tropical mega deltas poses serious threats to food security for more than half of the world's population that relies on rice as a staple food (Hoanh, 2010). Low elevation also makes human settlement in deltas exposed to coastal flooding and storm surges (Syvitski, 2008). Deltas are subject to adverse environmental changes principally through human modifications of land use over the past century, notably through rapid deforestation, urbanization and agricultural development. Some of the deltas (e.g., Ganges-Brahmaputra and Yangtze River basin) are already facing the problems of salinization (Alam, 1996) and water quality degradation (Dearing et al. 2014) which not only affects the land use and agriculture productivity of the region, but also the health and well-being of populations and the integrity of socio-ecological systems of deltas. Furthermore, soil and water salinity are projected to increase because of upstream water diversions, sea level rise and climate change (Wong et al. 2014).

The combination of several forces is likely to lead to a widespread problem of water salinity with the ensuing detrimental health effects, in particular, for populations living along the coast and in deltaic areas. The current recommended dietary intake of salt (sodium chloride) has been set at 5 g/day, according to the report of a Joint Expert Consultation of the World Health Organization (WHO) and the Food and Health Organization (FAO) of the United Nations in 2002 (Nishida et al. 2004). The Intergovernmental Panel on Climate Change (IPCC) estimated that marine and coastal ecosystems in South and South-East Asia will be affected by sea-level rise (IPCC, 2007) with a grading of "high confidence". It also stated that future climate change will have severe effects on water security in developing countries, adversely affecting human health in a number of ways (IPCC, 2007).

Sea-level rise is a critical factor that makes deltaic regions particularly vulnerable to climate change. Other environmental factors, like tropical cyclones, are likely to interact with higher mean sea-levels and contribute to higher storm surges and increased flooding (Ahren et al. 2005). For example, there is already evidence that salt water from the Bay of Bengal in Bangladesh has penetrated more than 100 km inland along tributary channels during the dry season (Allison, 2003). This not only increases the potential for economic and infrastructural damage, but also affects livelihoods and increases health risks through contamination of drinking water (Khan, 2011). About 15 million people are forced to drink saline water due to lack of available safe water sources in the coastal area of Bangladesh (Hoque, 2009). Besides drinking water, there are other routes of exposure to high salinity like through diet, bathing etc. that also have potential effects on health. According to Caritas Development Institute (CDI, 2005) the health problems include hypertension, miscarriage among pregnant women, skin disease, acute respiratory infection and diarrhoeal diseases that has link to increased salinity exposure

through drinking, cooking and bathing. Therefore, the present research has been undertaken to generate information regarding health status and daily water use by the local people of coastal and non-coastal area of Bengal delta.

## 2. Methodology

### 2.1 location of the study area

The study area encompasses two different villages from two districts of Bangladesh. The name of one village is Shunner chor (H village) in a coastal district named Noakhali. The another village is Dakshin chamuria (D village) in a non-coastal district named Tangail (Figure 1).

### 2.2 Data collection

Information about health status of the local people were collected from the local health complex. Information on environmental condition and daily water use were collected using open structured questionnaire having interview with the local people.

### 2.3 water sample collection

To get physical characteristics of water, the samples were collected from five (5) different spots of the village. The spots included pond, river, field, tube-well and ditch. The water samples were collected to determine temperature ( $^{\circ}\text{C}$ ), pH, Dissolved oxygen (DO), Total dissolved solid (TDS) and water salinity (EC-ds/m). The analysis was done in the central laboratory of Bangladesh Agricultural University, Mymensingh, Bangladesh.

## 3. Results

### 3.1 Health status of the local people and environmental condition of the study area

Major diseases occurred in local people was found similar in both the study area. For example, the local people used to suffer from diarrhea, pneumonia, peptic ulcer etc. Though the degree of occurrence of the disease, especially diarrhea was found high among the children in coastal village (Table 1).

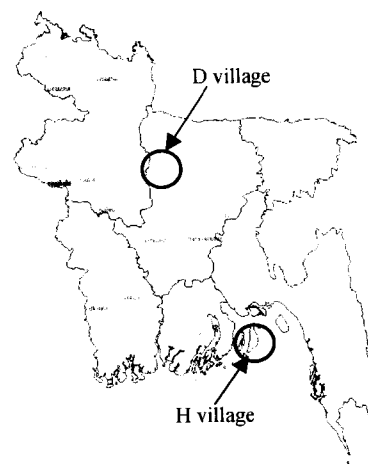


Figure 1: Location of the study villages

Table 1. Major diseases and environmental condition in the study area

Study area	
H village (coastal area)	D village (non-coastal area)
<b>Major diseases</b>	
1. Diarrhea: Occurrence rate is high in case of children (55%), sometimes become serious and moderate for adult (24.7%).	1. Diarrhea: Occurrence rate is high in female (50%) than in male (20%) and children (30%).
2. Pneumonia: Occurrence rate is moderate for children (24.2%) and not found in adult. If the occurrence is serious then the patient is referred to district hospital.	2. Pneumonia: Occurrence rate is very low. About 4-5 persons in last year. If the occurrence is serious then the patient is referred to Upazila Health Complex.
3. Other diseases: peptic ulcer is very common for adults, fever, cold is occurred season wise, sometimes bronchiolitis in children and anemia found in adults.	3. Other diseases: Ulcer, fever, cold etc. are common depending on season.
<b>Environmental condition</b>	
1. Rainfall starts at May and ends at October. With severe rainfall floods occurred and entered to houses located near the Meghna river.	1. Rainfall starts at May and ends at October. No flooding occurred from last few years.
2. Hottest month is April and it lasts until June-July. Temperature is lowest during January.	2. About 30 years ago the hottest month was April-May, now it has changed to August.

Source: Field survey, 2016

### 3.2 Physical characteristics of water sample

Water samples from different locations were analyzed and it has been found that the temperature of pond, field, ditch and tube-well water was higher in coastal H village than non-coastal D village. Though, the pH level of water from all the sources of two villages were below the neutral level. But it was found that the pH level of river water from D village was much acidic than the other sources of water. This level of pH could be harmful for the aquatic life of that area. Another important aspect among physical characteristics of water was salinity level. It has been found that the salinity level was much higher in the river water of coastal H village than the non-coastal D village. Similarly, water sample from ditch and

tube-well also found slightly saline in H village compared to that of D village. However, physical characteristics of water samples have been presented in table 2.

Table 2. Physical characteristics of water samples of the study area

Source of water		Temperature (°C)	pH	DO (mg/L)	TDS (ppt)	EC (ds/m)
Pond	D village	25.0	6.5	4.9	0.21	0.4
	H village	27.5	6.8	4.4	0.13	0.3
River	D village	25.5	3.1	4.0	0.32	0.7
	H village	25.4	6.5	4.9	4.94	11.3
Field	D village	29.0	6.2	4.6	0.08	0.2
	H village	30.5	7.1	6.4	0.16	0.3
Ditch	D village	22.5	6.2	4.4	0.14	0.3
	H village	25.0	6.8	2.8	0.71	1.56
Tube-well	D village	25.0	6.4	6.3	0.17	0.4
	H village	27.2	6.7	2.3	0.59	2.31

Source: Field survey, 2016

### 3.3 Daily use of water and their sources

In both coastal and non-coastal area, local people used to collect drinking water from tube well. In the coastal H village, the tube well water was found as slightly saline (table 2) and it could be harmful, if this saline water is drunk for the long time. For bathing purpose, 90% of the people used to have water from tube well in D village but in H village 80% people used tubewell water for bathing purpose and rest 20% used to get in pond. But for washing clothes or bathing their cattle the people from both the villages used to go to pond or ditch or river. It was found in the both the study area that for cooking purpose they usually did not use tube well water but pond or ditch water, especially for the purpose of rice cooking or lentil soup preparation. The local people explained that if they use tube well water then the boiled rice or lentil soup become black in colour which they don't like and for this reason they usually used to get pond/ditch water. However, the uses and source of water have been presented in the table 3.

Table 3. Daily use and source of water in the study area

Uses of water	Source of water	
	H village	D village
Drinking	Deep tubewell/Tube well	Tube well
Bathing	Tube well (80%), Pond (20%)	Tube well (90%), Pond (7%) and Ditch (3%)
Washing cloths	Pond and Ditch	Tube well (90%), Pond and Ditch
Bathing of cattle	Pond and River (Meghna)	Ditch and River (Rangaidoho)
Exceptional use		
- Cooking of rice	Pond	-
- Cooking of dal (Lentil soup)	Pond	Pond or Ditch
- Making puffed rice	-	Pond or Ditch
- Raising of boro rice seedling	-	Pond or Ditch

Source: Field survey, 2016

### 4. Conclusion

The study identifies the present health status of the local people, environmental condition of the selected coastal and non-coastal area. The information regarding water use and its sources also identified and the physical characteristics of the water from different location have been determined. In coastal village the occurrence of diarrhea and pneumonia is high than that of non-coastal area. There could have a relationship between occurrence of these diseases and the use of water especially bathing in the pond. Sometimes they cook rice with the pond water and this could be another reason of having diarrhea among children in the coastal village. Because children are more susceptible to diarrhea than adults. However, the salinity level of the tube well water was also found slightly saline and the local people including adults and children, they used to drink this saline water and therefore, it could be harmful for the health of the local people if this is continued for a long time.

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