Initial Environmental Examination

Project Number: 55040-001
September 2023

Bangladesh: Dhaka Power System Expansion and Strengthening Project

Main Report Part 2

Prepared by Ministry of Power, Energy and Mineral Resources for the Asian Development Bank.

5. Environmental and Social Baseline

5.1 Introduction

This chapter discusses the current condition of the study area prior to any intervention. It is important to identify the environmental and social baseline conditions to comprehend the changes or impact due to the project interventions. The physical environment, the agricultural, ecological, fisheries and socio-economic resources of the study area are investigated and their current statuses are captured in this chapter.

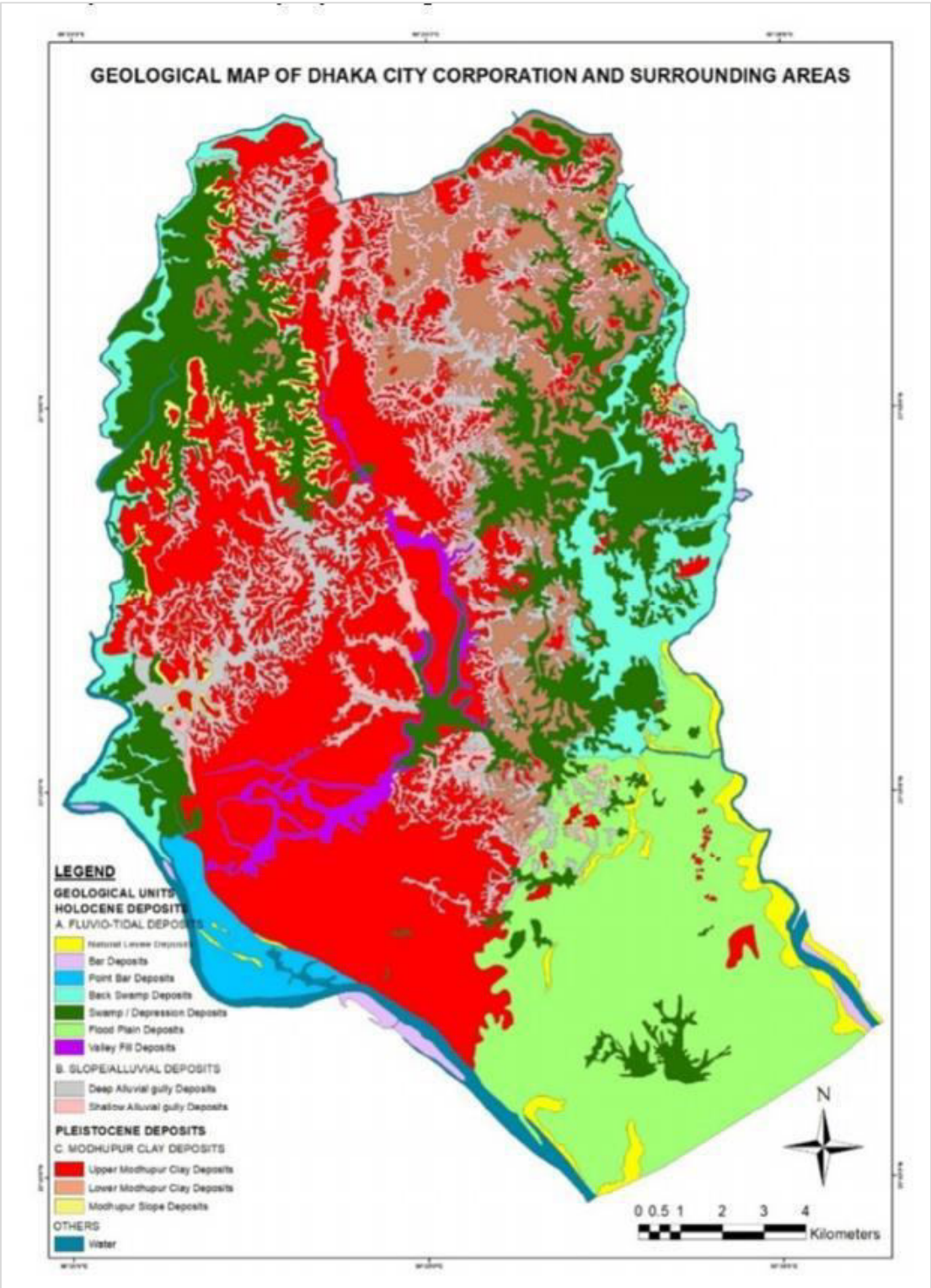
The proposed project comprises of three major components, substations, underground transmission and distribution lines for connecting the substations, and overhead lines. The proposed locations for substations are: (i) Airport; (ii) Kalshi (Mirpur); (iii) Bashundhara; (iv) Tongi; (v) Purbachal; (vi) Kalachadpur (Baridhara); (vii) Uttara (Rupayan City); and (viii) Mirpur Ceramics (Mirpur) and these locations are the focus of the site-specific baseline write up together with the indicative routes of the 132kV and 33kV underground cable since the 11 kV and 0.4 kV routes are not yet known. It is to be noted that environmental quality monitoring was undertaken prior to finalization of the substations and so includes proposed substations that are no longer part of the project scope or where the location has subsequently moved.

5.2 Physical Environment

5.2.1 Geology and Topography

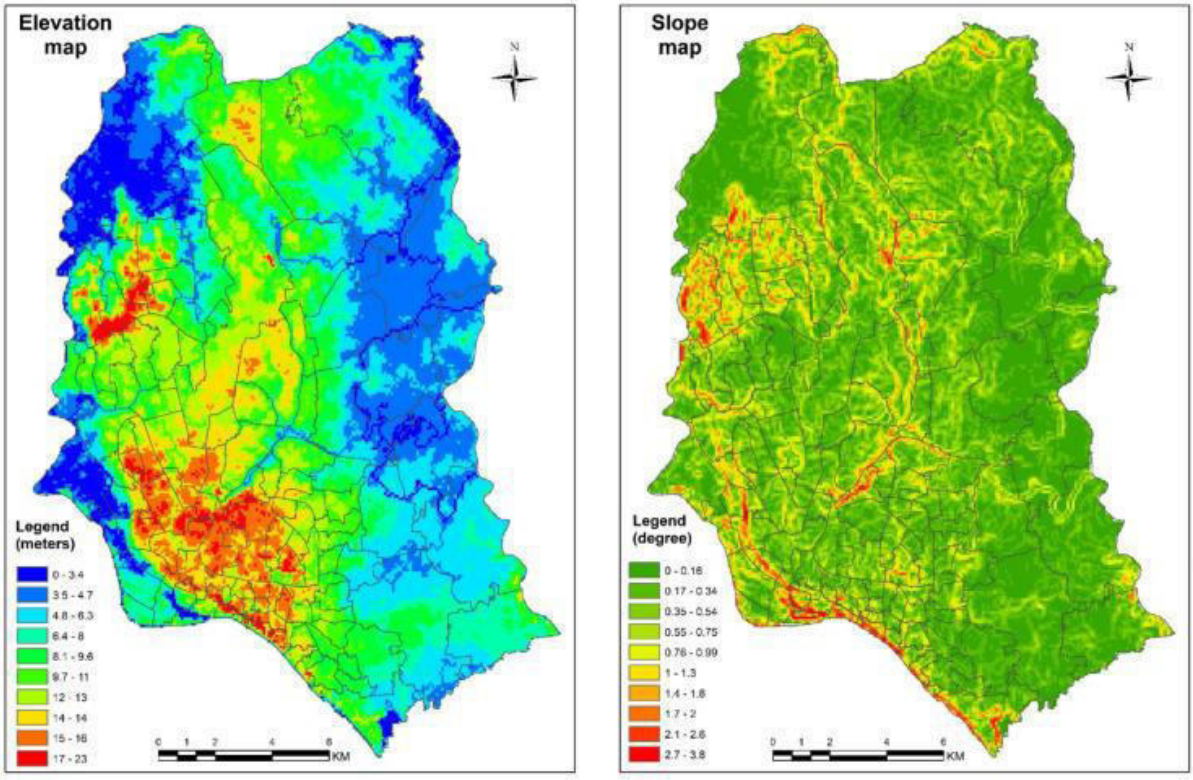
Dhaka is built partly on the elevated Pleistocene terrace (Madhupur terrace) and partly on the surrounding low-lying Holocene floodplains. The surface geology of the city has been divided into six units: 1) Pleistocene terrace deposit, 2) Holocene terrace deposit, 3) Holocene alluvial valley fill deposit, 4) Holocene alluvium, 5) Holocene channel deposit, and 6) Artificial fill. Topographically, Dhaka is relatively flat land, the surface elevation of the city ranges between 0 and 23 meters above sea level. The erosional landforms (mostly clays) that remain above the normal flood level and are not influenced by river conditions comprise the upper Madhupur Terrace, lower Madhupur Terrace, Madhupur slope and gully head. These landforms are mostly found in the north, upper terrace has an elevation >5m whilst the lower terrace has an elevation between 2.5m to 4m. The depositional landforms of the floodplains comprising sand, silt and clay are further divided into several geomorphological units as meander channel, natural levee, point bar, channel bar, lateral bar, back swamp, swamp/depression, floodplain, shallow alluvial gully, deep alluvial gully and valley/abandoned channel. Of these units the natural levees over 4m are not normally flooded except during extreme flood events; below 4m the land may be inundated by flood water during the monsoon period.[15]

[15] https://www.scirp.org/journal/paperinformation.aspx?paperid=70921



Source:https://www.researchgate.net/publication/332704192_Geomorphology_and_Geology_of_the_Dhaka_City_Corporation_Area-an_Approach_of_Remote_Sensing_and_GIS_Technique

Figure 5.1: Geological Map of Dhaka



Sources: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10076438/

Figure 5.2: Elevation and Slope in Dhaka

5.2.2 Meteorology and Climate Change

Bangladesh has a humid, warm climate influenced by pre-monsoon, monsoon and post-monsoon circulations and frequently experiences heavy precipitation and tropical cyclones. The substations and the transmission and distribution lines are to be exposed to the climatic condition of the study area. For drawing the climatic and meteorological condition of the study area, various meteorological data like rainfall, temperature, relative humidity, wind speed and sunshine hours were collected from Dhaka BMD station which is nearby the study area. The data were analyzed and their status is discussed briefly in the following sections. In relation to climate change risks the project's Climate Risk Assessment (2023) was referred.

Rainfall

The monthly maximum and average rainfall data over 30 years (1988-2017) were collected, analyzed and shown in Figure 5.1. The result shows that the monthly average rainfall varies from 301.58 mm to 388.84 mm in the monsoon and the area received the maximum of 836 mm rainfall in September, 2004. The historical maximum annual rainfall of this station was recorded as 2892 mm in 2017 and minimum was 1169 mm in 1992. Monthly maximum and average rainfall at Dhaka BMD Station for the period of 1988-2017 for an annum is shown in Figure 5.4.

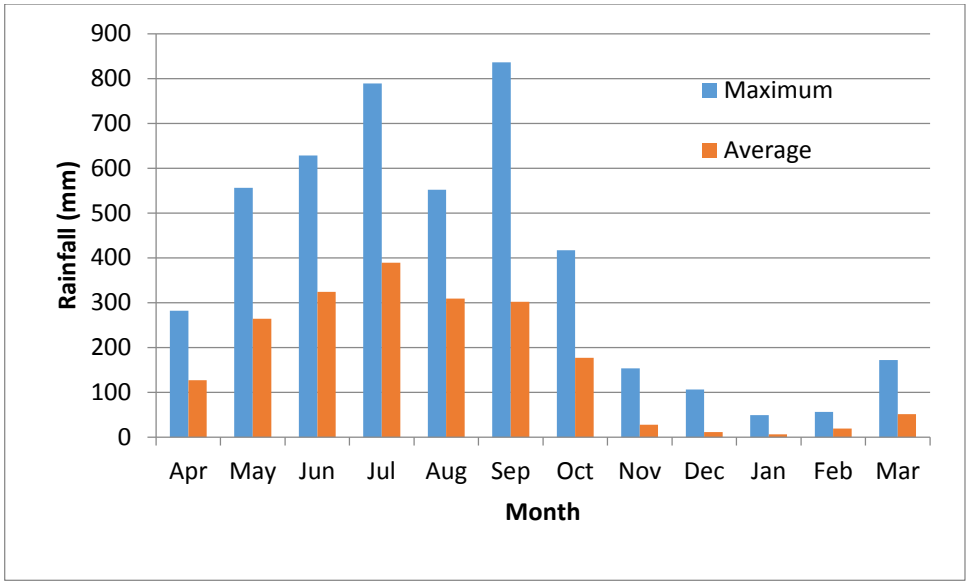


Figure 5.3: Monthly Maximum and Average Rainfall at Dhaka BMD Station (1988-2017)

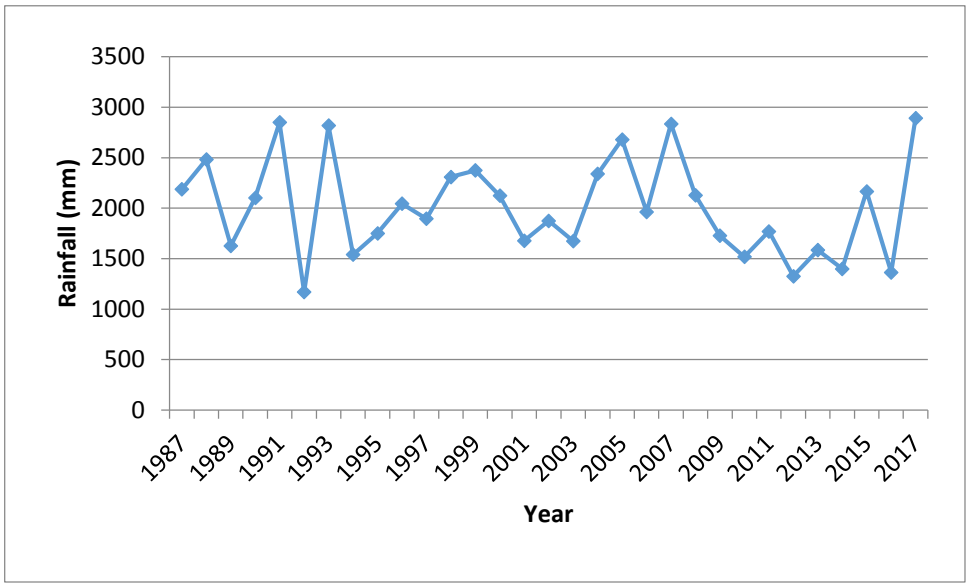


Figure 5.4: Annual Rainfall Pattern at Dhaka BMD Station (1988-2017)

Temperature

The monthly average temperature data over 30 years (1988-2017) shows that the maximum temperature varies from 28.48°C to 37.15°C and April is the warmest month while the minimum temperature varies from 9.51°C to 24.2°C and January is the coldest month in the study area. The monthly average of maximum and minimum temperature of Dhaka Station is shown in Figure 5.5.

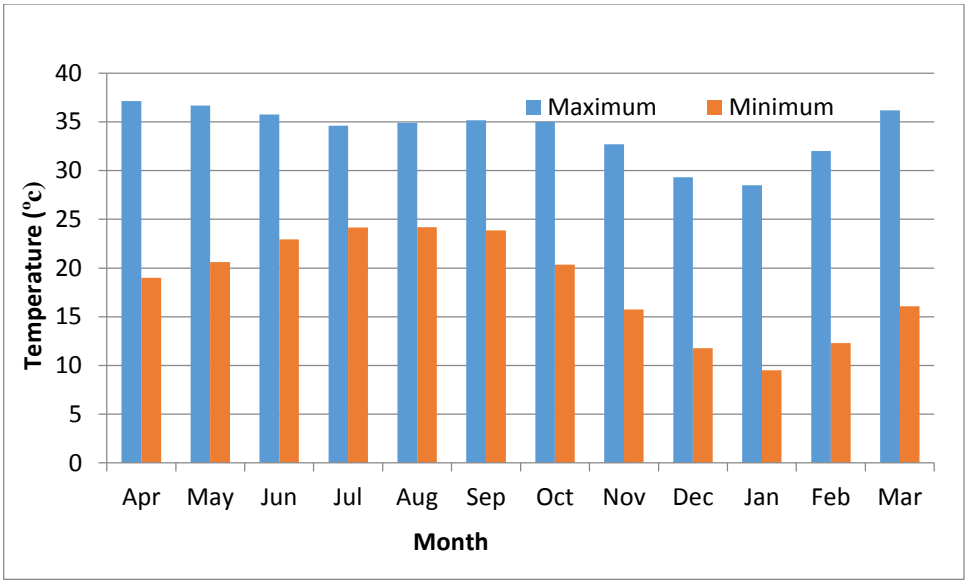


Figure 5.5: Monthly Temperature (°C) at Dhaka BMD Station (1988-2017)

Relative Humidity (RH)

The analysis of the Relative Humidity (RH) data for the period from 1988 to 2017 indicates that the average RH varies seasonally from minimum of 61.3 % in March to maximum of 82.6% in July. The mean monthly RH data for the last 30 years (1988-2017) is shown in Figure 5.6.

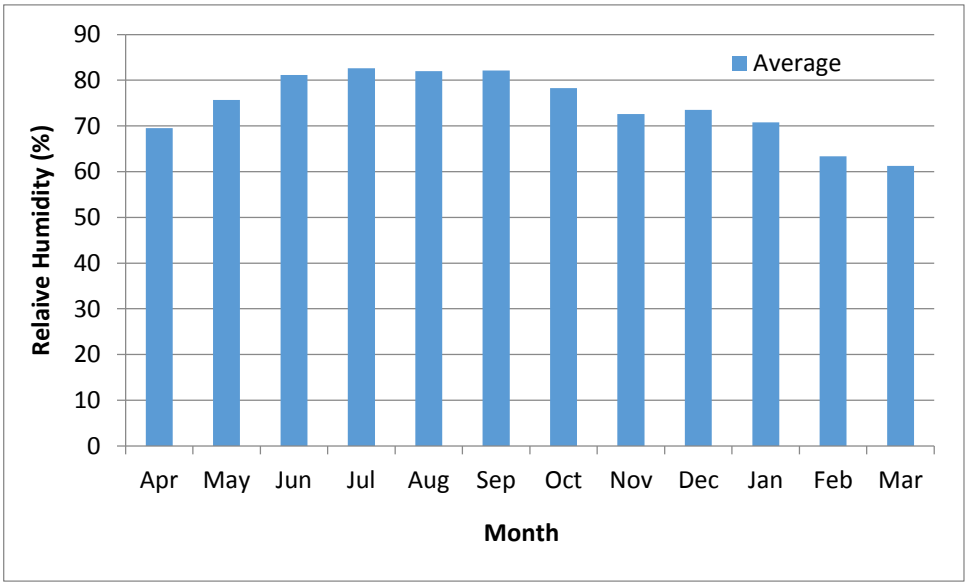


Figure 5.6: Monthly Relative Humidity at Dhaka BMD Station (1988-2017)

Wind Speed

Wind in the area is mostly characterized by Southerly wind from the Bay of Bengal during monsoon and North-westerly wind from Himalaya during winter (Figure 5.8). The data of maximum wind speed over 30 years (1988 to 2017) shows that the monthly maximum wind speed of 68.52 km/hour occurred in November, 1988. On the other hand, the average of maximum wind speed was analyzed and found that it varies from 10.91 km/hour in December to 25.27 km/hour in May. The monthly maximum and average of maximum of wind speed are shown in Figure 5.7.

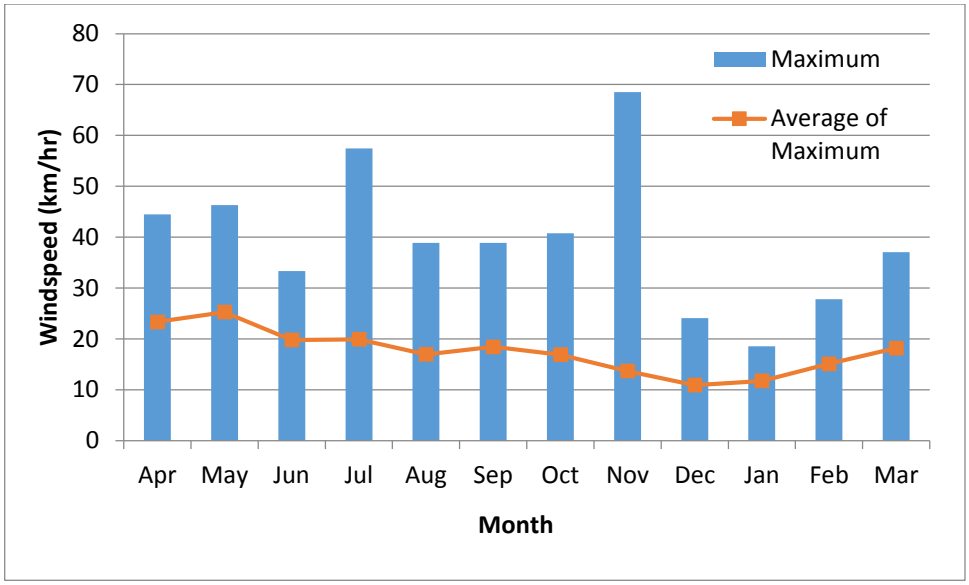


Figure 5.7: Monthly Maximum and Average of Maximum Wind Speed at Dhaka BMD Station (1988-2017)

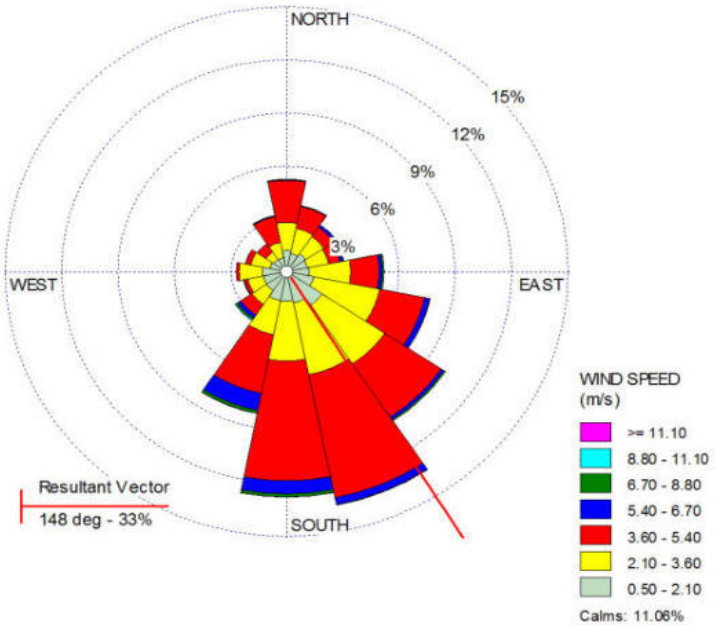


Figure 5.8: Annual Wind Rose Diagram of Dhaka City

Sunshine Hours

The data of sunshine hours for a 31 years' period (1987-2017) was collected and analyzed. It reveals from the analysis that the monthly average sunshine hour varies from minimum of 3.97 hours/day in July to maximum of 7.74 hours/day in March. The variations of monthly average sunshine hours are shown in Figure 5.9.

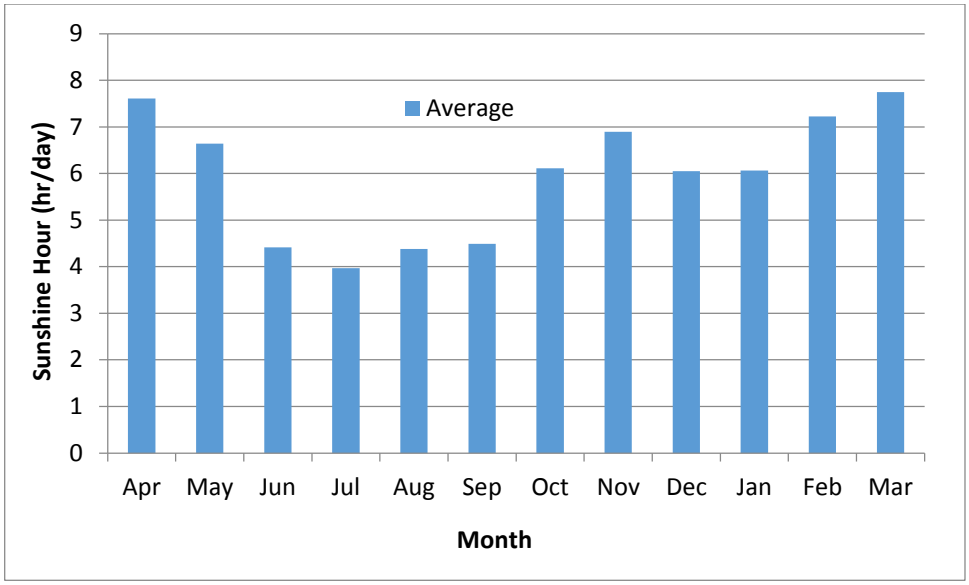


Figure 5.9: Monthly Variation of Sunshine Hours at Dhaka BMD Station (1987-2017)

Evaporation

The maximum and average monthly evaporation data collected from BMD station at Dhaka for a 29 years period (1983-2011) is shown in Figure 5.10. It is observed that the evaporation changes with increasing of temperature. The average of maximum evaporation in the area varies from 4.7 mm/day in January to 8.9 mm/day in March. On the other hand, the average evaporation varies from 1.28 mm/day in December to 2.76 mm/day in April.

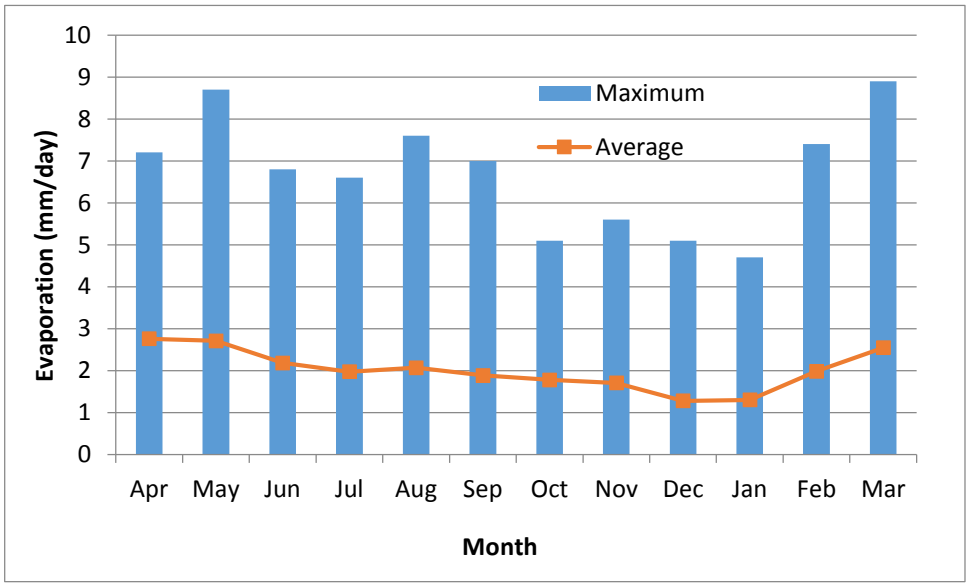


Figure 5.10: Monthly Variation of Evaporation at Dhaka BMD Station (1983-2011)

Evapotranspiration (ETo)

The maximum and average monthly ETo data collected from BMD station at Dhaka for 30 years (1979-2008) is shown in Figure 5.11. It is observed that the evapotranspiration changes with the increase of temperature and also with the change of humidity and wind speed. The monthly average of maximum ETo in the area varies from 3.2 mm/day in December to 7.72 mm/day in April. On the other hand, the average ETo varies from 2.06 mm/day in December to 4.96 mm/day in April.

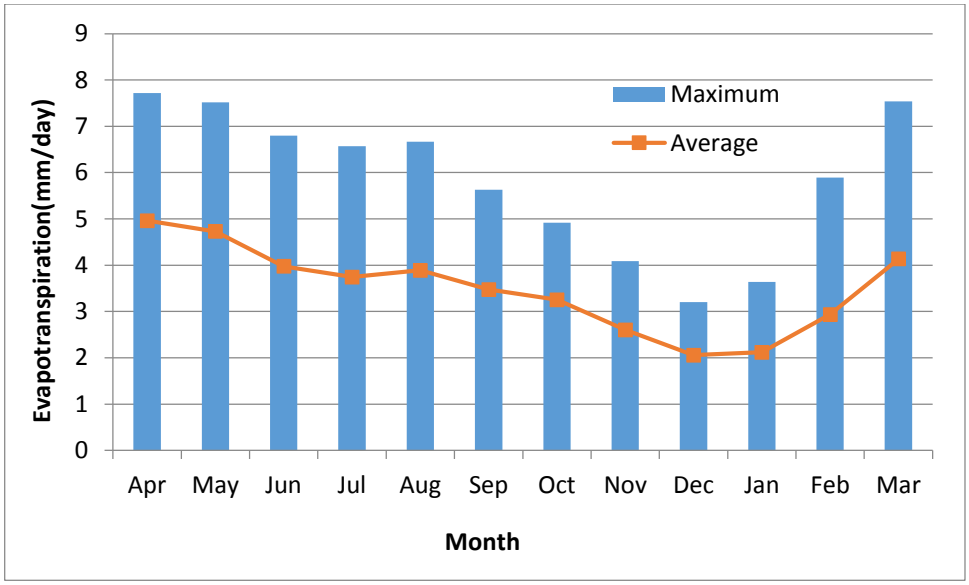


Figure 5.11: Monthly Variation of Evapotranspiration (ETo) at Dhaka BMD Station (1979-2008)

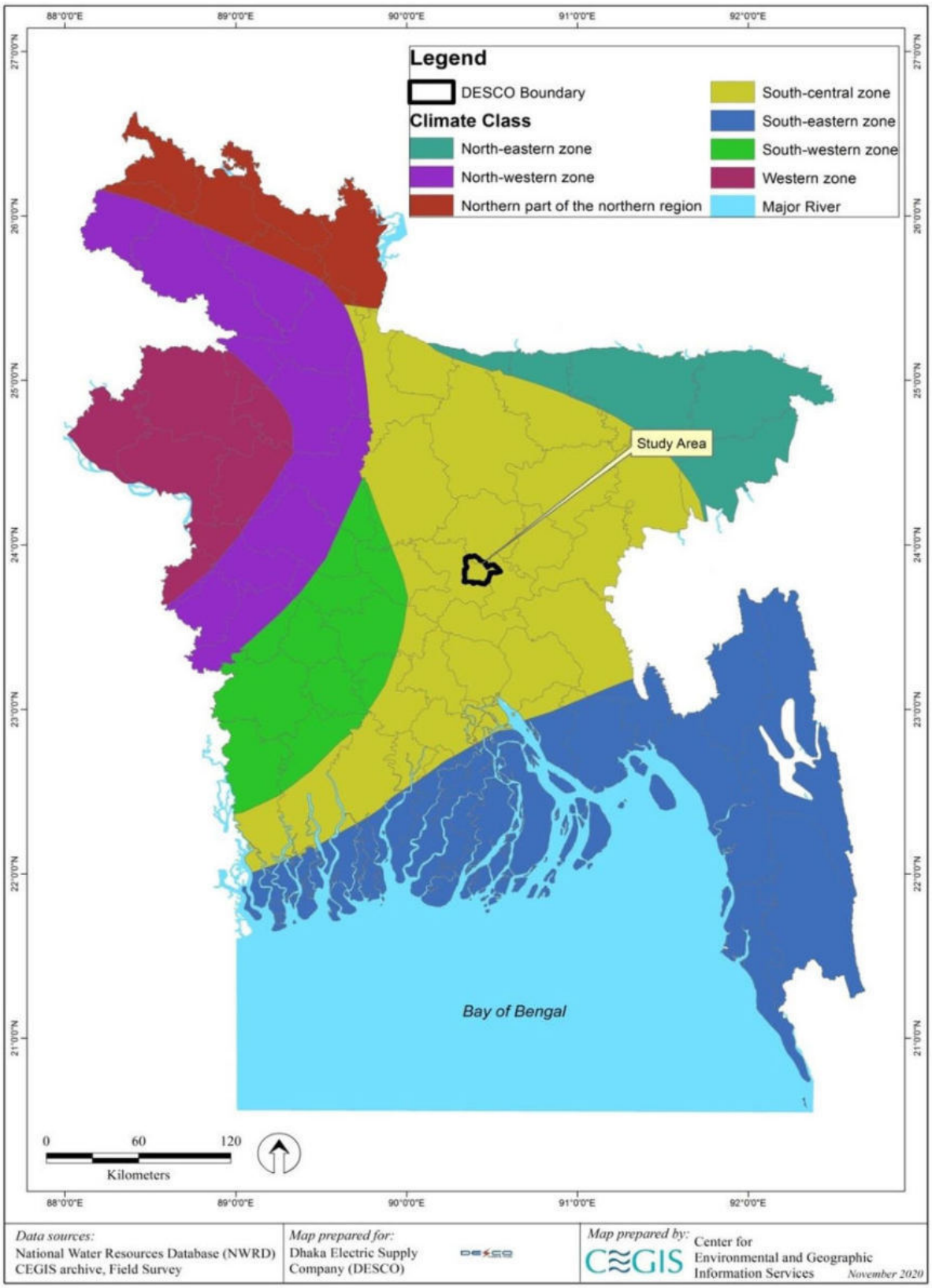


Figure 5.12: Climatology Map of Bangladesh Showing the Study Area

Climate Class

According to the map, the proposed DESCO project area falls under South-Central Zone. This is a transitory zone between the South-eastern, North-western and South-western zones and most of the severe hail storms, nor'westers and tornadoes are recorded in this area.

Climate Change

Bangladesh's NC3 reports average, daily maximum, and daily minimum temperature rises of 0.16°C, 0.2°C, and 0.12°C per decade respectively over the period 1977–2008.23 The Berkeley Earth dataset suggests an average temperature rise of 1.03°C in Dhaka over the period 1900–1917 to 2000–2017. Observations indicate that the temperature rise was strongest in the monsoon season (June–August). Bangladesh's NC3 also reports that no statistically significant changes in historical average annual precipitation have been measured. However, over the period 1975–2003, changes in the seasonality of precipitation were significant, with increases in the post-monsoon season in the range of 5–15% and decreases in the pre-monsoon season that typically less than 5%. Overall, from 2015-2100, Bangladesh's projected average minimum and maximum temperatures would remain similar throughout the years. For precipitation it is projected that year 2100 would see the maximum amount of precipitation close to 1800 mm.

5.2.3 Natural Hazards (Geological and Climate)

Seismicity

Bangladesh lies between 20°30' and 26°40' north latitude and 88°03' and 92°40' east longitude which is within an active seismic zone and the probability of earthquake is high. Tectonic framework of Bangladesh and adjoining areas indicate that Bangladesh is situated adjacent to the plate margins of India and Eurasia where devastating earthquakes have occurred in the past.

Bangladesh is surrounded by regions of high seismicity. The Indian Plate is moving northeast, slowly colliding with the Eurasian Plate. To the east, the Burmese Plate pushes west against the Indian Plate. These tectonic activities along with other reasons are the main causes of frequent earthquake or tremors in Bangladesh. So, the analysis of earthquake hazard is more of a regional concern than that of local. For example, an earthquake occurring in Nepal may cause damage in Bangladesh. So, regional earthquake analysis is necessary to predict any earthquake hazard in Bangladesh.

Considering the above aspect, Bangladesh has been divided into four generalized seismic zones (Map): Zone-I, Zone-II, Zone-III and Zone-IV on the basis of distribution of earthquake epicenters and morph tectonic behavior of different tectonic blocks (BNBC 2020). The study area covers some portion of Gazipur District (Tongi) and major portion of Dhaka City which falls under Zone-II. Zone-II comprising the central part of Bangladesh consists of the regions of recent uplifted Pleistocene blocks of the Barind and Madhupur and the western extension of the folded belt with the Bask seismic co-efficient of 0.20. The zone-II is extended from north-west to south-east of Bangladesh and holds middle class of risk among the four zones.

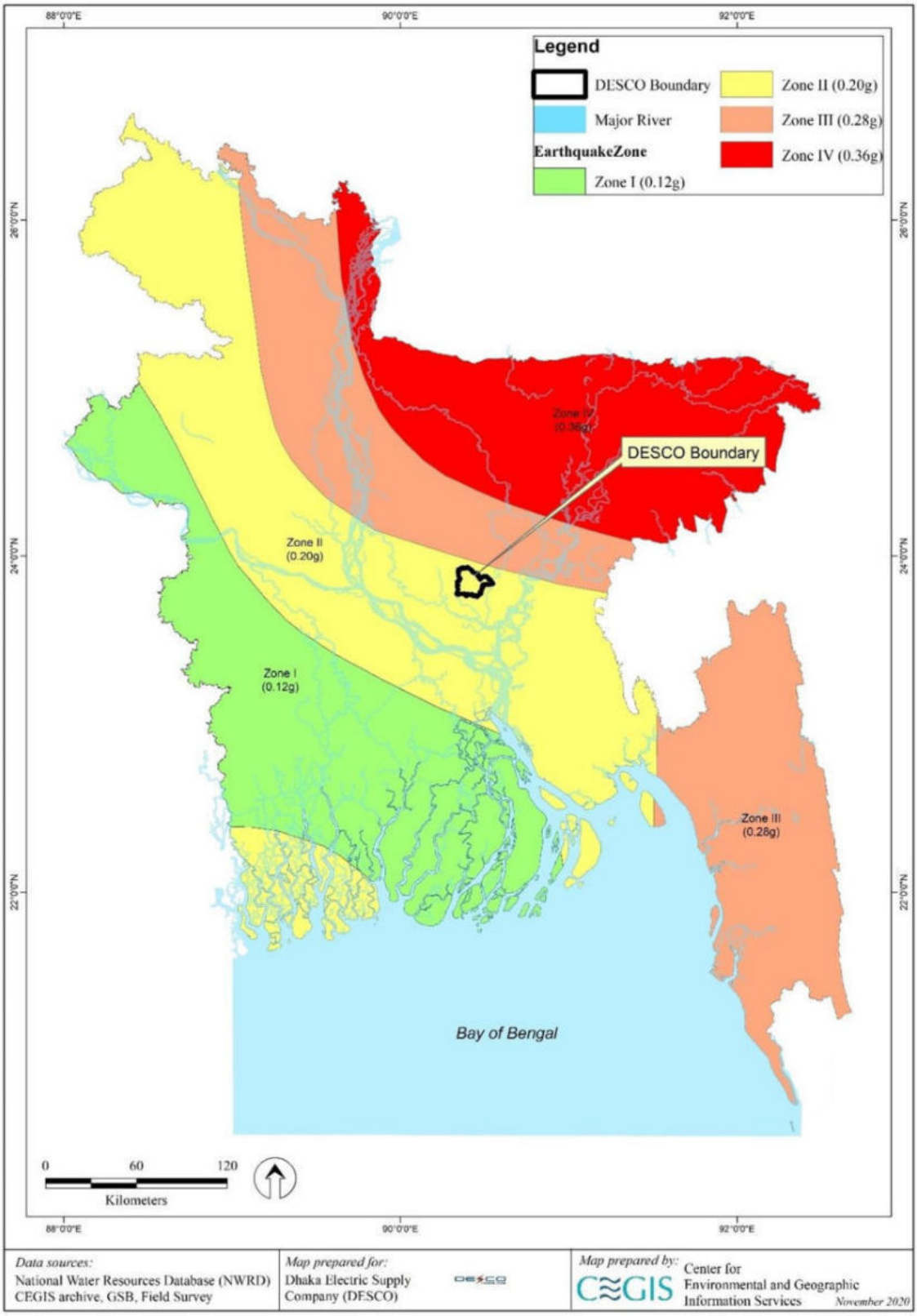


Figure 5.13: Seismic Map of Bangladesh Showing the Study Area (According to Seismic Zoning Map, 2020)

Landslide

The study area has plain topography and the districts of Dhaka, Gazipur and Narayanganj have very low susceptibility to landslides.

Climate Risk

Dhaka district does not have significant flood, storm surge, or drought risk but cyclone risk is moderate. Gazipur district does not have significant flood, storm surge, or cyclone risk but the drought risk which falls is moderate. However, Narayanganj district is extremely susceptible to floods and cyclone. Increase in minimum, maximum temperatures and precipitation might cause floods, cyclone, and droughts to increase in the future.

Drought

Droughts in Bangladesh are mostly seasonal in nature due to a deficit of rainfall in a particular season when surface water flows are reduced and groundwater and soil moisture depleted. Drought mostly affects Bangladesh pre-monsoon and post-monsoon. Two critical dry periods are distinguished. "Rabi" (December-February) as well as "Pre-Kharif" (March-May) drought occur due to the cumulative effect of dry days; higher temperatures during pre-Kharif and low soil moisture availability. "Kharif" droughts in the period June/July to October are created by sub-humid and dry conditions in the highland and medium highland areas.

Cyclones and Storms

Tropical cyclones generally strike Bangladesh in two seasons, March through July and September through December, with the greatest majority of storms arriving in May and October. Cyclones hit the coastal areas of Bangladesh every year, and on average a severe cyclone, with wind speed ranging 90–119 km per hour, strikes Bangladesh every three years. There are some evidences of local seasonal storms, popularly known as nor'westers *(Kalbaishakhi).* Severe nor'westers are generally associated with tornadoes. The frequency of nor'westers usually reaches a maximum in April, whereas it is low in May and minimum in March. Nor'westers and tornadoes are more frequent in the afternoon. Nor'westers may occur in late February due to early withdrawal of winter from the Shillong Plateau of India.

Floods and Waterlogging

Climate change will increase flooding intensity and damage over the country. Bangladesh Water Development Board (BWDB) measures water level and discharge of the river regularly throughout the country. To estimate the highest flood level around Dhaka City, water level data, collected by BWDB for the available four measurement stations have been used for the period of 1985 to 2020. The major flood events have been identified and highest flood level (HFL) has been estimated and given in **Table 5.1**. Dhaka, Gazipur and Narayanganj all fall in the very low category of flash flood hazard. Flooding in the monsoon is not a common phenomenon in the study area like in other areas of Bangladesh. However, Dhaka city faces extensive water logging during the monsoon (May to October) as a regular phenomenon when the water level of the surrounding rivers is higher than the internal drainage level, e.g., when the water level in the river increases the drainage capacity to the river is reduced. Localized flooding might affect the substations at Tongi and Airport area (Figure 14) as they are situated near a water body. Heavy rainfall causes inundation of the low-lying land around the proposed substation site at Tongi. Stagnation of water prevails for a few months at a depth range of 0.61-1.22 m. Thereafter, the water drains out through Tongi Khal, percolates into the ground or gets

evaporated. The other substation sites are located in premises already developed to avoid the risk of flood.

Table 5.1: Flood level in and around Dhaka for available BWDB's stations

Station Id	Station Name	River Name	Long (DD)	Lat (DD)	Flood Level (mPWD)				
					1988	1998	2004	2007	HFL
302	Mirpur	Turag	90.338	23.783	8.35	7.97	7.29	6.62	8.35
299	Tongi	Tongi Khal	90.404	23.882	7.84	7.54	7.13	6.87	7.84
179	Demra	Lakhya	90.505	23.723	6.92	7.11	-	6.2	7.11
42	Dhaka (Mill B.)	Buriganga	90.445	23.677	7.58	7.24	6.68	6.01	7.58

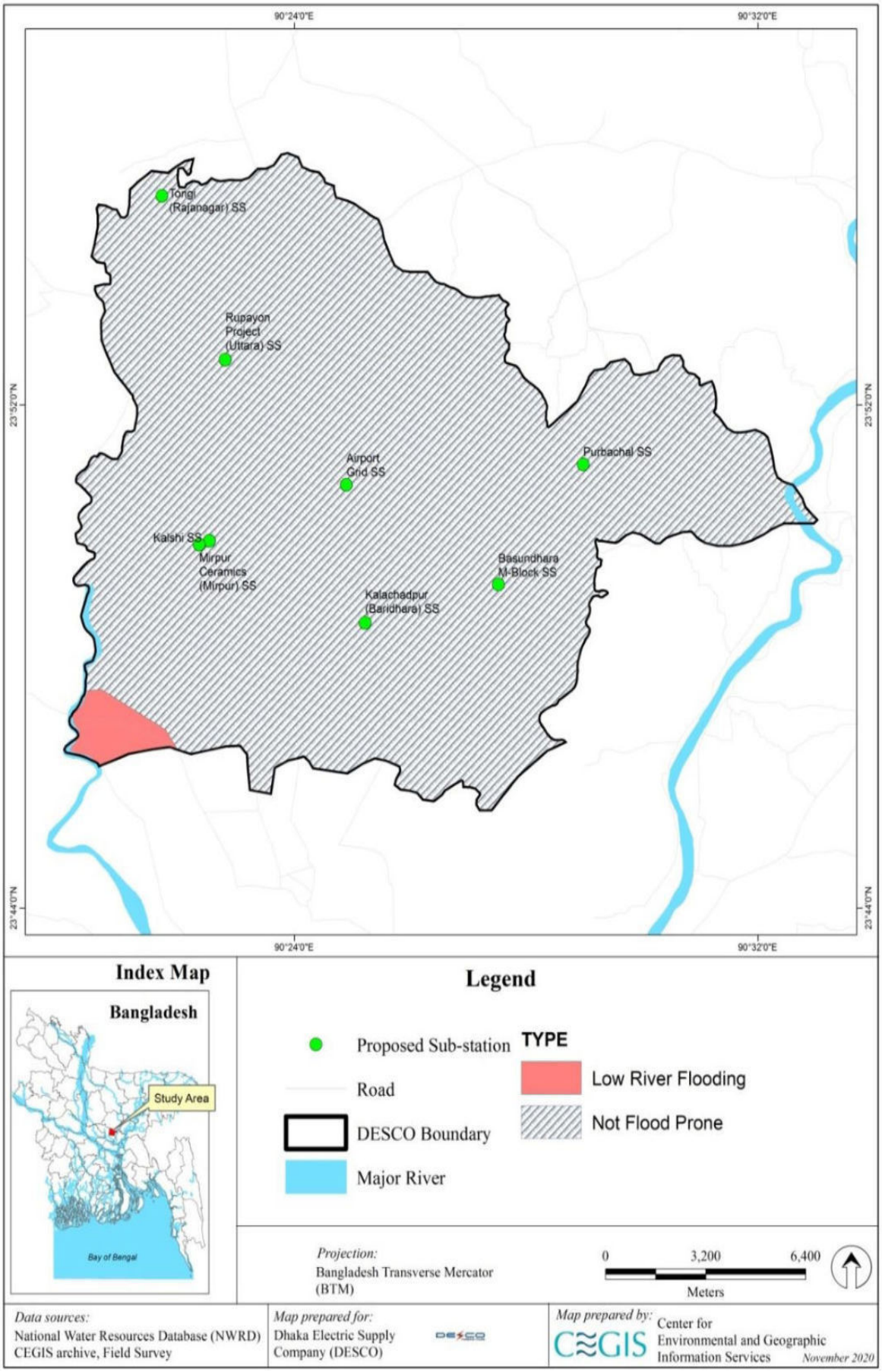


Figure 5.14: Flood Prone Zones within the DESCO Project Site

According to Figure 5.14, the only low-lying area within the project boundary is located at the south-west corner of the project site adjacent to the Turag River, which is approximately 2 kilometers away from the nearest proposed substation. The rest of the areas is High Land, which has lower chance of flooding inundation.

5.2.4 Water Resources

River System and Surface Water

There are two major rivers, namely Turag River and Balu River, observed within the study area. Aside from that, there are a number of smaller watercourses, including *beels* and *khals*. A brief description of the two rivers is presented below. The natural drainage system in Dhaka city comprises of several retention and detention areas including khals (canals), which are linked to the surrounding rivers. Rainfall runoff is accumulated in retention and detention areas and discharged to the surrounding rivers through the khals. The catchment waters of the substation sites are drained out through the nearby rivers/canals like the Balu and the Tongi Khal into Turag River. The site of the Tongi substation is located approximately 0.768 km away from the Tongi Khal. Similarly, the site of the proposed Purbachal substation is located around 2.68 km away from Balu River. There are also large waterbodies adjacent to Tongi and Airport substations; for former is a 3ha wetland whilst the latter is an enclosed reservoir. Purbachal substation supports a small pond. There are no waterbodies near to the other substations.

Turag River

The Turag River originates from the Bangshi River at Kaliakoir Upazila in Gazipur that receives significant runoff from the inland Gar areas. The Turag has split into two branches at Birulia Union under Savar Upazila. Of the two, one branch has fallen in the Bangshi (Savar) River in Kaundia Union, Savar and the main branch has fallen in Buriganga River under Aminbazar Union. The river is connected to the Balu River through the Tongi khal before joining to the Buriganga River at Mirpur. Turag also receives flows from the Karnatalia from its right bank at Mirpur. The Balu originates from the Gar areas and joins the Lakhya near Demra. Tongi khal normally flows from Turag to Balu in the monsoon when there is no tidal effect but the direction of flows gets reversed in the dry season due to lower water level in in the Turag and higher water level in the Balu caused by tidal influence in the Balu. There is tidal influence in the Turag all the year round in its downstream portion. The flow of water increases during monsoon and inundates both sides of the floodplains of the river. Different types of water vessels ply in the river throughout the year. There is a gauge station of Bangladesh Water Development Board (BWDB) at Mirpur. The danger level marked at this station is 5.94m (PWD). This river is categorized as class IV navigation by Bangladesh Inland Water Transport Authority (BIWTA).

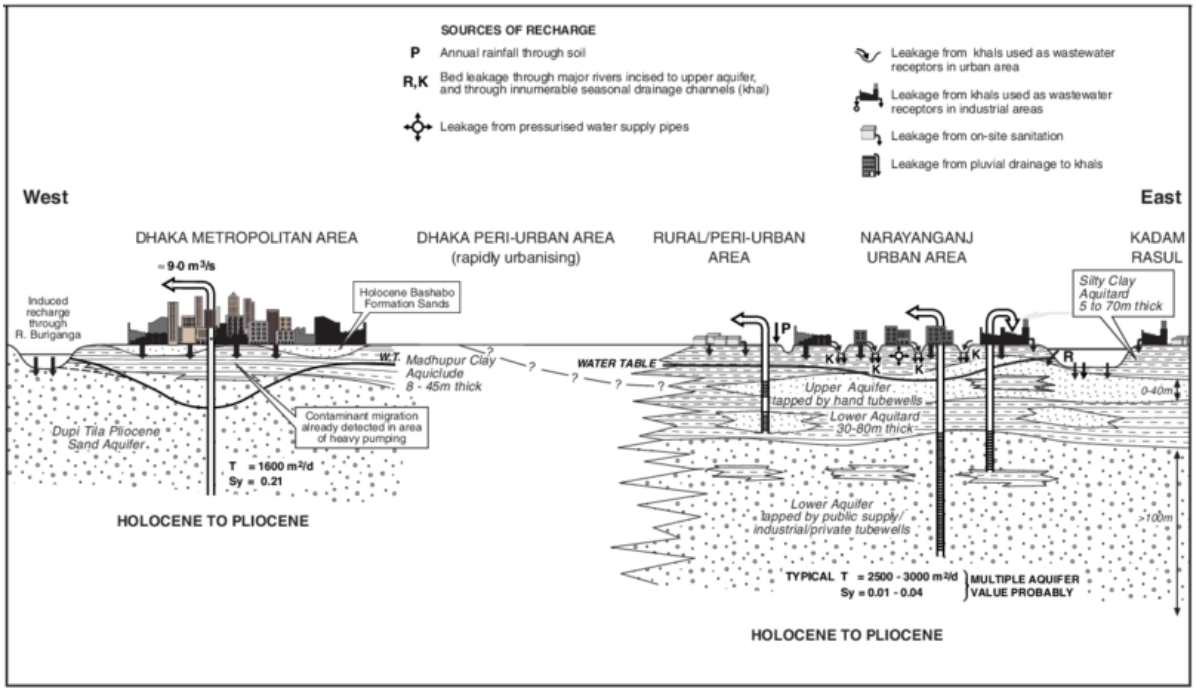
Balu River

The Balu River runs mainly through the extensive swamps of Beel Belai and those east of Dhaka, joining the Shitalakshya River near Demra. It has a narrow connection through the Suti Nadi near kapasia with the Shitalakshya, and also by way of the Tongi Khal with the Turag; there is also a link with the Shitalakshya near Kaliganj. Although it carries floodwater from the Shitalakshya and the Turag during the flood season, the Balu is of importance mainly for local drainage and access by small boats.

Groundwater

The layers forming the aquifers and aquitards of Dhaka have a scattered distribution but can be generalized into five layers: top soil, clay, fine sand, medium sand and coarse sand. Two different aquifer systems can be broadly distinguished, namely the deeper Dupi-Tila sands beneath the Madhupur clays, forming a confined aquifer to semi confined aquifer, and recent alluvium of the floodplains (east and west side of the Dhaka City) containing a shallow aquifer in semi-confined conditions.

For groundwater recharge, during the wet season, recharge is through vertical percolation from precipitation and surface runoff. However, in Dhaka, the aquifer layers are confined to semi-confined being with the deeper aquifer covered by a thick Pleistocene clay layer (known as Modhupur clay) with the top surface area of the shallow aquifer also covered with impervious surfaces, such as roads and buildings. The clay layer and impervious surfaces restrict or retard vertical percolation and prevent recharge of the aquifers. With the development of the urban area, unpaved areas, natural depressions and agricultural lands were replaced. In many cases, natural drainage canals and open water bodies were filled up for the development works further reducing the area for groundwater recharge. Therefore, most recharge of the deeper Dupi-Tila sand layers comes only from horizontal inflow which is insufficient to maintain groundwater balance considering the current rate of abstraction.



Source: www.researchgate.net/figure/Groundwater-setting-of-Narayanganj-Bangladesh_fig1_251359228

Figure 5.15: Groundwater Setting

Water Level and Water Quality

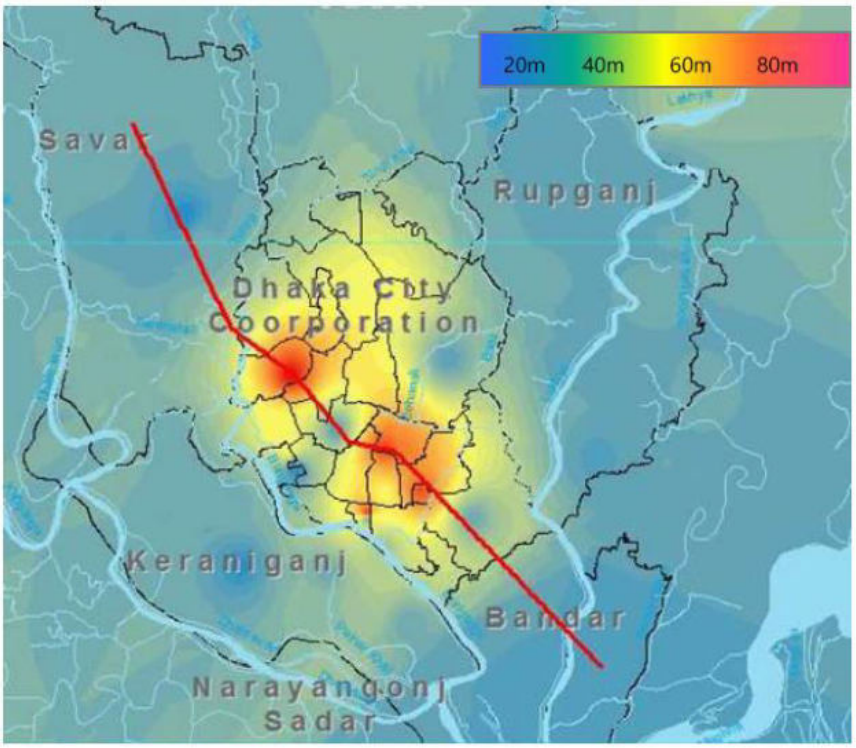
Surface Water

Within the study area there is no surface water level station found in either of the two designated rivers, flood levels are provided in **Table 5.1**. The water quality of Balu and Tongi Khal are vulnerable to pollution from sedimentation, illegal encroachment, and disposal of solid waste, untreated industrial effluents and municipal wastewater, runoff from various chemical, fertilizer and pesticides,

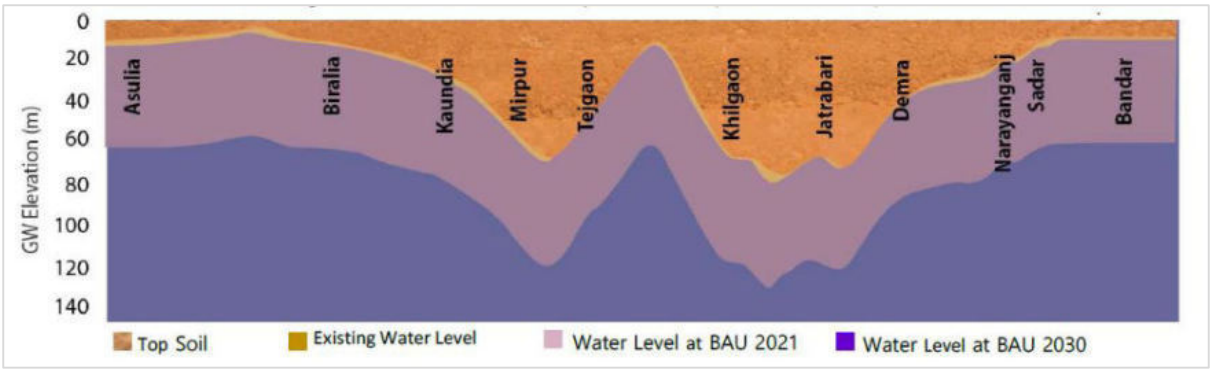
and oil and lube spillage in and around the operation of river transportation. Secondary data shows the concentration of pH, Chemical Oxygen Demand (COD), Biological Oxygen Demand (BOD), Turbidity, Dissolved Oxygen (DO), Total Dissolved Solids (TDS), Electrical Conductivity (Ec), Nitrate-Nitrogen (NO3-N), Ammonium-Nitrogen (NH4+ –N), Phosphate (PO4), Cadmium, Lead and Zinc are 7.22 to 8.33 mg/L, 103 to139 mg/L, 99.8-147 mg/L, 5.9 to 7.07 mg/L, 1.2 to 1.3 mg/L, 670 to 847 mg/L, 209 to 310 µS/cm, 4.12 to 5.96 mg/L, 4.45 to 5.81 mg/L, .742 to 1.097 mg/L, 3.45 to 5.38 mg/L, 5.13 to 7.29 mg/L and 39.3 to 72.1 at the monsoon and pre-monsoon seasons in the Tongi Khal and Balu river respectively.[16] According to the data, the level of contamination in Tongi Khal and Baul are severely polluted reducing the suitability of surface water for drinking, agriculture, fisheries and other uses.

Groundwater

Four groundwater level stations were found in the study area of the project. Their analyses and description are presented below. Between 1985 and the beginning of 2000, the groundwater level declined significantly from 10 to 30m bgl. This fall resulted in the start of the development of a depression (Figure 5.16) beneath the city. As groundwater abstraction continued to exceed the natural recharge rate the depression deepened. At present, the average depth (below ground level) of the groundwater table is about 78m, which may sink down to 312m by 2030. The groundwater abstraction, dumping of municipal and industrial waste, and seepage of contaminated surface water contribute to the degradation of groundwater quality in the shallow aquifer and upper Dupitila aquifer. High arsenic concentrations are naturally found in the shallow aquifer, but levels are highly variable so testing is required to determine if groundwater is safe for drinking water. Iron and manganese can also be present in high concentration. Overall, the groundwater quality of the deeper aquifer is still good.



[16] https://societyandchange.com/uploads/1509362204.pdf

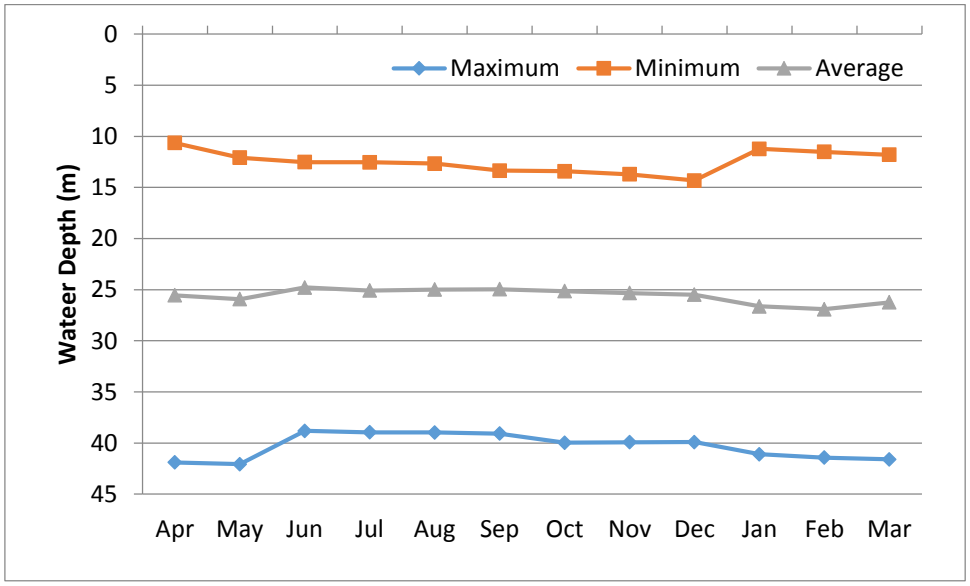


Source: https://2030wrg.org/wp-content/uploads/2019/11/GW-Report-Final-Peer-Reviewed.pdf

Figure 5.16: Groundwater Levels in Dhaka City

Station DHA001

The groundwater data of BWDB observation well around Dhaka (Station DHA001) was collected from NWRD-CEGIS database archives for the period of 1984 to 2013. The average of 30 years data (Figure 5.14) shows that the depth of groundwater level from the ground surface sinks in the dry season, with the highest average groundwater depth in February. Conversely, the water table rises during monsoon due to recharge by rain water and peripheral river water. Consequently, the lowest, shallowest depths of groundwater can be observed from June to October. The monthly maximum and minimum depth of groundwater from the ground surface during this period are also shown in Figure 5.17.

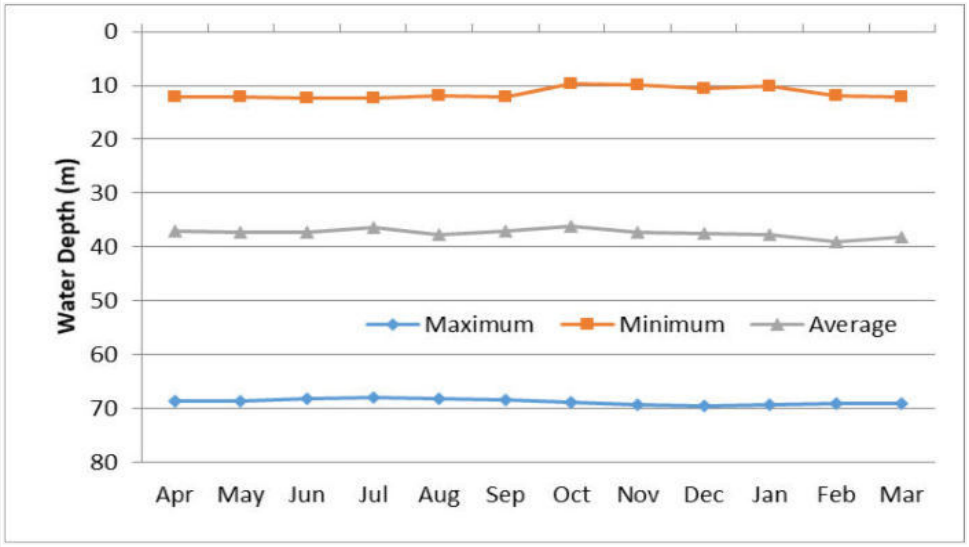


Source: NWRD, BWDB well station DHA001

Figure 5.17: Depth of Groundwater Near Baridhara Proposed Substation at DHA001 Station

Station DHA010

The groundwater data of BWDB observation well around Dhaka (Station DHA010) shows the same pattern. The monthly maximum and minimum depth of groundwater from the ground surface in the 30-year period between 1984 – 2013 is shown in Figure 5.18.

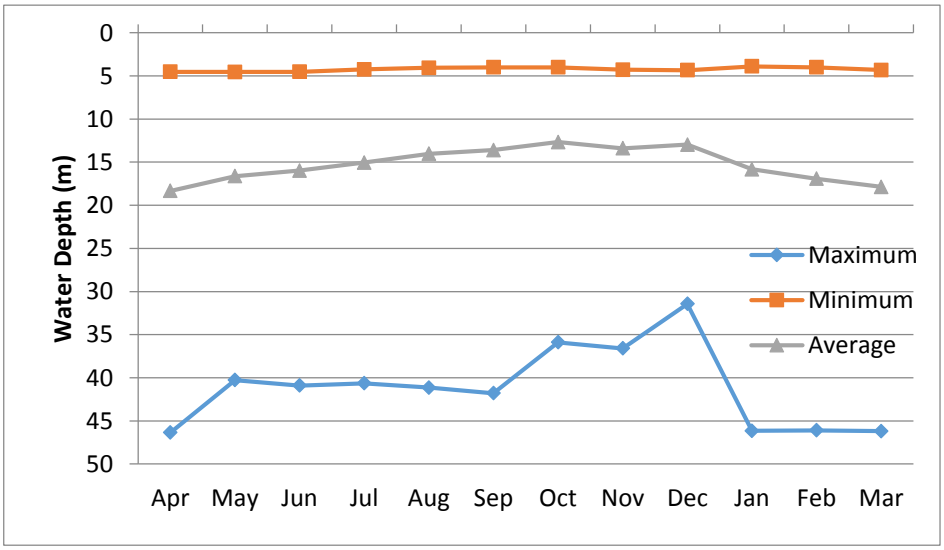


Source: NWRD, BWDB well station DHA010

Figure 5.18: Depth of Groundwater Near Mirpur and Kalshi Proposed Substation at DHA010 Station

Station GAZ020

Data collected at this station shows a similar pattern, too. The monthly maximum and minimum depth of groundwater from the ground surface during this period are also shown in Figure 5.19**.**

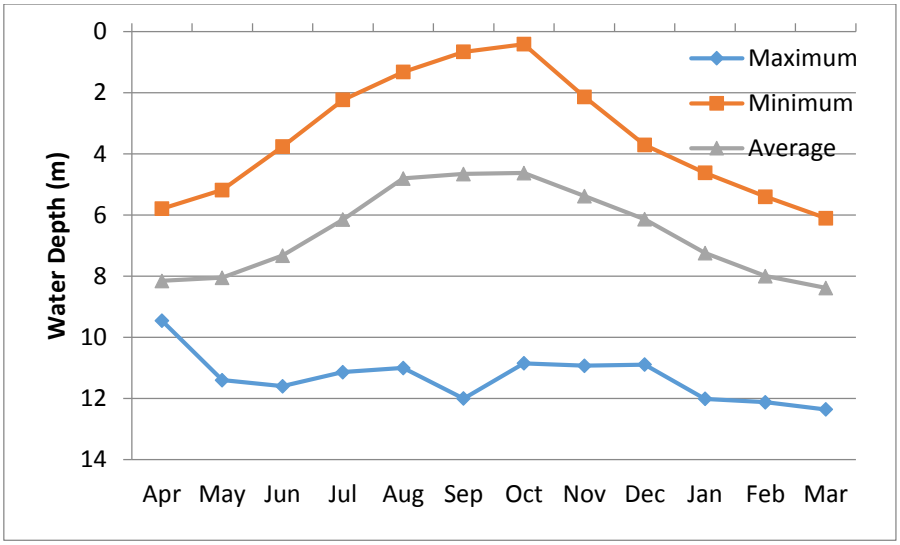


Source: NWRD, BWDB well station GAZ020

Figure 5.19: Depth of Groundwater Near Tongi and Uttara Proposed Substation at GAZ020 Station

Station NAG008

For Station NAG008, a similar pattern can be seen, based on the 30-year data (Figure 5.20.).



Source: NWRD, BWDB well station NAG008

Figure 5.20: Depth of Groundwater Near Purbachal Proposed Substation at NAG008 Station

Water Resources

The proposed Airport, Kalshi, Mirpur, Bashundhara, Kalachadpur (Baridhara) and Uttara (Rupayan City) substations lie within the service area of DHAKA Water Supply and Sewerage Authority (WASA) who will supply the water for construction and operation of the substations. At present the service area of Dhaka WASA extends to Mirpur and Uttara in the north and to Narayanganj in the south. As WASA supply the water, the water requirements for these substations can be met by 'supply water' and will not cause water rights conflict with other users. From 2018-19, Dhaka had a daily water demand of 2.45 billion liters and 78% of the water demand was met by extracting groundwater from underground aquifers with the rest from surface water. Dhaka WASA currently has 887 deep tube wells for extracting groundwater. There are also numerous private tube wells within the districts. In the Dhaka WASA area, there are about 1,570 with a combined authorized production capacity of 68.5 MLD.

During the field visits, the local community at the other substations stated that, to their knowledge, the construction activities in the surrounding areas are usually conducted using groundwater. Use of private groundwater will be needed at Purbachal substation due to lack of supply or surface water. For Tongi substation it is also likely that groundwater will be used since the waterbody is artificially pumped out in the dry season. There is currently adequate groundwater availability here to meet the water demand. However, Dhaka WASA recognize the need to reduce the dependence on groundwater.

Due to increased abstraction and a reduced recharge area as a result of urban development, the annual water decline rate for Dhaka city is 3m per year. If the demand increases, it may reach 5.1 m per year in 2030. If preventive measures are not taken groundwater levels will fall to 100 to 150 m by 2050. The upper well casing length of deep tube wells is having to increase to keep pace with the lowering static water table. However, the upper aquifer may run out of water, especially in the dry season, by year 2030. This will likely affect the industrial zones at Savar, Ashulia, Tongi and Narayanganj leading to land subsidence and shortfalls in drinking water supply from groundwater sources.[17] Dhaka WASA has surface water treatment plants but although there is significant flow available the poor water

[17] https://2030wrg.org/wp-content/uploads/2019/11/GW-Report-Final-Peer-Reviewed.pdf

quality of the surface water intake means treated water may not meet national and WHO drinking water standards.

5.2.5 Environmental Quality

Noise Level

Daytime noise levels were measured by CEGIS for a one-hour duration at sensitive receptor locations near the proposed substation sites and at key crossing locations of the underground transmission lines (Table 5.3). Though the measurements were taken over an hour the average which would be comparable to standards/guidelines was not recorded, only the minimum and maximum. Further noise measurements were not taken at all substations included in the scope of works and the night time noise was also not measured. These gaps will need to be addressed through pre-construction monitoring over a 24-hour period (e.g., 24 x 1hr LAeq measurements) which should be undertaken in dry weather at all substation/bay extension sites to provide a robust baseline for monitoring against.

The noise standards/guidelines that are applicable to the study area depend on the nature of the surrounding environment. The Noise Pollution (Control) Rules 2006, of Department of Environment (DoE), Bangladesh has defined standard noise levels which are presented in Table 5.2. Table 5.3 summarizes the relevant WHO guidelines from the IFC/World Bank Group Environmental Health Standard (EHS) Guidelines pertaining to noise.

Table 5.2: Standards of Noise Levels for Different Zones of Bangladesh (DoE)

Sl. No.	Category of Areas	Standards (dBA) (no period given)	
		Day	Night
1	Silent zone[18]	50	40
2	Residential zone	55	45
3	Mixed zone (mainly residential area, simultaneously used for commercial and industrial purposes)	60	50
4	Commercial zone	70	60
5	Industrial zone	75	70

Table 5.3: Noise Level Guidelines (EHS, World Bank)

Receptor	One Hour LAeq (dBA)	
	Daytime 07:00 - 22:00	Nighttime 22:00 - 07:00
Residential; institutional; educational	55	45
Industrial; commercial	70	70

Source: WBG EHS Guidelines, 2007

For residential receptors the standards are the same but Bangladesh has a more stringent silent zone in the vicinity of sensitive receptors like schools. The standards for commercial and industrial zones are not directly comparable, as the zones have been grouped together differently by DoE and WHO,

[18] Area up to a radius of 100 meters around hospitals or educational institutions or special institutions/establishments identified/to be identified by the Government is designated as Silent Zones where use of horns of vehicles or other audio signals, and loudspeakers are prohibited.

the Bangladesh standards are more stringent for commercial areas at night but less stringent in the case of daytime industrial areas.

Table 5.4 shows the measured noise levels in the daytime at some key locations in the study area. The maximum measured daytime noise levels are elevated on occasion, but the minimum only exceeds national noise level standards at the earlier proposed substation site at Purchabal which was located close to the road and nearby construction activities—the substation site has been relocated since noise monitoring was completed. Similarly, they are exceeded by the maximum noise level in the mixed zone near Balu Bridge adjacent the bridge at Purbachal. At other sites the levels are within the national noise level standards.

Table 5.4: Daytime Noise Levels in the Study Area

Sl. No.	Location	Global Positioning System (GPS Reading	Values (dBA)	Area Category	Date of Noise Level Measurement
1	Former Tongi Substation Site at Darail (Previous Site)	23°55’18.9858” N 90°21’42.8375” E	41.3-45.5	Residential Zone	07.10.2020
2	Tongi Khal Adjacent Bazar	23°54’59.486” N 90°21’19.112” E	51.6-62.8	Commercial Area	07.10.2020
3	Former Purbachal Substation Site (Previous Site)	23°51’5.60556” N 90°28’58.54224” E	59.1-61.7	Residential Zone	08.10.2020
4	Balu river Aadjacent Bridge	23°50’13.98068” N 90°28’39.23007” E	51.5-66.2	Mixed Zone	08.10.2020
5	Tongi Shataish Bazar	23’55'5”52"N 90’22'12”08"E	52.5-62.2	Commercial Zone	07.10.2020
6	Bashudhara M Block	23°’49'8.26”32"N 90’27'32.”81"E	48.7-54.6	Residential Zone	08.10.2020
7	Shopnonogor Housing	23°49’53.19” N 90°22’35.27” E	49.1-52.7	Residential Zone	13.10.2020
8	Kalachadpur (Baridhara)	23°48’32.6938” N 90°25’13.6337” E	48.9-54.6	Residential Zone	13.10.2020
9	Rupayan City, Uttara	23°52’42” N 90°22’47” E	47.3-53.3	Mixed Zone	12.10.2020
10	Kaola Housing at Airport	23°50’43” N 90°24’54.0776” E	48.8-54.5	Residential Zone	12.10.2020

Source: CEGIS field survey, August, 2020

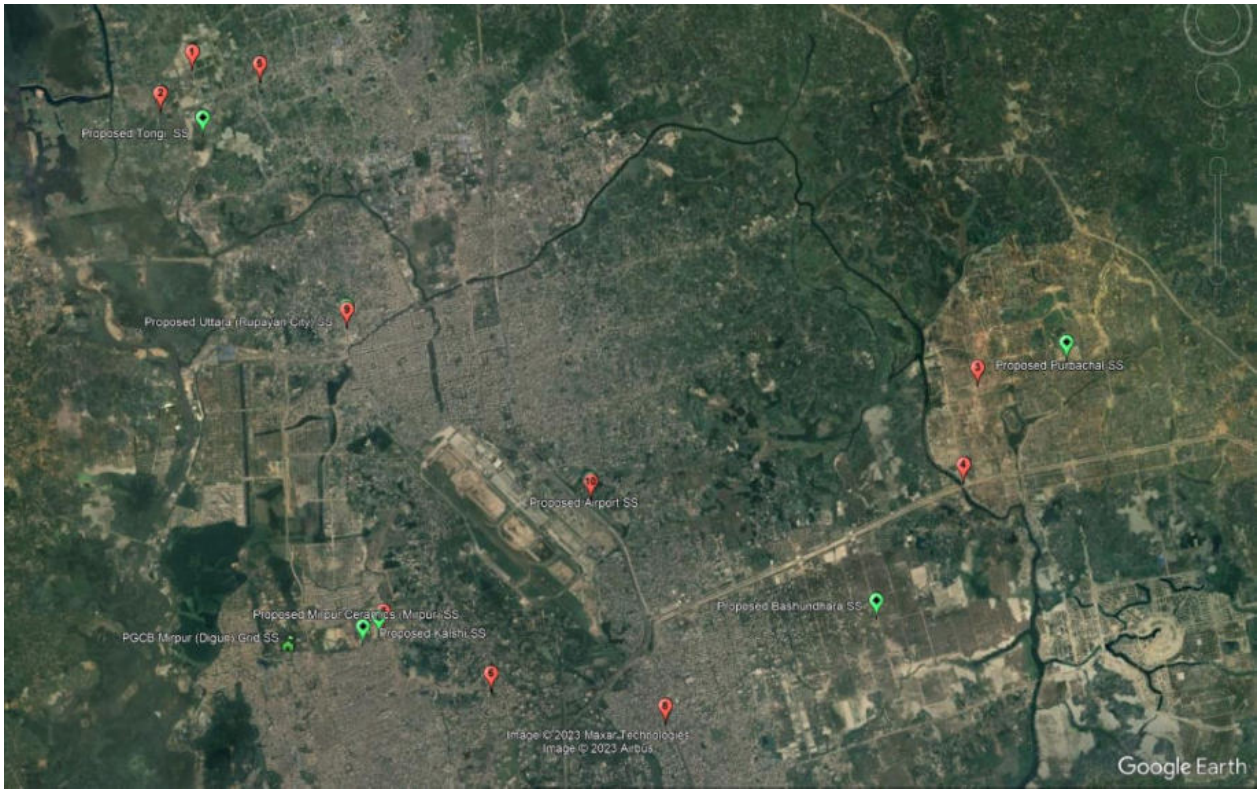


Figure 5.21: Map Showing Noise Survey Sites

Water Quality

Both surface and groundwater samples were collected by CEGIS at various locations in and around the project area as shown in Figures 5.22 and 5.23. Some parameters were tested in-situ, others were analyzed in the laboratory by CEGIS, as illustrated in Table 5.5 which also lists the GPS coordinates of the sampling locations. Since surface and ground water samples were not taken at all substation locations (e.g., the waterbodies immediately adjacent to Airport and Tongi substations) this gap will need to be filled through pre-construction baseline surveys to provide a robust baseline to monitor against.

The results illustrate that without treatment the water is unlikely to be suitable for drinking water purposes, but it can be used on the construction sites for purposes such as dust suppression and wheel washing.

Groundwater quality is better than surface water quality.

Table 5.5: Sampling Locations and Parameters

SL	Water Source	Location	GPS	Parameters	
				Laboratory	In-situ
1	Former Purbachal proposed substation (Previous Site) Sample: GW01	Purbachal	23°51’5.60556” N 90°28’58.5422” E	EC, TDS, DO, Salinity, Turbidity, pH, nitrate, phosphate, sulphate, iron, silica, Arsenic	Temp, TDS, EC, Salinity
2	Former Bashundhara Proposed Substation (Previous Site) Sample: GW02	Bashundhara M Block	23°48’31.712” N 90°26’39.84” E		

SL	Water Source	Location	GPS	Parameters	
				Laboratory	In-situ
3	Kalachadpur (Baridhara) Proposed Substation Sample: GW03	Baridhara Residential Area	23°48'32.6938" N 90°25'13.6337" E		
4	Shopnonogor Housing Sample: GW04	Mirpur	23°49'53.19" N 90°22'35.27" E		
5	Rupayan City Sample: GW05	Uttara Residential Area	23°52'42" N 90°22'47" E		
6	Kaola Housing Sample: GW06	Kaola, Opposite Dhaka international Airport	23°50'43" N 90°24'54.0776" E		
7	Tongi Jheel Water Sample: GW07	Tongi	23°53'41.4" N 90°21'40.565" E		
8	Kaola Housing Sample: SW01	Kaola, Opposite Dhaka international Airport	23°50'43" N 90°24'54.0776" E		
9	Tongi Khal Sample: SW02	Rajnogor, Tongi	23°5'59.4863" N 90°21'19.1122" E		
10	Balu River Sample: SW03	Tongi Jheel, Tongi	23°50'13.98" N 90°28'39.23" E		
11	Airport SS: SW04	Kaola	23°50'46.35816" 90°24'47.71584" E		

Table 5.6 presents the values of the in-situ measurements of water quality parameters of the study area with reference to the DoE standard. These in-situ tests were done where surface water was found in proximity to the substations and 132 kV and 33 kV transmission and distribution lines. However, as the locations of the Tongi and airport substations were shifted following the water sampling program no additional water samples were taken at the new waterbodies which are adjacent to them. It shows that, except for temperature, the values of in-situ tested parameters are within the DoE standard.

Table 5.6: In-situ Tests for Water Quality of the Study Area

Sample No.	Water source	Water quality parameter			
		TDS (g/l)	Temperature (°C)	EC	Salinity
GW-01	Former Purbachal proposed substation (previous site)	82.6	28.6	164.6	0.3
GW-02	Former Bashundhara Proposed Substation (previous site)	472	31.5	944	1.9
SW-02	Tongi Khal	58.4	30.3	117	0.2
SW-03	Balu River, Purbachal	74.7	30.5	149.5	0.3
DoE Standard Value (Bangladesh)		***1000***	***20-30***	***n/a***	***n/a***

Source: Measured in situ, CEGIS field visit, August, 2020

Table 5.7 presents the CEGIS Laboratory results for various water quality parameters of the study area with reference to the DoE standard.

Table 5.7: Laboratory Test Result of Water Quality Parameters in the Study Area for Surface and Groundwater

Sl.	Sample Source (River)	Electric Conductivity (EC)	Total Dissolved Solid (TDS)	Dissolved Oxygen (DO)	Salinity	Turbidity	pH	Nitrate (NO_3^-)	Phosphate (PO_4^{3-})	Sulphate (SO_4^{2-})	Iron (Fe)	Silica (SiO_2)	Arsenic (As)	Remarks
Unit		**(µS/cm)**	**(mg/L)**	**(mg/L)**	**(ppt)**	**(NTU)**	**-**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppb**	
1	Purbachal proposed substation (previous site) **Groundwater*** (GW01)	257.5	128.4	5.34	0.05	0.234	7.67	1.39	0.1117	0	0	65.60	0.001	Reduced DO levels, high silica
2	Former Bashundhara proposed substation (previous site) **Groundwater** (GW02)	1667	583	6.21	0.53	0.436	7.36	0.40	0.0734	51.80	0	59.30	0	High silica
3	Kalachadpur (Baridhara) Proposed Substation **Groundwater** (GW03)	243.3	117.2	6.65	0.03	1.44	8.15	1.28	0.0096	0	0	61.75	0	All the parameters are within limit. The water may be used for drinking if necessary.
4	Shopnonogor Housing **Groundwater** (GW04)	49.1	24.5	6.77	0	0.77	8.20	0.67	0	0.01	0	12.83	0	Turbidity of the water is more than limit
5	Rupayan city **Groundwater** (GW05)	239	119.5	5.56	0.04	0.84	7.70	0	0.0095	0	0	63	0	All the parameters are within limit, apart from reduced DO.
6	Kaola Housing **Groundwater**	142.7	71.3	5.97	0	0.66	7.61	0.27	0.0042	0	0	33.08	0	Amount of dissolved

Sl.	Sample Source (River)	Electric Conductivity (EC)	Total Dissolved Solid (TDS)	Dissolved Oxygen (DO)	Salinity	Turbidity	pH	Nitrate (NO_3^-)	Phosphate (PO_4^{3-})	Sulphate (SO_4^{2-})	Iron (Fe)	Silica (SiO_2)	Arsenic (As)	Remarks
Unit		**(µS/cm)**	**(mg/L)**	**(mg/L)**	**(ppt)**	**(NTU)**	**-**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppb**	
	(GW06)													oxygen is less than 6
7	Tongi Jheel Water **Groundwater (GW07)**	275.6	137.8	3.81	0.06	13.6	6.90	3.0516	0.3893	12.785	-	0	-	Elevated turbidity, reduced DO
8	Kaola Housing, Airpot **Surface Water** (SW01)	306	153	6.68	0.07	18.3	8.40	4.12	0.0004	50.18	0.0266	10.26	0	Other than turbidity, no exceedances of the national standards.
9	Tongi Khal Water **Surface Water** (SW02)	147	73.1	5.77	0	30.6	7.68	3.24	0.0040	9.01	0	24.85	0	High turbidity, reduced DO levels
10	Balu River Water **Surface Water** (SW03)	186	93.2	5.10	0	6.16	7.43	1.53	0.0123	12.07	0	0	0	All the parameters are within limit apart from reduced DO.
11	Airport SS **Surface water (SW04)**	462	231	5.37	0.16	97.3	7.08	6.1426	3.6255	15.882	1.0476	126.1	0	High turbidity, low DO.
Bangladesh Standard		**-**	**1000**	**6**	**-**	**10**	**6.5-8.5**	**10**	**6**	**400**	**0.3-1.0**	**0**	**50**	

*Note:*DPHE Test Results Report givening in Appendix III.*

Source: CEGIS field survey and CEGIS Laboratory test, August 2020 & October 2021 (Tongi/Purbachal)

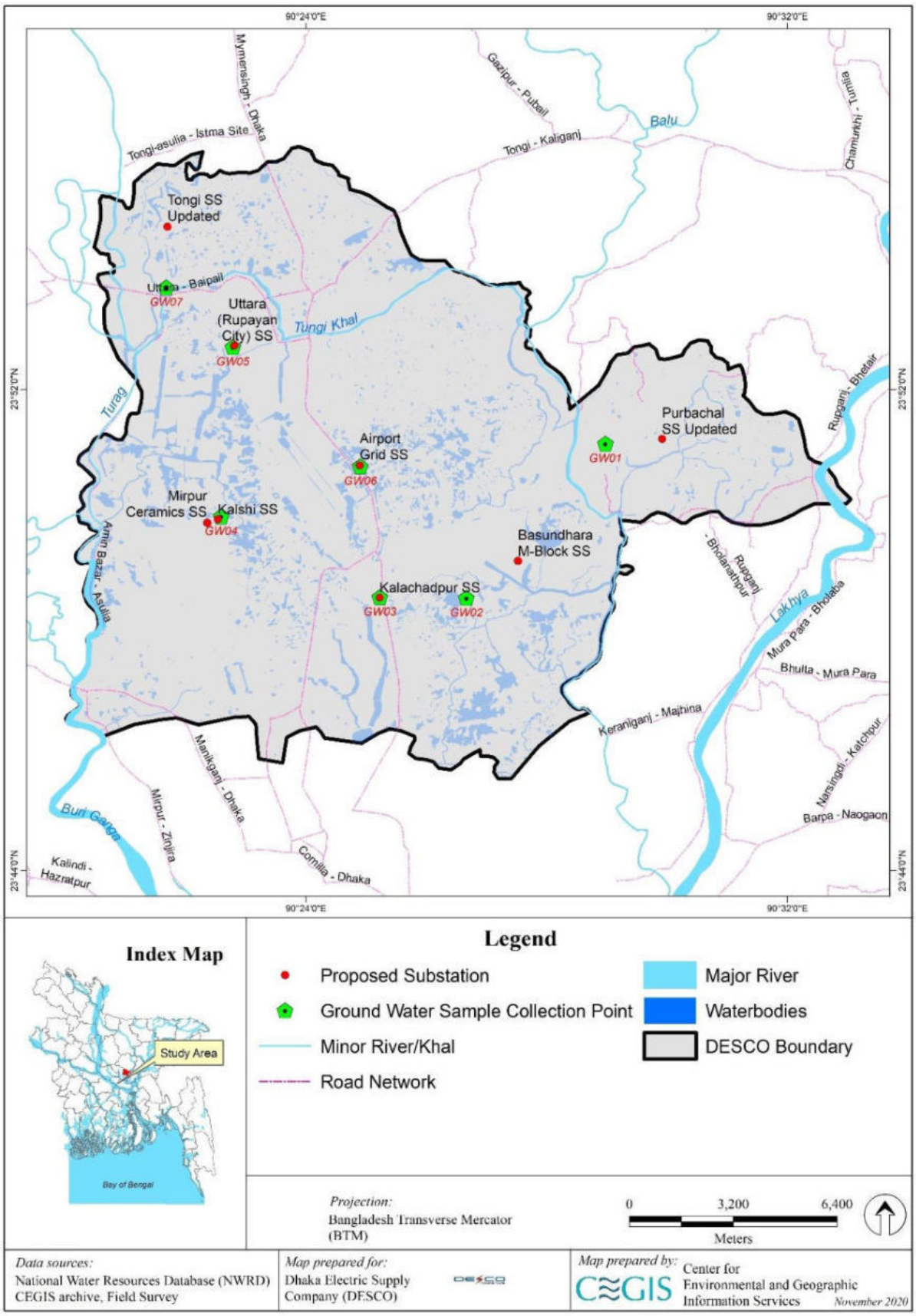


Figure 5.22: Map Showing Ground Water Sample Collection Point

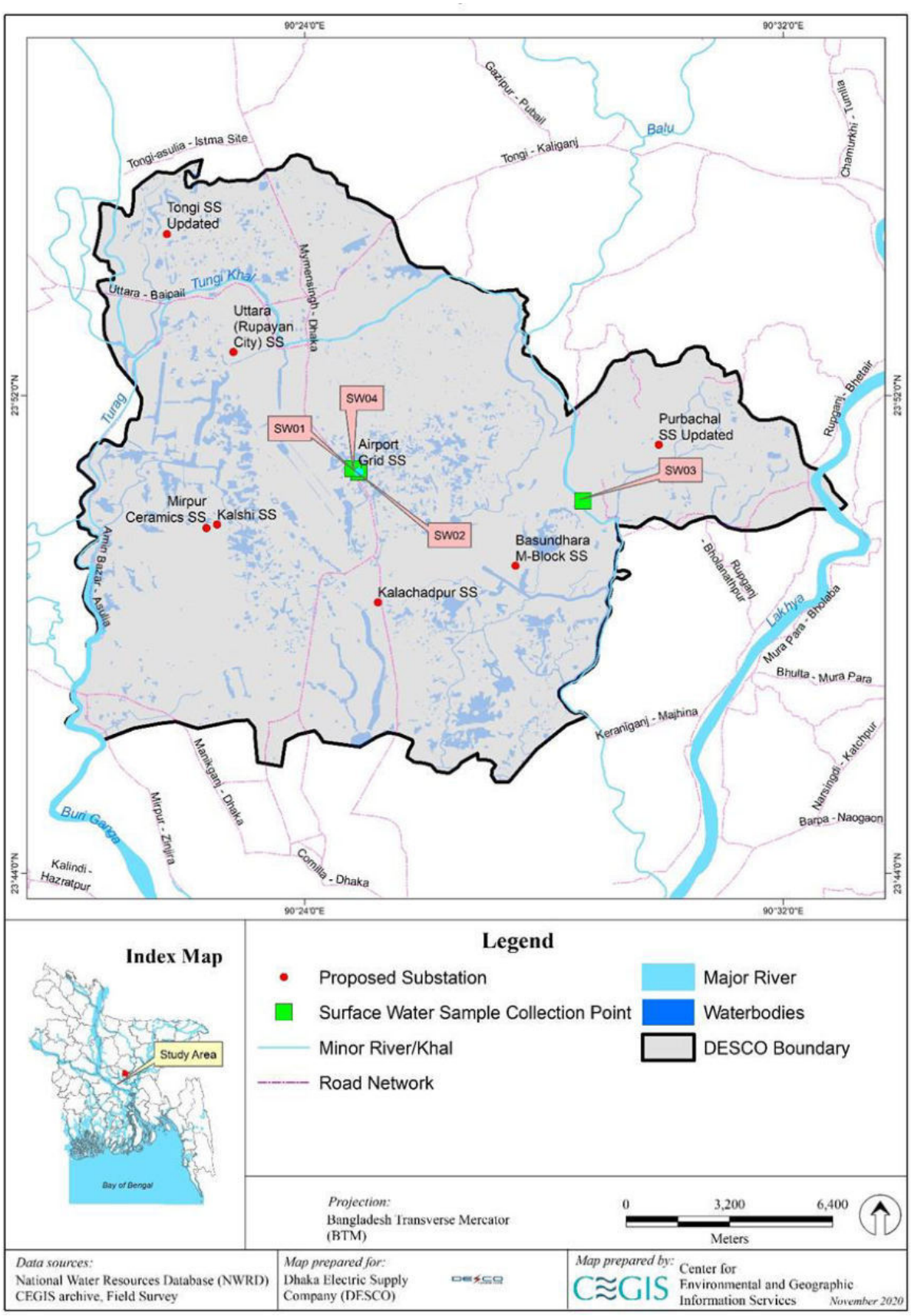


Figure 5.23: Map Showing Surface Water Sample Collection Point

Air Quality

The ambient air quality of the study area is described using the available secondary air quality data. Primary data will need to be collected at the substations/bay extension sites over 24 hours to provide a robust site-specific baseline for monitoring against.

100% of Bangladesh's population are exposed to air pollution levels exceeding WHO guidelines. Major sources of particulate matter (PM10 and PM2.5) are vehicular and brick kiln emissions, re-suspension from roads and construction sites, and refuse burning by slum dwellers; with clear seasonal variation and elevated concentrations during the winter due to seasonal fluctuations of the emissions, and meteorological effects including wind direction and mixing heights. A number of factors such as temperature, rainfall, humidity, sunshine hours and wind speed from different directions are responsible for the air quality of a certain area.

The Department of Environment (DoE) monitors ambient air quality continuously at monitoring stations distributed all over the country. The nearest monitoring stations to the project site are CAMS-3, Darus-Salam, Dhaka and CAMS-4, Gazipur (Figure 5.24). Therefore, the monitoring data of CAMS-3 and CAMS-4 has been considered to determine the ambient air quality baseline status. The data presented in Table 5.8 and Table 5.9 are based on monitoring results of air quality parameters collected from DoE from January 2018 to December 2021. The study has also considered the monthly air quality monitoring report published by the Clean Air and Sustainable Environment (CASE) project, DoE, for January to July, 2018 and April, June 2019. The rest of the air quality monitoring data has been analyzed by CEGIS. During data quality control some inconsistent and outliers data were flagged as invalid and not included in the analysis.

The Dhaka and Gazipur monitoring results show that during the dry period months, November to March, the concentration of particulate matter, i.e. dust, exceeded the national standard during 2018-2021 due to higher concentration of particulate matter in the air. Alongside the natural process, the ongoing massive development activities in Dhaka and Gazipur districts might be one of the main reasons for higher concentration of particulate matter. Conversely, during the monsoon season, April to October during 2018-2021, the concentration of all particulate matter is within the permissible limit nationally. However, the particular matter levels consistently exceed the annual WHO guidelines of 2021 so the airshed can be considered as degraded and any additional pollution should not exacerbate the existing situation.

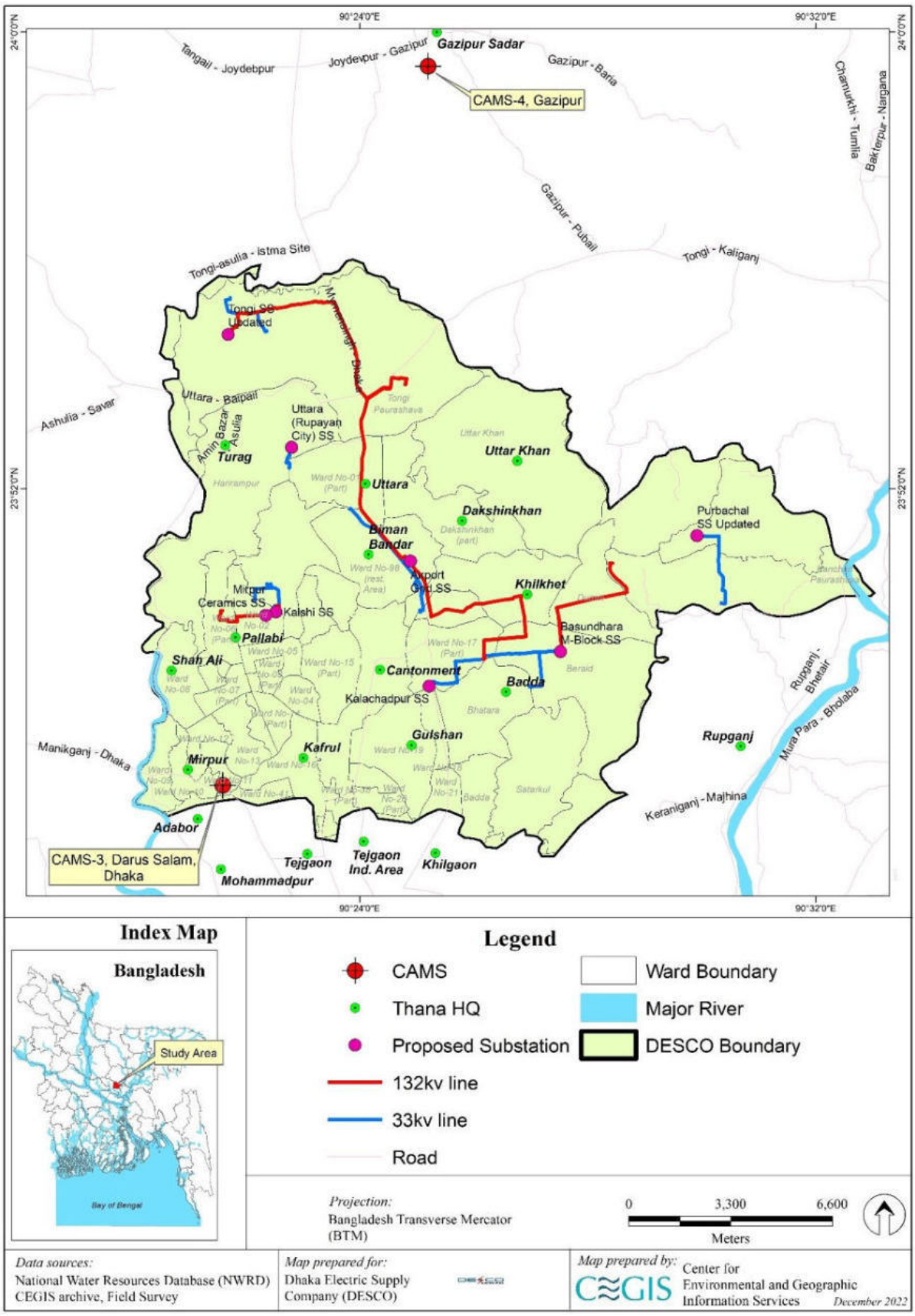


Figure 5.24: Continuous Air Quality Monitoring Station Nearest to the Study Area

Table 5.8: Summary Air Quality Data Measured during 2018-2021 at CAMS-3 (Dhaka)

Month	2018		2019		2020		2021	
	PM2.5	**PM10**	**PM2.5**	**PM10**	**PM2.5**	**PM10**	**PM2.5**	**PM10**
January	**194.69**	**282.91**	**198.12**	**263.64**	**166.63**	**207.64**	DNA	DNA
February	**141.62**	**276.79**	**106.71**	**191.98**	**154.9**	**201.89**	DNA	DNA
March	**97.49**	**200.35**	**94.65**	**168.73**	**85.78**	142.25	DNA	DNA
April	63	120.85	57	107.2	47.56	134.4	DNA	DNA
May	42.79	76.95	48.97	98.97	37.12	86.57	DNA	DNA
June	35.05	72.95	27.87	50.74	26.68	64.31	DNA	DNA
July	28.06	65.28	28.87	58.72	26.68	49.37	22.33	35.12
August	22.03	58.1	37.73	49.93	24.5	37.22	31.18	49.71
September	38.91	86.52	24.36	53.95	26.81	43.9	45.75	60.01
October	**80.1**	144.25	53.83	88.44	54.95	82.79	68.36	91.01
November	**110.15**	**183.8**	**90.55**	**127.94**	**108.73**	**152.47**	**123.29**	**209**
December	**163.13**	**214.05**	**142**	**184.49**	**175.52**	**220.99**	**144.45**	**168.97**
Annual Average	84.75	148.57	75.89	120.39	77.99	118.65	36.28	51.15
NAAQS (no period)	65	150	65	150	65	150	65	150
WHO[19]	5 (1-year) 15 (24-h)	15 (1-year) 45 (24-h)	5 (1-year) 15 (24-h)	15 (1-year) 45 (24-h)	5 (1-year) 15 (24-h)	15 (1-year) 45 (24-h	5 (1-year) 15 (24-h)	15 (1-year) 45 (24-h
Units: µg/m3								

[19] WHO Ambient Air Quality Guidelines (global update 2021)

Table 5.9: Summary Air Quality Data Measured during 2018-2021 at CAMS-4 (Gazipur)

Month	2018		2019		2020		2021	
	PM2.5	**PM10**	**PM2.5**	**PM10**	**PM2.5**	**PM10**	**PM2.5**	**PM10**
January	**208**	**300.00**	**193.06**	**284.16**	**120.62**	147.00	**192.34**	**261.95**
February	**171**	**288.00**	**135.64**	**230.08**	**103.70**	DNA	**164.87**	**255.00**
March	**115**	**216.00**	**101.56**	**188.35**	**127.25**	DNA	**107.25**	**241.92**
April	**68.73**	115.65	64	118	39.05	36.02	**74.01**	145.79
May	39.10	63.60	43.04	92.14	36.56	DNA	39.70	83.02
June	37.50	56.50	33.5	64.1	28.81	59.54	35.86	71.39
July	28.00	52.80	7.96	42.14	15.71	DNA	22.92	DNA
August	34.43	39.54	DNA	DNA	18.87	29.96	32.70	DNA
September	DNA	79.19	30.04	55.96	29.33	28.93	25.51	DNA
October	DNA	126.83	53.13	84.35	51.52	25.01	56.04	DNA
November	DNA	**173.90**	**122.25**	**186.83**	**95.37**	22.72	98.82	DNA
December	**154.39**	**223.55**	**140.93**	**190.10**	DNA	DNA	**112.98**	**180.20**
Annual Average	71.35	144.63	77.09	128.02	55.57	29.10	80.25	103.27
NAAQS (no period)	65	150	65	150	65	150	65	150
WHO	5 (1-year) 15 (24-h)	15 (1-year) 45 (24-h)	5 (1-year) 15 (24-h)	15 (1-year) 45 (24-h)	5 (1-year) 15 (24-h)	15 (1-year) 45 (24-h)	5 (1-year) 5 (24-h)	15 (1-year) 45 (24-h)
Units: µg/m3								

Note: CAMS- Continuous Air Monitoring Station; NAAQS- National Ambient Air Quality Standard; DNA- Data Not Available due to malfunction of the analyzer/sensor (Data Source: CASE Project and DoE, Bangladesh)*

5.3 Land Use, Soils and Agriculture Resources

5.3.1 Agro-ecological Zone (AEZ)

Thirty agro-ecological zone (AEZ) and 88 sub-zones (BARC, 2012) have been identified by adding successive layers of information on the physical environment which are relevant for land use and assessing agricultural potential. The study area falls within the Madhupur Tract Zone (AEZ 28). The physico-chemical properties of this AEZ are presented below:

Madhupur Tract (AEZ- 28)

This region of complex relief and soils developed over the Madhupur Clay. The landscape comprises level upland, closely or broadly dissected terrace associated with either shallow or broad, deep valleys. Eleven general soil types exist in the area; of which, Deep Red Brown Terrace, Shallow Red Brown Terrace soils and Acid Basin Clays are the major ones. The soils on the terrace are better drained, friable clay loams to clays overlying friable clay substratum at varying depth. The soils in the valleys are dark grey heavy clays. They are strongly acidic in reaction with low status of organic matter, low moisture holding capacity and low fertility level.

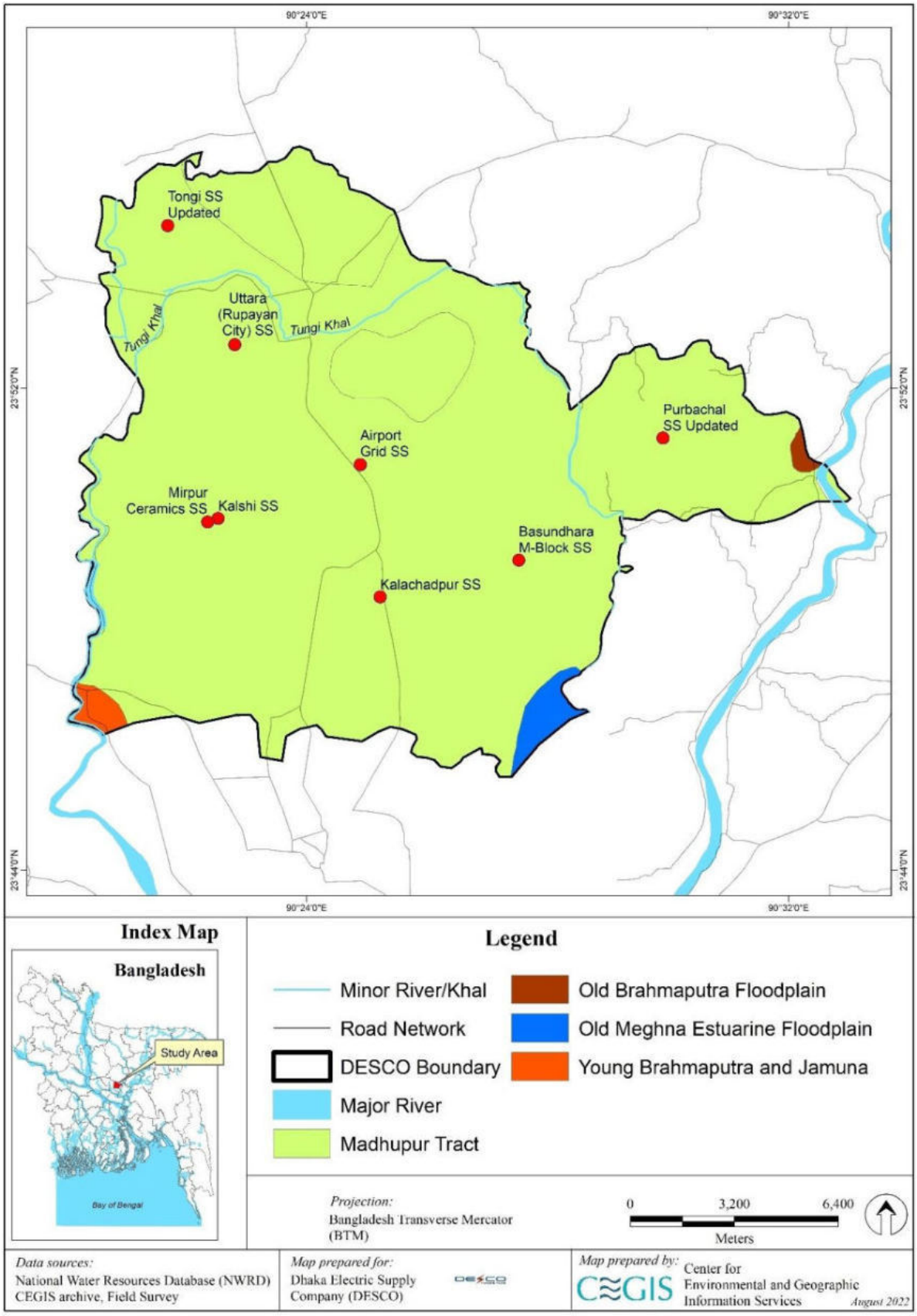


Figure 5.25: Map Showing Study Area AEZ

5.3.2 Land Usage

The total land take for all eight proposed substations is 2.35 hectares of land. Of this 0.51ha at Tongi substation, and 0.6 ha at Bashundhara under cultivated land use although none of the sites are currently being used for the agricultural practices with major residential development permitted and already having commenced in the vicinity of the latter. Within the entire study area of 24,890 hectares, just under half, namely 10,803 hectares (43.40%) is cultivated land. The remainder of 14,087 hectares is primarily occupied by settlements, with a minor percentage covered by water bodies (River, Beel and Lake) about 54.16% and 2.44% respectively. Detailed land use of the study area is presented in Table 5.10 and Figure 5.26.

Table 5.10: Land Use of Study Area

Land Use	Project area (ha)	Study area (ha)	% of gross area
Net Cultivated Area (NCA)	0.51 (Tongi) 0.60 (Bashundhara)	10,803	43.40
Settlement	0.51 (Airport) 0.31 (Kalshi) 0.13 (Purchabal) 0.06 (Kalachandpur) 0.13 (Uttara) 0.10 (Mirpur)	13,480	54.16
Water bodies (River, Beel and Lake)	-	607	2.44
Grand total	**2.35**	**24,890**	**100**

Source: Rapid Eye image analysis; 2015

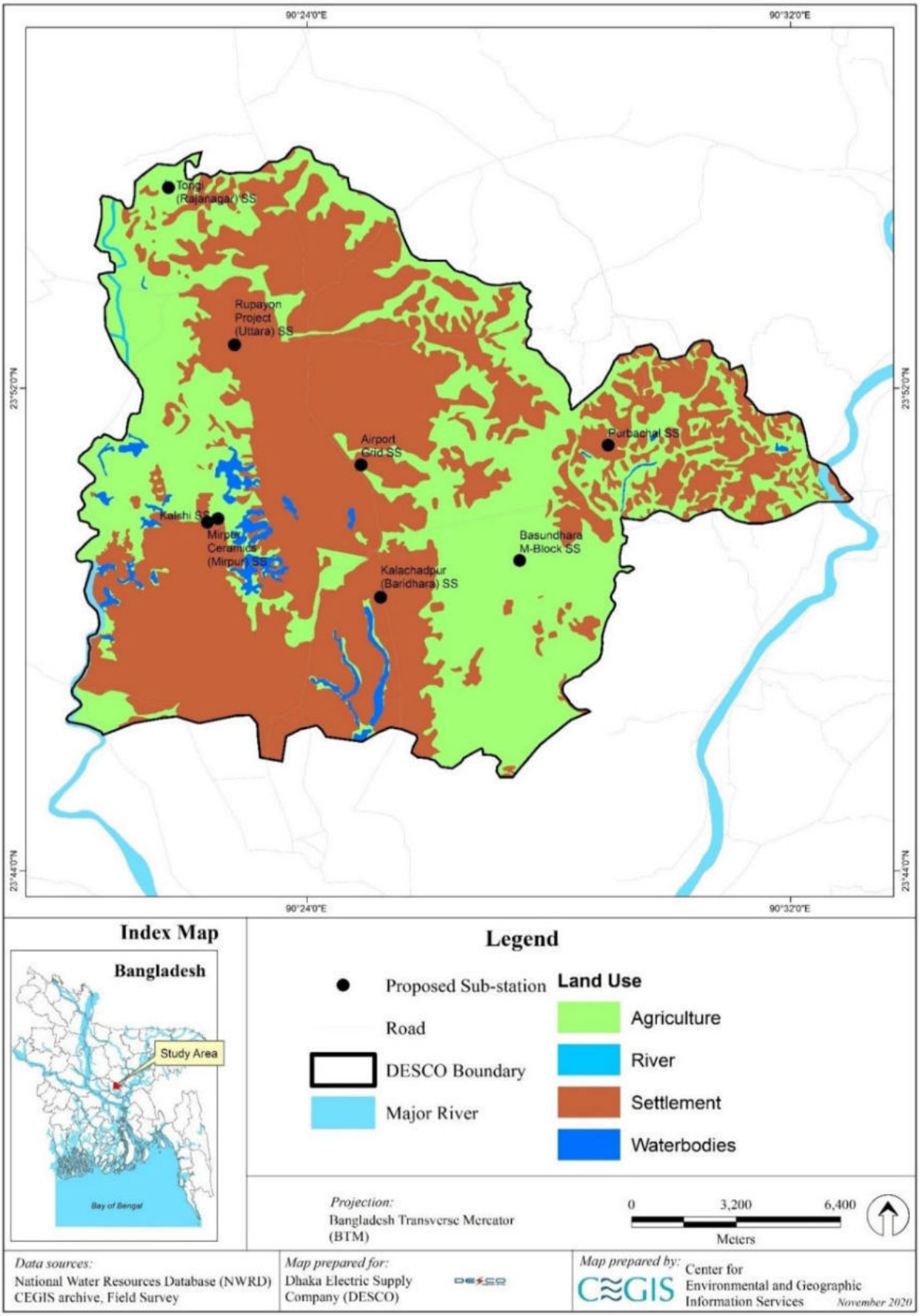


Figure 5.26: Land Use Map of the Study Area

5.3.3 Land Type

Land type is a system of classifying cultivated land based on the seasonal inundation depth within a normal flooding year. According to Soil Resources Development Institute (SRDI, 1988), there are five land types: high land (F0), medium high land (F1), medium low land (F2), low land (F3) and very low land (F4). They are classified in terms of depth of flooding of agriculture land. The entire study area falls predominantly under high land and medium high land. The detailed land type of the study area is presented in Table 5.11 and Figure 5.27.

Table 5.11: Land Type of the Study Area

Land Type	Area (hectare)	Percent (%) of NCA
Highland (F_0)	9533	88.24
Medium Highland (F_1)	1122	10.39
Medium Lowland (F_2)	121	1.12
Lowland (F_3)	27	0.25
Grand total	**10,803**	**100**

Source: SRDI, 2001and Department of Agricuture Extension (DAE) October, 2020

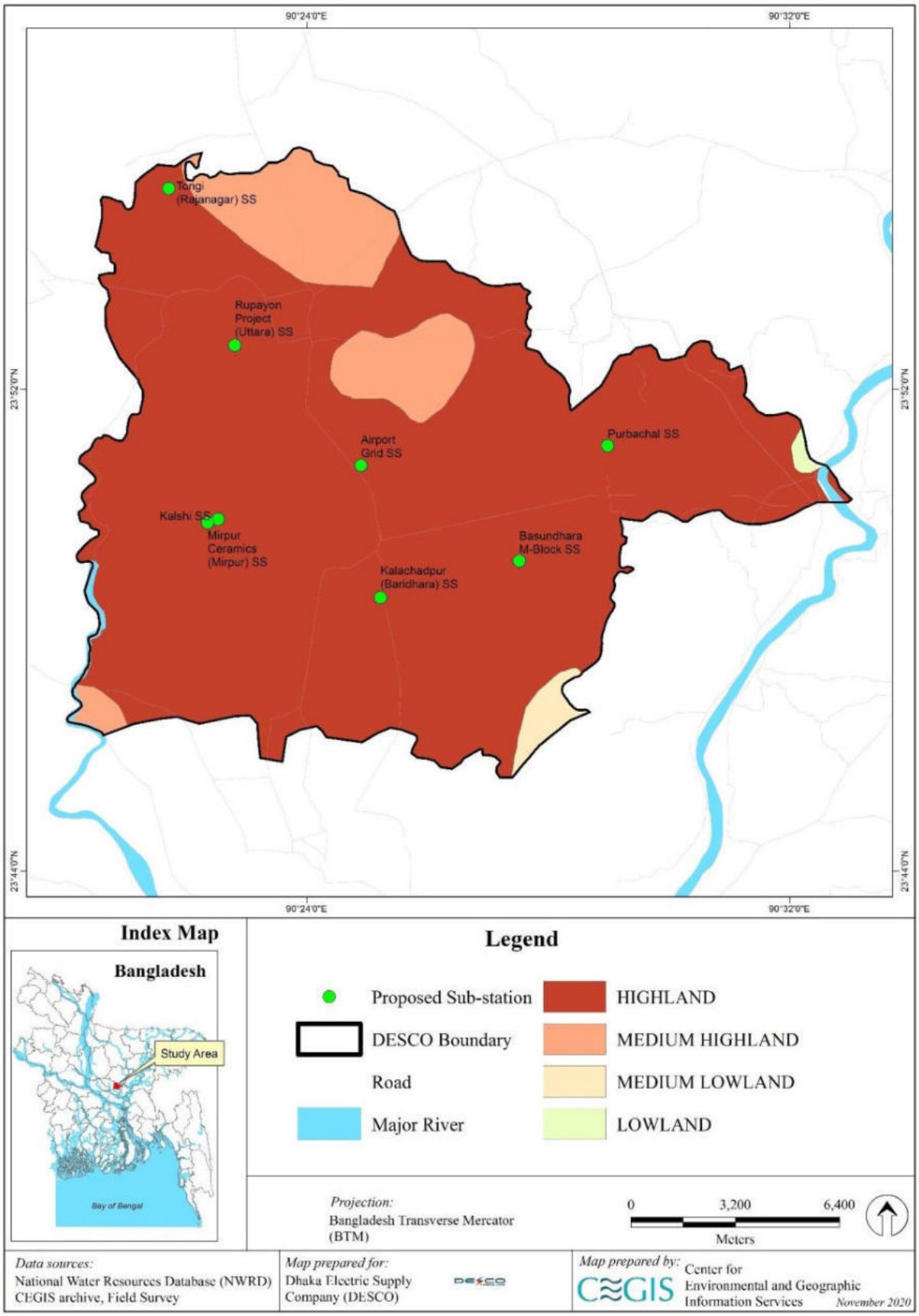


Figure 5.27: Land Type Map of the Study Area

5.3.4 Soil Texture

Soil texture is based on the relative proportions of sand, silt and clay. Soil can be classified as one of four major textural classes: a) sands b) silts c) loams and d) clays. Soil texture is an important soil characteristic that determines crop selection, crop production and also field management. In the study area, about 18%, 38% and 44% of the NCA are defined as loam, loam clay and clay soil texture respectively. The detailed soil texture of the study area is presented in Table 5.12.

Table 5.12: Soil Texture of Study Area

Texture	Area (hectare)	Percent (%) of NCA
Loam	1960	18
Loam Clay	4051	38
Clay	4792	44
Grand total	**10803**	**100**

Source:SRDI, 2001

5.3.5 Farming Practices

Farming practices in the study area are largely controlled by physical, biological, climatological and socio-economic factors. Agricultural crops are grown by cropping seasons. There are two cropping seasons in a year. They are Kharif and Rabi seasons. The Kharif season starts from March and ends in October while the Rabi season starts from November and ends in February. Based on crop suitability and farming practice, the Kharif season has been further sub-divided into the Kharif-I (March-June) and the Kharif-II (July-October) season.

The climatic condition in the kharif-I season is characterized by high temperature, low humidity, high evaporation, high solar radiation. The season is also characterized by uncertain rainfall, which means low alternating dry and wet spells. In this season land remains fully fallow due to high salinity of soil. The salinity level goes beyond the tolerance level of crop, that is usually grown in this season e.g. vegetables and fruits. The Kharif-II (monsoon) cropping season is characterized by high rainfall, lower solar radiation, lower temperature and high humidity. The Kharif-II season starts from July and ends in October. HYV Aman rice is the predominant crop grown during this season due to the submergence of soil in the study area. The Rabi (winter) cropping season starts in November and ends in February. During this period, crops are favored with high solar radiation, low humidity and temperature. But due to inadequate soil moisture, the crop yield is low in this study area. Major crops grown in this season are vegetable, HYV Boro rice, fruits etc.

Figure 5.28: Banana Field in the Study Area (Tongi)

Figure 5.29: Vegetable Field in the Study Area (Purbachal)

5.3.6 Cropping Pattern and Intensity in the Study Area

The dominant cropping pattern in the study area is Fallow-HYV Aman-Fallow which occupy 25.50% of the NCA. A significant area, i.e., 75% remains fallow during the Rabi season due to scarcity of irrigation water. The farmers of the study area have used the lands for grazing purpose in this period. The single, double and triple cropped area is 40.74%, 30.39% and 28.87 % of the NCA respectively. The cropping intensity of the study area is 157%. Detailed cropping pattern along with land types is presented in Table 5.13.

Table 5.13: Present Cropping Pattern by Land Type of the Study Area

Land Type	Cropping Patterns			Area (ha)	% of NCA
	Kharif-I (March-June)	Kharif-II (July-October)	Robi (November-February)		
High land (F_0)	Vegetable	Vegetable	Vegetable	2,863	26.50
	Fallow	HYV Aman	Vegetable	1,567	14.50
	Fallow	HYV Aman	Chili	648	6.00
	Fallow	HYV Aman	Fallow	2,755	25.50
	Fodder	Fodder	Fodder	1,106	10.24
	Banana	Banana	Banana	324	3.00
	Mango	Mango	Mango	162	1.50
	Litchi	Litchi	Litchi	108	1.00
			Sub-Total	**9,533**	**88.24**
Medium Highland (F_1)	Fallow	HYV Aman	Potato	232	2.00
	Fallow	HYV Aman	Mustard	200	2.00
	Vegetable	Fallow	HYV Boro	216	2.00
	Fallow	HYV Aman	HYV Boro	108	1.00
	Vegetable	Fallow	Vegetable	216	2.00
	Dhoincha	Fallow	Mustard	150	1.39
			Sub-Total	**1,122**	**10.39**
Medium Lowland (F_2)	Fallow	Fallow	HYV Boro	81	0.75
	Fallow	Fallow	Potato	27	0.25

Land Type	Cropping Patterns			Area (ha)	% of NCA
	Kharif-I (March-June)	Kharif-II (July-October)	Robi (November-February)		
	Fallow	Fallow	Fallow	13	0.12
			Sub-Total	**121**	**1.12**
Lowland (F3)	Fallow	Fallow	Fallow	27	0.25
			Sub-Total	**27**	**0.25**
			Grand Total	**10,803**	**100**
			Cropping Intensity (%)	**157**	

Sources: CEGIS estimation based on field information and DAE, October; 2020

Figure 5.30: FGD on Agriculture Aspect in the Study Area

Figure 5.31: HYV Aman Rice Field in the Study Area (Purbachal)

5.3.7 Area, Yield and Production

The crop area, yield and production of the study area were estimated using primary and secondary data from the local Department of Agriculture Extension (DAE) office in the study area. Detailed cropped area, yield and annual production in the study area is presented in 5.14.

Table 5.14: Cropped Area, Yield and Annual Production in the Study Area

Crop Name	Crop Area (ha)	Yield (metric ton/ha)	Total Production(metric ton)
HYV Boro Rice	405	3.40*	1,377
HYV Aman Rice	5,510	2.90*	15,979
Total rice	**5,915**	**-**	**17,356**
Mustard	350	1.10	385
Potato	259	13.00	3,367
Chili	648	1.20	778
Dhoincha	150	1.20	180
Summer Vegetables	3,295	13.0	42,835
Winter Vegetables	4,646	12.0	55,752
Fodder (Napier)	1,106	18.0	19,908
Banana	324	14.0	4,536
Mango	162	12.0	1,944
Litchi	108	6.20	669
Total non-rice	**11,048**	**-**	**130,354**
Total	**16,963**	**-**	**147,710**

*Sources: CEGIS estimation based on field information and DAE, October 2020; *Indicates cleaned rice*

Total cropped area is 16,963 hectares of which rice crop area is 5,915 hectares (34.87%) and non-rice crop area is 11,048 hectares (65.13%) respectively. The crop yield rate was estimated based on the information collected from the local DAE office and in consultation with the stakeholders and farmers at the field level. The yield rate of vegetables was calculated based on the average yield rate. The average normal yield rate of HYV Boro rice, HYV Aman rice, summer vegetables and winter vegetables are found to be 3.40, 2.90, 13.0 and 12.0 metric tons/hectare respectively in the study area. The total annual crop production in the study area is 147,710 metric tons of which rice production is 17,356 metric tons (11.75%) and non-rice 130,354 metric tons (88.25%). Detailed crop area, yield, and production of the study area is presented in Table 5.14.

In the study area almost 45% of the crop production related activities are manually done. The rate of fertilizer use per hectare varies considerably from farmer to farmer depending on soil fertility, cropping pattern and financial ability etc. The major fertilizers used in this area are Urea, TSP and MP. In most of the cases farmers use fertilizers disproportionately. Organic manures are not used by the farmers in the field crops. According to the local farmer and fertilizer and pesticides dealers, different types of pesticides such as Superhit, Virtako, Jeen-1, Ostad, Tido, Ronster, Regent, Entracol, Acamide, Sulphox, Thiovit, Kumulus and Flora etc. are being used to prevent pest infestation in rice, maize, chili, pulses and vegetables cultivation. Both liquid and granular pesticides are being used to prevent pest and diseases infestation.

Ground water is the source of irrigation. HYV Boro rice and Winter vegetables are grown by irrigation with the help of the Shallow Tube Well Pumps (STWs). HYV Aman rice crops are grown in rain-fed condition. Supplementary irrigation is not done in HYV Aman plots. Details of the irrigation facilities of the study area are presented in Table 5.15.

Table 5.15: Irrigation Facilities in the Study Area

Crop Name	Study Area					
	Irrigation (Ground Water)			Irrigation (Surface Water)		
	Irrigated area (hectare)	% of NCA	Charge BDT (hectare)	Irrigated area (hectare)	% of NCA	Charge BDT (hectare)
HYV Roro	405	3.75	8,500-10,000	0	0	0
Winter Vegetables	172	2	4,000-4,500	0	0	0

Source: Based on field information, October; 2020

5.4 Biological Environment

5.4.1 Bio-ecological Zone

IUCN Bangladesh in 2002 classified the country into 25 bio-ecological zones (BEZs) in the contexts of biological diversity, physiography and other parameters. As per this classification, the proposed study area falls under two important BEZs, namely Madhupur Sal Tract, and Brahmaputra –Jamuna Floodplain. These BEZs are described in the following Table 5.16 focusing on area coverage, flora and fauna. Figure 5.32 visualizes the study area BEZs as an index map.

Table 5.16: Bio-ecological Zones of the Project and Study Area

BEZ	Area Coverage (Ha)	Area Covergae (%)	Flora	Fauna
Madhupur Sal Tract	15,707	63%	This BEZ extends across the districts: Gazipur, Tangail and Mymensingh. Sal *(Shorea robusta),* Banyan (Ficus *bengalensis),* Tamarind *(Tamarindus indica),* Sada Koroi *(Albizia procera),* Simul *(Bombax ceiba),* and Ashwath *(Ficus religiosa).*	This BEZ is abundant with cobras and has a rich diversity of bird species. The ommon peafowl *(Pavo cristatus)* was formerly found as a permanent resident bird but has now become extinct. The Blue-breasted quail *(Coturnix chinensis)* and Common quail (C. *coturnix)* are sometimes seen in scrub.
Brahmaputra-Jamuna Floodplain	9,183	37%	This BEZ, situated in greater Mymensingh and Dhaka Districts, comprises the active channel of the Brahmaputra River. It possesses a unique variety of plants, medicinal herbs, fruit bearing trees, hundreds of jungle shrubs, creepers and climbers, flowering trees etc. Some of the floral species, which are valued as fuel wood are: Banyan *(Ficus bengalensis)*, Tamarind *(Tamarindus indica),* Sada koroi *(Albizia procera),* Simul *(Bombax ceiba)* and Ashwath *(Ficus religiosa).* The prominent fruit-bearing trees are: Mango *(Mangifera indica),* Jackfruit *(Artocarpus heterophyllus),* and Litchi (*Litchi chinensis*). Bushes of reeds and canes are also found here.	The smaller animals, mongooses, civet cats, hares as well as foxes and jackals, can be seen in the open areas as well as in the scrub (Rizvi, 1975a). The Bengal monitor (*Varanus bengalensis*) and other common lizards inhabit in scattered patches of jungle throughout this zone. Among snakes, Madhupur Sal Tract is a suitable habitat for cobras. In terms of diversity of bird species, this zone is still relatively rich.

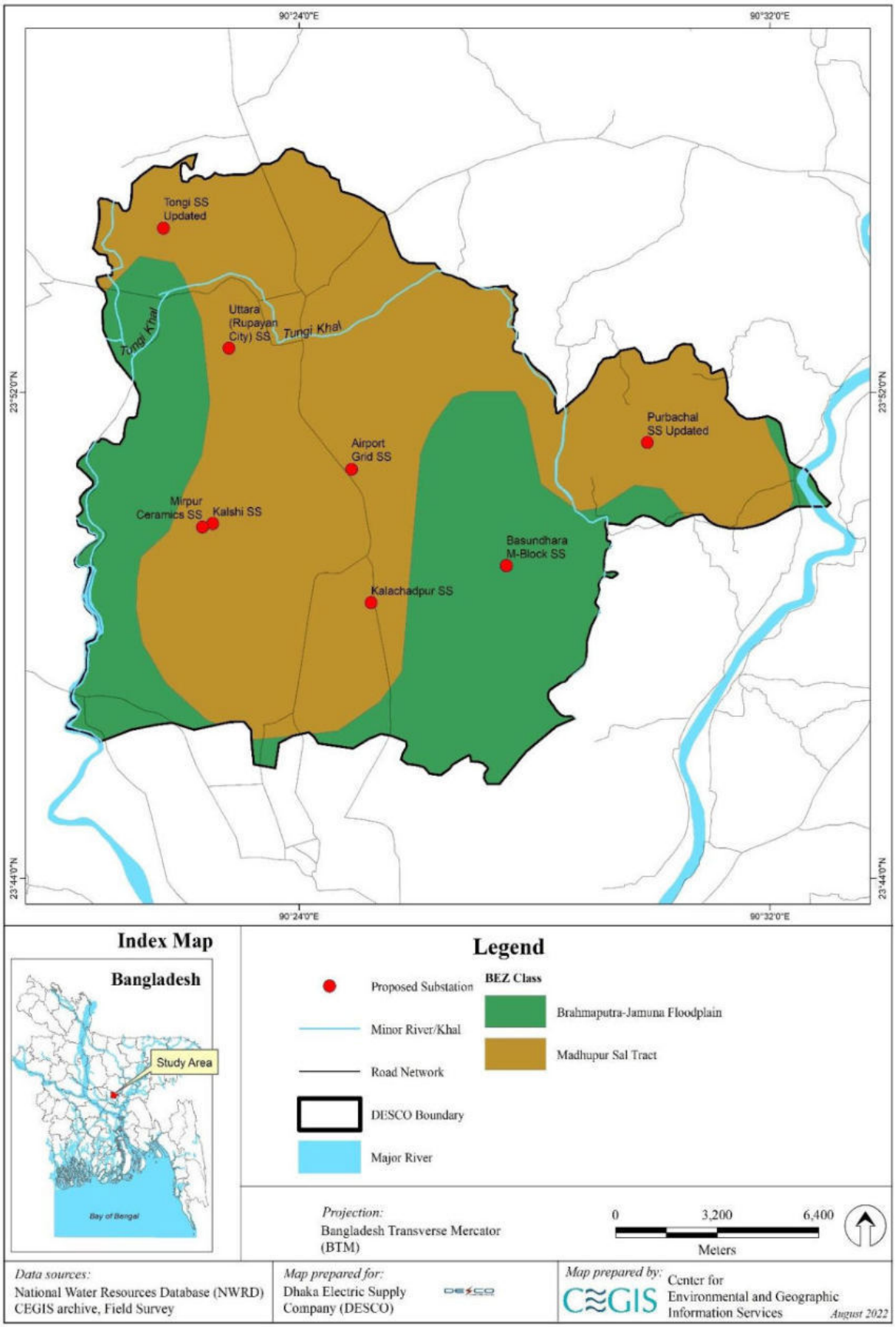


Figure 5.32: Map Showing Study Area BEZ

5.4.2 Ecological Description of the Study Area

The study area is represented by both urban and rural environments with the domination of terrestrial ecosystems. The study area also possesses some aquatic ecosystems of both perennial (i.e., river) and seasonal (i.e., floodplain) nature. Each of the major categories is further divided into sub-categories. The major terrestrial natural ecosystems include scrub and forests (Sal Bon) on flat land and hillocks etc. and the modified ecosystems include crop fields, homestead backyards, built-up area vegetation etc. The aquatic natural ecosystems include rivers (the Balu River, Turag River), floodplain etc. and the modified ecosystems include ponds, etc. Each of the above ecosystems has many sub-units with distinct characteristics as well.

Terrestrial ecosystems

The study area is urban and semi urban. There is no forest patch or dense natural vegetation inside the study area. The urban area is characterized by ornamental vegetation, rather than natural flora. In the roadside habitats, particularly in the semi-urban areas, some large fruit bearing plants are found. Mainly timber and medicinal plants are observed here. The rapid urbanization poses a threat to the terrestrial ecosystem and its biodiversity. Most of the naturally grown plants have disappeared due to the rapid expansion of residential area and industrial growth.

Terrestrial Flora: The most common trees in the unpaved areas are Mango (*Mangifera indica*), Areca nut (*Areca catechu*) and Coconut (*Cocos nucifera*). Along the roadsides Raintree (*Albizia saman*) and American Mahogany (*Swietenia mahagon*i) are common. The species of natural undergrowth vegetation (herbs, shrubs, creepers) found are Apple of Sodom (*Calotropis procera*), Vaant (*Clerodendron viscosum*), Indian Heliotrope (*Heliotropium indicum*) and Doab (*Cynodon dactylon*). Some plants also grow naturally in-between and underneath cultivated plants on either sides of the road which function as barrier of soil weathering. The small-sized herbs are also available and Vaant (*Clerodendron viscosum*), Indian Acalypa (*Acalypha indica*) and Doab (*Cynodon dactylon*) are sporadically found everywhere in the area.

Figure 5.33: Urban Terrestrial Floral Composition

Terrestrial fauna: The diversity of terrestrial fauna is one of the most important ecological indicators to evaluate the quality of habitats. At this time, habitats of birds, mammals, amphibians and reptiles inside the urban area are gradually being reduced due to various reasons including depletion of forests, change in natural vegetation, rapid urbanization, plantation of exotic trees and human interference. Of the urban avifauna the most common species in the study area are the following: House Crow (*Corvus splendens)*, House Sparrow (*Passer domesticus)*, Common Myna (*Fulica leucoptera)*, Black kite (*Dicrurus macrocercus)*, Spotted dove (*Spilopelia chinensis)*, Paid starling(*Lamprotornis bicolor)*, Red Vented Bulbul (*Pycnonotus cafer)*, and Black Durango (*Dicrurus macrocercus).* These are opportunistic species typically found near human settlements. Of the mammal species the Asian House Shrew (*Suncus murinus)*, the House Rat (*Rattus rattus)* and Small Indian Mongoose (*Herpestes auropunctatus)* are found rarely along building corridors and marsh areas. The Common House Gecko (*Hemidactylus frenatus)*, Keeled Grass Skink (*Mabuya carinata)* and Common Garden Lizard (*Calotes versicolor*) are the common reptiles in this study area. Among the

amphibian species, the Common Toad is usually noted at damp and cool places of parks and residences.

Aquatic ecosystem

Aquatic Flora: The major floral diversity of aquatic ecosystems is concentrated within seasonal floodplains and ditches within agricultural lands. The existing aquatic flora in the wetlands are classified as a) Submerged plants, b) Free floating plants c) Rooted floating plants, d) Sedges and meadows, e) Marginal (on surrounding saturated soil) plants as presented below.

Submerged plants start their growth with the rise of water level at the beginning of the monsoon and persist as long as water exists. The common submerged flora observed within the study area are *Ceratophyllum, Myriophyllum and Hydrilla sp.* These abound within the floodplains, canals and ditches.

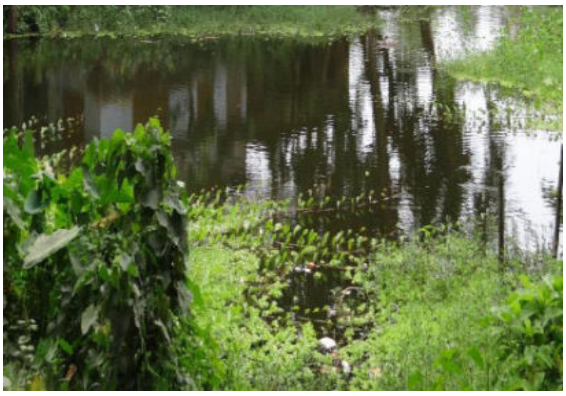



Figure 5.34: Aquatic Floral Composition of a Wetland inside the Study Area

The invasive Kochuripana/ water hyacinth (*Eichhornia crassipes*) is the single most dominant species among this type of community, followed by Tentulpana (*Salvinia sp*.), Kutipana (*Azolla sp*.) and Khudipana (*Lemna sp*.).

The free-floating community is also very common in the study area, their dominance was observed in perennial water bodies, including homesteads ponds.

Rooted floating plants are available both in perennial and seasonal wetlands of the study area. The common flora in this type of wetland is Shapla (*Nymphaea pubescens*), Chandmala (*Nymphoides sp*) and Pani kolmi (*Ipomoea aquatica*).

Sedges and meadows form an ecotone type consisting of amphibious plants. This type has the highest species diversity and is one of the most important wetland plant communities in the study area. This type of plant community generally occupies the water margin and moves with water level fluctuations. These include Nol (*Imperata cylindrica*), Dhol Kolmi (*Ipomoea fistulosa*), Helencha (*Enhydra flactuans*), Biskantali (*Polygonum Sp*.) and Buno dhan (*Oryza rufipogon*).

Marginal plants are not defined as communities; rather they are a composition of both wetland plants and small dry land herbs occupying surrounding saturated soil. The composition of the marginal plants depends on the degree of water logging and the flood tolerance of each species. The Cyperaceae is the dominant family followed by the Amaranthaceae and the Poaceae.

Aquatic Fauna: Common amphibian species found in this area are the Common Toad (*B. bufo)*, Skipper Frog (*Euphlyctis cyanophlyctis)*, Cricket frog (*Limnonectes limnoccharis)* and Indian bull frog (*Hoplobactrachus tigerinus)*. Snakes such as the Striped Keel Back (*Amphiesma stolatum*) and Common Smooth Water Snake (*Enhydris enhydris*) are residents of most types of wetlands. Water dependent

birds are abundant along the ponds and ditches. Common Kingfisher (*Alcedoatthis),* Little cormorant (*Microcarboniger)*, Indian pond heron (*Ardeolagrayii)*, are some examples. A Bird Survey was undertaken at the proposed Tongi site in the period of December 2022 – February 2023. The site lies adjacent to a sizeable wetland. Here a total of 36 bird species were counted, including both resident and migratory species. No rare or endangered species were spotted. The species assemblage included both waterbirds who depend on such wetlands and/or open water and terrestrial birds. For the full species list see the Bird Survey Report (Appendix XIV).

5.4.3 Ecological Description of the Project Sites

The substations and cable/line routes are situated in the urban and suburban area. The only project site which is substantially different in character is the proposed substation at Tongi. The setting is also a suburban area under development, but it is more rural in character, still being used for agriculture, and the site lies adjacent to a sizeable, enclosed, temporary water body which develops during the rainy season, but reduces in size during the dry season. This is a natural waterbody albeit heavily modified. Land use here includes paddy cultivation and low-key aquaculture.

Floral and faunal information of the proposed substation sites are given below. No Critical Habitat trigger species were found during the site investigation undertaken in October 2020, nor during the subsequent bird surveys of the proposed Tongi substation site which were undertaken in the period of December 2022 – February 2023.

Component 1: Substations

1. Tongi SS	
	**Natural/Modified (officially agricultural land)** The site, once connected with the Turag River, is now disconnected due to various land development activities around it. It is generally water logged and mostly covered with aquatic plant species, such as Kochuripana/water hyacinth (*Eichhornia crassipes)*, Khudipana/common duckweed (*Lemna sp.*), and Pani kolmi/water spinach (*Ipomoea aquatica*). These species have no conservation significance. No shrubs and trees were observed onsite. During monsoon Indian Bull Frog and Skipper Frog are found in this site according to the reports of local. Aquatic birds like Common kingfisher, Indian Pond Heron, etc. have seen in this site. During the dry season, terrestrial birds have been seen such as Common Myna, Black Durango, and Pied Starling using this land for feeding purpose. Bird surveys were undertaken in the period of December 2022 – February 2023 to investigate the presence of both migratory and resident bird species around the proposed site (for the full Bird Survey Report see Appendix XIV). Whilst no rare or endangered species were found, a total of 36 different species were sighted, including both migratory and resident species.

2. Uttara (Rupayan City) SS	
	**Modified** The proposed substation site is situated within the boundary of Rupayan city and it is currently an empty plot. Some common shrub and low growing herbs, grass (especially stargrass (*Cynodon* spp) and fern types were found during the field visit. These species have no conservation significance. No trees were observed on site. Some common birds have seen such as Common Myna, Black Durango, Common Kestrel, Long-tailed Shrike, Cattle Egret and Pied Starling etc.
3. Purbachal SS	
	**Modified** The proposed site is located on medium high land located within an area reserved for Purbachal residential development. The land is mainly occupied by terrestrial species of different types such as grass, herbs, shrubs and trees. 11 trees are within the site with trees also found adjacent. There are diverse fruit trees, woody trees and also wood cum fuel trees. Species include Mango (*Mangifera indica)*, banana (*Musa sp)*, Neem (*Azadirachta indica)*, Guava (*Psidium guajava*), Papaya *(Carica papaya),* Jujube (*Zizyphus* sp), Mahogany (*Swietenia macrophylla)*, and Jibon/Indian nettle tree (*Trema orientalis)*. However, shrubs of less than 3m in height are predominant on the site. This land provides roosting area for resident birds, Common Myna, Black Durango, Common Kestrel, Long-tailed Shrike, and Pied Starling etc.
4. Airport SS	
	**Modified** The Civil Aviation Authority donated land adjacent to a newly built substation of DESCO. Currently the site is occupied by an office building of the Civil Aviation Authority. This will be demolished in the course of site preparation. The proposed project area is high land surrounded by some trees, including mango (*Mangifera indica)*, jackfruit (*Artocarpus heterophyllus)*, banana (*Musa sp)*, papaya *(Carica papaya)*, plus few shrubs, herbs, and fern plants. In total 20 trees are supported. Some common birds have been seen such as Common Myna, Black Durango, Common Kestrel, Long-tailed Shrike, Cattle Egret and Pied Starling etc. There is a waterbody (an enclosed reservoir) found behind the proposed sub-station area. It was observed to be polluted, only Ajolla and Lemna – duckweeds, Frogs, and Insects including mosquito were observed.

5. Kalshi (Mirpur) SS

Modified

The project area is on medium high land with a mix of shrubs and trees. 22no. trees were counted at the site. Shrubs are prominent. Major herbaceous species growing in this area are *Euphorbia hirta, Rorippa indica, Cynodon dactylon , Marsilea quadrifolia, Calotropis gigantea, Heliotropium indicum, Amaranthus spinosus, Centipeda orbicularis, Cyperus sp., Croton bonplandianum, Chenopodium ambrosoides,* and *Dryopteris, pteris.* This land provides habitat for many resident birds and nesting sites for water birds like little egret and heron.

6. Mirpur Ceramics (Mirpur) SS

Modified

The project area is high land with a mix of common seasonal herbs and shrubs with a few trees – 4no. Papaya *(Carica papaya)*, Mahogany (*Swietenia macrophylla)*, Tal/ Palmyra palm (*Borassus flabellifer)* and Sojne/Moringa *(Moringa oleifera*) were observed during the field visit. Seasonal vegetables are cultivated in the south portion of the site. During the dry season, terrestrial birds feed in the area. Some common birds have been seen such as Common Myna, Black Durango, Common Kestrel, Long-tailed Shrike, Cattle Egret and Pied Starling etc.

7.Bashundhara SS

Modified

Bashundhara residential office currently occupies the proposed substation site. Common herbaceous plants include *Cynodon dactylon* and *Cyperus rotundus*. Cultivated trees within the site boundary number 16 and include Mango (*Mangifera indica*), Krishnochora (*Delonix regia*), Lemon (*Citrus* sp.), Indian jujube (*Ziziphus mauritiana*), Guava (*Psidium guajava*) and kash (*Saccharum spontaneum*). Shrub, herb and fern species have been found during th field investigation. Common bird species (i.e., Black Durango, Common Kestrel, Long-tailed Shrike, Cattle Egret) are also observed.

8. Kalachadpur (Baridhara) SS

Modified

The proposed location is the existing substation site. The plot is occupied by buildings with a few (5no.) cultivated trees, including Mango (*Mangifera indica*).

Component 2: Transmission/ Distribution Lines

Floral Status

The proposed transmission and distribution line routes - both overhead and underground - cross mainly residential and commercial areas. These still support different types of floral species, mainly herbs, shrubs and trees. However, there is no natural vegetation, only roadside vegetation like planted Buddha tree (*Polyalthialongifolia*) Mango (*Mangifera indica*), Ironwood (*Mesua ferrea* L) etc. The vegetation and dependent wildlife surveys for the 132 kV and 33 kV underground cable routes have been conducted by following different tools and techniques, such as walk over survey through transect walk, KII, FGD etc. along the ROW of the proposed transmission and distribution lines. The findings of vegetation survey for underground cables are presented in Table 5.17.

Table 5.17: List of Common and Dominant Plants along the RoW of the Proposed Underground Cables (132 kV and 33 kV)

Sl. No.	Local Name	Scientific Name	Family	Usage	Abundance
1.	Narikel/Coconut	*Cocos nucifera*	Arecaceae	Fruit and Fuel wood	VC
2.	Simul/ Cotton	*Bombax ceiba*	Bombacaceae	Cotton and fuel wood	C
3.	Bot/Banyan	*Ficus benghalensis*,	Moraceae	Timber	C
4.	Jambura/ Pomelo	*Citrus grandis*	Rutaceae	Fruit and Fuel wood	R
5.	Rain tree	*Samanea saman*	Fabaceae	Timber and fuel wood	VC
6.	Aam /Mango	*Mangifera indica*	Anacardiaceae	Fruit and Timber and Fuel wood	C
7.	Akasmoni / Vachellia aroma	*Acacia auriculiformis*	Fabaceae	Timber and fuel wood	VC
8.	Eukalyptus/Gum	*Eukalyptus* sp	Myrtaceae	Timber and fuel wood	C
9.	Krisnochura/ phoenix flower	*Delonix regia*	Fabaceae	Timber and fuel wood	C
10.	Bamboo/Bash	*Bamboosa* spp.	Poaceae	Thatching	C
11.	Mahogany / American mahogani	*Swietenia macrophylla*	Meliaceae	Timber and medicine	VC
12.	Kodom/Burflower-tree	*Neolamarckia cadamba,*	Rubiaceae	Ornamental	R
13.	Supari/ Indian nut palm	*Areca catechu*	Arecaceae	Timber and fuel wood	C
14.	Kanthal / Jackfruit	*Artocarpus heterophyllus*	Moraceae	Fruit and timber	R
15.	Amra/Hog plum	*Spondias mombin*	Anacardiaceae	Fruit	R
16.	Debdaru/Buddha tree	*Polyalthia longifolia*	Annonaceae	Fuel wood and Timber	C
17.	Nagessor/Ironwood	*Mesua ferrea*	Calophyllaceae	Medicinal and Fuel wood	R
18.	Supari/Betel nut	*Areca catechu*	Arecaceae	Fruit and Fuel wood	C
19.	Neem	*Azadirachta indica*	Meliaceae	Timber and fuel wood	C
20.	Banana	*Musa sp*		Fruit	VC
21.	Sisso/ Indian rosewood	*Dalbergia sissoo*	Fabaceae	Timber and fuel wood	C

Sl. No.	Local Name	Scientific Name	Family	Usage	Abundance
22.	Tal	*Borassus flabellifer*	Palmae	Fruit and Timber	C
23.	Sirish	*Albizia saman*	Leguminosae	Timber and fuel wood	C
24.	Jibon or Indian nettle tree	*Trema orientalis*	Ulmaceae	Fuel wood, Food for wildlife	C
25.	Zziphus/Boroi	*Zizyphus* sp	Rhamnaceae	Fruit	C
26.	Koroi	*Albizia procera*	Fabaceae	Timber and fuel wood	VC
27.	Tetul	*Tamarindus indica*	Leguminosae	Fruit and timber	R
28.	Chambol/Chapalish	*Albizia richardiana*	Leguminosae	Timber and fuel wood	C
29.	Pitali	*Trewia nudiflora*	Euphorbiaceae	Fuel wood and Timber	C
30.	Jiga	*Lannea coromandelica*	Anacardiaceae	Fuel wood	C
31.	Dumur	*Ficus hispida*	Moraceae	Fruit and Fuel wood	C
32.	Sungrass	*Imperata cylindrica*	Peaceae	-	C
33.	Akanda/ Crown flower	*Calotropis procera*	Apocynaceae	-	C
34.	Durba	*Cynodon dactylon*	Poaceae	-	VC
35.	Mutha	*Cyperus spp.*	Cyperaceae	-	VC
36.	Bishkatali	*Polygonum sp.*	Polygonaceae	-	C
37.	Bonjhal	*Croton bonplandianum*	Euphorbiaceae	-	VC

Source: CEGIS Field Visit, 2021, Satellite Image Analysis, Rank_ VC=Very common, C= Common, R=Rare

Dominant vegetation mostly observed at the road crossings for underground cables are presented in Table 5.18. Among the vegetation, some falls inside the ROWs, which are largely coming from herb and shrub groups.

Table 5.18: Floral Species Status of 132 kV and 33 kV Transmission Lines

Name of TLs	Floral Species (In Order of Dominance)
132 kV	
Airport Grid (DESCO) to Bashundhara D Block Grid (PGCB)	Sirish (*Albizia saman)*, Koroi (*Albizia procera)*, Jibon/Indian nettle tree (*Trema orientalis)*, Akasmoni /Vachellia aroma (*Acacia auriculiformis)*, herbs, shrubs and undergrowth vegetation.
PGCB Digun Grid to Kalshi Grid (DESCO)	Jibon/Indian nettle tree (*Trema orientalis)*, herbs, shrubs and undergrowth vegetation.
PGCB Purbachal Grid to Bashundhara M Block Grid (DESCO)	Sungrass, herbs, shrubs, and undergrowth vegetation
PGCB Purchabal Grid to Airport Grid (DESCO)	Mahogany (*Swietenia macrophylla)*, Koroi (*Albizia procera)*, coconut (*Cocos nucifera)*, Jibon/Indian nettle tree (*Trema orientalis)*, banana (*Musa sp)*, herbs, and shrubs.
PGCB Tongi Old Grid to Tongi Rajanagar Grid (DESCO)	Herbs, and shrubs.

Name of TLs	Floral Species (In Order of Dominance)
33 kV	
Airport Grid to Airport Terminal-3	Grasses, and undergrowth vegetation.
Airport Grid to CAAB	Mango(*Mangifera indica)*, Mahogany (*Swietenia macrophylla)*, Vachellia aroma/ Akashmoni(*Acacia auriculiformis)* , Betel nut /Supari(*Areca catechu*), Phoenix flower /Krisnochura (*Delonix regia)*, Jackfruit (*Artocarpus heterophyllus)*, Coconut (*Cocos nucifera)*, herbs, shrubs and undergrowth vegetation.
Airport Grid to Nikunja	Mahogany (*Swietenia macrophylla)*, Vachellia aroma/ Akashmoni(*Acacia auriculiformis)*, herbs, shrubs and undergrowth vegetation.
Bashundhara M-Block to Bashundhara I-Extension	Grasses, and undergrowth vegetation.
Bashundhara M-Block to Kalachadpur	Mahogany (*Swietenia macrophylla)*, Vachellia aroma/ Akashmoni(*Acacia auriculiformis)* , Betel nut /Supari(*Areca catechu*) , Phoenix flower /Krisnochura (*Delonix regia)*, Mango(*Mangifera indica)*, Banana (*Musa sp*), herbs, shrubs and undergrowth vegetation.
Kalshi Grid to DOHS-1	Herbs, shrubs and undergrowth vegetation.
Kalshi Grid to DOHS-2	Grasses, and undergrowth vegetation.
Kalshi Grid to Mirpur Ceramics	Herbs, and shrubs.
Purbachal S-2 Grid to Purbachal-3 S/S	Jibon/Indian nettle tree (*Trema orientalis)*, Banana (*Musa sp*), grasses, undergrowth vegetation.
Tongi Grid to Tongi-27 SS	Coconut (*Cocos nucifera)*, Betel nut /Supari(*Areca catechu*) herbs, shrubs and undergrowth vegetation.
Uttara Grid to Rupayan City	Herbs, and shrubs.
Airport Grid to ADA	Herbs, and shrubs.

Source: GIS SpatiSal Analysis, 2020; NWRD, 2012

Faunal Status

Being a part and parcel of the intervened environment, wildlife have been investigated in different ways mentioned earlier and the findings are presented in the following sections. The abundance of avifauna is found more than those of other wildlife guilds and species. Among the avifauna, most of them are categorized as 'Least Concern' according to the IUCN Bangladesh Red List 2015 and are resident birds like House Crow (*Corvus Splendens*), Large-billed crow (*Corvusmacrorhynchos*), House Sparrow (*Passer domesticus*) etc.

Component 1: Substations

A list of wildlife species has been prepared for the SS sites based on sightings and local community interviews during field visits and presented in Table 5.19. For Tongi SS, additional bird species are listed in the survey report.

Component 2: Transmission/ Distribution Lines

The study area covered by the proposed transmission/distribution lines has been investigated to draw a status of faunal diversity with IUCN threatened status and attributed in Table 5.19. The species observed in the substation sites are almost similar to the species identified in the transmission/distribution lines.

Table 5.19: Wildlife Occurrence within the Proposed SS Areas and Surroundings

Species Name	Common Name	IUCN Conservation		Abundances							
				Name of SS							
		Status in Bangladesh	Global Status	Tongi	Uttara (Rupayan City)	Purbachal	Airport	Kalshi (Mirpur)	Mirpur Ciramics (Mirpur)	Bashudhara	Kalachadpur (Baridhara)
Amphibians											
Duttaphrynus melanostictus	Asian Common toad	LC	LC	-	-	-	O	C	-	-	-
Fejervarya sp.	Cricket Frog	LC	LC	C	-	C	O	C	C	R	-
Hoplobatrachus tigerinus	Indian Bullfrog	LC	LC	C	C	-	-	-	-	-	-
Euphlyctis cyanophlyctis	Skipper Frog	LC	LC	C	-	-	-	-	-	-	-
Birds											
Ardeola grayii	Indian Pond Heron	LC	LC	C	-	-	-	-	-	-	-
Acridotheres tristis	C Myna	LC	LC	C	C	C	VC	C	C	C	C
Alcedo atthis	C Kingfisher	LC	LC	VC	-	-	-	-	-	-	-
Amaurornis phoenicurus	White-breasted Waterhen	LC	LC	-	-	-	-	-	-	-	-
Columba livia	Rock dove	LC	LC	C	C	C	C	-	-	R	-
Copsychus saularis	Oriental Magpie robin	LC	LC	C	-	C	-	C	C	C	-
Corvus macrorhynchos	Jungle Crow	LC	LC	-	-	-	C	-	-	C	C
Corvus splendens	House Crow	LC	LC	C	C	C	VC	VC	VC	VC	VC
Dendrocygna javanica	Lesser Whistling Duck	LC	LC	-	-	-	-	-	-	-	-
Dicrurus macrocercus	Black Drongo	LC	LC	VC	C	VC	C	VC	VC	C	C
Egretta garzetta	Little Egret	LC	LC	R	-	-	-	-	-	-	-
Eudynamys scolopaceus	Asian Koel	LC	LC	C	-	C	R	R	C	R	-
Gallinula chloropus	Common Moorhen	LC	LC	-	-	-	-	-	-	-	-

Species Name	Common Name	IUCN Conservation		Abundances							
				Name of SS							
		Status in Bangladesh	Global Status	Tongi	Uttara (Rupayan City)	Purbachal	Airport	Kalshi (Mirpur)	Mirpur Ciramics (Mirpur)	Bashudhara	Kalachadpur (Baridhara)
Gracupica contra	Asian Pied Starling	LC	LC	C	C	VC	C	C	C	C	-
Haliastur Indus	Brahminy Kite	LC	LC	-	-	C	-	-	-	R	-
Lanius schach	Long Tailed Shrike	LC	LC	-	C	-	R		R		-
Milvus migrans	Black kite	LC	LC	-	C	-	R	R	-	C	-
Passer domesticus	House Sparrow	LC	LC	VC	-	VC	C	VC	VC	VC	VC
Phalacrocorax niger	Little Cormorant	LC	LC	C	-	-	-	-	-	-	-
Ploceus philippinus	Baya Weaver	LC	LC	-	-	R	-	-	R	-	-
Pycnonotus cafer	Red Vented Bulbul	LC	LC	C	C	VC	C	VC	C	C	C
Spilornis cheela	Crested Serpent Eagle	LC	LC	-	-	R	-	-	-	-	-
Streptopelia chinensis	Spotted Dove	LC	LC	-	C	C	-	C	C		
Tyto alba	Barn Owl	LC	LC	-	-	C	-	-	-	-	-
Mammals											
Herpestes edwardsiL	Common Mongoose	LC	LC	-	C	C		R	R		-
Vulpes bengalensis	Bengal Fox	VU	LC	-	-	-	-	-	-	-	-
Mus musculus	Field Mouse	LC	LC	C	C	C	O	C	C	O	-
Suncus murinus	Asian House Shrew	LC	LC	C	C	-	-	-	-	-	-
Felis viverrina	Fishing Cat	EN	EN	-	-	-	-	-	-	-	-
Funambulus Palmarum	Indian Palm Squirrel	LC	LC	-	-	R	-	R	O	-	-
Pteropus giganteus	Indian Flying Fox	LC	LC	-	-	-	-	-	-	-	-
Reptiles											
Amphiesma stolatum	Striped Keelback	LC	NE	-					-		-
Calotes	C Garden	LC	NE	C	R	R		C	-	R	-

Species Name	Common Name	IUCN Conservation		Abundances							
				Name of SS							
		Status in Bangladesh	Global Status	Tongi	Uttara (Rupayan City)	Purbachal	Airport	Kalshi (Mirpur)	Mirpur Ciramics (Mirpur)	Bashudhara	Kalachadpur (Baridhara)
versicolor	Lizard										
Naja naja	Spectacled Cobra	NT	NE	-	-	-	-	-	-	-	-
Varanus bengalensis	Bengal Monitor	NT	LC	-	-	-	-	-	-	-	-
Xenochrophis piscator	Checkered keelback	LC	NE	R	-	-	-	R	-	-	-

IUCN Status Code: NE= Not Evaluated; NT= Near Threatened, VU= Vulnerable, EN= Endangered, LS= Least concern, DD= Data deficient

Abundances: VC=Very Common, C=Common, O=Occasional, R=Rare;

Source: CEGIS Field Visit, 2021

Asian Pied Starling

House Sparrow

Black Drongo

Figure 5.35: Major Avifauna Observed at the Substation Sites

5.5 Fisheries Resources

5.5.1 Fish Habitats

Different types of habitats, such as rivers, khals, beels, floodplains and aquaculture ponds are found in the wider study area. The major fisheries feature in the study area include the Turag and Balu Rivers and Beels including Chandkondai Beel and Kalmahar Beel.

The proposed substation sites are located on raised land with no surrounding water of any fisheries value, except for Tongi substation. The proposed site for Tongi substation will be an infilled part of a wetland adjacent to a 3ha seasonal water body. Due to the loss of connectivity with Turag River plus the effects of urbanization the floodplain is unlikely to provide the former natural seasonal habitats for fish. However, this area is used for low key fish aquaculture. The planned land development in this project area will convert the floodplain land and ditches to a high land category. Therefore, this aquaculture activity will be stopped and any remaining seasonal fish habitats will be destroyed permanently (subject to the land development receiving Environmental Clearance of DOE).

Waterbody at backyard of the Civil Aviation Office

Present Situation of Proposed Substation at Tongi

The Turag River

The Balu River

Figure 5.36: Waterbodies within the Study Area

5.5.2 Fish Species Diversity in the Study Area

The rivers Turag and Balu carry polluted water, especially in the dry season. These conditions are not conducive to a high biodiversity or a healthy fish population. Generally, various types of fish species especially SIS (Small Indigenous Species) are found in the monsoon season especially from May to October. During fishing season, mainly part time fishermen catch fish. During consultation, local communities reported that due to untreated industrial effluent and disposal of wastage into the river, fish diversity has been declining day by day in the study area. A list of the most abundant fish species in the study area is given in Table 5.20.

Table 5.20: Fish Species in Study Area

Scientific Name	English Name	Local Name	IUCN Status in Bangladesh, 2015
Channa striatus	Striped snakehead	Shol	LC
Anabas testudineus	Climbing perch	Koi	LC
Chanda nama	Elongate glass-perchlet	Chanda	LC
Labeo Rohita	Roho labeo	Rui	LC
Mystus bleekeri	Bleeker's Mystus	Tengra	LC
Ailia coila	Gangetic Ailia	Kajuli	LC
Catla catla	Catla	Katla	LC
Rhinomugil corsula	Corsula	Kholla	LC
Puntius chola	Chola Barb	Chola Punti	LC
Pethia conchonius	Red Barb	Kanchan Punti	LC
Glossogobius giuris	Tank goby	Baila	LC
Orechromis niloticus	Nile Tilapia	Tilapia	LC
Mystus tengara	Tengara catfish	Tengra	LC
Amblypharyngodon mola	Mola Carplet	Mola	LC
Channa punctatus	Spotted snakehead	Taki	LC
Leander styliferus	Small prawn	Icha	LC
Neotropius atherinoides	Indian Batasi	Batasi	LC
Colisa fasciata	Banded gourami	Kholshe	LC
Heteropneustes fossilis	Stinging catfish	Shing	LC
Labeo bata	Bata Labeo	Bata	LC

Note: IUCN status (VU-Vulnerable, EN- Endangered, LC-Least concern, NT-Near threatened)

Sources: IUCN Bangladesh, 2015.

5.5.3 Protected Areas and Other Biodiversity of High Conservation Value

Ecologically Critical Areas (ECA_2)

Under the provision of the Act, in 2009, 4 rivers (the Buriganga, the Sitalakhya, Balu and Turag) around Dhaka city were declared as ECA_2s[20]. These are declared due to the pollution causing them to be in ecologically critical condition. Development that threatens their biodiversity and ecology is strictly prohibited in them.

For most watercourse crossings HDD will be used as the preferred option which will result in no impact on them. However, the proposed underground cables of Purbachal Grid to Bashundhara M Block Grid (about 75 m) and PGCB Tongi Old Grid to Airport Grid (about 50 m) will need to cross Balu River and Turag River/Tongi Khal above ground. In order to minimize any impact to these ECA_2s, the cable will be run along a cable bridge as is the case with the Balu River crossing where there is already an existing cable bridge. Added to that, minimum horizontal clearance of 50m from the river alignment

[20] Bangladesh Environment Conservation (Amendment) Act, 2010 provides that "Ecologically Critical Area" means such area which is rich in unique biodiversity or due to the importance of environmental perspective necessary to protect or conserve from destructive activities under section 5 of this Act. These areas also fall within the category of cultural and natural heritage.

will be maintained while traversing parallel to it. For the Balu River crossing this is illustrated below (Figure 5.37).

Other than the Balu River and Turag River no further Ecologically Critical Areas are located within or near the proposed substation sites and the transmission/distribution lines.

Figure 5.37: Balu River Crossing

Protected areas

Bangladesh currently has 48 protected[21] areas, of which 18 are National Parks, 23 are Wildlife Sanctuaries, two are Special Biodiversity Conservation Areas, one is a Marine Protected Area (MPA), three are Eco-parks and one is a Botanical Garden which have been declared by the government to conserve wildlife and their habitats (BFD 2020)[22]. **None of the proposed 132/33 kV transmission/distribution lines traverse any of the protected areas (Figure 5.32). The National Botanical Garden lies within approximately 1 km of Mirpur Ceramic SS and Kalshi SS but this will not be affected by the project activities – although it is to be confirmed once the 11kV and 0.4kV routes are confirmed**.

Important Bird and Biodiversity Areas (IBBAs)

A total of 19 IBBAs are designated in Bangladesh with a total area of about 544,438 ha (Birdlife 2019)[23] of which 11 are protected, two partially protected and six are unprotected. Eleven (11) of them support globally threatened species, 10 have biome-restricted species and nine (9) qualify as Important Bird Areas (IBAs) because they hold large congregations of water birds[24]. **None of the IBBAs fall within the impact area of proposed SS and 132/33 kV transmission and distribution lines (Figure 5.34).**

Ramsar Site and World Heritage Site (WHS)

There are no Ramsar Sites within the Study Area.

Bangladesh possesses three WHS namely i) Historic Shat Gambuj Mosque in City of Bagerhat, ii) Ruins of the Buddhist Vihara at Paharpur and iii) The Sundarbans (mangrove forest). Out of the three, the first two have cultural designation and the latter is designated for its natural value. A further five sites have been proposed for WHS designation. These are Mahansthangarh and its Environs, The Lalmai-Mainamati Group of monuments, Lalbagh Fort, HaludVihara and JaggadalaVihara (WHC, 2019)[25]. **None of these sites are located within or surrounding the proposed transmission and distribution lines and substations.**

The Integrated Biodiversity Assessment Tool (IBAT) does not identify any additional important areas for biodiversity on or around any of the proposed substation sites or transmission/distribution line routes.

International Migratory Bird Flyway and breeding places

Two migratory bird flyways cross Bangladesh. The Country has been a Partner of the East Asian Australian Flyway Partnership (EAAFP) since 2010 and is home to 5 Flyway Network Sites, designated under the specifications set by EAAFP. Bangladesh is an important country for non-breeding individuals of incredibly rare Spoon-billed Sandpiper, and is also part of the breeding range of the

[21] Bangladesh government has declared several wildlife protected areas under the provisions of the Wildlife (Protection and Safety) Act, 2012. In addition, Reserved Forests and Protected Forests have also been declared under the Forest Act, 1927. Further to that, the Environmental Conservation Act 1995 has also declared several Ecological Critical Areas for better management and conservation of the natural resources and environment.

22 http://www.bforest.gov.bd/site/page/5430ce33-561e-44f6-9827-ea1ebaa2c00d/- Last accessed 28th September, 2020.

23http://datazone.birdlife.org/country/bangladesh/ibas, last accessed on 28 September, 2020.

24 Bangladesh, Key Habitats and Birds; Birdlife International.

25https://whc.unesco.org/en/statesparties/bd; last accessed on 28 September, 2020.

endangered Masked Finfoot, among many other waterbirds (eaaflyway, 2019)[26]. The key sites of importance are Tanguar Haor, Hakaluki Haor, Hail Haor, Nijhum Dwip and Sonadia Island. All the designated sites are well distant from the proposed substations and transmission and distribution lines.

Forest Area[27]

According to Bangladesh Forest Department, 5 categories of forested land (Reserved Forests, Protected Forests, Acquired forest/Vested forests, Unclassified State Forest, Unclassified Revenue Forest) are maintained by the department with an total area of 25,79,387.9 acre or 10,43,843 ha (BFD 2016)[28]. **None of the proposed 132/33 kV transmission/distribution lines and substations traverse over any forest area (Figure 5.33). It is also unlikely the 11 kV and 0.4 kV lines will as the closest forest area lies 12 km away but this will be reconfirmed once the routings are known.**

Wetland Area

Almost half of the wetland areas of Dhaka have been converted into other land uses during 1988 to 2016. In 1988, 43.08% areas were under wetland category, reduced to 26.97% in 2002 and 12.13% in 2016. The decreasing rate of wetlands is 71.84% between these 28 years. Changes of the water body mostly occurred due to urban expansion. The wetlands provide the residents of Dhaka with ecosystem services such as fisheries and flood protection. Urban flooding may have been induced by this change in wetlands as they are not capable of holding a huge amount of rainwater at present. **Tongi substation is on the edge of a natural albeit heavily modified wetland area of about 3ha, although the official land use for the site is agricultural. Further details of this wetland are provided in the bird survey report. There is also a wetland area (enclosed reservoir) adjacent to the airport substation.**

None of the other substations or proposed 132/33 kV transmission/distribution lines impact wetland. It is also unlikely 11 kV and 0.4 kV lines will, but this will be reconfirmed once the routings are known.

Critical Habitat

No Critical Habitat was identified during the field visits around the proposed substation sites or along the routes of the 132/33 kV transmission/distribution lines. Triggers for potential Critical Habitat under ADB's Safeguard Policy Statement (2006) are the following six (6) criteria. In relation to criterion 1 to 4 the thresholds of the IFC Performance Standard 6 guidelines can be used to determine critical habitat presence when these categories of species have been observed in the study area:

1. Presence of globally or nationally Critically Endangered or Endangered species;
2. Restricted-range or endemic species;
3. Concentrations of migratory species;

[26]https://www.eaaflyway.net/

27 The forest area means, the land having the spanning more than 0.5 hectares with trees higher than 5 meters (exception for the *Ceriops decandra* with height of 2 meters) and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ. It does not include land that is predominantly under rural settlement, agricultural or urban land use therefore trees grow outside forest land are considered as non-forest trees (BFD, 2017). http://www.bforest.gov.bd/site/page/eca2a291-b487-4c7a-8ce0-dbe5069524ac/-; last accessed on 28 September, 2020.. http://www.bforest.gov.bd/site/page/837e6966-0fce-4274-a0d0-bcdfa49ce492/- ; last accessed on 28 September, 2020.

28http://www.bforest.gov.bd/site/page/837e6966-0fce-4274-a0d0-bcdfa49ce492/- ; last accessed on 28 September, 2020.

4. Concentrations of congregatory species;
5. Unique assemblages, key evolutionary processes or key ecosystem services;
6. Significant social, economic, or cultural importance to local communities.

Based on the above ecological descriptions none of these six criteria apply to any of the substation sites or the routes of the 132/33 kV transmission/distribution lines and their surrounds. It is also unlikely these criteria would apply following survey of the 11 kV and 0.4 kV lines given the flora and fauna reported to be supported by the wider study area, or Area of Analysis for critical habitat. No critically endangered, endangered, restricted range or endemic species have been recorded. The wetland at Tongi substation supports migratory/congregatory species but in numbers far below the IFC Performance Standard 6 thresholds: (a) areas known to sustain, on a cyclical or otherwise regular basis, ≥ 1 percent of the global population of a migratory or congregatory species at any point of the species' lifecycle (b) areas that predictably support ≥10 percent of the global population of a species during periods of environmental stress. Though the wetland also provides ecosystem services and is of importance to the local community it does not support high biodiversity value in the context of defining critical habitat under criterion 5 or 6. Similarly, although the 4 rivers (the Buriganga, the Sitalakhya, Balu and Turag) around Dhaka city were declared by government as ECA_2s as a result of their current pollution status they are not currently a trigger for critical habitat under criterion 5 or 6.

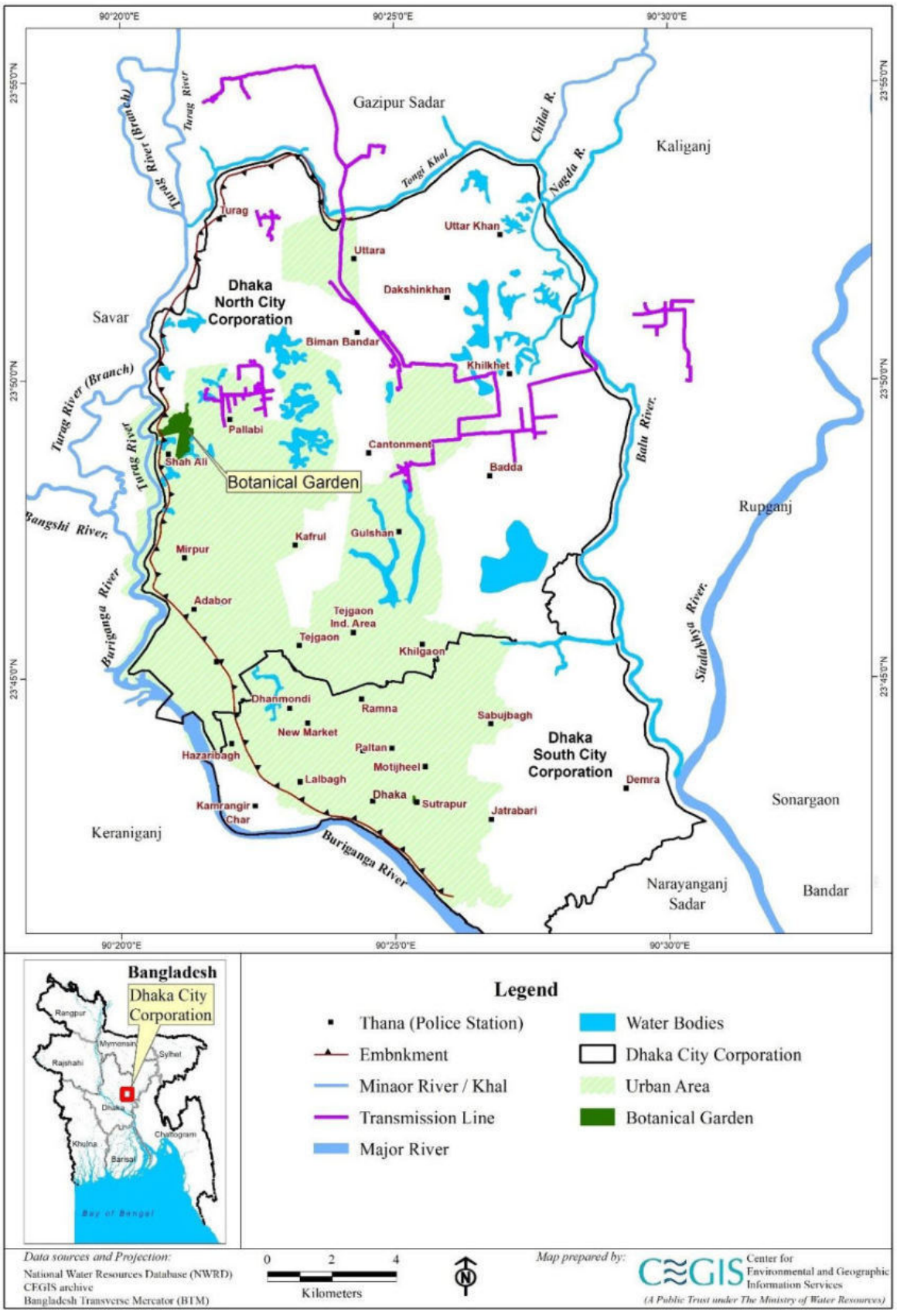


Figure 5.38: Protected Areas in Bangladesh and the Proposed 132 kV and 33 kV Underground Cables

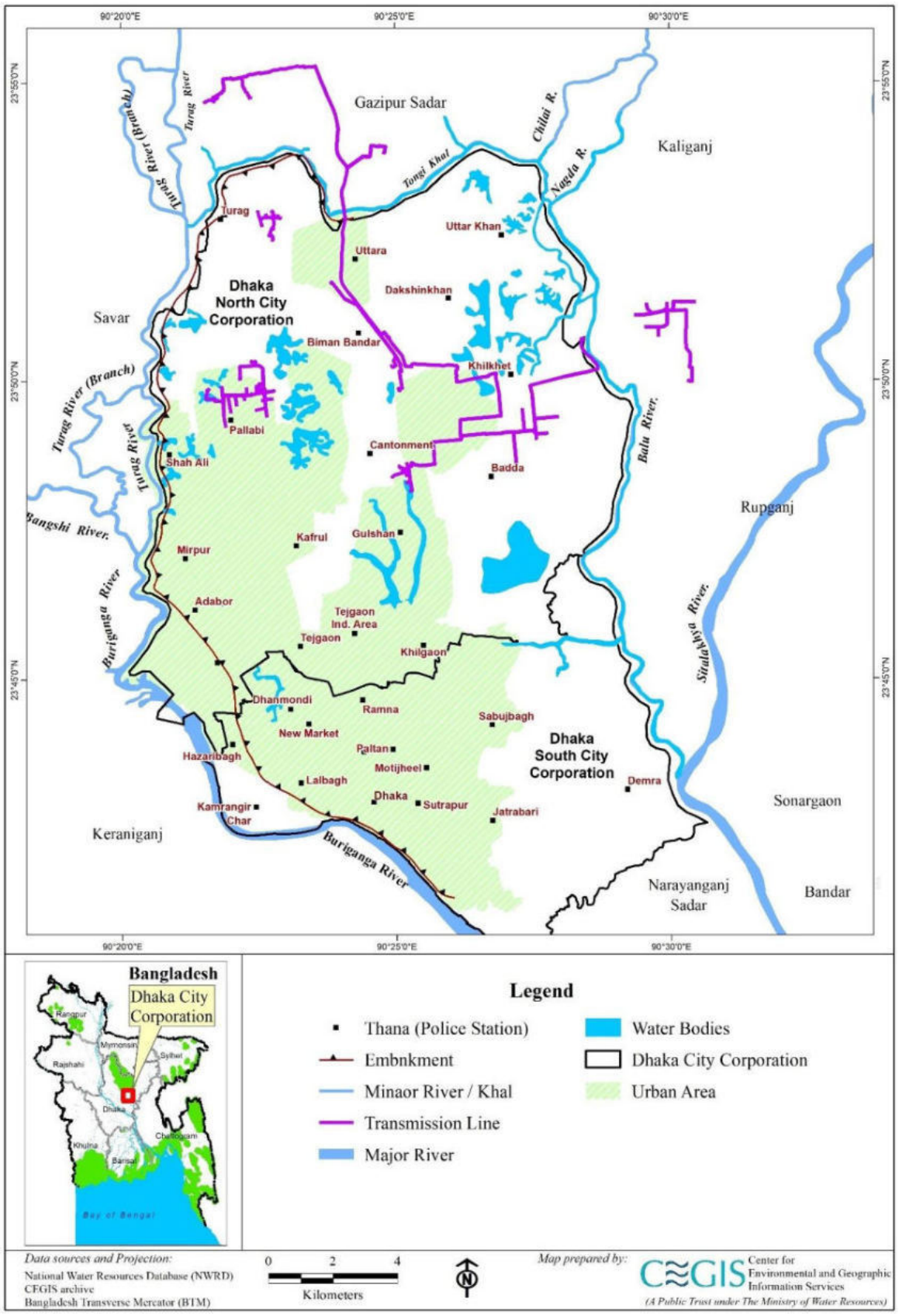


Figure 5.39: Proposed 132 kV and 33 kV Underground Cables and Nearest Forest Coverage

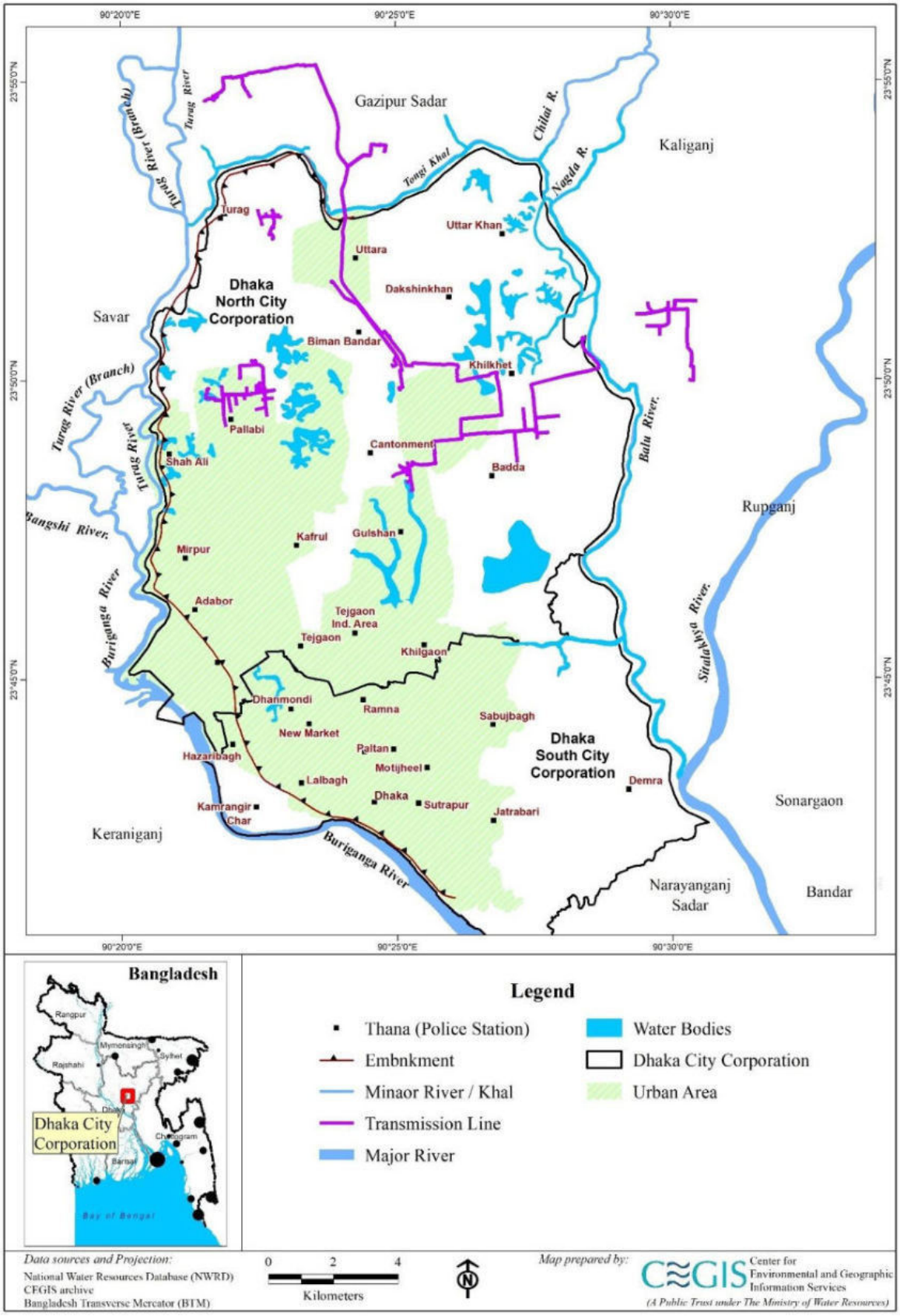


Figure 5.40: IBBAs in Bangladesh and the Proposed 132 kV and 33 kV Underground Cables

5.6 Social Baseline

The social baseline condition of the study area including the project sites was investigated on the basis of the following indicators: demography, economic conditions, working conditions and lifestyle. In addition, the waste management situation was determined. The following sections give an overview of the present situation of the mentioned indicators for better prediction of the during and after effect of the project.

5.6.1 Administrative Bounding of the Study Area

The entire DESCO area is considered as the study area consisting of twenty-one (21) Thanas/Upazilas and fifty-three (53) Union/Wards under three (03) districts namely Dhaka, Gazipur and Narayanganj. Six (06) substations out of eight (08) will be constructed at the selected areas of Baridhara, Bashundhara, Mirpur Ceramics, Kalshi, Airport and Rupayan City of DNCC and the two remaining substations will be constructed at Tongi Paurashava of Gazipur District and Rupganj Upazila of Narayanganj District.

Land Use of the Substation Sites

There are some structures at four (04) out of eight (08) substation sites. These structures will need to be demolished for implementation of the project. The current physical features and other status of the substation areas are presented in Table 5.21 with distances to the nearest receptors in Table 5.22. The distance to the receptors and presence of silent zones needs to be reconfirmed during project implementation.

Table 5.21: Features of the Eight Substations Sites

Proposed Substation Site	Present Views of Physical Features of the Sites	Description of Site Features	Area Connotation (distance to nearest property and note if silent zone)	Land Area (katha/ ha)	Land Owning Status
Baridhara (Kalachandpur)		▪ There is a DESCO switching station, three storied building which will be demolished by DESCO's EPC contractor. ▪ 1st floor of this building is being used by DPDC as repository of their	Residential Area Nearest Property: Residential 10m Silent Zone: No	5 (0.06)	DESCO's own land (Land Documents in Appendix VI).

Proposed Substation Site	Present Views of Physical Features of the Sites	Description of Site Features	Area Connotation (distance to nearest property and note if silent zone)	Land Area (katha/ ha)	Land Owning Status
		official documents			
Bashundhara		There is an office building of Bashundhara housing developer. It will be demolished by the housing developer prior to handover.	Residential Area Nearest Property: Commercial 37m Silent Zone: Yes (school in construction)	47 (0.6)	The land belongs to the Bashundhara Real Estate Company but was donated to DESCO for development of the substation (MoU for Land Agreement: Appendix VI).
Mirpur Ceramics		There is a labor shed of Mirpur Ceramics (MC) on the site which will be demolished by DESCO's EPC Contractor. A madrasa lies within 100m of the site boundary.	Commercial Area Nearest Property: Commercial 22m Silent Zone: Yes (Madrasa)	8 (0.1)	The land belongs to Mirpur Ceramics but was donated to DESCO for development of the substation. (MoU for Land Agreement: Appendix VI).
Kalshi (Shopnonagar Housing, Mirpur)		A vacant land with vegetation cover, there is waste deposited on the site to be cleared.	Residential Area Nearest Property: Residential 20m Silent Zone: Yes (school)	24.44 (0.31)	The land belongs to the Shopnonagar Housing Company but was donated to DESCO for development of the substation (MoU for Land Agreement: Appendix VI).

Proposed Substation Site	Present Views of Physical Features of the Sites	Description of Site Features	Area Connotation (distance to nearest property and note if silent zone)	Land Area (katha/ ha)	Land Owning Status
Airport		There is an office building of Civil Aviation Authority. It will be demolished by them prior to handover.	Residential Area Nearest Property: Residential 38m Silent Zone: Yes (school)	40 (0.51)	The land belongs to the Civil Aviation Authority but will be leased to DESCO for development of the substation (MoU for Land Agreement: Appendix VI).
Purbachal		A vacant land with vegetation cover.	Residential Area Nearest Property: Informal Settlers 60m Silent Zone: No	10 (0.13)	The land belongs to the Purbachal Real Estate Company but was donated to DESCO for development of the substation – land transfer is completed (MoU for Land Agreement: Appendix VI).
Uttara (Rupayan City)		A vacant land with vegetation cover, there is waste deposited on the site to be cleared.	Residential Area Nearest Property: Commercial 22m Silent Zone: No	10 (0.13)	The land belongs to the Rupayan City, a Real Estate Company but was donated to DESCO for development of the substation (MoU for Land Agreement: Appendix VI).

Proposed Substation Site	Present Views of Physical Features of the Sites	Description of Site Features	Area Connotation (distance to nearest property and note if silent zone)	Land Area (katha/ ha)	Land Owning Status
Tongi		A vacant land on the edge of a water body, there is waste deposited on the site to be cleared.	Residential Area Nearest Property: Residential 40m Silent Zone: No	40 (0.51)	The land belongs to the Chayakunka 5th Residential Project Authority but was donated to DESCO for development of the substation (MoU for Land Agreement: Appendix VI).

Table 5.22: Sensitive receptors near to Substations

SN	Type	Name	Distance (meter)
Airport Substation			
1	CAAB Apartment Building 01		38
2	CAAB Apartment Building 02		67
3	CAAB Apartment Building 03		88
4	CAAB Apartment Building 04		51
5	CAAB Apartment Building 05		85
6	CAAB Apartment Building 06		78
7	CAAB Apartment Building 07		86
8	CAAB Apartment Building 08		80
9	Bangabandhu Pathagar		45
10	Shahinbag Bus Stand		68
11	Civil Aviation Park		85
Mirpur Ceramic SS			
1	Pet care & Vet point, Mirpur		22
2	Amin Medical Hall		68
3	Mirpur Ceramic Techno-Islamic Training Center		65
4	Moinul Quran Madrasah, Mirpur		37
5	Himachol Bus Stop		62
6	Pico Technology and Training Institute		56
7	Residential buildings in south		60

SN	Type	Name	Distance (meter)
Bashundhara Substation			
1	Bashundhara site office		25
2	Capital FM Tx		37
Kalachandpur (Baridhara) Substation			
1	Residential buildings surrounding SS		3
Tongi Substation			
1	Settlement area surrounding the SS		40
Uttara (Rupayan City) SS			
1	Baitur Rahman Jame Masjid		58
2	Hasina Medicine Center		24
3	Rupayan Grand Building 3		50
Purbachal Substation			
1	Residential buildings surrounding the SS		60
Kalshi (Mirpur) Substation			
1	Shopno Nogor Residential area surrounding the SS		20

Source: Google Image

5.6.2 Land Use on the Routes of Underground Cables

It was observed in the field that the RoWs of the proposed 132 kV and 33 kV underground cable routes were to be mainly in the commercial and to some extent in the residential areas. Many high-rise commercial and residential buildings are situated on both sides of the RoWs of the cable routes, which include hospitals, parks, mosques, educational institutions (school, college, university, madrasha), shopping complex, etc. The proposed cable route alignments will pass through a wide range of areas, as such, it is not possible to capture all the entities located on both sides of the alignment. Table 5.23 shows some of the important entities by name, type and their distance from the RoWs. Of particular note is the presence of schools as children will be vulnerable to construction and electrical infrastructure. The presence of adjacent features on the 11 kV and 0.4kV routes will need to be confirmed once finalized.

Table 5.23: Prominent Features Adjacent to the Proposed Cable Route Alignment by Type, Designated Name and Distance

Sl	Feature Type	Name	Distance (m)
33 kV			
1	Market	Jonab Super Market	10
2	Mosque	Hazrat Ali Jame Mosque	8
3	Mosque	Jame Masjid	10
4	Kazi Office	Kazi Office	5
5	Community Center	Community Center- Nikunja 2	10
6	Club	Bashundhara Cosmopolitan Club	8
7	**School/College**	**Kalachandpur High School & College**	**5**
8	University	Independent University, Bangladesh	10
9	Hospital	Evercare Hospital Dhaka	10
10	**School**	**Playpen School**	**3**

Sl	Feature Type	Name	Distance (m)
11.	Club	Uttara Club at Uttara	13
132 kV			
1	Mosque	Pallabi Jame Masjid	8
2	College	Pallabi Nursing College	10
3	Bank	Uttara Bank Pallabi	8
4	Shopping Center	Polwel Carnation Shopping Center at Abdullahpur	14
5	Community Center	Polwel Convention Center	8
6	Market	Ramjan Ali Market	8
7	Mosque	Tongi Hospital Masjid	9
8	Petrol Pump/ Filling Station	A S Filling Station	10
9	Garments factory	Daylight Fashion Ltd	7
10	Garments factory	S S Sweater Ltd	10
11	Garments factory	Frame and RRA Sweater	4
12	College	Gateway of Bangabandhu Collage at Mirpur	2

Source: Google Image

Mosque at Darail, Satais, Tongi

Road side shops at Darail

Road side shops at Satais

Road side infrastructure at Bashundhara Area

Uttara Club

Road side infrastructure at Baridhara

Armed Police Battalion Headquarters at Uttara

Monolova Kabab and Restaurant at Airport Rail Station

Hotel Le Meridien at Airport Road

Jahan Ara Clinic Uttara

Road side infrastructure at Baridhara

Road side infrastructure at Bashundhara area

Mirpur DOHS Shopping Complex, Mirpur

Bangabandhu Collage at Mirpur

Polwel Carnation Shopping Center at Abdullahpur

Mosque at Uttara

Road side infrastructure at Mirpur Ceramic area

Road side infrastructure at Pallabi, Mirpur

Road side infrastructure at Mirpur

Figure 5.41: Physical Features at Either Sides of the Underground Cables

5.6.3 Households and Population

Table 5.24 shows the total number of households and population of the study area. According to Bangladesh Population and Housing Census 2011, the total population of the area is 3,910,650, who are living in 878,907 households. Out of the total population, 54.3% (2,125,128) are male and 45.7% (1,785,522) are female and the sex ratio is 119 males per 100 females, which is higher than the national level sex ratio of 100.3 (BBS, 2012). Based on the national growth rate[29] (1.01%), the total number of populations in the year 2020 is projected[30]. According to this projection, a total of 4,280,832 population are currently living in this study area where 2,326,293 are male and 1,954,540 are female. In July 2023, a total of 104 HHs were surveyed along the routes of the 132 kV and 33 kV underground cables for the resettlement plan. Only 8 households were female headed and the rest of the 96 HHs were male headed. The marital status of the surveyed household heads are 101 (97.11%) are married and the rest (2.89%) are unmarried.

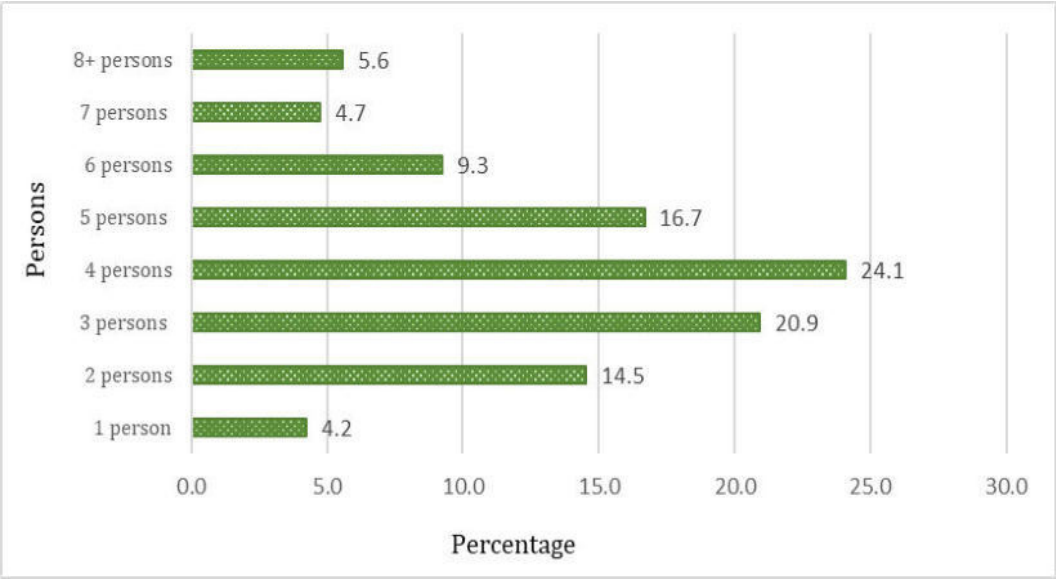
Table 5.24: Households and Population of the Study Area

Data source	Total Household	Total Population	Male	Female	Sex Ratio
Census 2011	878,907	3,910,650	212,5128	1,785,522	119
Projected Population (2020)		4,280,832	2,326,293	1,954,540	

*Source: Population and Housing Census 2011, BBS, 2012 *Estimated for 2020*

5.6.4 Household Size

Data from the Population and Housing Census 2011 shows that most of the households in the study area (about 60.3%) have four (4) or more members and the average household size is 4.2 which is more or less similar to the national average household size of 4.4. **Figure 5.42** shows the percentage of households by number of household members (persons) in the study area.



Source: Population and Housing Census 2011, BBS, 2012

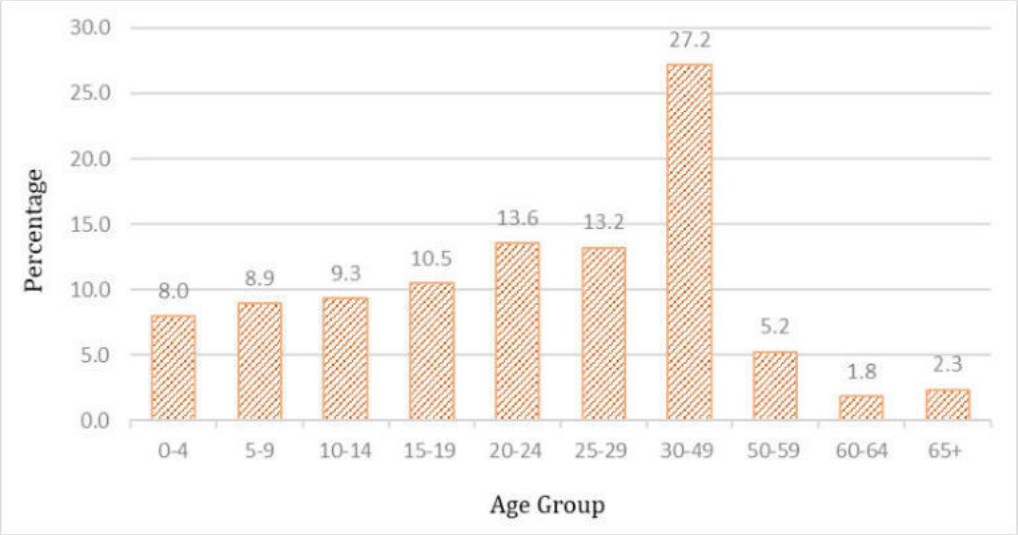
Figure 5.42: Household Size in the Study Area

[29] https://www.worldometers.info/world-population/bangladesh-population/

[30] Projected Population = Present Population*(1+ Growth Rate)^9

5.6.5 Age Composition and Dependency Ratio

The population of the study area are distributed according to the age range which is shown in **Figure 5.43**. Among all age groups, the dominant age group is 30 to 49 years of age; 27% of the population belongs to this group.



Source: Population and Housing Census 2011, BBS, 2012

Figure 5.43: Percentage of Population by Age Group in the Study Area

Dependency ratio is a measure of the portion of population who are dependent (people who are too young or too old to work) on other population for their living. According to BBS data, population within the age-bracket of 15 to 59 years is considered as potential labor force whereas population below or equal to 14 years and 60 to above years are considered as dependent. Thus, the ratio of dependent and economically active population of the study area is found as 30:70 based on Population and Housing Census 2011.

In July 2023, a total of 104 HHs were surveyed along the routes of the 132 kV and 33 kV underground cables for the resettlement plan. The highest number of households (36) is from the age group of 36-50. Then the second highest numbers are 30, from the group of 0-35 and 21 from the age group of 51-64. A significant amount of the cable route is used for commercial purpose. The age distribution also corresponds to the fact that majority of the surveyed households are below operational age of 64 years.

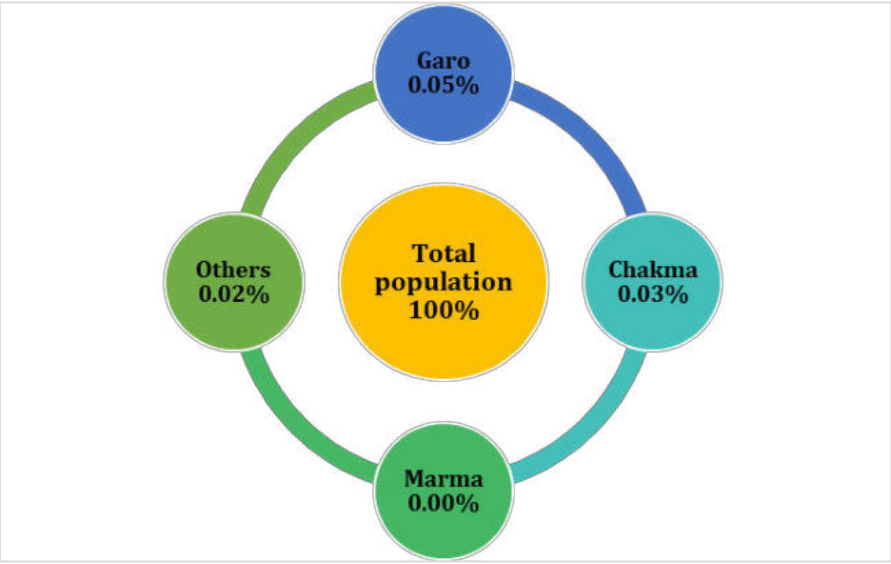
5.6.6 Ethnic Community and Religion

Figure 5.44 shows the status of ethnic community in the study area based on the Bangladesh Population and Housing Census 2011.

A small number of ethnic people (Garo, Chakma, Marma and others) temporarily live in the study area but they are not permanent residents of the study area. Because of education and job purposes, they are living in rented houses.

Islam is the dominant religion in Dhaka, with most of the population identifying as Muslim. Most Muslims are Sunni, and Ahmadiyya and Shia make up the remainder. Hinduism is the second most practiced religion, and Christianity and Buddhism are considered minority religions within the study area. In July 2023, a total of 104 HHs were surveyed along the routes of the 132 kV and 33 kV underground cables for the resettlement plan. The survey revealed that 97.11%, the majority of the

surveyed households follow Islam (Muslim) religion. The rest of the households are dominated by Hindu (1.93%) and Buddhist (0.96%) communities.



Source: Population and Housing Census 2011, BBS, 2012

Figure 5.44: Percentage of Ethnic People in the Study Area

5.6.7 Vulnerable People

In this project no vulnerable peoples[31] are found in the substation sites and also the alignment of the 132 kV and 33 kV underground cable routes. The ADB TA consultants and CEGIS have already conducted visits to the indicative routes and not identified any permanent businesses, vendors or informal settlers that will involuntarily be displaced physically or economically (whether permanent or temporary) in the ROWs mainly as the activities will take place alongside existing roads. Same will need to be confirmed when the 11 kV and 0.4kV routes are finalized. However, there are vulnerable groups adjacent to the project sites notably children who due to their age will be at risk from construction and electricity infrastructure.

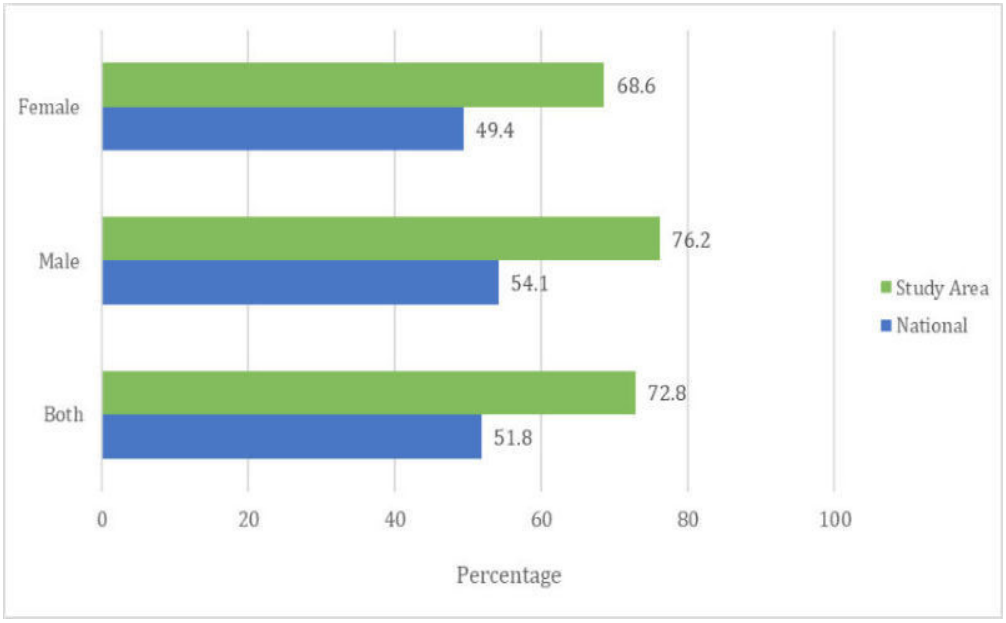
Gender vulnerability of women is manifested in different forms such as household food insecurity, restricted social and economic mobility, limited amounts of freedom due to strict religious and moral codes and social practices such as child marriage and dowry. No indigenous people's communities are identified as either project beneficiaries or project affected as defined in ADB's Safeguard Policy Statement (2009).

5.6.8 Literacy Rate

The primary language in Dhaka is Bengali, with English being the second most primarily used language. Figure 5.45 shows the literacy rate of the study area. According to Bangladesh Population and Housing Census 2011, the literacy rate (based on a definition "ability to write a letter in any language") is 72.8%, where the literacy rate of male is 76.2% and female is 68.6%. The national literacy rate of both male and female is 51.8%. In July 2023, a total of 104 HHs were surveyed along the routes of the 132 kV and 33 kV underground cables for the resettlement plan. Most surveyed HH entered primary and secondary level of education, but the number gradually decreased as they proceed for higher studies. A total of 4 HHs were found informal educated that only have basic literacy.

[31] Vulnerable populations include the economically disadvantaged, racial and ethnic minorities, the uninsured, low-income children, the elderly, the homeless.

The survey found that 21 HHs completed class VI to X, 58 HHs passed SSC and HSC and above HSC are 21 HHs.

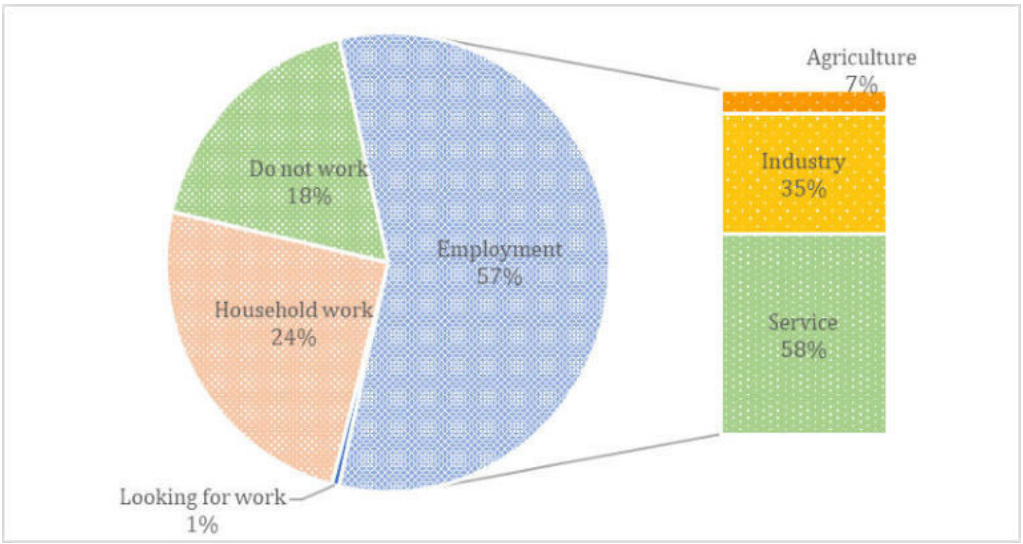


Source: Population and Housing Census 2011, BBS, 2012

Figure 5.45: Literacy Rate in the Study Area

5.6.9 Employment and Occupation

Secondary Data (Population and Housing Census 2011, BBS 2012) shows that about 57.1% of the population (aged 7 years and above, and not attending school) is employed in different sectors (i.e., agriculture, industry and service) of which 37.6% are male and 19.5% are female. About 24.5% of the women are engaged in household work. The study area has an unemployment rate of 17.9%including 8.1% are male and 9.8% are female. Lastly, 0.5% of the total population is actively seeking employment.



Source: Population and Housing Census 2011, BBS, 2012

Figure 5.46: Employement Status in the Study Area

Most of the working adults are engaged in service and industrial activities, as the study area is mainly urban and commercial area. About 58.1% people including 40.6% male and 17.5% female are engaged

in the service sector. On the other hand, 34.9% people are engaged in industrial sector activities of which 18.7% are male and 16.2% are female. Only 7% of the people are engaged in agricultural activities (BBS, 2012). Data shows that women's participation in income generating activities are very common in this area. In the industrial sector women's contributions are quite similar to men, as the women have easy access to get jobs in the garment and other different industries.

In July 2023, a total of 104 HHs were surveyed along the routes of the 132 kV and 33 kV underground cables for the resettlement plan. Most of the affected HHs are from commercial HHs, which is 45.19% of the total HHs. These commercial HHs are mainly engaged in Shops, Restaurants, Vendors, Suppliers and Contractors and Artisans are Tailor. The second largest number is Landlord (Rental Property as Houses for families). Although there are versatile job opportunities in the area, females are only engaged in business, garments, etc.

5.6.10 Labor and Wage Rate

The agricultural land is reducing day by day due to urbanization and industrialization in the study area. The agricultural land is mainly used for producing single crop to manage the local food demand. Therefore, scope of labor engagement in this sector is very low. People have intentions to move from farming activities to industrial activities. In the study area, laborers are working in the readymade garments industry, different factories and business shops. A number of laborers are involved in different mega construction activities (i.e., construction of high-rise building, shopping complex, road, flyover, elevated express highway, etc.) on a monthly or daily remuneration basis. The wage rate of industrial labor varies by types of work and industries. Male laborers get more wages than female laborers. The labor availability and wage rate in the study area are given in Table 5.25.

Table 5.25: Availability of Laborer and Wage Rate in the Study Area

Laborer availability and wage rate				
Type of activity	**Male laborer availability**	**Wage rate (in BDT)**	**Female laborer availability**	**Wage rate (in BDT)**
Agricultural	Low	400-600	-	-
Non-agricultural	High	600-800	Medium	500-600

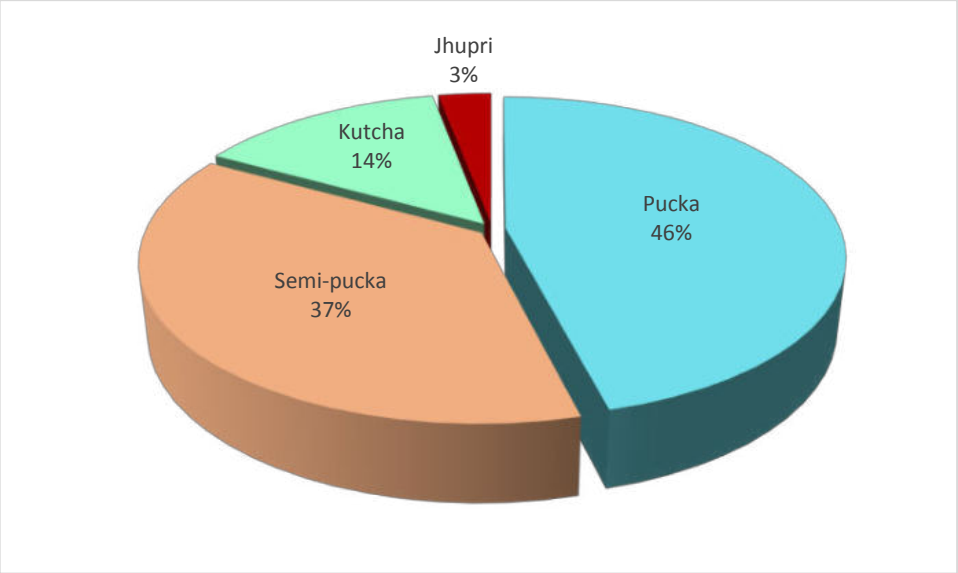
Source: Field Survey (RRA) for this study, 2020

5.6.11 Laborer Migration

Seasonal laborer migration is commonly found in the study area. Because the study area is in Dhaka, Gazipur, and Narayanganj city people from different parts of the country migrate here with a view to support their livelihood. This was confirmed by field observations. At the Mirpur Ceramics project site there is currently a labor shed housing 20 laborers. All of the laborers are involved in the ceramics industry. They are mainly from Rangpur, Jamalpur, Comilla and Barishal Districts. Most of them work on a contract basis. Some are permanent laborers.

5.6.12 Housing Conditions

Most of the houses (83%) are Pucka[32] and semi-Pucka[33] , 14% houses are Kutcha[34] and remaining houses are Jhupri[35] (Census 2011). These features indicate that the people living in the study area have moderate category of housing facility. The housing condition is presented in Figure 5.47.



Source: Population and Housing Census 2011, BBS, 2012

Figure 5.47: Housing Condition in the Study Area

5.6.13 Housing Tenancy

The study area lies in the northern part of Dhaka City and a small part of Gazipur and Narayanganj Districts. There are many multinational offices and industries situated in this area. Therefore, people from different parts of the country come here for livelihoods and other purposes and become part of the rent-paying dwellers, in other words tenants. The number of such people is increasing day by day. The Census 2011 shows that about 74.5% of the people in this area live in rented accommodation. Around 20.5% are land/flat owners and the remaining 5% are house owners.

5.6.14 Drinking Water Facilities

Based on Census 2011 (BBS, 2012) data, in the study area about 77.3% households depend on supply water (tap water) and it is considered as their main source of drinking water. Around 20% households depend on tube well water, and a few households (2.7%) use other water sources like ponds and river. But nowadays, in the study area there is no household dependency on ponds and river water for drinking and other purpose.

[32] **Pucka**: House which is fully made by concrete, cement, and iron.

[33] **Semi-pucka**: Walls: bamboo mats, CI sheet, timber or bamboo framing. In some areas walls are made by earth, sometimes part or full brick. Foundation: Earthen plinth; Brick perimeter wall with earth infill; Brick and concrete also used. Roof: CI sheet with timber or bamboo framing.

[34] **Kutcha**: Walls: Organic materials like jute stick, catkin grass, straw, and bamboo mats. Split are bamboo framing. In some areas walls are made by earth. Foundation: Earthen plinth with bamboo or timber posts. Roof: Thatch-rice or wheat or maize straw and catkin grass, with split bamboo framing;

[35] **Jhupri**: consist of mud walls of 1.5 to 3.0 ft thickness which carry the roof load. Earthen floor, thatch or CI sheets are used as roofing materials. There is no monolithic joint between the wall and the roof.

Out of the proposed 8 substation areas, some areas fall under the real estate projects; so, there is pressure to fulfill the community water demand. Therefore, to meet the demand of water for both drinking and domestic purposes the real estate business projects and the Civil Aviation Authority and Mirpur Ceramics have their own deep-water pump systems. The Tongi substation area is presently vacant land but communities surrounding the project site depend on tube well or borehole and piped water. Households adjacent to the Purbachal project area are dependent on tube well water only. In the study area other than these areas, the local people reported that they could get supply water from Dhaka WASA.

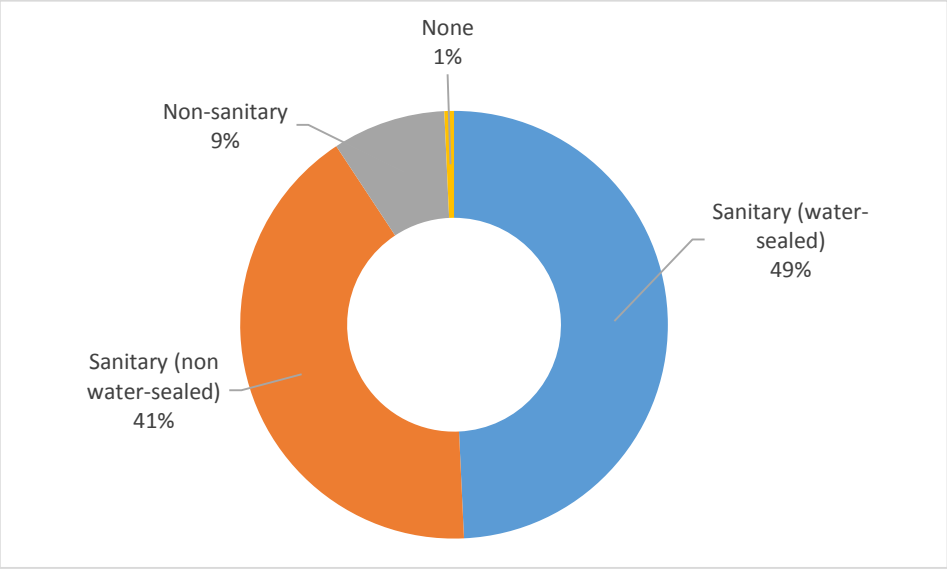
Table 5.26: Water Sources per Substation

Substation area	Sources of water			
	Dhaka WASA Supply Area	Deep water pump supply of landowner	Use of supply water	Tube well of local community
Baridhara (Kalachadpur)	√		√	
Bashundhara	√	√		
Mirpur Ceramics (Mirpur)	√	√		
Kalshi (Mirpur, Shopnonagar Housing)	√	√		
Airport	√	√		
Purbachal				√
Uttara (Rupayan City)	√	√		
Tongi				√

Source: Field Survey Data for this Study, 2021

5.6.15 Sanitation Facilities

Sanitation facility data (Census 2011) shows that about 90% households use sanitary latrines of which 49% are water-sealed and 41% are not water-sealed. A notable portion (9%) of households in this area has non-sanitary (kutcha) toilet facility and only 1% households still defecate in open places. These are mostly informal settlers (BBS, 2012). The detailed sanitation facilities of the study area are shown in **Figure 5.48.**



Source: Population and Housing Census 2011, BBS, 2012

Figure 5.48: Sanitation Facilities in the Study Area

5.6.16 Electricity Facility

Dhaka city alone consumes 46% of the electricity that Bangladesh produces[36]. The electricity distribution system of entire Dhaka city is divided into two different zones (North and South). In the North Part, DESCO plays the role of providing electricity to the door of the customer. For any kind of power maintenance issues these institutions circulate information to the customer through mobile SMS, notices in the newspaper and miking at the selected area. DESCO have their own established website where customers can place their complaints easily or over the phone. Following receipt of a complaint, the services are ready to reach within half an hour or maximum one hour. During power cuts, most of the household have no alternative power sources; some households use generator, IPS, solar panel as other options.

In the study area, 100% (Government declared *that Dhaka, Gazipur and Narayanganj full coverage of electricity*) households are under the electricity coverage. Therefore, local people in the study area reported that they are getting uninterrupted electricity for 24 hours and are very pleased about the electricity supply service of DESCO.

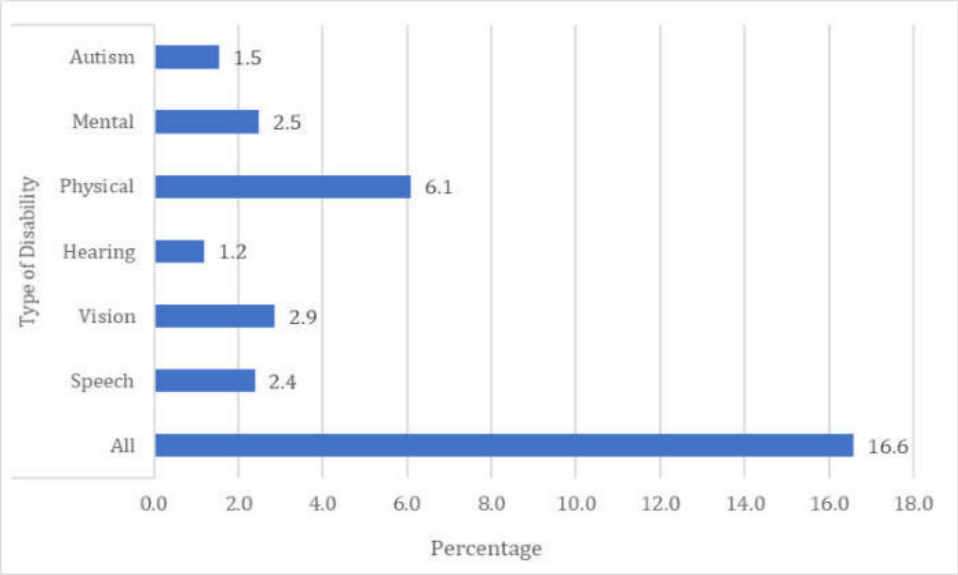
5.6.17 Energy Use

Electricity is an essential part of modern life and it helps people in different ways. Electricity is needed on a regular basis in everyday life. Electricity is used ranging from the entertainment industry to transport and communication, household, commercial and other sectors. All areas (commercial and residential) in the capital city have 100% electricity coverage. The use of electricity is noticeable in commercial sector compared to the use in residential (non-commercial) sector. In residential sector electricity is used for lighting, heating, cooling, refrigeration and freezing foods, watching television, washing clothes, cooking, bathing, online working from home in computers and running other devices. In cooking purpose, pipeline gas and LPG cylinder gas are the main sources of fuel used and electricity is also used as the alternative source of fuel for using some electric cooking machineries like rice cooker, curry cooker, induction oven and microwave oven.

5.6.18 Health Status

The Population Census 2011 identified almost six types of disabilities and their proportionate distribution in the study area are shown in Figure 5.49. Overall, it is found that about 16.6% people are suffering from disabilities among which about 6.1% people are physically challenged in the study area.

[36] https://archive.dhakatribune.com/bangladesh/2021/06/12/dhaka-consumes-46-of-the-electricity-bangladesh-generates



Source: Population Census-2011

Figure 5.49: Proportionate distribution of types of Disability

Field findings show that seasonal diseases such as colds, influenza/common fever are the most prevalent diseases. Children and old people are the main victims. A list of diseases which are commonly found in the study area is presented in Table 5.27. There is prevalence of Chikungunya and dengue and a low risk of malaria.

Table 5.27: Common Diseases Profile in the Study Area

S. L	Disease
1	Cough/cold
2	Gastric
3	Skin Diseases
4	CORONA Virus, Omicron (Covid-19)
5	Influenza/Common Fever
6	Dysentery
7	Stroke/Heart Attack
8	Diabetes
9	Diarrhea/Cholera
10	Typhoid
11	Asthma
12	Hypertension
13	Chicken Pox

Source: CEGIS fieldwork, 2022

On the other hand, health services and facilities are quite good as reported by the local people. Being a capital city people get all type of treatment facilities here. There are many medical colleges, hospitals, and, clinics providing medical services in the study area.

5.6.19 Public Utilities

Public utility services like water, gas and sewerage have an underground network whilst electricity is primarily above ground supplies along with the telecommunication services. The network of these

various services might be hampered during installation of the underground and overhead electric cables.

5.6.20 Road Network

The entire underground cable network will connect different substations of the north part of Dhaka city, Tongi and Purbachal. During the field visit, it was found that the underground cable line will pass through highway and inter road/junctions where traffic jams are a very common phenomenon. Here, the HDD method will be applied to minimize disruption. Names of some major roads /points are given below.

- Airport to Tongi Road
- Kalshi via Mirpur 12 Road
- Road of Bashundhara Residential area to Nodda

Approach Road of Proposed Tongi Substation (post-photo construction now complete)

Cable Route at Satais of Tongi

Cable Route at Kalshi Point

Nodda Point

Abdullahpur Road

Mirpur Road

Khilkhet Point

Figure 5.50: Roadways and Traffic at Different Points along the Proposed Cable Route

Figure 5.51 shows the RoWs of the underground cables that were surveyed over the road network.

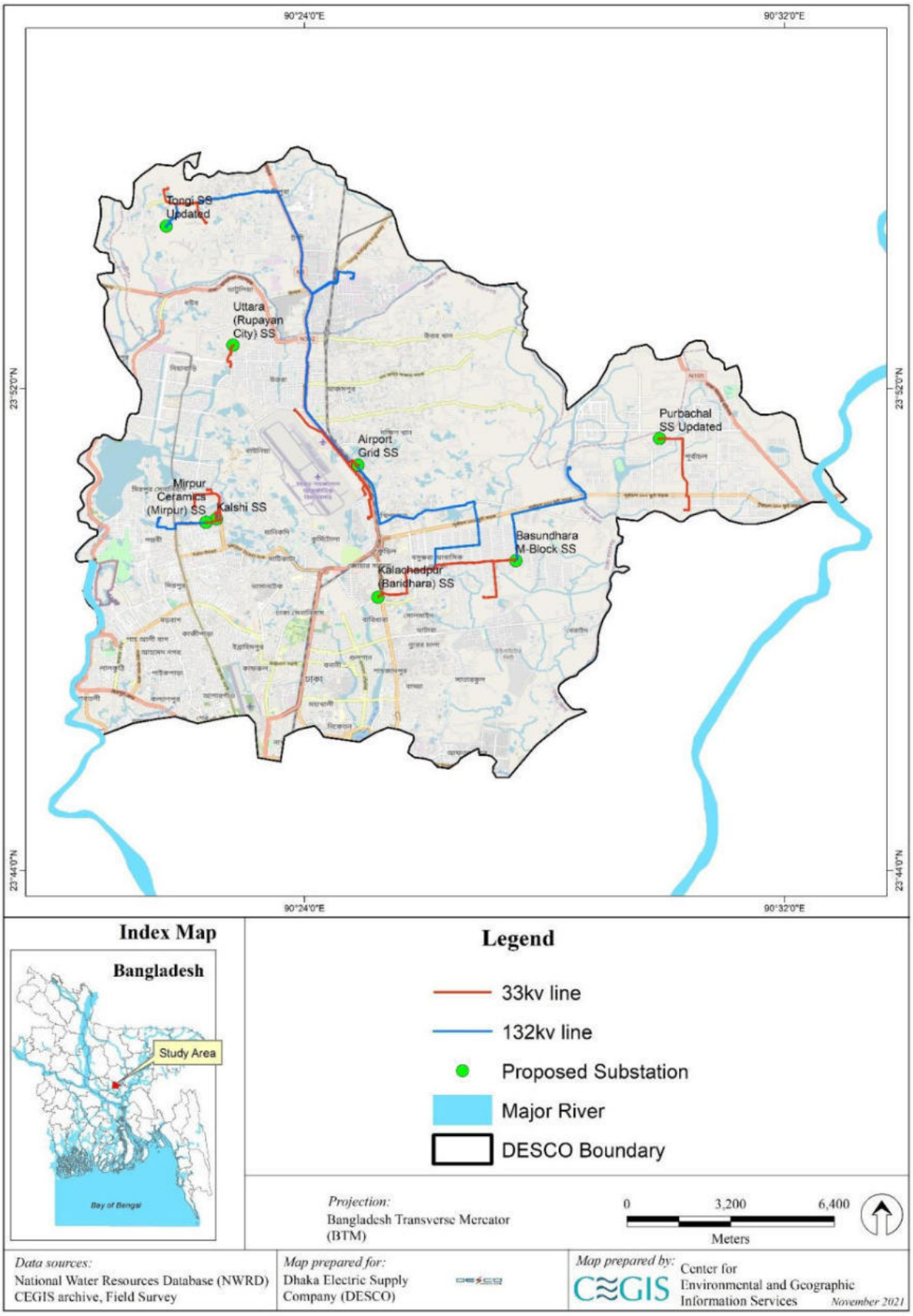


Figure 5.51: Alignment of the Underground Cable

5.6.21 Waste Management

In 2018 approximately 6,500 tons/day of solid waste were generated in Dhaka. Managing this solid waste is a serious environmental problem. North Dhaka City Corporation is responsible for collection of all waste in its administrative area which cannot be recycled or reused om site within North Dhaka. About 6,000-7,000 private contractors work for the city corporation collecting waste door to door. It is typically transported to their designated dump sites, Gabtoli and Nutunbazar. There is no segregation of waste before it is dumped, so hazardous waste may be mixed with solid waste. Scavengers search for materials which can be reused or recycled. These were engineered sanitary landfills but they have exceeded their capacity and their management no longer follow sanitary landfill norms.[37] However, only about 50% of waste is actually collected by the city corporation. The rest is open dumped along the road, in drains and in low lying areas as evidenced by waste deposited at several of the substation sites. During heavy rains the waste disposed on the road and in drains in carried into the river system.

There are no waste management facilities that can handle disposal of hazardous waste which must be recycled or reused. Most hazardous waste is disposed of comingled with solid waste in landfill, on the roadside, in drains etc. DESCO has its own facility to recycle transformer oil. In yearly maintenance schedules DESCO checks the oil quality and if needed, recycles the oil by centrifuging machine. However, even for regulated activities enforcement of environmental standards by government is weak.

5.6.22 Physical Cultural Resources

There is no known or listed archeological and historical infrastructure found in the substation areas and also by the side of the 132 kV and 33 kV underground cable route. However, the physical Cultural Resource list after analyzing the Google image considering a 100 m radius circle from the center point for the substations and 50m buffer from the center line of the underground cables is presented in Table 5.28. The presence of physical cultural resources on the 11 kV and 0.4kV routes will need to be confirmed once finalized.

Table 5.28: Physical Cultural Resources considering a 100 m radius circle from the center point for the substations and 50m buffer from the center line of the transmission line

Uttara Grid- To Rupayan 33 kV UG TL			
Sl	Type	Name	Distance (meter)
1	Mosque	Raytur Rahman Jame Masjid	6
2	Mosque	Baitun Noor Jame Mosjid	17
Circuit-1 for Kalshi Grid 132 kV UG TL			
Sl	Type	Name	Distance (meter)
1	Mosque	Pallabi Jhil Jame Masjid	6.3
2	Mosque	D Block Jame Masjid	18
Kalshi Grid to DOHS-1 33kV UG Tl			
Sl	Type	Name	Distance (meter)
1	Mosque	Swapnagar-1 A/A Jame Masjid	7
Basundhara M-Block to Kalachadpur			
SN	Type	Name	Distance (meter)
1	Mosque	Uttar Baridhara Baitur Nur Jame Masjid	4
2	Mosque	Baitul Atik baram uddinJame Mosjid	8

[37] https://journal-buildingscities.org/articles/10.5334/bc.108

3	Mosque	Bashundhara Boro Masjid	19
4	Mosque	Center For Islamic Economics Madrasah Mosque	5
Airport Grid to Basundhara D Block Grid			
SN	Type	Name	Distance (meter)
1	Mosque	F Block Masjid (Chapra Masjid) Bashundhara R/A	25
2	Mosque	Baganbari Jame Masjid	3.5
3	Mosque	Uttar Khilkhet Jame Masjid	13
Airport Grid to CAAB			
SN	Type	Name	Distance (meter)
1	Mosque	Uttara 1 No. Sector Jame Mosque	10
Tongi Old Grid to Airport Grid			
1	Mosque	Biman Bandar Railway Masjid	45
2	Mosque	Sadharan Bima Corporation Masjid	21.7
3	Mosque	Central Mosque Tongi	5
4	Mosque	Machhimpur Baitun Nayeem Jame Masjid	27
5	Mosque	Saheb Bari Darus Salam Jame Masjid	5
6	Mosque	Baitul Jannat Jame Masjid	5
Tongi Old Grid to Tongi Rajanagar Grid			
SN	Type	Name	Distance (meter)
1	Mosque	Tongi Hospital Masjid	16
Airport Substation			
1	Bangabandhu Pathagar		45
Mirpur Ceramic SS			
1	Moinul Quran Madrasah, Mirpur		37
Uttara (Rupayan City) SS			
1	Baitur Rahman Jame Masjid		58

Source: Google Image