

## A ROUTINE ENVIRONMENTAL MONITORING IN DEVELOPMENT WORKPLACES: A COMPELLING STUDY CONDUCTED AT COASTAL DACOPE UPAZILA OF BANGLADESH

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### ABSTRACT

The study was conducted at coastal Dacope upazila of Khulna district during the period 2020-2022. Environmental monitoring was carried out in respect of air quality, surface water quality as well as soil quality. The air quality was measured in respect of CO, SO<sub>2</sub>, NO<sub>x</sub> and PM concentration in that particular area using Gas Analyzers (model: Handheld 3016). The present study investigated some physico-chemical parameters from surface water such as pH, turbidity, TDS, Cl<sup>-</sup>, DO and BOD<sub>5</sub> to assess the suitability for different human purposes. Different methods were followed during detecting the soil quality. In general, air quality was in good condition and was not affected by the construction activities carried out in Dacope Upazila. In some cases, SPM<sub>2.5</sub> and NO<sub>2</sub> exceeded national values. The study showed that surface water qualities were not affected by the development activities carried out for rehabilitation the degraded coastal Dacope Upazila of Bangladesh. The pH values ranged from 7.11 to 7.63. The Cl<sup>-</sup> contents were 918.33 and 83.33 μg/g for the year 2019 and 2021, respectively. All have high contents of organic matter. The level of N and S contents were quite enough but low contents of phosphorous potassium and zinc.

**Key words:** Environmental monitoring, development workplace, coastal area

### Introduction

The coast of Bangladesh are highly resistant to climate change due to very low elevations, some terrain on the sea level, the topography of the deltaic region, the Bay of Bengal, socioeconomic profile and infrastructure renders the capacity to tackle the effects of climate related disasters (Agrawala *et al.*, 2003). This area is more affected than any other regions of Bangladesh. They experience a variety of natural and man-made disaster events (sea level rise-SLR, cyclones, storm surges, floods, droughts, saltwater intrusions, riverbank erosion, and landslides). The coastal areas of southwestern Bangladesh are already affected by rising temperatures, slow climatic stresses such as saltwater intrusions into agricultural soils, ground water, sudden storm surges and increased intensity such as floods, riverbank erosion impacting from cyclones, storm surges and climate change (Huq *et al.*, 2015). The coastal areas of Bangladesh are home to about 40 million people, who are dominated by natural resource-based livelihoods. Almost every year in the last few decades, the region has witnessed multiple disaster events that have caused enormous loss and damage to human life, livelihoods and well-being, and created uncertainty about food insecurity (Nasim *et al.*, 2019). The Bangladesh government predicts that SLR could evacuate 20 million people over the next 40 years (Barua *et al.*, 2017). By 2050, one out of seven people in Bangladesh is projected to be migrated from their hometown due to climate change (Khan, 2019). The mangrove forest, locally known as The Sundrban, is the country's most important ecosystem on which the lives of 10 million people depend. People are forced to leave their homes, evacuate to dry land and change their way of earning (Sarwar, 2008). This will bring about a complete change in their lifestyle. The effects of climate change are being felt by different parts of the world and by different communities. It is already established that climate-related risks, including extreme events such as cyclones, excessive rainfall, and consequent floods and logging, salinity and riverbank erosion, adversely impact the rural life of South Asian's coast (Dastagir, 2015). Kabir *et al.* (2016) stated that the effects of climate change have serious implications on the lifestyle

patterns of affected people and their overall health. Climate factors increase the incidence of various water-borne infections such as cholera and diarrhea, as well as vector infections such as dengue fever and malaria associated with common health problems (Costello *et al.*, 2011). Adebo and Sekumade (2013) showed that these groups are suffering from health problems due to climate changes. Moreover, women, the elderly, adolescents and children are the most vulnerable in the coastal community in Bangladesh. Salinity and its seasonal variation are dominant factors for the coastal ecosystem, fisheries, and agriculture. So, in the 1960s, modernization started in the coastal zone of the country to convert this area into permanent agricultural lands to increase agriculture production. The polders in this area are enclosed on all sides by dikes or embankments, separating the land from the main river system and offering protection against tidal floods, salinity intrusion, and sedimentation. Without embankments, the coastal communities would be exposed to diurnal tidal flooding. Now the dykes are vulnerable to storm surges; high tides; annual floods; land erosion and drainage congestion. So, maintenance of the polder system with embankments and structural elements has become of permanent importance. The GoB either with assistance from international donors and lending agencies or out of its own resources has been spending money almost on a regular basis to keep the Polders in good working condition eventually to save the coastal people. Bangladesh Water Development Board (BWDB) is one of the latest such interventions to address a systematic restoration and upgrading of the polder systems in the coastal region of Bangladesh. During polder rehabilitation the environment as well as the biodiversity in the working impacts by development interventions. Different organizations likely GO/NGO or GOB/Donor agency have co-opted different types of activities for improving coastal livelihood and enhancing adaptability in the South-Western coastal Dacope Upazila of Bangladesh. Hence the study minutely evaluated the present environmental situations as the part of Climate Smart tools for developing smart as well as well being citizens of Bangladesh.

### **Materials and Methods**

The study was conducted at coastal Dacope upazila of Khulna district during the period 2020-2022. Environmental monitoring was carried out in respect of air quality, surface water quality as well as soil quality. The air quality was measured in respect of CO, SO<sub>2</sub>, NO<sub>x</sub> and PM concentration in that particular area using Gas Analyzers (model: Handheld 3016). The wind direction of those sites was also monitored during monitoring the greenhouse gases emission. The present study investigated some physico-chemical parameters from surface water such as pH, turbidity, TDS, Cl<sup>-</sup>, DO and BOD<sub>5</sub> to assess the suitability for different human purposes. Different methods were followed during detecting the soil quality. Semi-microkjeldahl method was used for the analysis of total nitrogen (Page *et al.*, 1989). Available Phosphorus determination was carried out by Bray and Kurtz method (Bray and Kurtz, 1945) as outlined by Tandon (1995). Available potassium and sulfur were analyzed by the method described by Page *et al.* (1989). Zn was determined by DTPA extracting solution as outlined by Peterson (2002). The analytical works were performed in the Consultancy Research & Testing Services (CRTS), Khulna University of Engineering & Technology (KUET), Khulna-9203. Finally, the analyzed data was combined, presented as a table and to add in the manuscript.

### **Results and Discussion**

**Air qualities:** Five air quality parameters (SPM<sub>10</sub>, SPM<sub>2.5</sub>, SO<sub>2</sub>, NO<sub>2</sub> and CO) were measured from four locations of Dacope Upazila. The obtained results have been compared with the national standard (ECR, 2023). In general, air quality was in good condition and was not affected by the construction activities carried out in Dacope Upazila. In some cases, SPM<sub>2.5</sub> and NO<sub>2</sub> exceeded national values due to excessive traffic loads resulting from the successful implementation of the rehabilitation as well as Development activities.

**Surface water qualities:** Surface water is both the crucial and important freshwater source in the coastal areas of Bangladesh. The qualities checked from six different types of surface water sources and the studied parameters are pH, turbidity, TDS, chloride, DO and BOD. The study showed that surface water qualities

were not affected by the development activities carried out for rehabilitation the degraded coastal Dacope Upazila of Bangladesh. According to ECR (2023) standard pH range is 7.5 to 8.5 for coastal water. It revealed that pH of the coastal surface water were within the standard level (Table 2). The ADB (1994) set the standard values as 1000 mg/L; hence the studied coastal water is safe for aquatic culture in respect of TDS. A study conducted by Sharif *et al.* (2003) found that the DO and BOD contents were 5.90 and 5.20 mg/L, respectively in the coastal Bakkhali river water of Cox's Bazar.

Table 1. Air qualities in coastal Dacope Upazila of Bangladesh

Parameters	2019	2021	National standard (APCR, 2022)	Remarks
SPM <sub>10</sub> (µg/m <sup>3</sup> )	71	100	150 (24-hr-avg)	Good quality
SPM <sub>2.5</sub> (µg/m <sup>3</sup> )	51	89	65 (24-hr-avg)	Health concern in 2021
SO <sub>2</sub> (µg/m <sup>3</sup> )	90	12	250 (1-hr-avg)	Good quality
NO <sub>2</sub> (µg/m <sup>3</sup> )	109	74	80 (24-hr-avg)	Health concern in 2019
CO (mg/m <sup>3</sup> )	1	0.1	20 (1-hr-avg)	Good quality

Table 2. Surface water qualities in coastal Dacope Upazila of Bangladesh

Parameters	2019	2021	National standard (ECR, 2023)	Remarks
pH	7.7	7.6	7.5-8.5	Safe for uses
Turbidity	51	291	-	Safe for uses
TDS (mg/L)	2134	460	-	Safe for uses
Cl <sup>-</sup> (mg/L)	1534	127	-	Safe for uses
DO (mg/L)	6	4	≥5	Safe for uses
BOD <sub>5</sub> (mg/L)	10	3	≤6 (for fisheries); ≤12 (for irrigation)	Suitable for irrigation

**Analysis of soil quality:** Six soil samples were tested for analyzing soil pH, Chloride, Organic Matter, Nitrogen, Phosphorous, Potassium, Zinc and Sulphur in Polder area. According to the test results, all have high contents of organic matter. The pH values ranged from 7.11 to 7.63 in the collected sample (Table 3).

Table 3. Soil qualities in coastal Dacope Upazila of Bangladesh

Parameters	2019	2021	Bangladesh Standard (FRG, 2005)						Remarks
			Very low	Low	Medium	Optimum	High	Very high	
pH	7.63	7.11	-	-	-	-	-	-	-
Cl <sup>-</sup> (µg/g)	918.33	83.33	-	-	-	-	-	-	-
OM (%)	7.24	7.43	-	-	-	-	-	-	-
N (%)	3.82	0.50	<=0.09	0.091-0.180	0.0181-0.270	0.271-0.360	0.361-0.450	>0.450	Very high content
P (µg/g)	3.27	3.67	<=3.75	3.751-7.50	7.51-11.25	11.251-15.00	15.10-18.75	>18.75	Low content
K (meq/100g)	0.16	0.15	<=0.075	0.076-0.15	0.151-0.225	0.226-0.30	0.31-0.375	>0.375	Low content
S (µg/g)	116.50	49.83	<=9.0	9.1-18.0	18.1-27.0	27.1-36.0	36.1-45.0	>45.0	Very high content
Zn (µg/g)	0.74	0.71	<=0.45	0.451-0.90	0.91-1.35	1.351-1.80	1.81-2.25	>2.25	Low content

The Cl<sup>-</sup> contents were 918.33 and 83.33µg/g for the year 2019 and 2021, respectively. The analytical results expressed that amount of nitrogen were 3.82 and 0.50% for the year of 2019 and 2021, respectively which ensured the very high nitrogen status in the soil around the study area (Tables 3). Phosphorous,

potassium and zinc have low contents but sulphur has very high contents may be excessive movement of vehicle and the burning level of fuel is not quite enough. In this case top soil management can be guaranteed and minimum diesel pollution is highly recommended.

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