

Environmental and Social Impact Assessment (ESIA)
Of
CAPEX/BMRE for Upgradation and Modernization of Existing Core
Network Infrastructure and Strengthening of Overall Network
Capacity by Robi Axiata Limited (Robi).



Robi Axiata Limited (Robi).
Robi Corporate Office, 53 Gulshan South Avenue, Gulshan-1
Dhaka-1212, Bangladesh.

Prepared by



Enviro Consultants Ltd.
8, Garden Rose, 1st Floor, Monipuripara
Tejgaon, Dhaka-1215
Email: ecl@enviroconsultant.org
Web: enviroconsultant.org

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CAPEX/BMRE for upgradation and modernization of existing core network infrastructure and strengthening of overall network capacity by Robi Axiata Ltd. (Robi).

LIST OF ACRONYMS

%	Percentage
°C	Degrees Celsius
3G	Third-Generation Cellular Networks
ADB	Asian Development Bank
BMD	Bone mineral density
BOD	Biochemical Oxygen Demand
BSC	Base Station Controller
BTRC	Bangladesh Telecommunication Regulatory Commission
BTS	Base Transceiver Station
CCD	Charge-Coupled Device
CCL	Center for Creative Leadership
CCO	Chief Compliance Officer
CEN	European Committee for Standardization
CENELEC	European Committee for Electro Technical Standardization
COD	Chemical Oxygen Demand
CSSR	Climate Science Special Report
dB	decibels
DC	Deputy Commissioner
DNS	Domain Name Server
DoE	Department of Environment
ECA	Educational Credential Assessment
ECC	Environmental clearance certificate
ECR	Emigration Check Required
EDA	Economic Development Activities
EMF	Electrical and Magnetic Field
EMP	Environmental Management Plan
EMR	Environmental Monitoring Reports
EQS	Environmental Quality Standards
ERDMP	Emergency Response and Disaster Management Plan
ERP	Emergency Response Plan
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESSF	Environmental and Social Safeguards Framework
ETSI	European Telecommunications Standards Institute
GDP	Gross Domestic Product
GHG	Greenhouse Gases
GNI	Gross National Income
GoB	Government of Bangladesh
GPRS	General Packet Radio Service
HSPA	High-Speed Packet Access
ICNIRP	International Commission on Non-Ionizing Radiation Protection
ICT	Information and Communication Technologies
IDCOL	Infrastructure Development Company
IEC	International Electro Technical Commission
IEE	Institution of Electrical Engineers
IEEE	Institute of Electrical and Electronics Engineers
IETF	Internet Engineering Task Force
HLR	Home Location Register
IOT	Internet of Things
IPP	Indigenous Peoples Plan
ITU	International Telecommunication Union

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KPI	Key Performance Indicator
LTE	Long Term Evolution
MGW	Media Gateway
MDG	Millennium Development Goals
MSC	Mobile Switching Centre
NCCD	Nationally Consistent Collection of Data
NCI	National Cancer Institute
NEP	National Energy Policy
NGO	Non-Governmental Organization
NGO	A non-governmental Organization
NOC	No Objection Certificate
PAPs	Project Affected Persons
PM	Project Manager
PPE	Personal Protective Equipment
RAU	Remote Acquisition Unit Interconnecting Station
RF	Radiofrequency
RP	Resettlement Plan
SCC	Switching Control Center
SMS	Short Messaging Services
SPS	Safeguard Policy Statement
TDD	Time Division Duplex
ToR	Terms of Reference
TSS	Total Suspended Solids
UMTS	Universal Mobile Telecommunications Service
UNICEF	United Nations International Children's Emergency Fund
WHO	World Health Organization
WMP	Waste Management Plan

GLOSSARY

Client	One who uses the services or advice of a professional person or organization
Communities	A group of interacting people, living in some proximity (i.e., in space, time, or relationship) that shares common values and has social cohesion.
Framework	An organized structure of policies, legislation, programs, and tasks created to achieve a specific outcome. There can be frameworks for broad policies and strategic initiatives at various scales (e.g. provincial, regional, sector, media); programs and program delivery; and short-term tasks and projects
Drinking Water	Water that is used for drinking, cooking, dishwashing, or other domestic purposes requiring water that is suitable for human consumption
Project Proponent	An individual or organization that together with others, each of which is also a project proponent, has overall control or responsibility for the project
Runoff	Water that moves across (or through) soils on the land during snowmelt or rainstorms
Stakeholders	Any and/ all individuals, groups, organizations, and institutions interested in and potentially affected by a project or having the ability to influence a project
3G	The third-generation cellular networks were developed with the aim of offering high speed data and multimedia connectivity to subscribers. The International Telecommunication Union (ITU) under the initiative IMT-2000 has defined 3G systems as being capable of supporting high speed data ranges of 144 kbps to greater than 2 Mbps. A few technologies are able to fulfil the International Mobile Telecommunications (IMT) standards, such as CDMA, UMTS and some variation of GSM such as EDGE
4G	4G standards, named the International Mobile Telecommunications Advanced (IMT-Advanced) specification, setting peak speed requirements for 4G service at 100 megabits per second (Mbit/s) for high mobility communication (such as from trains and cars) and 1 gigabit per second (Gbit/s) for low mobility communication (such as pedestrians and stationary users)
Bandwidth	In wireless communications, the word 'bandwidth' is used to refer to analogue signal bandwidth measured in hertz. The connection is that according to Hartley's law, the digital data rate limit (or channel capacity) of a physical communication link is proportional to its bandwidth in hertz.
Cellular network	A cellular network or mobile network is a radio network distributed over land areas called cells, each served by at least one fixed location transceiver, known as a cell site or base station. In a cellular network, each cell uses a different set of frequencies (frequency reuse) from neighbouring cells, to avoid interference and provide guaranteed bandwidth within each cell.
Fading	Fading or more specifically small-scale fading is often described by a mathematical model that describes the distortion that a carrier-modulated communication signal experiences during its propagation through an operating environment. Thus, fading describes the rapid fluctuations of the amplitudes, phases, or multi-path delays of a radio signal over a short period of time or distance. Fading is caused when two or more versions of a transmitted signal arrive at the receiver with small amounts of time in between them. Therefore, these signals, or multi-path waves combine at the receiver antenna, resulting in a signal that varies widely in phase as well as in amplitude, which depends on the distribution of the intensity,

	relative propagation time of the waves, and the bandwidth of the transmitted signal.
HSPA	High-speed packet access (HSPA) refers to a set of technologies that came about as a result of enhancements to wideband code division multiple access (WCDMA) systems. HSPA is composed of the High-Speed Downlink Packet Access (HSDPA) protocol and the High-Speed Uplink Packet Access (HSUPA) protocol.
Latency	Latency is a measure of time delay experienced in a system, the precise definition of which depends on the system and the time being measured. In communications, the lower limit of latency is determined by the medium being used for communications. In reliable two-way communication systems, latency limits the maximum rate that information can be transmitted, as there is often a limit on the amount of information that is "in-flight" at any one moment. In the field of human machine interaction, perceptible latency has a strong effect on user satisfaction and usability.
LTE	LTE – is the acronym of long-term evolution, marketed as 4G LTE, is a standard for wireless communication of high-speed data for mobile phones and data terminals. It is based on the GSM/EDGE and UMTS/HSPA network technologies, increasing the capacity and speed using a different radio interface together with core network improvements.
Network capacity	Network capacity is the maximum capacity of a link or network path to convey data from one location in the network to another.

EXECUTIVE SUMMARY

Background

Robi Axiata Limited (Robi) is a mobile connectivity, internet access, and mobile telecommunication service provider in Bangladesh providing voice, data, and other related services. Global data traffic is expected to grow exponentially in the next few years with video and smartphone applications driving data growth. Many mobile network providers in Bangladesh have either deployed or planning to deploy 4th generation Long-Term Evolution (LTE) mobile technology as the solution to meet capacity demands. This study evaluates the technological improvements in 4G LTE in comparison to 3G High-Speed Packet Access (HSPA) and further conducts a techno-economic analysis using primary researched tariff data to determine network operator profitability and mobile tariff strategy to meet user demand. To ensure holistic analysis, the study also considers the environmental impacts of 4G by determining the annual carbon emission for a network operator. The study results show 4G will prove high-speed data and profitable; however, a trade-off has to be made by network operators between meeting consumer tariff demands or increasing profitability. The analysis also shows a 63% reduction in carbon emissions is possible with migration to 4G services with the implication of further financial benefits for network operators as a result.

In order to expand the 4G network from its existing network in the whole Bangladesh Robi intended to implement the CAPEX/BMRE for up-gradation and modernization of existing core network infrastructure and strengthening of overall network capacity to meet the present and future demand to attain Bangladesh the middle-income country.

Present Coverage

At present Robi is providing the following area of the whole country coverage with 2G, 3G, 4G, and 4.5G.

- Total planned Physical Sites 1160,
- 4G new colocation 1025
- 260 Gbps Core capacity enhancement
- 2,700 Km fiber expansion

Proposed Coverage

Robi has proposed the coverage the services-based on the implementation of the project at the end of the Year 2019 PoP Coverage: 2G - 82%, 3G - 67%, 4G - 75% and proposed end of the Year 2020 forecasted PoP Coverage: 2G - 85%, 3G - 70%, 4G - 82%.

Description of the Project

From 1997 to date Robi established and improved infrastructural facilities (1G, 2G, 2.5G, 3G, 4G and 4.5G) an infrastructure like MSC, BSC and TBS every year. Robi already using 4G network and provides services a part of the country using their existing infrastructure. Now Robi is intended to provide high speed internet facilities to users rest of the unserved area of the country.

Robi holds the best spectrum possession in local market with highest lower band and contiguous mid band for a decent capacity layer. Next 3 Years Spectrum acquisition plan: 5MHz from 1800 band, 20MHz from 2600 TDD Band and Usage Plan of 2600 TDD Band.

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Initially this will be used for 4G capacity and gradually migrate to 5G according to eco system development of 5G.

Robi proposes build up voice layer over 2G and 4G, intend to 4G as primary Data layer until 2021 followed by gradual migration to 5G, identifies 3G as Sunset Technology with Investment Cut off from 2020 and discontinuation based on residual device penetration. Current state 2019 and Evolution state 2022 of Network & Spectrum Topology

Currently, Robi has a total of 39.8 MHz of spectrum in 900 MHz, 1800 MHz, and 2100 MHz bands, which is higher than any other operators in the country. The tenure of the license is for 15 years with which can be extended afterwards by paying relevant fees.

Location of the Project

Robi is a telecommunication service provider Company having its Corporate office in Gulshan 1, Dhaka, and other regional offices in different districts of Bangladesh. Other than these offices Robi has 10 Mobile Switching Centre (MSC) sites, 9 Base Station Controller (BSC) sites and approximately 11,500 Base Transceiver Station (BTS) sites all over the country. Based on the list of location and address of the project as shown in Table 3.1, the expansion of the project site is not situated in the ecologically critical area

Air and Noise Pollution Impact and Mitigation

During the implementation period of the project noise and air pollution may generate from the generator for a temporary/short period of time. Minor impact on occupational health and safety may occur during the implementation period of the project. During operation period noise and air pollution may occur only when generators will use due to power disruption. Mitigation of impact may be minimized through the implementation of the mitigation measure outline of EMP in the report.

Liquid Waste and Mitigation

There is no process water required for the expansion work. Hence no scope of the generation of wastewater and no impact. Only domestic purposes for the washroom, toilets, and drinking water are required for each site of the project. Drinking water and food will be supply from the third-party catering services. Liquid wastewater from the toilet will be treated through the septic tank fitted with a soak pit for each of the sites. Minor or negligible impact on liquid and occupational health and safety may occur during the implementation period of the project.

Solid Waste and Mitigation

During the expansion period, some solid waste will generate each site that will dispose of by the contractor. A negligible amount of solid waste like the used battery will generate during the operation of the project. This waste battery will be store in a safe place for interim period and dispose off through DoE registered vendor. Food waste disposal of the third party catering services. Minor or negligible impact on solid waste generation and disposal.

E-Waste

E-waste will generate from each of the tower stations after certain time period. Provision to reduce, reuse, and recycle of disposing of equipment to maintain environmental and socioeconomic benefits should be on the basis of strategies pointed out in the 'National 3R Strategy for Waste Management, 2010' issued by the Department of Environment.

Soil contamination and Mitigation

There is no scope of soil contamination during the implementation of the expansion work. Diesel oil will use only for generator fuel when power will not be available. There is a scope of the oil spill and oil and grease waste will generate which is an insignificant amount. This insignificant oil waste also will dispose of by the third-party registered vendor approved by the Department of Environment (DoE).

Ecology Impact and Mitigation

There is no loss of flora and fauna species since there is no land clearing and no land acquisition requirements for the expansion of the project. Negative impact on green coconut, fruit tree loses their pollination and high fruit trees. It reduces the water inside the green coconut and other fruits. Birds, insect and living things may get health impact is more due to radiation from the 4G network near the tower. The radiation impact of the ecology may be minimized by the use of low radiation equipment with modern technology.

Impact on Human

Due to the increase of mobile connectivity and data transfer, it may impact and damage brain cells, mental imbalance, and cause cancer for over radiation.

Social Impact and Mitigation

Desk studies and observations by the consultant were carried out on the potential social impacts identified at the time of the study. This was done in order to first, determine the potential for such impacts, and secondly, to identify and propose mitigation measures that would enable avoidance or reduction of severity should the potential impacts occur or to increase the benefit of potential positive impacts. Many positive impacts identified during the study like improve lifestyle, increase business, communication, etc. Negative impacts may be on health problems due to radiation during excessive use of mobile.

Stakeholder Engagement

“An individual, group, or organization, who may affect, be affected by or perceive itself to be affected by a decision, BMRE, activity, or outcome of a project” is considered as a stakeholder. Stakeholder engagement is a process conducted throughout the project life-cycle, which supports the development of strong, constructive, and responsive relationships that are important for the successful management of a project’s environmental and social risks. Stakeholder engagement is most effective when initiated at an early stage of the project development process and is an integral part of early project decisions and the assessment, management, and monitoring of the project’s environmental and social risks and impacts. The process of stakeholder engagement will involve the following, (i) stakeholder identification and analysis; (ii) planning for engagement with stakeholders during the life of the project; (iii) disclosure of information; (iv) consultation with stakeholders; (v) addressing and responding to grievances; and (vi) reporting to stakeholders. Stakeholder's engagement consultation has been completed by a social special Md Humayun Kabir and an Environmental Engineer Md Nashir Uddin.

Radiation Impact and Mitigation

Potential adverse impacts on communities from exposure to electromagnetic fields is extremely unlikely, with the Company’s use of equipment designed and maintained to emit radiation within industry prescribed radiation thresholds. The implementation of stakeholder

consultation and community development action plan shall ensure the grievance redress and inform the community about the new expansion operational development. No indigenous people are living at the proximity of the project site towers even in the three hill tracts districts.

Human health hazards may exist mainly in relation to exposure to electromagnetic wave radiation. These risks are minimized through various mitigation measures by the use of advanced technology with lower radiation emissions equipment, regular training of officers, engineers, and technicians, with the required personal protective equipment (PPE) and job safety analyses. EMF test report indicated that the radiation impact is less than the standard.

Lightening Impact and Mitigation

Lightening is frequently occurred in recent times in Bangladesh and poses health hazards, loss of human, animal, birds' life, and mobile towers. This lightning is the biggest threat to telecommunication towers.

Lightning usually hits the sharpest and tallest object in an area because ground charges emitted from objects with high elevations reach to opposite charged streamers of the cloud earlier than the charges from any shorter object. On the other hand, lightning current aims to reach the ground by following the shortest and most conducive way. That is why a tall metal structure such as a telecommunication tower and related equipment are the primary target for lightning strikes.

In order to mitigate this disruption and damages of equipment save the mobile communication from lightning, a lightning prevention system uses which dissipates the charges on the structure through thousands of tiny sharp points and blocks the emission of these charges. This process makes the protected site "*invisible*" to lightning and prevents a possible strike on it.

Benefits of the Project

There are many positive impacts identified due to the implementation of the expansion of the 4G project.

- Increase of GDP growth
- High voice quality, very quick data access, increase the use of data receive and transfer
- Easily access the internet, faster live streaming media and video calling, etc.
- Increased throughput, lower latency, and stronger security.
- Efficient multicast/broadcast, fast communication, and easily accessible to the IT world
- Less Expenditure of the ICT industry, freelancers get more access to the freelance marketplace and earn more foreign currency.
- Revolution of the ICT industry shortly
- Increase data transfer for banks, financial institution, corporations, digitalization of government agencies activities
- Many services to the people doorstep and improve lifestyle
- The benefit to social media, increase social and business communication
- Reduce transportation and movement expenses and improve health and education services.
- GHG emission will reduce drastically and make the environment sustainable

Environmental and Social Management Plan

Mobile broadband technologies have emerged and transformed almost all aspects of consumer social life: relationships, community, work, individual and national governance. Thus, we observe that:

- consumers are increasingly connected;
- immense data are stored and secured on the cloud;
- there is the expansion of content and video in mobile devices;
- new business models.

During the last years, mobile devices have significantly enriched the digital experience: in addition to calls and messaging mobile devices offer photos, video, maps, location-based services, internet, social networks, gaming, and millions of services that have become a daily necessity.

The convenience and efficiency of additional functionality make consumer lives easier but also dependent on technology.

Monitoring Plan

A monitoring system is put in place to ensure that management practices for mitigating negative impacts and enhancing those that are positive be affected. It must however be ensured that recommendations made in the Environmental Management Plans are followed.

Institutional Arrangement

Executive responsibility for project management commonly involves a number of organizations/ persons, each with specific responsibilities for particular aspects during the preparatory works for site clearing, earth cutting on-site execution, and operation & maintenance phases.

The institutional arrangements for the implementation of various aspects of ESMF and environment management of the project comprise the following.

1. Environment Management Cell (EMC) at PMU to monitor all the aspects of environmental and social management of the project
2. Project Environment Cell (PEC) at PIU to ensure adequate integration of environmental management measures in the design phase and supervise the implementation of ESMF and specific requirements of ESMP
3. Environment Management Unit (EMU) to implement EMP and other regulatory requirements during the planning, implementation & operation phase of the project.

Findings

The overall findings of the ESIA are that the proposed installation of CAPEX/BMRE for upgradation and modernization of existing core network infrastructure and strengthening of the overall network capacity of Robi.

The project will not cause any significant adverse environmental impacts during the expansion period, provided that adequate mitigation measures are implemented. The proposed mitigation measures are prescribed conceptually in the ESIA, as an outline EMP. This will be developed by the contractor in the implementation and operation phase.

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EMF test report indicated that the radiation impact is less than the standard. So it is safe to use mobile technology for people.

Thus, it can be concluded that the proposed expansion 4G project is environmentally acceptable and will bring economic, high-speed data access, cultural, social, and environmental benefits to the mobile voice and data users and local community in the area.

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CHAPTER 1 INTRODUCTION

1.1 Background

Robi Axiata Limited (Robi) is a subsidiary company of the Asian telecom giant, Axiata Group Berhad, based in Malaysia started its commercial operation on 16 November 2016. Other shareholders in the entity are Bharti Airtel International (Singapore) Pte Ltd and NTT DOCOMO Inc. Robi is the second-largest mobile network operator in Bangladesh with 46.88Mn subscribers as of the end of December 2018. The company commenced operation in 1997 as Telekom Malaysia International (Bangladesh) with the brand name 'Aktel'. In 2010, it was rebranded as 'Robi' and the company changed its name to Robi Axiata Limited. As of now, this is the biggest ever merger of the country and the first-ever merger in the mobile telecom sector of Bangladesh.

Robi Axiata Limited (Robi) is a mobile connectivity, internet access, and mobile telecommunication service provider in Bangladesh providing voice, data, and other related services. The company also provides international roaming agreements with various operators of different countries across the world. The company obtained a radio system operating license from the Ministry of Posts and Telecommunications (MOPT), Government of Bangladesh in 1996 which expired on 10 November 2011. The license was renewed for a period of another 15 years with effect from 11 November 2011. Launching its commercial operations on 15 November 1997 with the brand name of "Aktel", RAL operates under the brand name of "Robi" and stands as the second-largest telecom operator in Bangladesh, with an active subscriber of 49 million and a market share of 30%, trailing just behind Grameen Phone.

Robi was the first operator to introduce GPRS and 3.5G services in the country. It is the first company to launch 4.5G service in all the 64 districts of the country. In fact, this landmark milestone was achieved on the first day of the commercial launch of the service by Robi on 20 February 2018. By the end of 2018, Robi created the largest 4.5G network of the country with nearly 7,400 sites covering 99 percent of the thanas of the country.

Robi also proudly claims to have the widest international roaming coverage with 398 operators across 182 countries with a widest 4G roaming footprint in 29 countries with 40 operators.

The company has introduced many first of its kind digital services in the country and has been the pioneer for paving the way in taking mobile financial services to the underserved communities in the rural and semi-urban areas. It is the only mobile operator to have successfully conducted the trial run of 5G and Voice over LTE technology on its 4.5G network.

The Company's operation requires an Environmental and Social Impact Assessment (ESIA) report in order to obtain funding from the Infrastructure Development Company (IDCOL) as well as to get the environmental certificate from the Department of Environment (DoE), Government of Bangladesh.

This report presents the results and outcomes of data and information collected and consultations carried out by a team of environmentalists and socio-economists during July-August 2020.

1.2 Objective of the ESIA

The primary objectives of the ESIA are to:

- Assess the baseline environmental and social conditions in the project area;
- Identify the potential environmental, social and occupational health impacts due to the installation in terms of expansion of 4G mobile network and operation;
- Propose appropriate mitigation measures and monitoring plans to minimize adverse environmental, occupational, and social impacts as per the DOE and ADB guidelines.

The assignment consists of conducting an ESIA of proposed Robi Axiata Limited. To mitigate the acute work crisis, Robi has planned to install MSC, BSC, and BTS at the Project area, Bangladesh.

1.3 Scope of the Study

The scope of work would include, inter alia, the following:

- Review the environmental regulatory regime as relevant to the expansion of the project
- Conduct baseline condition survey
- Literature review secondary data on weather, soil, water resources, wildlife, vegetation, etc.
- Land use and environmental assessment of the project area
- All the above activities will be undertaken to establish the baseline condition. After establishing the baseline conditions all the project activities from 4G Instrument setup to operation phases will be analyzed to study their impacts on the receiving environment. Based on the analysis of the impacts, and the Environmental Management Plan will be developed.

To fulfill the requirements of IDCOL, Environmental, and Social Impact Assessment (ESIA) reports on Robi would be prepared.

ESIA, a detailed environmental and social impact assessment, will be carried out based on-desk, online platform, and site visits. The fundamental objective of the ESIA is shaping the project so as to improve overall environmental and social performance, through enhancing beneficial impacts and minimizing adverse impacts, and the studies will be carried out with this objective clearly in mind. To this end, the environmental studies will be fully integrated with the engineering studies which will be carried out concurrently, so that the development objectives of the project can be achieved in a manner that is fully consistent with ECA's 95.

1.4 ESIA Team

This report has been prepared by Enviro Consultants Ltd. under the guidance and supervision of Dr. J C Saha. The other members of the team are Md. Nashir Uddin, Sujoy Mandol, Md. Saad, Zisan Binte Walid, and Md. Humayun Kabir. The team leader is an Environmental Specialist having a PhD in Environmental Engineering. The other members are Environmental

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Engineer, Electrical and Electronic Engineering, Chemist, Ecology/biologist, and Sociologist respectively with the specialization in ESIA.

1.5 Structure of the EIA Report

The report has been structured in compliance with the requirement of the TOR.

Chapter 1: Introduction: The introductory chapter presents a brief overview of the assignment along with its background, brief description, the scope of the study, methodology, limitation and EIA team, etc.

Chapter 2: Policy, Legal and Administrative Framework: Chapter Two outlines the Policy and Legislation on environmental issues covering the potential legal, administrative, planning, and policies framework within EIA will be prepared.

Chapter 3: Project Description: Chapter three describes the proposed interventions including alternative options suggested by the project, background, project category, need for the project, location, size, and magnitude of the operation.

Chapter 4: Description of Environmental and Social Baseline: Chapter four presents a description of the environmental baseline condition (socioeconomic, physical, and biological) of the project area.

Chapter 5: Analysis of Suitability for Alternative Routes: Chapter Seven presents the description of the alternative routes and suitability analysis of the selected route.

Chapter 6: Identification of Potential Impacts and Mitigation Measure: The potential impacts due to the implementation of 4G mobile technology cover the whole Bangladesh will be identified through the checklist method and possible mitigation measures describe in this chapter.

Chapter 7: Environmental Management Plan: The chapter mainly deals with the environmental and social management plan, which includes an implementation plan of mitigation measures, and the environmental monitoring program of the project. The ESMP also includes specific compensation, monitoring, and enhancement plan.

Chapter 8: Grievance Redress Mechanism and Stakeholder Engagement: This chapter mainly addresses the grievance from the employees and other stakeholders. Describes the stakeholder's consultation through a questionnaire survey based on major problems, positive and negative impacts, and probable solutions recommended by the project.

Chapter 9: Institutional Arrangement:

This chapter presents the institutional requirements and responsibilities of the project.

Chapter 10: Conclusion and Recommendations: This chapter presents the findings, conclusion, and recommendations of the project.

1.6 Limitations

There were some limitations to this ESIA study. Those are given below:

- First of all, due to the COVID-19 pandemic situation, there is a limitation and restriction of maintaining of physical distance for arranging and conducting stakeholder consultation, focus group discussion, and environmental and social survey, the study could not be done physically onsite, however, the consultants collected data and information through virtual consultation/meeting and discussion over the cell phone and mail during July 2020 from various stakeholders.
- Secondary data was collected from BMD for temperature, rainfall, humidity, and wind speed and direction.
- Secondary data used for air, noise, and water quality.

1.7 Acknowledgment

The successful completion of this ESIA study report was made possible by several individuals, local bodies, agencies, establishments, and institutions that helped in gathering data and providing information and services. The expert acknowledges the input of the proponent in terms of providing resources, documentation, and logistical support that was necessary for data collection as well as the compilation of this ESIA Study Report.

To obtain baseline information on the project site, the firm of experts relied on secondary data and information, literature review of information available from government offices, and previous ESIA studies undertaken by lead consultants.

The consultants thanks the local body, NGO, IT firms, for their input during the public consultation process for accepting to participate in virtual meetings and interviews as well as responding to the questionnaires on the possible impacts associated with the proposed project development.

CHAPTER 2 POLICY, LEGAL, AND ADMINISTRATIVE FRAMEWORK

2.1 Introduction

This chapter highlights the relevant legal provisions which would govern the process of ESIA under which this proposed project falls. These provisions are broadly categorized as policies, legislation, regulations, and administrative frameworks.

2.2 Category of the Project

CAPEX/BMRE for up-gradation and modernization of existing core network infrastructure and strengthening of overall network capacity by Robi Axiata Limited (Robi) activities is not included in the classification of different industrial units or projects list in ECR 97. However, based on the component of the project activities mainly on the expansion of 4G network and communication and strengthening of overall network capacity, it is assumed that the proposed project of Robi Axiata Limited (Robi) is of an "Orange B Category".

According to the environmental and social categorization of the Safeguards Policy Statement (SPS), 2009 of Asian Development Bank (ADB), it seems to be a B category project. Besides, the Environmental and Social Safeguards Framework (ESSF) has inferred the project as a Moderate Risk Project. Based on these categorizations, RAL is required and intended to prepare a comprehensive Environmental and Social Impact Assessment (ESIA) report including an Environmental Management Plan (EMP) for sustainable development of the Project.

Most of these impacts are radio wave specific and can be mitigated with standard mitigation measures.

2.3 National Environmental Acts, Rules, Policies, and Strategies

General Discussion

The Government of Bangladesh has laid out various policy guidelines, acts, and regulations pertaining to environmental and social aspects. All the applicable GOB regulations and their relevance to this project are presented below in **Table 2.1**.

Table 2.1: Summary of Applicable Environmental and Social Laws, Regulations and Policies of GoB

S. No	Act/ Rules/ Laws/ Regulations	Key Features and purpose	Applicability to Project ESIA of RAL
1	Environment Conservation Act, 1995 (amendment in 2000, 2002 and 2010)	Conservation of the environment, improvement of environmental standards, and control and mitigation of environmental pollution.	Conservation of the environment, compliance of environmental standards, the control and mitigation of

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S. No	Act/ Rules/ Laws/ Regulations	Key Features and purpose	Applicability to Project ESIA of RAL
			environmental pollution.
2	National Environmental Policy, 1992	▪ Maintaining the ecological balance, overall progress, and sustainable development of the country through the protection and conservation of the environment. ▪ Protecting the country from natural disasters ▪ Identifying and regulating all types of activities which pollute and degrade the environment ▪ Ensuring environmental-friendly development of all sectors ▪ Maintain the active association as far as possible with all environmentally-related international initiatives ▪ To adopt corrective measures in phases in industries that cause pollution. ▪ To ensure sustainable use of raw materials in industries and to prevent their wastage.	Concerning the installation and/or set up equipment the environmental policy aims at the prevention of pollution and degradation of resources caused by radiation, radio wave, and microwave transmission, energy, waste, and raw material (Section 2.1-2.11, 3.1-3.5).
3	National Conservation Strategy, 1992	All industries shall be subject to an ESIA; • Adoption of pollution additionally, the operation of the prevention/control technologies shall be enforced; • Hazardous or toxic materials/ wastes shall not be imported as raw materials; • Import of appropriate and environmentally-sound technology; ▪ Dependence on imported technology and machinery gradually be reduced in favor of sustainable local skills and resources	Applicable as the project would require natural resources for the 4G Instrument setup. Robi project would result in a reduction in emission
4	The National Water Policy, 1999	• Protection, restoration, and Applicable for the preservation of water enhancement of water resources quality • Protection of water quality, including strengthening regulations concerning agrochemicals and industrial effluent • Sanitation and potable water ▪ Fish and fisheries	Participation of local communities in all water sector development
5	Environment Conservation Rules (ECR), 1997 (amendment in 2002, 2003 and 2010)	Prescribes processes and requirements for obtaining environmental clearance (Section 7). The environmental clearance certificate (ECC) is provided by the Director-General of the Department of the Environment (DOE). The Environmental Clearance Certificate must be obtained before any activities are carried out on the site. Projects are classified according to the impact on the environment into four Groups: Green, Orange (A), Orange (B), and Red (Section 7.1).	According to the project category by DoE, the proposed project is not listed in 4 categories. But the consultant is considering the project category under Orange B to take into account its impact.
6	National Environmental Management Action Plan, 1995	▪ Identification of key environmental issues affecting Bangladesh; ▪ Identification of actions necessary to halt or reduce the rate of environmental degradation; ▪ Improvement of the natural and built environment;	Pollution abatement in terms of waste minimization and treatment.

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S. No	Act/ Rules/ Laws/ Regulations	Key Features and purpose	Applicability to Project ESIA of RAL
		- Conservation of habitats and biodiversity; - Promotion of sustainable development; - Improvement in the quality of life of the people.	
7	Environment Court Act, 2000 subsequent amendments in 2002 and 2010.	Establishes environmental courts and procedures to make rules for the protection of environmental pollution. Environmental courts are at the district level, but the government may establish courts outside the districts. The courts have the power to take cognizance of offenses relating to pollution.	The Environmental Court has established in Dhaka and other divisional headquarters
8	National Forestry Policy, 1994	Under the policy, due to scarcity of forests, forestation is actively pursued with targets to —implement programs of tree plantation and forestation on vacant land and homestead land, which are under private ownership. II	There is no statutory requirement to replace trees planted for beautification, but it is desirable to incorporate tree planting in the project wherever it is practicable to do so as requested by the Commissioner of Forests.
9	Inspection and Enforcement Manual (2008)	The manual was written to provide national standards and uniformity of environmental sampling for the inspection, investigation, and chemist in the Department of Environment (DOE).	To comply with where relevant to sampling and analysis
10	The Ground Water Management Ordinance, 1985	The ordinance includes i) Management of groundwater resources and ii) Installation of tube-wells at any place after license from Upazila Parishad only	The proposed expansion project will not use groundwater sources.
11	Bangladesh National Building Code (BNBC) 2014	BNBC Code is the ultimate code that is followed in Bangladesh to build safe houses and buildings. Earthquakes and wind effects of different building systems are incorporated in this code. However, there are some differences in that as it incorporates modifications by keeping in view the biological, environmental, and geological factors in Bangladesh. Moreover, socio-economic factors have also been taken into consideration while preparing this code.	Follow the BNBC code during and construction of the building
12	Antiquities Act, 1968	- This legislation governs preservation of the national cultural heritage, protects and controls ancient monuments, regulates antiquities as well as the maintenance, conservation and restoration of protected sites and monuments, controls planning, exploration and excavation of archaeological sites - This legislation governs preservation of the national cultural heritage, protects and controls ancient monuments, regulates antiquities as well as the maintenance, conservation and restoration of protected sites and monuments, controls planning,	The study area does not have any likely cultural heritage or ancient monuments of national or international significance. However, in case of any chance archaeological findings, the Project will act in consonance to the Act No (The study area does not have any

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S. No	Act/ Rules/ Laws/ Regulations	Key Features and purpose	Applicability to Project ESIA of RAL
		exploration and excavation of archaeological sites	likely cultural heritage or ancient monuments of national or international significance.
13	The Land Acquisition/ Requisition of Immovable Property Ordinance, 1982 Act	The Ordinance governs acquisition and requisition by the government of immovable property for any public purpose or in the public interest. It may be noted that contrary to the previous Acts (i.e. Act XIII of 1948), this Ordinance deals only with immovable property	The project does not require any land acquisition and requisition. So, this law will not apply
14	Bangladesh Labor Act, 2006 (amended in 2013, 2015 and 2018)	The Act provides the guidance on employer's extent of responsibility and workers' extent of rights to compensation in case of injury by accident while working. It also gives a general framework for Occupation Health and Safety (OHS), welfare, and working conditions of workers. A number of sections provide the duties of employers, including conditions of service and employment (sections 3-33), working hours and leave (sections 100-119), payment of wages (sections 120-137), determination of minimum wage (sections 138-149), and compensation for injuries to workers (sections 150-174). The act also specifies provisions on maternity benefits (sections 45-50), health (sections 51-60), safety (sections 61-88), and labor welfare (sections 89-99).	Provides for the safety of the workforce during the installation and setup of the instrument. Yes (This shall be the contractor's responsibility for compliance)
15	Building and Other Construction act, 2006	To regulate the employment and conditions of service of building and other construction workers and to provide for their safety, health and welfare measures and for other matters connected therewith or incidental thereto.	No building Construction shall be done.
16	Bangladesh Climate Change Strategy and Action Plan (BCCSAP) 2008 and revised in 2009	This action plan addresses the following strategies • Food security, social protection and health to ensure that the poorest and most vulnerable in society, including women and children, are protected from climate change. All programs focus on the needs of this group for food security, safe housing, employment and access to basic services, including health. • Comprehensive disaster management to further strengthen the country's already proven disaster management systems to deal with increasingly frequent and severe natural calamities. • Research and Knowledge management to predict that the likely scale and timing of climate change impacts on different sectors of the economy and socioeconomic groups; to underpin future investment strategies and to ensure that Bangladesh is networked into the latest global thinking on climate change.	Considered the climate change effect.

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S. No	Act/ Rules/ Laws/ Regulations	Key Features and purpose	Applicability to Project ESIA of RAL
		- Mitigation and low carbon development to evolve low carbon development options and implement these as the country's economy grows over the coming decades. - Capacity building and Institutional strengthening to enhance the capacity government ministries, civil society and private sector to meet the challenge of climate change.	
17	Bangladesh Standard Specification for Drinking Water, 1990	Formulation and revision of national standards. Now it is incorporated into the schedule of ECR 1997	Water supply should be under this consideration
18	National Biodiversity Strategy and Action Plan (2004)	Conserve, and restore the biodiversity of the project area for the well-being of the present and future generations through environmental stability for ecosystems; guarantees the safe passage and conservation of globally endangered migratory species, especially birds and mammals in the country; stops the introduction of invasive alien species, genetically modified organisms and living modified organisms.	This strategy will not affect
19	Water Supply and Sewerage Authority Act, 1996	The Act specifies WASA's responsibility to develop and manage water supply and sewerage systems for the public health and environmental conservation.	Construct drainage system as per WASA Act
20	Information and Communication Technology Act, ICT Act 2006	The primary object of the Information and Communication Technology Act, 2006 (the ICT Act) is to provide legal validity and security to information and communication technology. The significance of the ICT Act in relation to telecommunication lies in the fact that the Act removes and explains some of the legal uncertainties in relation to information and communication technology.	The act is applicable in this project
21	The Energy Policy (1996)	Provides for utilization of energy for sustainable economic growth, supply to different zones of the country, development of the indigenous energy source and environmentally sound sustainable energy development programs. Highlights the importance of ESIA's for any new energy development project.	Follow the Energy Policy
22	National Land use Policy (2001)	Deals with land use for agriculture, industrialization, railways and roads, tea and rubber and identifies land use constraints in these sectors. It may be noted that there are additional policies for these sectors.	Follow the land use policy
23	Ozone Depleting Substances Rules (2004)	Addresses issues related to Green House Gas (GHG) emission by phasing out the use of Ozone-depleting substances and ultimately banning the use of Ozone-depleting substances.	Use alternate material for CFC

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S. No	Act/ Rules/ Laws/ Regulations	Key Features and purpose	Applicability to Project ESIA of RAL
24	Noise Pollution Rules (2006)	This pertains to the prevention of noise pollution and setting standards for noise levels for different applications. Sets the acceptable sound limit at commercial areas at 70 dB for day and 60dB for night	Maintain noise level as per law Yes (This shall be the contractor's responsibility for compliance)
25	The Right to Information Act, 2005	The Act provides for setting out the practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, the constitution of a Central Information Commission and State Information Commissions and for matters connected therewith or incidental thereto.	Applicable to the project as a whole.
26	The Penal Code of Bangladesh; The Suppression of Immoral Traffic Act 1933; The Cruelty to Women Ordinance 1983; Trafficking in Women and Children Act 1993; Prevention of Women and Child Repression Act 2000	- a number of provisions protecting women from violence like rape, acid throwing, and attempt to cause death or grievous injury - provides penalty for forced prostitution, kidnapping, abduction, trafficking in women, cruelty because of dowry	Yes (This shall be the contractor's responsibility for compliance)

2.3.1 National Legislative Framework

There are several environmental policies and legislations which have direct and indirect relevance for the proposed project, particularly, the Environment Conservation Act (ECA), 1995 (amended in 2010) and the Environment Conservation Rules (ECR), 1997 (amended in December 2017). The Department of Environment (DoE), under the Ministry of Environment and Forest, Government of the People's Republic of Bangladesh, is responsible for ensuring the application of environmental laws and issuance of necessary clearances.

The ECR, 1997 (Amendment 2017) assigns activities of power network development projects into the Orange-B category (categories are discussed later in the Chapter). The Orange B category projects require submission of an Initial Environmental Examination (IEE) report along with an Environmental Management Plan (EMP) for site clearance certificate (SCC) and environmental clearance certificate (ECC) from the DoE. However, when this project was initiated, it fell under Red Category which required a full IEE and subsequently, an EIA (Environmental Impact Assessment) for SCC and ECC.

2.3.2 Environment Conservation Act, 1995 (Amendment 2010)

The main objectives of ECA, 1995 include conservation of the natural environment, improvement of environmental standards, and control and mitigation of environmental pollution. The main functions and strategies of the Act can be summarized as:

- Declaration of ecologically critical areas, and restrictions on the operation and process, which can be carried out or cannot be initiated in the ecologically critical areas.
- Regulation in respect of vehicles emitting smoke harmful for the environment.
- Environmental clearance.
- Regulation of the industries and other development activities – discharge permit.
- Promulgation of standards for quality of air, water, noise and soil for different areas for different purposes.
- Promulgation of standard limit for discharging and emitting waste.
- Formulation and declaration of environmental guidelines.

Failure to comply with any part of the Environment Conservation Act 1995 may result in punishment to a maximum of 5 years imprisonment or a maximum fine of Tk. 100,000, or both.

2.3.3 Environment Conservation Rules, 1997 (Amendments in 2002, 2003, 2017)

A set of relevant rules has been promulgated to implement the ECA. There have been four amendments to the Rules until now in February and August 2002, April 2003 and December 2017. The Rules mainly consist of:

The National Environmental Quality Standards (EQS) for ambient air, surface water, groundwater, drinking water, industrial effluents, emissions, noise and vehicular exhaust;

- Categorization of industries, development projects and other activities on the basis of pollution activities of the existing or proposed industries/development projects/activities.
- Procedure for obtaining environmental clearance;
- The requirement for undertaking IEE and EIA as well as formulating EMP according to categories of industries/development projects/activities; and
- Procedure for damage-claim by persons affected or likely to be affected due to polluting activities or activities causing hindrance to normal civic life.

2.3.4 Categorization of Projects or Industrial Units

The Rules incorporate 'inclusion lists' of projects requiring varying degrees of environmental investigation. Projects are screened as Green, Orange-A, Orange-B and Red based on their location, type and environmental burden. A list of industries is given in the Rules under each of the categories which aid the proponent on choosing the correct administrative procedures. A brief description of each category is below:

Green projects are those with positive environmental impacts or negligible negative impacts such as plantation and nursery. Clearance for these is obtained on the basis of project description, initial screening and No Objection Certificate (NOC) by the local authority.

Orange A projects are those with minor and mostly temporary environmental impacts for which there are standard mitigation measures, such as the installation of tube-wells, pond sand filter, tank/reservoir, sanitary latrines, etc. Application for DoE's environmental clearance requires general information, a feasibility report, a process flow diagram, and schematic diagrams of facilities, environmental screening form, NOC from the local authority.

Orange B projects are those which may cause moderately significant environmental impacts for which mitigation measures are easily identified, such as construction/re-construction of earthen roads, culverts, community center, office building for general services, re-excavation of the canal, repairing embankment, school field, etc. These require ECC from the DoE, for which an IEE with an EMP along with the information and papers specified for Orange A Category projects are needed.

Red projects are those which may cause significant adverse environmental impacts such as the construction of bridges, industrial factories, flood shelters, embankments, water control structures, power plants, etc. Red categorized projects require an IEE report to obtain an SCC, and subsequently a full EIA report for ECC, along with the information required for all other categories.

Environmental Quality Standards in operation in Bangladesh are also promulgated under the ECR, 1997. There are standards prescribed for varying water sources, ambient air, noise, industrial effluents and discharges, vehicular emissions, etc.

The Bangladesh standards intend to impose restrictions on the volume and concentrations of waste-water/ solid waste/ gaseous emissions discharged into the environment. In addition, the number of surrogate pollution parameters like Biochemical Oxygen Demand (BOD), or Chemical Oxygen Demand (COD); and Total Suspended Solids (TSS) are specified in terms of concentration and/or total allowable quality discharged in case of waste-water/solid waste.

Additionally, specific parameters depending on the manufacturing process are specified such as phenol, cyanide, copper, zinc, chromium, etc. Air emission-quality standards refer mostly to the concentration of mass emission of various types of particulate, sulfur dioxide, and oxides of nitrogen and in some cases volatile organic compounds and other substances.

The Bangladesh standards, in general, are less stringent compared to the developed countries. This is in view to promote and encourage industrialization in the country. The Bangladesh standards are not for any specific period of time. There is no provision for partial compliance.

2.3.5 Environment Court Act, 2010

The Environment Court Act, 2010 is the mechanism for the establishment of environment courts for matters incidental to environmental pollution and incidental matters. The environment court enjoys the exclusive jurisdiction for trial of an offense or for compensation falling under the ECA, 1995 (amended 2010). This Act allows the government to take necessary legal action against any parties who create environmental hazards or cause damage to environmentally sensitive areas as well as to human society.

According to this Act, the government can take legal actions if any environmental problem occurs due to this proposed power system improvement project interventions.

2.3.6 Acquisition and Requisition of Immovable Property Act, 2017

Land acquisition in Bangladesh is governed by a) the Acquisition and Requisition of Immovable Property Act, 2017 (henceforth, the 2017 Act) which repealed the Acquisition and Requisition of Immovable Property Ordinance 1982 (with subsequent amendments of the latter up to 1994; henceforth 1982 Ordinance) and b) the East Bengal State Acquisition and Tenancy Act (1950) revised in 1994. The 2017 Act provides certain safeguards for the owners and has provision for payment of “fair value” for the property acquired. The 2017 Act also gives the right to the landowner to appeal against land acquisition within 15 (fifteen) days of

notice (Section 5 of the 2017 Act). The appropriate procedure for such appeals is in place. The 2017 Act, however, does not cover project affected persons (PAP) without titles or ownership records, such as informal settler/ squatters, occupiers, and informal tenants and lease-holders (without document) and does not ensure replacement value of the property acquired. The Act has no provision of resettlement assistance and transitional allowances for the restoration of livelihoods of the non-titled affected persons.

The 2017 Act requires that compensation be paid for the followings: (a) land and assets permanently acquired including house, (b) loss of standing crops and trees; (c) loss of property value due to partial acquisition; (d) loss of other immovable or movable assets or source of income; and (e) relocation of living place or business and the cost incurred for such.

The Deputy Commissioner (DC) in all cases, determine “market value” of acquired assets on the date of notice of acquisition (notice under Section 9 of the 2017 Ordinance). The assessment of this market value is done considering the average price of immovable properties of the same class, with similar facilities and within the vicinity of the “to be” permanently acquired land and assets. The DC then adds 200 percent and 300 percent premium of the assessed value for cash compensation under the law (CCL) of the land and assets including a house for government and non-governmental acquisitions respectively. For any other losses as specified above, i.e. from (b) to (e), the DC adds a 100 percent premium of the assessed value to pay as compensation. The CCL paid for land is generally less than the “market value” as owners customarily report lower values during registration to avoid or pay fewer taxes. If land acquired has standing crops cultivated by a tenant (bargadar)¹ under a legally constituted written agreement, the law requires that part of the compensation money be paid in cash to the tenants as per the agreement. If there is a dispute regarding the amount of compensation, there is an option for arbitration and the procedures for such are in place. Places of worship, graveyard and cremation grounds are not to be acquired for any purpose, unless the acquisition of these places is deemed unavoidable for the best of interest of the people. The proponent will be allowed to acquire such areas given that it funds the replacement and rebuilding of such places. The law requires that the salvaged materials upon payment of compensation will be auctioned out by the Government.

The DC processes land acquisition under the 2017 Act and pays compensation to the legal owners of the acquired land. The Ministry of Lands (MoL) is authorized to deal with land acquisition through the DCs. Khas² lands should be acquired first when a project acquires both khas and private land. If a project acquires only khas, the land will be transferred through an inter-ministerial meeting following the preparation of the acquisition proposal submitted to DC/ MoL.

2.3.7 East Bengal State Acquisition and Tenancy Act, 1950

The landowner has to establish ownership by producing a record-of-rights in order to be eligible for compensation under the law. The record of rights prepared under Section 143 or 144 of the State Acquisition and Tenancy Act 1950 (revised 1994) are not always updated and as a result, legal landowners have faced difficulties to “prove” ownership. The PAPs must also produce rent receipt or receipt of land development tax, but this does not assist in some

¹ Bargadar is a person who, under the system generally known as adhi, barga, or bhag, cultivates the land of another person on condition of delivering a share of produce of such land to that person.

² Khas land means government owned fallow land, where nobody has property rights. It is a land which is deemed to be owned by the government and available for allocation according to government priorities.

situations when a person is exempted from payment of rent if the area of his land is less than 25 bighas (3.37 hectare).

2.3.8 Bangladesh Water Act, 2013

The Water Act 2013 is based on the National Water Policy and designed for integrated development, management, extraction, distribution, usage, protection and conservation of water resources in Bangladesh.

As per this Act, all forms of water (e.g. surface water, groundwater, seawater, rainwater and atmospheric water) within the territory of Bangladesh belong to the government on behalf of the people. The private landowners will be able to use the surface water inside their property for all purposes in accordance with the Act. A worthwhile initiative is a requirement for permits/licenses for large scale water withdrawal by individuals and organizations beyond domestic use. Without prior permission issued by the Executive Committee, no individuals or organizations will be allowed to extract, distribute, use, develop, protect, and conserve water resources, nor they will be allowed to build any structure that impedes the natural flow of rivers and creeks.

4G Instrument setup of the project may deteriorate the water quality. However, it should be ensured that water used for other purposes in surrounding areas are not hampered by taking mitigation measures.

2.3.9 Wildlife (Conservation and Security) Act, 2012

The Bangladesh Wildlife (Conservation and Security) Act, 2012 provides the conservation and safety of biodiversity, forest and wildlife of the country by repealing the previous laws i.e. Wildlife (Preservation) Act of 1973. The Department of Forest (DoF) has the primary responsibility for implementing this Act. The key features of this Act are:

- Prohibition made in relation to wild animals and plants that no person can hunt any wild animal without a license or willfully pick, uproot, destroy or collect any plant;
- Determination of vulnerable, endangered and critically endangered species of wild animals and plants;
- Declaration of sanctuary for the conservation of forest and habitat of wildlife and prohibitions made on such sanctuary;
- A requirement of the license to cultivate, extract, manufacture, rear, export, or import any wild animal or part of its body, meat, trophy, uncured trophy, or any plant; and
- Restriction on import, export and re-export of wild animals and plants.

This Act is applicable for this project because under this Act 'biodiversity' means genetic and species diversity of all species or subspecies of flora and fauna living in aquatic, terrestrial and marine ecosystems or diversity of their ecosystems. Wildlife species and their habitats would be damaged or disturbed due to the proposed activities for which mitigation measures need to be implemented.

2.3.10 The Protection and Conservation of Fish Act, 1950 and Rules, 1985

This Act and Rule cover all types of aquatic species including fish, prawn, shrimp, amphibians, tortoises, turtles, crustaceans, mollusks, echinoderms and frogs at all stages in their lifecycle and all types of water bodies. The Act specifies the number of useful fisheries management

rules for sustainable fish culture and conservation in the country. These include the use of appropriate fishing gear (net, cage, trap, explosives) and building water management structures (dams, weirs, bunds and embankments). It also specifies the fishing and non-fishing seasons and the size of fish below which any prohibited species cannot be killed or sold. This Act is revised and included the banning of 'jatka'³ of hilsa and use of synthetic mesh (locally known as 'current jal'⁴) in 2011.

2.3.11 Noise Pollution (Control) Rules, 2006

According to the Environment Protection Act, 1995, the government formulated the noise pollution Rules in 2006. The Rules has been improved through ECR 1997 (Amendment 2017). The ECR, 1997 (Amendment 2017) addresses the sound levels to be no more than 45dB in quiet areas⁵ at daytime (6 am to 9 pm) and 35 dB at night-time (9 pm to 6 am). In residential areas, these levels are 50 dB and 40 dB, mixed area⁶ 60 dB and 50 dB, in commercial areas 70 dB and 60 dB and industrial areas 75 dB and 70 dB for daytime and night-time, respectively.

2.3.12 Disaster Management Act, 2012

The Disaster Management Act, 2012 aims to make the activities about disaster management coordinated, object-oriented and strengthened and to formulate rules to build up an infrastructure of effective disaster management to fight all types of disaster. Disaster means any such incidents created by nature or humans.

Disaster (to a certain degree) may occur in the present project if any harmful situation occurs during the normal work or 4G Instrument setup activity. Therefore, an appropriate management plan should have to be taken by the project proponent to prevent any unwanted disaster in the plant.

This Act is particularly relevant to avoid accidental hazards both in the 4G Instrument setup and operation and maintenance phase. The relevance of this act for this proposed project arises as follows:

To make a disaster management plan for rehabilitation to bring back any infrastructure, life, livelihood, and working environment damaged by disaster to previous condition or better condition.

- to create effective disaster management infrastructure to fight disaster and to make the public concerned and strengthened to face the disasters.
- to ensure no obstacle is created in playing fire brigade and rescue vehicles during a fire broke out, earthquake, building slide, or other disasters.

³ Any young fish returning to the sea are known as Jatka in Bangladesh. Jatka of hilsa refers to any hilsa smaller than or equal to nine inches in length;

⁴ Current Jal" means fishing net made of monofilament synthetic nylon fibre of different mesh sizes;

⁵ The area within 100 meters from hospital, academic institutions or places identified/identifiable by the government;

⁶ An area, which is primarily a residential area with either or both commercial and industrial parts in it.

2.3.13 Bangladesh Labor Act, 2006 and Rules, 2015

Bangladesh Labor Act was promulgated in 2006. The legislation pertains to the occupational rights and safety of factory workers and the provision of a comfortable work environment and reasonable working conditions. The amendment in 2013 has introduced a good number of important items like workers' welfare, rights and safety and industrial safety and expansion of the industry are particularly relevant for this proposed study.

This Act applies to the proposed project as it is under the industry which is responsible for transformation, generation, conversion, transmission, or distribution of electrical energy. The occupational health and safety of the workers are covered under this Act. It is mandatory for every factory to keep its workers abreast of work risk(s) by providing all personal protection equipment (PPE). Factory owners have to ensure a secured power system and ensure that the exit paths are unlocked and the staircases/paths in the factories are kept open during the working hours to meet any emergency.

In 2015, the Bangladesh government has introduced the Bangladesh Labor Rules. Some of the relevant points of this Rules are health and fire safety, prescribe a form for filling case in Labor Court, and approval of factory plan and any extension among others.

The Bangladesh Labor Act, 2006 consolidated and repealed 25 previous labor-related laws including the Dock laborers Act, 1934, the Factories Act, 1965 among others.

2.3.14 Bangladesh Telecommunication Act 2001, Amendment 2006 and 2010

The Bangladesh Telecommunication Act, 2001

Enactment of the Bangladesh Telecommunication Act, 2001 was a significant step from the Bangladesh government to liberalize the telecommunication sector of Bangladesh. The major duties of regulating the sector are transferred to the newly created and independent commission known as the Bangladesh Telecommunications Regulatory Commission (BTRC). The Act sets out the fundamental rules of telecommunication in Bangladesh. For example, section 35 states that no person will establish telecommunication and internet services without a license under the Act. Similarly, section 55 prohibits the use of radiofrequency without the license from the Authority. Sections 47 of the Telecommunication Act require licensees under the Act to interconnect with and provide telecommunication facilities to any other licensee if certain conditions exist.

2.3.15 ICT Policy 2002, Amendment 2018

National Information Communication Technology (ICT) Policy, 2002: This policy document presents the policy guidelines for the development of the ICT sector in Bangladesh and encompasses the broad fields of data/information processing, transmission, and communications by means of computer and telecommunication techniques and these modern tools are being increasingly used for organizational/personal information processing in all sectors of economy and society. The policy was framed to ensure access to information by every citizen to facilitate the empowerment of people and enhance democratic values and norms for sustainable economic development by using the infrastructure for human resources development, governance, e-commerce, banking, public utility services, and all sorts of on-

line ICT- enabled services. The objectives of the policy outline some clauses relating to telecommunication:

- a. The development of telecommunication infrastructure should be considered as Infrastructure Development Industries like Development of Road, Electricity, Power, Computer/ICT Industry, etc.
- b. Facilitate the development of telecommunication infrastructure at the least possible cost with little or no customs duty during the construction of the infrastructure up to June 2006.
- c. As telecommunication infrastructure [Telephone Exchange, Towers, Radio/Telephone Transmission Lines, etc.] are similar to electric power infrastructure [Generator, Pylons, Power Grid, and Gas Transmission Lines], so Customs Duty & Tax, etc. should be amended accordingly in the same line.
- d. Cellular telephone handsets are being increasingly used as terminals for emailing and other ICT uses. Customs duty & tax etc. of cellular mobile telephone handsets should be brought down to a reasonable level.
- e. Telecommunication facilities will be made available to all segments of the society and all of the present and emerging services will be provided at an affordable cost.
- f. To improve the quality of present telecommunication services and to help provide value-added services analog telephone switches and transmission links of the existing telephone network will be replaced by digital switches and digital transmission links as early as possible.

The ICT policy was revised in 2008 and adopted by the government in 2015. The key vision of the ICT policy 2015 was to support the national goal of becoming a middle-income country within ten years and join the ranks of the developed countries of the world within thirty years.

2.3.16 The Information and Communication Technology Act, 2006

The primary object of the Information and Communication Technology Act, 2006 (the ICT Act) is to provide legal validity and security to information and communication technology. This Act, however, does not regulate the telecommunication sector in the manner of the Telecommunication Act. The significance of the ICT Act in relation to telecommunication lies in the fact that the Act removes and explains some of the legal uncertainties in relation to information and communication technology.

2.3.17 National Energy Policy, 2005

The National Energy Policy (NEP), 2005 of Bangladesh was first formulated in 1996 by the Ministry of Power, Energy and Mineral Resources to ensure proper exploration, production, distribution and rational use of energy resources to meet the growing energy demands of different zones, consuming sectors and consumers groups on a sustainable basis. With the rapid change of global as well as domestic situation, the policy was updated in 2005.

The objectives of the updated National Energy Policy (NEP) are outlined as follows:

- To provide energy for sustainable economic growth so that the economic development activities of different sectors are not constrained due to shortage of energy;
- To ensure optimum development of all the indigenous energy sources;
- To meet the energy needs of different zones of the country and socio-economic groups;
- To ensure sustainable operation of the energy utilities;
- To ensure rational use of total energy sources;
- To ensure environmentally sound sustainable energy development programs, with due importance to renewable energy, causing minimum damage to the environment;
- To encourage public and private sector participation in the development and management of the energy sector;
- To integrate energy with rural development to boost the rural economy;
- To bring the entire country under electrification by the year 2020;
- To ensure a reliable supply of energy to the people at a reasonable and affordable price;
- To develop a regional energy market for a rational exchange of commercial energy to ensure energy security.

2.4 ADB Requirements

2.4.1 ADB's Safeguard Policy Statement

In July 2009, ADB's Board of Directors approved the new Safeguard Policy Statement (SPS) governing the environmental and social safeguards of ADB's operations. The SPS builds upon ADB's previous safeguard policies on the Environment, Involuntary Resettlement, and Indigenous Peoples, and brings them into one consolidated policy framework with enhanced consistency and coherence, and more comprehensively addresses environmental and social impacts and risks. The SPS also provides a platform for participation by affected people and other stakeholders in the project design and implementation.

The SPS applies to all ADB-financed and/or ADB-administered projects and their components, regardless of the source of financing, including investment projects funded by a loan; and/or a grant; and/or other means, such as equity and/or guarantees. ADB works with borrowers and clients to put into practice the requirements of SPS.

The SPS supersedes ADB's Involuntary Resettlement Policy (1995), Policy on Indigenous Peoples (1998), and Environment Policy (2002). In accordance with the SPS, these previous policies apply to all projects and tranches of multi-tranche financing facility projects that were reviewed by ADB's management before 20 January 2010.

The objectives of ADB's safeguards are to:

- avoid adverse impacts of projects on the environment and affected people, where possible;
- minimize, mitigate, and/or compensate for adverse project impacts on the environment and affected people when avoidance is not possible; and
- assist borrowers and clients to strengthen their safeguard systems and develop the capacity to manage environmental and social risks.

ADB's SPS sets out the policy objectives, scope and triggers, and principles for three key safeguard areas:

- Environmental safeguards;
- Involuntary Resettlement safeguards; and
- Indigenous Peoples safeguards.

To help borrowers and clients and their projects achieve the desired outcomes, ADB adopts a set of specific safeguard requirements that borrowers and clients are required to meet in addressing environmental and social impacts and risks. These safeguard requirements are as follows:

- Safeguard Requirements 1: Environment (Appendix 1 of SPS);
- Safeguard Requirements 2: Involuntary Resettlement (Appendix 2 of SPS);
- Safeguard Requirements 3: Indigenous Peoples (Appendix 3 of SPS); and
- Safeguard Requirements 4: Special Requirements for Different Finance Modalities (Appendix 4 of SPS).

In addition, ADB does not finance activities on the prohibited investment activities list (Appendix 5 of SPS). Furthermore, ADB does not finance projects that do not comply with its safeguard policy statement, nor does it finance projects that do not comply with the host country's social and environmental laws and regulations, including those laws implementing host country obligations under international law.

Consultation and Disclosure requirements of ADB

ADB's *Safeguard Policy and Public Communications Policy (2011)* sets out disclosure requirements for various ADB activities, including safeguard requirements. Safeguard Requirements 2: Involuntary Resettlement (ADB's Appendix 2 of SPS); and Safeguard Requirements 3: Indigenous Peoples (ADB's Appendix 3 of SPS) sets out the need for meaningful consultation and information disclosure during project preparation and operation to the affected population and other stakeholders. Key requirements include:

- a. Information Disclosure: The borrower/client will submit the following documents to ADB for disclosure on ADB's website as per the applicability with respect to the Project:
 - Draft EIA including draft EMP;
 - Final EIA/IEE;
 - Updated EIA/IEE and corrective action plan;
 - Environmental Monitoring Reports.
 - Resettlement Plan (RP)
 - Indigenous Peoples Plan (IPP)
- b. Information disclosure to affected people or stakeholders: The borrower/client will provide relevant environmental information promptly, in an accessible place and a form and language(s) understandable to affected people and other stakeholders. For illiterate people, other suitable communication methods will be used.

- c. Consultation and Participation: The borrower/client will carry out meaningful consultation with affected people and other concerned stakeholders, including civil society, and facilitate their informed participation.
- d. Timing and Frequency for consultation and participation: Meaningful consultation begins early in the project preparation stage and is carried out on an ongoing basis throughout the project cycle.

2.4.2 ADB Project Categorization

The SPS, 2009 further outlines a classification system for the categorization of projects. The classification tentatively occurs at the project identification stage, during the initial screening of anticipated impacts. However, classification is an ongoing process, and the classification can be changed at any time with the concurrence of the Chief Compliance Officer (CCO), as more detailed information becomes available and a project proceeds.

Environment

A project's environment category is determined by the category of its most environmentally sensitive component, including direct, indirect, induced, and cumulative impacts. Each proposed project is scrutinized as to its type, location, scale, sensitivity and the magnitude of its potential environmental impacts. The level of detail and comprehensiveness of the EIA or IEE is commensurate with the significance of the potential impacts and risks.

A proposed project is assigned to one of the following categories depending on the significance of the potential environmental impacts and risks:

- **Category A:** Projects that could have significant environmental impacts. An Environmental Impact Assessment (ESIA) is required.
- **Category B:** Projects that could have some adverse environmental impacts, but of less significance than those for category A. An Initial Environmental Examination (IEE) is required to determine whether significant impacts warranting an EIA are likely. If an EIA is not needed, the IEE is regarded as the final environmental assessment report.
- **Category C:** Projects that are unlikely to have adverse environmental impacts. No EIA or IEE is required, although environmental implications are reviewed.
- **Category FI:** Projects that involve a credit line through a financial intermediary (FI) or an equity investment in a FI. The FI must apply an environmental management system unless all subprojects will result in insignificant impacts.

Involuntary Resettlement

A project's involuntary resettlement category is determined by the category of its most sensitive component in terms of involuntary resettlement impacts. The involuntary resettlement impacts of an ADB-supported project are considered significant if 200 or more persons will experience major impacts, which are defined as (i) being physically displaced from housing, or (ii) losing 10% or more of their productive assets (income-generating). The level of detail and comprehensiveness of the resettlement plan is commensurate with the significance of the potential impacts and risks. A proposed project is assigned to one of the following categories depending on the significance of the probable involuntary resettlement impacts:

- **Category A:** A proposed project is classified as category A if it is likely to have significant involuntary resettlement impacts. A resettlement plan, including assessment of social impacts, is required;
- **Category B:** A proposed project is classified as category B if it includes involuntary resettlement impacts that are not deemed significant. A resettlement plan, including assessment of social impacts, is required;
- **Category C:** A proposed project is classified as category C if it has no involuntary resettlement impacts. No further action is required; and
- **Category FI:** A proposed project is classified as category FI if it involves the investment of ADB funds to, or through, a financial intermediary.

Projects are also classified on the basis of impacts to indigenous people, however, is not applicable for this Project. Based on the diversity of the work of the proposed RAL 4G enhancement project has been fallen under Category B

CHAPTER 3 DESCRIPTION OF WORK

3.1 Background and Rationale of the Work

The mobile market of Bangladesh underwent its first major in-country consolidation in 2016, following the merger of Robi (Axiata) with Airtel (Bharti Airtel), which created the second largest operator by the number of connections. At the end of 2017, Grameenphone held a 45.2% share of total connections, followed by Robi (30.1%), Banglalink (22.2%), and Teletalk (2.5%). CDMA-based Citycell (Pacific Bangladesh) had effectively been closed since the final quarter of 2016; the BTRC suspended its operating license due to the nonpayment of dues.

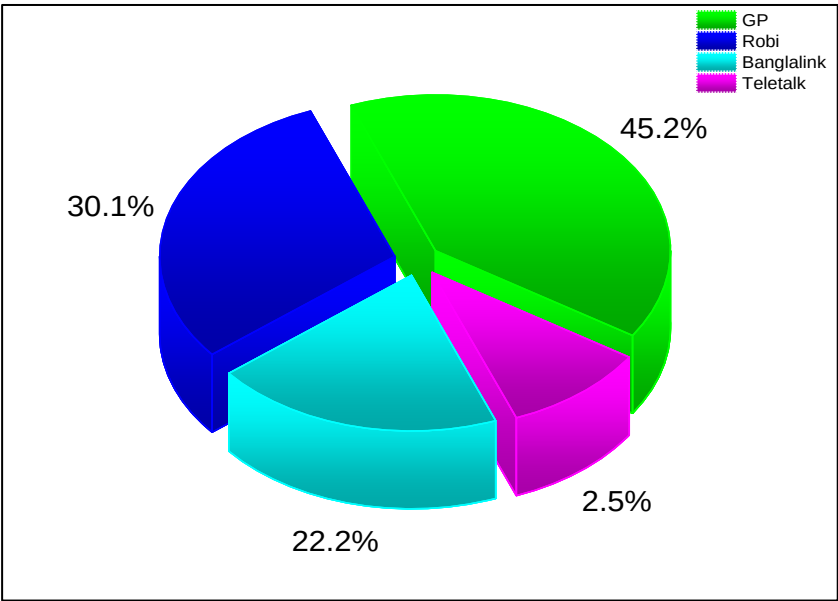


Figure 3.1: Share of connections (including cellular IoT) by mobile operator
Source: GSMA Intelligence (2017 Q 4); BTRC.

In Bangladesh, the mobile ecosystem contributed 6.2% or around \$13 billion in economic value to the GDP of Bangladesh in 2015. Figure 3.1 is inclusive of the direct economic impact of mobile operators and the broader ecosystem as well as the indirect impact and the productivity increase brought about by the use of mobile technologies.

Robi Axiata Ltd is a prominent and technologically advanced telecommunications company in Bangladesh, providing significant coverage all over the country. In order to capture the leading part of the whole country, Robi has decided to enhance and strengthen mobile connectivity, internet access, and mobile telecommunication services to its customers in whole Bangladesh.

3.1 Description of Operation

Enhancement and strengthen mobile connectivity, internet access, and mobile telecommunications are the processes of sensing, transmitting, and receiving information over a distance to communicate. It involves the transmission of signs, signals, messages, words, writings, images and sounds or intelligence of any nature by wire, radio, optical, or other electromagnetic systems. It is transmitted either electrically over physical media, such as

CAPEX/BMRE for upgradation and modernization of existing core network infrastructure and strengthening of overall network capacity by Robi Axiata Ltd. (Robi).

cables, or via electromagnetic radiation. The main benefit of mobile telecommunications is the ability to perform point-to-point or point-to-multipoint transmissions using either a digital or digitized analog signal.

The various protocols utilized in mobile telecommunications require specific actions taken at certain times for two devices to connect and receive information. Each of these protocols takes the form of physical layering, which is transmitted in a specific manner and ultimately deciphered by the receiving device.

Cellular technology makes the most notable use of mobile telecommunications technology. The concept utilizes a series of base stations, a land-based facility or tower designed to propagate the signal from one location to another, and satellite technology. This allows the technology to spread to further locations, providing service to those across a country. Mobile cellular telecommunications began in the late 1970s, evolving in public access, cost, and quality over the years.

3.2 Project Description

From 1997 to date Robi established and improved infrastructural facilities (1G, 2G, 2.5G, 3G, 4G and 4.5G) an infrastructure like MSC, BSC and TBS every year. Robi already using 4G network and provides services a part of the country using their existing infrastructure. Now Robi is intended to provide high speed internet facilities to users rest of the unserved area of the country.

Robi holds the best spectrum possession in local market with highest lower band and contiguous mid band for a decent capacity layer. Next 3 Years Spectrum acquisition plan: 5MHz from 1800 band, 20MHz from 2600 TDD Band and Usage Plan of 2600 TDD Band. Initially this will be used for 4G capacity and gradually migrate to 5G according to eco system development of 5G.

Robi proposes build up voice layer over 2G and 4G, intend to 4G as primary Data layer until 2021 followed by gradual migration to 5G, identifies 3G as Sunset Technology with Investment Cut off from 2020 and discontinuation based on residual device penetration. Current state 2019 and Evolution state 2022 of Network & Spectrum Topology is shown in Figure 3.2.

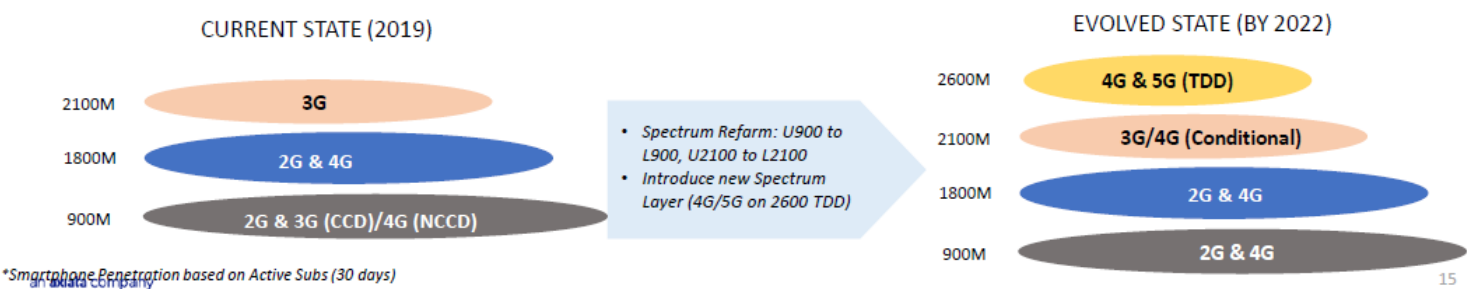


Figure 3.2: Current 2019 and Evolution 2022 State of Network & Spectrum Topology

Robi is planning to continue the effort to take advantage of the unique lower band in possession in terms of differentiated spectrum topology in regions, extensive dynamic spectrum sharing, and Technology transformation over the spectrum to secure optimum efficiency. Robi has 11940 physical sites among them 11808 sites under 2G, 10597 sites of

CAPEX/BMRE for upgradation and modernization of existing core network infrastructure and strengthening of overall network capacity by Robi Axiata Ltd. (Robi).

3G, and 10647 sites of 4G. The mobile network coverage of Robi is presented in Figure 3.3. Robi holds the best spectrum possession in the local market with the highest lower band and the contiguous mid band for a decent capacity layer. Robi wants to spectrum acquisition of 5MHz from 18000 Band and 20MHz from 2600 TDD Band. Initially plan to use 2600 TDD Band for 4G capacity which will gradually be migrated to 5G according to the ecosystem development of 5G.

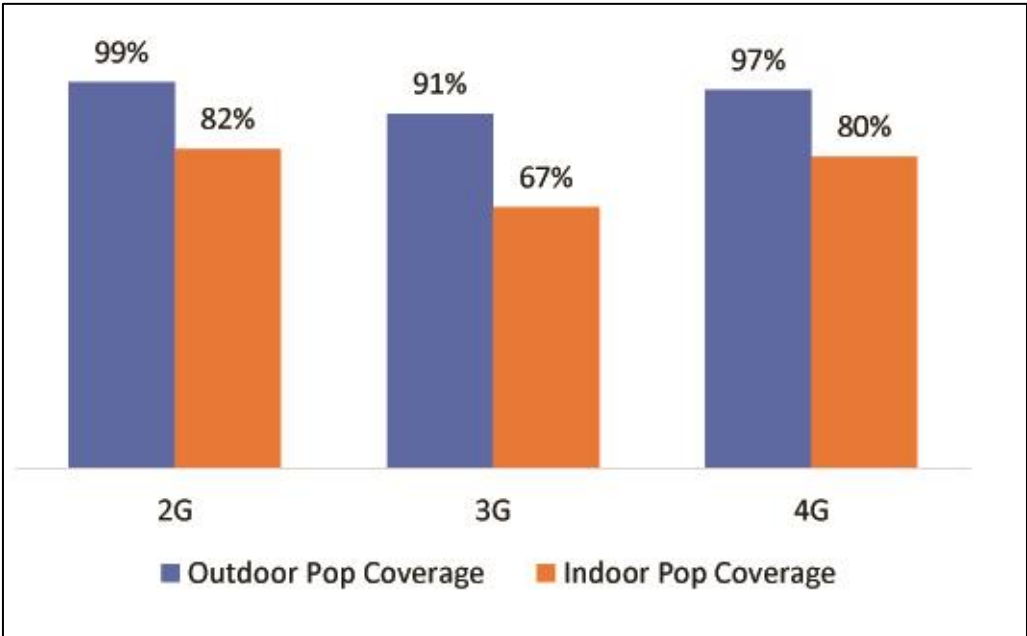


Figure 3.3: Mobile Network Coverage (% Population, Jun'20)

To implement the 4G network across the country, Bangladesh Telecommunication Regulatory Commission (BTRC) held an auction on 13 February 2018 for allocating new frequencies through a competitive bidding process. Robi did not purchase any new spectrum in the auction but applied for tech neutrality of the existing 26.4 MHz in 900 MHz and 1800 MHz bands. Currently, Robi has a total of 39.8 MHz of spectrum in 900 MHz, 1800 MHz, and 2100 MHz bands, which is higher than any other operators in the country. The tenure of the license is for 15 years with which can be extended afterward by paying relevant fees. Now Robi has taken initiative the CAPEX/BMRE, optimization and modernization of existing core network infrastructure, expansion of the 4G network, and strengthening of overall network capacity.

Robi’s has adopted several technology buildup strategies:

4.5G Coverage Aspiration: 98% sites will be upgraded with 4G by 2020. 86% 4G Pop Coverage nationwide by 2020

Dynamic Spectrum for asset utilization: Introducing Dynamic spectrum sharing over 900M & 1800M. Trial of 4G over 2100M (DSS) to gain cost efficiency using same HW.

Futuristic Network Topology with 5G Readiness: Mix of 4X4 MIMO, 8T8R, NB –IoTand 5G Readiness, VoLTE Deployment in virtualized platform, Carrier WiFiTrail to offload MBB traffic.

CAPEX/BMRE for upgradation and modernization of existing core network infrastructure and strengthening of overall network capacity by Robi Axiata Ltd. (Robi).

Robust & Resilient Fibre Network: Simplified Transport architecture with OpexReduction, Enhanced Network resilience through 3 Way protections (ASON technology)

E2E Core Network Pooling/Virtualization: World largest VMSC pooling in virtualized platform, Cost efficiency at its excellence for PS One pool concept.

Customer Insights & Analytics: Introduce Network Analytics, Analytics driven Development and Operation Process. Introduce Google, Facebook Analytics to Enhance Data Network Capacity and Quality.

Operational/Cost efficiency (CEP): Significant reduction of cost per site YoY. Introduction of new towerco

During COVID-19 period network expansion work

Alternate data capacity enhancement solution and adaptable business approach devised to cater surge of Traffic as an impact of COVID-19 in a shortest possible time which had been well reflected in terms of data utilization and experience

- Additional license managed through optimization of existing inventory and special COVID time deal with vendors.
- Technology conversion from 3G to 4G and Spectrum refarmed for 4G from 2G in Dhaka.
- 20% more spectrum poisoned for 4G from 2G over Dynamic Spectrum Sharing in CC.
- Optimum Traffic steering among different Technology in NCCD to manage Data capacity.
- AI based automatic Traffic Management through SON. - More than 1,200 4G Site added in Q2'20

3.3 Location of the Project

Robi is a telecommunication service provider Company having its Corporate office in Gulshan 1, Dhaka, and other regional offices in different districts of Bangladesh. Other than these offices Robi has 10 Mobile Switching Centre (MSC) sites, 9 Base Station Controller (BSC) sites, and approximately 11,500 Base Transceiver Station (BTS) sites. Based on the core site area and location Robi divided in three division of whole Bangladesh named: (i) CC, (ii) Dhaka and (iii) NCCD for implementation of the expansion project. Three major proejct locations is shown in Figure 3.4. The expansion project location and address in each divison are presented in Table 3.1. The expansion of the project found is not situated in the ecologically critical area.

CAPEX/BMRE for upgradation and modernization of existing core network infrastructure and strengthening of overall network capacity by Robi Axiata Ltd. (Robi).

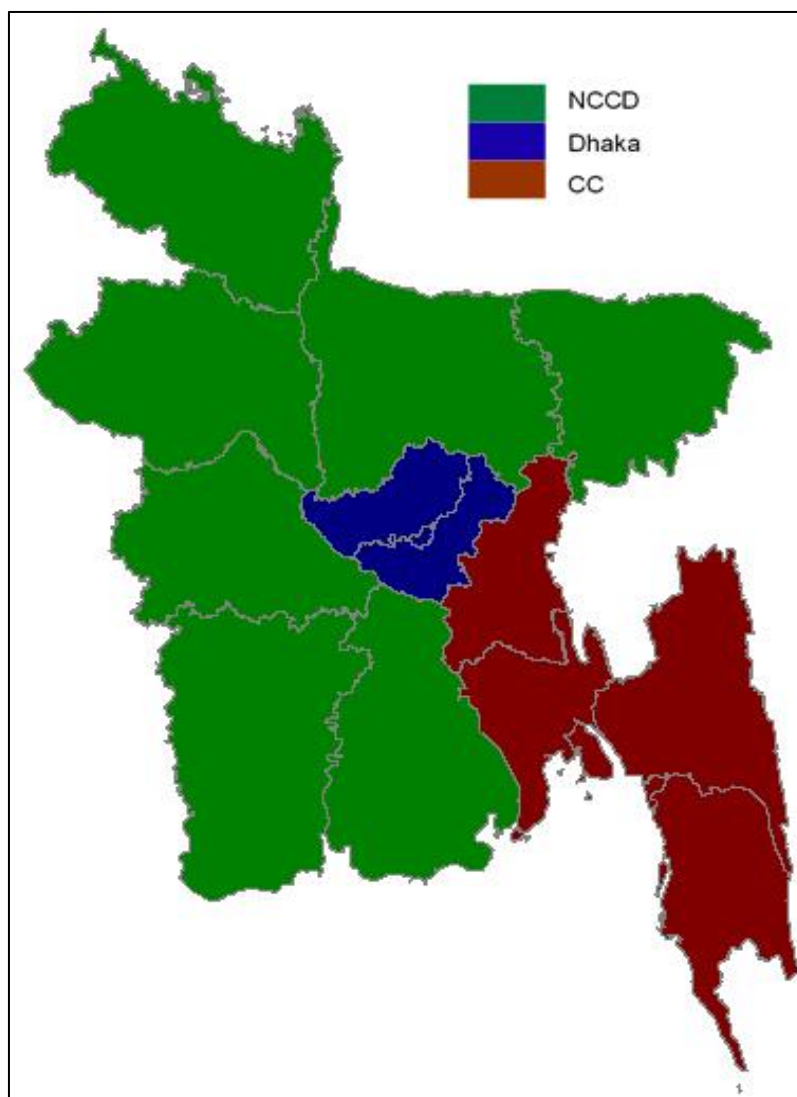


Figure 3.4: Robi spectrum utilization & topology as of q2'2020

Table 3.1: Location and address of the Project

<u>Sl no.</u>	<u>Location Code</u>	<u>Location Name</u>	<u>District</u>	<u>Address</u>
CC				
1	<u>CGCD G41</u>	<u>Chittagong South Core Site</u>	<u>Chittagong</u>	<u>Mouza: Purba Sholo Shahar, JL No - 14, RS Khatian no - 839 & 55, RS Dag Nos - 1137/1138/1139/1140, PS Khatian No - 345,343,735, PS Dag No - 2408/2407/2406, BS Khatian No - 1293, Namjari Khatian no -1293/1, Khazar Road, Baddarhat, Thana - Chandgaon, District: Chittagong</u>
2	<u>020139 6</u>	<u>Aktaruzzaman, Ctg</u>	<u>Chittagong</u>	<u>22/22 Agrabad Commercial Area, Agrabad, Chittagong</u>
3	<u>CMDK N01</u>	<u>Gauripur</u>	<u>Comilla</u>	<u>Dist. Comilla, P.S.&Sub-RegistryOffice-Daudkandi, Mouza-PennoybeingNo.190, KhatianNo.C.S.-226, R.S.-313, Mutation-1116, DagNo.C.S.&R.S.-2492.</u>
4	<u>CMSD R01</u>	<u>Alekharchar</u>	<u>Comilla</u>	<u>Dist.-Comilla, P.S.-Comilla Sadar, In the office of Sub-Registrar-Sadar 3rd Joint Comilla, Mouza-Alakarcharbeing No.Sabek-112, Hal-20, (A) Khatian No.-C.S.-2, R.S.-25, B.S.-483, Bujarat-126</u>

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NCCD				
1	<u>BOSJP 02</u>	<u>Bogra Backbone 75m</u>	<u>Bogra</u>	<u>DagNo.5356, Mouza-Sajapur, J.L.No.-179, Thana-Bogra Sadar, District-Bogra.</u>
2	<u>BSSDR 16</u>	<u>Barisalland75m</u>	<u>Barisal</u>	<u>Plot (Dag) No. Sabek1556, D. P2682, KhatianNo.Sabek 321, Mutation 321/1, D. P298, Mouza-Gonopara, J.L.No.12, P.S.Kotowali, District-Barishal</u>
3	<u>HGNB G03</u>	<u>Debparaback bone 75m</u>	<u>Habiganj</u>	<u>Dist-Habiganj, P.S.&Sub-RegistryOffice-Nabiganj, Mouza-Vanudevl, J.L.No.133, KhatianNo.Sabek-170,7, Hal-179,505, D.P.-293, Dag No.-Sabek-340, 358Hal-313,312area of land 28decimal(85.66ftX122ft+146X12ft)</u>
4	<u>JHSDR 06</u>	<u>Hat Gopalpur land 55m</u>	<u>Jhenaidah</u>	<u>Plot (Dag) No. Sabek351, Hal458, KhatianNo. Sabek 513, Hal 60, Mouza-Padmakar,J.L.No.247,P.OHatgopalpur,P.S.Jhenidah,District-Jhenidah</u>
5	<u>KHRPS 01</u>	<u>Rupsa Backbone 75m</u>	<u>Khulna</u>	<u>Dag No. S.A-247, Hal-236,239Mouza-Joypur, J.L.No.-27, Thana-Rupsha, District-Khulna.</u>
6	<u>NTSDR 02</u>	<u>Uttara Ganobhaban land 55m</u>	<u>Natore</u>	<u>Previously BS Plot (Dag) no. 228, Now-236, JL no.221 Mouza-Chottotarishpur, Po Box-Dighapatia, District-Natore</u>
7	<u>RPPGN 02</u>	<u>Pirganj backbone 75m</u>	<u>Rangpur</u>	<u>DagNo.289, Mouza-Pachakandor, J.L.No.-184, Thana-Pirganj, District-Rangpur.</u>
8	<u>SYBLG 04</u>	<u>Kurua BKB 75m</u>	<u>Sylhet</u>	<u>Kurua, Balaganj, Sylhet</u>
9	<u>0605BH BNPR</u>	<u>BHABANIPUR BSC</u>	<u>Dinajpur</u>	<u>Dag No.37, Mouza-Palashbai, J.L. No.-166, Thana-Parbotipur, District- Dinajpur.</u>
10	<u>MYSDR 03</u>	<u>JK Tower</u>	<u>Mymensing</u>	<u>Mustafizur Rahman Khan, S/o: late-Alhaj Faiz Uddin Khan, J.K Tower, 6/B, Ganga Das Guha Road, Mymensingh. Ph#0171-687782</u>
11	<u>FPSDR 07</u>	<u>Faridpur BSC</u>	<u>Faridpur</u>	<u>Shams uddin Koraisi, S/o: late Abdul Gani Koraisi, Shams Uddin Tower, Muzib Sarak, Janata Bank Moore, Alipur, Faridpur. Ph#0171-481671</u>
12	<u>KHSDR 04</u>	<u>SHILPA BANK</u>	<u>Khulna</u>	<u>Deputy General Manager, Shilpa Bank Bhaban, 25-26, KDA Avenue, Khulna</u>
DHAKA				
1	<u>DHGUL 19</u>	<u>Uday Tower</u>	<u>Dhaka</u>	<u>Al-Amin Construction Ltd, Registered office, House-33, Road-02, Dhanmondi R/A, Dhaka. (Location: Uday Tower, 57,57A, Gulshan Avenue, Gulshan-1, Dhaka)</u>
2	<u>GPSDR 34</u>	<u>Pubailland75m</u>	<u>Gazipur</u>	<u>Plot (Dag) No. S.A. 32, R.S. 65, Khatian No. S.A. 49, R.S. 63 and Plot No. S.A. 23, R.S. 42, Khatian No. S.A. 6, R.S. 62, Mouza-Satpoa, J.L. No. Sabek-166, Hal-98, P.S. Gazipur Sadar, District-Gazipur</u>
3	<u>NGRP G01</u>	<u>Vulta (Rupganj)</u>	<u>Narayanganj</u>	<u>Vulta, Rupganj, Narayanganj</u>
4	<u>GPSDR 05</u>	<u>Jajor</u>	<u>Gazipur</u>	-

3.4 Land Require

Since the expansion of the project will be implemented in the existing structure and rooftop of the building so, additional land and structure will not be required. There is no much space is

CAPEX/BMRE for upgradation and modernization of existing core network infrastructure and strengthening of overall network capacity by Robi Axiata Ltd. (Robi).

required for set up a capacity expansion of 4G equipment. So. No land acquisition or requisition will be required for the expansion of the project.

3.4 Basic Information's of the Project

The basic information's of the project is shown in Table 3.2:

Table 3.2: Basic Information's of the Project

Project Title	: Optimization and modernization of existing core network infrastructure, expansion of 4G network and strengthening of overall network capacity by Robi Axiata Limited (Robi).
Name of Ministry	: Ministry of Posts, Telecommunications and Information Technology
Address of Registered Office	Nafi Tower, 53 Gulshan South Avenue, Gulshan 1, Dhaka 1212
	• As-Salam Tower 13th Floor, 57 Agrabad C/A, Chattogram-4100 • Uday Tower, 57 & 57/A, Gulshan Avenue, Gulshan-1, Dhaka • Chowdhury Plaza, Karimpur Road, Noakhali • M M Plaza (2nd floor & basement) Rajshahi • Holding No: 223/201, Joatola, Comilla • Alo Bhaban, NS Road, Babar Ali Road, Kushtia • Nasim Bhuiyan Tower, 316 S S K Road, Feni-3900 • 44, Dhaka Sylhet Road, Moulovi Bazar • Sabur Khan Tower, 37 Kali Bari Road, Tangail • Zillur Rahman Super Market, 2nd Floor, Bhairab
Telephone No.	+88 02 9887146-48
Website Address	www.robi.com.bd/en
E-mail Address	shahed.alam@robi.com.bd
Contact Person	Mohammed Shahedul Alam Chief Corporate and Regulatory Officer & Company Secretary
Project Locations	Rajshahi, Rangpur, Mymensingh, Khulna, Sylhet and Barisal
Water consumption for office	Drinking water: 800 L/day Regular Water: 150,000 L/day
Fuel Consumption	112,950 L/Month
Temperature	0 to +55°C
Relative Humidity	5–95%
Absolute Humidity	1–29 g/m ³
Maximum temperature change	0.5°C/min
Financed by	Robi Axiata Ltd
Total Project Cost	: BDT 156 mUSD
Project Locations	: Rajshahi, Rangpur, Mymensingh, Khulna, Sylhet and Barisal

3.5 Description of Major Services as Provided by Robi

Robi Axiata Limited is a mobile connectivity, internet access and mobile telecommunication service provider in Bangladesh providing voice, data and other internet-based innovative digital services through telecommunication network coverage across the country using 10 Mobile Switching Centre (MSC) sites, 9 Base Station Controller (BSC) sites and approximately 11,500 Base Transceiver Station (BTS) sites. The Company also provides international roaming services through an international roaming agreementss with various operators of different countries across the world. The Company launched its commercial operations on 15th November 1997 and currently has national wide network coverage which spreads over 64 districts.

Along with voice, data and SMS services, Robi Axiata Ltd. provides innovative digital solutions to the people across the country under two brands – Robi & Airtel.

The brand Robi strives to ensure integrated digital lifestyle options for the modern and progressive individuals by facilitating access to a world of opportunities. With its advanced technology and superior network, life-enhancing digital solutions and relevant partnerships, Robi focuses on delivering relevant innovation to the people of Bangladesh.

Airtel brand on the other hand exists to provide the youth of today a social digital lifestyle enabling them to discover more with friends. With Airtel's superior network, youth relevant services, content and competitive pricing, the brand enables the youth to capture precious moments, share experiences and learn about what the world has to offer to them.

In addition to the core mobile voice services, Robi Axiata offers data services over 3G universal mobile telecommunications service (UMTS) and 4G long term evolution (LTE) network, short messaging services (SMS), a diverse range of value-added services (VAS) and advanced digital and IoT solutions. Its services are available both on pre-paid and post-paid platforms.

Voice Services: Voice services are offered to the subscribers on both prepaid and postpaid platforms across Bangladesh. Robi subscribers can also use their voice services abroad by activating international roaming services. Robi is the first operator to have trialed and launched VoLTE service on its 4G network providing a new experience of voice service.¹⁶

Data Services: With countrywide coverage of 3G and 4G networks, Robi offers an innovative portfolio of mobile data services enabling download, upload, gaming, streaming, video calling and browsing services. It also offers the best data roaming service in more than 50 countries.

Service Package for Women: Robi has recently launched an innovative offering specially tailored for the women, named as 'Icchedana', a mobile-based service exclusively available for the women. A collection of user-friendly features like emergency alerts, number masking during retail recharge along with attractive tariffs makes it the most innovative package in the country for women.

Islamic Lifestyle Solutions: Robi has launched a digital Islamic lifestyle solution, Noor, available in the form of a mobile package and mobile application. The service includes features like Quran tilawat, Namaaz alerts, Jakat ¹⁶ <https://www.thedailystar.net/business/news/robi-launches-volte-better-services-1867306>,

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calculators along with attractive voice and data offers to cater to the digital need of the Islamic community of the country.

Advanced Digital Services & IOT Solutions: In addition to Voice and USSD based Value Added Services, Robi has a diverse portfolio of digital services and IoT based solutions to cater to the growing digital need of individuals and businesses. One-stop sports entertainment app- My Sports, mobile-based health insurance digital service- My Health, entertainment content platform- Robi TV+, the premier ticketing platform, bdtickets.com, IoT based vehicle and workforce tracking solutions, a large-scale gaming competition - Axiata Game hero are few examples of its diverse digital services portfolio. The Company has also introduced self-care app for its services (My Robi App for Robi and My Airtel app for Airtel customers) where customers directly get specially tailored offers based of their usage pattern.

Current Market, Past Trends and Future Prospects.

The mobile telecommunication industry is going through a rapid transformational phase. Having matured in the voice market segment, the country is rapidly growing appetite for data and digital services. As the fourth industrial revolution knocks on the door, country's business community appears eager to adopt digital solutions to remain competitive in local and the international market. The rapid adoption of new-age technologies – IoT, Cloud, Big Data, Data Analytics, Virtual & Augmented Reality, Artificial Intelligence etc. – are opening a new world of opportunities for telecom operators. Coupled with this technological upgradation, the Government's thrust for Digitalization as part of realizing the Digital Bangladesh vision is fueling demand for robust nationwide broadband connectivity- all these translates into massive growth opportunity for the telecom sector going forward. As on December 2019, the country has 165.57 million mobile customers (excluding IOT subscriptions), out of which Robi Axiata's share is 49.00 million customers. This shows that Robi is set to play an important role in paving the nation's digital journey ahead. Supported by the robust 4G and wide 3G coverage, Robi has introduced several digital innovations in education, entertainment, and lifestyle arena to provide an integrated digital experience to the people of the country. Airtel enjoys a special bonding with the youth of the country who are the main driving force for digitalization. In this backdrop, Airtel is set to leverage its special relationship with the youth to foment digital economy in the country. Bangladesh's growing young urban population & Gross National Income per capita, increasing affordability of smartphones, growth in social media usage and digital content consumption are set to drive the growth in mobile data service;

Robi's strong 4G LTE network is only going to work as a catalyst to this inevitable phenomenon. Already, it has been observed that the smartphone penetration among Robi subscribers is increasing rapidly due to availability of affordable smartphones and gradual reduction in data tariffs. Growing purchasing power of people is also playing a role here. Given the fact that the country is still in its early stage as far as digitalization is concerned, there is significant prospect for 4G business to grow in Bangladesh. The most encouraging part is, Bangladesh's medium-term growth prospect remains robust. This will naturally stimulate peoples' appetite for digital lifestyle, as the digital services are rapidly becoming available and affordable to all. The proliferation of video content facilitated by strong data network will change the overall consumptions and behavior pattern of the society. The rising income in the rural areas will also create demand for digital services in this vast market segment. Being the first operator of the country to have trialed 5G service with the support from Huawei Technologies, BTRC and Posts & Telecommunications Division of the Ministry of Posts, Telecommunications and Information Technology, Robi stands on sound foundation.

3.6 Mobile Telecommunication Technology

Telecom network is evolving at breakneck speed. In this backdrop, Robi needs to efficiently manage three-plus technology generations (2G, 3G, 4G) each with significant customer base. Keeping these demands in mind, Robi Technology strategy keeps a fine balance between customer experience and regional investment. The entire strategy hinges on operational efficiency. The Company is also driving for digitalization by ensuring the optimum utilization of the existing technologies while expanding its technology portfolio by aspiring to include new technologies like, VoLTE, 5G and IoT. Robi, over the years has put in place its technology infra that is flexible, scalable and futuristic with a view to adapting to the rapid transformation taking place in the technology arena. Crucial component of this is the Radio access network (RAN) architecture. Robi has made sure that this vital component is compatible with multimode, multiband and multilayer along with higher order MIMO capability to accommodate high capacity demands of the network. The RAN infra is particularly designed to essentially support the evolution of 5G and NB IoT. As part of transport network strategy, Robi has built up robust fiber footprint with simplified architecture. The Company has also built its Core Network focusing on simplified, scalable, modular, secured and futuristic architecture to meet the exponential data growth in the coming years.

3.7 Telecommunication Technologies Utilized

The process of sending, transmitting and receiving information, rendering it possible to make phone calls across the country involves the use of various types of equipment, machinery and processes. Some of the main equipment and their functions, used by Orange SL are described in the following sections.

Mini Link Traffic Node

The MINI-LINK Traffic Node (an Ericsson Product) is a microwave transmission system used by mobile networks. The following description was obtained from their Technical Description manual (2004).

The node provides a ten-fold increase in aggregated transport capacity, while enhancing network quality, flexibility and control, and reducing site space by up to 70 percent. This method of traffic routing minimizes the use of cables (safety feature), improves network quality and facilitates control from a remote location.

The equipment can be divided into 2 parts: the indoor part and the outdoor part. The indoor part consists of an Access Module Magazine (AMM) with plug-in units interconnected via a backplane. It is connected to the outdoor part through coaxial cables carrying full duplex traffic, DC supply voltage, as well as operation and maintenance data. The outdoor part consists of an antenna, a Radio Unit (RAU) and associated installation hardware.

The antennae used are 0.6m diameter microwave antennae with a frequency of 15GHz.

The equipment is designed in compliance with the following standards and recommendations:

- CEN - European Committee for Standardization
- CENELEC - European Committee for Electro technical Standardization
- ETSI - European Telecommunications Standards Institute
- ITU - International Telecommunication Union
- IEC - International Electro technical Commission

IEEE - Institute of Electrical and Electronics Engineers

IETF - Internet Engineering Task Force

Switched-Mode Power Supply (SMPS, or switcher)

An indispensable part of a telecom network is the telecommunication power supply which directly affects the stability, reliability and smoothness of the network. Orange utilizes the SMPS which is an electronic power supply that incorporates a switching regulator to convert electrical power efficiently. The SMPS transfers power from a DC or AC source (often mains power) to DC loads, such as the telecommunications equipment, while converting voltage and current characteristics.

Ideally, a switched-mode power supply dissipates no power and voltage regulation is achieved.

Radio Base Station

The Radio Base Station is the equipment that facilitates wireless communication between user equipment (phones, modems, etc.) and a mobile network. Its main function is to provide connection with mobile stations over the air interface and includes all radio and transmission interface equipment needed on site to provide radio transmission for one or several cells.

The RBS is also responsible for the processing of signals before transmission and after reception.

Cell Towers

A cell tower is a cellular telephone site where antennae and electronic communications equipment are placed typically on a tower or other raised structure to create a cell in a cellular network. Cell tower with antennae and electronic communications equipment is shown in Figure 3.5

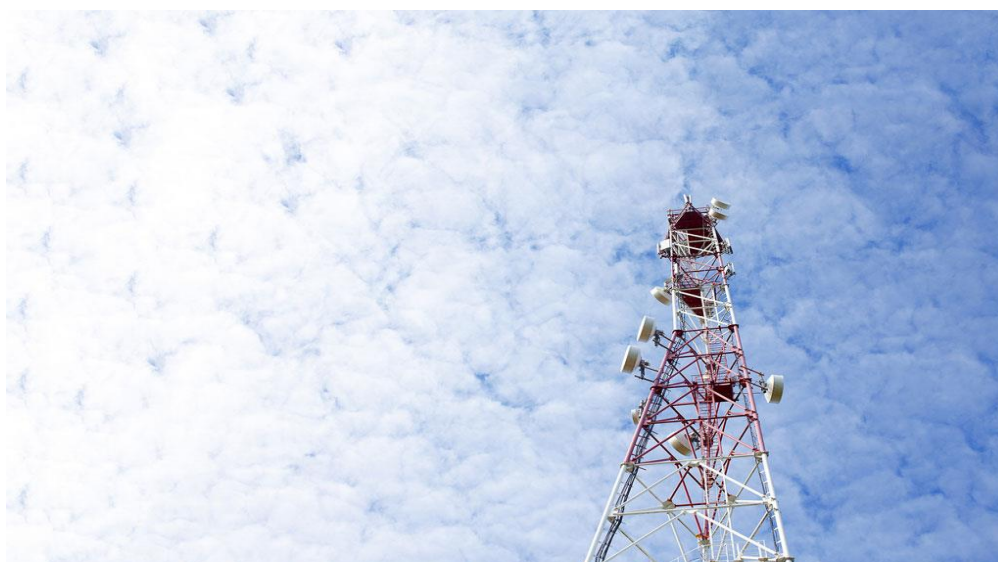


Figure 3.5: Cell tower with antennae and electronic communications equipment

3.8 Microwave and Radio Frequency Radiation

Telecommunications Antennas and related equipment which transmit information, emit radiofrequency (RF) radiation (which includes microwave radiation).

Mobile phone base stations may be considered as relatively low-power multi-channel two-way radio systems. They comprise transmitter and receiver systems and transmit-receive antennas. These antennas produce radio frequency radiation that is generally low. The consensus of the scientific community is that the power from these mobile base stations antennas is far too low to produce health hazards as long as the general public are kept away from direct access to the antennas⁷. It is also important to differentiate between the antennas that produce the RF radiation and the towers (or masts), which are the structures that support the antennas.

3.9 Advantages of CAPEX/BMRE of 4G Technology

The GSMA expects the economic contribution of the mobile industry in Bangladesh will continue to increase with right policies in place. By 2020 the mobile industry is expected to generate \$17 billion of economic value (GSMA, 2017). Probable outcomes of 4G in Business of Bangladesh are following-

Enhanced Mobile Working

4G technology encourages the organizational employees to work remotely where 61% of Irish CEOs are designing a company by this way so that their employees can work remotely. The speed and reliability of 4G makes this possible for an organization.

Enhanced Innovation

4G Technology allows workforce to be more innovative and creative through connecting smartphones and tablets where 80% of CEOs in Ireland fall into line that connected devices with faster connection and download speeds can collaborate among team wherever they are.

Cloud Storage

4G makes it easier to share and edit documents, saving valuable time and lets you save to the cloud.

Quick access to Information

All business transactions through online are conducted promptly because 4G makes it possible to quick access to information.

Time consuming

As 4G is 10 times faster than 3G so it is possible to compare and check more products at a same time than 3G.

Apps work better on 4G

⁷ Dawoud, M. M (2003). High Frequency Radiation and Human Exposure. [online] Available at <http://www.who.int/peh-emf/meetings/archive/en/keynote5dawoud.pdf>

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Businessman and customers can get more comfort and easily done of apps. Using with 4G network technology Businessman and customers can edit document or emailing. Business growth going to the apex position because the 4G network technology providing the following benefits in business- Facility to use latest mobile technology, changing better customer employees" and customers" expectation, Better user experience, Graphic rich content, Video advertising, Affordable Price of 3G, Faster browsing and so on.

3.10 Summary of major activities of project

The major activities of RAL is shown in Table 3.3. Antenna picture and Indoor picture of tower station is shown in Figure 3.6 and 3.7 respectively.

- i. Regular expansion for a large network synergy
- ii. Extended investigation and surveillance activity
- iii. Diversification, modernization, expansion

Table 3.3: The Major Activities of Robi

DHKT02	Region Name:	Dhaka metro
Chowk Bazaar	Zone Name:	Dhaka
Md. Torikul Islam	Contact No:	01836885685
26/10/17	Site Type:	RTP
Info Description	Value	Remarks
No of GSM Antenna (2G+3G)	6	
No of Inactive GSM Antenna at Tower	0	
No of MW Antenna	2	
No of Inactive MW Antenna at Tower	2	
No of Free GSM Pole/Mounting Kit	0	
No of Free MW Pole/Mounting Kit	0	
No of Free RRU/Other Pole/Mounting Kit	0	
No of RRU (2G+3G)	9	
No of TMA	0	
No of MUX/Router/Switch (including NTTN)	1	scl
No of Node B (Inside TX rack)	1	
No of Node B (Outside TX rack)	0	
No of Repeater box	0	
Total No of Tx Rack (Incl. other operators)	1	
Robi: Count	3	DUG-2, DUW-1
GP: Count		
BL: Count		

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TBL: Count	
Robi: Amp	15
GP: Amp	
BL: Amp	
TBL: Amp	
Total AC Load: Amp	15
DG Brand	
DG Capacity: KVA	
Fuel QTY: Liter	
Rectifier Model Name	AGISON
No of Rectifier Module	3
Connected Battery Brand	Northstar
Connected Battery Type	1
Connected Battery Capacity: Ah	900
Total Active Load: Amp	48
Rectifier Model Name	
No of Rectifier Module	
Connected Battery Brand	
Connected Battery Type	
Connected Battery Capacity: Ah	
Total Active Load: Amp	



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Figure 3.6: Antenna picture



Figure 3.7: Indoor picture of tower station

3.11 Process flow diagram of general communication

Figure 3.8 shows the block diagram of a general communication system, in which the different functional elements are represented by blocks. Mobile network architecture and coverage is presented in Figure 3.9, Radio network architecture in Figure 3.10, Transport Network Architecture in figure 3.11 and Core Architecture of Voice and data Nodes in Figure 3.12.

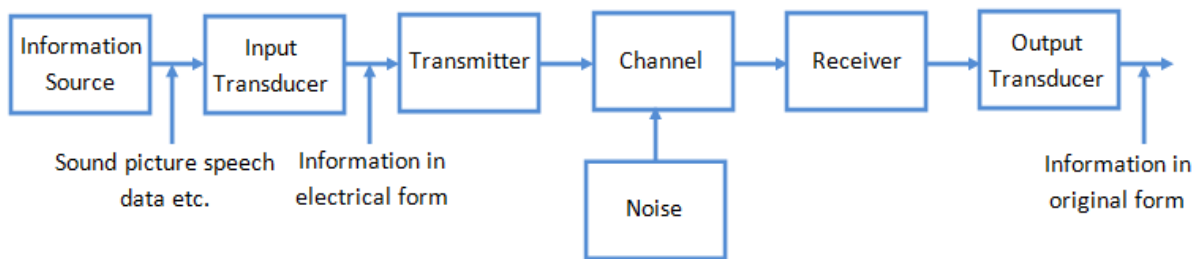


Figure 3.8: Block diagram of a general communication system

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MOBILE NETWORK ARCHITECTURE AND COVERAGE

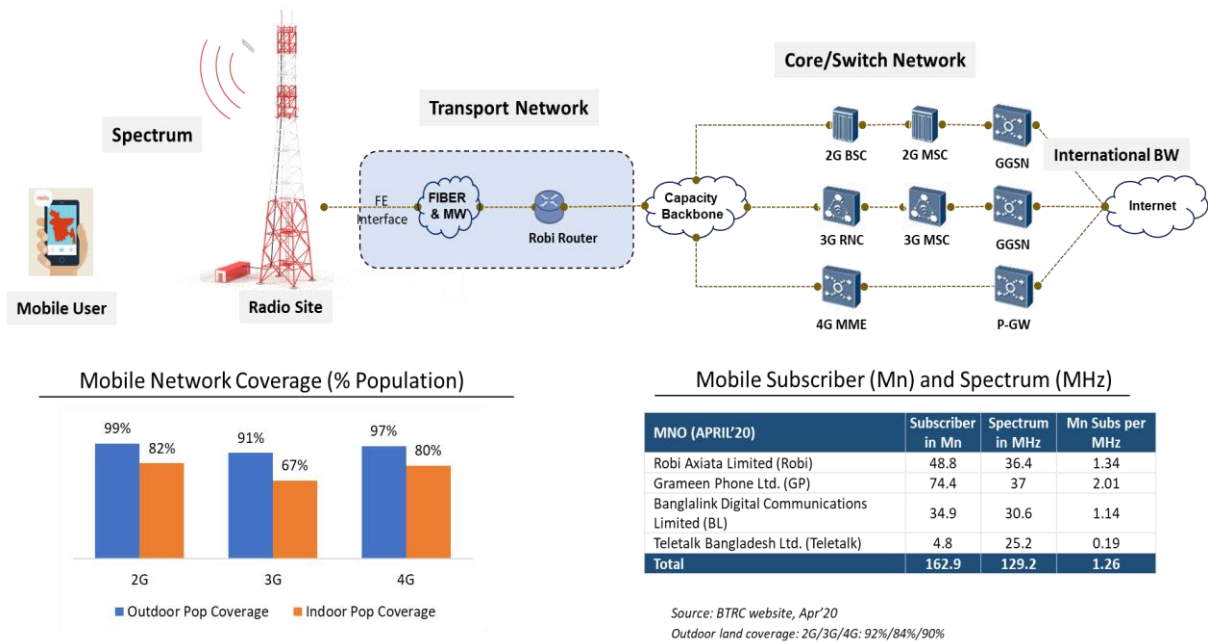


Figure 3.9: Mobile Network Architecture and Coverage

RADIO NETWORK ARCHITECTURE

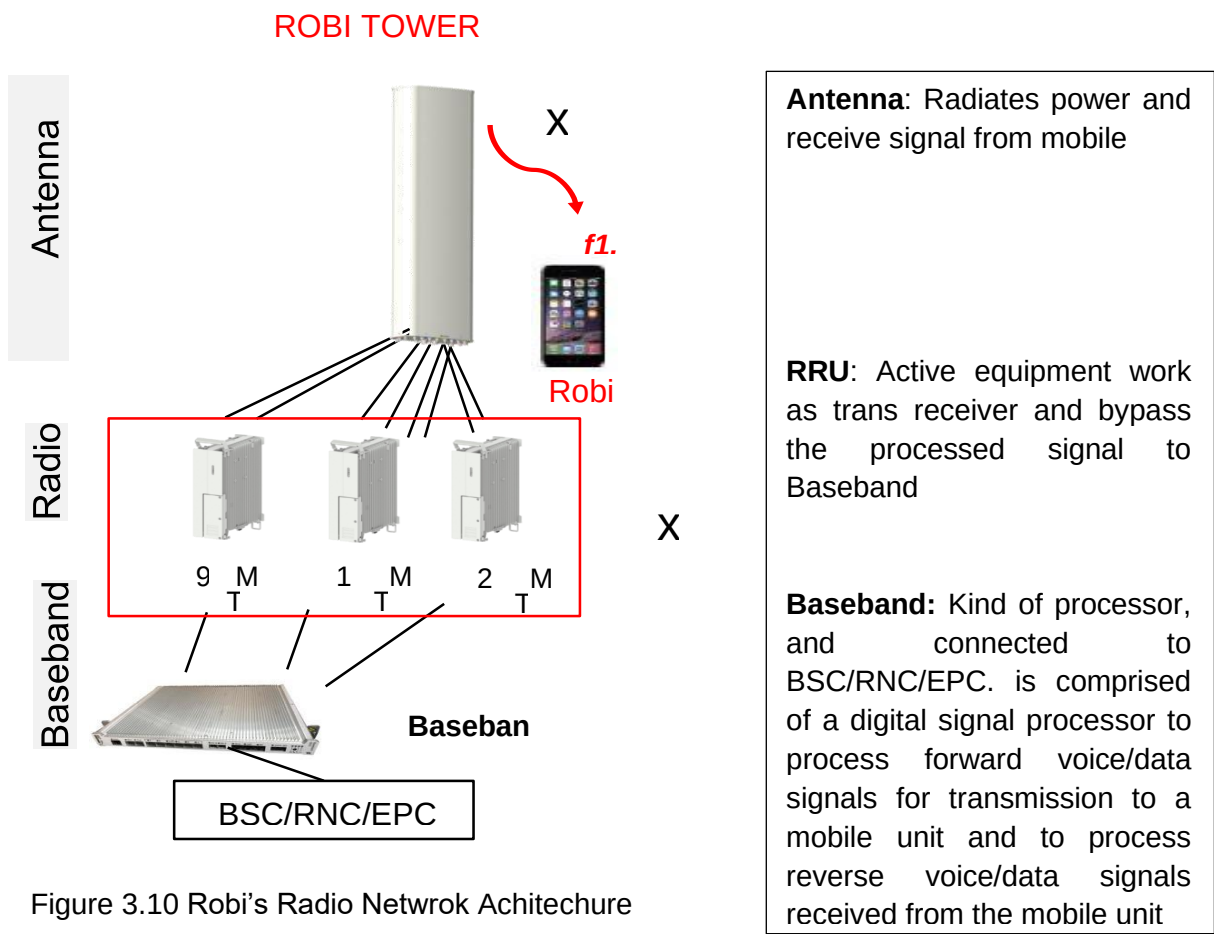


Figure 3.10 Robi’s Radio Network Achitecture

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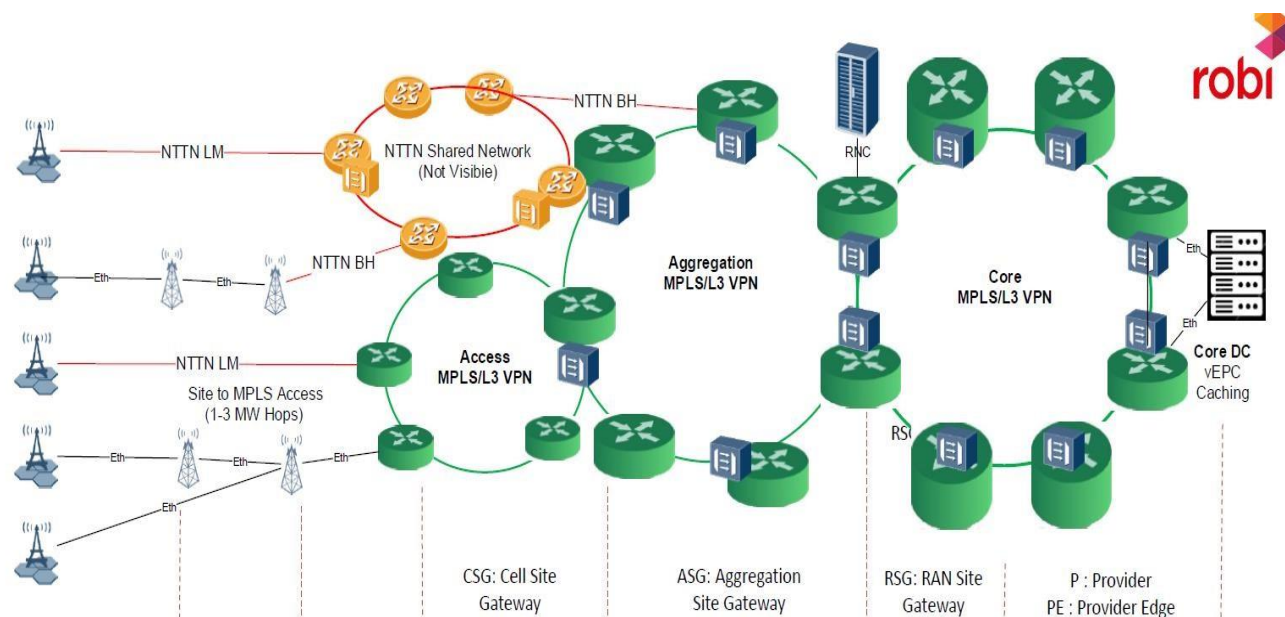


Figure 3.11: Robi's Transport Network Architecture

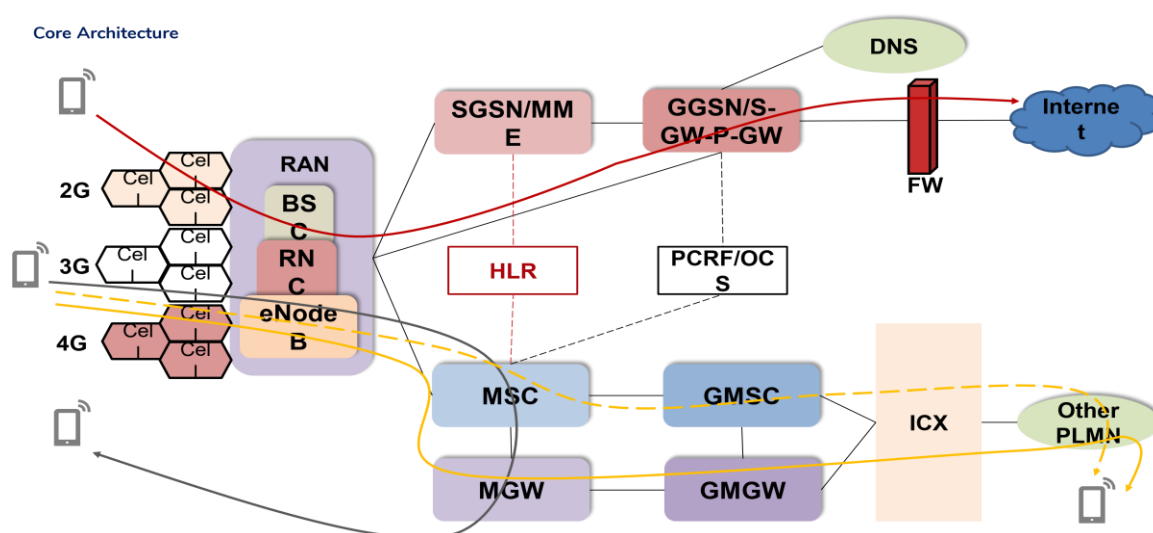


Figure 3.12: Core Architecture of Voice and Data Nodes

3.12 Major equipment/devices as are being used by Robi

Major equipment/device in the site are as follows. The Tentative energy/electricity consumption and emission is shown in Table 3.4.

1. Microwave
2. BTS equipment (2G, 3G, 4G), RRU etc.
3. Access to commercial power line
4. Rectifier for converting AC to DC
5. Batteries for power backup
6. Precision Air Conditioner (PAC)
7. Auto Fire Protection System (AFPS)

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Main Features

This section describes the main features of the baseband. Not all features are supported by all equipment configuration. For a description of the current equipment configurations.

The main features of the baseband are the following:

- NR
- LTE (FDD and TDD), WCDMA, GSM
- NB-IoT
- Elastic RAN
- Mixed Mode
- Backhaul cascading
- Baseband 6630 supports multi base band configurations

Table 3.4: Tentative energy/electricity consumption and emission

Energy Consumption & Carbon Emissions	
<i>Energy Consumption during reporting period</i>	<i>Jan'19 to Dec'19</i>
From Renewal Energy Technology (RET) kWh	2,634,931
Grid + Diesel Generator (DG) kWh	195,354,926
<i>Carbon Emission during the reporting period</i>	<i>109,054</i>
Carbon Emission Scope 1 (MT) Direct Emissions from DG	10,974
Carbon Emission Scope 2 (MT) Indirect Emissions from Grid	98,674

All the sites having commercial power line in addition to for site 4, 5 diesel-run generators ranging 550 KV to 1,100 KV.

3.13 Summary of total workforce with breakdown of men and women, as well as permanent and contractual.

The total number of workforce male and female employees are given in Table 3.5. Recently Robi revamps the manpower and employees in organizational outlook by adopting the concept of Modern, Agile and Digital (MAD) organization and also by introducing a new performance management framework called IGNITE. IGNITE has helped in driving exceptional performance and indoctrinate the organization with the “pay for performance” Philosophy. Besides, IGNITE has provided the framework to ensure equitable and fair assessment of employees’ performances. These changes are aimed to catalyze the ongoing digital transformation of the organization. Robi’s human resources summary workforce management is shown in Figure 3.13

Table 3.5: Manpower and Employee Details

Employee	Male	Female	Total
Permanent	1,394	173	1567
New hire	186	47	233
Attrition	196	40	236
Internal Placement	165	2	167

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Fresh Graduate	46	14	60
Total	1,987	276	2263

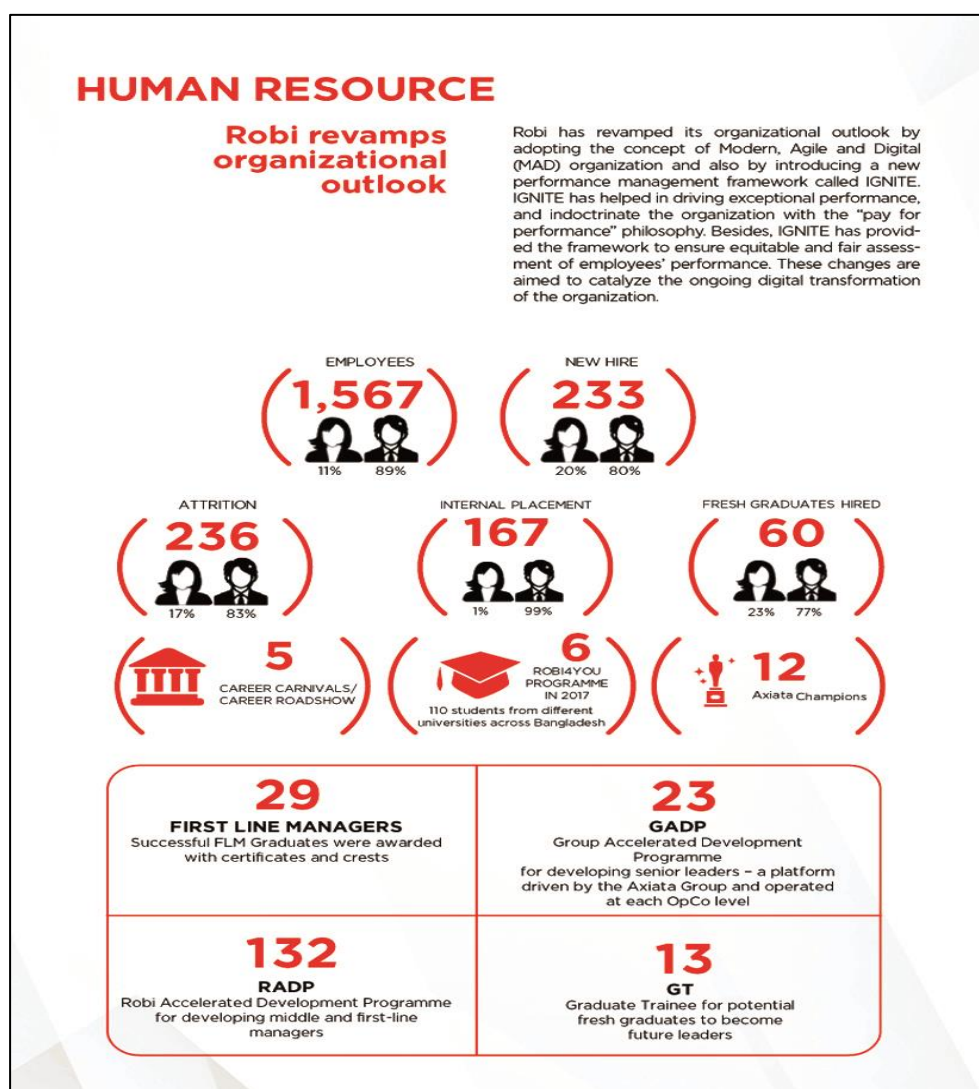


Figure 3.13: Detail of summary workforce as human resource management

3.14 Gender Equity:

Robi's recent policy increase the female worker than earlier. In order to maintain the gender equality recently, Robi management recruited 20% of female employees against previous time 11% which is increasing trend.

3.15 Summary of current coverage of services in regard of Bangladesh.

At present Robi is providing following area of the whole country coverage with 2G, 3G, 4G and 4.5G

- Total planned Physical Sites 1160,
- 4G new colocation 1025

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- 260 Gbps Core capacity enhancement
- 2,700 Km fiber expansion

3.16 Summary of proposed coverage or enhancement of the services based on the implication of this project.

The rapid adoption of new-age technologies – IoT, Cloud, Big Data, Data Analytics, Virtual & Augmented Reality, Artificial Intelligence etc. – are opening a new world of opportunities for telecom operators. Coupled with this technological upgradation, the Government's thrust for Digitalization as part of realizing the Digital Bangladesh vision is fueling demand for robust nationwide broadband connectivity- all these translates into massive growth opportunity for the telecom sector going forward.

As on December 2019, the country has 165.57 million mobile customers (excluding IOT subscriptions), out of which Robi Axiata's Ltd share is 49.00 million customers.⁸ This shows that Robi is set to play an important role in paving the nation's digital journey ahead. Supported by the robust 4G and wide 3G coverage, Robi has introduced several digital innovations in education, entertainment, and lifestyle arena to provide an integrated digital experience to the people of the country.

Airtel enjoys a special bonding with the youth of the country who are the main driving force for digitalization. In this backdrop, Airtel is set to leverage its special relationship with the youth to foment digital economy in the country.

Bangladesh's growing young urban population & Gross National Income per capita, increasing affordability of smartphones, growth in social media usage and digital content consumption are set to drive the growth in mobile data service; Robi's strong 4G LTE network is only going to work as a catalyst to this inevitable phenomenon. Already, it has been observed that the smartphone penetration among Robi subscribers is increasing rapidly due to availability of affordable smartphones and gradual reduction in data tariffs. Growing purchasing power of people is also playing a role here. Given the fact that the country is still in its early stage as far as digitalization is concerned, there is significant prospect for 4G business to grow in Bangladesh.

Robi has proposed the coverage the services-based on the implementation of the project at the end of Year 2019 PoP Coverage: 2G - 82%, 3G - 67%, 4G - 75% and proposed end of Year 2020 forecasted PoP Covearge: 2G - 85%, 3G - 70%, 4G - 82%.

3.17 Backup generators

It has access to commercial power from Rural Electrification Board (REB) and for power backup it has 5 diesel-run generators ranging 550 KV to 1,100 KV. There are batteries, which also provides backup upto 6 hours in case of any power failure in the commercial line.

⁸ <http://www.btrc.gov.bd/content/mobile-phone-subscribers-bangladesh-november-2019>

3.18 The number, type of required fuel and monthly total fuel consumption.

The Robi uses diesel generators as standby in case of any power disruption in the corporate office. All MSC, BSC, and BTS sites have adequate back-up batteries in case of any power failure. All MSC and BSC sites have adequate number of back-up generators to facilitate an un-interrupted network coverage to its subscribers. In case of load shading or power failures or in the event of any emergency, BTS sites are run by portable generators, batteries and solar powers. Approximately diesel fuel consumption requires 112,950 Liter/month.

Number of Airtel: 663
TowerCo (edotco): 1435
And Core :74

3.19 GHG Emission generation

Robi approximately 112,950-liter/month diesel oil used for its generator located in various area of the country for alternate emergency power supply. As per standard emission rate 2.6 kg CO₂ generate per liter of diesel oil burning.

Total CO₂ emission is $112,950 \times 2.6 = 293,670$ kg/month.

3.20 GHG Emission Reduction Target

The Robi has taken an GHG emission reduction target for energy conservation related corporate policy / programs and sustainability of KPIs on: carbon emissions per year; and energy usage (kWh/year).

Carbon reduction initiatives-2019: Total (ton) from “Fuel, Electrical”: 164,327 (3.1%) and Energy Usage for 11800+ sites (BTS+Core) ~36000 kWh/Year, with the following measures By end of 2020, Robi have a plan to use Solar Energy in 10% of BTS sites. At present Robi is performing trials of different energy efficiency solutions at the access sites including Intelligent Resource allocation and Voltage boosting to reduce Energy loss.

Robi is planning to use solar energy and a target to reduce 10% of GHG emission of the BTS sites. So, amount of GHG reduction is 29367 kg/month. After using solar energy remaining CO₂ emission will be 264,303 Kg/month

3.21 Summary of the key third parties/vendors with list of major services.

Storage and/or treatment of used engine oil is sold out or deliver by the Robi's third party to a DoE registered vendor who will treat the used oil and recycles the oil before disposal. List of Robi's third party vendor is shown in Table 3.6.

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Table 3.6: List of Robi's third-party vendors.

Sl.	Vendor	PO Amount (MUSD)	Procured Items/Services
1	Ericsson	126.38	RAN, Core, Transmission equipments & services
2	Huawei	88.99	RAN, Core, Transmission equipments & services
3	Summit	24.95	Lease Line
4	Fiber@Home	12.89	Lease Line, GI Bandwidth
5	Axiata Digital	11.09	Digital & Social Media
6	Smart	8.86	IT Solution, IT Services
7	ESL	6.35	IT Solution, IT Services
8	HS Engineering	5.08	Local Installation Materials, Civil, Passive Items
9	Cellular Mobile (Pte) Ltd.	6.31	Handset
10	Genex Infosys Limited	5.77	Outsourcing Service
11	HS Engineering	5.08	Local Installation Materials, Civil, Passive Items
12	Havas Media Bangladesh Ltd	5.07	Media
13	Aamra	4.54	IT Services, GI Bandwidth
14	Nokia	4.11	IT Solution, IT Services
15	Vinyl World & Sign	3.88	Digital Printing
16	edotco Bangladesh Co. Ltd.	3.38	Passive O&M
17	Media Consultants Ltd.	3.37	Media
18	Zass Telecom Limited	3.08	Power & It's Services
19	Taurus International Ltd.	3.01	Local Installation Materials, Outsourcing Service
20	Digicon Technologies Ltd.	3.01	Outsourcing Service
21	FRONTDESK BANGLADESH LIMITED	2.50	Outsourcing Service
22	Shark Ltd.	2.32	Network Maintenance, Power & It's Services
23	Communication Access Limited	2.10	Lease Line
24	Level3 Carrier Limited	2.06	GI Bandwidth
25	Tango Telecom	1.98	IT Solution, IT Services
26	NEC CORPORATION	1.92	RAN, Transmission equipments & services
27	SARBS Communications Limited	1.89	Power & It's Services (Battery, Rectifier etc.)
28	Quickly Global Ltd.	1.80	Network Maintenance
29	BASE	1.66	Power & It's Services (Battery)

3.22 Project Present status

The project is now in initial stage. Physical development and instrument setup works have not yet started which was observed during live streaming inspection on July 20, 2020.

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Robi authority approved CAPEX 156 m\$ and issued the PO till mid-July' 20 105 m\$, issued PO in immediate pipeline 37.5 m\$ and rest 13.5 m\$ consumed by end of this year

3.23 Project Schedule

Implementation period of the project is 18 months. The project has already been started, its commencement date is 01st July 2019 and completion date will be 31st December 2020. BP initiation taken on Mid of July 2019, CAPEX buildup, internal approval completed by Oct 2019 and finally Board Approval by mid of November 2019

CHAPTER 4 BASELINE OF ENVIRONMENTAL AND SOCIO-ECONOMIC CONDITION

4.1 General Consideration

Baseline condition of environment states the present status of different components of environment in absence of the project. The main objective of examining the present environment is to provide an environmental baseline against which potential impacts from Instrumentation set up and operational phases of any project can be compared. A second important function of establishing a baseline for parameters such as air, noise and water quality is to ensure that any problems arising from existing sources are not erroneously attributed to the project under study. In the present study the different environmental components examined from secondary information for setting baseline conditions of the project area, are physico-chemical, biological and socio-economical.

In physico-chemical component, parameters included are land, water quality, air quality, noise and soil quality and meteorology

4.2 Baseline Physical Environmental Condition of the Proposed Location

4.2.1 Geology

As per Tectonic framework Bangladesh is divided into two major tectonic units: (i) Stable Precambrian Platform in the northwest and (ii) Geosynclinal basin in the southeast. A third unit, a narrow northeast-southwest trending zone called the Hinge Zone separates the above two units almost through the middle of the country.

4.2.2 Topology

Although Bangladesh is a small country, it has considerable topographic diversity. It has three distinctive features: (i) a broad alluvial plain subject to frequent flooding, (ii) a slightly elevated relatively older plain, and (iii) a small hill region drained by flashy rivers.

4.2.3 Geomorphology

The proposed project is located in the High Ganges River Floodplain; this region includes the western part of the Ganges river floodplain which is predominantly highland and medium highland. Most areas have a complex relief of broad and narrow ridges and inter-ridge depressions. The upper parts of high ridges stand above normal flood level. Lower parts of ridges and basin margins are seasonally shallowly flooded.

4.2.4 Seismology

Bangladesh is located in the tectonically active Himalayan orogenic belt that developed by the collision among the Indian, Arabian, and Eurasian plates over the last 30-40 million years (Ma), (Aitchinson et al.2007). Moderate to large earthquake magnitudes are common in this

region and will continue to occur as long as the tectonic deformation continues. Some of these earthquakes caused serious damage to buildings and infrastructures through strong ground shaking and also, in some cases, faults rupturing the ground surface. The destructive and deadly hazards associated with earthquakes pose a real and serious threat to the life of people, property damage, economic growth and development of the country. A proper understanding of the distribution and level of seismic hazard throughout the country is therefore necessary. In order to perform rigorous seismic hazard analysis, all available knowledge of the historical earthquake, tectonic environment, and instrumental seismic data are required to predict the strong ground shaking in future earthquakes. The section provides appropriate earthquake ground motion parameters for seismic mitigation based on current existing data and most recent geological data interpretation.

The country has been divided into four seismic zones with different levels of ground motion. Table 4.1 includes a description of the four seismic zones.

According to the National Seismic Zoning Map produced by the Geological Survey of Bangladesh (GSB), Dhaka lies at the end of the Dauki fault in an area of medium seismic risk. This means that shocks of moderate intensity are possible, with a probable maximum magnitude of 6.5-7 on the Richter scale. Seismic events in Bangladesh are relatively infrequent but historically have been severe, such as the earthquakes of 1930 and 1950 that caused widespread damage throughout the country, and the earthquake in 2004 that damaged large parts of Dhaka City. Bangladesh is possibly one of the most vulnerable to potential earthquake threat and damage. Earthquake vulnerability of any place largely depends on its geology and topography, population density, building density and quality, and finally the coping strategy of its people and it shows clear spatial variations.

The National Seismic Zoning Map (Figure 4.1) produced by the Geological Survey of Bangladesh (GSB), divides the country into three regions: a high risk zone between Mymensingh and Sylhet in the north and north-east; a medium risk zone stretching diagonally from Rajshahi in the north-west through Dhaka and Comilla to Chattogram and Cox's Bazar in the south-east; and a low-risk zone in the south and south-west, around Khulna and Barisal. In the medium risk zone, shocks of moderate intensity are possible, with a probable maximum magnitude of 6-7 on the Richter scale. Seismic events in Bangladesh are relatively infrequent but historically have been severe. The Assam earthquake of 1897 was the largest in the region's history, when a force of 8.7 on the Richter scale caused extensive damage across Assam, Bengal and Bihar.

According to the Global Seismic Hazard Assessment Program (GSHAP), the most hazardous division in Bangladesh is the port city, Chittagong. Chittagong metropolis together with its surroundings is situated in the seismic zone 2, which has a basic seismic coefficient, $Z=0.15$ (BNBC, 1993). The Seismic zoning map is shown in the Figure 4.1).

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Figure 4.1: National Seismic Zone in Bangladesh

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Table 4.1: Seismic Zones of Bangladesh

Seismic Zone	Location	Seismic Intensity	Seismic Zone Coefficient, Z
1	South-western part including Barisal, Khulna, Jessore, Rajshahi	Low	0.12
2	Lower central and North-western part including Noakhali, Dhaka, Pabna, Dinajpur as well as the south-western corner including Sundarbans	Moderate	0.20
3	Upper central and north-western part including Brahmanbaria, Sirajganj, Rangpur	Severe	0.28
4	North-western part including Sylhet, Mymensingh, Kurigram	Very Severe	0.36

4.2.5 Water quality

Water is absolutely essential not only for the survival of human beings, but also for animals, plants, and all other living beings. Water is also crucial for the quality of life. River and pond water quality is a key concern as it is used for drinking and domestic purpose, irrigation and aquatic life including fish and fisheries.

Water quality and quantity greatly affect the ecosystem's productivity and services they provide. To provide necessary information for sustainable services especially of the aquatic ecosystem, continuous monitoring of water quality is essential. There was spatiotemporal variation in water quality. From the analyses, the impact of seasons, industrialization, and urbanization on water quality surfaced up especially for the rivers surrounding Dhaka city. During the rainy season, the water quality of most rivers (under the monitoring program) was improved, while comparing with the Environmental Quality Standard (EQS) set in the ECR, 1997. The water quality of rivers around Dhaka city, Chittagong, and Khulna did not comply with EQS in the dry season indicating the most probable effect of dense industrialization in those areas followed by huge human pressure on rivers.

Based on the parameters of the water quality of the major rivers viz. Padma, Meghna, Jamuna, Dhaleshwari, Surma, Korotoa, etc. was within the limit of Environmental Quality Standards (EQS) in 2015 while rivers around greater Dhaka were highly polluted especially in the first five months of 2015 in terms of DO, BOD, and COD value. DO was almost zero from January to May at different locations of Buriganga, Shitalakhya, and Turag River. High levels of Chloride (135.6 mg/l), TDS (639 mg/l), BOD (35 mg/l), and COD (124.3 mg/l) were found in the Buriganga river from January to December in 2015. In Meghna DO and BOD levels were found within the EQS which varied from 4.7 to 8.1 mg/l and 1.0 to 7.0 mg/l, respectively. In Jamuna DO and BOD levels were found from 5.0 to 7.6 mg/l and 0.3 to 5.2 mg/l, respectively. High levels of Chloride, TDS, and Turbidity were found in Moyuri, Rupsha, Pashur, and Kakshiali River. The highest level of Chloride (12692 mg/l) and TDS (16376 mg/l) were found in the Pashur River. The highest value of Turbidity (134.3 NTU) was found in the Kakshiali river. High COD (489 mg/l) was found in the Karnaphuli river. The impact of seasonality on

water quality surfaced up while analyzing data. During dry seasons water quality become worse. On the contrary, river water quality improved greatly during the wet seasons indicating a clear relationship between the increased flow of the river and river water quality.

Robi uses 150,000 liters of water as drinking water for its employees. The drinking water is supplied by the third-party vendor with dining water quality standards.

4.2.6 Air Quality

Air quality of greater Dhaka, other cities and the surrounding of industrial area is alarming and deteriorating day by day. A recent study by CASE project under DoE monthly air quality monitoring June 2019 showed that one of the major environmental problems, the dwellers of Dhaka metropolitan city and other major divisional metropolitan cities and its surrounding are facing air pollution from vehicular exhausts and industrial activities including brick kiln. Due to population explosion in Bangladesh, the number of motorized vehicles increased in the same magnitude but road network didn't expand in that ratio.

Up-to-date air quality data around the project site are not available, as there is no provision for monitoring air quality in the project area. DoE is measuring real-time ambient level pollutants through continuous emission monitoring (CEM) at 8 major cities (Namely, Dhaka, Narayanganj, Gazipur, Chittagong, Rajshahi, Khulna, Barisal and Sylhet) of Bangladesh. The data generated will be used to define the nature and severity of pollution in the cities; identify pollution trends in the country; and develop air models and emission inventories.

The continuous emission monitoring (CEM) stations results are found that the apparent ambient air quality of all the 8 stations is fairly good and below standard except three stations Dhaka BARC, Gazipur and Narayanganj stations for PM_{2.5} and PM₁₀. The monitoring results are presented in Annex 1.

The data have been quality controlled and the air pollution levels have been compared to the Bangladesh Ambient Air Quality Standard as adopted in 2005. Table 4.2 represents the current and approved air quality standards for Bangladesh.

Table 4.2: National Ambient Air Quality Standards for Bangladesh

Pollutant	Objective	Average
CO	10 mg/m ³ (9 ppm)	8 hours(a)
	40 mg/m ³ (35 ppm)	1 hour(a)
Pb	0.5 µg/m ³	Annual
NO _x	100 µg/m ³ (0.053 ppm)	Annual
PM ₁₀	50 µg/m ³	Annual (b)
	150 µg/m ³	24 hours (c)
PM _{2.5}	15 µg/m ³	Annual
	65 µg/m ³	24 hours
O ₃	235 µg/m ³ (0.12 ppm)	1 hour (d)

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	157 $\mu\text{g}/\text{m}^3$ (0.08 ppm)	8 hours
SO ₂	80 $\mu\text{g}/\text{m}^3$ (0.03 ppm)	Annual
	365 $\mu\text{g}/\text{m}^3$ (0.14 ppm)	24 hours (a)

Notes:

- (a) Not to be exceeded more than once per year
- (b) The objective is attained when the annual arithmetic mean is less than or equal to 50 $\mu\text{g}/\text{m}^3$
- (c) The objective is attained when the expected number of days per calendar year with a 24- hour average of 150 $\mu\text{g}/\text{m}^3$ is equal to or less than 1
- (d) The objective is attained when the expected number of days per calendar year with the maximum hourly average of 0.12 ppm is equal to or less than 1 (Source: AQMP, DOE).

4.2.7 Noise Quality

Noise level data of greater Dhaka, other cities and the surrounding of industrial area is increasing day by day. A recent study by DOE showed that one of the major environmental problems, the dwellers of Dhaka metropolitan city and other major divisional metropolitan cities and its surrounding are facing noise pollution from vehicular horn, industrial activities and from the generator operation. Due to population explosion in Bangladesh, the number of motorized vehicles and movement of the people increase tremendously. Some of the hot spot area the level of noise level data is exceed the normal; allowable limit.

Up-to-date noise level data around the project site are not available, as there is no provision for monitoring of noise quality in the project area. But from the virtual observation is found that the apparent ambient noise quality of all the project area is fairly good. The Noise quality standards of DoE by zone and time of day is presented in Table 4.3.

Table 4.3 Noise Quality Standards, by Zone and Time of Day

Zone Class	Limits in dB(A)	
	Daytime (6 am – 9 pm)	Nighttime (9 pm – 6 am)
Silent zone	45	35
Residential zone	50	40
Mixed (residential/commercial/industrial)zone	60	50
Commercial zone	70	60
Industrial zone	75	70

Source: Department of Environment (DoE), Bangladesh

4.2.8 Soil Quality

The major part of Bangladesh is on the delta formed by the three major rivers Brahmaputra, Ganges and Meghna. These rivers and many of the country's other minor

rivers originate outside the national boundary of the country and make up the Ganges-Brahmaputra-Meghna river system.

The system drains a basin of some 1.76 million sq km and carry not only snowmelt water from the Himalayas but also runoff water from some of the highest rainfall areas of the world. Over millennia, the sediments carried by the huge discharges of these rivers have built a broad delta, forming most of the large area of Bangladesh and the submerged delta-plain in the bay of bengal. These huge sediments are the major sources of formation of 80% soils of the country. The remaining 20% of soils have been formed in Tertiary and Quaternary sediments of hills (12%) and in uplifted pleistocene terrace (8%). The General soil types of Bangladesh is shown in Table 4.4.

Table 4.4 General Soil Types of Bangladesh.

General soil type	Area (ha)	(%)
Floodplain soils	9,718,722	78.96
Calcareous Alluvium	591,796	4.81
Non-calcareous Alluvium	562,242	4.57
Calcareous Brown Floodplain soils	478,518	3.89
Calcareous Grey Floodplain soils	170,767	1.39
Calcareous Dark Grey Floodplain soils	1,434,678	11.66
Non-Calcareous Grey Floodplain soils	3,387,153	27.52
Non-Calcareous Brown Floodplain soils	383,312	3.11
Non-Calcareous Dark Grey Floodplain soils	1,599,645	13.00
Black Terai soils	83,408	0.68
Acid Basin clays	348,994	2.84
Acid Sulphate soils	226,647	1.84
Peat	130,005	1.06
Grey Piedmont Soils	215,279	1.75
Made-land	106,278	0.86
Hill soils (Brown Hill Soils)	1,561,472	12.69
Terrace soils	1,028,030	8.35
Shallow Red-Brown Terrace soils	72,549	0.59
Deep Red-Brown Terrace soils	189,380	1.54
Brown Mottled Terrace soils	34,235	0.28
Shallow Grey Terrace soils	265,427	2.16
Deep Grey Terrace soils	352,152	2.86
Grey Valley soils	114,287	0.93
Total soil area	12,308,224	100.00

Source FAO/UNDP, 1988.

The project is located on the delta formed by the three major rivers Brahmaputra, Ganges and Meghna. General soil types predominantly include calcareous dark grey floodplain soils and calcareous brown floodplain soils. Organic matter content in the brown ridge soils is low but

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higher in the dark grey soils. Soils are slightly alkaline in reaction. General fertility level is low. The map of general soil type in Bangladesh is shown in Figure 4.2

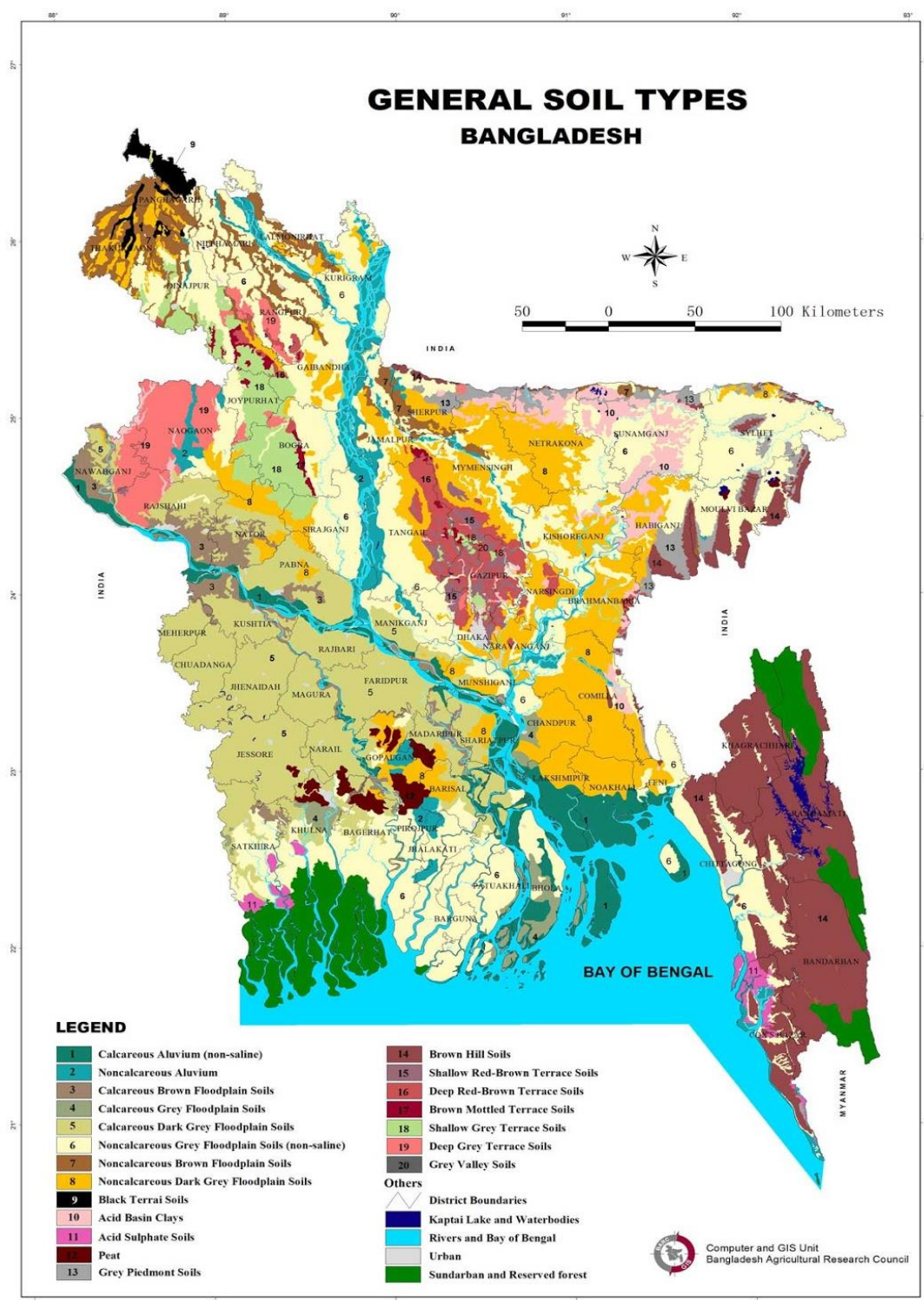


Figure 4.2: General Soil Type in Bangladesh
Source: BARC

4.2.6 Meteorology

4.2.6.1 Temperature

Bangladesh has a subtropical monsoon climate characterized by wide seasonal variations in high temperatures and humidity. There are three distinct seasons in Bangladesh: a hot, humid summer from March to June; a cool, rainy monsoon season from June to October; and a cool, dry winter from October to March. In general, maximum summer temperatures range between 30°C and 40°C. April is the warmest month in most parts of the country. January is the coldest month when the average temperature for most of the district is about 10°C. The result of some weather stations is presented in the Annex 2

For comparison monthly as well as seasonal normal minimum and maximum temperatures of Bangladesh are calculated using the period of 1971-2000 and 1981-2010. It is found that the monthly minimum temperature of Bangladesh during 1981-2010 increased in February, May to October and nearly equal in other months (Figure 4.3). Country average monthly maximum temperature slightly increased in February to September and nearly equal in all other months (Figure 4.4).

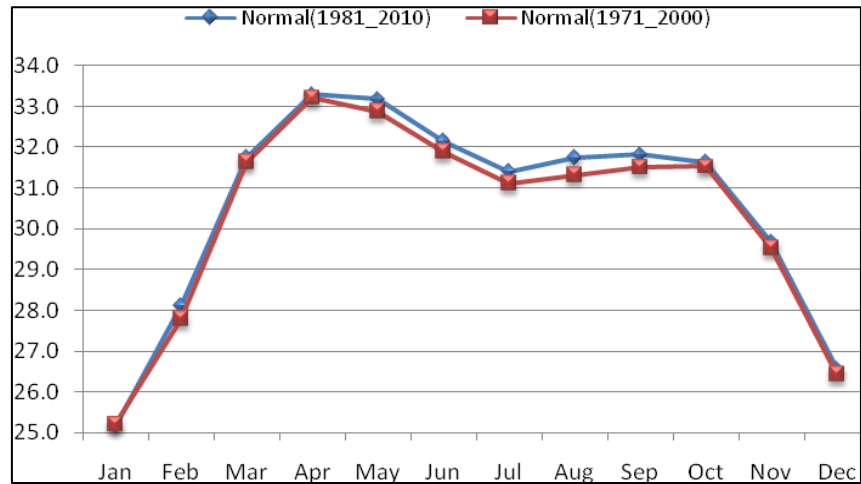


Figure 4.3: Country averaged maximum temperature of Bangladesh during 1971-2000 and 1981-2010

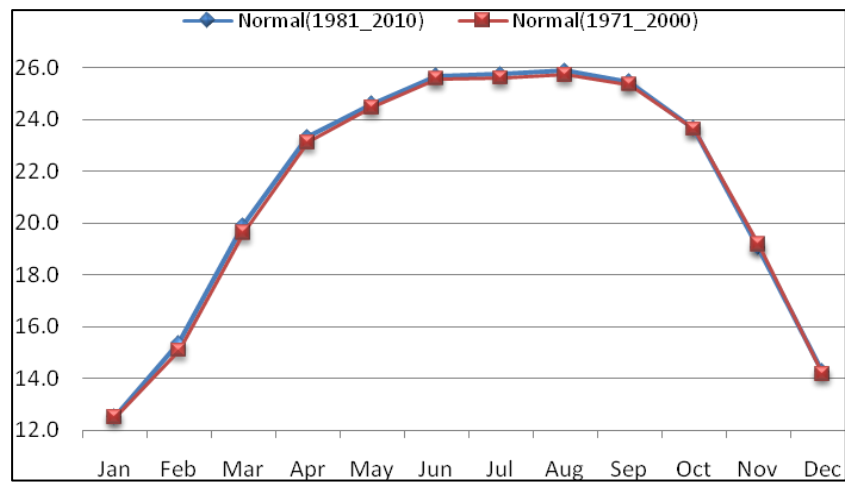


Figure 4.4: Country averaged minimum temperature of Bangladesh during 1971-2000 and 1981-2010

4.2.6.2 Rainfall

Heavy rainfall is characteristic of Bangladesh. With the exception of the relatively dry western region of Rajshahi, where the annual rainfall is about 1600 mm, most parts of the country receive at least 2000 mm of rainfall per year. Because of its location just south of the foothills of the Himalayas, where monsoon winds turn west and northwest, the regions in northeastern Bangladesh receives the greatest average precipitation, sometimes over 4000 mm per year. About 80 percent of Bangladesh's rain falls during the monsoon season.

For calculating the monthly and seasonal changes of rainfall, two rainfall data sets for the period of 1971-2000 and 1981-2010 are used. The normal rainfall during 1971-2000 is considered as the base period and then the change of rainfall during the period of 1981-2010 is calculated. It is found that the rainfall during 1981-2010 increases in July, September and October and it decreases in March to June. It remains nearly unchanged during the remaining months (Figure 4.5). Map of rainfall in different areas of Bangladesh in various seasons represented in the Annex 3.

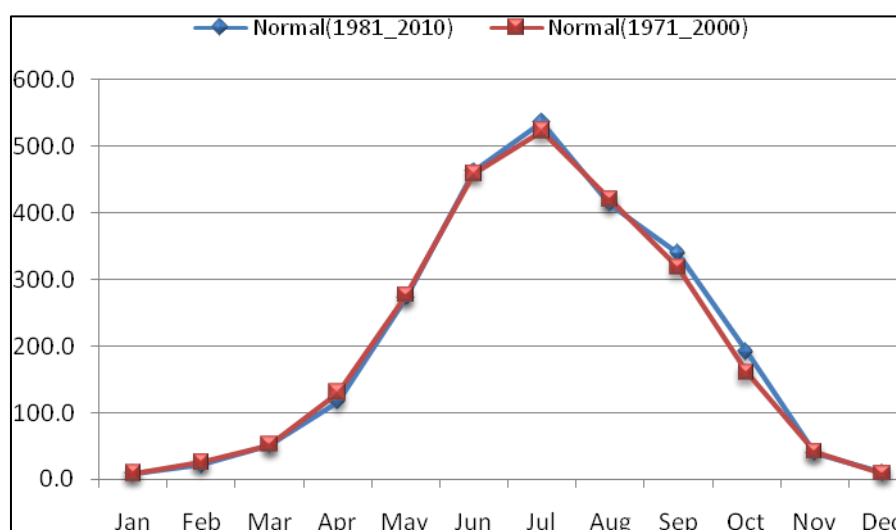


Figure 4.5: Country normal rainfall comparison over Bangladesh

It is also found that the rainfall of winter season decreases over southwestern part of Bangladesh during 1981-2010 than 1971-2010 and accordingly the significant decreases are found at Madaripur (-28%), Mongla and Bhola (-25% each), Feni (-22%) and Satkhira (-20%). But it increases in the southeastern and adjoining southern and northeastern parts. Considerable increase of rainfall is found at Teknaf (+36%), Cox's Bazar (+22%) and Khepupara (+15%). Spatial distribution of winter rainfall during 1981-2010 and 1971-2000 and their deviations are shown in Annex 2.

Rainfall deviations are negative at Barisal division, some parts of Dhaka division and Pabna region but it is negative in the remaining parts of the country during pre-monsoon season (Annex 2). Significant negative deviations are found at Barisal (-38%), Madaripur (-15%), Faridpur and Ishurdi (-14% each), Bhola (-13%) and Dhaka (-12%). Positive deviations of rainfall during this season are found southeastern, northeastern and extreme northwestern parts and Satkhira region (Annex 3). Significant positive deviations are detected at Kutubdia (+18%) and Sayedpur (10%).

During monsoon season negative deviations of rainfall are found over Rajshahi division and some parts of Dhaka, Sylhet and Chittagong divisions but positive deviations are found over the remaining parts of the country. Accordingly, significant positive deviation is found at Hatiya

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(+12%), Teknaf (+7%), Cox’s Bazar, Jessore and Sitakundha (+7% each). But the noted negative deviation is found at Ishurdi (-9%) and Rajshahi (-7%) as depicted in Annex 2.

During post-monsoon season negative deviations are found over northeastern part of Bangladesh adjoining areas including Dhaka region but positive deviations are observed over the northwestern part, southwestern part and the regions Noakhali and Comilla Annex 2. Considerable maximum positive deviations are found at Dinajpur (+39%), Rangpur (37%), Chandpur (26%) and Sayedpur (25%) and negative deviation are found at Sylhet (-11%).

Distribution pattern of annual rainfall during 1981-2010, 1971-2000, and their deviations are shown in Figure 4.6. It is very similar of distribution pattern of annual rainfall during 1971-2000 and 1981-2010 to each other. But the comparison between these two periods shows that the amounts of annual rainfall increased during 1981-2010 over extreme southeastern part, HatiyaSandwip, Rangpur and Jessore regions. But the amounts of rainfall decreased over Rajshahi division and the regions of Faridpur, Dhaka, Sylhet, Kushtia and Barisal. Substantial increments are found at Hatiya (+9%), Teknaf (+8%) and Jessore (+7%) but the considerable declines are found at Ishurdi (-9%), Barisal (-6%), Rajshahi and Faridpur (-5% each).

From the previous 10 years monthly rainfall data it can be observed that the minimum average rainfall was observed 0.14mm in December and maximum average rainfall was observed 7.98mm in August and shown in Figure 4.6.

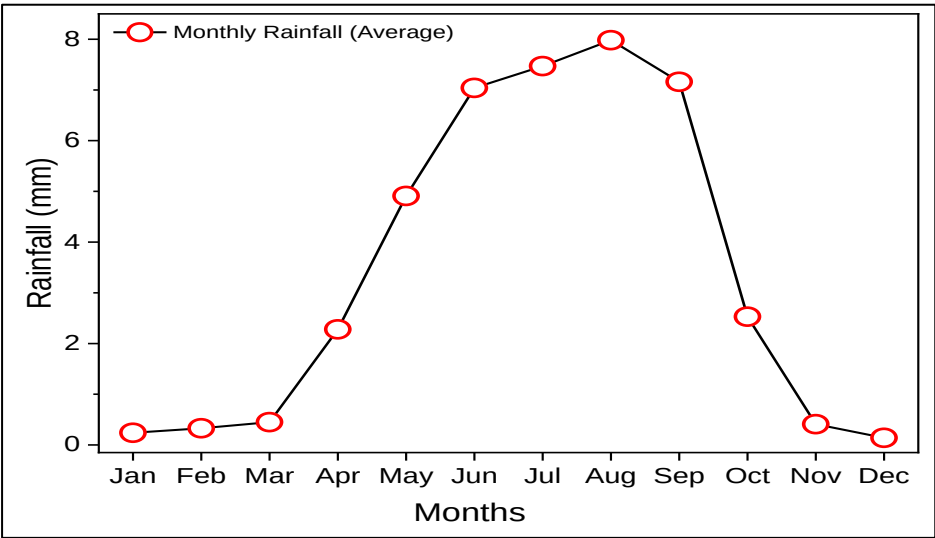


Figure 4.6: Monthly Average Rainfall Pattern during 2006-2016
Source: Bangladesh Meteorological Department (BMD)

4.2.6.3 Humidity

From the previous 10 years monthly humidity data it can be observed that the minimum average humidity was observed 64.12mm in March and maximum average humidity was observed 85.74mm in August. Figure 4.7 illustrate the monthly average humidity.

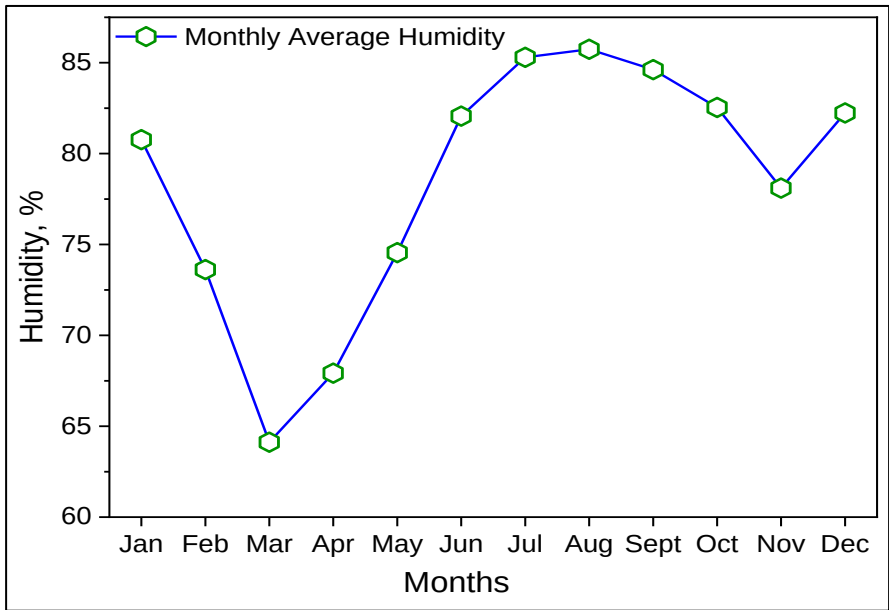


Figure 4.7: Monthly Average Humidity during 2006-2016
Source: Bangladesh Meteorological Department (BMD)

4.2.6.4 Wind pattern (Direction and Speed) for different seasons in Bangladesh

Wind is a vital indicator of the atmospheric circulation. Changes in wind speed and direction is an indication of the changes in circulation position due to either natural or anthropogenic processes. In meteorology, wind direction is considered as the direction from which wind blows and expressed in degrees and measured clockwise from the geographical north or in terms of the points of the compass. The wind direction is generally measured by an instrument called wind vane which is one of the oldest metrological instruments. Wind speed is the rate of movement of air in its instantaneous direction and is measured as kilometers per hour or meter per second or knots. In this study the unit of wind speed is meter per second is considered.

Seasonal wind pattern and distribution of wind speed of all the stations of BMD are prepared and compiled are represented in the Annex 4.

The winter season in Bangladesh comprises of December, January and February. During winter season (December, January and February) the northeasterly winds prevail over the country blowing from land to sea except northern hilly areas where mainly easterly wind prevails. Clear sky, low temperatures, low humidity and light winds are the common weather phenomenon of winter season. But during the passage of upper air cyclonic circulation over northwestern part of the country (called western disturbances) light rain occurs over the country.

During summer season (March to May) heating belt shifts northward due to apparent northward movement of the sun. The summer months experience high temperature and falling of air pressure over the country. Circulation of air begins to set in around this low-pressure area results strong gusty, hot, dry winds blowing the day. Thunderstorms are very common during this season over the country. In this season, localized thunderstorms associated with violent winds, torrential downpours and occasionally hail occur. These are locally known as the ‘Kalbaishakhi’ are the common weather phenomena.

The prominent features of wind climatology in Bangladesh are the circulations influenced by the strong southwest monsoon when warm and humid air moves towards the land. Generally,

monsoon season onsets early June and withdraws by the end of September in Bangladesh. During this season, the persisting low pressure over the northern India and Bangladesh intensifies and attracts the trade winds of the southern hemisphere. These trade winds originate over warm sub-tropical oceanic areas of the southern hemisphere, cross the equator and blow in a southwesterly direction entering the Indian peninsula and the Bay of Bengal. After that, it covers the whole Bangladesh as a southwest monsoon.

The post-monsoon season in Bangladesh continues during October to November. During this season the low-pressure trough over Bangladesh territory becomes weaken and gradually replaces by a high-pressure system. After withdrawal of monsoon, the period of October and November months acts as a transition from hot rainy season to dry winter conditions. So, wind pattern shows more variable than other seasons. The low-pressure conditions transfer to the Bay of Bengal by early November resulting in formation of depressions which of them sometimes intensified into a cyclonic storm. These cyclones generate high wind along the path and generally cross Indian coast/ Bangladesh causing widespread heavy rain. The monthly average wind speed data during (2006-2016) is shown in Table 4.5. The Basic wind speed map of Bangladesh is shown in Figure 4.8.

Table 4.5 Monthly Average Wind Speed Data

Stations	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Dhaka	1.23	1.60	2.59	4.21	3.80	3.70	3.64	3.21	2.24	1.28	0.93	0.92	2.45
Mymensingh	1.07	1.45	2.18	3.21	3.21	3.21	3.01	2.68	2.10	1.32	0.87	0.78	2.12
Tangail	1.23	1.44	2.08	3.17	3.23	3.29	3.19	2.65	1.12	1.26	0.97	0.90	2.13
Faridpur	1.26	1.43	2.42	3.92	4.06	3.76	3.62	3.31	2.66	1.53	1.09	1.12	2.53
Madaripur	0.84	0.94	1.53	2.40	2.22	2.03	2.21	2.09	1.38	0.83	0.59	0.60	1.47
Chittagong	2.54	3.27	5.03	7.54	7.44	8.77	8.87	7.92	5.56	3.06	2.14	2.11	5.37
Sandwip	1.27	1.78	3.10	4.19	4.20	4.91	4.90	4.51	2.87	1.75	1.09	1.10	2.98
Sitakunda	1.12	1.57	2.56	3.21	3.21	3.70	3.54	3.19	2.19	1.21	0.86	0.83	2.26
Rangamati	1.26	1.51	2.31	2.90	2.60	2.54	2.54	2.12	1.62	1.26	1.10	1.09	1.90
Comilla	1.16	1.58	2.81	4.30	4.36	4.64	4.73	4.10	2.69	1.44	0.89	0.88	2.82
Chandpur	0.85	0.96	1.92	2.80	2.22	2.21	2.12	1.87	1.36	0.92	0.72	0.67	1.56
M_Court	0.71	1.08	1.81	2.91	2.84	3.41	3.45	3.01	1.98	1.08	0.71	0.60	1.98
Feni	0.84	1.26	1.97	2.95	2.75	3.17	3.43	3.02	2.01	1.00	0.70	0.63	1.96
Hatiya	2.33	2.53	3.57	5.14	5.02	5.81	5.64	4.67	3.38	2.06	1.63	1.65	3.63
Cox's_Bazar	3.60	3.85	4.30	4.84	5.36	6.15	6.41	5.75	4.20	3.15	2.93	3.13	4.48
Kutubdia	2.52	2.64	3.38	3.88	4.02	5.40	5.40	4.78	3.13	2.19	1.72	1.93	3.43
Teknaf	1.93	2.44	2.54	2.15	2.27	2.39	2.48	2.27	1.49	1.29	1.21	1.16	1.97
Sylhet	2.18	2.68	3.25	3.25	2.82	2.56	2.39	2.18	1.84	1.84	1.98	2.07	2.42

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Srimangal	0.46	0.91	1.63	1.83	1.53	1.42	1.63	1.21	0.87	0.58	0.36	0.30	1.07
Rajshahi	1.64	1.77	2.26	3.40	3.73	3.55	3.24	2.90	2.45	1.53	1.45	1.66	2.46
Ishurdi	1.57	1.75	2.64	4.62	4.92	4.73	4.23	3.85	2.89	1.58	1.34	1.53	2.98
Bogra	1.29	1.58	2.17	3.07	3.12	2.90	2.65	2.38	1.90	1.20	0.96	1.05	2.02
Rangpur	1.25	1.59	2.50	3.40	3.01	2.93	2.77	2.60	2.14	1.63	1.46	1.25	2.22
Dinajpur	0.98	1.20	1.72	1.99	1.76	1.74	1.62	1.43	1.18	0.81	0.66	0.69	1.32
Sayedpur	2.67	3.14	4.60	4.76	4.00	3.73	3.56	3.05	2.74	2.12	2.04	2.24	3.22
Khulna	1.34	1.61	2.48	3.72	3.74	3.34	3.20	3.25	2.23	1.27	0.97	1.07	2.38
Mongla	1.86	2.05	2.71	3.96	4.17	3.98	3.70	3.46	2.71	1.87	1.45	1.50	2.78
Satkhira	1.54	1.81	2.50	3.75	3.72	3.16	2.83	2.56	2.05	1.51	1.40	1.47	2.36
Jessore	1.38	1.85	3.42	6.00	6.25	5.41	4.84	4.29	3.37	1.71	1.19	1.11	3.42
Chuadanga	0.82	0.95	1.57	2.47	2.44	2.31	1.99	1.71	1.55	0.94	0.62	0.66	1.50
Barisal	0.64	0.96	1.85	3.11	3.00	2.92	2.84	2.45	1.62	0.83	0.54	0.56	1.78
Patuakhali	1.61	1.77	2.72	3.93	4.02	3.69	3.59	3.23	2.42	1.51	1.24	1.16	2.56
Khepupara	1.75	2.19	3.63	5.64	5.92	5.72	5.58	4.96	3.36	1.77	1.36	1.37	3.62
Bhola	0.61	0.93	1.65	2.81	2.40	2.19	2.21	1.87	1.28	0.65	0.47	0.52	1.47

Source: BMD

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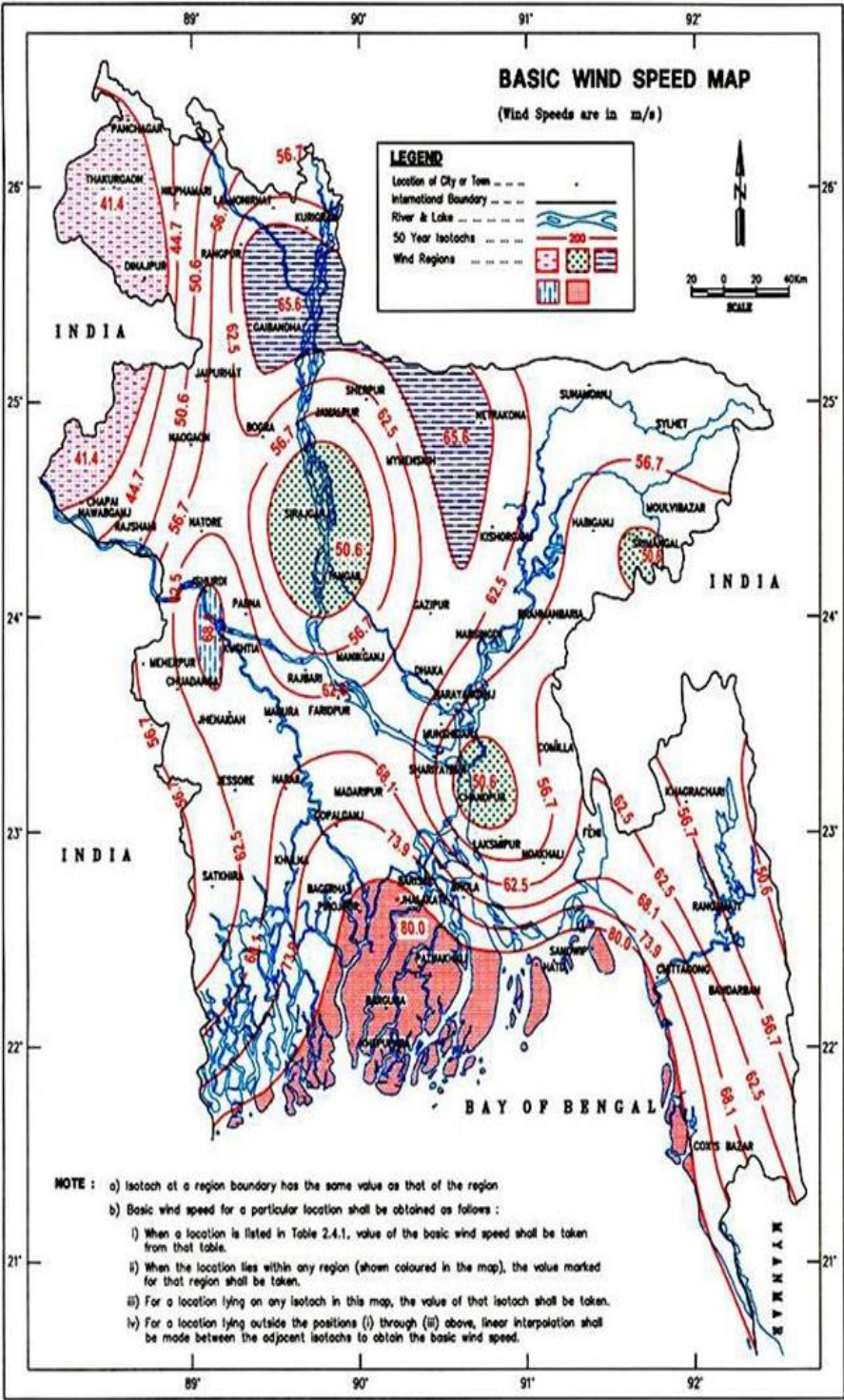


Figure 4.8: Basic wind speed map of Bangladesh

4.2.6.5 Hydrology

From the hydrological study water level data of Ganges River of Rajshahi stations SW88 has been observed. Danger level (DL) and high-water level (HWL) of the station is 18.50mPWD and 20mPWD respectively. According to Hydrological study data (2006-2016) the Standard high-water level (SHWL) data 12.29m and Standard low water level (SLWL) data is 10.62m of station SW88 in Ganges River. The variation of water level from 2006 to 2016 for last 10 years is shown in Figure.4.9

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The ground level of Robi station should be 1.5 m higher than the maximum water level.

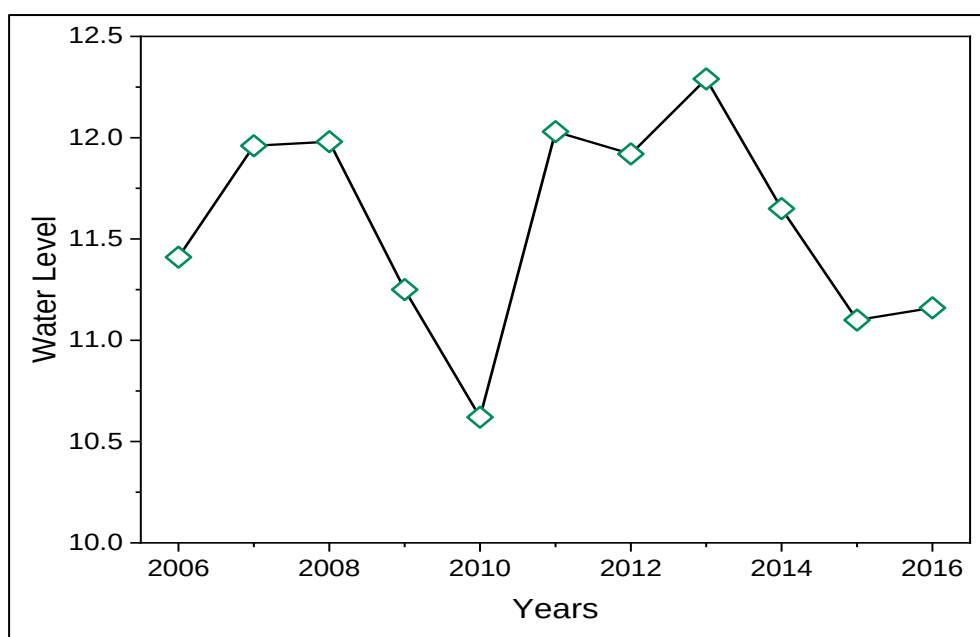


Figure 4.9: Water Level Data Graph View at Rajshahi (SW88) Station
Source: Bangladesh Water Development Board (BWDB)

4.2.6.5 Lightning and Thundering at Rajshahi

In addition to wind and precipitation (usually rain, but sometimes also hail), thunderstorms are accompanied by lightning that can pose a hazard to characters without proper shelter (especially those in metal armor). The following table describe the lightning strike on electrical lines. Table 4.6 shows the monthly average frequency of thunderstorm of the project area. Maximum average thunderstorm of 26.8 times was observed in June and minimum average temperature was 0 time in November and December. Lightning are frequently occurred in the recent time in Bangladesh and poses health hazard, loss of human, animal, birds' life and telecommunication towers. This lightning is the biggest threat to telecommunication towers. Figure 4.10 shows monthly average frequency of lightning & thunderstorm for the project area.

Effect of lightning and thundering strike on electrical lines shown in Figure 4.11.

Table 4.6 Monthly Average Frequency of Thunderstorm Data of Rajshahi (2008-2012)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
2008	2	0	6	13	33	25	33	23	17	9	0	0
2009	0	3	14	4	25	16	20	24	26	9	0	0
2010	0	2	2	7	26	26	13	28	11	7	0	0
2011	3	0	11	27	35	38	7	11	17	4	0	0
2012	1	0	6	15	12	29	26	9	33	8	0	0
Ave.	1.2	1	7.8	13.2	26.2	26.8	19.8	19	20.8	7.4	0	0

Source: Bangladesh Meteorological Department (BMD, 2012)

Note: Cells shaded in light grey indicate the highest and lowest value.

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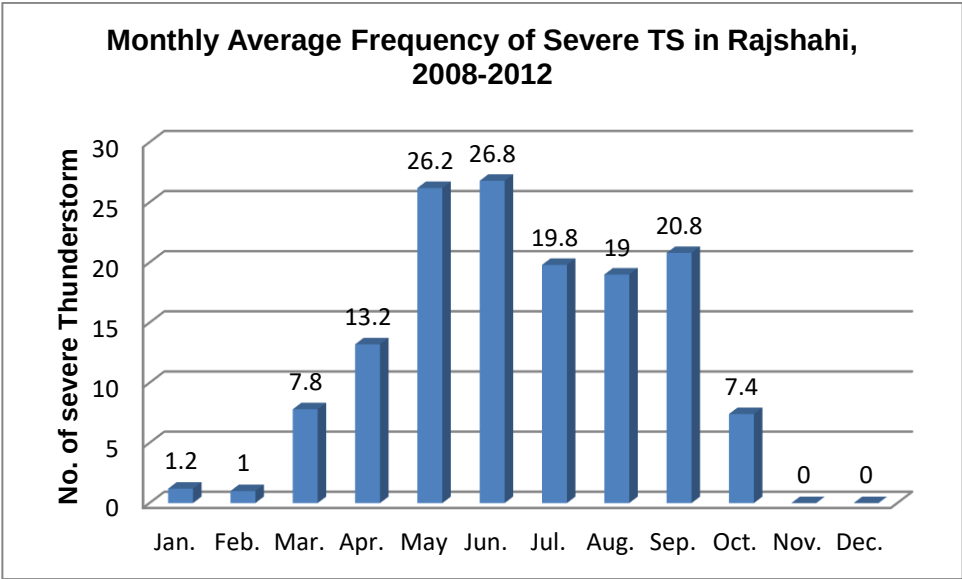


Figure 4.10: Monthly Average frequency of severe Thunderstorm during 2008-2012



Figure 4.11: Effect of lightning and thundering strike on mobile tower

4.2.6.6 Microwave and Radio Frequency Radiation

Telecommunications Antennas and related equipment which transmit information, emit radiofrequency radiation (which includes microwave radiation).

Mobile phone base stations may be considered as relatively low-power multi-channel two way radio systems. They comprise transmitter and receiver systems and transmit-receive antennas. These antennas produce radio frequency radiation that is generally low. The consensus of the scientific community is that the power from these mobile base stations antennas is far too low to produce health hazards as long as the general public are kept away

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from direct access to the antennas⁹. It is also important to differentiate between the antennas that produce the RF radiation and the towers (or masts), which are the structures that support the antennas.

Safety guidelines for exposure of the public to the RF radiation from transmitting antennas are set by different organizations all over the world. The most widely accepted standards are those developed by the Institute of Electrical and Electronics Engineers (IEEE) and American National Standards Institute (ANSI), the International Commission on Nonionizing Radiation Protection (ICNIRP), and the National Council on Radiation protection and Measurements (NCRP). These standards are expressed in power density in (milli watts per square centimeters - mW/Cm²). The Exposure Standards for General Public is shown in Table 4.7.

Table 4.7 Exposure Standards for General Public

Organization	Exposure Standards for General Public			
1992 ANSI/IEEE/NRCP	1.2	mW/Cm ²	for	antennas operating in the 1800- 2000 MHz range
	0.57	mW/Cm ²	for	antennas operating in the 900 MHz range

In the presence of multiple antennas, these standards apply to the total power produced by all antennas.

Telecommunications technicians are however at a higher risk of exposure, due to their proximity while working on cellular antennae or related equipment. The Occupational Safety and Health Administration threshold for Radio Frequency Radiation exposure (Specific Absorption Rate) for 6-minute periods is 1mW/cm² between the frequencies of 10MHz and 400MH¹⁰.

Health problems related to microwave and radio frequency radiation include damage to reproductive organs, eyes and even the brain. Studies have even drawn links to birth defects and central nervous system damage¹¹.

Orange uses fiber cables in the installation of its telecommunications equipment which are preferable for a number of technical as well as safety reasons including the elimination of spark hazards and electromagnetic interference, need for fewer and smaller sized cables, reduced risk of radiation exposure. Older model equipment which are now being phased out are insulated to prevent radiation exposure to technicians. Technicians are also trained to do regular checks on cable connectors to ensure their tightness, as slack connectors could indicate radiation leakage.

Robi has developed own inhouse advance analytics cell for EMF measurement tools. This tools is being extensively used to measure and monitor EMF exposure. Robi’s EMF radiation measuring instrument is shown in Figure 4.12

⁹ Dawoud, M. M (2003). High Frequency Radiation and Human Exposure. [online] Available at <http://www.who.int/peh-emf/meetings/archive/en/keynote5dawoud.pdf>

¹⁰ Chan, W.S. Non-ionizing Radiation Safety. [online] Available at http://www.cityu.edu.hk/cse/safety/Safety_training/Course/nirs/index.html

¹¹ Communications Workers Association (2017). Microwave and Radio Frequency Radiation. [online] Available at <https://www.cwa-union.org/national-issues/health-and-safety/healthand-safety-fact-sheets/microwave-and-radio-frequency>

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The monitoring cell measure the electrical and magnetic field (EMF) exposure level regularly and period manner as per standard method. The company reviewed and monitored EMF risks and exposure levels as required under IFC EHS Guideline for Telecommunications, April 2007 and BTRC regulations. IFC EHS guideline provides (and BTRC regulations, if any) details on EMF exposure guidelines (Section 1.2 of the guideline) and exposure limits for general public & occupational exposure (Tables 1 and 2 of the guideline) to EMF as published by the International Commission on Non-Ionizing Radiation Protection (ICNIRP).

All the samples measured is within safe level of Radiation standard defined by ICNIRP -



Figure 4.12: Robi's EMF radiation measuring instrument

BTRC also monitor the EMF radiation test and analysis for exposure of all the operation in every year. BTRC performed the monitoring and rest analysis for May, July-August and October 2019 and the results are presented in Annex 5.

4.3 Biological Environment

Plant species that grows in the wild inhabitants for a particular period is known as flora. It plays vital socio-economic and ecological roles for a particular type of habitat or ecosystem. On the basis of habitat, the floral species are divided into two major categories viz.(a) aquatic flora, and (b) terrestrial flora. This Section describes the floral diversity in areas within and surrounding the project site with their status in Bangladesh.

Animal and fish which grow in the wild are known as fauna. The study areas have various assemblages of animal communities; some species use the areas as permanent habitat, while

others as temporary habitat. Based on habitat, faunal species are divided into two major categories viz.(a) aquatic fauna, and (b) terrestrial fauna.

Forests, pasture lands, rivers, surface water, and other water bodies, etc. are the most important natural ecosystems. They are the foundation on which conservation of biological diversity depends. Biological diversity, which refers to genetic variation as well as to the diversity of human populations and ecosystems, is a resource that belongs not only to regions and to nations but also all of humankind. Although it is a renewable resource, it can be irreversibly destroyed. Future uses of this resource (medicine, plant breeding. etc.) cannot be foreseen at present, although they will certainly be extensive in scope, and they even are crucial to the survival of humankind.

4.3.1 Biodiversity of Flora

The floral diversity of Bangladesh is extraordinary. Khan (1991) reported that the country possessed more than 5,000 species of angiosperms and many of which have several subspecies. Of these, only some 160 species are used as crops (Mondal 1990). The major crops are rice, wheat, jute, pulses, oilseed plants, minor cereals, sugar crops, fruits, vegetables root tubers, spices, beverage crops, flowers, medicinal and aromatic plants, forest tree species and other wild plants. The natural forests of Bangladesh consist of three major vegetation types occurring on the three distinctly different land types (Hassan 1994). The natural forests are richest in floristic composition and some 2,260 plant species are reported from the Chittagong region which falls between two major floristic regions of Asia (DoE 2015). The geographical location and the climate of the country support a rich biodiversity but, unfortunately the total flora of the country is not yet fully investigated. A checklist developed by Basak and Alam (2015) enlisted 1,048 tree species (gymnosperm, dicot and monocot) under 432 genera in 99 families that will give information of the tree species in Bangladesh. Recent publication of 'Encyclopedia of Flora and Fauna of Bangladesh' by Asiatic Society provides an enumeration of the plant and animal resources of the country (Ahmed et al. 2008, 2009). It recorded 3,611 taxa of angiosperms from the country. Exploration, identification and description of new species are being published by the Bangladesh National Herbarium (BNH). Another 64 angiosperms were added to the flora during June 2009 to June 2013 of which 8 species were described as new to science (Irfanullah 2013) and BNH has reported 40 angiosperm species very recently (Ara and Khan 2015). A comparison of both the recorded and estimated number of flora of Bangladesh and the world is shown in Table 4.8. The Bio-Ecological Zone of Bangladesh is shown in Figure 4.13

Table 4.8 Recorded and Estimated Number of Flora of Bangladesh

Categories	Recorded in Bangladesh	Estimated in Bangladesh
Algae	3600	6,000
Fungi	275	
Lichens	51	--
Bryophytes	290	400
Pteridophytes	200	250
Gymnosperms	7	7
Angiosperms	3,723*	>5,700

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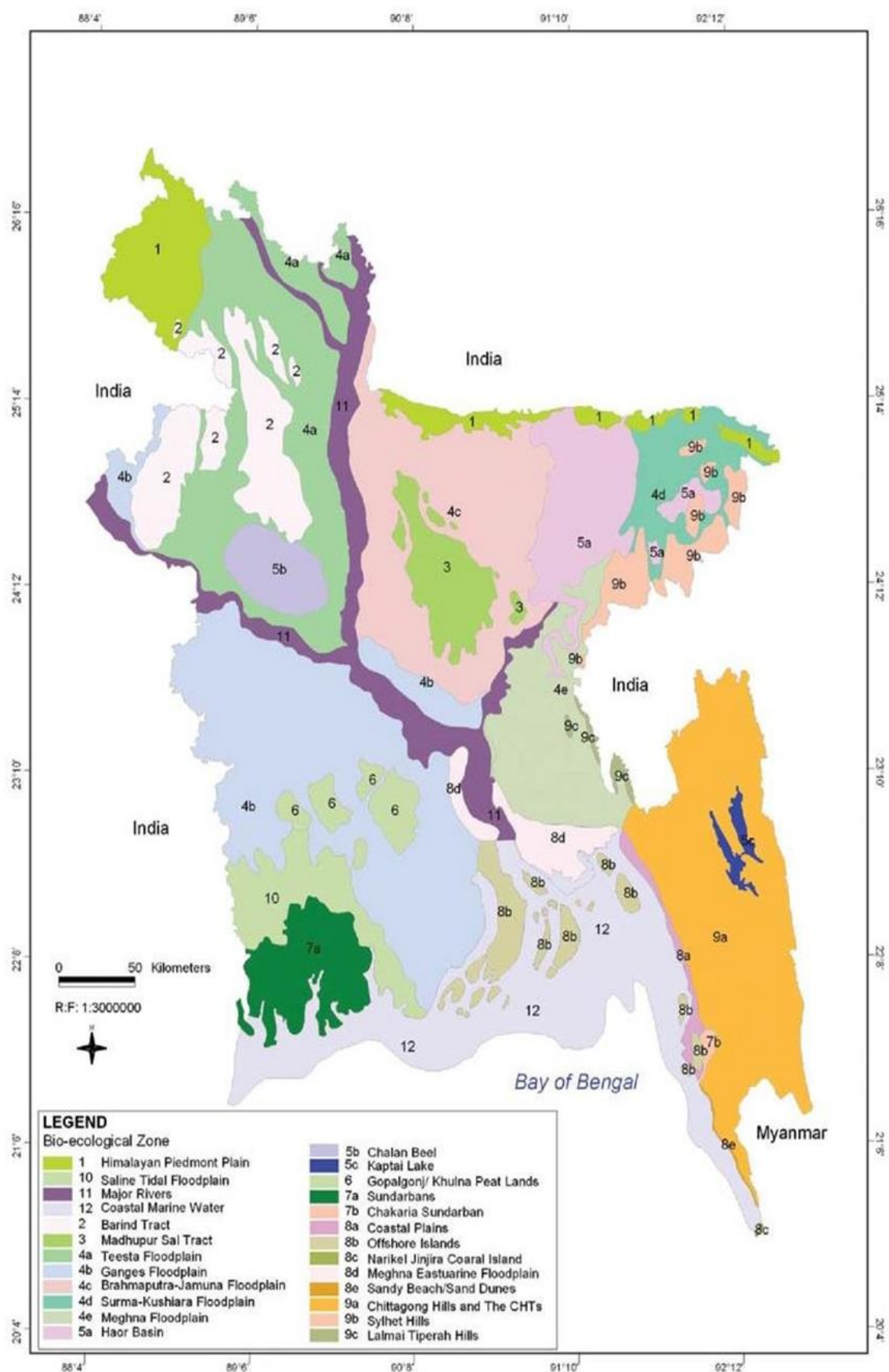


Figure 4.13: Bio-Ecological Zone of Bangladesh (Source: IUCN)

4.3.2 Biodiversity of Fauna

Birds (Avifauna)

Birds

The common birds of the district include crow, sparrow, shalik, sparrow, black drongo, prevented, bulbul and the pariah kite. Nearly as common as these are the doel, tailor bird, pied moyna, common weaver bird, green bee-eater and the common kingfisher. Besides these, there are broad bills, parakeets, woodpecker, barbets, and cuckoos.

Indian pitta (*Pitta brachyuran*), Dollar bird (*Eurystomus orientalis*), Blue-tailed bee-eater (*Merops philippinus*), Dusky eagle owl (*Bubo coromandus*), Green-billed malkoha (*Phaenicophaeus tristis*), Lesser coucal (*Centropus bengalensis*), Yellow-footed green pigeon (*Treron phoenicoptera*)

Amphibians & Reptiles

Amphibians

Kaloula/painted bull frog (*Kaloula pulchra*), Ornate microhylid (*Microhyla ornate*), Red microhylid (*Microhyla rubra*, Taipeh from (*Rana taipehenis*), Balloon from (*Uperodon globulosus*)

Reptiles

Indian black turtle (*Melanochelys trijuga*), Monocellate cobra (*Naja kaouthia*), Cantoros kukri snake (*Oligodon cyclurus*)

Mammals

Mammals

Capped langur (*Trachypithecus pilcatus*), Wild boar (*Sus scrofa*), Asiatic brush-tailed porcupine (*Atherurus macrorurus*), Jackal (*Canis aureus*), Jungle cat (*Felis chaus*)

Butterflies

Butterflies play a vital role in the ecosystem and act as bio-indicator; the diversity and abundance of butterflies is a good indicator of the state of a habitat or biosphere. Larvae, pupae, eggs and adult butterflies are source of food for various species of birds, bats, dragonflies, lizards, small mammals and large insects. Many butterflies within Bangladesh are widely distributed and abundant. The common Mormon and Lime butterfly are very common and are distributed throughout the country, as are the peacock pansy, Common Grass Yellow, Common Emigrant, Pale Grass blue and Tiny Grass Blue. Other, such as the Common Birdwing, Clipper, Purple Sapphire, Popinjay, Courtesan, Knight and Orange Oakleaf are more restricted in their distribution.

Fisheries

There are 251 species of freshwater fishes in Bangladesh and maximum fishes are common in everywhere in Bangladesh. But the snakehead fishes (Shol, Taki, Gajar etc.) are now becoming rare. Carps are the major fishes in pond. The most preferred fish in Bangladesh is the Climbing perch (Koi), *Anabas testudineus*, The common fishes in the project area

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Catla (*Catla catla*), Rui (*Labeo rohita*) and Mrigal (*Cirrhinus mrigala*), Mola (*Amblypharyngodon mola*), Punti (*Puntius chola*), Kholisa (*Colisa fasciatus*), etc. Exotic carps like silver carp, common carp, grass carp, catfishes, tilapias, prawns, etc are also found in ponds. (Source: Banglapedia)

Wild animal and elephant movement route

During field visits and literature surveys, it was found that no wild animal and elephant movement routes along and around the project area. Elephant movement and pass path are found at Chunati and Adhunagar (Lohagara), Puichari (Banshkhali), Chiringa, Harbang, and Dulhazara (Chakaria) all are away from 25-75 km from the project site.

4.4 SOCIO-ECONOMIC

4.4.1 Population and Development

This report reviews demographic trends in Bangladesh, assesses the impact of these trends on socioeconomic development, and highlights the policy implications of the linkages between population dynamics and socio-economic development for policy and planning over the coming decades. The report describes the results of a series of population projections carried out for the purpose of this study in order to frame the possible demographic futures of the country and its implications. Based on these projections and the lessons learned from recent population-development interactions, the report concludes with a series of policy recommendations that may be incorporated into the 7th Five-Year Plan as well as future five-year plans and sector-based strategies.

The backdrop against which population trends in Bangladesh have been analyzed and policy recommendations formulated in this report is the model of the “demographic transition”. This model suggests that all countries undergoing socio-economic development pass from a situation in which birth and death rates are high and the population growth rate is low to a situation in which birth and death rates are low and the growth rate is again low. The transition between these two stages is a period of progressively rapid population growth.

Population and development perspectives

From the 1950s up until the early 1980s, macroeconomic perspectives on population and development were heavily influenced by the concept of a population-poverty “trap”. At very low levels of per-capita income, it was argued, small improvements in welfare would result in reduced mortality leading to further population growth, which would return per capita income to its previous level, thus creating a “vicious circle”. Unless the rate of economic growth could receive a boost to overcome the trap and break the cycle of “circular causation”, poor countries experiencing rapid population growth were destined to remain poor. The population trap concept also stimulated public policies on the demographic side as well as the economy. If rapid population growth rates could be reduced directly by providing family planning services to those who might otherwise not have access to them, then the rates of population growth and economic growth might be brought into closer alignment and the population growth rate could potentially drop below the rate of economic growth, and the growth in per capita income would receive a boost.

Bangladesh: The national context

Formulating policies to address population and development relationships requires a sound understanding of the social, economic, and cultural conditions of the country. Despite several

decades of moderately high economic growth, Bangladesh remains a poor country today. Per capita GDP in nominal terms was \$1,033 in 2013 and Bangladesh ranked 186 out of 213 countries in per capita Gross National Income (GNI) placing it in the bottom fifth of countries ranked by income. Although incomes are rising, Bangladesh remains classified as a “low income” country by the World Bank, whereas neighboring Pakistan, India, Sri Lanka, and Bhutan have all graduated to “lower-middle-income” status.

Bangladesh’s level of social development based on MDG and similar indicators compares favorably with neighboring South Asian countries. However, Bangladesh has done comparatively poorly in antenatal care, births attended by a skilled medical provider, and the proportion of underweight children.

4.4.2 Poverty

Based on the international standard measure of “extreme” poverty—less than \$US1.25 per day per capita (PPP)—Bangladesh’s Poverty Headcount Ratio in 2010 was 43.3 percent, compared with 24.5 percent in the South Asian region as a whole (World Bank 2014b). Using the \$2 per day consumption standard, 76.5 percent of the population was in poverty in 2010, a much higher Figure 4.14. Over the 1989-2010 period, poverty declined by 43.2 percent using the \$1.25 standard while the \$2/per day poverty measure dropped by 17 percent, an average rate of 1.8 percent and 0.7 percent, respectively (Table 4.9).

Bangladesh’s national poverty line gives significantly lower rates of poverty than international definitions. By this measure poverty declined from 56.7 percent of the population in 1992 to 31.5 percent in 2010 (Table 4.9).

Table 4.9 Poverty Headcount Ratios Using Different Measures of Poverty, 1992-2010

Poverty measure	1992	1996	2000	2005	2010
<\$1.25 per day*	70.2	60.9	58.6	50.5	43.3
<\$2.00 per day*	93.0	85.5	84.4	80.3	76.5
National poverty line#	56.7	50.1	48.9	40.0	31.5
Asian regional poverty line**	--	--	--	64.5	58.0
Poverty line incl. food insecurity**	--	--	--	50.5	47.8
Poverty line incl. vulnerability**	--	--	--	56.4	50.9

Sources: *World Bank (2014c, 2014d); **Asian Development Bank (2014); # BBS (2011c).

Variations in poverty

Bangladesh’s national poverty line has two levels—an “upper” poverty line, which is employed for the purpose of MDG reporting and similar purposes, and a lower or “extreme” poverty line which measures absolute deprivation. Despite a significant decline in general poverty over recent decades, about 18 percent of the population remained in extreme poverty in 2010 (Table 4.10) and the extremely poor remain a majority of the generally poor. Extreme poverty would appear to be declining at a more rapid rate than general poverty based on the trend between 2005 and 2010, but this is largely because of the rapid decline (47 percent in five years) of extreme poverty in urban areas. In rural areas, the rate of decline in both general and extreme poverty has been considerably slower.

Table 4.10 Poverty Head Count Rate (CBN) by Severity of Poverty and Residence, 2005 and 2010

Residence	Upper Poverty Line		Lower Poverty Line	
	2005	2010	2005	2010
National	40.0	31.5	25.1	17.6
Rural	43.8	35.2	28.6	21.1
Urban	28.4	21.3	14.6	7.7

Source: BBS (2011e).

Poverty rates vary by geographical area. At the Division level, Barisal and Rangpur had the highest poverty rate in 2010 using the “upper poverty line” and Chittagong and Sylhet had the lowest (Figure 4.14). Barisal and Rangpur also have the highest rates of “extreme” poverty with Chittagong, Dhaka and Khulna having the lowest. Over the decade 2000-2010, the rate of extreme poverty has declined fastest in Dhaka, Khulna and Chittagong, and slowest in Sylhet and Barisal. All forms of poverty tend to be lower in urban areas and the rate of decline is also faster than in rural areas. Thus, the location of a large city within a Division will tend to result in a lower poverty rate and a faster decline in poverty in that Division. Sylhet is a possible exception to this pattern where poverty is ameliorated to some extent by its high proportion of international labour migrants and its connections with the Bangladeshi diaspora. However, poverty rates by Division generally reflect the east/west divide in terms of overall development with the eastern side of the country significantly better off than the western side. It is possible that this divide can be explained partly by deteriorating environmental conditions, including river bank erosion, leading to shortages of food, clean water and building materials, in the western side.

There is also a clear relationship between education and poverty, although this relationship is to some extent cross-cut by other factors, such as rural or urban residence. The illiterate is much more likely to be in poverty than the literate. The poverty rate declines sharply as educational status rises: the incidence of poverty is about six times higher among those with no education than those with completed Secondary School Certificate (Class 10) and higher levels of education (Figure 4.15). A possible explanation for this difference is that persons at that level of education may represent the working poor who may not be poor enough to benefit from social safety net programmes. It is known that household characteristics other than educational attainment are also related to poverty, such as having a widowed or divorced household head. Such households are disadvantaged by their lack of assets and alternative sources of livelihood, especially among females.

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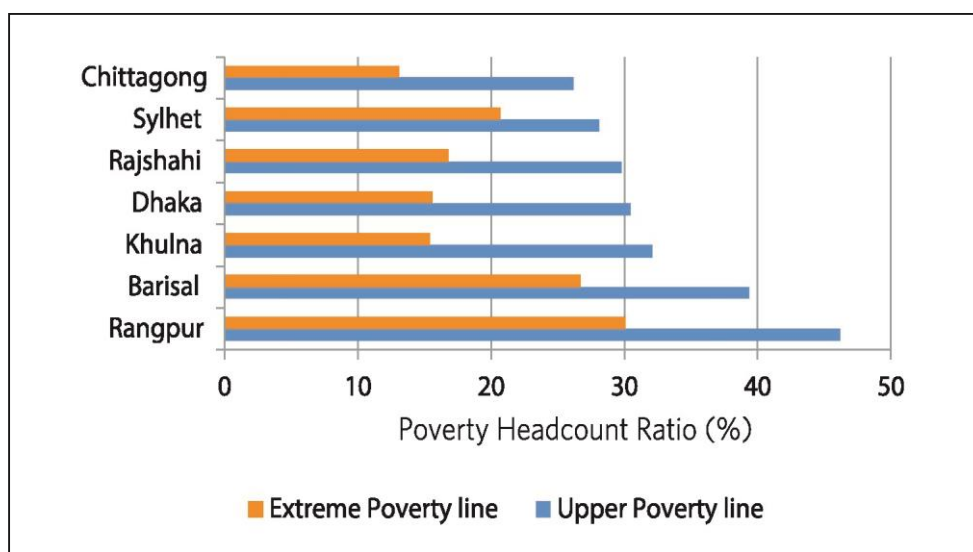


Figure 4.14: Poverty headcount ratio by Division and degree of poverty, 2010
Source: BBS (2006b; 2011e)^{12 13}. Titumir (2014).

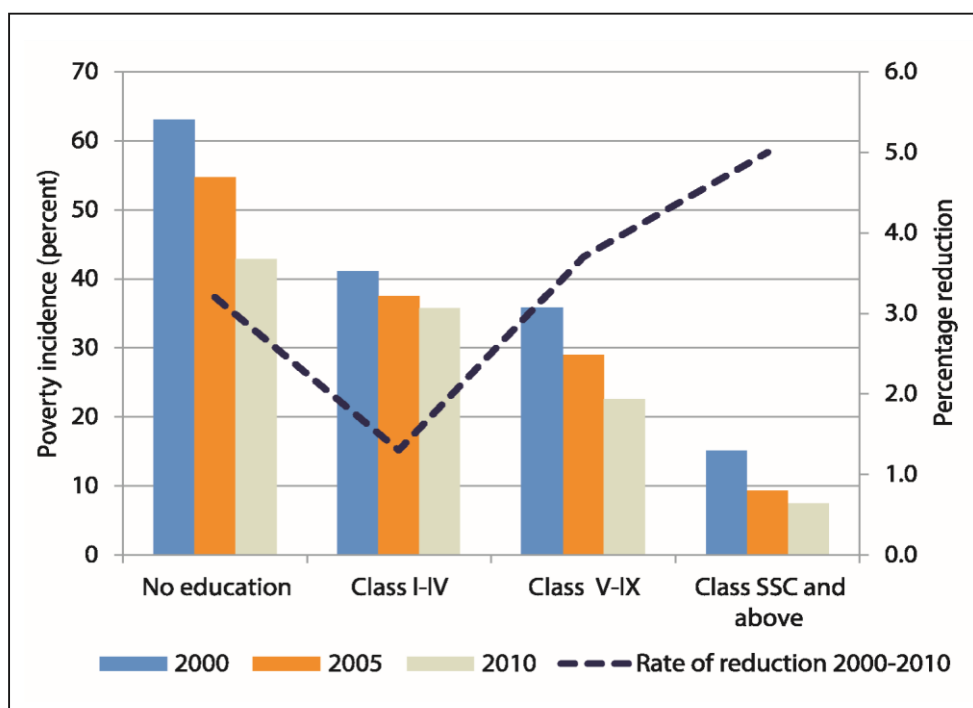


Figure 4.15: Relationship between education and poverty, 2000-2010
Source: BBS (2006b; 2011e). Titumir (2014)¹⁴.

In rural areas poverty is closely related to the size of landholdings (Figure 4.16). The highest poverty rates are found among those with either no land or a holding too small to form a farm

¹² Bangladesh Bureau of Statistics (BBS). 2006b. Report of the Household Expenditure & Income Survey, 2005, Dhaka.

¹³ Bangladesh Bureau of Statistics (BBS) 2011c. Report of the Household Expenditure & Income Survey, 2010, Bureau of Statistics, Dhaka.

¹⁴ Titumir, R.A.M. 2014. "Economic Growth, Employment and Poverty Reduction", Unpublished manuscript. Dhaka: Unnayan Onneshan.

or even a garden. Poverty drops most significantly when the size of landholding reaches 1.5-2.5 acres and is lowest among the “rich” landowners holding 7.5 or more acres.

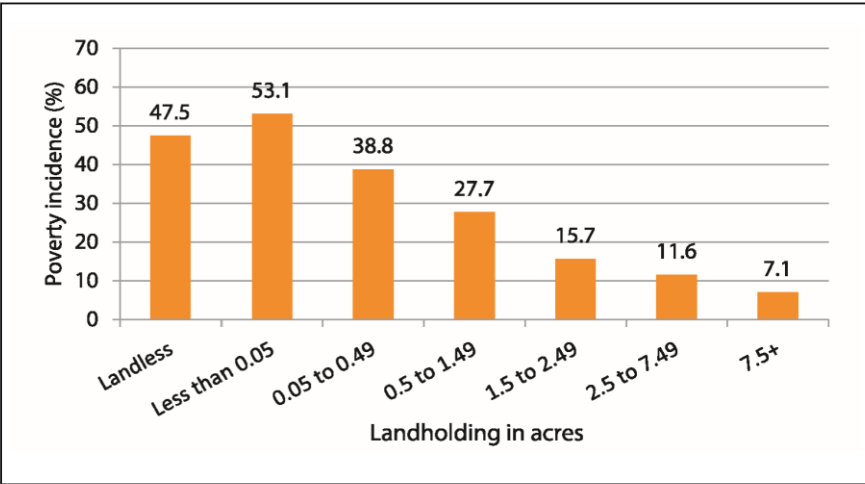


Figure 4.16: Relationship between rural landholding and poverty, 2010
Source: BBS (2006b; 2011e). Titumir (2014)

Finally, poverty is closely related to household size, as shown in Figure 4.17. The overall distribution is consistent in each of the three survey-years with poverty rates rising with household size up to 9-10 persons per household and then declining. The direction of causality (whether large household size causes poverty or poverty causes large household size) is a matter of some debate. In the Bangladesh context it is worth recalling the statement of Rafiqul Chaudhury (1989) who pointed out the dilemma of population and land in rural areas: “...on the one hand the increasing pressure of population reduces the size of inherited plots steadily, but on the other hand, the majority of the rural households who own small pieces of land, find in a larger family size an important means for their upward mobility. This vicious circle may continue till poor peasants find alternatives, other than through their children, to enhance their economic position.”

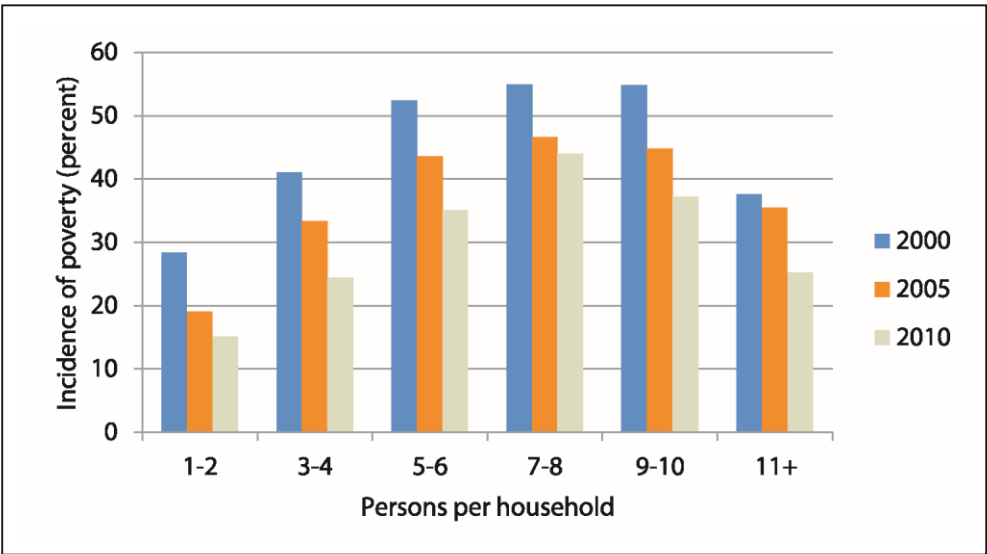


Figure 4.17: Poverty and household size, 2000-2010
Source: BBS (2006b; 2011e); Titumir (2014).

Occupation is also related to poverty. In 2010, “Service Workers” had the highest poverty rates of all occupations (44.2 percent) whereas in 2005 agricultural workers had the highest rate (48.2 percent). But the highest poverty rates in 2010 were recorded among rural service workers (49.1 percent) while in urban areas the poverty rate among service workers was considerably lower (34.4 percent) (BBS 2013c).

Poverty decline in Bangladesh is generally attributed to moderate but sustained economic growth, significant inflows of migrant remittances, the declining population growth rate, a trend toward an economically more favourable age structure, the development of new industries, increases in real labour income, improved infrastructure, and the expansion of social safety net programmes. In other words, broad-based development on a number of fronts has contributed to poverty reduction. Possibly the social safety net programmes developed in recent years would have had a greater impact had it not been for various shortcomings, such as overlap and duplication between and among the various implementing agencies, poor selection of beneficiaries, leakages and wastages of various kinds (World Bank 2006; Khuda 2011a).

Inequality of income

Although poverty has declined by most measures in recent decades, income inequality has nevertheless worsened over the past two decades. The share of the poorest quintile in national income declined from 6.5 percent in 1991-92 to 5.2 in 2010 and a similar decline is evident in both rural and urban areas (Figure 4.18). These data suggest that the poor are getting poorer relative to other income groups, despite the fact that the headcount poverty rate has been declining. There is evidence to suggest that widening income differentials between those with higher education compared to the less-educated is the single most important factor accounting for increasing inequality (ADB 2005; 2007).

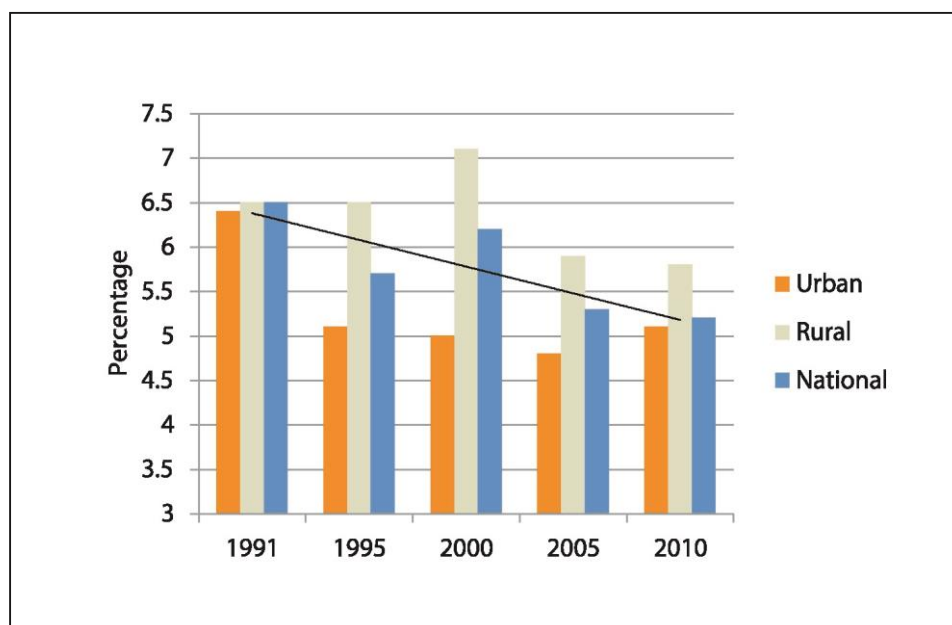


Figure 4.18: Share of Poorest Quintile in National Income, 1991-2010

Source: 1991-92 HIES; 2000, 2005 and 2010 HIES, BBS.

Another measure of inequality is provided by the Gini coefficient, which shows that overall income inequality in Bangladesh has increased over the past two decades, but remained largely unchanged over the 2000-10 decade (Table 4.11). Income inequality is, however, less in Bangladesh than in most South Asian countries.

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Table 4.11 Gini coefficients for income in Bangladesh, 1991-2010

Residence	1991	1995	2000	2005	2010
National	0.388	0.432	0.451	0.467	0.458
Rural	--	--	0.497	0.497	0.452
Urban	--	--	0.393	0.428	0.430

Sources: BBS 1991-92 HIES; BBS (2006b; 2011c).

4.4.3 Structure of the economy

While the population of Bangladesh remains about 70 percent rural, and nearly 50 percent of the labour force is in agriculture, the dominant economic sector in terms of output is “services”. The service sector generated 55 percent of GDP in 2010-11 with agriculture making up 18 percent and industry 27 percent (Figure 4.19). The share of agriculture in GDP has been declining over several decades, as would be expected in a developing economy, but relatively slowly. The services sector is by far the largest sector, although its share is also declining, while the contribution of industry has been increasing. The expansion of banking, insurance, micro-credit, transportation and telecommunications accounts for the large services sector.

On the other hand, the on-going dominance of agriculture in the labour force, which is apparent in Figure 4.20, suggests that the productivity of labour in agriculture, although rising somewhat over this period, remains comparatively low. The implied higher productivity of labour in the services sector provides strong incentives for rural-urban migration, whether permanent, seasonal or circular.

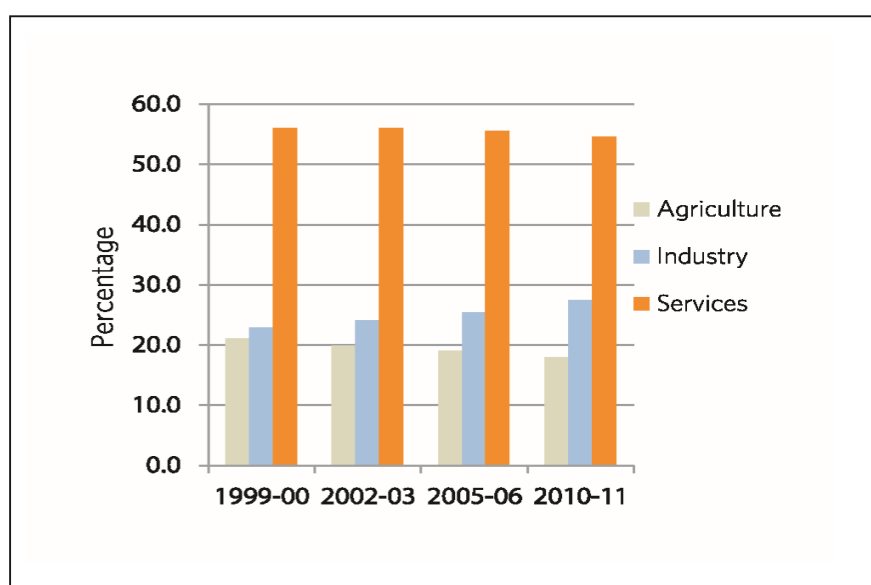


Figure 4.19: Distribution of GDP by broad economic sector

Source: BBS, Unpublished tabulations

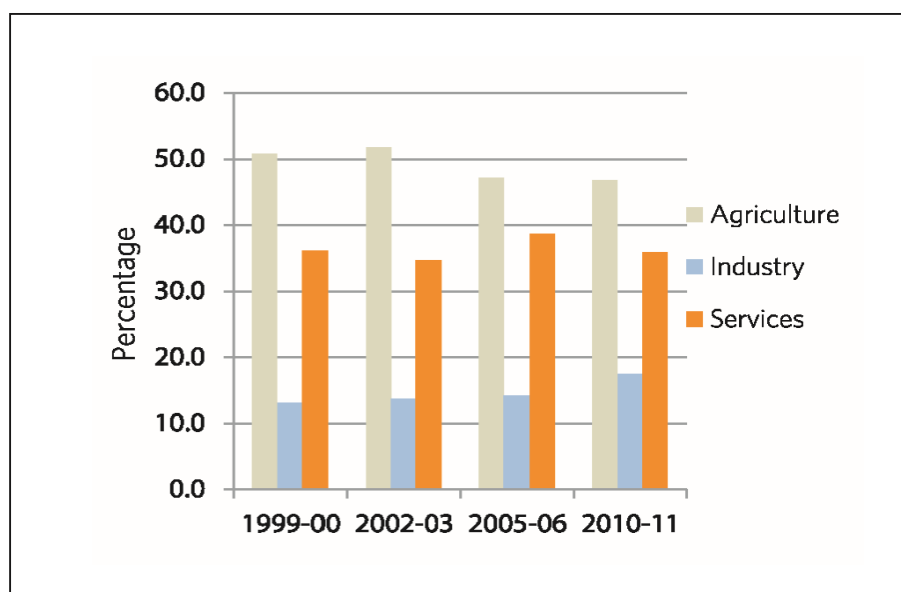


Figure 4.20: Distribution of the labour force by broad economic sector
Source: BBS, Unpublished tabulations

4.4.4 Social structure and organization

Bangladesh's rural agricultural economy remains based on a small-holder or "peasant" mode of production which most likely accounts for its low level of productivity. Population pressure combined with an initial distribution of land that was highly unequal has resulted in the number of land holdings less than 1.5 acres increasing through time while the number of holdings above 2.5 acres has been decreasing. There is little indication of significant accumulation of land-holdings up to a scale that would permit a more industrialized form of production through economies of scale. Complete landlessness has increased from 20 percent in 1968 to an estimated 40 percent today, but holdings of less than half an acre of land now characterizes another 39 percent of rural households who have land. These trends have made the family-based mode of production increasingly unviable. This in turn has implications for future population change because children are more likely to be a liability than an asset for the landless or urban poor household. As the economic value of children has declined, the desired family size has declined accordingly.

Another consequence of increasing landlessness, declining farm size and the decline in the family mode of agricultural production is fracturing of the family as individual members seek alternative forms of employment or attempt to supplement their low agricultural incomes. Rural-urban migration, overseas contract labour migration, rural-urban commuting, circular and seasonal migration and petty trading are among the activities that family members engage in today. The use of such household survival strategies is clearly associated with population growth, which has pushed population density to an extremely high level. While caste is no longer an important basis for social organization, the distribution of wealth and income has become increasingly unequal since the 1990s based on emerging class relations.

4.4.5 Education

The adult literacy rate has increased very slowly in Bangladesh—from 53 percent in 1998 to 59 percent in 2010 according to the Sample Vital Registration Survey (BBS Statistical Yearbook 2012). Census data show lower literacy rates and a slower rate of improvement, with literacy increasing from 48 to only 53 percent between the 2001 and 2011 censuses,

about a 10 percent rise in a decade. At the national level, adult female literacy was just under 50 percent in 2011 compared to 57 percent for males, but literacy has been increasing faster for females than for males at least according to census data. At the Zila level, female literacy was as low 33.3 percent, meaning that two-thirds of adult women were illiterate in such places, and even male literacy is below 40 percent in some Zila. These Figures 4.20 indicate that illiteracy remains a major issue in Bangladesh and a significant constraint on development.

Primary schooling

The net primary enrolment rate has increased significantly over the 1990-2013 period, especially for girls, and is now approaching 100 percent (Table 4.12). Gender parity was essentially achieved in year 2000, but female enrolment has since exceeded male.

Table 4.12 Trends in Net Enrolment Ratio at primary level in Bangladesh, 1990-2013

Year	Total	Girls	Boys
1980	60.5	50.8	69.4
1995	75.8	73.9	77.5
2000	85.5	85.8	85.2
2005	87.2	90.1	84.4
2010	94.8	97.6	92.2
2013	97.3	98.2	96.2

Source: GED (2014)

Little information is available on the quality of education in Bangladesh. The 2011 Bangladesh Literacy Assessment Survey was conducted to assess four different measures of literacy levels: (i) reading, (ii) writing, (iii) numeracy, and (iv) communication and comprehension (BBS 2013d). The functional literacy rate was lower in rural (51 percent) than urban areas (66 percent), among both males and females (BBS 2013d, Table 4.10). The functional literacy rate increases with the level of education. However, only 44 percent of boys and 36 percent of girls completing primary education were functionally literate, indicating the poor quality of primary education.

Secondary education

A surprising feature of Bangladesh's educational situation is its low enrolment rates in secondary schooling. As indicated in Figure 4.21, male secondary enrolment was generally flat between 1999 and 2011 and only reached 50 percent in 2012. Female enrolment has increased at a faster rate than male over this period (and particularly since 2009) but was still under 60 percent in 2012. Female secondary enrolment essentially levelled-out between 2004 and 2008, an unusual phenomenon. But clearly the overall low rate of secondary schooling was not caused by gender inequality and is rather a function of overall low enrolment rates among both sexes.

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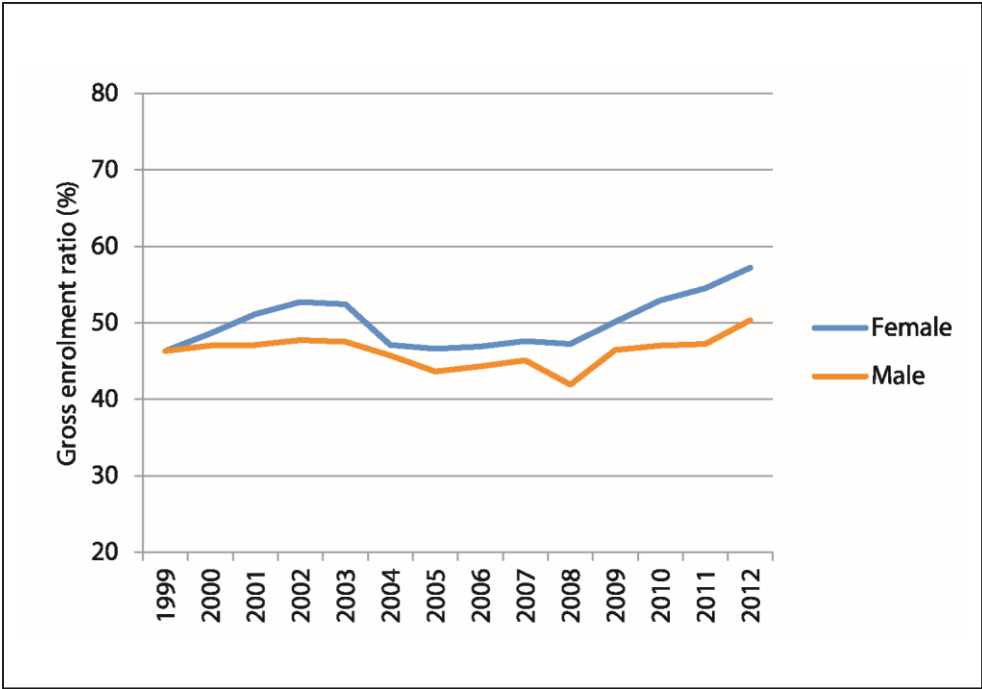


Figure 4.21: Gross secondary enrolment rate by sex, 1999-2012
Source: UNESCO (2015).

A comparative perspective is provided by Figure 4.22, which shows that secondary enrolment in Bangladesh has lagged well behind the Southern Asian region as well as other Asian countries such as China and Indonesia. It is not clear why Bangladesh has fallen back. In 2003, the secondary enrolment rate was equal to that of India, but by 2011 it was only 74 percent of India's level, and 59 percent of China's. This is despite the steady expansion of secondary schools and the increasing number of teachers.

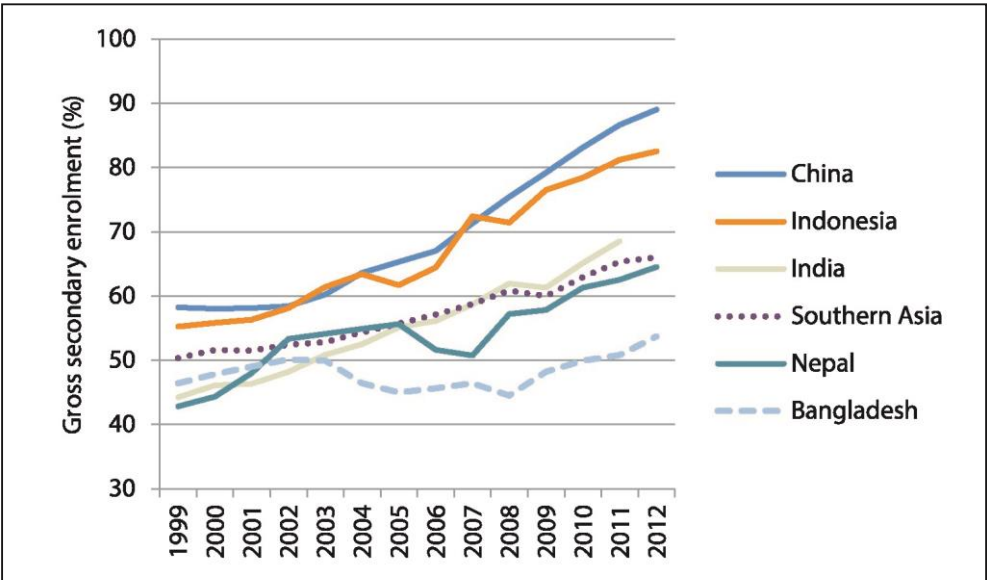


Figure 4.22: Gross secondary enrolment rates in selected Asian countries, 1999-2012 (both sexes)
Source: UNESCO (2015).

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Gender parity at the primary and secondary levels was essentially achieved between 2000 and 2005, but from year 2000 onwards, more girls are attending secondary school than boys (Table 4.13),

Table 4.13 Gender Parity Index (GPI) at primary and secondary education in Bangladesh, 1990-2013

Year	GPI (Primary)	GPI (Secondary)
1990	0.82	NA
1991	NA	0.52
1995	0.90	0.82
2000	0.96	1.06
2005	1.01	1.04
2010	1.02	1.14
2011	1.02	1.13
2012	1.01	1.14
2013	1.00	NA

Source: GED (2014).

The Figures on educational attainment (Table 4.14) essentially confirm the enrolment data, revealing that only 40.4 percent of 20-24-year-olds had attained senior secondary level in 2011, while about 56 percent have attained junior secondary or less. The proportion of university graduates among the 2011 population is very low at 4.1 percent in the 15 and over population as a whole and rising to a maximum of 6.2 percent among those aged 30-34.

Table 4.14 Adult Educational Attainment by 5-year Age group, Bangladesh, 2011.

Age group	Highest class passed						Total
	No schooling	Primary	Junior secondary	Secondary/ higher sec.	Graduate	Masters or higher	
15-19	1.6	23.1	28.4	46.8	0.2	0.0	100
20-24	2.2	26.6	26.9	40.4	3.7	0.3	100
24-29	3.4	30.2	25.4	33.8	5.3	1.8	100
30-34	5.2	32.2	22.7	31.0	6.2	2.7	100
35-39	7.4	35.5	21.6	27.6	5.6	2.3	100
40-44	9.5	35.9	20.2	26.5	5.7	2.2	100
45-49	10.4	37.3	20.0	25.9	4.6	1.8	100
50-54	13.3	39.0	17.8	24.4	4.3	1.3	100
55-59	13.6	39.3	17.2	24.4	3.9	1.5	100

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60-64	15.1	41.1	16.3	22.8	3.7	1.1	100
65+	15.6	41.4	17.4	21.7	3.0	0.8	100
All ages 15+	7.1	32.7	22.7	32.0	4.1	1.4	100

Source: BBS (2012).

Tertiary education

From the 1980s up to 2011 (the last year for which data are available), the number of students enrolled in public universities increased more than ten-fold. In 2011 there were 316,331 students attending public universities, of whom 34 percent were female—indicating a large gender gap at this level of education. In addition, another 279,205 students were attending private universities, of whom 25 percent were female, a significantly larger gender gap. Overall, 30 percent of the 595,500 university students in Bangladesh were female (a ratio of 2.3:1), but in private universities the male/female ratio is as high as 27:1 (State University of Bangladesh), and 9:1 ratio are not uncommon, including in the University of Communication Technology and Science.

4.4.6 Health

A number of demographic indicators that measure mortality, and therefore contribute to the measurement of population growth, are also indicators of health status, given that mortality rates are a direct (although incomplete) measure of the health of a population¹⁵. A full picture of the health situation requires an understanding of morbidity as well as mortality, but this task is beyond the scope of the present report; we focus mainly on mortality, but from an epidemiological perspective.

A number of Bangladesh's health outcome (mortality) indicators have improved significantly in recent decades. Infant and under-five mortality rates, for example, have declined at or above the pace required to achieve the targets specified in the MDG framework for the 1990-2015 period, as has the Maternal Mortality Ratio (MMR). Demographic factors such as declining fertility and a decreasing proportion of births to high risk mothers (such as high parity births) have contributed to a substantial decline in the MMR since 1990 along with improved access to and use of health facilities. Improved educational achievement among women of child-bearing age, higher incomes and reduced poverty rates have also contributed. The proportion of pregnant women receiving ANC from a qualified provider has increased to 55 percent from 30 percent in 2004 (Khuda and Barkat 2014a; 2014b) and the proportion receiving the recommended 4 or more ANC visits rose from 18 percent in 2005 to 26 percent in 2010¹⁶. The proportion of births delivered in a health facility rose from 9 percent in 2001 to 23 percent in 2010. Many of these same factors, along with a two-thirds increase in the percentage of 1-year olds immunized against measles, will have contributed to lower infant and child mortality. Maternal and child mortality rates are closely correlated.

¹⁵ The difference between the demographer's use of a mortality indicator and an epidemiologist's use of the same indicator is one of perspective: for the demographer mortality is an "independent" variable with precise effects on population growth; for the health specialist or epidemiologist mortality is a "dependent" variable which has multiple and complex causes.

¹⁶ The recently released figures from the 2014 DHS on the indicators in this paragraph are: ANC from a qualified provider, 63.9 percent; proportion of pregnant women receiving 4 or more ANC visits, 31.2 percent; the proportion of births in a health facility, 31.2 percent (NIPORT, et al. 2015). These figures show on-going improvement in these RH indicators, consistent with past trends.

Inasmuch as lower death rates indicate improved health, *adult* health conditions have also improved between 1975 and 2011 as is evident in the much-reduced age-specific death rates above the age of 40 in 2011, compared to 1975, and above the age of 60 compared to 1991 (Figure 4.23). The combined effect of reduced infant and child mortality and lowered adult mortality has been an increase in life expectancy to 69 years for both sexes combined in 2011.

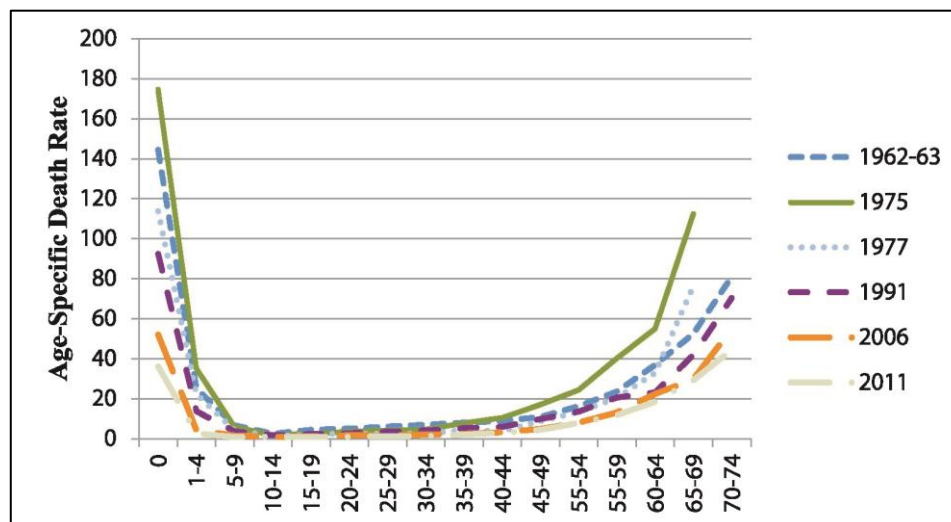


Figure 4.23: Age-specific death rates, 1962-2011 (both sexes)

Sources: 1962-1963, F. Yusuf, "Abridged life tables for Pakistan and its provinces 1962-64", Sydney Conference Proceedings (Liege, IUSSP, 1967), pp. 533-541; Report on the 1974 Bangladesh Retrospective Survey of Fertility and Mortality (Dacca, 1977), pp. 89-90. 1975, Demographic Surveillance System: Matlab, vol. 4, 1977 (derived from Population of Bangladesh, Country Monograph Series No. 8, ESCAP); 1991-2011, Sample Vital Registration System 2011, Bangladesh Bureau of Statistics.

4.4.7 Gender relations and equality

The social and economic position of women has improved in recent decades in part because of women's increasing labour force participation rates. The expansion of the Ready-Made Garment (RMG) industry has provided new opportunities for women to find wage work in urban areas, though women's employment has also increased in agriculture and services. The traditional seclusion of women has given way as the need for alternative sources of income outside of agriculture has intensified. The value of women's labour has risen and with it their social status. Nevertheless, gender inequality remains a serious impediment to women's advancement. Bangladesh remains a highly "patriarchal" society. Women are subject to harassment and discrimination in their new workplaces. While there is presently a gender balance in primary and secondary school enrolment rates, women are poorly represented in higher education (less than one-third of university students are female) and higher level technical and managerial positions. In rural areas, women's economic participation in the economy has been advanced by micro-credit schemes but these programmes have done little to address broader inequalities. Among the structural constraints to women's autonomy and success in the labour market is the practice of child marriage, which limits access to education and employment while making young women married to older husbands more vulnerable when facing domestic violence.

4.4.8 Geography, Climate, Resources, Environment

It is impossible to exaggerate the importance of the unique population-environment relationship in Bangladesh. The country's location on the Indo-Gangetic plain has historically provided favourable conditions for subsistence agriculture, but population density reached 1,015 persons per square kilometre in 2011, three times the density of India and seven times China's. Bangladesh is the only major country to have such high population density while half the labour force remains dependent on agriculture for their livelihood. Bangladesh's exceptionally high population density makes it a "special case" among developing countries and places it at great risk of reaching saturation in terms of its ability to absorb further population growth.

Although the population of Bangladesh has increased by 83 million persons since independence, the land under cultivation ("net cropped area") has declined by about 7 percent. There is no "land frontier" remaining in Bangladesh that would allow the supply of land to be increased through reclamation or other works. It is estimated that 26,000 people per year are losing their land due to the effects of flooding and erosion and those who lose their land either have to migrate to towns or cities or resort to living on chars—lands or areas of land that are created during floods, or other marginal lands. Further population increase can only intensify pressure on the land, which will be greatly exacerbated by expected climate change, including potential sea-level rise. Salinization, water-logging and river bank erosion is among the processes that affect the human use of the land and increase the vulnerability of various population groups, particularly the poor.

In 2011, about 92.3 million people (64 percent of the total population) were exposed to flood hazard to some degree. More than two thirds of these were subject to low or moderate river flooding or low flash flooding, which are the processes by which the fertility of the soil has been maintained. However, about 10 percent of these (9.3 million) are exposed to severe flash flooding and river flooding with another 7.2 percent (10.4 million) exposed to severe tidal surge which produces inundation, a form of flooding that can have long-lasting effects. Future population growth will increase the size of the vulnerable population, although rural urban migration and population re-distribution could mitigate these effects.

4.4.9 Urbanization

Urbanization remains relatively low in Bangladesh—28 percent of the population lived in an urban area in 2011—despite significant rural-urban migration. Past estimates indicate that in the largest metropolitan areas, 63 percent of the urban population growth rate of 3.5 percent was due to net migration, the balance to natural increase. More crucially, slum populations have been increasing at double the rate of urban areas. In Dhaka, 37 percent of the city's population was estimated to be living in slums, where conditions remain poor. Three-quarters of slum households live in one room and the median living area is less than 40 percent of that of non-slum areas. Slum dwellers are disproportionately poor, the vast majority being in the lowest two wealth quintiles. Access to sanitation and adequate garbage disposal in the slums is limited and recent migrants form the poorest groups.

The analysis of urbanization is complicated by these changes, because of the difficulty of relating 2011 populations for many urban areas with equivalent areas in 2001 or earlier years. For this reason, only rather basic analysis of urbanization trends is possible. The key point is that urbanization in Bangladesh has proceeded gradually, the proportion urban reaching 28 per cent in 2011, slightly less than the proportion urban in India.

The population census in 2011 identified 506 urban centres in Bangladesh, of which 43 are cities (100,000 to 4,999,999 population), 310 are paurashava towns or municipalities (5,000 to 99,999 population) and the remaining centres are classified as other urban areas which usually have no full-fledged municipality. The geographical distribution and relative populations of urban centres having a population of 25,000 or more is shown in Map 3, which also shows growth rates over the 20-year period 1991-2011. Table 4.15 provides some additional analysis of urban growth patterns. Urban populations in 2011 and growth rate 1991-2011 is shown in Figure 4.24.

Table 4.15 Urban Population and Growth Rate by City Type, 1991-2011

Type of urban centre	Population 2011	Inter-censal growth rate (%) (1991-2011)
Dhaka Megacity	14,171,567	218.4
Chittagong SMA	3,724,433	179.1
Khulna SMA	1,046,341	113.6
Rajshahi SMA	679,889	134.0
Barisal City Corporation	339,308	161.9
Sylhet City Corporation	531,663	207.8
Other Cities (popn.100,000 to 500,000)	7,095,426	n.a.
Paurashavas (popn. 50,000 to 99,999)	3,059,388	158.7
Paurashavas (popn. 25,000 to 49,999)	4,573,958	136.2
Paurashavas (popn. 5,000 to 24,999)	1,816,845	n.a.
Bangladesh urban (based on enumerated urban population)	33,563,183	160.8
Bangladesh urban (based on adjusted urban population)	41,943,532	186.8
28 cities in the Eastern part of the country		212.0
15 cities in the Western part of the country		139.8

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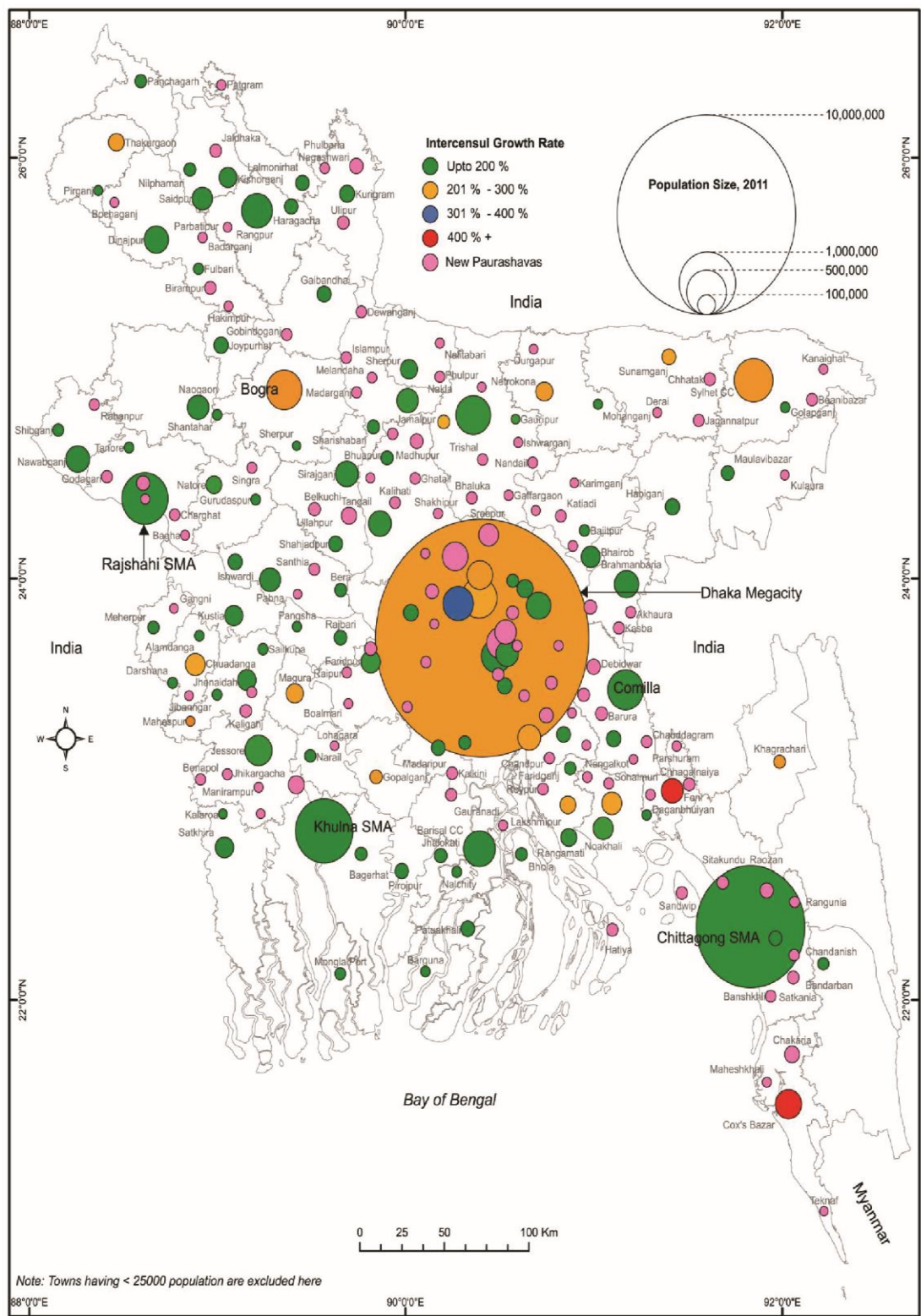


Figure 4.24: Urban populations in 2011 and growth rate 1991-2011

4.4.10 Age Composition

A country approaching the end of its demographic transition will have a very different age structure to the one it had at the beginning and different again from the one it had in the middle

of the transition, but the impact varies according to the age group. In the case of Bangladesh, considering only the three major age-groups, it is evident in Table 4.16 that the proportion of the population aged 0-14 rose to a peak in 1974 and has since declined significantly. By contrast, the proportion of the population in the core labour force age group (15-59) has increased, declined and then increased again over the same period. The elderly population has also increased steadily over the transition period as a proportion of the total, rising from 4.4 percent in 1911 to 7.5 percent in 2011. The changing proportions of these major age groups are reflected in the trend in the dependency ratio which peaked in 1974 and by 2011 had declined to lower than it had been 100 years earlier. These long-run proportional shifts are shown clearly in Figure 4.24. Changing age structure in Bangladesh (in percent): 1911-2011 is shown in Figure 4.25.

Table 4.16 Percentage Distribution of Population by age groups, 1911-2011

Census year	Major age groups			Dependency Ratio
	0-14	15-39	60+	
1911	42.3	53.3	4.4	87.6
1921	42.3	53.6	4.1	86.6
1931	41.9	54.9	3.2	82.2
1941	41.4	55.1	3.5	81.5
1951	42.1	53.5	4.4	86.9
1961	46.0	48.8	5.2	104.9
1974	48.0	46.3	5.7	116.0
1981	46.7	47.8	5.5	109.2
1991	45.1	49.5	5.4	102.0
2001	39.1	54.7	6.2	82.8
2011	34.7	59.1	7.5	71.4

Sources: 1911-1974, Rahim (1969); 1974 Bangladesh Population Census Report, BBS 1977; 1981-2011, Bangladesh Population Census Reports, BBS.

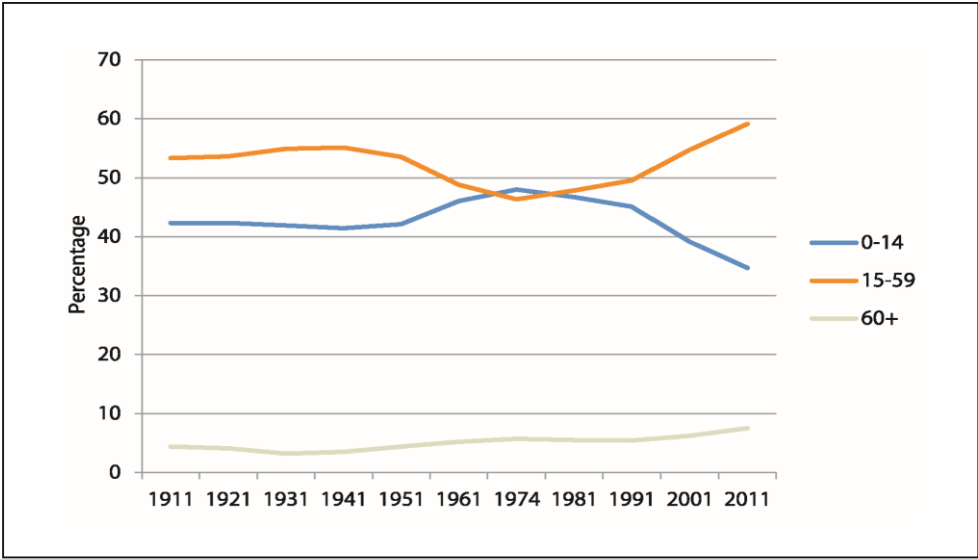


Figure 4.25: Changing age structure in Bangladesh (in percent): 1911-2011

Sources: Rahim, M.A. (1969); Bangladesh Bureau of Statistics, Reports of the Bangladesh Population Census, 1977; 1981-2011.

The difference between the 1974 and 2011 age-sex distribution is clearly evident in Figure 4.26. The 1974 distribution shows the effects of high fertility in the 1965-70 period which resulted in the 5-9 age group comprising over 18 percent of the population. Although the under-enumeration of children may have been a factor, the smaller 0-4 age group relative to the 5-9 suggests the beginning of fertility decline. Nevertheless, the population was poised for large increases in the youth population in the coming decades. Although the 2011 age structure is much more “mature” than in 1974, it is still the case that the 5-9 age group is the largest age group in the population, comprising a little over 12 percent of the total. As the projections presented in Chapter 3 indicate, it will take several decades for this cohort to work its way through the age structure and as it does it will contribute to the “momentum” factor that ensures that population growth will continue even though fertility has declined to a historically low level.

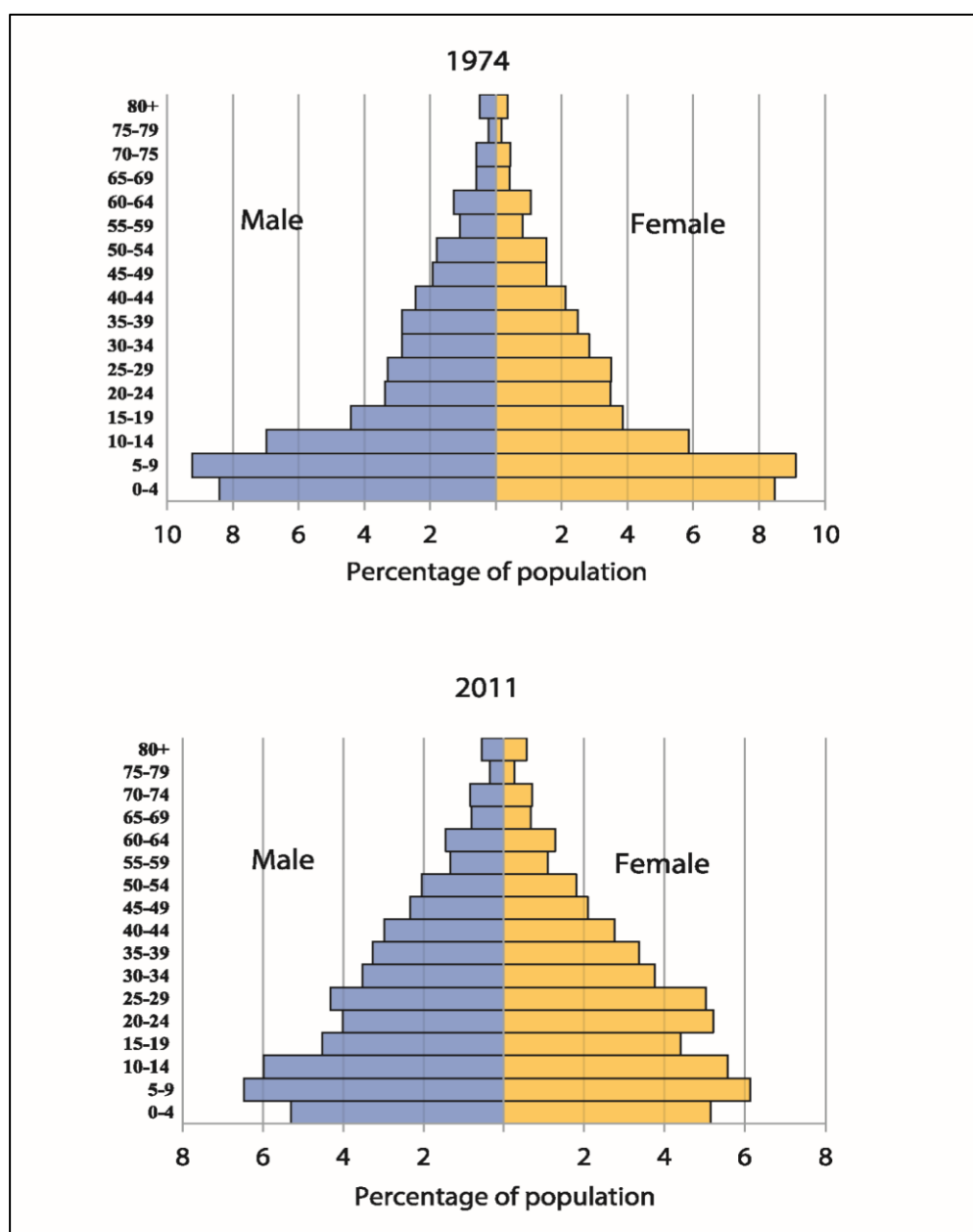


Figure 4.26: Age-sex distribution in 1974 and 2011

Sources: BBS, Census Reports, 1974 and 2011.

4.4.11 Geographical distribution

The geographic distribution of population in Bangladesh has not been analysed in much detail, perhaps due to the limitations of census data. At the Division level, it is clear that the most urbanized Divisions (Dhaka and Chittagong), along with Sylhet Division have been increasing their share of the population since the 1990s while all the other Divisions are losing share. But even among those Divisions that are gaining share, the largest gain by far is in Dhaka Division, no doubt due to the fact that Dhaka “megacity” is located there. As of 2011, one third of the population was in Dhaka Division. Thus, the population is becoming more centralized. Aside from Dhaka, however, the overall geographical distribution, at least at the Division level, has

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been quite stable since the 1990s. The detailed analysis of population distribution at Zila level is beyond the scope of this study. Population distribution by Division is shown in Table 4.17.

Table 4.17 Population Distribution by Division, 1991-2011

Division	Number (millions)			Percent			Change
	1991	2001	2011	1991	2001	2011	1991-2011
Dhaka	32.7	39.0	47.4	30.7	31.4	32.9	2.2
Chittagong	20.5	24.3	28.4	19.3	19.5	19.7	0.4
Rajshahi	14.2	16.4	18.5	13.4	13.2	12.8	-0.5
Rangpur	12.0	13.8	15.8	11.3	11.1	11.0	-0.3
Khulna	12.7	14.7	15.7	11.9	11.8	10.9	-1.0
Sylhet	6.8	7.9	9.9	6.4	6.4	6.9	0.5
Barisal	7.5	8.2	8.3	7.0	6.6	5.8	-1.2
TOTAL	106.3	124.4	144.0	100.0	100.0	100.0	--

Source: BBS 2013 Statistical Yearbook.

4.4.12 Basic Services: Housing, Sanitation and Social Protection

Access to basic social services, including adequate housing, clean water and sanitation is far from universal in Bangladesh. Housing quality has been improving slowly, but in urban areas homeless people can be found sleeping at railway terminals and bus stations, at ports, and in empty markets, parks, and stairways. Access to hygienic toilet facilities is generally inadequate. In rural areas, the proportion of the population having access to safe water has increased from 77 to 84 percent, but it remained almost unchanged at around 87 percent in urban areas.

The Bangladesh Government's social protection and social welfare programme, which accounted for 15.2 percent of the national budget and 2.5 percent of GDP in 2009-10, is directed toward the chronically poor, pensioners, widows, war veterans, people with disability, transients and people vulnerable in special circumstances. It is impressive that Bangladesh, as a poor country, has been able to establish a comprehensive system of social welfare at this stage of its development, given the pressures of population growth. However, its effectiveness could be greatly improved. A multiplicity of programs under the SSNP umbrella has contributed to poor implementation arising in part from programme overlap and lack of resource allocation. The amount of benefit per household at the national level is small. The selection process of beneficiaries is lengthy, often influenced by political considerations, and has two major leakages—inclusion entry fee for beneficiaries and fraudulent muster rolls, especially in workfare programmes.

The expected changing age structure of population in Bangladesh will increase the pressure on the State to increase the allocation of funds to support the elderly. Currently, around 28 percent of the population aged 60 years and above are living below the national poverty line, while many older people are close to the poverty line and therefore vulnerable.

4.4.13 Water Supply

In 1993, the country's groundwater, the source of drinking water for 97% of the rural population and a significant share of the urban population, was contaminated with arsenic. However, in 2004, 98% of the population already has access to an improved water source, a very high level for a low-income country¹⁷. This has been achieved through the construction of hand pumps with the support of external donors.

Bangladesh has a low level of cost recovery due to low tariffs and poor economic efficiency, especially in urban areas where revenues from water sales do not cover operating costs.

Only 56% of the population was estimated to have access to adequate sanitation facilities in 2010¹⁸. But a new approach to improve sanitation coverage in rural areas, namely the community-led total sanitation concept, was introduced in Bangladesh and is credited for having contributed significantly to the increase in sanitation coverage¹⁹.

In 2015, 87% of the population had access to "improved" water, and the figure was identical to rural and urban areas. In 2015, there were still around 21 million lacking access to "improved" water. Regarding sanitation, 61% of the total population had access to "improved" sanitation, or 58% and 62%, in urban and rural areas, respectively.^{20 21}

Since arsenic was discovered in Bangladeshi groundwater in 1993, the share of population with access to safe drinking water had to be adjusted downward. According to the Joint Monitoring Program for Water Supply and Sanitation of UNICEF and the World Health Organization (WHO), access to an improved source of water supply increased only slightly from 77% in 1990 to 81% in 2010, whereas coverage of improved sanitation increased from 39% to 46% during the same period.²²

Estimates of access to an improved source of water supply is greatly affected by the presence of arsenic in groundwater, which is estimated to affect 27% of all wells and is subtracted from the figures obtained by solely measuring the level of access to infrastructure. Without taking into account the presence of arsenic, 99% of the urban population and 97% of the rural population actually had access to an improved source of water supply according to the Demographic and Health Survey of 2004, which is an unusually high level of access for a low-income country. In urban areas, access is broken down as follows:

- 23% piped inside dwelling
- 8% piped outside dwelling
- 68% tubewells
- In rural areas the breakdown is:

¹⁷ World Health Organization; UNICEF. "Joint Monitoring Program". Archived from the original on 16 February 2008. Retrieved 20 October 2010. Data are based on National Institute of Population Research and Training (Bangladesh); Mitra and Associates (Dhaka); ORC Macro. MEASURE/DHS+ (Programme) (May 2005). Bangladesh Demographic and Health Survey, 2017. Dhaka.

¹⁸ "Bangladesh". The World Factbook. Central Intelligence Agency. Retrieved 25 September 2013

¹⁹ Kar, Kamal; Bongartz, Petra (April 2006). Update on Some Recent Developments in Community-Led Total Sanitation (PDF). Brighton, UK: Institute of Development Studies, University of Sussex. ISBN 1-85864-614-6. Retrieved 28 April 2008.

²⁰ WHO/UNICEF (2015) Progress on sanitation and drinking water - 2015 update and MDG assessment Archived 18 April 2014 at the Wayback Machine, Joint Monitoring Programme for Water Supply and Sanitation

²¹ WASHwatch.org - Bangladesh". washwatch.org. Retrieved 12 April 2017.

²² World Health Organization; UNICEF. "Joint Monitoring Program". Archived from the original on 16 February 2008. Retrieved 20 October 2010. Data are based on National Institute of Population Research and Training (Bangladesh); Mitra and Associates (Dhaka); ORC Macro. MEASURE/DHS+ (Programme) (May 2005). Bangladesh Demographic and Health Survey, 2017. Dhaka.

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- Less than 0.6% piped inside and outside dwelling
- 96% tubewells
- 1% dug wells
- More than 2% ponds, lakes and rivers

Rainwater harvesting, although practiced in Bangladesh, was not included in the survey.

4.4.14 Electricity

The power sector in Bangladesh is highly dependent on fossil fuels, as natural gas and coal are the dominating sources for power generation in the country. About 62.9% of Bangladeshi generated electricity comes from natural gas, while 10% is from diesel, 5% comes from coal, 3% of heavy oil, and 3.3% is of renewable sources²³.

The country has about 1.5 billion people who lack electricity access, according to IEA's 2008 estimates, representing almost 20% of the total population. Furthermore, approximately 96.2 million people in the country still even without access to a nearby electrified city. 52% of the total population are with partial electricity access, while only 10-15% of the rural population have electricity access that barely meets limited usages: light, ceiling fans, refrigeration, and irrigation.

Bangladesh's electrification rate in rural areas is still poor, since only 38% of rural households are with access to electricity. Despite the fact that the Bangladeshi government is cooperating with other 30 partner organizations for improving the electricity access situation in the rural areas, yet the pace is still too slow. In 2016, Bangladesh had an electrification rate of 76%.²⁴

The following figure (Figure 4.27) shows an example of the country's energy production from different sources during the few past fiscal years, in particular the fiscal year 16/17, and as shown, natural gas is highly dominant.

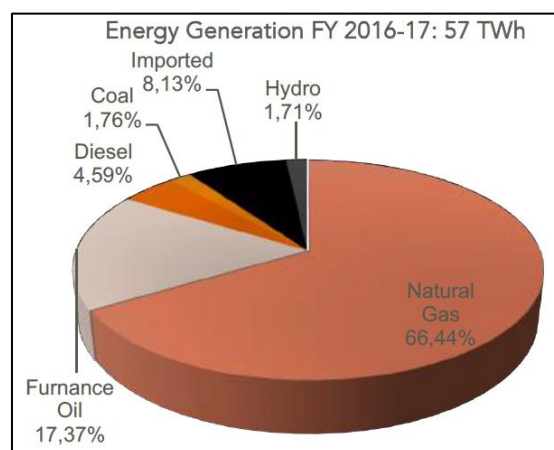


Figure 4.27: Bangladesh's Total Energy Generation by Source 2016-2017

Source: Suntrace, 2018.²⁵

²³ Taheruzzaman, M. & Janik, P. (2016). Electricity Access in Bangladesh. Retrieved from: https://www.researchgate.net/publication/306047475_Electric_Energy_Access_in_Bangladesh

²⁴ Government of Bangladesh. 'Bangladesh's Power Sector at a Glance (May 2015), 2016. <http://www.powercell.gov.bd/site/page/d730f98d-8912-47a2-8a35-382c4935eddc/Power-Sector-at-a-Glance>

²⁵ Suntrace. (2018). Solar Market Brief: Bangladesh. Retrieved from: https://suntrace.de/fileadmin/user_upload/Suntrace_Solar_Market_Brief_Bangladesh.pdf

4.4.15 Transportation

The transport sector of Bangladesh consists of a variety of modes. The country being a flat plain, all three modes of surface transport, i.e. road, railway and water are widely used in carrying both passengers and cargo.

More than half of Bangladesh have access to an all-weather hard surface road within 3 miles distance. There has been a dramatic expansion of road network in recent years. In 1947 there were only 461.8 kilometers of metalled roads. In 1997, the total length of paved road under the Roads and Highways Department stood at more than 20,000 kilometers. It is estimated that mechanized road transport carry about 70% of the country's total passenger and cargo volume.

About 32% of the total area of Bangladesh is effectively covered by the railways. State-owned Bangladesh Railway operates a track of 2706 kilometer, employs about 60,000 people, owns a fleet of 307 locomotives, 1240 coaching vehicles and 1 L643 freight wagons, and provides passenger and cargo services through 502 stations.

About two-thirds of Bangladesh is a wetland laced with a dense network of rivers, canals and creeks. Water transport is the only means available in nearly 10% of the total area. The navigable waterways vary between 8372 kilometer during the monsoon to 5200 kilometer during the dry season. Bangladesh Inland Water Transport Authority has been established by the government for maintenance of navigability of ports and channels while the state-owned BIWTC provide passenger and cargo services in inland waterways and coastal areas of the country.

The entire coast along the Bay of Bengal is 710 kilometer long. There are two major ports in the country. Chattogram, the oldest port, has been an entry-port for at least 1000 years. The Mongla port in Khulna region serves the western part of Bangladesh.

There are now 11 operational airports in Bangladesh. These are Dhaka, Barisal. Chittagomig. Comilla, Cox' s Bazar, Ishurdi, Jessore, Rajshahi, Syedpur, Sylhet and Thakurgaon. Of these, the airports at Dhaka, Chattogram and Sylhet serve international routes. Air careo and Short Take-off and Landing (STOL) services have been opened to the private sector by the government.

4.5 Ancillary Operations

In addition to the technical aspects of the operations, Robi Axiata Limited also engages in a range of support services to their customers including customer care, marketing (advertisements, promotions and campaigns) and sales (sim cards, phones, internet modems etc.).

4.5.1 Utility Consumption

4.5.1.1 Water

In Bangladesh, water is provided by the WASA in Dhaka city area which supplies water in bowsers to above ground storage tanks for cleaning and domestic (toilets) use.

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In the rural network sites visited, water is sourced from neighboring community or private water sources (hand dug water well, hand pumps and streams). Water storage at the sites is limited with either no facilities for storage being available in the hilly areas.

In the Company Shops at all over Bangladesh, water is stored in above ground storage tanks for cleaning and domestic (toilets) use. The water supply in these shops is from water wells which are connected with which water supply lines or submersible pumps are used to deliver water into the storage tanks. Water for consumption by staff is purchased by bottle/sachets.

On average, weekly usage volumes are as follows:

Offices	– 10,000L
Shops	– 10,000L
Active Network Sites	- 1,000L

4.5.1.2 Electricity and Energy

Electricity is obtained from 3 sources – the main electricity grid (EDSA), back up batteries and diesel generators. Back up battery banks (48 Volts DC) are being installed and are operational in most network sites. Grid power is the preferred option in all locations. At network sites, if the grid power fails, the battery bank automatically kicks in. Diesel back-up generators are used when grid power fails in offices and shops, and if neither grid power nor battery power is available at network sites. Where battery power has been depleted, the generator runs until the battery bank is fully charged at which point the generator is turned off and the battery bank takes over.

The Headquarter Office has 2 Diesel Generators – a 500KVA used during the day when required and a 100KVA generator used at night. The Data Centre also has 9 generators – 275KVA generator which is most often used and two 1,500KVA generator which are rarely used. Network sites have 12.5 to 60KVA generators.

Diesel consumption at network sites varies between 600 and 3200L monthly (2000L Capacity tanks are installed at all sites), with the average consumption figure being roughly 3,200L.

4.5.2 Waste Management

In Bangladesh, waste is managed by the city corporation authority in the city area and municipality authorities are responsible in the municipal areas where waste management is being completed by their own facilities or by incorporating company which is responsible for cleaning, collecting and disposing of the company's facilities. Domestic waste is stored in sealed wheelie bins for disposal at the city landfills. Storage areas are clean and free of debris, and receptacles protecting wastes from dispersal.

Operational wastes such as waste/used oil are removed from the facility by the equipment suppliers' technicians who perform repairs/servicing. Obsolete equipment, computers, etc. are safely stored at the headquarters until they can be sold off to interested buyers who recycle and repurpose the equipment parts. Robi is in the process of drawing up policies for re-use and disposal of these equipment for use in any 3rd party purchase agreements.

Waste/used oil from the repair of machinery and vehicles is collected and disposed of by the engineering contractors in charge of servicing and maintenance.

Sewage is directed into underground sewage line set by the city corporation or municipal authorities.

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Waste management in the rural sites is however less structured. Very few network sites were noted to have waste receptacles, with most opting to dispose of their wastes in nearby waste heaps within the community. These public disposal areas are such that wastes are prone to dispersal by wind, water or animals; communities also resort to open burning of these wastes.

Shops utilize waste baskets which are collected and emptied regularly at the designated city/town landfill.

4.5.3 Fire Safety

Fire safety consciousness is evident throughout the facilities. With fire extinguishers strategically positioned at all the offices/shop/network sites visited. Data and server rooms are fitted with smoke detectors, fire alarms and sprinkler systems. The Data Centre is installed with a fire fighting (hydrant) system.

Emergency fire drills for staff are conducted with the National Fire Force bi-annually. Robi Associates are contracted to manage the Company's fire security system. The Fire drill at various place is shown in Figure 4.28.

Snapshots of Emergency Fire Drill



Figure 4.28: Emergency Fire drill at 7, KDA Avenue, Munna Tower, Ground Floor, Khulna WIC, Khulna

4.5.4 Occupational Health and Safety

Occupational health and safety are available in all the facilities through a variety of means including provision and use of Personal protective equipment, signage indicating prohibited areas, dangerous areas, reminders to use PPE etc.

Staff training is also employed to ensure that staff are aware of safe work practices and proper use of PPE. Risk assessments are carried out before risk prone activities such as working at heights, exposure to electricity or radiation, etc. In these situations, PPE specific to the required work is issued, such as safety harness for working at heights (e.g. on the towers), electrostatic discharge wrist-strap for working with electricity, etc. Only staff trained and qualified to handle these specialist areas are utilized.

CHAPTER 5 ANALYSIS OF ALTERNATIVES

5.1 Network Selection

Bangladesh is a fast-developing country and improving all most all the index including GDP. Per capita income increased to 1960 USD. Economic activities increasing very fast and life style is also improving over the time. There is a very high demand of high-speed internet for all sectors in business, education and production and manufacturing industries.

From 1997 to date Robi established and improved infrastructural facilities (1G, 2G, 2.5G, 3G, 4G and 4.5G) an infrastructure like MSC, BSC and TBS every year. Robi already using 4G network and provides services a part of the country using their existing infrastructure. Now Robi is intended to provide high speed internet facilities to users of rest of the unserved area of the country.

As per present ESIA good practice, it is appropriate for the ESIA to study the alternatives considered during planning of expansion of the company's operations, and to explain why the proposed methods were selected, including any environmental and social considerations. The aim is to establish whether there are reasonable alternatives which could be pursued which meet the company's objectives with less impact on the environment, and if there are, to explain what other factors determined the choice of proposal.

The company is enjoying the existing facilities like infrastructure, like MSC, BSC and TBS and a bandwidth. So, there is no logical need to look into alternative network facilities.

5.2 The “No Project Option”

“No project” scenario considers the situation of not developing any project. As a result, there will be no new investment for the telecommunication sector and no provision of digitalization of Bangladesh for development. From of socioeconomic point of view, the ‘no project scenario is not acceptable since this will negatively impact the potential for socio-economic development and advancement of the country. The Without Project Option is the least preferred from the socio-economic perspective due to the following factors:

- The socioeconomic status of Bangladesh is in general and the youth in particular would remain unchanged.
- No employment opportunities will be created for the youth who will work in the software firms and startup business.
- Foreign and local investors will be discouraged
- Development of infrastructural facilities (roads, fiber cables, and associated infrastructure) will not be undertaken.
- Emission of GHG level increase due to increase physical and transport movement.
- Valuable time as working hours will be lost

So, it is concluded that the ‘No build’ alternative is not acceptable, and the potential socio-economic benefits of implementation of such project far outweigh the adverse impacts, all of which can be controlled and minimized to an allowable level. As per anecdotal evidence gathered during study, most users of the network in of RAL network and services, are aware of the radiation risks is negligible and tremendous benefits of such expansion of the existing project.

From a purely physical environmental point of view, the ‘do-nothing is not preferable like any other projects implementation’ since it would generation adverse impacts associated with the

project. However, the potential socio-economic benefits to the nation would be foregone, and human resource development would be hampered.

So, it is concluded that the 'No build' alternative is unacceptable, and the potential socio-economic benefits of implementation of such project far outweigh the adverse impacts, all of which can be controlled and minimized to an allowable level. As per anecdotal evidence gathered during virtual meeting.

5.3 With Project Scenarios

The project is designed to have strong and tangible socioeconomic benefit for the whole country.

First, when the expansion work completed, the improved services will attract substantial the youth, private and foreign companies' users than in a scenario without project interventions.

Second, the project will create substantial amounts of job in local and foreign firms for strengthen mobile connectivity and internet access and telecommunication sector.

Thirdly, the project will provide valuable experiences for the promising speedy data communication and transfer, startup business and IT sector of Bangladesh regarding public private partnership and it will generate lessons learnt for other government entities and have positive demonstration effects.

Fourthly, Telemedicine, virtual office, online shopping, training, learning and other remote service will increase. As result transportation and consumption of fuel will reduce drastically and hence the GHG emission and carbon footprint will also be reduced drastically which will ultimately provide positive impact on climate change and saving our environment.

Fifthly, the project will generate new and innovative practices to improve social and environmental outcomes will reduce negative externalities, as well as good governance practices. The project will also have some positive socioeconomic impact for the people lifestyle.

Also, no ethnic minority groups in project area and cultural heritage will not be negatively affected by the project. The proposed expansion project will be setup using modern, locally and internationally accepted materials to achieve public health, safety, security and environmental aesthetic requirements.

Besides it requires lower maintenance costs as they are built from sustainable components which in turn adds value to the property.

5.4 Technological Alternatives

The process of sending, transmitting and receiving information, rendering it possible to make phone calls across the country involves the use of various types of equipment, machinery and processes. The existing technology and equipment are utilized in Robi's operations are selected primarily based on their technical effectiveness and efficiency. Other important considerations include health and safety benefits.

The company is currently in the process of expanding and enhancing 4G network capacity with more recent and advanced technology for uncovered area. These new technologies come with improved health and safety benefits in relation to radiation levels, radiation protection/exposure risk minimization. The technology has a lower carbon footprint and a reduced impact on the environment.

CHAPTER 6 IDENTIFICATION OF POTENTIAL IMPACTS AND MITIGATION

6.1 Introduction

This section identifies and predicts the probable impacts on different environmental and social parameters due to planning, implementation and operation of project activities. After studying the existing environmental and social baseline scenario, monitoring environmental parameters, reviewing the socio-economic condition of the study area, reviewing the process and experts' comment and perception of the user, and related statutory norms, major impacts during the operation phase were identified. The impacts have been evaluated with respect to their nature of impact (i.e. direct or indirect), spatial nature (i.e. local or widespread), temporal nature (i.e. long term or short term), and the likelihood of occurrence. Finally, the consequences of these impacts have been categorized into a qualitative scale defined by the nature of work for each category. The following sections describe all the potential impacts during different phases of the project (i.e. planning, implementation and operation) on living life, ecology, physio-chemical (water resources, land resources, agricultural resources, fisheries resources, ecosystem resources) and socio-economic environment in and around the project area. During the implementation phase, the impacts may be observed as temporary or short-term; while long-term impacts may be observed during the operation stage when Robi activities will run in the whole coverage area of the country.

6.2 Impact Identification

Based on the activities involved, an impact interaction matrix for planning, implementation and operation phases has been prepared for the project. Impacts have been categorized based on the Environmental and Social aspects.

6.2.1 Methodology

- A number of steps were followed in carrying out the impact assessment:
- A matrix of important project-specific impact categories was prepared;
- The level of significance, achievability of mitigation steps measured against practicality and cost-effectiveness were discussed in the workshop/meeting setting;
- An impact assessment scale was then developed.

Table 6.1: Degree of Certainty of Impact

Certainty of Impact	Description
Certain	The incidence of this impact is unavoidable and to be expected.
Very Likely	There is a high percentage of possibility for this impact to occur, and measures need to be put in place to mitigate it.
Likely	There is an even chance that the impact will may occur
Unlikely	The possibility of this impact occurring is remote, however it must be considered

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Table 6.2: Environmental and Social Significance Scale

Significance scale	Description
Very High	Major or permanent alteration of environmental or social dynamics, with severe or very severe consequences, or (in the case of benefits), beneficial or very beneficial effects.
High	Long term effect on the social or natural environment. This category should be treated with a significant degree of importance at the project decision making stage.
Moderate	Medium to long term effects on the social or natural environment. This category should also be taken into cognizance in decision making as constituting a fairly important degree of threat.
Low	These would have medium to short term ramifications on the social or natural environment; these are relatively unimportant and pose very little real threat.

Table 6.3: Degree of Difficulty to Mitigate

Degree of Difficulty	Description
Very Difficult	The impact can be mitigated in theory, but the extent of financial or technical involvement militates against its application or effectiveness
Difficult	The impact can be mitigated, but there is a significant degree of difficulty in implementing the proposed measures.
Achievable	The impact can be mitigated without much technicality or cost.
Easily Achievable	The impact can be easily and effectively mitigated

Table 6.4: Impact Assessment Matrix

Mitigation Potential	Impact Significance				Certainty of Impact
	Low	Moderate	High	Very High	
Very Difficult	Medium	Major	Extreme	Extreme	Certain
Difficult	Minor	Medium	Major	Extreme	Very Likely
Mitigation Potential	Impact Significance				Certainty of Impact
	Low	Moderate	High	Very High	
Achievable	Minor	Minor	Medium	Major	Likely
Easily Achievable	Minor	Minor	Minor	Medium	Unlikely

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Table 6.5: Categories of Impact

Impact	Description
Extreme	Very significant action would be required to avoid or reduce these impacts. In certain instances, such impacts would prevent the action or option concerned from being taken or approved; and alternatives would have to be considered.
Major	These impacts are significant, meaning that if effective mitigation measures are not taken, a project may be hindered from commencing or continuing. Such an option would require effective management and monitoring, or abandonment altogether of other options.
Medium	These impacts though important, are less serious; in such a case, the Best Available Technology (or Practice) Not Entailing Excessive Cost should be employed. Such impacts alone are usually not significant enough to prevent a project from commencing or proceeding.
Minor	These impacts fall within the acceptable limits of the impact of a project on the environment, and mitigation is desirable but not necessary. This does not preclude 'Best Practice' as a means of avoiding cumulative impacts.
Positive	A beneficial impact on the bio-physical and/or socio-economic environment.

The impact identification matrices based on the activities involved in the different phases are presented in Table 6.6.

Table 6.6: Impact identification matrices based on the activities involved in the different phases of environmental, occupational and social condition

	SI No	Action affecting Environmental Resources and Values	Temporal aspect	SEIs without mitigation measures						Comments/ Observations
				Spatial aspect	Reversibility	Likelihood	Magnitude	Sensitivity	Significance	
Project Phase	1	Loss of land displacement from homestead and agricultural land	Long term	Local	IR	UL	Nil	Low	Nil	No loss of land displacement from homesteads land; no impact
	2	Damage to nearby operation	Long term	Local	R	UL	Nil	Low	Nil	No impact anticipated
	3	Los of vegetation	Long term	Local	R	UL	Nil	Low	Nil	No impact
	4	Disruption to drainage pattern	Long term	Local	R	UL	Nil	Low	Nil	No impact
	5	Change in landscape	Long term	Local	IR	C	Nil	Low	Nil	Invariably will occur but would have a positive impact
Implementation Stage	5	Noise and vibration hazard	Short term	Local	R	L	Moderate	Moderate	Nil	Impacts are expected during generator operation
	6	Traffic congestion	Short term	Local	R	L	Low	Low	Nil	No impact is anticipated since it will be in a confined area and have adequate surrounding road facilities.
	7	Damage to nearby operation	Short term	Local	R	L	Moderate	Low	Nil	No excavation and piling activities will be done
	8	Disruption to drainage pattern	Short term	Local	R	L	Low	Moderate	Negligible	No impact anticipated
	9	Worker accident	Short term	Local	R	L	Moderate	Moderate	Minor	The accident during work in height and electrical works
		Occupational health safety hazard	Short term	Local	R	L	Low	Moderate	Negligible	Minor or no impact anticipated
	10	Air pollution	Short term	Local	R	L	Moderate	Moderate	Minor	Impact generator running
Operation Stage	11	Pollution from liquid discharge	Long term	Project boundary	R	C	Moderate	Moderate	Negligible	If the septic tank connected with the soak pit will not work properly
	12	Pollution from solid waste Used battery	Long term	Project boundary	R	C	low	Low	Negligible	Waste from official works, no kitchen used, etc. Food managed by third-party catering service
	13	Air pollution	Long term	Project boundary	R	L	Moderate	Moderate	Minor	Minor impact anticipated when generator used, vehicle moving to and from the sites
	14	Noise and vibration hazard	Long term	Local	R	L	low	Moderate	Minor	Minor impact anticipated when the generator used
	15	Occupational Health and safety	Long term	Local	R	L	low	Low	Negligible	Minor impact anticipated
	16	Ecology	Long term	Project area	IR	L	Substantial	Moderate	Substantial	Impact on green coconut, & other trees.
	17	Radiation	Long term	Local	R	L	Moderate	Moderate	Minor	Radiation from electromagnetic wave
	18	Lightning	Short time	Local	IR	L	High	Moderate	Minor	Loss of equipment & telecommunication system
	19	Risk of health	Long term	Local	R	L	Moderate	Moderate	Minor	Health risk will be moderate
	20	GHG Emission reduction	Long term	Project area	R	L	Substantial	High	Substantial	Drastic reduction of GHG*
	21	Employment	Long term	Project area	R	L	Substantial	High	Substantial	Employment will increase *

C- Certain, L- Likely, UL-Unlikely, IR - Irreversible, R - Reversible, SEC- Significant Environmental Impact, *- Positive impact

6.3 Environmental Impact

6.3.1 Background

An ESIA (a combination of desk studies and on-site observations by the project team) was carried out on the potential environmental and social impacts identified at the time of the study. This was done in order to first, determine the potential for such impacts, and secondly, to identify and propose mitigation measures that would enable avoidance or reduction of severity should the potential impacts occur or to increase the benefit of potential positive impacts.

6.3.2 Land Loss and Change of Landscape

There is no land required for this expansion project hence no land acquisition and requisition are required. The additional equipment will be set up in the existing structure. There is no scope of disruption to drainage pattern and change of landscape.

6.3.3 Loss of Vegetation

Since there is no land require for this expansion project hence no land clearing is required and no vegetation loss.

6.3.4 Liquid Waste and Mitigation

Robi uses 150,000 liters of water as drinking water for its employees. The drinking water is supplied by the third-party vendor with dining water quality standards. There is no food or and any other process water requirements for the expansion work. Hence no scope of the generation of wastewater and no impact. Only domestic purposes for the washroom, toilets, and drinking water are required for each site of the project. Drinking water from the third-party catering services. Liquid wastewater from the toilet will be treated through the septic tank fitted with a soak pit for each of the sites with existing facilities.

6.3.5 Air pollution Impact and Mitigation

During the implementation period of the project air pollution may generate from the generator for a temporary/short period. During the operation period, air pollution may occur only when generators will use due to power disruption. Mitigation of impact may be minimized by using the less emission producing modern generator.

6.3.6 Noise Impact and Mitigation

During the implementation period of the project, noise pollution may generate from the generator for a temporary/short period of time. During operation period noise may occur only when generators will use due to power disruption. Mitigation of impact may be minimized through using a silencer and less noise generated generator.

6.3.7 Occupational Health and Safety Impact and Mitigation

During the implementation period of the project, a minor impact on occupational health and safety may occur. During the operation period, occupational health and safety may occur only when operate all the equipment. Mitigation of impact may be minimized through adopting the occupational health and safety guideline.

6.3.8 Solid Waste and E-Waste and Mitigation

During the expansion period, some solid waste will generate each site that will dispose of by the contractor. A negligible amount of solid waste like paper, cartoon, empty packet and the used battery will generate during the operation of the project. Food waste is disposed of by the third-party catering services that supply the food.

E-waste will generate from each of the tower stations after certain time period. E-Waste provision to reduce, reuse, and recycle of disposing equipment from Robi's facilities to maintain environmental and socioeconomic benefits should be based on strategies pointed out in the 'National 3R Strategy for Waste Management, 2010' issued by the Department of Environment.

6.3.9 Soil contamination and Mitigation

There is no scope of soil contamination during the implementation of the expansion work. Diesel oil will use only for generator fuel when power will not be available. There is a scope of the oil spill and oil & grease waste will generate during the operation period which is an insignificant amount. This insignificant oil waste will store in a safe place and will dispose of by the third-party registered vendor approved by the Department of Environment (DoE).

6.3.10 Ecology Impact and Mitigation

There is no loss of flora and fauna species since there is no land clearing and no land acquisition requirements for the expansion of the project. Negative impact on green coconut, fruit tree loses their pollination and high fruit trees. It reduces the water inside the green coconut and other fruits. Birds, insects and living things may get health impact is more due to radiation from the 4G network near the tower. The radiation impact of the ecology maybe minimizes by the use of low radiation equipment with modern technology.

6.3.12 Impact of Electrostatic Discharge

Electrostatic discharge (ESD) is the sudden flow of electricity between two electrically charged objects caused by contact, an electrical short, or dielectric breakdown. ESD can occur on human contact with sensitive electrical devices.

To guard against electric shock to technicians working on electronic devices, the ESD Wrist Strap is worn, which grounds the person wearing it, to protect against the buildup of static charges. The technician putting on the electrostatic discharge wrist-strap is shown in Figure 6.1. The higher the resistivity of an antistatic wrist-strap the less susceptible it is to higher voltages.

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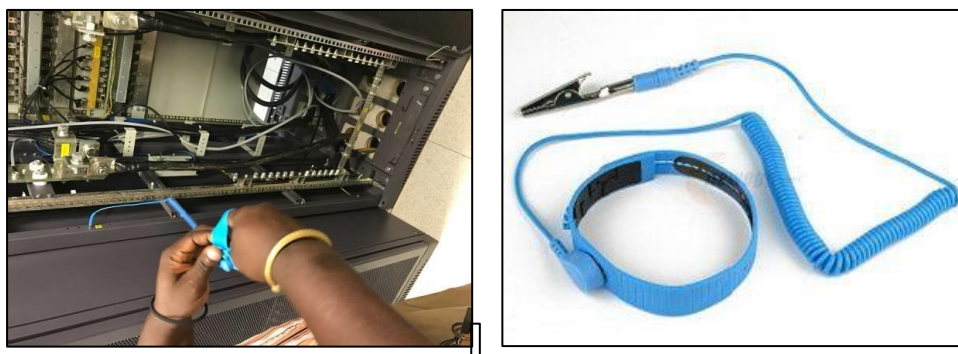


Figure 6.1: Technician putting on the Electrostatic Discharge Wrist-Strap

6.3.13 Radiation Impact and Mitigation

Potential adverse impacts on communities from exposure to electromagnetic fields is extremely unlikely, with the Company's use of equipment designed and maintained to emit radiation within industry prescribed radiation thresholds. The implementation of stakeholder consultation and community development action plan shall ensure the grievance redress and inform the community about the new expansion operational development.

Human health hazards may exist mainly in relation to exposure to electromagnetic wave radiation. These risks are minimized through various mitigation measures by the use of advanced technology with lower radiation emissions equipment, regular training of officers, engineers, and technicians, with the required personal protective equipment (PPE) and job safety analyses.

6.3.14 Lightning Impact and Mitigation

Lightening is frequently occurred in recent times in Bangladesh and poses a health hazard, loss of human, animal, birds' life, and mobile towers. This lightning strike is the biggest threat to telecommunication towers.

Lightning usually hits the sharpest and tallest object in an area because ground charges emitted from objects with high elevations reach to opposite charged streamers of the cloud earlier than the charges from any shorter object. On the other hand, lightning current aims to reach the ground by following the shortest and most conducive way. That is why a tall metal structure such as a telecommunication tower is the primary target for lightning strikes.

When lightning strikes on one of the top sharp corners of the tower, lightning current flows down to the ground through the tower legs and damages all electronic equipment like radomes, radios, antennas, dishes, etc. on the tower body. On the way to the ground, lightning current also can leak into the shelter located nearby the tower and give irreversible damage to sensitive electronic devices inside.

In order to mitigate this disruption and damages of equipment save the mobile communication from lightning, a lightning prevention system uses which dissipates the charges on the structure through thousands of tiny sharp points and blocks the emission of these charges. This process makes the protected site "*invisible*" to lightning and prevents a possible strike on it.

6.4 Social Impact

Mobile broadband technologies have emerged and transformed almost all aspects of consumer social life: relationships, community, work, individual and national governance. Thus, we observe that:

- consumers are increasingly connected;
- immense data are stored and secured on the cloud;
- there is an expansion of content and video in mobile devices;
- new business models.

During the last years, mobile devices have significantly enriched the digital experience: in addition to calls and messaging mobile devices offer photos, video, maps, location-based services, internet, social networks, gaming and millions of services that have become a daily necessity.

The convenience and efficiency of additional functionality make consumer lives easier but also dependent on technology.

Mobile technologies significantly increase interpersonal communication that allows contacting anyone from anywhere at low or no costs. For a fixed subscription fee consumers can receive voice, video, and messaging services via different applications. Also, consumers can record a message and send it to the recipient via storage in the cloud. In general, consumers can keep in touch with more people on a smartphone than on a simple phone or a computer. Verbal and non-verbal communication becomes real-time and effective.

Mobiles and 4G networks have an impact on re-shaping work the environment – people will be able to work not only from home or public space but also while being in transit. There will be flexibility in combining personal life with work, not sacrificing one or other. People can work from a distance and save on commuting or long-distance drives. Increased mobility and flexibility transform offices. There is more and more short-term co-working office space available for people in need of occasional physical office space, meeting rooms or reception services. It is crucial for start-ups or small businesses that are sensitive to office rent costs.

The development of social media is responsible for the emergence of virtual communities that can exist with a small number of members and low income. At the same time, these communities can provide active involvement due to virtual connectivity. Some virtual communities are disrupting traditional businesses by offering a cheaper and socially more engaging environment. Examples of such businesses include Airbnb, a peer-to-peer accommodation service, which represents competition for hotels by offering cheaper and more home-like accommodation while traveling. Uber, Pathao and Shohoz compete with taxi companies by creating an informal transportation market. Amazon competes with a book and general stores, offering a full range of books, digital content, electronics and home goods. Coursera deformalizes education with the creation of a cheap and high-quality lifelong learning platform. Square, Wise Transfer and PayPal compete for the money transfer market with banks. The business models of most of these apps could not exist without mobiles and the 4G network.

Employment effects

Although several studies (Deloitte (2011)²⁶ or Capital Economics (2012)²⁷) provide at least indirect information on the potential employment effects of 4G infrastructure investment the results are subject to considerable interpretation and are likely to be sensitive to where in the business cycle the economy is. Thus, in a boom the net employment effect is likely to be considerably less than the first-round impact effect. Moreover, just as with the GDP effect the employment impact of infrastructure investment is likely to be transitory – when the investment ceases the employment effect vanishes.

Long run employment effects

It is not at all obvious what the medium to long run employment impact of 4G is likely to be. Unlike the impact of the expansion phase of 4G development even the short run employment impact of the changes induced by 4G is uncertain. Are the changes likely to be labour-using or are they labor-saving? Probably both kinds of change are likely to be observed and 'lost' jobs in one area are likely to be replaced by created ones in another. In the long run the evidence is that productivity growth and employment are complementary. For example, McKinsey Global Institute (2011b)²⁸ report that in the United States, over an 80-year period (1929-2009), there has been only one ten-year period where employment declined while productivity increased, whereas there were 7 ten-year periods when both productivity and employment increased.

The telecommunication industry's revenue will grow by 34 percent in the next five years to \$5.08 billion from \$3.8 billion at present, on the back of expanding user base and wide range of services, said the USAID in a new study.

"The sector is quite large in size and has a crucial contribution to achieving the goal of making Bangladesh a middle-income country," said the report of the United States Agency for International Development (USAID) published recently.

The industry employs about 7.60 lakh people directly, of which 92.5 percent are unskilled and 7 percent are women, the Comprehensive Private Sector Assessment report said. The job growth rate in the sector will be 9 percent from 2016 to 2020.

6.4.1 Impact on Productivity and Growth

It is in its impact on productivity and growth that 4G will (and already has) contribute sustainable economic benefits rather than in the macro-economic effects of roll-out which although valuable (especially at a time of low economic activity as was the case in the Swedish and Estonian roll-out phases) are transitory. Here the impacts are easier to describe than to measure.

There are considerable reasons to suppose that mobile technology and networks have a significant impact on business productivity (especially in the service sector). Mobile technology can affect labour productivity by saving time of employees to do a particular task

²⁶ Deloitte (2011) *The impact of 4G technology on commercial interactions, economic growth, and U.S. competitiveness* <http://www.deloitte.com/us/impactof4g>

²⁷Capital Economics (2012) *Mobile Broadband and the UK Economy*.

²⁸ McKinsey Global Institute (2011b) *Growth and renewal in the United States: Retooling America's economic engine* http://www.mckinsey.com/insights/americas/growth_and_renewal_in_the_us

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or capital productivity by reducing the need for specific devices, vehicles, office space and other capital resources.

An important productivity gain comes from communication “on the go” – sending and receiving emails, video calls, sharing and editing documents on a cloud without being physically in the office. Another aspect is productivity growth on “down time”. 4G can offer at least one fifth of the download times as compared with 3G (depending on country and provider) which means users do not spend time watching a file or email being loaded. Productivity and organizational apps can significantly reduce administrative resources and time needed to perform simple tasks (e.g. calendars, customer relation management, voting). These tools are nowadays available on mobile devices all the time.

According to the McKinsey Global Institute (2012)²⁹, there is considerable unrealized productivity potential in mobile technologies. It is estimated that the productivity of interaction workers could increase by 20-25% with the implementation of social technologies: email communication can be moved to a social collaboration platform, searching and gathering information can be faster and immediate, supervision and decision making can be done without physical presence.

In terms of capital productivity, businesses can save with teleworking (office rent, ICT and electricity), logistic apps (for more efficient exchange of information with distributors and suppliers), and m-commerce (on physical store space, warehouse occupancy and efficient inventory management).

These are powerful and plausible arguments but to date few empirical studies directly measure these impacts and translate them into productivity or growth numbers. The Capital Economics (2012)³⁰ and Deloitte (2011)³¹ reports use studies of broadband impact and studies of mobile telephony impact to make inferences and draw conclusions. This is also the approach adopted here. The Productivity gains from mobile devices is shown in Figure 6.2.

²⁹ McKinsey Global Institute (2012) *The social economy: Unlocking value and productivity through social technologies* http://www.mckinsey.com/insights/high_tech_telecoms_internet/the_social_economy

³⁰ Capital Economics (2012) *Mobile Broadband and the UK Economy*.

³¹ Deloitte (2011) *The impact of 4G technology on commercial interactions, economic growth, and U.S. competitiveness* <http://www.deloitte.com/us/impactof4g>

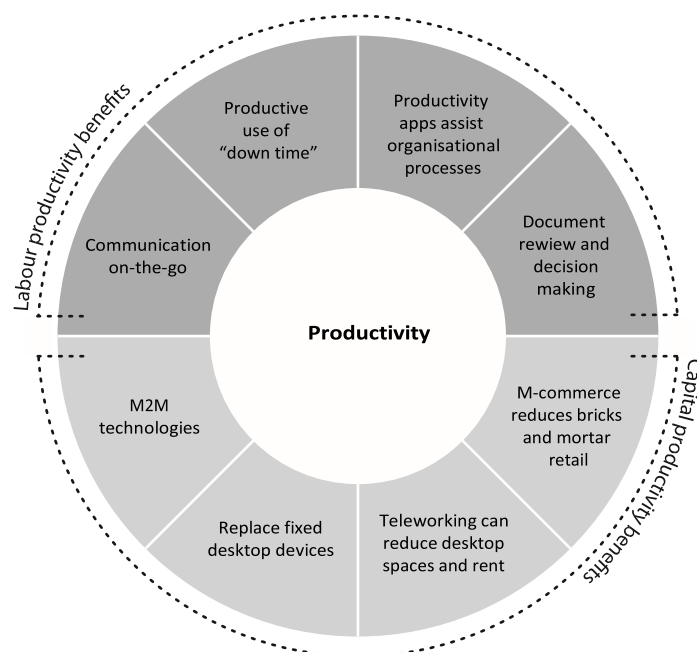


Figure 6.2: Productivity gains from mobile devices.

Source: Deloitte Access Economics (2013)³²

6.4.2 Impact of mobile telecommunications on economic growth

There are three kind of econometric studies on the relationship between mobile telephony and GDP growth:

1. What is the quantitative link between mobile penetration in general and economic growth?
2. How does a switch from 2G to 3G affect economic growth?
3. How does an increase in the use of mobile data affect economic growth?

General impact: A large number of studies have found a positive relationship between mobile penetration and growth of GDP and productivity. A good example is the paper by Gruber and Koutroumpis (2011)³³ who use data from 192 countries over the period 1990– 2007 to assess the impact of mobile telecommunications on economic growth. They find that the effect on high-income countries was almost double that of the effect in low-income countries – 0.20% as against 0.11%. For some countries Gruber and Koutroumpis were able to estimate the impact on productivity growth, which generally was higher than the GDP impact.

There are two problems with this approach: one is the so-called ‘reverse causality’ problem i.e. did mobile penetration cause’ GDP growth or was it the other way round. Gruber and Koutroumpis (and other authors using this kind of approach) argue they have addressed this

³² Deloitte (2011) *The impact of 4G technology on commercial interactions, economic growth, and U.S. competitiveness* <http://www.deloitte.com/us/impactof4g>

³³ Koutroumpis, P. (2009). “The Economic Impact of Broadband on Growth: A Simultaneous Approach.” *Telecommunications Policy*, 33, 471-485

issue, but not everyone is convinced. The other problem is that in Bangladesh mobile penetration as such is saturated and 4G is about the 'kind of mobile' rather than the quantum.

The effects of an upgrade

While substitution of 3G for 2G does not increase mobile penetration as such it may nevertheless generate measurable benefits on GDP growth. Econometric estimates in Deloitte (2012) based on a panel of 96 countries over 2008-2011 suggest that for a given level of mobile penetration a 10% increase in 3G penetration would increase GDP growth by 0.15 percentage points.

As before there is a reverse causality issue but additionally can we reliably apply figures based on a transition from 2G to 3G to the further transition to 4G? Will the effect be smaller? Or will it be larger? Arguably it could be larger because relatively speaking the transition to 4G may prove to be more 'revolutionary'.

The mobile data effect

An alternative metric to penetration rates by which to measure the impact of the higher capabilities of 4G is in its ability to handle a much greater quantum of data. Again Deloitte (2012)³⁴ offer an estimate of this effect based on a sample of 14 countries over 2005-2010 and report the result that for a given level of 3G penetration a doubling of data usage is associated with an increase of 0.5 percentage points of GDP growth. Again, there are reverse causality/endogeneity issues.

6.4.3 Impact of 4G on Business in Bangladesh

In 2015, mobile technologies and services generated 6.2% of GDP in Bangladesh, a contribution that amounted to around \$13 billion of economic value. This includes the direct impact of the mobile ecosystem as well as the indirect impact and the increase in productivity brought about using mobile technologies (GSMA, 2017).

4G mobile internet will be able to surf 10x faster than 3G mobile internet on 4G enabled mobile. E-Business fully depends on the internet so it is not possible to imagine the E-business model without the internet. People of Bangladesh who are using 4G technology are getting more opportunity to e-Shopping. In Bangladesh E-business industry got an extra wing with the blessings of 3G mobile internet in the last couple of years. Now in Bangladesh more than 70 thousand online shoppers optimize their sites for mobile devices. Dhaka the capital city of Bangladesh with more than 1.5 crore people with huge traffic in the roads and shopping malls, people start responding to online shopping enormously. E-business industry in Bangladesh more than 70% of the shopping is done from the smartphone or similar devices and has become more than 1000 crores turnover yearly. With reference to the experts, this industry will get bigger hit on launching the 5G mobile internet in Bangladesh.

"4G internet is need of time for Bangladeshi e-Business industry. Graphics-rich content and videos are still not suitable for the 3G internet that we have right now. Secondly, if 4G comes in urban areas than the price of 3G will become totally affordable to everyone- especially the people living in remote and rural areas. So, a big change will happen overnight which will definitely help E-business industry as well".

³⁴ Deloitte (2012) *What is the impact of mobile telephony on economic growth?* <http://www.gsma.com/publicpolicy/wp-content/uploads/2012/11/gsma-deloitte-impact-mobile-telephony-economic-growth.pdf>

In Bangladesh, currently, a huge number of smartphones like iPhone, Samsung, HTC, Huawei, Micromax, Oppo, Xiaomi and more are 4G LTE enabled smartphones. As of February 2018, there are 7.75 crore active mobile internet connections in Bangladesh while 3.23 percent of them are now using 4G on their phones (BTRC). That means the users are currently using the 4G technology and also, they are ready to welcome 5G internet. From the following screenshot from an E-business site it will be clear that more than 80% of the users are using coming for high-end Android devices.

When people will have a smartphone with 4G internet- you will be able to browse any E-Business site faster. That means you will be able to check and compare more products at the same time you are doing now. 4G internet will be 10x faster. E-Business fully depends on the internet, not only for the business owners but also need for the end users. Neighbor country of Bangladesh India is a high impact on 4G internet on E-Business. Users are getting a better experience. They are able to surf different E-Business sites more swiftly. They can compare and choose the right product more conveniently. In Bangladesh, users are ready, operators are almost ready- just we are waiting for the sunlight. Most of the internet users in Bangladesh are young although only 10 percent handsets in Bangladesh are 4G-enabled and they are more curious to know about new technology and products. Online Shopping will be the next destination. Faster internet means, a faster site that means better user experience. E-Business industry is going to more diversified besides Facebook, news and press media and other social media. The E-Business market will be at least 4x bigger than current days by taking the benefits of 4g technology as faster 4G mobile internet will definitely boost the E-Business market and will generate more thoughts of online shopping. Positive economic outlook, increasing investment in 4G network by telecom operators, prospect of 5G and LTE era enabling faster internet and proliferation of low-cost smartphones indicate a much bigger “online” population by 2021 than the 90% population coverage govt. is projecting currently (data.gov.bd). New businesses have arrived in the growth position with the development of the internet because of our homes, workplaces, factories, educational institutions, and transports would be swarmed with internet-based sensors which would bring forth a truly connected society. 4G will change the way we communicate, live, work, play, or connect to each other. The report said, between 2017 and 2023 connected IoT devices are expected to increase at a rate of 19%, driven by new use cases and affordability. Bangladesh may have come a long way with its digital vision and everybody will be connected but the introduction of 4G would take the country further. In terms of its economy, it (4G) is likely to take a leap towards becoming a middle-income nation.

Standard 4G is around five to seven times faster than 3G which offering theoretical speeds of up to 150Mbps that equates to maximum potential speeds of around 80Mbps in the real world. 4G or long-term evolution (LTE) services is a data connection technology faster than the existing 3G services. Dynamic network capacity and coverage of 4G leads to accommodate the changing consumers’ patterns of buying the product and services.

6.4.4 4G in Future Modern Business

The GSMA expects the economic contribution of the mobile industry in Bangladesh will continue to increase with right policies in place. By 2020 the mobile industry is expected to generate \$17 billion of economic value (GSMA, 2017). Probable outcomes of 4G in Business of Bangladesh are following-

Enhanced Mobile Working

4G technology encourages the organizational employees to work remotely where 61% of Irish CEOs are designing a company by this way so that their employees can work remotely. The speed and reliability of 4G makes this possible for an organization.

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Enhanced Innovation

4G Technology allows workforce to be more innovative and creative through connecting smartphones and tablets where 80% of CEOs in Ireland fall into line that connected devices with faster connection and download speeds can collaborate among team wherever they are.

Cloud Storage

4G makes it easier to share and edit documents, saving valuable time and lets you save to the cloud.

Quick access to Information

All business transactions through online are conducted promptly because 4G makes it possible to quick access to information.

Time consuming

As 4G is 10 times faster than 3G so it is possible to compare and check more products at a same time than 3G.

Apps work better on 4G

Businessman and customers can get more comfort and easily done of apps. Using with 4G network technology Businessman and customers can edit document or emailing. Business growth going to the apex position because the 4G network technology providing the following benefits in business- Facility to use latest mobile technology, changing better customer employees" and customers" expectation, Better user experience, Graphic rich content, Video advertising, Affordable Price of 3G, Faster browsing and so on.

Online Freelancing

Online freelancing means freelancing via internet, and it's related to a freelancing market place where buyers and sellers provided their service. Freelancing job included the following:

- Search Engine Optimization
- Social Media Marketing
- Article writing
- Journalism
- Publishing
- Computer programming
- Web design
- Graphic design
- Website development
- Illustrating, etc.

Online freelancing is common in Bangladesh. It is growing tremendous rate and many people work regularly on a dream of becoming an independent freelancer. Individuals can start freelancing business with a computer and an internet connection. It possible only in the urban areas but quite impossible due to weak internet connection in the rural area. Robi has taken initiatives to update and enhance 4G network which will help to future online freelancing in Bangladesh. 4G network will provide stable and strong internet that will lead to drastic reduction in young unemployment in future as well as create employment for women.

6.4.5 Education

Education is the fundamental right of the population and educated manpower can enhance the economic development and growth of a country. The modalities of education delivery are now shifting from bricks to click. With the rapid advancement of Information and Communication Technology (ICT) and mobile technology most of the education providers are planning to deliver their programs through it. Besides formal education, Open and Distance Learning (ODL) is an alternative way to educated mass population with its multi-diversified programs. For ODL learning strong internet is the fundamental requirement. Internet brings the world in the finger tips. One can complete education not being physically present in the educational institution by the help of internet. Various disaster like Covid-19 pandemic situation, internet playing a vital role in the educational sector. Educational institutions are conducting classes in the online platform all over the world. Bangladeshi education also trying to use online platform but there are some limitations because of internet network coverage. City and urban student only getting these benefits. If 4G network become available throughout the country individual student can enjoy the equal benefit of study.

The Internet has become a major tool for effective teaching as well as a learning tool. Teachers can use it as a teaching tool by posting their teaching materials (notes and videos) on school website or forum. The learning process becomes interesting and diverse with the use of tutorial videos and notes.

Robi's 4G network coverage increasement and enhancement will improve the quality of education in many ways. It will open doorways to a wealth of information, knowledge and educational resources, increasing opportunities for learning in and beyond the classroom. Teachers will be able to use online materials to prepare lessons, and students to extend their range of learning even staying in the remote place or village.

6.4.6 Indigenous people

There are no indigenous people living at the proximity of the project site towers even in the three hill tracts districts. The locations of 4G towers selected in such a way that to avoid the indigenous peoples living areas. So, no impact anticipated.

6.5 Anticipated Environmental, Occupational and Social Impacts and Mitigation Measures

The assessment of potential impacts was undertaken through the analysis of the different project activities and envisaging potential impacts to the environment. The first step is the identification of the potential impacts at pre-installation, installation and during operation phase. Then, each potential impact was qualitatively analyzed. Based on the findings of the assessment, mitigation measures have been recommended to minimize and manage these impacts to meet prevailing regulatory requirements and good international industry practice for such projects.

The project will enhance the national telecommunication development agenda to improve communications for the population and thereby create immense benefits to the socio-economy of the country. The project would also create jobs throughout the country in the various sector i.e. info-communication and information technology, fields. This socio-economic assessment did not identify any significant adverse social impacts arising from the proposed project.

6.6 Environmental Occupational Health Safety Impact Assessment and Mitigation Measure

Cancer

Its only consistently observed biological effect in humans is tissue heating. In animal studies, it has not been found to cause cancer or to enhance the cancer-causing effects of known chemical carcinogens." There is no strong or consistent evidence that mobile phone use increases the risk of getting brain cancer or other head tumors.

Male fertility

A decline in male sperm quality has been observed over several decades. Studies on the impact of mobile radiation on male fertility are conflicting, and the effects of the radio frequency electromagnetic radiation (RF-EMR) emitted by these devices on the reproductive systems are currently under active debate. A 2012 review concluded that "together, the results of these studies have shown that RF-EMR decreases sperm count and motility and increases oxidative_stress". A 2017 study of 153 men that attended an academic fertility clinic in Boston, Massachusetts found that self-reported mobile phone use was not related to semen quality, and that carrying a mobile phone in the pants pocket was not related to semen quality.

Glucose metabolism

According to the National Cancer Institute, two small studies exploring whether and how mobile phone radiation affects brain glucose metabolism showed inconsistent results.^[1]

Effects on children

A report from the Australian Government's Radiation Protection and Nuclear Safety Agency (ARPANSA) in June 2017 noted that:

The 2010 WHO Research Agenda identified a lack of sufficient evidence relating to children and this is still the case. Given that no long-term prospective study has looked at this issue to date this research need remains a high priority. For cancer in particular only one completed case-control study involving four European countries has investigated mobile phone use among children or adolescents and risk of brain tumour; showing no association between the two (Aydin et al. 2011). Given this paucity of information regarding children using mobile phones and cancer ... more epidemiological studies are needed.

6.7 During COVID-19 outbreak health impact and risk identified.

Due to COVID-19 pandemic situation major disruption of Robi's Operation hampered. The following steps were taken by the company to prevent or mitigate these disruptions.

The following possible risk are identified which impact the company:

1. Absence of key staff or contractors
2. Lack of utilities
3. Limited ICT services
4. Lack of critical equipment
5. Lockdown by government
6. Community protest
7. Limited security response
8. Disruption of supply chain.

Due to COVID pandemic outbreak following risk identified and mitigation-

1. People Movement Restriction of accommodation and Transportation
2. Due to movement restriction by law enforce authority, many sites outage restoration delayed which trigger higher MTTR (Mean time to repair) of fault management 111 sites access was restricted which were locked for certain time, due to many office closure, 33 sites were locked for Zero traffic and 31 sites entry was restricted for COVID issues by HO/LL/authority which trigger significant revenue loss.
3. Efficiency projects, preventive maintenance and other minor rectification was paused, which has indirect impact of network as well as revenue.
4. Preventative Maintenance and Periodic site quality inspection is paused, so quality control is being hampered
5. Site rollout became delayed a bit for movement restriction and accommodation for some cases specially initially for COVID-19 out break.

6.8 Impact of release of toxic, harmful, hazardous substance

COVID-19 pandemic period specific risks and mitigations steps have identified related to release of toxic, harmful, hazardous or otherwise polluting substances.

1. Limited staff or suppliers available for maintenance and operation of critical equipment.
2. Inability to effectively manage pollution and hazardous materials may result in potential fire
3. Explosion and pollution risks
4. Lack of firefighting services both from government as internal may increase risk of fire
5. Shut off of regular waste management services.
6. Response by company

COVID-19 Spread areas, red zone, locked down area, Hospitals where company have sites impacted huge on our field Operations movement as risk.

Mitigation:

For 11,800 sites Maintenance Eco has 30 and Robi has 30 Maintenance points. Necessary measures taken for all Maintenance Points:

- Keeping the workplace safe & Encourage employees
- Provide Caution Banner to each and every Sub-center (Describing protection procedure)
- Provided Mask, Hand wash items, Hexasol, Sanitizers etc.
- Stopped handshaking –use other noncontact methods of greeting
- Cleaned hands at the door and schedule regular hand washing
- Created habits and reminders to avoid touching their faces and cover coughs and sneezes

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- Disinfected surfaces like doorknobs, tables, desks, and handrails regularly
- Increased ventilation by opening windows or adjusting air conditioning
- Limit food sharing
- Wearing PPE at red zone/ Hospital

CHAPTER 7 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

The Environmental and Social Management Plan (ESMP) is the synthesis of all proposed mitigation and monitoring actions, set to a time frame with specific responsibility assigned and follow-up actions defined. ESMP is a plan of actions for avoidance, mitigation and management of the negative impacts of the project. Environmental and social enhancement is also an important component of ESMP. A detailed set of mitigation measures have been compiled in view of the likely impacts associated with the proposed CAPEX/BMRE for upgradation and modernization of existing core network infrastructure and strengthening of overall network capacity by Robi Axiata Limited (Robi).

7.1 Environmental and Social Mitigation and Management Plan

Impacts at this stage are often temporary. At the planning stage, the main concern will be ensuring that installation and designs requirements are met and done in such a way as to limit the negative environmental and social impacts that could occur during operations.

During the installation stage, occupational safety incidents, as well as environmental impacts are paramount. Risks can be reduced by strict adherence to best 4G Instrument setup management practices. The impacts anticipated at the 4G Instrument setup stage, their recommended mitigation measures and residual impacts are shown in the following Table 7.1.

Table 7.1: Environmental and Social Impacts and Mitigation Measures during Installation of New Sites

Environmental /Social Aspect	Impact Description	Impact Category	Mitigation / Enhancement Measure	Responsibility
Air Quality	Dust generated from 4G Instrument setup machinery can cause considerable nuisance to communities close to sites, and could cause health problems including respiratory complaints / diseases.	Medium	- Dust minimization measures shall be implemented including watering of the 4G Instrument setup areas. - Vehicles transporting 4G Instrument will be enclosed or sheeted. - Loading, unloading and handling of dusty materials will as best as possible be done furthest away from the most immediate neighbours.	Contractor & Environmental Cell of Robi
	Emissions from installation activities like fuel combustion from generators and vehicles could cause adverse impacts on air quality worker/ community health and air quality	Minor	- Effective preventative maintenance established to ensure all 4G Instrument setup and generators are maintained in good working order and do not adversely impact air quality due to inadequate maintenance or damage.	Contractor & Environmental Cell of Robi
Noise	Noise generated from generator	Medium	- 4G Instrument setup activities producing excessive noise levels will be restricted to the day-time. - Locating and orientating equipment to maximise the distance, and to direct noise emissions away from the closest neighbours where possible; - Turning off equipment when not in use.	Contractor

Environmental /Social Aspect	Impact Description	Impact Category	Mitigation / Enhancement Measure	Responsibility
			- Maintenance of equipment and vehicles to prevent emission of excessive noise or vibration - Workers will be provided with noise protection PPE when operating noise generating machinery	
Water Quality	Pollution of water resources may arise at installation sites due to accidental spillage or leakage of polluting materials (fuel, paints, chemicals, etc). Pollution may also occur as a result of poor waste management with waste being carried off into nearby water sources by surface water, wind, etc.	Major	- The 4G Instrument setup contractor will be contractually required to take all reasonable precautions to prevent and clean up all spills / leaks. - The Waste Management Plans (WMP) will be implemented including effective housekeeping and waste storage measures.	Contractor
Waste Management	Improper management of waste may result in environmental and human health hazards such as pollution and disease.	Medium	- Waste bins will be stationed at all 4G Instrument setup sites for the disposal of the various types of wastes generated by the project. These bins will be clearly marked to facilitate segregation of waste. - Separation of domestic and hazardous waste at the source shall be strictly enforced. - Where possible, wastes will be re-used. - Burning of waste will not be permitted - Installation and 4G Instrument setup personnel will be trained in the appropriate management of waste. - Waste materials that can be safely reused or recycled may be donated to local communities following an appropriate risk assessment.	Contractor & Environmental Cell of Robi

Environmental /Social Aspect	Impact Description	Impact Category	Mitigation / Enhancement Measure	Responsibility
Occupational Health and Safety	Injuries at 4G Instrument setup work-sites include falling from heights, getting hit by falling objects, as well as from the use of equipment and tools, cuts from stepping on sharp objects such as nails and other metal off-cuts are likely to occur. OHS issues related to the installation of communication towers and electrical components include exposure to live current and electromagnetic waves.	Medium	- An appropriate OHS management system will be implemented. - Workers will be provided with all the required PPE. - Toolbox talks will be carried out daily on safe work practices and other OHS issues. - Only trained and qualified technicians will be involved in the electrical and communications infrastructure installations.	Contractor & Environmental Cell of Robi
Community Benefits from Project	Job Opportunities for skilled and unskilled members of the community	Minor	- Although labour recruitment is a matter for the contractor, who has the right to determine whom to employ, he will be formally encouraged to hire locally wherever possible, in order to maximise the benefit distribution and social acceptability of the project. - Unskilled labour will be preferentially hired from the local communities. - Opportunities for sustainable local procurement of goods and services to support 4G Instrument setup will be identified wherever possible and measures will be devised to maximize the potential for these opportunities.	Contractor & Environmental Cell of Robi

Environmental and Social Impacts during the Operations Phase

During the operations phase, impacts considered during the planning and development phase would have been realized. Mitigation measures to minimize these impacts would be implemented and modifications and inclusions will be made to better address issues based on experience. This section describes the impacts likely to occur during operations. Environmental and social impacts and mitigation measures during operations phase is shown in Table 7.2

Table 7.2: Environmental and Social Impacts and Mitigation Measures during Operations Phase

Environmental /Social Aspect	Impact Description	Impact Category	Mitigation / Enhancement Measure	Responsibility
Air Quality	Emissions from generators, vehicles and used batteries could cause adverse impacts on air quality worker/ community health and air quality	Minor	- Effective preventative maintenance established to ensure all 4G Instrument setup and generators are maintained in good working order and do not adversely impact air quality due to inadequate maintenance or damage. - CloudEngine 6881 series air flow should be from front to back or back to front	Contractor & Environmental Cell of Robi
Noise and vibration	Noise and vibration may generate from operations from generators which may be a source of annoyance to immediate neighbours.	Medium	- Turning off generators when not in use. - Maintenance of generators to prevent emission of excessive noise or vibration - Use noiseless generators	Contractor & Environmental Cell of Robi
Water Quality	Pollution of water resources may arise during operations from accidental spillage or leakage fuel/oil. Pollution may also occur as a result of poor waste management with waste	Major	- Workers in operational areas (office/ shop/ network site) will be required to take all reasonable precautions to prevent and clean up all spills / leaks. - The Waste Management Plans will be implemented including effective housekeeping and waste storage measures.	Contractor & Environmental Cell of Robi

	being carried off into nearby water sources by surface water, wind, etc. Such pollution adversely affects those who depend on local water resources.			
<u>Solid and E-Waste Management</u>	Improper management of waste may result in environmental and human health hazards such as pollution and disease.	Medium	- Waste bins will be stationed in all operational areas for the disposal of the various types of wastes. These bins will be clearly marked to facilitate segregation at source. - Separation of domestic and hazardous waste at the source shall be strictly enforced. - Arrangements will be made with a local waste management company for collection and disposal of domestic wastes. Hazardous wastes e.g. waste/used oil, used batteries, electrical and electronic wastes will be safely stored in designated storage areas until a suitable disposal option becomes available. - Burning of waste will not be permitted - Company personnel will be trained in the appropriate management of waste. - Waste materials that can be safely reused or recycled may be donated to local communities following an appropriate risk assessment. - E-Waste provision to reduce, reuse, and recycle of disposing of equipment to maintain environmental and socioeconomic benefits based on DoE 'National 3R Strategy for waste management.	Contractor & Environmental Cell of Robi
Occupational Health and Safety	Occupational health and safety issues during operations include exposure to electric current, electromagnetic fields, trips, falls, acid fume from batteries,	Medium	- An appropriate OHS management system will be implemented.	Contractor & Environmental Cell of Robi

	and other activities related to operation and maintenance of facilities.		- Company personnel involved in technical operations will be provided with all the required PPE. - Toolbox talks will be carried out daily on safe work practices and other OHS issues. - Only trained and qualified technicians will be involved in the maintenance of equipment and machinery. Achievable Moderate	
Community Health and Safety (Exposure to EMF- Microwave and Radio Frequency Radiation)	Health risks associated with the exposure of humans to EMF from telecommunications equipment.	Minor	- The consensus of the scientific community is that the power from these mobile base stations antennas is far too low to produce health hazards as long as the general public are kept away from direct access to the antennas (Dawoud, 2003). - Orange equipment are sourced from reputable telecommunications manufacturers and are designed to emit EMF within prescribed industry standards. - Network sites will be restricted to communities; related signage and security is in place to prevent unauthorized access.	Contractor & Environmental Cell of Robi
Lightning	Lightning is the biggest threat to telecommunication towers. When lightning strikes on one of the top sharp corners of the tower, lightning current flows down to the ground through tower legs and damages all electronic equipment like radomes, radios, antennas, dishes, etc. on tower body. This give irreversible damage to sensitive electronic devices inside.	High	- Lightning Prevention System dissipates the charges on the structure through thousands of tiny sharp points and blocks the emission of these charges. This process makes the protected site “invisible” to lightning and prevents a possible strike on it.	Contractor & Environmental Cell of Robi

Community Grievances	Grievances may be generated in host or neighboring companies as a result of company activities, unrealistic expectations about the company's presence in communities, etc. If allowed to continue, these grievances could escalate and into physical/ legal action which could interrupt or affect operations.	Medium	- Regular stakeholder consultation to ensure that communication lines are open between communities and the company - Creation of a grievance mechanism which will serve as a means through which complaints can be relayed and handled by Orange. - Implementation of Community Development Action Plan activities will help mitigate	Contractor & Environmental Cell of Robi
Community Benefits from 4G network	Job Opportunities for skilled and unskilled members of the community Business opportunities to provide goods and services to employees (e.g. food and drink) Benefits from community development activities	Medium	- Management will seek to hire locally wherever possible, in order to maximize the benefit distribution and social acceptability of the project. Unskilled labour will be preferentially hired from the local communities. - Opportunities for sustainable local procurement of goods and services to support operations will be identified wherever possible and measures will be devised to maximize the potential for these opportunities.	Contractor & Environmental Cell of Robi
Energy efficiency	Reduce consumption of energy	Medium	- The fan speed will be adjusted dynamically based on system consumption	Contractor & Environmental Cell of Robi

7.2 Environmental and health safety management (EHS) system

EHS compliance in case of accessing service from third party/vendor. Third party/vendor is obliged to sign "Suppliers' Code of Conduct" which includes below:

Health and Safety suppliers shall provide their employees with a safe and healthy workplace in compliance with all applicable laws and regulations. Consistent with these obligations, our Suppliers shall have and implement effective programs that include effective safety programs covering such areas as: human safety, emergency preparedness, chemical, physical and biological agent exposure, ergonomics, and incident reporting and investigation. Our Suppliers undertake to control hazards and take the best reasonably possible precautionary measures against accidents and occupational diseases.

7.3 Emergency Response and Disaster Management Plan

An Emergency Response & Disaster Management Plan is a written document, which is required according to occupational health safety standards for an organization and must be displayed at every job site. It is a detail step-by-step procedure to follow in emergency such as fire, chemical spill or a major accident. An emergency response plan also includes information such as whom to notify, who should do what, and location of emergency stock. The Emergency Response Plan includes any measures that should be in place at all facilities to combat an accident resulting from fire, explosion or due to any natural calamities (e.g. Earthquake, cyclones, and flood). An initiative to response in emergency and disaster Management is provided in Annex 6.

Guidelines for Environmental and Social Conditions in Contract Document

The environmental and social management program should be carried out as an integral part of the project planning and execution. It must not be seen merely as an activity limited to monitoring and regulating activities against a pre-determined checklist of required actions. Rather it must interact dynamically as project implementation proceeds, dealing flexibly with environmental impacts, both expected and unexpected.

For this purpose, it is recommended that the Project Manager (PM) for this specific project takes the overall responsibility of environmental & social management and monitoring. The PM will form a team with required manpower and expertise to ensure proper environmental monitoring, and to take appropriate measures to mitigate any adverse impact and to enhance beneficial impacts resulting from the project activities. The PM through its team will ensure that the contractor shall undertake and implement appropriate measures as stipulated in the contract document. It should be emphasized that local communities should be involved in the management of activities that have potential impacts on them. They should be properly consulted before taking any management decision that may affect them. Environmental and social management is likely to be most successful if such decisions are taken in consultation with the local community.

Guidelines on Environmental safeguards are generally incorporated in the Schedule of Works/ BOQ.

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In case of DB/ DBO contractors are engaged, the following guidelines need to be followed:
The Schedule of Works for a DBO Project is as follows:

- General items
- Design
- Civil works
- Procurement of instruments for APEX/BMRE of existing network
- Mechanical equipment
- Electrical equipment
- Operation & maintenance works for 3 years

Environmental and social safeguard guidelines to be included in the General items of Schedule of Works and comprise the following points:

- Insurances for Contractor's equipment, insurances for injury to persons and damage to properties and other insurances.
- Quality assurance and control plan
- Environmental & social management plan
- Traffic management plan
- Health and safety plan
- GBV plan
- Labor management plan

A detailed write-up on the above issues is generally included in the employer's requirement which is a part of the bidding document.

Some but not limited to the following conditions should be included in the employer's requirement with the contract document for the DB/DBO contractor.

The DB/DBO contractor shall:

- a. designs the works to minimize adverse environmental impacts;
- b. meets all the obligations under the prevailing environmental regulations and the Environmental Management Plan;
- c. The Contractor shall at all times operate and maintain the Works in accordance with the approved Environmental Social Management Plan and approved Contractor's Documents including:
 - i. the operating and maintenance manuals
 - ii. the Emergency Response Plan
 - iii. Traffic Management Plan
 - iv. the water quality testing plan
 - v. the health and safety manual
 - vi. GBV plan
 - vii. the quality assurance manual
 - viii. providing training on OHS and waste management plan
- d. The Contractor shall undertake all monitoring, sampling and testing in accordance with:

- i. The minimum frequencies and sampling methods specified in these Employer's Requirements;
- ii. The approved water quality testing plan;
- iii. The Environmental Social Management Plan;
- iv. Any additional requirements specified by the applicable regulatory authorities

For a DB/DBO contract The Employer should specify the scope of the contractor's responsibilities for preparing and implementing the ESMF and the ESMP. The proposals related to environmental social safeguards of the Contractor needs to be submitted to DoE for environmental verification. If the ESMP has already been prepared it should be included in the Employer's Requirements as an appendix.

Under the general requirement for planning, design, approvals and documents of the Bid document the following requirements are mandatory:

- a. designs the works to minimize adverse environmental impacts;
- b. meets all the obligations under the prevailing environmental regulations and the Environmental Management Plan;

Under the general requirement for Operation Management in the Bid Document the following requirements are mandatory:

maintain the site in tidy condition and take measures to control potential environmental nuisance, including but not limited to, odors, litter, pests, insects, rodents and birds;

Under the general requirement for Performance during the Operation Service Period in the Bid Document the following requirements are mandatory:

The Contractor shall at all times operate and maintain the Works in accordance with the approved Environmental Social Management Plan and approved Contractor's Documents including:

- i. the operating and maintenance manuals
- ii. the Emergency Response Plan which includes managing emergencies in the event of chemical spills; contamination of the water source; pollution of the environment;
- iii. the water quality testing plan
- iv. traffic management plan
- v. the health and safety manual
- vi. the quality assurance manual

Under the general requirement for Water Quality Testing Plan in the Bid Document the following requirements are mandatory:

- i. The Contractor shall develop a water quality testing plan (the "Water Quality Testing Plan") including methods, procedures, schedules and frequencies of sampling and analysis
- ii. a plan to monitor noise and other local environmental impacts
- iii. a program to monitor whether the work is complying with the Environmental Social Management Plan

Under the general requirement for Overall description of the Operation Service in the Bid Document the following requirements are mandatory:

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- The Contractor shall treat wastewater including septic waste to meet the specified standards and shall discharge the treated wastewater into the environment safely (or at the specified discharge point)

7.4 Robi's Environmental Health & Safety Policy Statement

7.4.1 General

Robi Axiata Limited is committed to implement the company's own policy on Health, Safety and Environment (HSE) that protect all its employees, property, contractors, and visitors at all its premises. Robi is conducted and protected its existing operations in compliance with all relevant local, national and international legislation, policy, rules and regulations and standards.

Employees at every level are responsible for the company's health and safety performance, as well as for environment-friendly operations. Robi Axiata expects active participation from everyone, every day, in every task to achieve excellence in HSE.

Robi Axiata Ltd. is committed to:

- Promoting positive, safe and healthy working environments and culture
- Preventing all accident and work-related illness
- Continuously improve HSE management, performance
- Protecting the environment through environmentally friendly operation
- Improving use of natural resources through energy efficiency initiatives
- Robi has no discrimination on caste, color, gender, religion, during recruitment and has special consideration for Indigenous People in regard of employment and providing services.

Employees and contractors are responsible for following all sets of procedures and working towards improved HSE conditions at all our operations.

Employees at every level should be familiar with the requirements of the Bangladesh Legislation and the Company's requirements related to Occupational Health, Safety and Environment in their work.

Robi's goal is a healthy, injury-free & environment-friendly workplace for all. By working together in all operations, the company can achieve this goal.

This HSE policy has been endorsed by the management committee of Robi Axiata Ltd.

7.4.2 The objectives of the EHS Policy

- Provide safe places of work and healthy working environments for company's employees, contractors/third-party vendors and users of our facilities.

- Reduce and ultimately prevent injuries at work places by developing safe working practices, which include training and evaluating the performance of employees and departments.
- Promote health, safety and environmental protection as an integral part of the duties of management along with the education of all employees.
- Supply appropriate information, instruction and training to promote a high degree of awareness of health, safety and environmental concerns and the responsibility of each employee to prevent injury to themselves and others.
- Comply with all laws and regulations covering occupational health and safety and the environment.
- Develop and implement policies and procedures designed to promote safe working practices and environmental protection and encourage healthy and safe operating conditions in all across the company.
- Implement practices and procedures for the use, handling, storage and transportation of products, service equipment's and to eliminate discharges and omissions that could harm the environment

7.4.3 Principle of Robi Policy

Robi Axiata Ltd. Employee Health & Safety (EHS) services will achieve maximum effectiveness only if all employees maintain a consistent, positive attitude towards safety. Therefore, all Robi employees shall conduct themselves in accordance with the following global guiding principles:

- i. Accidents and injuries are preventable.
- ii. Safety is line management accountability.
- iii. Every bodies are responsible for their own safety.
- iv. All employees are obligated to stop a job or refuse to perform a job if it is not safe or cannot be performed safely.
- v. Efforts in safety will yield results.
- vi. Safety is a condition of the company employment.

The policy will follow the Bangladesh Labor Law 2006, OHSAS 18001:1999 OSHE Specifications and ISO-OSH:2001 Guidelines on OS&HMS.

The company is also following the associated document:

- EHS Procedure manual
- Employee Health & Safety Handbook

7.4.4 Leadership and Involvement and Responsibility

- i. Management Responsibilities
- ii. Supervisor or Line Manager Responsibilities
- iii. Responsibilities of Health, Safety and Environment General Manager
- iv. Floor Marshal Responsibilities
- v. Safety Committee
- vi. Employee Responsibilities

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- vii. EHS Meeting
- viii. Motivation & Behavior
- ix. Management Review

7.4.5 HSE Legislation and Industrial Compliance

The company shall comply with all relevant local, industry specific regulations.

The Company considers the following recognized organizations regulations, guidelines, and additional materials relevant to the Company's operations:

- ✓ Bangladesh Labor Law 2006
- ✓ Occupational Health & safety Guideline

The objectives of this legal compliance are to:

- ✓ Provide oversight and governance to legal compliance across Robi operation
- ✓ Identify and document applicable legal requirements
- ✓ Identify and implement controls necessary to achieve and maintain compliance with identified legal compliance requirements
- ✓ Assess and verify compliance with identified legal requirements
- ✓ Identify and manage instances of potential noncompliance (i.e., known or alleged nonfulfillment of a legal requirement) and track associated corrective actions to resolution
- ✓ Evaluate overall compliance status on an ongoing basis

7.4.6 Risk Analysis and Risk Management

Robi performs quarterly risk assessments for its operations. Currently Robi has dedicated Enterprise Risk Management (ERM) team. ERM team assess, evaluate and monitor company risks with the support from concern internal stakeholders. The risks along with mitigation plans are presented to top management and also to board.

The Business Continuity Management (BCM) team ensures the disaster risk management and disaster recovery management. Robi has a documented disaster recovery plan is also in place to manage crisis or disaster.

Risk Assessment

The Company shall identify and document EHS risks in order to prevent and control the risk. As a minimum, the risk assessment will include consideration of the following:

- ✓ Nature of work
- ✓ Location of work
- ✓ Potential for exposure to worksite hazards
- ✓ Potential consequences of incident (environmental, legal, or delay in operations.)

In some cases the risk or hazard can be identified by observation. In other cases, measurements such as noise levels or gas detectors may be necessary to determine the level

of risk. Emphasis will be placed on areas of operations or procedures that are identified as having the potential for greatest severity.

Risk Control

When risks or hazards have been analyzed and assessed, decisions can be made about control measures, which must be taken into account. The following risk control principles shall apply:

- ✓ Eliminate or minimize the risk by substituting safer operational procedures.
- ✓ Use engineering controls.
- ✓ Minimize the risk by the use of personal protection and equipment.

Employees involved in these areas of operations will receive appropriate EHS training, participate in site-specific safety meetings and review job safety that apply to the particular risk or hazard, on a regular basis.

Hazard & Accident reporting

Employees may choose any method to report their concerns as long as it is a written report containing as much pertinent information as possible. However, employees are urged to use the Robi portal Hazard Report Form. This report is designed to meet all the required information for taking action to remediate the substandard condition. Alternative reporting options include e-mail to the Safety team. Verbal reports may be used to start the investigative process but these must be followed up with a written report.

Reports should contain all the details to fully describe the incident or conditions that present a hazard. The reporting accident is not only a legal requirement, but also provides the Robi with valuable information on its occupational health & Safety performance and areas of improvement. The Robi shall therefore ensure that appropriate arrangements are available for reporting of all major accidents.

7.4.7 Occupational Health & Safety Procedures

The purpose of these procedures is to give a clear guideline of different occupational hazard. The Company operations shall adhere to the EHS Procedures Manual Health and Safety Handbook, safety rules, and regulations.

- i. General Procedure
- ii. Personal Protective Equipment
- iii. Electrical safety
- iv. First Aid and Medication
- v. Working at Height
- vi. Earthquake and structural Collapse
- vii. Road Safety
- viii. Contractor Management

7.4.8 Work Environment Management Procedure

- i. Cleanliness/Housekeeping

The purpose of this procedure is to define the Robi Axiata Ltd. Requirements in respect of Housekeeping and Cleanliness of the Robi Axiata Ltd. sites.

ii. Waste Disposal

The purpose of this procedure is to provide the guidance and instructions regarding the proper waste disposal requirement to maintain and ensure safe & hygienic work environment at Robi Axiata Ltd

iii. Ventilation and Temperature

The purpose of this procedure is to provide guidance and instructions to ensure proper ventilation and temperature at Robi Axiata Ltd offices

iv. Dust and Fume

The purpose of this procedure is to provide guidance and instructions regarding the control of dust and fume at Robi Axiata Ltd.

v. Flammable liquid

The purpose of this procedure is to provide guidance and instructions regarding the precaution against such element at Robi Axiata Ltd.

vi. Lighting

There must be adequate and proper lighting in all working places and access ways; to ensure safe working environment, to prevent eyestrain & headaches, it improves quality output and productivity. Store and warehouses should also be properly lighted.

vii. Office Ergonomics

The purpose of the office Ergonomics process is to reduce office-based ergonomics issue and discomfort and manage risk.

- The objectives of the process are to:
- Assess office ergonomics risk for all employees
- Provide training to recognize ergonomics risks and apply behaviors, techniques, and equipment to reduce risk

7.4.9 Health and Hygiene Procedure

i. Drinking Water

The purpose of this procedure is to provide guidance and instructions for quality drinking water at all Robi Axiata Ltd. establishments.

ii. Cafeteria Hygiene

The purpose of this procedure is to provide food hygiene standards at all Robi Axiata Ltd. establishments.

iii. Restroom Hygiene

The purpose of this procedure is to provide guidance and instructions regarding the cleanness and hygiene conditions of the office restrooms.

iv. Smoking Policy

In support of the Robi fire control procedure, smoking is not allowed inside any Robi offices or vehicles. Smoking is only allowed in the designated/ safe smoking area outside the building/ vehicle.

7.4.10 Instructions, Rules and Procedures

i. Safety Sign and Labels

The Company will provide and maintain safety signs following risk assessment. The purpose of these signs is to warn or instruct employees where potential risk cannot fully mitigate by other ways.

Employees will be given appropriate and sufficient instruction and training relating to the meaning of signs including signaling systems and what to do about them.

ii. Documentation and Record

The proper record system should be adopted to safeguard the documents of the individual divisions. Divisional heads shall monitor and ensure the filling and storage of the documents. The documentation and record procedure of EHS procedure manual will be considered for keeping all document and record.

7.4.11 Emergency Response Plans

i. Emergency Procedure

The company shall establish emergency procedures at all work locations. These shall define specific responsibilities for the management of a response to an emergency. The company shall provide training in these procedures to all relevant personnel in accordance with the EHS Procedures Manual.

ii. Emergency Drills

Emergency drills shall be held minimum once in year and documented. These drills will consist of fire drills, and/ or emergency evacuation drills.

iii. Corrective and preventive actions

Corrective and preventive action shall be taken at any stage of a potential risk to eliminate, or reduce to an acceptable level, risk to the health and safety of the Company's employees and other persons for whom it is responsible.

A formal corrective action report may be initiated as a result of an internal EHS audit, or in response to an EHS problem identified in the normal course of business.

7.4.12 Training and Communications

i. Training

Safety training shall be considered as a basic mandatory training for all RAX members and advanced training on safety will also be provided to the concerned employees according to the safety requirements and supervisor recommendation.

ii. Safety Orientation

During new employee orientation and induction program, Safety team will describe the Robi Safety rules and regulations to the new employee, so that, everyone become safety concern and make Robi a safe place to work.

7.4.13 Management Responsibility

Supervisor or Line Manager Responsibilities: Although the success of any safety program requires the combined efforts of management, supervisors, and the worker; supervisor is the key person. It is the degree to which the supervisor applies the intent of the program and the principles of safety that governs the success of this program. Safety is an area of mutual interest between the supervisor and the worker, and the supervisor must lead the way in developing the EHS program.

- ✓ Responsible for respective team and update status to respective SLT
- ✓ Promote & support implementation of safety culture within the team
- ✓ Ensure implementation of HSE activities within the team.

Compliance and EHS Manager Responsibilities

The coordination of the company's EHS program shall be the responsibility of the Compliance and EHS. Compliance and EHS General Manager Responsibilities

- ✓ Prepare and update safety Policy/Manual as require
- ✓ Conduct awareness sessions
- ✓ Schedule and coordinate site safety inspections
- ✓ Follow-up all action items to closure
- ✓ Schedule and coordinate all evacuation drill
- ✓ Drive cultural change in safety aspect

Floor Marshal Responsibilities

All division/department shall select their respective Floor Marshal and Deputy Floor Marshal with the coordination of Compliance and EHS General Manager.

Responsibilities of that particular floor and to take prompt initiative to handle the situation or to evacuate all the staffs safely in case of any emergency situations like fire, earthquake or any other disasters.

- ✓ Coordinate safety activities at his/her site
- ✓ Report all safety concerns
- ✓ Support evacuation event
- ✓ Create awareness and promote safety cultures

Safety committee structure and member's Responsibilities

Establish a safety committee (Appendix- 1) including regions. All safety committee members will have a define role & responsibilities. Regional safety committee will have cross functional team representatives. Committee members will support to execute all safety related issue at that region. Regional safety committee will consist of minimum five members.

- i. External Parties
- ii. Management
- iii. Floor Marshal
- iv. Divisional Coordinators
- v. Regional Coordinators

Safety Audit and Inspection

It is the responsibility of the concern units of HR and Administration to carry out independent audits according to the checklist; adhoc inspections and make recommendations in writing to the Management for any necessary action that needs to be taken. The responsibility of the management team is shown in Figure 7.1.

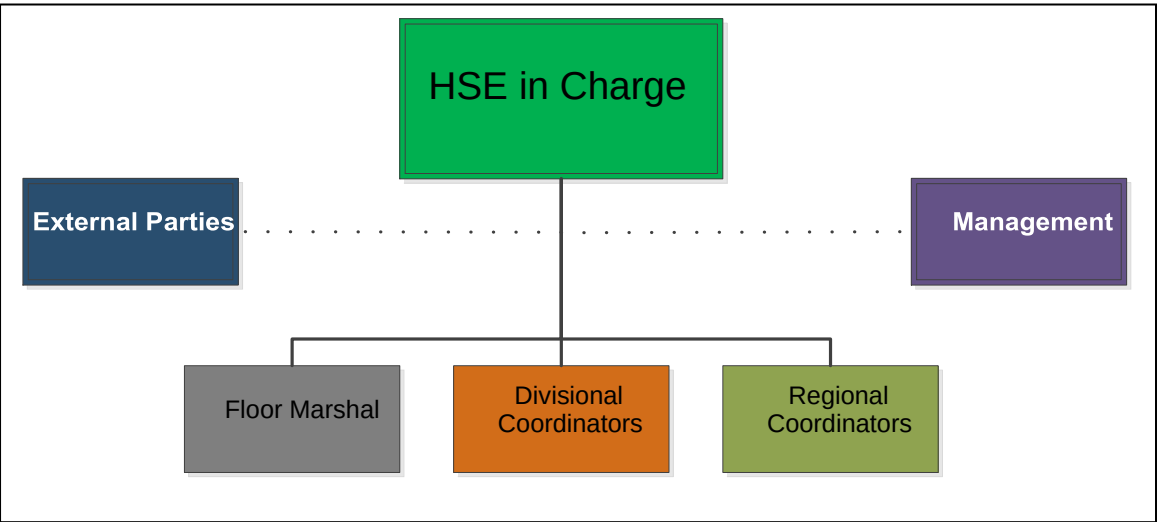


Figure 7.1: Organogram of Management Team

7.5 Requirements for Environmental Management and Monitoring

The best implementation of EMP largely depends on a suitable monitoring programme. Environmental monitoring during project implementation provides information to the regulatory agency on the environmental compliance and the efficacy of the various mitigation measures, particularly the environmental impacts of the project and the effectiveness of mitigation measures. Such information enables the implementing agencies and other supervising agencies to evaluate the success of mitigation as part of project supervision, and allows corrective action to be taken when needed. Therefore, the EMP identifies monitoring objectives and specifies the type of monitoring, with linkages to the impacts assessed in the ESIA report and the mitigation measures described in the EMP.

The EMP contains environmental requirements which are required for the successful implementation of mitigation measures, environmental monitoring, emergency measures and environmental auditing to be carried out during the 4G Instrument setup works on the site. The implementation of mitigation measures and emergency measures shall be the responsibility of the project proponent. The proponent shall ensure compliance with all environmental

legislation, regulations and conventions. The responsibility for environmental monitoring lies with the Implementing Agency.

Specifically, the monitoring techniques of the EMP provide:

(a) a specific description, and technical details, of monitoring measures, including the parameters to be measured, methods to be used, sampling locations, frequency of measurements, detection limits (where appropriate), and definition of thresholds that will signal the need for corrective actions; and (b) monitoring and reporting procedures to (i) ensure early detection of conditions that necessitate particular mitigation measures, and (ii) furnish information on the progress and results of mitigation.

Likewise, all physical and biological environmental parameters, which have been identified as receptors of significant impacts and the pollution control measures should be covered under the monitoring programme. The monitoring should include monitoring of the health of all persons working in the plant, particularly the health aspects related to occupational hazards and COVID-19 aspect.

Regular monitoring of the performance is very important and sometimes vital. It should be mentioned here that the monitoring program should be such that it can ensure compliance with national environmental standards and legal requirements. The importance of this monitoring program is also for ensuring that the project does not create adverse environmental changes in the area and providing a database of operations and maintenance which can be utilized if unwarranted complaints are made.

There are two basic forms of monitoring:

- Visual observation or checking, coupled with inquiries
- Physical measurement of selected parameters

In the case of expansion site projects in general, monitoring is done by physical measurement of some selected parameters like air, drinking water, noise, solid waste, etc. It should be mentioned here that the monitoring program should be such so that it can ensure compliance with national environmental standards.

7.6 Monitoring Parameters and Schedule

7.6.1 Monitoring Indicators

Environmental monitoring requires a set of indicators that could be conveniently measured, assessed and evaluated periodically to establish trends of change in baseline environment quality. A list of parameters to be tested, sample number and sampling frequency are given in Table 7.3. These indicators may be independent or may be functionally related. The physico-chemical, ecological, human interest and socio-economic indicators should be well defined and a mutual relationship among the indicators should be well understood. The monitoring program, in view of the possible impacts as assessed earlier, should consider the indicators for the impact assessment related to the following issues:

Table 7.3: Types, Parameters and Location and Frequency of Monitoring

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7.6.2 Noise Monitoring

Environmental Component	Parameters	Location	Frequency of Monitoring
Drinking Water	pH, Total coliform, Fe & As	Supplied drinking water	During Implementation period (once)
Disinfectant	Spraying of disinfectant	Expansion sites	Daily
Air quality	SPM, PM _{2.5} and PM ₁₀ , SOx and NO ₂	Near site	During implementation period (once)
Noise	Noise level	Expansion sites	During implementation period (once)
Waste Management	Monitoring, collection, transportation, disposal of SW.	Expansion sites	Weekly
Health and safety	Monitoring health and safety of worker	Expansion sites	Daily
EMF Radiation	Radiation measure Value (W/Sq.m) [Max]	Expansion sites	Quarterly

Generator and vehicle movement should be handled cautiously to check the noise and high noise-making equipment should be avoided as far as possible. Sufficient cover or canopy should be used on the equipment or machines in case of high-volume noise sources. Power generator units should be placed in the soundproof rooms and regulating the use of hydraulic horns should be monitored for compliance.

7.6.3 Drinking Water Quality Monitoring

Drinking water quality monitoring shall be done during the implementation period of the site. Routine monitoring on the Environmental Performance of the project will be reported by the Project Management Unit (PMU).

7.6.4 Air Quality Monitoring

It was identified earlier that the negative impact on air quality, mainly dust and gaseous emissions generated from the movement of heavy vehicles during implementation, operations, and maintenance of the site. Dust load on the nearby areas and office is an indicator of dust pollution in the air from the generators. Mitigation measures suggested earlier will successfully offset these negative impacts. Monitoring of suspended particle load in the atmosphere of the project implementation sites should be measured frequently to comply with the air quality standard.

7.6.5 Direct Implementation Impacts Monitoring

Monitoring need to be done during direct implementation sites mainly on dust and gaseous emission, and noise generation. Three basic monitoring systems during the implementation stage will be followed and these are:

- Monitoring of air quality at the selected point during implementation

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-
- Monitoring of noise close to working location
 - Monitoring of restriction or obstruction to traffic movement at workplaces during the implementation period

The significant physical impact will be on air quality due to the generation of dust during the implementation period. One point in the site will be monitored during the implementation period for SPM, PM_{2.5} and PM₁₀, CO, SO_x, and NO₂. As the other issues related to air quality is of no concern.

Water supply and sanitation in the technician/labor camps will be monitored to ensure that the contractor engaged actually follows the guidelines under contractual obligation.

Solid wastes are to be disposed of at designated places, in bins. The used battery will be stored and dispose off by the DoE registered vendor. The grey waters are to be processed through septic tanks. If any hazardous waste is produced, should be properly collected, disposed of through a registered DoE vendor, and make an inventory.

E-Waste provision to reduce, reuse, and recycle of disposing of equipment to maintain environmental and socioeconomic benefits should be on the basis of strategies pointed out in the 'National 3R Strategy for Waste Management, 2010' issued by the Department of Environment.

7.7 Environmental Management and Monitoring Program

The environmental management of the Robi expansion project should be based on the framework of the concerned project environmental cell of Robi. The project cell should be fully involved in the development and implementation of the project Environmental Management Plan (EMP). Detail baseline monitoring, implementation period and operation should also be co-ordinated by concern project cell.

7.8 Environmental Management and Monitoring Budget

Most of the mitigation measures require the contractors/project authority to adopt good site practice, which should be part of their normal procedures already, so there are unlikely to be major costs associated with compliance. Mitigation that is the responsibility of Robi and contractor's will be provided as part of their management of the project. The cost estimation for Environmental Mitigation Measures and Monitoring is given in the following. The total mitigation and monitoring cost for the project is calculated as BDT 18.5 Lac. The total duration of the engagement of the expert will be decided as per the requirement of the project after getting approval from the PMU.

At this stage of the project, there are a number of environmental management issues which have been provided detail in EMP Table 7.4 and included in the contractor's responsibility.

- The precise nature and extent of works involved.
- Details of their nature and scope any institutional strengthening and environmental training which is required.

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Environmental management and monitoring cost will be around Tk. 20.5 Lac for monitoring and testing of various environmental parameters both for implementation and operation period. At this stage of the project, there are a number of matters which have not yet been resolved, which have a bearing on environmental monitoring cost includes as follows in Table 7.4

Table 7.4: Estimated outsourcing cost for environmental monitoring during implementation of 4G Instrument setup and operation phases.

Items	Number	Cost/ locatio in Tk.	No. of Location	Total cost in Tk.
Implementation Phase one time				
1. Ambient air	SPM, PM _{2.5} , PM ₁₀ , Nox, SO ₂ , CO for each location	50,000	10	500,000
1. Noise level	Noise level at each location	2,500	10	25,000
1. Drinking water	pH, Total coliform, Fe & As	10,000	10	100,000
1. Cost for sampling and transportation 4G Instrument setup phase		20,000	10	200,000
A. For Cost during implementation phase				825,000
Operation Phase per year				
1. Ambient air	SPM, PM _{2.5} , PM ₁₀ , Nox, SO ₂ , CO for each location	50,000	10	500,000
1. Noise level	Noise level at each location	2,500	10	25,000
1. Drinking water	pH, Total coliform, Fe & As	10,000	10	100,000
2. EMF Radiation	W/Sq.m [Max.].	20,000	10	200,000
1. OHS	General health safety			200,000
1. Cost for sampling and transportation operation phase		20,000	10	200,000
A. For Cost during operation phase				1,225,000
Grand Total (A+B) in Tk. Twenty lac fifty thousand only				2050,000

CHAPTER 8 GRIEVANCE REDRESS MECHANISM AND STAKEHOLDER ENGAGEMENT

8.1 GRIEVANCE REDRESS MECHANISM

Grievance Mechanism Structure/Architecture

Grievances in the project may range from the effect on the society and the local community due to installation-related activities or negative effects on the livelihood of project-affected people. Considering the overall need for the total project period, Robi intends to establish a GRM to address complaints and grievances starting from Project Implementation Level as there is not likely to be a reasonable adverse effect on the community. Based on consensus, the procedure will help to resolve issues/conflicts amicably and quickly, saving the aggrieved persons resorting to expensive, time-consuming legal actions. The mechanism will, however, not bar an aggrieved person to go to the courts of law.

The purpose of the GRM is to record and address any complaints that may arise during the life cycle of the project period effectively and efficiently. The GRM is designed to address concerns and complaints promptly and transparently with no impacts (cost, discrimination) for any reports made by project-affected people (PAPs) and the complainants. The GRM works within existing social management & resettlement frameworks, providing an additional opportunity to resolve grievances at the local, implementation project, level operations, and at the apex, Robi level. Necessary signposting/billboards would be placed at the central places/places where people gather for sharing detailed information of the GRCs at every level. The structure of the Grievance Mechanism chain is as follows: The structure of the Grievance Mechanism is shown in Figure 8.1

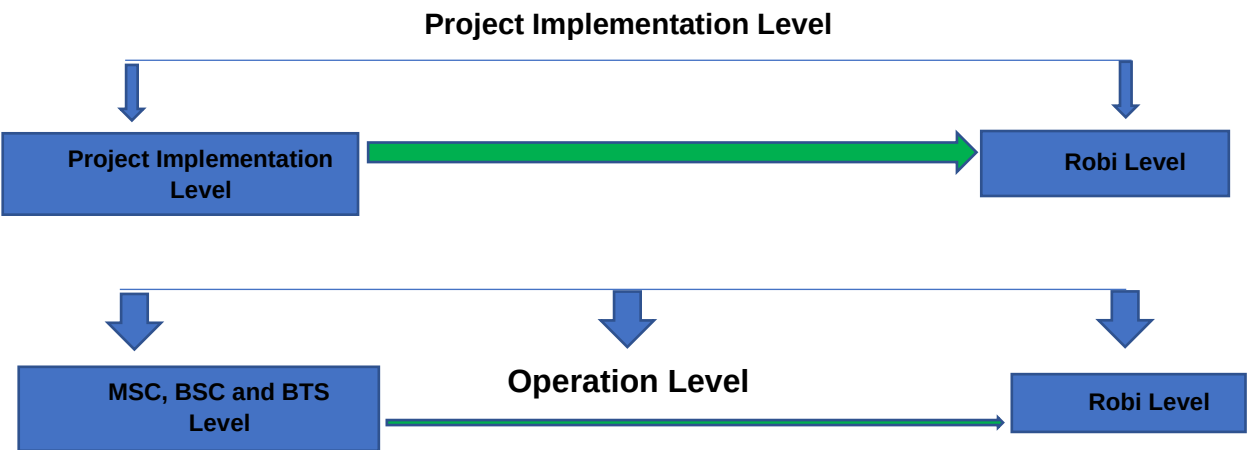


Figure 8.1: The structure of the Grievance Mechanism

8.2 Project Implementation Level Grievance Redress Mechanism

The objective of the project implementation level GRM is to bring the GRM closer to PAPs/ workers of the project in its implementation stage. All efforts shall be made to resolve issues

in the first instance. The Social Specialist at the project level shall carry out the following as regard to redressing grievances:

- Hear the grievances of the PAPs/staffs and workers, and provide an early and mutually satisfactory solution to those;
- Immediately bring to the notice of the Project unit or Social Standards Officer any serious matter that may have arisen/complaint received;
- Inform the aggrieved parties about the progress of actions of their grievances and decisions of the Project unit/Industry level.

The project Implementation level GRM shall have the following Grievance Redress Committee (GRC) members:

- Project Social Specialist (Convenor) – Robi
- A Member of the PAPs/workers of the project
- Local NGO working on Labor and Gender-related Issue
- Social/ Resettlement Specialist/ HR Manager (Member Secretary)

The project Implementation level GRC shall resolve or reach a decision within **fifteen (15) days** from the date the complaint is received. The chairperson of the GRC shall communicate the committee's decision to the aggrieved PAPs in writing and maintain a record of all decisions related to each case.

8.3 Grievance Redress Mechanism for Internal Official and External Stakeholders at Robi

The grievance is a cause of uneasiness and complaint; a wrong did and suffered; that which gives ground for remonstrance or resistance, as arising from injustice. There are different ways to deal with this and will depend on the degree of the unacceptability of the action. A few are mentioned below:

Verbal Warning

A disciplinary measure in which a manager or supervisor tells an employee that his or her performance is unacceptable. Verbal warnings should be noted on a calendar or some other tracking system for future reference.

Cautionary/Advice

Cautionary advice about something imminent (especially imminent danger or other unpleasantness); "a letter of caution about the dangers of immorality"; "the warning was to beware of surprises"; "his final word of advice was not to play with matches"

Written Warning

A letter written to an employee as a disciplinary measure. A written warning describes the performance problems or work violations of the employee in specific detail and explains the consequences to the employee if his or her performance does not improve within a specified period of time.

Suspension

A temporary abrogation or cessation, as of a law or rule. Whenever a charge of misconduct is brought against an employee, depending on the severity of the alleged misconduct the accused employee may be suspended pending enquiry into the charges against him/her. However, the period of suspension will not be more than 60 days unless the matter is pending before any court.

Dismissal

Official notice to the accused employee that he/she will cease to remain in his/her job or the termination of someone's employment. The dismissal might be followed by an enquiry or without any enquiry as a Management Decision.

8.4 MSC, BSc and BTS Level Grievance Redress Mechanism during Operation Stage

The objective of MSC, BSC and BTS level GRM is to oversee the GRM of the MSC, BSC and BTS at the operation stage and assist the users in addressing the grievances immediately upon receipt of a complaint. When a grievance could not be effectively addressed and mitigated at the user level, it would be forwarded to the Robi level for necessary action. All effort shall be made to resolve issues at the earliest. Appropriate representative of the Industry along with HR Manager at the operational level

The MSC, BSC and BTS level GRM shall have the following Grievance Redress Committee (GRC) members:

- Project Manager Administration of Robi as Convener
- Representative of the staff or workers of the MSC, BSC and BTS including a female staff/worker
- Project Social Specialist (Convenor) - Robi
- Local NGO working on Labor and Gender related Issue
- HR Manager Administration and a senior administrative staff (Member Secretary)

The MSC, BSC and BTS level GRC shall reach a decision **within fifteen (15) days** from the date the complaint is received. The chairperson of the GRC shall communicate the committee's decision to the aggrieved ones in writing and maintain a record of all decisions related to each case.

8.5 Robi Level Grievance Redress Mechanism

A committee of knowledgeable persons, experienced in the subject area, shall be constituted at the Robi to handle complaints that have not been addressed or resolved at the Project implementation and operational level. The Robi level GRM shall be comprised of the following members:

- General Manager, Robi (Convener)
- Legal Specialist, Member
- Social Specialist, Member

- Environmental Specialist-Member
- Ward Commissioner
- Chief Law Officer of Robi – Member
- Robi Manager Administration
- Project Manager Administration of MSC, BSC and BTS In charge
- Manager Administration-Robi - Member Secretary

The Robi level Grievance redress committee shall do everything possible to hear and determine the issues within 15 (fifteen) days from the date the case has been transferred to it from the Project and MSC, BSC and BTS GRC. To ensure impartiality and transparency, hearings on complaints will remain open to the public. The GRCs will record the details of the complaints, the reasons that led to acceptance or rejection of the particular cases, and the decision agreed with the complainants. Robi will keep records of all resolved and unresolved complaints and grievances and make them available for review as and when asked for by the ADB and other interested persons/entities.

The chairperson of the GRC shall communicate the outcome to the aggrieved PAP(s)/staffs in writing. The GRC shall maintain a record of all outcomes related to each case. Should measures taken by the Robi fail to satisfy the complainant, the aggrieved party is free to take his/her grievance to the court, and the court's decision will be final.

8.6 Growing with String Ethical Work-Culture

Robi's rise as the leading digital service provider of the country has been commensurate with the strengthening of the company's value system. So much so that the company now prides in the corporate governance framework it has put in place with cooperation from employees of all rank and file.

The clearly defined set of guiding principles has really worked wonders in terms of facilitating the communication of the mantra of uncompromising integrity to its employees. This has helped to make employees at all levels to appreciate the organization's values and guiding principles along with clear guideline on how to demonstrate them in their day-to-day actions and interactions.

Robi management is accountable to the Board Audit Committee on matters relating to internal management checks and balances and financial reporting. The company has a strong internal auditing apparatus whose aim is to add value by facilitating the improvement of the organization's operations. Besides, there is a whistle-blowing hotline to enable voicing of concerns by both internal as well as external entities. The complaints lodged through this facility is followed by extensive internal investigations.

Robi has an ethics office that deals with the internal investigation on defalcations, including, financial fraud, wrongful conduct, non-compliance of disciplinary procedure by the employees. In order to ensure internal control over financial reporting the company also conducts thorough external auditing.

Robi has a clearly set code of conduct for its employees. Putting uncompromising integrity at the heart of its operation, Robi employees make this a living document. Development of the whistle-blowing policy, gift guidance and ethics office procedure has given the company a clearly defined structure to practice uncompromising integrity in all its manifestations. In line with the company's digital aspirations, the gift declaration and outside engagement procedure has been digitalized.

Robi arranges training and mentoring sessions on ethics for both employees and the management. Apart from training, the company also actively encourages the employees to stay alert and to report on any ethical lapses within the company through effective internal communication campaigns.

Robi has a Defalcation Committee who evaluates the efforts made towards dealing with unethical behavior or breach of any code of conduct on a periodic basis. The Ethics officer acts as the secretary of the committee and maintains all files and papers related to the complaints, investigations, reports and actions.

8.7 HR Policy

Robi has always offered equal employment opportunity and firmly believes in diversity inclusion. As per our Compensation policy, pay structure is determined based on nature of task, experience and background of an incumbent and is not influenced by gender in any way. Employees have equal opportunities for progression, promotion and increment irrespective of gender. There is no bias during recruitment that a specific role has to be done by a male or female. To promote gender balance, Robi focuses on areas which can particularly affect females like pregnancy and motherhood.

These areas of concerns are covered under our Benefit policy for e.g. attractive medical insurance coverage during delivery; six-months paid-leave for maternity; day-care facilities and flexible working hours. To address harassment issues or any official concern, Robi has a designated Women Welfare Officer along with Ethics Office to deal with complaints raised by female employees. Periodic awareness sessions are arranging by both internal and external resources to promote awareness against harassment, promote fairness, etc for both male and female employees. In order to promote gender balance, Robi is also part of a cross-industry Diversity and Inclusion Council that is working towards supporting and driving the gender agenda at workplace.

8.7.1 Major Facilities Provided to Female Workers

Robi appreciates that diversity inclusion is beneficial for an organization. To encourage and support female employees, Robi tries to address areas important for female employees. Robi offers attractive benefits like medical insurance coverage during delivery; six-months paid-leave for maternity; day-care facilities and flexible working hours.

A female in-house doctor is appointed at the Corporate Office as most females prefer same gender physician.

Robi offers pick-drop service for employees which helps in ensuring security during commute. There is a separate resting area particularly pregnant females, and prayer room for females in the Corporate Office.

There are separate timings for females to enjoy Recreation Facilities (gym and swimming pool). To foster gender equality, Robi HR has also arranged mentorship program - where senior successful women, both internal and external, act as mentors for other female employees. Female performers are put into spotlight and recognized through both internal and external recognition events.

Robi has a designated Women Welfare Officer along with Ethics Office to deal with complaints raised by female employees. Robi HR arranges different programs for female employees from time to time for e.g. self-defense programs, yoga sessions, etc.

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Medical Insurance

Implementation of Group Medical Insurance Scheme whereby all full time and permanent employees along with their dependent family members (spouse & 2 children within age range from day 1 of birth to 25 years of age) are insured.

Employee shall entitle the regular and permanent Employees of Robi

- Hospitalization benefit
- Maternity treatment benefit
- Outpatient treatment benefit
- Life insurance

8.7.2 Robi's neutral position on its official and third-party suppliers performances.

The Performance appraisal system in Robi informs an employee what and how well they are performing and what level of effort and task directions are needed in future for self-development and for Company effectiveness.

Robi values **“Pay for Performance”** approach, which makes it critical to have a sound process for measuring performance. The tool includes:

- Performance Planning through Key Performance Indicator (KPI)/Objectives Setting.
- Performance Tracking/Ongoing Feedback.
- Collaboration with Company KPI, Divisional or Cross Functional Team (CFT) KPI, and Individual KPI for Incentives and Performance Assessment.
- Performance Appraisal (once a year)

8.8 Stakeholder Engagement

8.8.1 Introduction

“An individual, group, or organization, who may affect, be affected by or perceive itself to be affected by a decision, BMRE, activity, or outcome of a project” is considered as a stakeholder. Stakeholder engagement is a process conducted throughout the project life-cycle, which supports the development of strong, constructive, and responsive relationships that are important for the successful management of a project’s environmental and social risks. Stakeholder engagement is most effective when initiated at an early stage of the project development process and is an integral part of early project decisions and the assessment, management, and monitoring of the project’s environmental and social risks and impacts. The process of stakeholder engagement will involve the following, (i) stakeholder identification and analysis; (ii) planning for engagement with stakeholders during the life of the project; (iii) disclosure of information; (iv) consultation with stakeholders; (v) addressing and responding to grievances; and (vi) reporting to stakeholders. Stakeholder’s engagement consultation has been completed by a social specialist, Md. Humayun Kabir and an Environmental Engineer, Md. Nashir Uddin. The list of stakeholder is tabulated in Table 8.1

Table 8.1: List of Stakeholders

Sl. No	Stakeholder’s	Probable Concerns
1.	Mobile User	Key stakeholders in the BMRE Robi project need to reflect their expectations.
2.	IT Professional /freelancer	Freelancer and IT professional’s requirement which needs to be consulted.
3.	IT and Software service provider	To expansion the 4G network service, the consultation was carried out during the implementation period.
4.	Bank/Financial Institution Officer	High-speed data, data security, and cost of data transfer
5.	Shop owner	<u>Business expansion all over Bangladesh</u>
6.	Health Technician	<u>Health facilities enhancement</u>
7.	House owner	<u>The security system of the house</u>

8.8.2 Approach of Identification of Stakeholders

The section identifies the stakeholders in the Robi’s 4G BMRE Project. Stakeholder Analysis analyses the stakeholders’ position with relation to the project, the level of interest they have in the specific project. The level of influence depends on the power the stakeholder can marshal to promote its position in the project. The level of interest or salience is the priority and importance the stakeholder attaches to the project.

Based on ECL’s understanding of the project and preliminary discussion with the Client the stakeholders were identified and the concerns and their stakes in the project identified.

1. Network communication professional
2. Software sales, service provider and developer
3. Bank/Financial Institution

4. Web Developer
5. Mobile shop owner
6. Health technician
7. House owner within the Telecommunication Tower Network

8.8.3 Stakeholders Consultation

During the Preparation of the ESIA of Robi 4G expansion project virtual consultation/meeting and discussion over the cell phone, email was held with different stakeholder groups through a questionnaire survey in July 2020. They were appraised about the project and their feedback on the different aspects of the project which they would influence or be of influence on the stakeholder group were obtained. The stakeholder groups are shop owner, freelance web developer, network communication business owner, software developer, sale, service provider company owner, and financial institution Bank. The questionnaire survey data and the stakeholder feedback information are presented in Annex 7.

8.8.4 Stakeholder Analysis

The importance of stakeholder analysis lies in the assessment and understanding of the socio-political environment surrounding the project. It allows for:

- Mobile network and data user/s to be identified who need to be informed about the project during the execution phase
- Identification of the interests, concerns, and societal risks surrounding the stakeholders, as well as conflicts of interests
- Identification of relations between stakeholders that may enable “coalitions” of project sponsorship, ownership, and co-operation as well as the mechanisms which may influence other stakeholders
- Identify the stakeholders (those who might have an adverse and positive impact on the project) and taking appropriate measures to mitigate their influence

The following sub-sections provide a profile of the various stakeholders in the project as well as their concerns and relative influence with regards to the project. The summary of consultation is presented in Table 8.2.

Table 8.2: Summary of Consultations

SI	Key issues raised	Participant/s type	Stakeholder Feed back
1	How do they know about this project?		▪ Nearly all the participants said they have not heard the BMRE activities of Robi in Bangladesh.
2	What is the positive impact of the 4G mobile network?		▪ There are lots of positive benefits regarding BMRE of Robi's 4G expansion. Major impact will be improve lifestyle and and economic development

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SI	Key issues raised	Participant/s type	Stakeholder Feed back
3	How 4G network will bring benefits to people?	Network and IT professional, House owner near tower, Shop keeper, Banker, Heath Technician	▪ The progressive way to reach people and sell cloth items to them said shop owner Akhter. 4G network expansion will boost up the sell and people will be able to purchase products even staying in a rural area.
4	Negative Impact		▪ Most of the stakeholders feel that there may be health effects and tall tree like green coconut trees may have impact due to radiation but they don't have any specific idea about it. ▪ Impact on air, noise, soil, and water quality may be minor and no idea
5	The positive impact of the 4G mobile network		▪ Facilities will be improved because of competition among mobile operator and fully-mobile use of applications that require true broadband speeds. ▪ Improve lifestyle and increase income ▪ Security (no need authenticates onto another possibly public, network) ▪ Productivity gains ▪ Personal and team productivity ▪ Management effectiveness and innovation ▪ Process efficiency and effectiveness

CHAPTER 9 INSTITUTIONAL ARRANGEMENT

9.1 General

Executive responsibility for project management commonly involves a number of organizations/ persons, each with specific responsibilities for particular aspects during the preparatory works for site clearing, earth cutting onsite execution and operation & maintenance phases.

An important aspect of environmental management is the accumulation of a database of environmental measurements. The management measures shall have to be taken with regard to controlling the potential impacts that could, in broader terms, occur during the planning, implementation and operation and maintenance phases of the project and indicates responsibilities for the various actions concerned. The environmental management team should, at an early stage of project planning, prepare a detailed schedule of management actions required along with the fixation of specific individual responsibilities for these actions.

- Policy and Leadership
- Continuous Improvement
- Occupational health and safety
- Incident reporting and investigation
- Emergency preparedness and response
- Environmental protection
- Training and orientation
- Community relation
- Regulatory requirement

In the case of the donor funding component, the overall management will be borne by the Implementing Agency, Robi Axiata Limited (Robi) Authority. During the expansion planning and implementation phase, the overall compliance of the environmental and social issues largely lies in the contractors/developers. Whereas, supervision and monitoring lie with the implementation agency. So, the contractor will be responsible for the overall compliance of environmental and social issues.

The institutional arrangements for the implementation of various aspects of ESMF and environment management of the project comprise the following.

1. **Environment Management Cell (EMC) at PMU** to monitor all the aspects of environmental and social management of the project
2. **Project Environment Cell (PEC) at PIU** to ensure adequate integration of environmental management measures in the design phase and supervise the implementation of ESMF and specific requirements of ESMP
3. **Environment Management Unit (EMU)** to implement EMP and other regulatory requirements during the planning, implementation & operation phase of the project.

To coordinate and ensure the implementation of the ESMF, an Environment Management Cell (EMC) will set up at the PMU. The EMC will be headed by an 'Environmental Specialist' and will be supported by 'Environmental Engineers'. The EMC will monitor the environmental management aspects of the Project and will be responsible for the following.

1. Identify regulatory requirements of projects and monitor their compliance at all stages of the project;
2. Identify and ensure integration of various aspects of environmental management in the respective contract documents/tenant lease agreements of Master Developer/Operator/contractor and individual enterprises/ tenants;
3. Coordinate with respective implementing agencies and contractors/operators and ensure that the environmental management measures are implemented as per the respective EMPs conditions;
4. Prepare periodic progress reports on the implementation of the ESMF and share it with the Bank and other monitoring agencies.

It is to be mentioned here that, a full-time Environmental Specialist (ES) is required at the PMU. The Environmental Specialist will supervise and monitor the environmental management issues of the project.

9.2 Key Aspects of the Study Including the no. of Competency Staff

The key aspect of the study is to assess environmental impacts for the implementation of the project and is identified in Chapter 6. The mitigation measures of identifying impacts are described in Chapter 7 and will be implemented during the site implementation period. The respective implementing or responsible agencies and monitoring issues are also identified in Chapter 7.

The manpower requires for the successful implementation of the project is 5 officers and 5 staff. The positions are

Project Manager -1

Deputy Project Manager – 1

Assistant Engineer-1

Sub-Assistant Engineer-1

The other 2 skilled staff will be engaged during the implementation of the project.

9.3 Availability of Appropriate Technology and Equipment

A monitoring program will be implemented during the 4G Instrument setup of the project site. Scientific environmental monitoring is required for the implementation of the proposed project and environmental management plan. Specific monitoring parameters will help to achieve the monitoring objective and ensure environmental quality. Waste management, drinking water quality around the project sites will be regularly checked; tree plantation, quality of ambient air, noise, soil, and health & safety of officers & laborers involved in the project and employment of laborers, etc. should be monitored periodically to ensure a pollution-free environment in the project site.

The E&S Cell will have adequate numbers of environmental and social scientists/specialists and maintain coordination and liaison with CSC for effective EMP implementation. Similarly, the CSC will also have environmental and social monitors who will supervise and monitor the contractors for effective EMP implementation. The contractors in turn will also have HSE supervisors who will ensure EMP implementation during 4G Instrument setup activities and will be tasked to develop necessary detailed HSE plans as per this EMP, and oversee their implementation. Organogram for Environmental and Social Management of the Project is shown in Figure 9.1

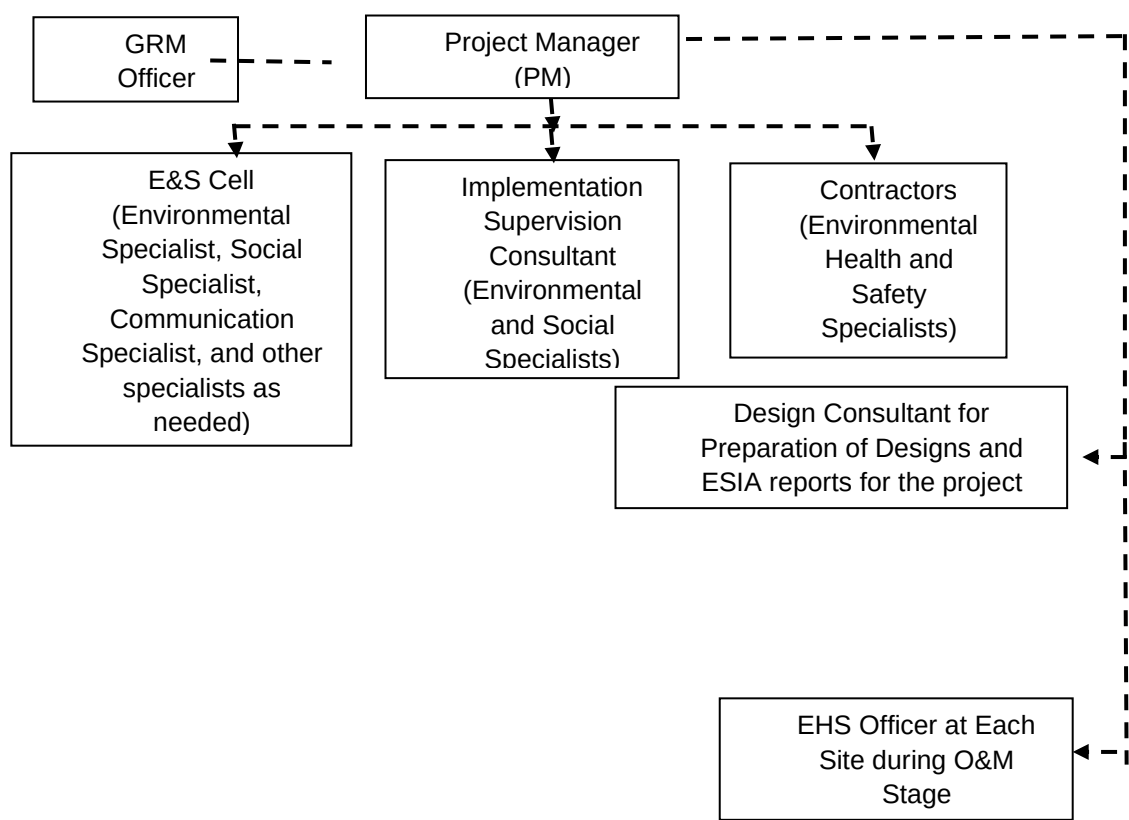


Figure 9.1: Organogram for Environmental and Social Management of the Project

CHAPTER 10

CONCLUSION AND RECOMMENDATION

An ESIA study has been carried out for the upgradation and modernization of existing core 4G network infrastructure and strengthening of overall network capacity by Robi Axiata Limited (Robi). During the ESIA study, no adverse impacts were identified. During the implementation period of the project noise and air pollution may generate from the generator for a temporary/short period of time. Minor impact on liquid, solid waste (mainly used battery) and occupational health and safety may occur during the implementation period of the project. During operation period noise and air pollution may occur only when generators will use due to power disruption. Mitigation of impact may be minimized through the implementation of the mitigation measure outline of EMP in the report.

There is no loss of flora and fauna species since there is no land clearing and no land acquisition requirements for the expansion of the project. There is no impact air, noise, water and soil quality. A negligible amount of air and noise found when generator use due to the non-availability of electricity. Stakeholder consultation found that bad Impact on green coconut and other fruit on long trees. It reduces the water inside the green coconut and other fruits. Birds, insects and living things may get health impacts are more due to radiation from the 4G network near the tower. The radiation impact of the ecology may be minimized by the use of low radiation equipment and modern technology.

Potential adverse impacts on communities from exposure to electromagnetic fields is extremely unlikely, with the Company's use of equipment designed and maintained to emit radiation within industry prescribed radiation thresholds. The implementation of stakeholder consultation and community development action plan shall ensure the grievance redress and inform the community about the new expansion operational development. There are no indigenous people living at the proximity of the project site towers even in the three **hill tracts** districts.

E-Waste provision to reduce, reuse, and recycle of disposing of equipment to maintain environmental and socioeconomic benefits based on DoE 'National 3R Strategy for waste management. Waste battery will be store in a safe place for interim period and dispose off through DoE registered vendor. Noise impact may be minimized through using a silencer and less noise generated generator. Air pollution also minimize by using using the less emission producing modern generator. Human health hazards may exist mainly in relation to exposure to electromagnetic wave radiation. These risks are minimized through various mitigation measures by the use of advanced technology with lower radiation emissions equipment, regular training of officers, engineers and technicians, with the required personal protective equipment (PPE) and job safety analyses. EMF test report indicated that the radiation impact is less than the standard.

Lightning are frequently occurred in recent times in Bangladesh and poses a health hazard, loss of human, animal, birds' life and telecommunication towers. This lightning is the biggest threat to telecommunication towers. In order to mitigate this disruption and damages of equipment of the telecommunication system from lightning, a Lightning Prevention System uses which dissipates the charges on the structure through thousands of tiny sharp

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points and blocks the emission of these charges. This process makes the protected site “invisible” to lightning and prevents a possible strike on it.

There are many positive impacts identified due to the implementation of the expansion of the 4G network project.

- Increase of GDP growth
- High voice quality, very quick data access, increase the use of data receive and transfer
- Easily access the internet, streaming media, video calling, etc.
- Efficient multicast/broadcast, fast communication and easily accessible to the IT world
- Less Expenditure of the ICT industry, freelancers get more access to the freelance marketplace and earn more foreign currency.
- Increase data transfer for banks, financial institution, corporations, digitalization of government agencies activities
- Many services to the people doorstep and improve lifestyle
- A benefit to social media, increase social and business communication
- Reduce transportation and movement expenses and improve health and education services.
- GHG emission will reduce drastically and make the environment sustainable

A monitoring system is put in place to ensure that management practices for mitigating of negative impacts and enhancing those that are positive be affected. It must however be ensured that recommendations made in the Environmental Management Plans are followed.

The overall findings of the ESIA are that the proposed installation of CAPEX/BMRE for upgradation and modernization of existing core network infrastructure and strengthening of the overall network capacity of Robi.

The project will not cause any significant adverse environmental impacts during the expansion period, provided that adequate mitigation measures are implemented. The proposed mitigation measures are prescribed conceptually in the ESIA, as an outline EMP. This will be developed by the contractor in the implementation and operation phase.

Thus, it can be concluded that the proposed expansion 4G project is environmentally acceptable and will bring economic, high-speed data access, cultural, social and environmental benefits to the mobile voice and data users and local community in the area.

Recommendation:

Impact on human health and other lives and change of ecology needs to be studying to mitigate the adverse impact. Use low radiation equipment with modern technology. Mitigation measures need to be adopted based on the finding and implement ESMP as per the ESIA report.

As per the law of DoE Robi is require environmental compliance for sustaining the environment of the project area.

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Annex 1: Summary Air Quality and Meteorological data measured during JUNE, 2019 at different CAMS operated under DoE

Parameter	unit	NAAQS	Summary	CAMS-1 (SBhaban)	CAMS-2 (BARC) ^a	CAMS-3 (D-salam)	CAMS-4 (Gazipur)	CAMS-5 (Narayongoanj)	CAMS-6 TV-St (Chittagong) ^a	CAMS-7 Agrabad- (Chittagong)	CAMS-8 (Sylhet)	CAMS-9 (Khulna) ^a	CAMS-10 (Rajshahi) a	CAMS-11 (Barisal)
SO ₂ -24 hr	ppb	140	Average	5.75	DNA	DNA	0.98	3.90	DNA	0.88	2.02	DNA	2.39	1.69
			Max	9.95	DNA	DNA	1.41	10.9	DNA	1.13	2.48	DNA	8.51	2.49
			Min	3.77	DNA	DNA	0.61	0.42	DNA	0.60	1.75	DNA	0.94	0.89
			Exceedance (Days)	0	DNA	DNA	0	0	DNA	0	0	DNA	0	0
			Data capture (%)	47	DNA	DNA	38	70	DNA	41	85	DNA	80	89
NO ₂ -24 hr	ppb	53 (Annual)	Average	DNA	DNA	15.9	DNA	12.6	DNA	DNA	15.1	DNA	16.3	DNA
			Max	DNA	DNA	22.5	DNA	17.6	DNA	DNA	24.9	DNA	20.1	DNA
			Min	DNA	DNA	10.4	DNA	6.57	DNA	DNA	10.3	DNA	7.73	DNA
			Exceedance(Days)	DNA	DNA	0	DNA	0	DNA	DNA	0	DNA	0	DNA
			Data capture (%)	DNA	DNA	74	DNA	45	DNA	DNA	84	DNA	92	DNA
CO- 1 hr	ppm	35	Average	0.98	0.56	1.32	0.58	0.66	DNA	0.31	0.45	DNA	0.67	DNA
			Max	3.29	1.54	8.48	3.82	1.32	DNA	0.81	2.33	DNA	1.85	DNA
			Min	0.54	0.13	0.07	0.10	0.32	DNA	0.05	0.09	DNA	0.05	DNA
			Excedance (Hour)	0	0	0	0	0	DNA	0	0	DNA	0	DNA
			Data capture (%)	45	95	60	63	85	DNA	93	85	DNA	85	DNA
CO-8hr	ppm	9	Average	0.96	0.56	1.33	0.58	0.66	DNA	0.31	0.45	DNA	0.69	DNA
			Max	2.52	1.37	4.55	1.39	1.29	DNA	0.63	1.41	DNA	1.67	DNA
			Min	0.55	0.28	0.16	0.18	0.36	DNA	0.12	0.19	DNA	0.09	DNA
			Exceedance (Hour)	0	0	0	0	0	DNA	0	0	DNA	0	DNA
			Data capture (%)	43	95	58	60	82	DNA	93	84	DNA	86	DNA
O ₃ -1hr	ppb	120	Average	DNA	18.4	2.12	8.94	DNA	DNA	DNA	3.47	DNA	DNA	6.04
			Max	DNA	83.9	7.12	32.0	DNA	DNA	DNA	30.1	DNA	DNA	17.3
			Min	DNA	0.06	0.79	3.16	DNA	DNA	DNA	0.07	DNA	DNA	0.28
			Exceedance (Hour)	DNA	0	0	0	DNA	DNA	DNA	0	DNA	DNA	0
			Data capture (%)	DNA	53	71	59	DNA	DNA	DNA	85	DNA	DNA	91
O ₃ -8hr	ppb	80	Average	DNA	19.9	2.11	8.76	DNA	DNA	DNA	3.41	DNA	DNA	6.02
			Max	DNA	56.5	4.06	20.1	DNA	DNA	DNA	20.7	DNA	DNA	15.0
			Min	DNA	0.28	1.33	3.58	DNA	DNA	DNA	0.17	DNA	DNA	0.68
			Exceedance (Hour)	DNA	0	0	0	DNA	DNA	DNA	0	DNA	DNA	0
			Data capture (%)	DNA	38	69	55	DNA	DNA	DNA	84	DNA	DNA	90

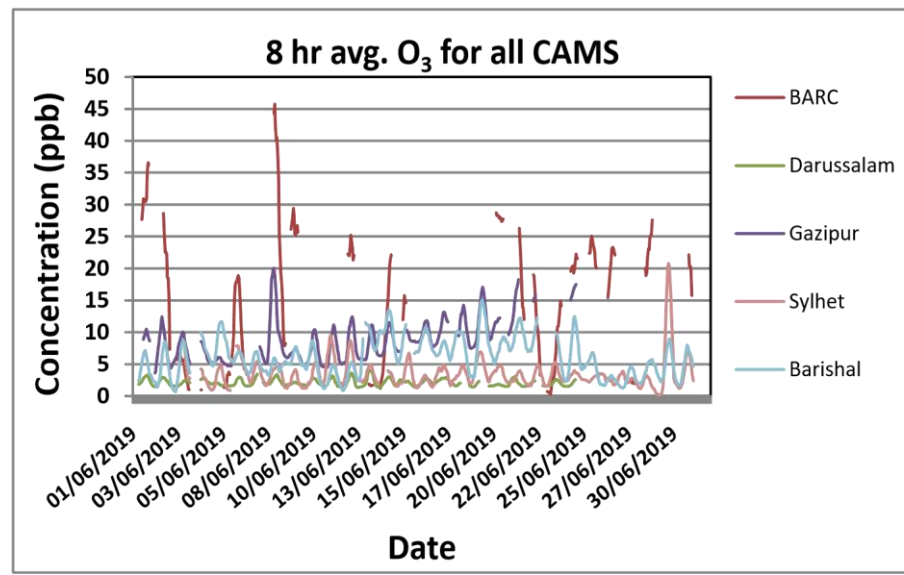
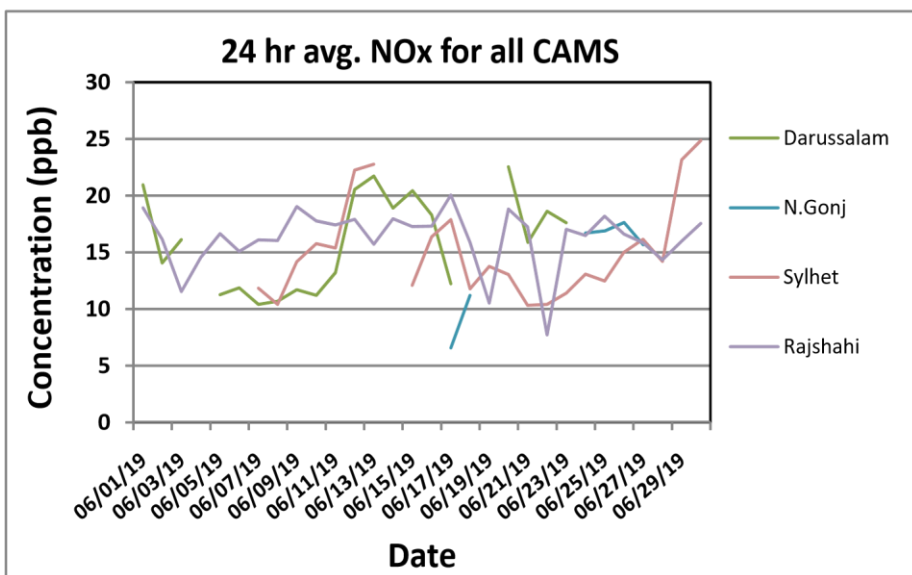
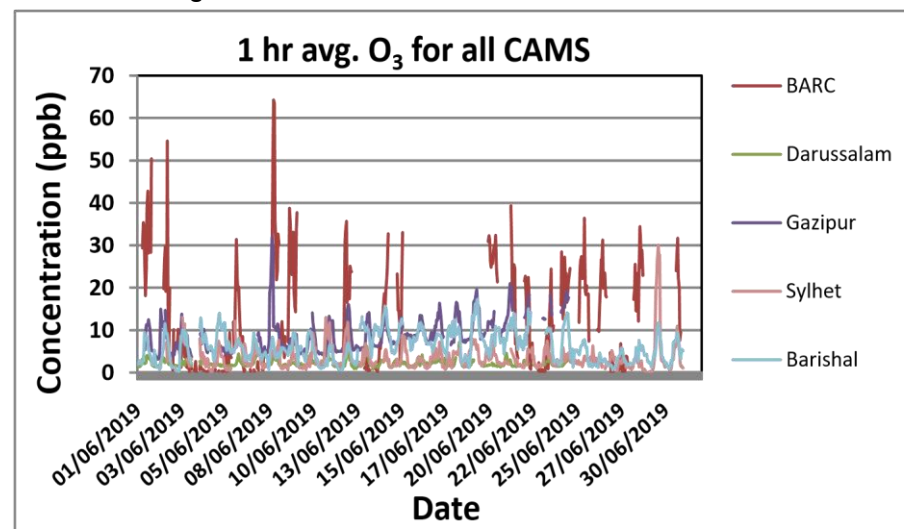
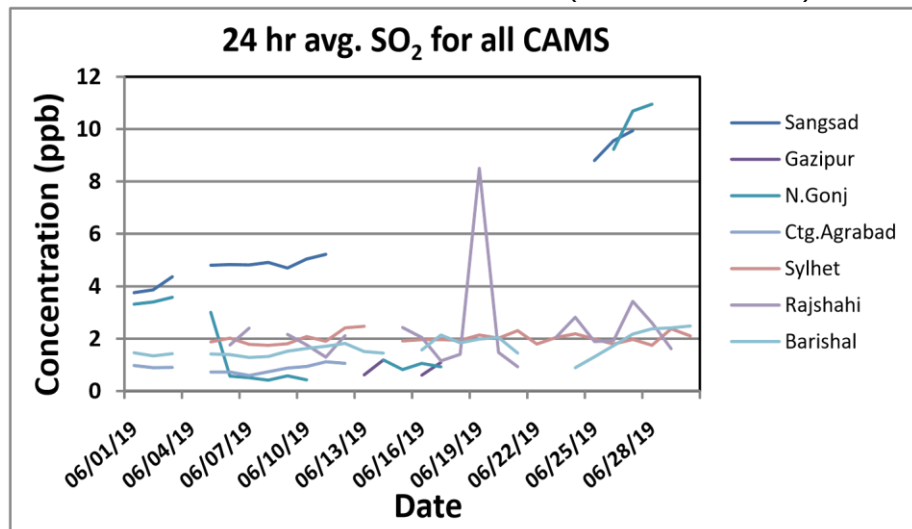
CAMS= Continuous Air Monitoring Station, NAAQS=National Ambient Air Quality Standard, a=Refurbishment CAMS, PM= Particulate Matter, DNA= Data Not Available

Summary Air Quality and Meteorological data measured during JUNE, 2019 at different CAMS operated under DoE (Cont'd)

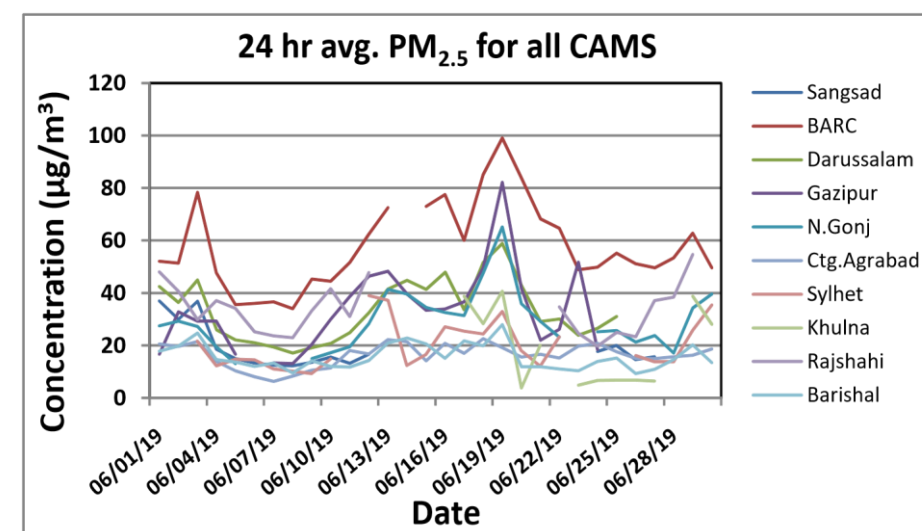
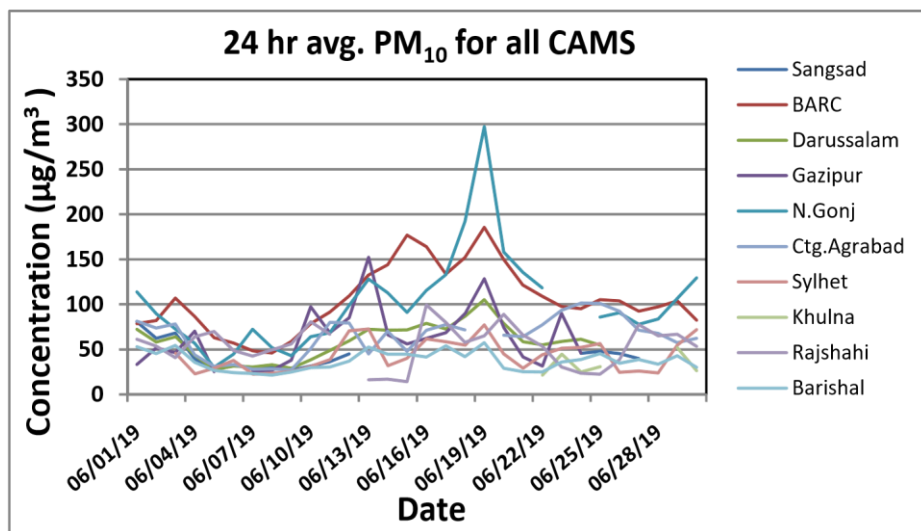
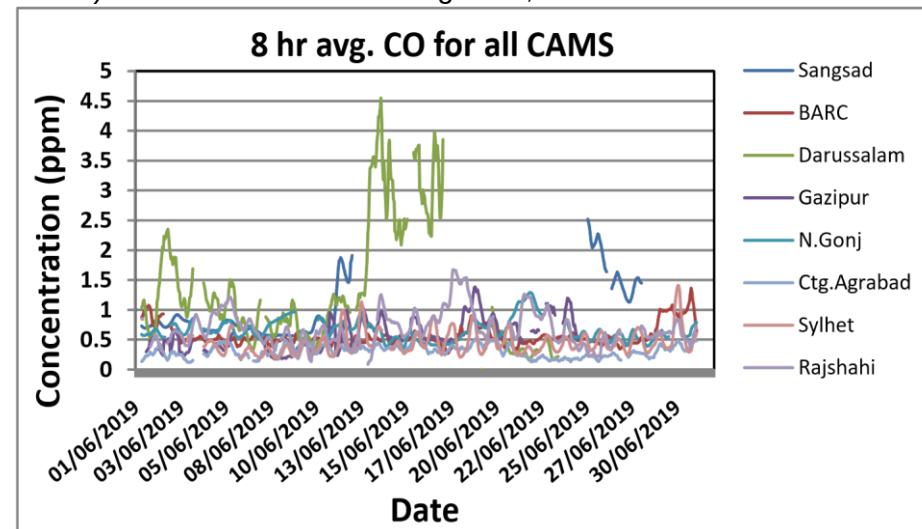
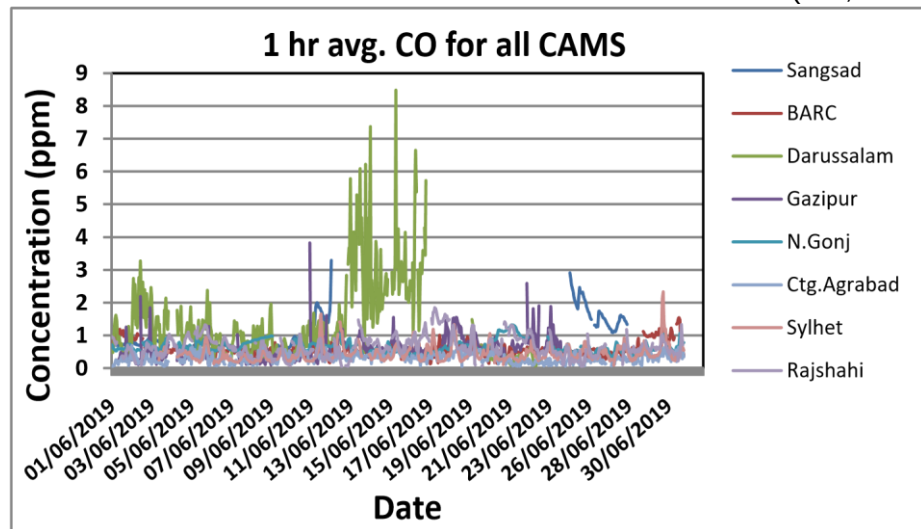
Parameter	unit	NAAQS	Summary	CAMS-1 (SBhaban)	CAMS-2 (BARC) ^a	CAMS-3 (D-salam)	CAMS-4 (Gazipur)	CAMS-5 (Narayanganj)	CAMS-6 TV-St (Chittagong) ^a	CAMS-7 Agrabad-Cht.)	CAMS-8 (Sylhet)	CAMS-9 (Khulna) ^a	CAMS-10 (Rajshahi) ^a	CAMS-11 (Barisal)
PM _{2.5} -24hr	µg /m ³	65	Average	18.9	58.0	33.2	33.5	29.4	DNA	16.4	20.1	19.2	33.7	15.7
			Max	37.0	99.1	58.9	82.2	65.2	DNA	22.7	39.1	40.7	54.7	28.0
			Min	12.3	34.1	17.1	13.1	13.1	DNA	6.29	9.31	3.87	19.8	9.37
			Excedance (Days)	0	8	0	1	1	DNA	0	0	0	0	0
			Data capture (%)	44	88	65	53	75	DNA	92	60	20	53	89
PM ₁₀ -24hr	µg /m ³	150	Average	43.0	105	58.4	64.1	102	DNA	64.6	43.5	36.0	54.0	37.4
			Max	80.4	186	105	152	298	DNA	101	77.2	57.6	99.3	57.5
			Min	26.7	45.9	27.6	25.2	30.0	DNA	27.4	22.3	21.3	14.1	21.5
			Excedance (Days)	0	5	0	1	3	DNA	0	0	0	0	0
			Data capture (%)	47	95	65	56	84	DNA	86	84	17	77	91
Solar rad. 1hr	watt/m ²	NA	Average	143	DNA	DNA	DNA	DNA	DNA	209	174	DNA	DNA	187
			Max	754	DNA	DNA	DNA	DNA	DNA	960	987	DNA	DNA	967
			Min	5.80	DNA	DNA	DNA	DNA	DNA	6.79	5.92	DNA	DNA	8.03
			Data capture (%)	48	DNA	DNA	DNA	DNA	DNA	97	87	DNA	DNA	93
Relative Humidity 1hr	(%)	NA	Average	76.6	66.5	DNA	DNA	77.0	DNA	76.2	83.7	DNA	DNA	81.8
			Max	91.6	73.2	DNA	DNA	90.3	DNA	92.3	99.4	DNA	DNA	97.7
			Min	45.7	58.2	DNA	DNA	46.7	DNA	46.5	54.0	DNA	DNA	55.0
			Data capture (%)	48	94	DNA	DNA	92	DNA	97	87	DNA	DNA	93
Ambient Temp. 1hr	(°c)	NA	Average	26.7	27.2	DNA	DNA	31.1	DNA	26.3	28.8	DNA	DNA	30.9
			Max	34.4	45.0	DNA	DNA	37.7	DNA	28.8	35.5	DNA	DNA	37.4
			Min	20.2	20.5	DNA	DNA	24.1	DNA	23.9	23.1	DNA	DNA	25.2
			Data capture (%)	48	94	DNA	DNA	92	DNA	97	87	DNA	DNA	93
Rainfall 1hr	(m.m.)	NA	Average	0.70	DNA	7.68	1.63	DNA	DNA	0.12	0.41	DNA	2.78	DNA
			Max	14.2	DNA	15.2	3.28	DNA	DNA	6.21	10.0	DNA	5.86	DNA
			Min	0.02	DNA	1.01	0.04	DNA	DNA	0.02	0.02	DNA	1.80	DNA
			Data capture (%)	41	DNA	60	64	DNA	DNA	90	68	DNA	90	DNA

CAMS= Continuous Air Monitoring Station, NAAQS=National Ambient Air Quality Standard, a=Refurbishment CAMS, PM= Particulate Matter DNA= Data Not Available

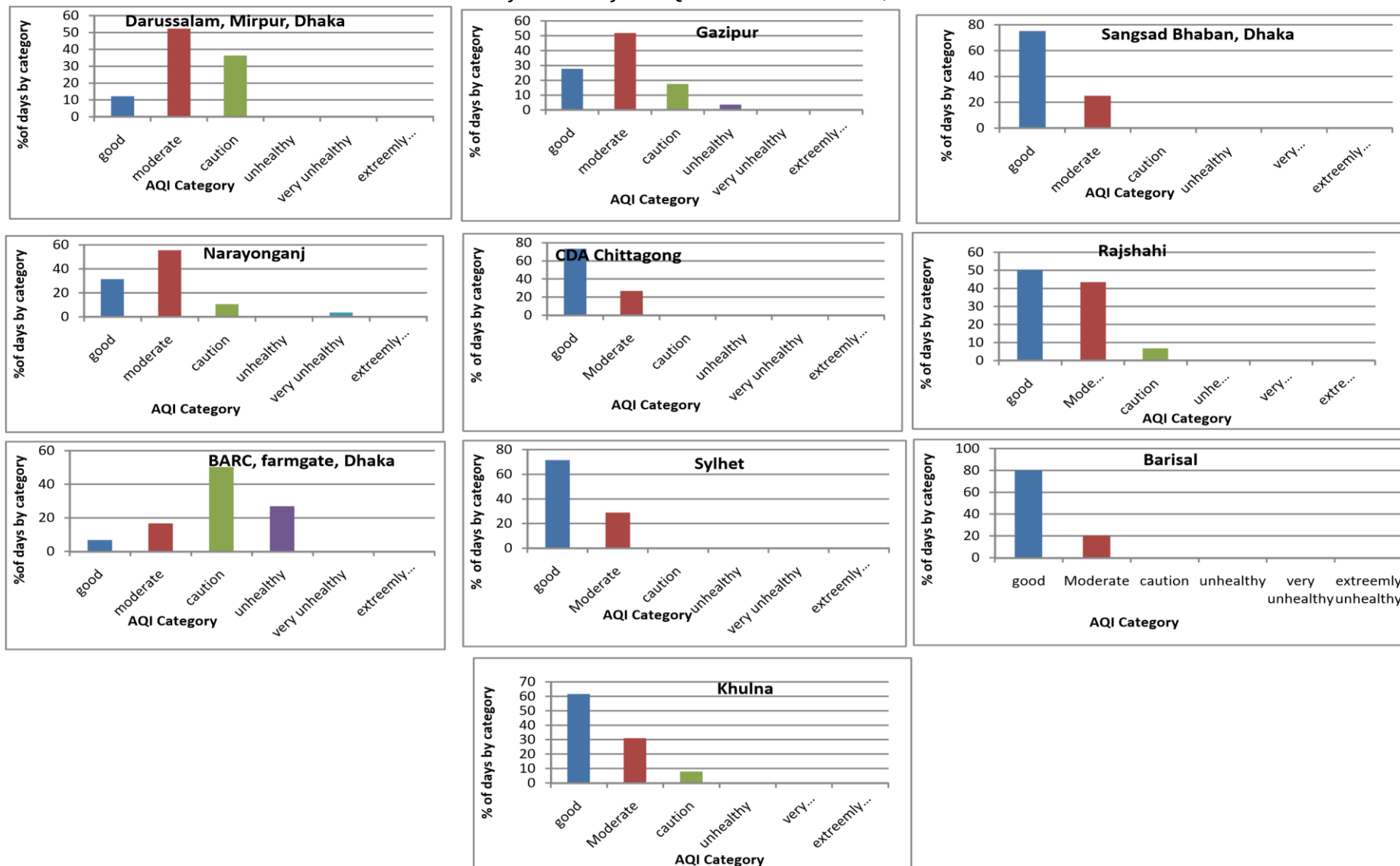
Time Series of All Parameters (SO₂, NO_x and O₃) Measured In All Cams During June, 2019



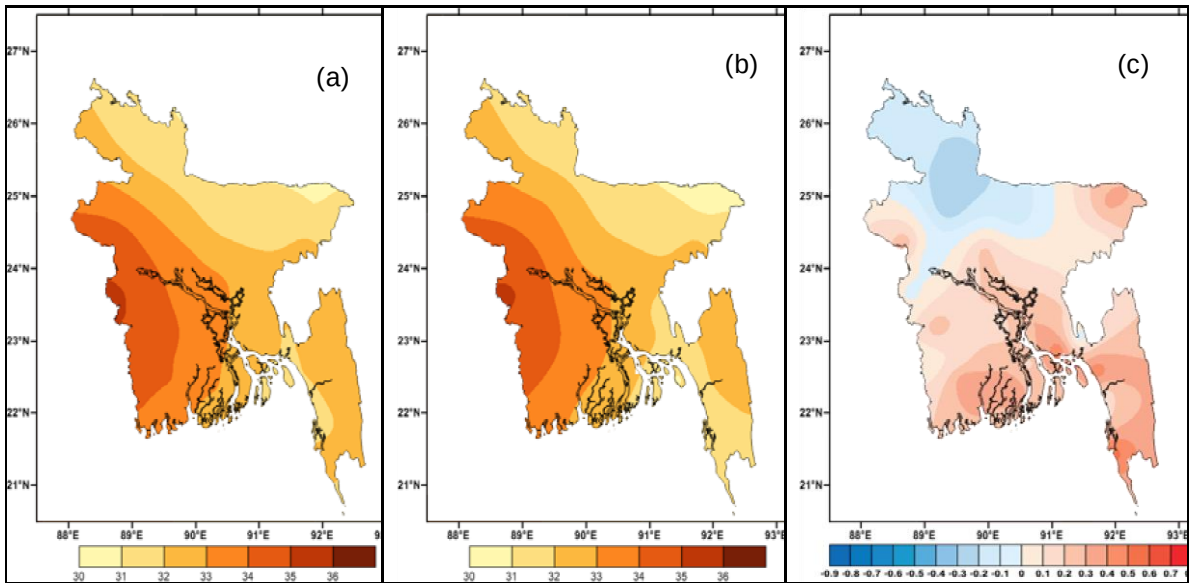
Time Series of All Parameters (CO, PM10 and PM2.5) Measured In Cams During June, 2019



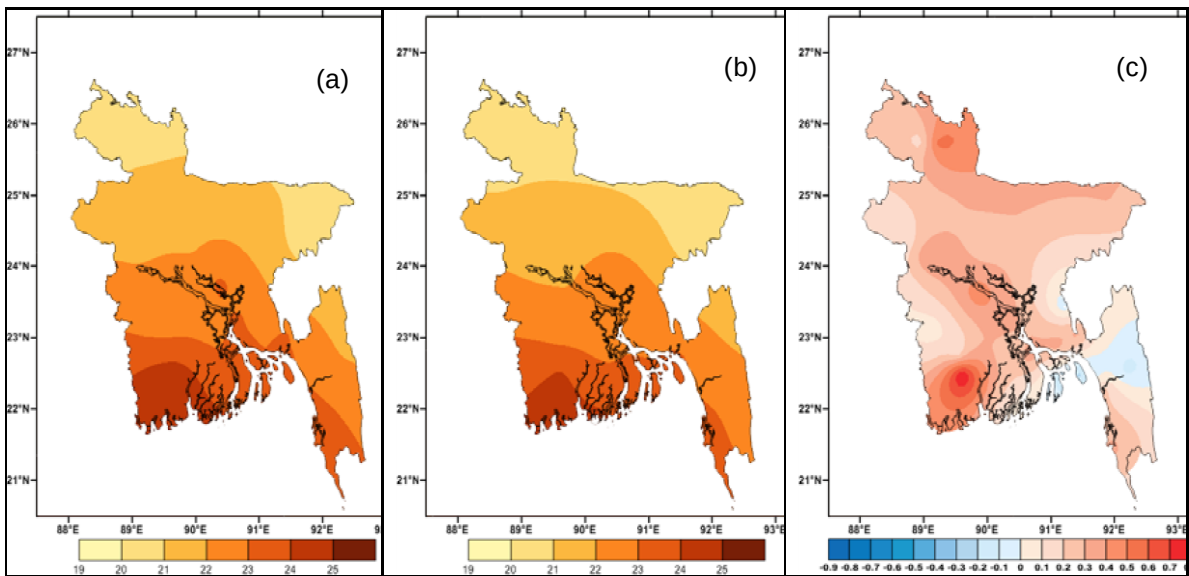
Monthly Summary of AQI for month of JUNE, 2019



Annex 2: Temperature of Bangladesh in various seasons.

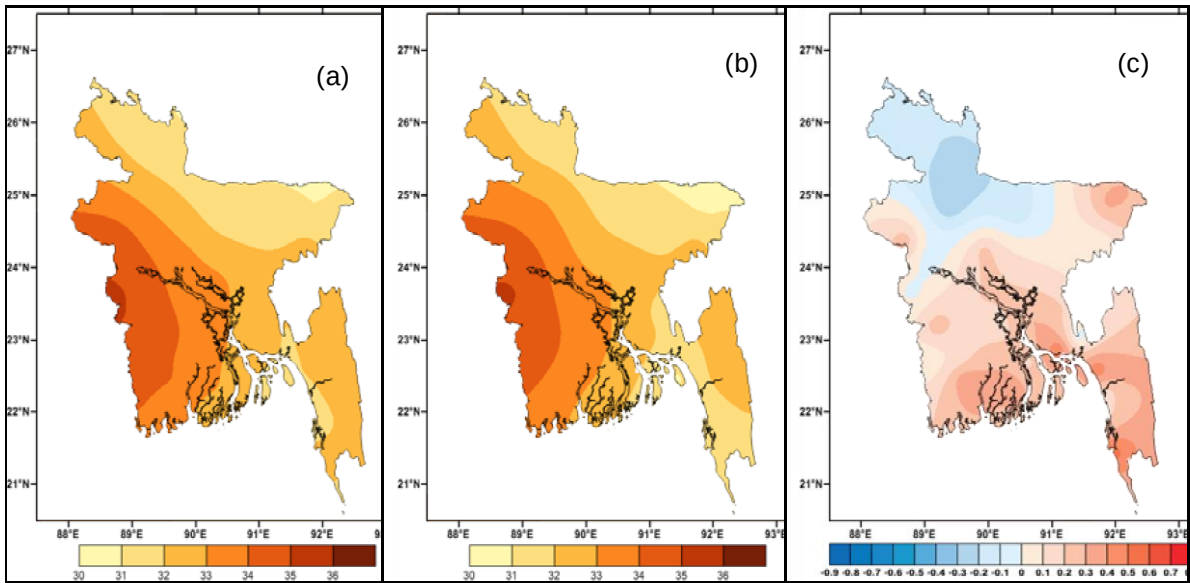


Spatial distribution of pre-monsoon maximum temperature (a) during 1981-2010, (b) during 1971-2000 and (c) deviation of pre-monsoon maximum temperature during 1981-2010 from 1971-2000.

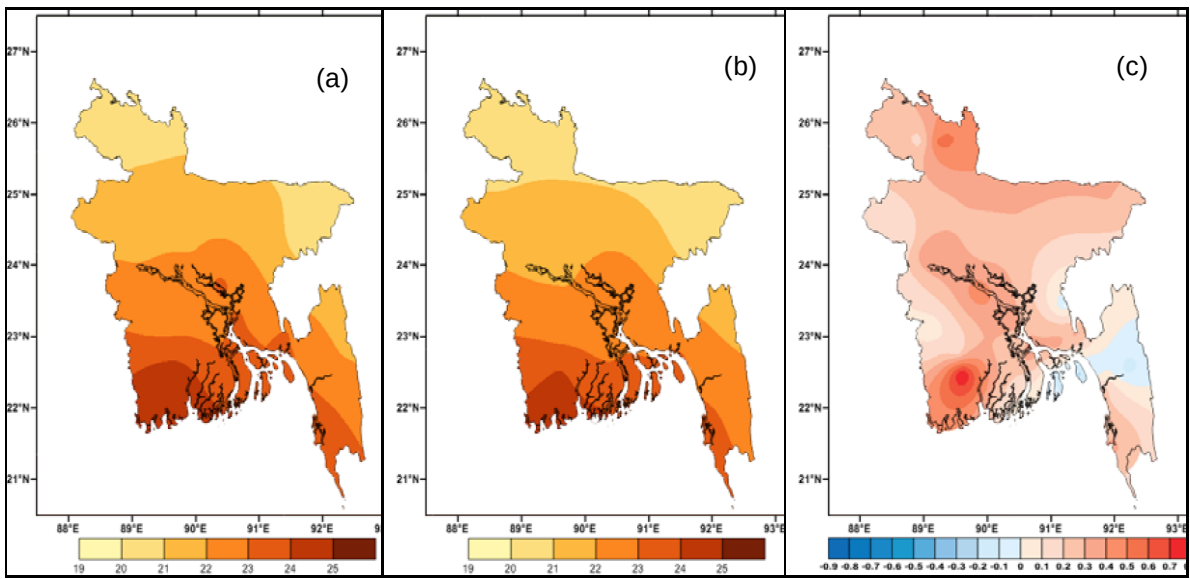


Spatial distribution of pre-monsoon minimum temperature (a) during 1981-2010, (b) during 1971-2000 and (c) deviation of pre-monsoon minimum temperature during 1981-2010 from 1971-2000.

CAPEX/BMRE for upgradation and modernization of existing core network infrastructure and strengthening of overall network capacity by Robi Axiata Ltd. (Robi).

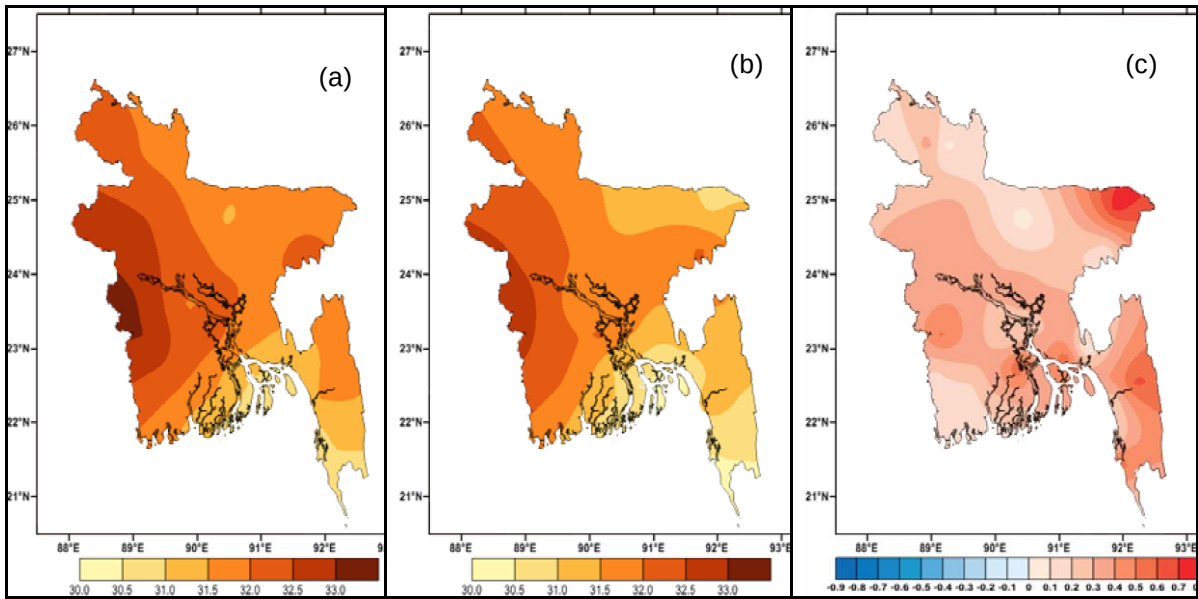


Spatial distribution of pre-monsoon maximum temperature (a) during 1981-2010, (b) during 1971-2000 and (c) deviation of pre-monsoon maximum temperature during 1981-2010 from 1971-2000.

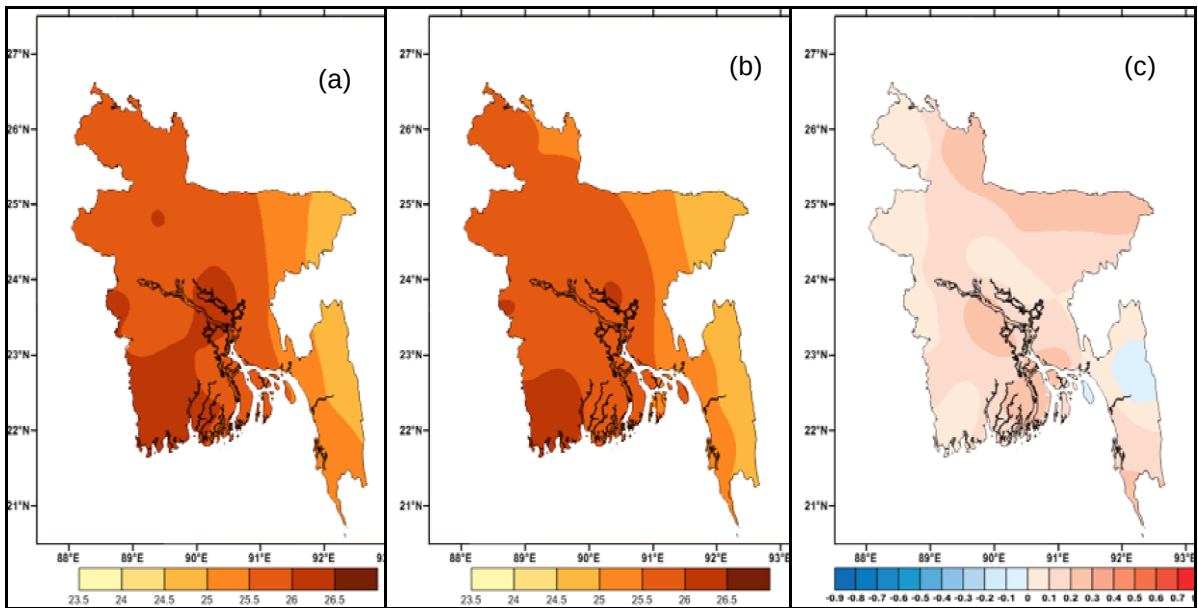


Spatial distribution of pre-monsoon minimum temperature (a) during 1981-2010, (b) during 1971-2000 and (c) deviation of pre-monsoon minimum temperature during 1981-2010 from 1971-2000.

CAPEX/BMRE for upgradation and modernization of existing core network infrastructure and strengthening of overall network capacity by Robi Axiata Ltd. (Robi).

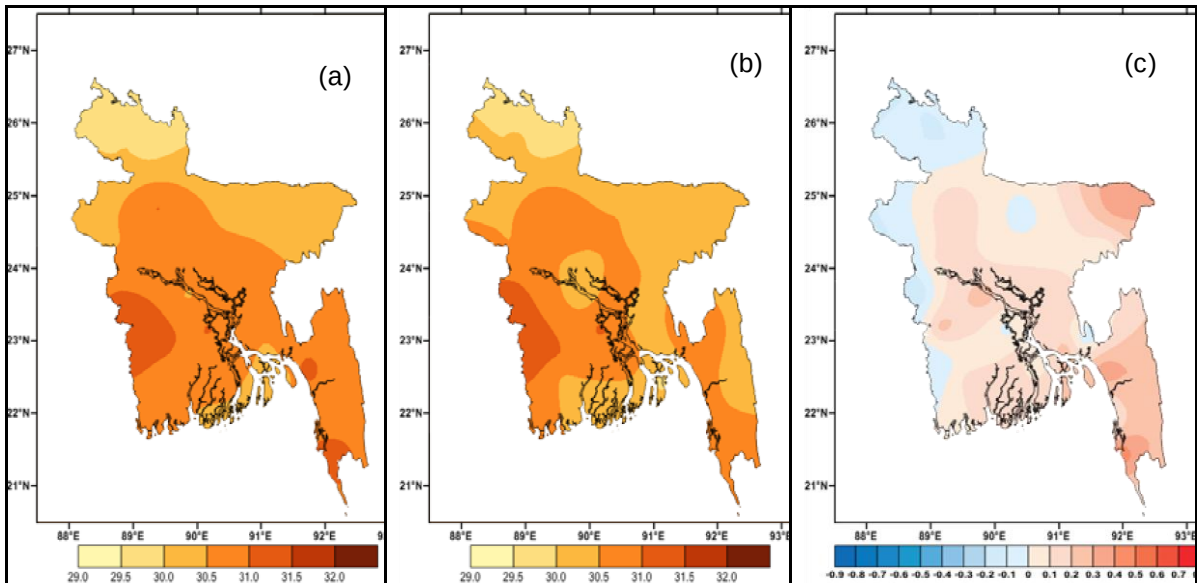


Spatial distribution of monsoon maximum temperature (a) during 1981-2010, (b) during 1971-2000 and (c) deviation of monsoon maximum temperature during 1981-2010 from 1971-2000.

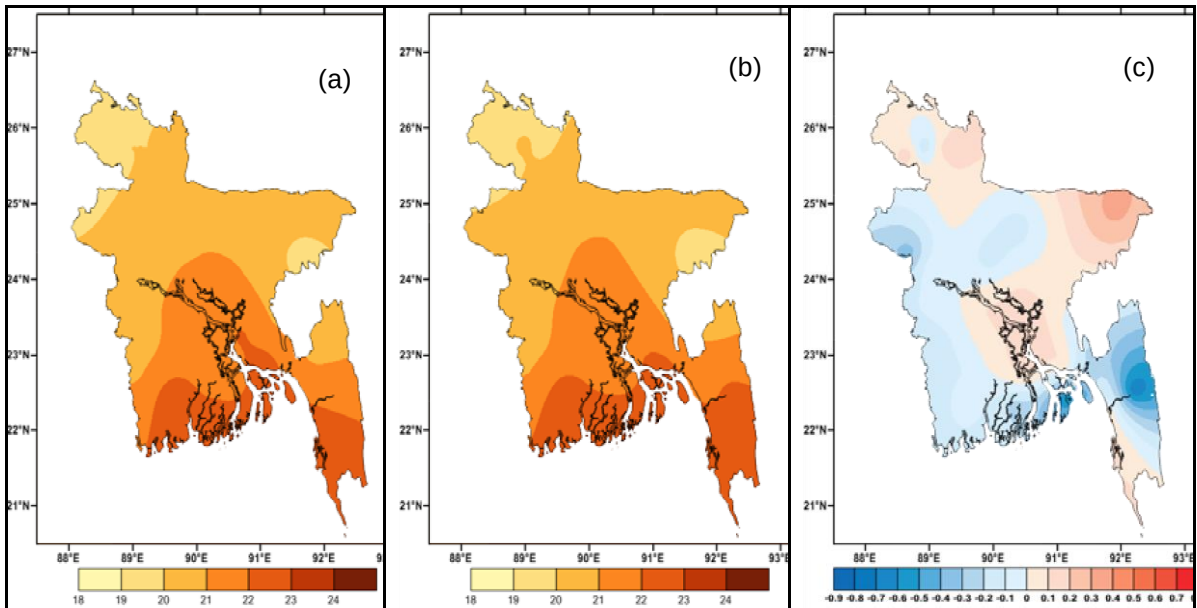


Spatial distribution of monsoon minimum temperature (a) during 1981-2010, (b) during 1971-2000 and (c) deviation of monsoon minimum temperature during 1981-2010 from 1971-2000.

CAPEX/BMRE for upgradation and modernization of existing core network infrastructure and strengthening of overall network capacity by Robi Axiata Ltd. (Robi).

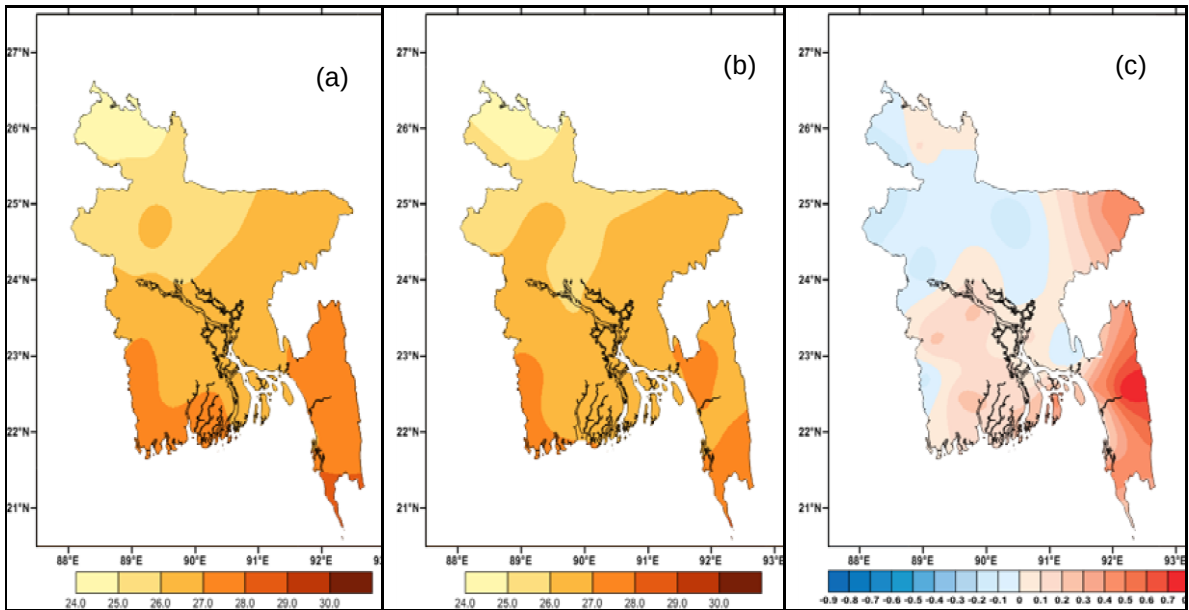


Spatial distribution of post-monsoon maximum temperature (a) during 1981-2010, (b) during 1971-2000 and (c) deviation of post-monsoon maximum temperature during 1981-2010 from 1971-2000.

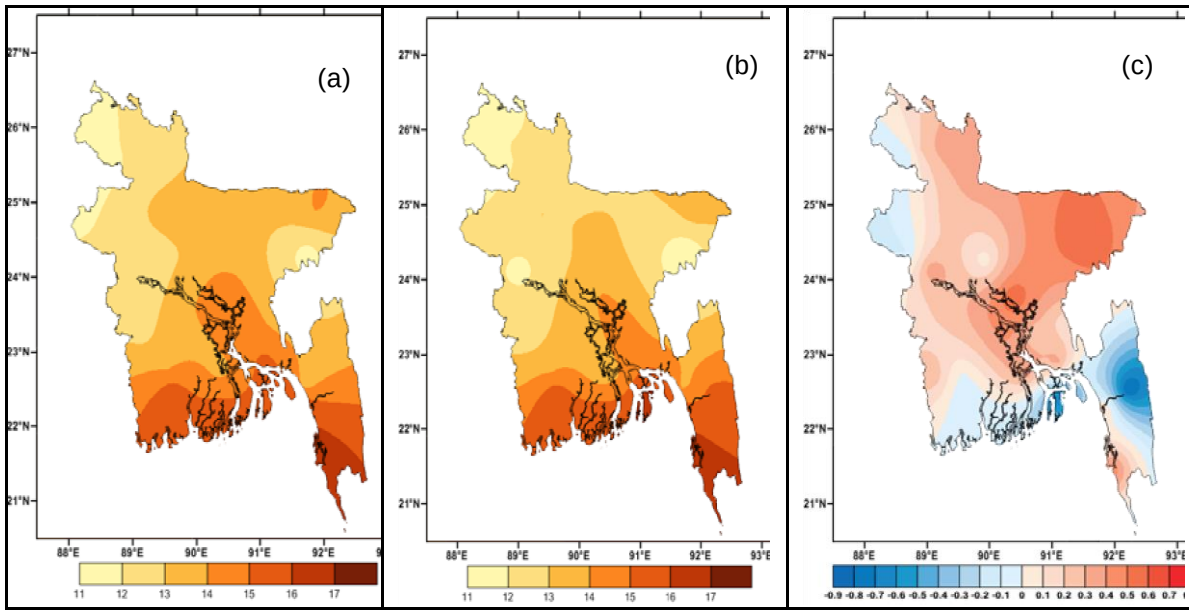


Spatial distribution of post-monsoon minimum temperature (a) during 1981-2010, (b) during 1971-2000 and (c) deviation of post-monsoon minimum temperature during 1981-2010 from 1971-2000.

CAPEX/BMRE for upgradation and modernization of existing core network infrastructure and strengthening of overall network capacity by Robi Axiata Ltd. (Robi).

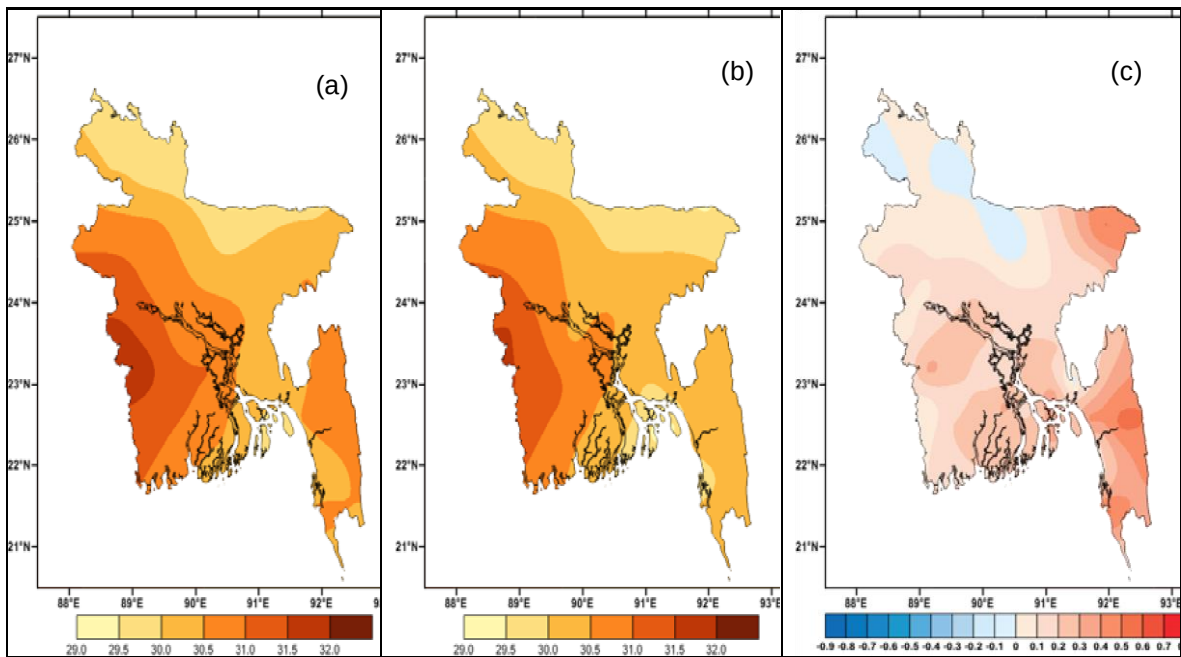


Spatial distribution of winter maximum temperature (a) during 1981-2010, (b) during 1971-2000 and (c) deviation of winter maximum temperature during 1981-2010 from 19712000.

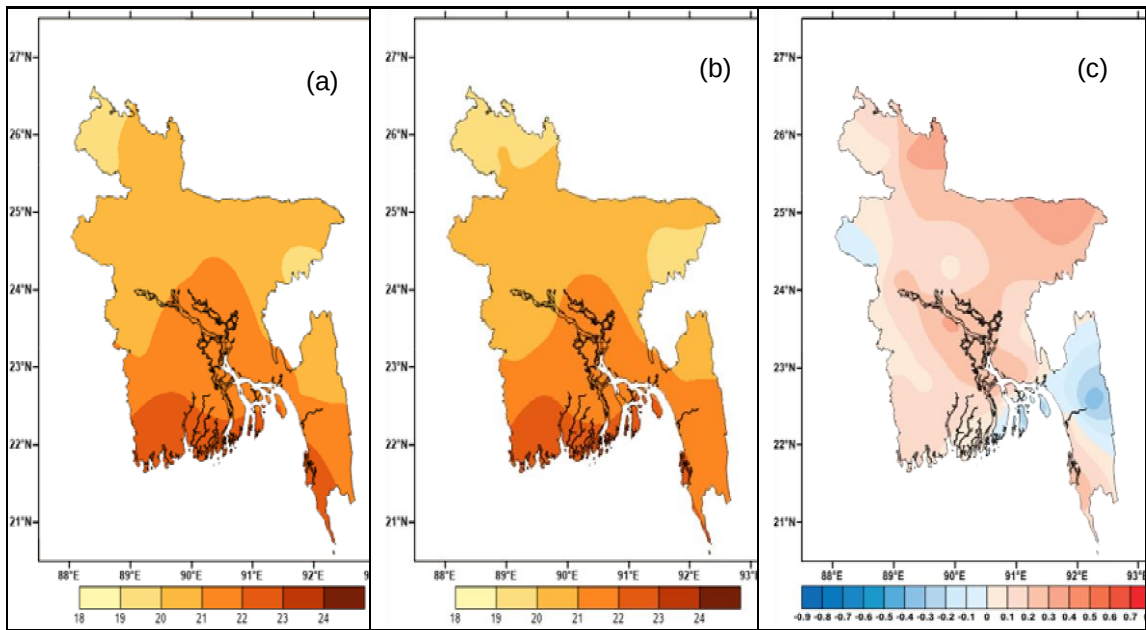


Spatial distribution of winter minimum temperature (a) during 1981-2010, (b) during 1971-2000 and (c) deviation of winter minimum temperature during 1981-2010 from 1971-2000.

CAPEX/BMRE for upgradation and modernization of existing core network infrastructure and strengthening of overall network capacity by Robi Axiata Ltd. (Robi).

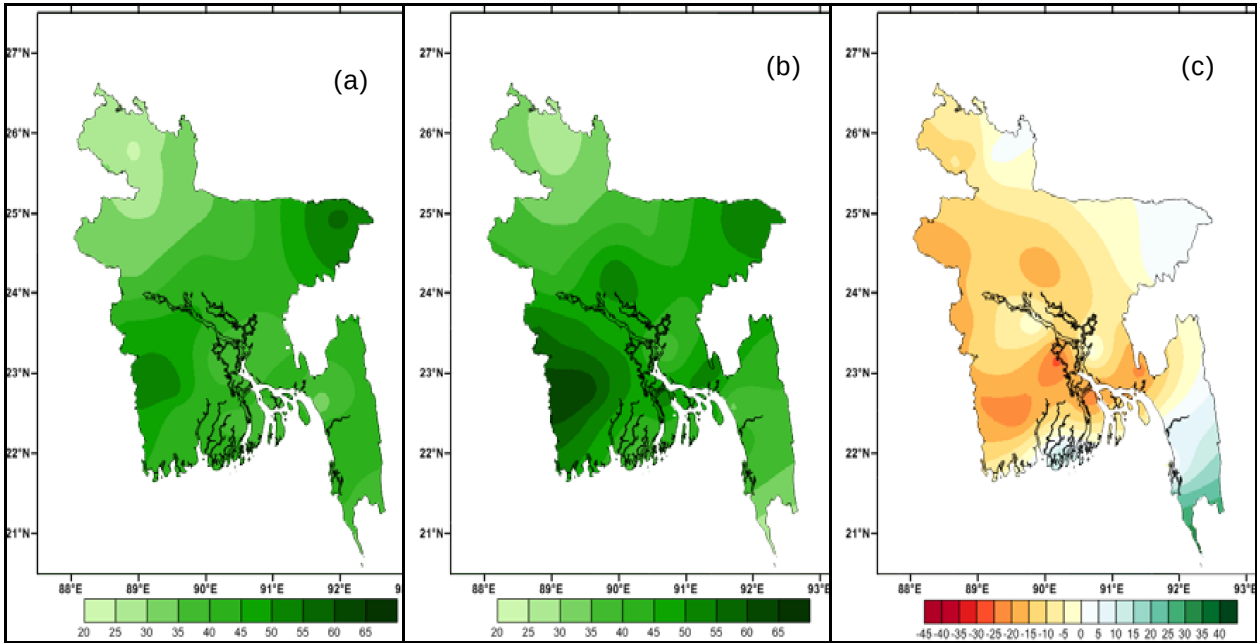


Spatial distribution of annual maximum temperature (a) during 1981-2010, (b) during 1971-2000 and (c) deviation of annual maximum temperature during 1981-2010 from 1971-2000.

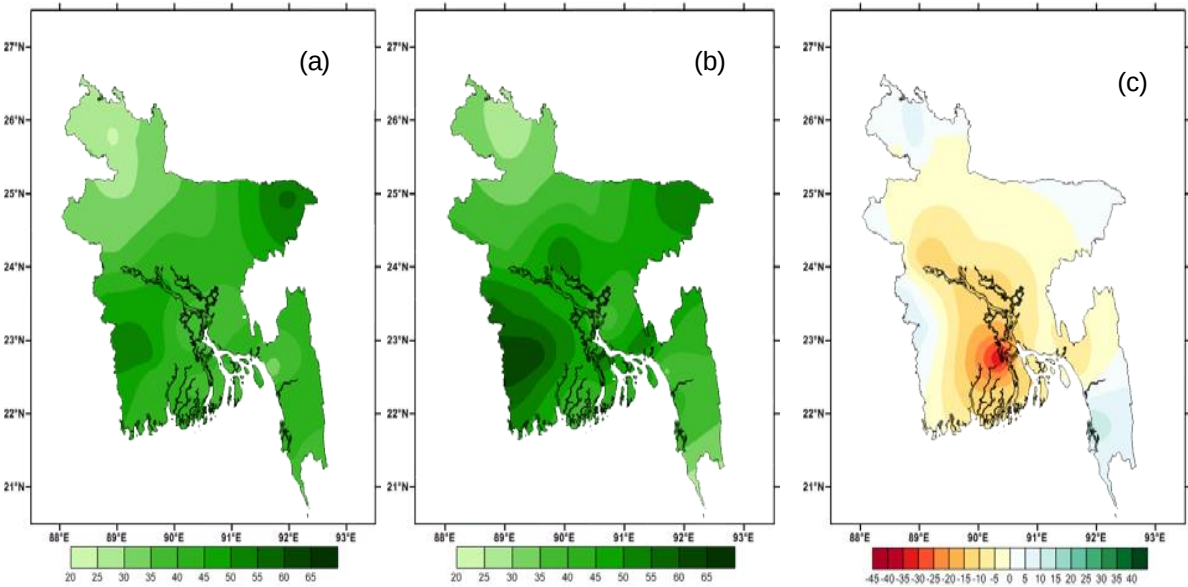


Spatial distribution of annual minimum temperature (a) during 1981-2010, (b) during 1971-2000 and (c) deviation of annual minimum temperature during 1981-2010 from 1971-2000.

Annex 3: Rainfall in various season

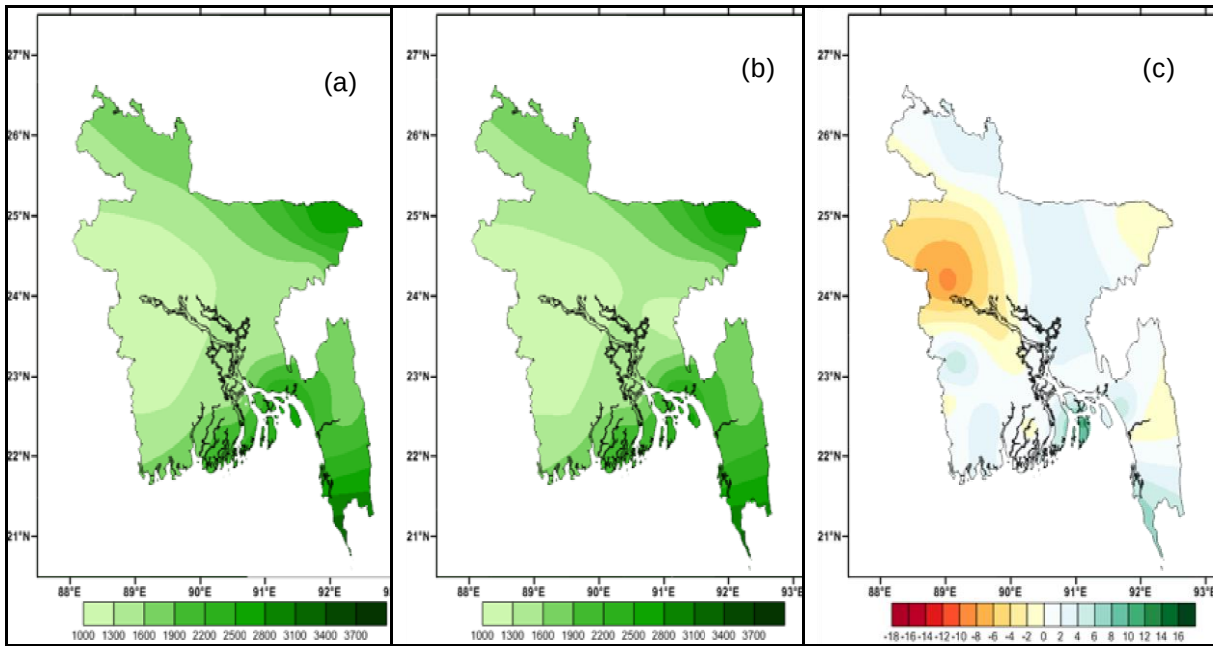


Spatial distribution of Winter Rainfall (a) during 1981-2010, (b) during 1971-2000 and (c) deviation (%) of Winter Rainfall during 1981-2010 based on 1971-2000.

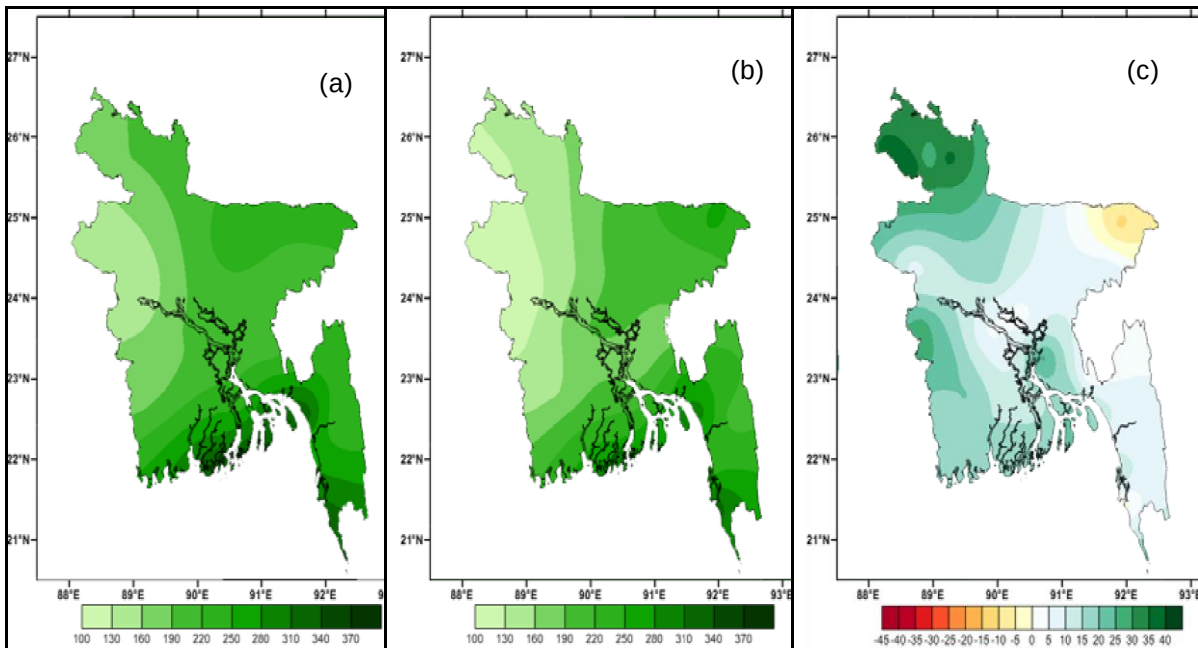


Spatial distribution of Pre-Monsoon Rainfall (a) during 1981-2010, (b) during 19712000 and (c) deviation (%) of Pre-Monsoon Rainfall during 1981-2010 based on 1971 2000.

CAPEX/BMRE for upgradation and modernization of existing core network infrastructure and strengthening of overall network capacity by Robi Axiata Ltd. (Robi).

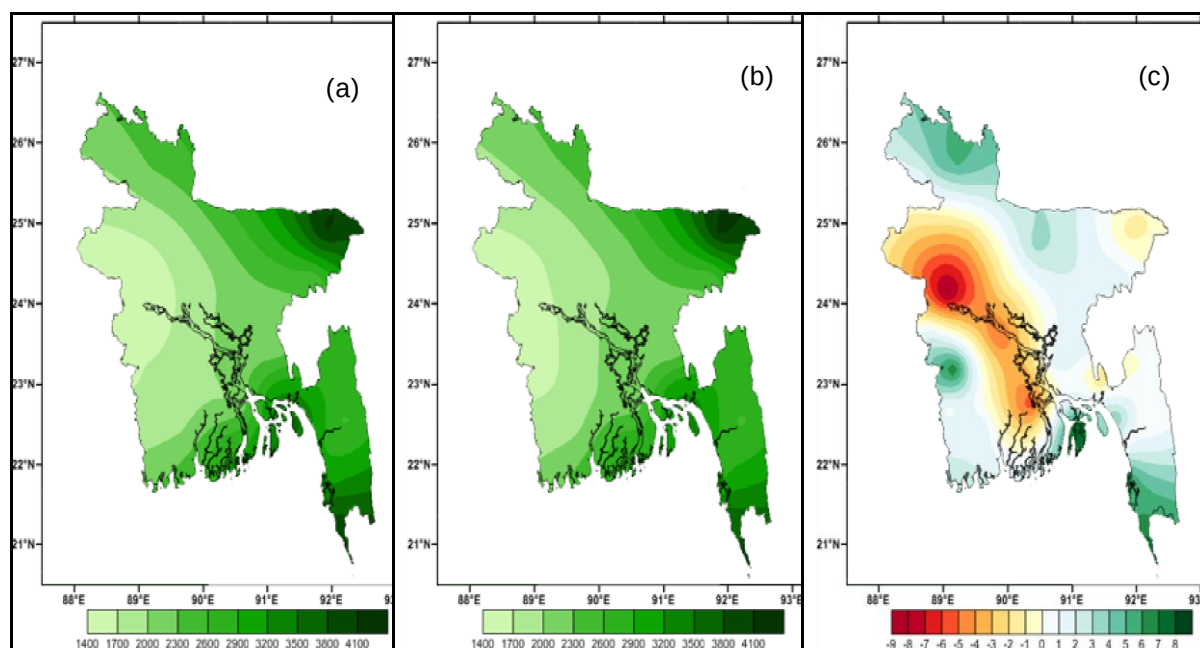


Spatial distribution of Monsoon Rainfall (a) during 1981-2010, (b) during 1971-2000 and (c) deviation (%) of Monsoon Rainfall during 1981-2010 based on 1971-2000.



Spatial distribution of Post-monsoon Rainfall (a) during 1981-2010, (b) during 19712000 and (c) deviation (%) of Post-monsoon Rainfall during 1981-2010 based on 1971-2000.

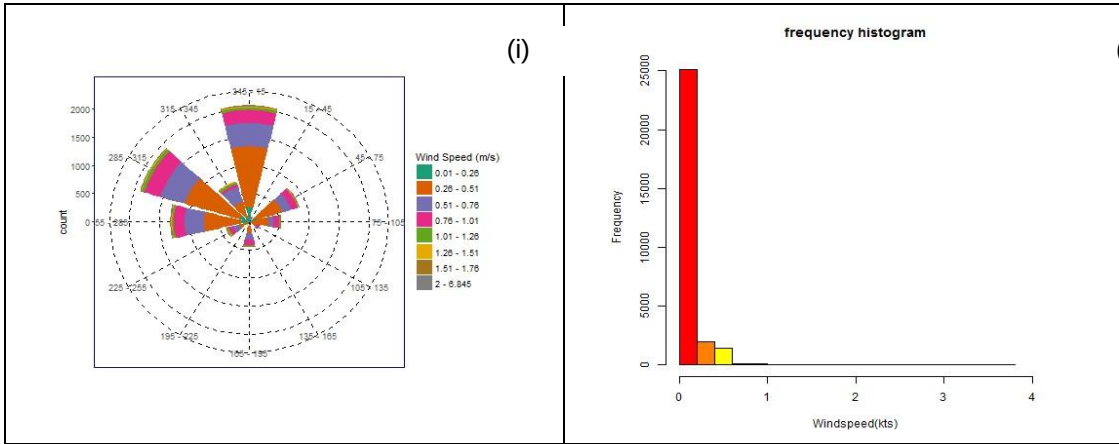
CAPEX/BMRE for upgradation and modernization of existing core network infrastructure and strengthening of overall network capacity by Robi Axiata Ltd. (Robi).



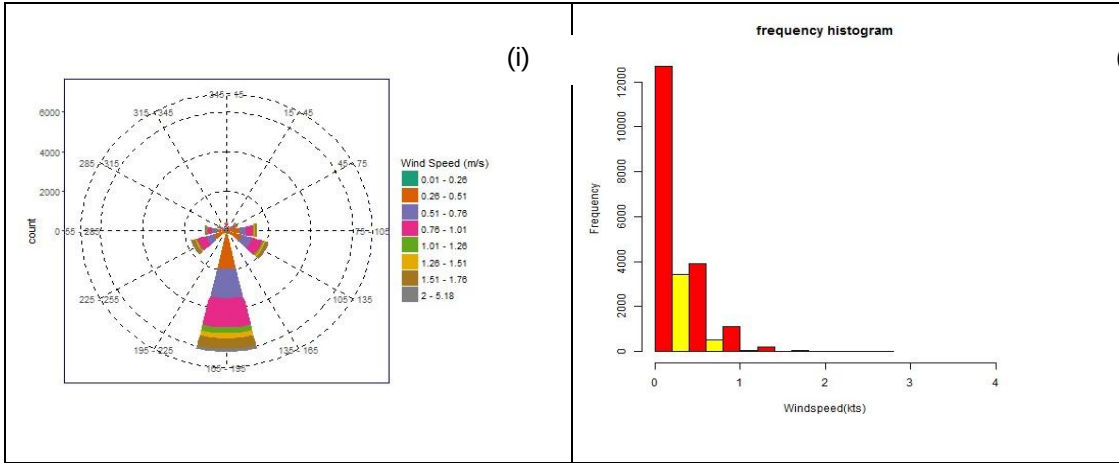
Spatial distribution of Annual Rainfall (a) during 1981-2010, (b) during 1971-2000 and (c) deviation (%) of Annual Rainfall during 1981-2010 based on 1971-2000.

CAPEX/BMRE for upgradation and modernization of existing core network infrastructure and strengthening of overall network capacity by Robi Axiata Ltd. (Robi).

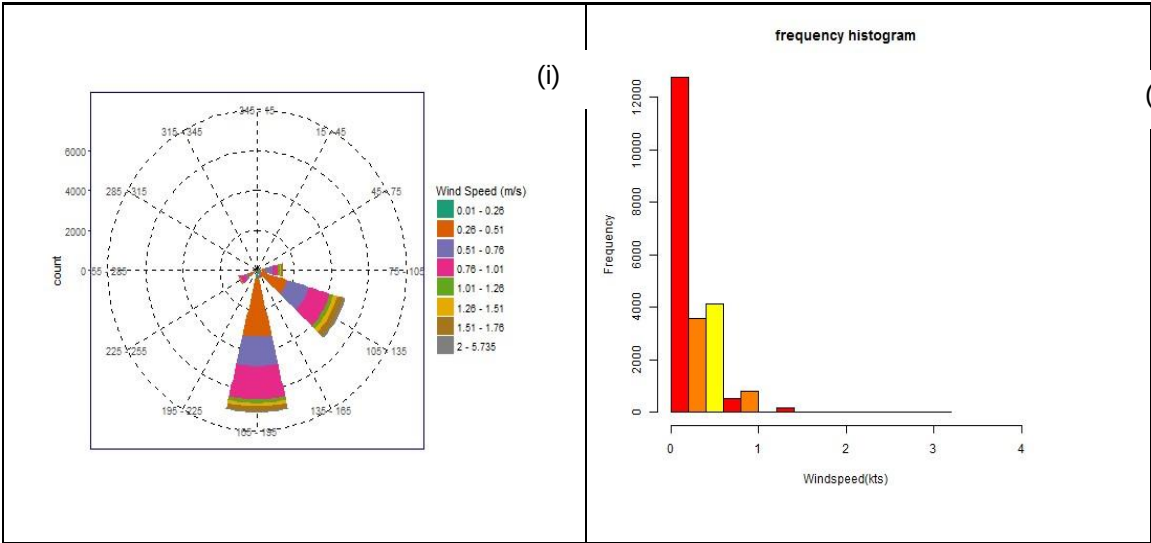
Annex 4: Distribution of wind direction and wind speed in various seasons in different weather station



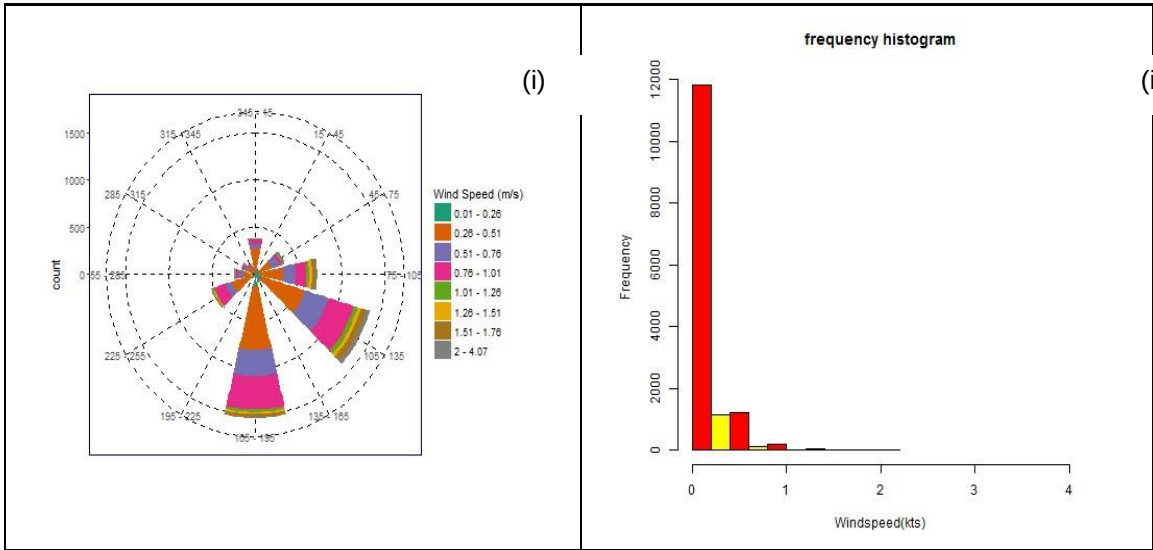
Distribution of (i) wind direction and (ii) wind speed of Dhaka during Winter Season



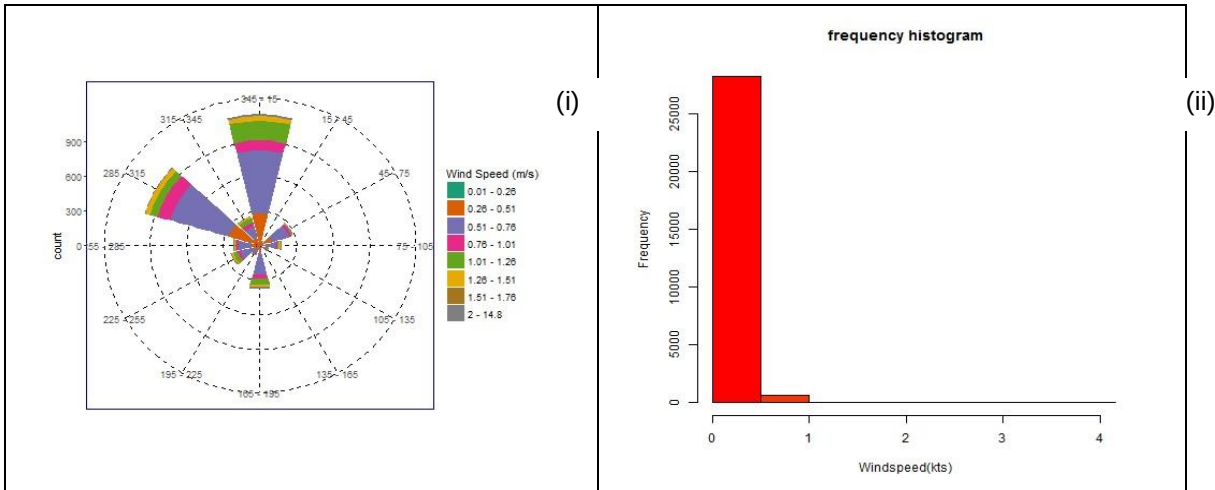
Distribution of (i) wind direction and (ii) wind speed of Dhaka during Pre-monsoon Season



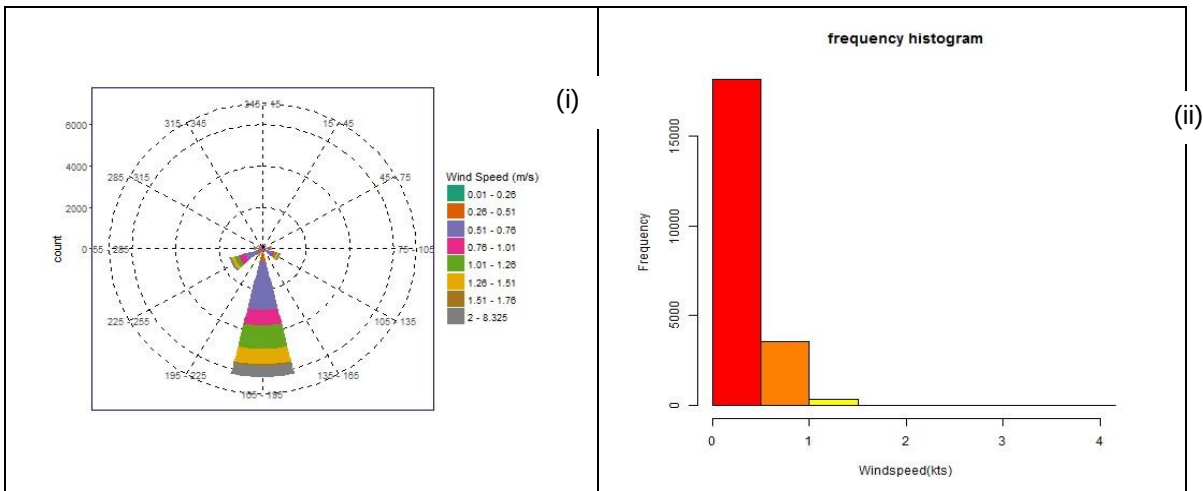
Distribution of (i) wind direction and (ii) wind speed of Dhaka during Monsoon Season



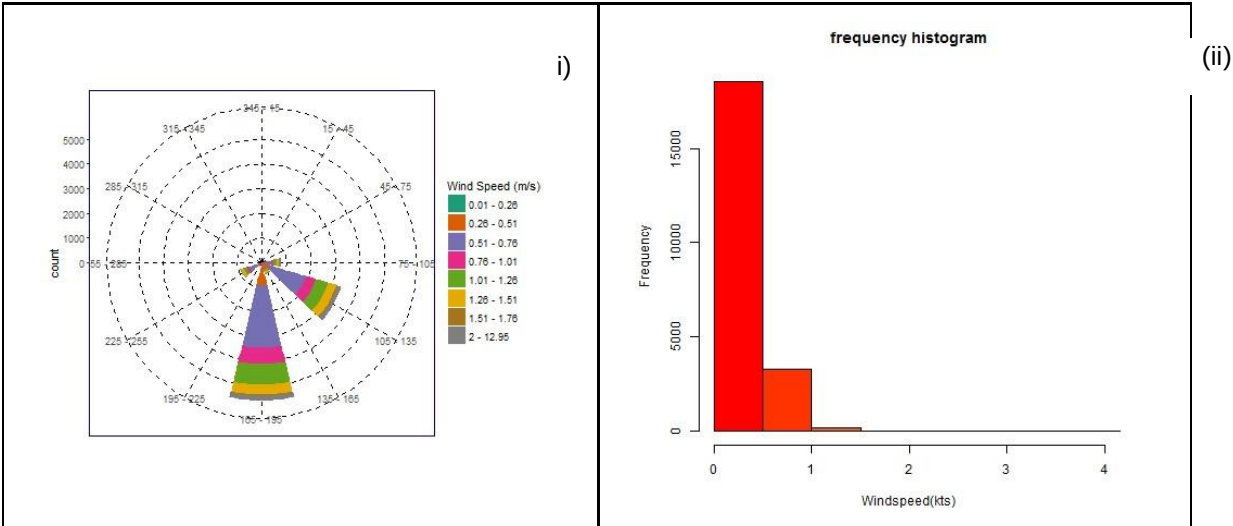
Distribution of (i) wind direction and (ii) wind speed of Dhaka during Post-monsoon Season



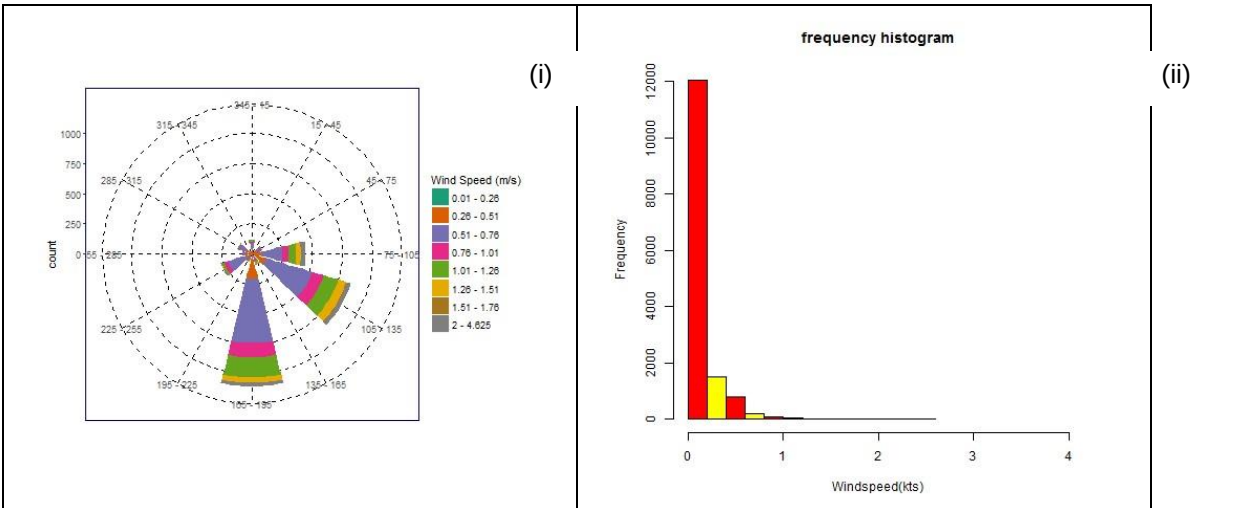
Distribution of (i) wind direction and (ii) wind speed of Barisal during Winter Season



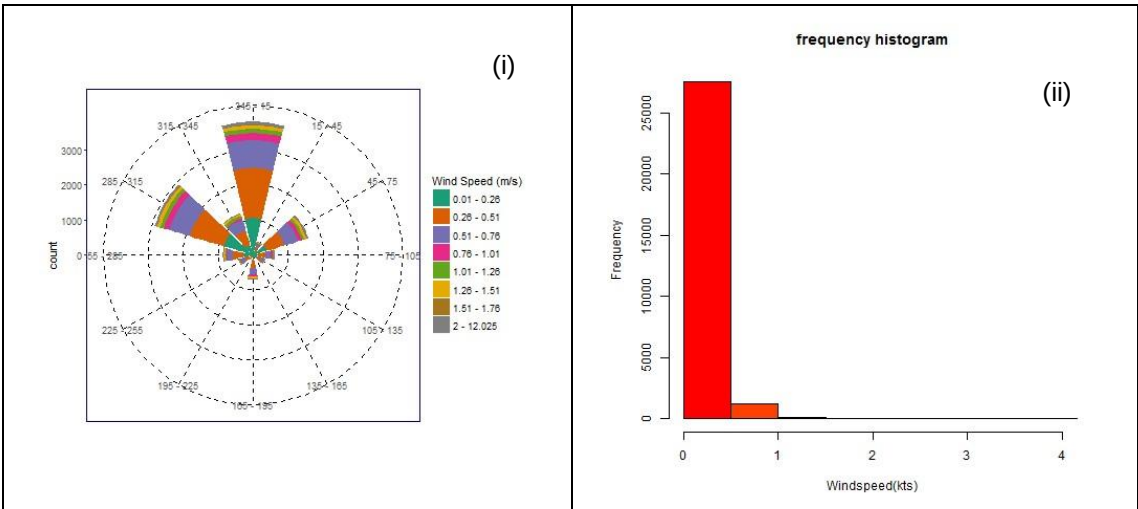
Distribution of (i) wind direction and (ii) wind speed of Barisal during Pre-monsoon Season



Distribution of (i) wind direction and (ii) wind speed of Barisal during Monsoon Season

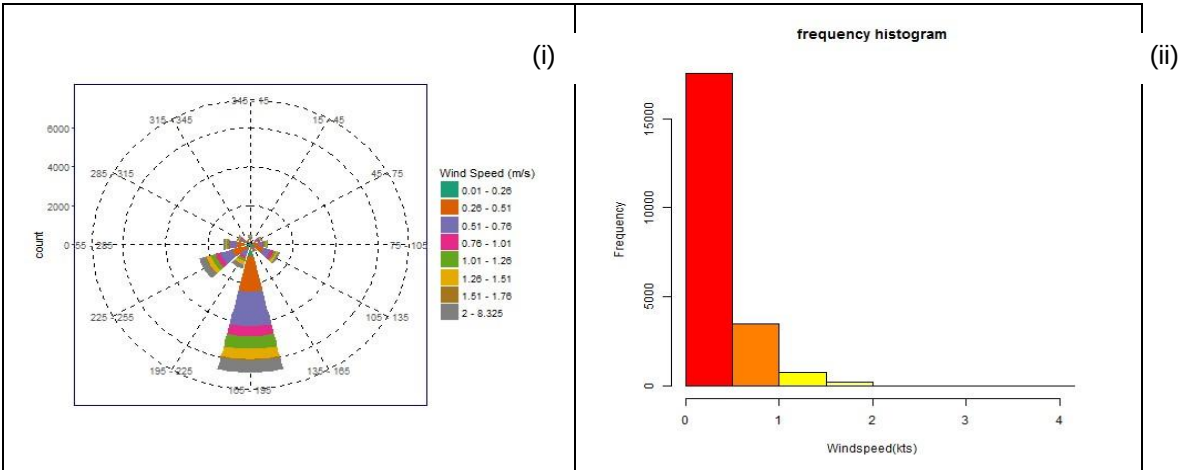


Distribution of (i) wind direction and (ii) wind speed of Barisal during Post-Monsoon Season

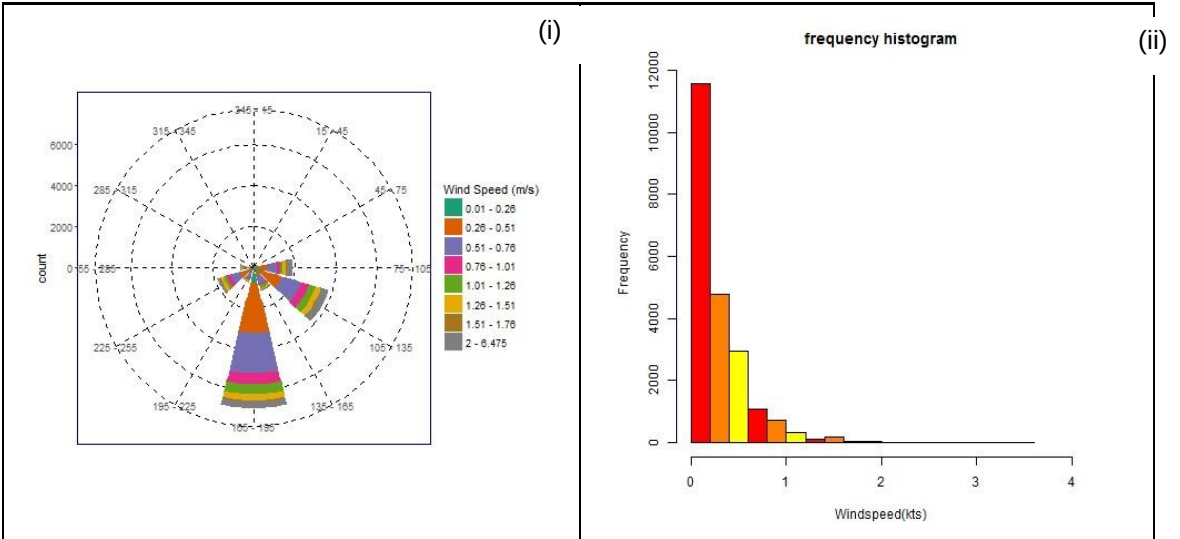


Distribution of (i) wind direction and (ii) wind speed of Khulna during Winter Season

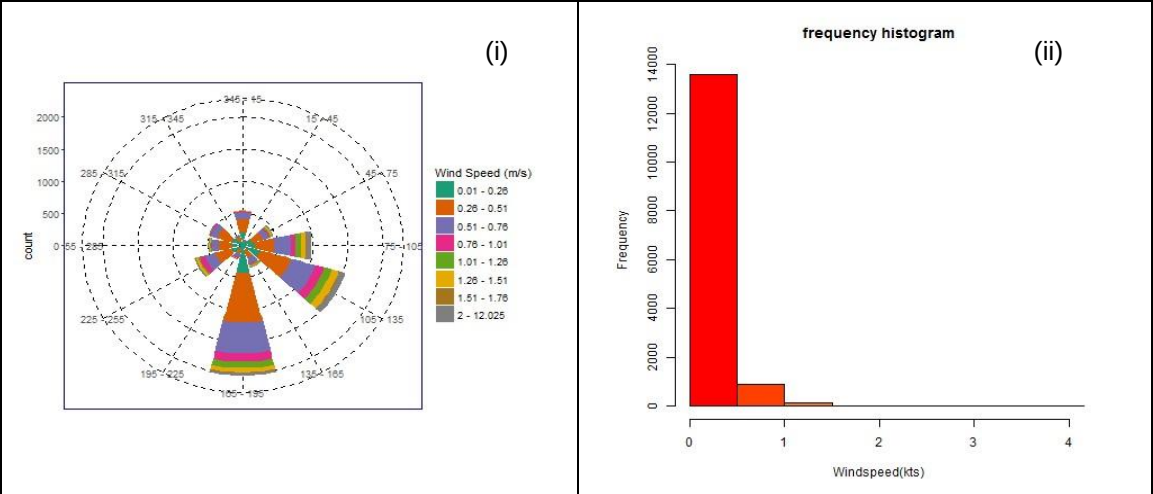
CAPEX/BMRE for upgradation and modernization of existing core network infrastructure and strengthening of overall network capacity by Robi Axiata Ltd. (Robi).



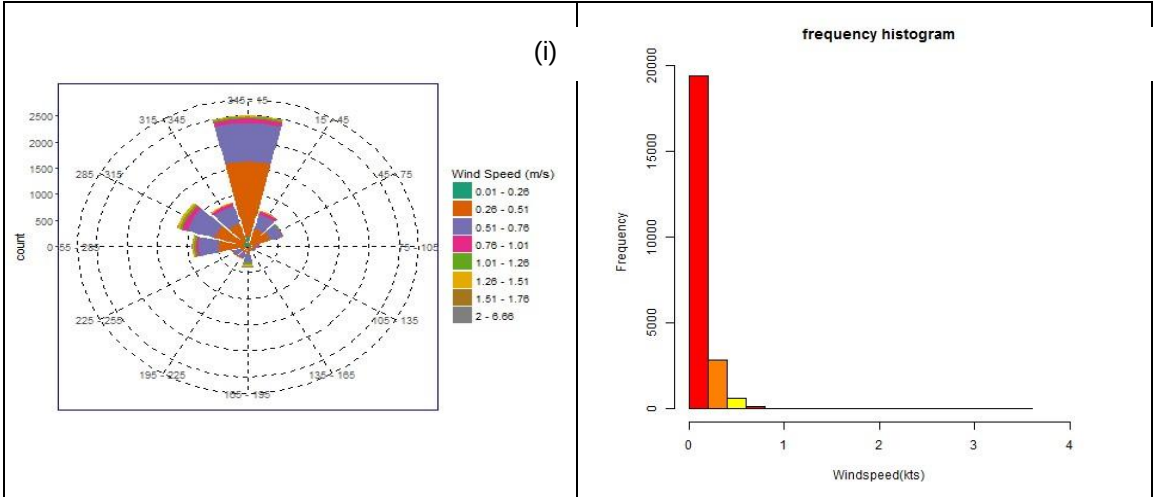
Distribution of (i) wind direction and (ii) wind speed of Khulna during Pre-monsoon Season



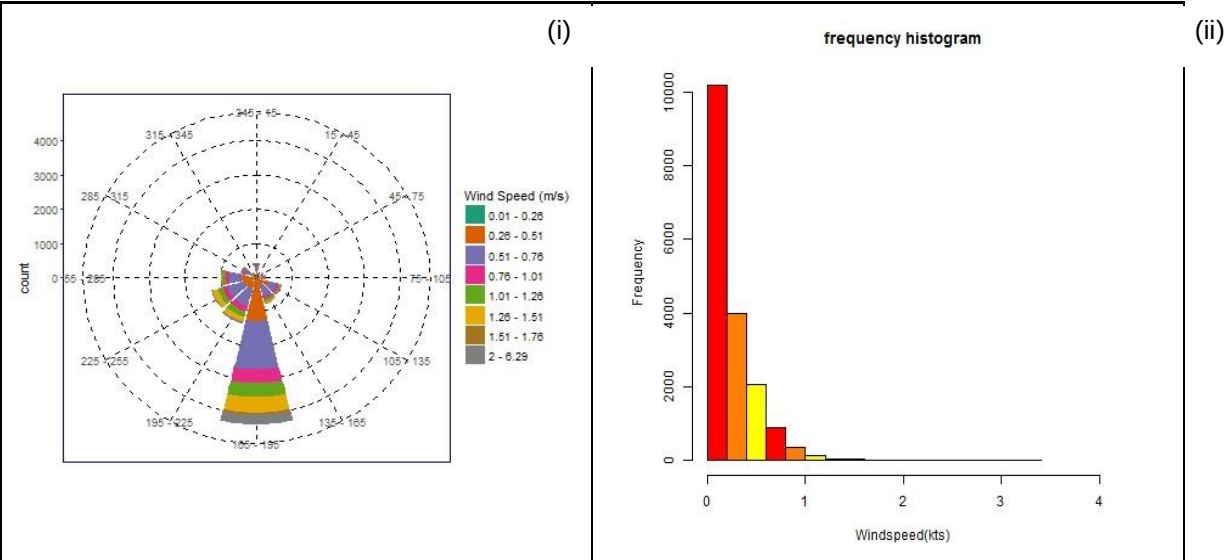
Distribution of (i) wind direction and (ii) wind speed of Khulna during Monsoon Season



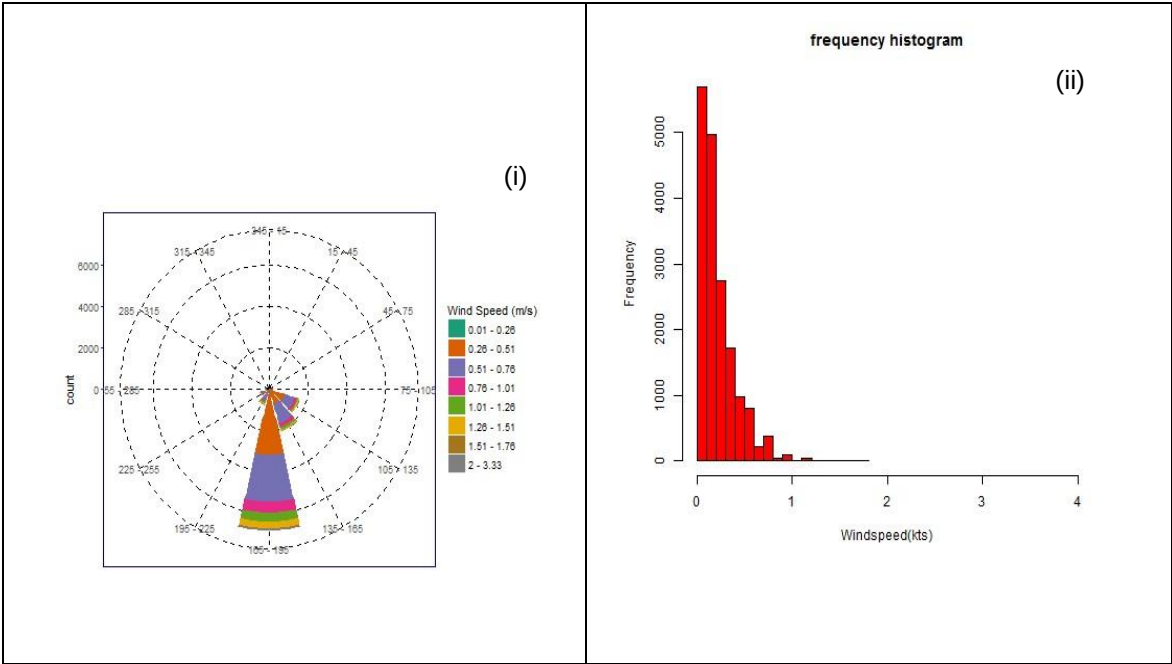
Distribution of (i) wind direction and (ii) wind speed of Khulna during Post-monsoon Season



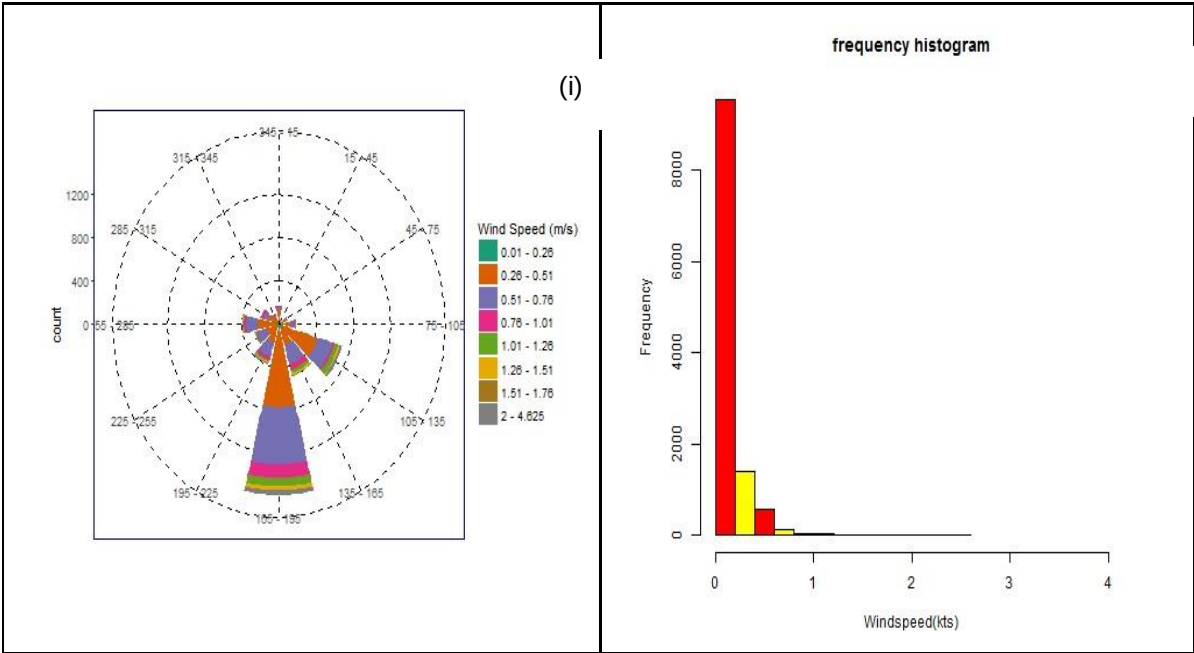
Distribution of (i) wind direction and (ii) wind speed of Chittagong during Winter Season



Distribution of (i) wind direction and (ii) wind speed of Chittagong during Pre monsoon Season

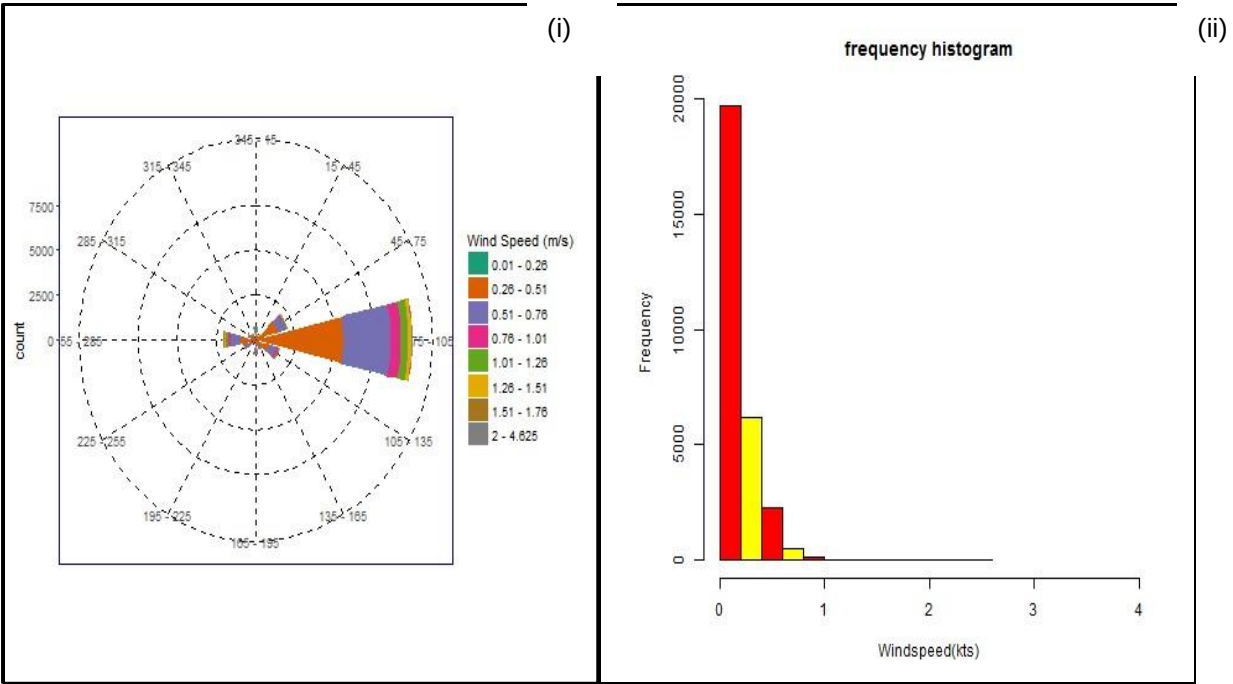


Distribution of (i) wind direction and (ii) wind speed of Chittagong during Monsoon Season

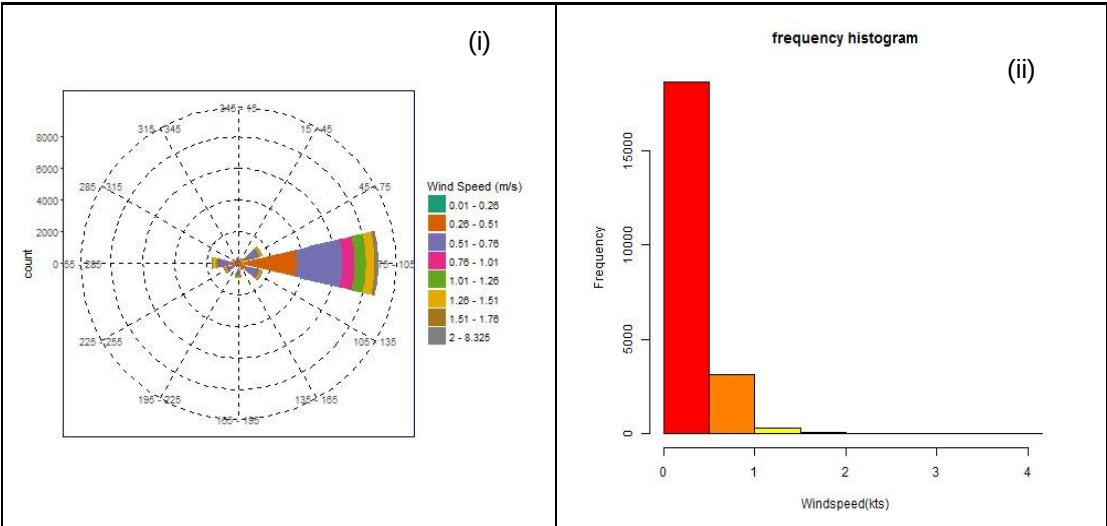


Distribution of (i) wind direction and (ii) wind speed of Chittagong during Post monsoon Season

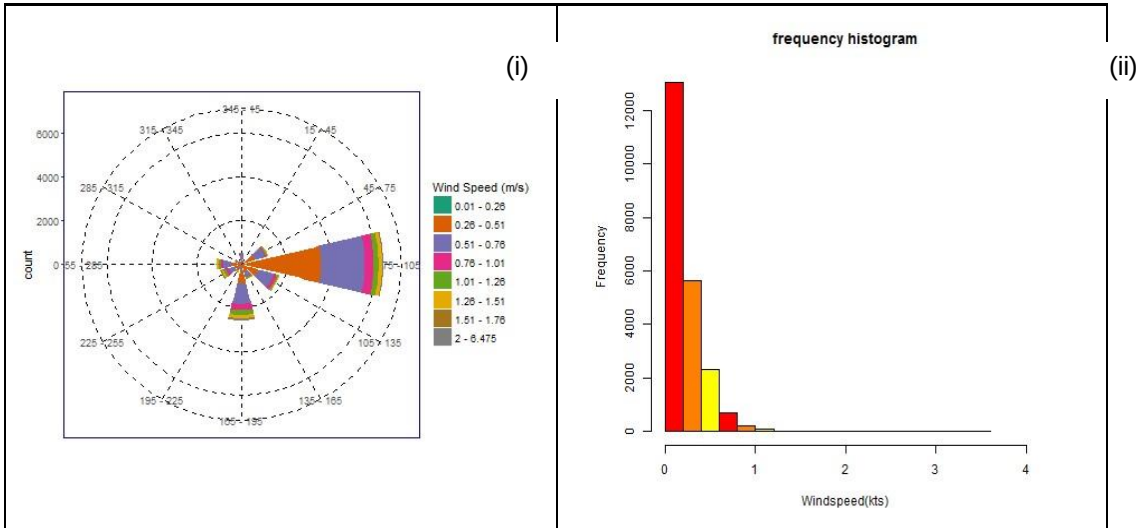
CAPEX/BMRE for upgradation and modernization of existing core network infrastructure and strengthening of overall network capacity by Robi Axiata Ltd. (Robi).



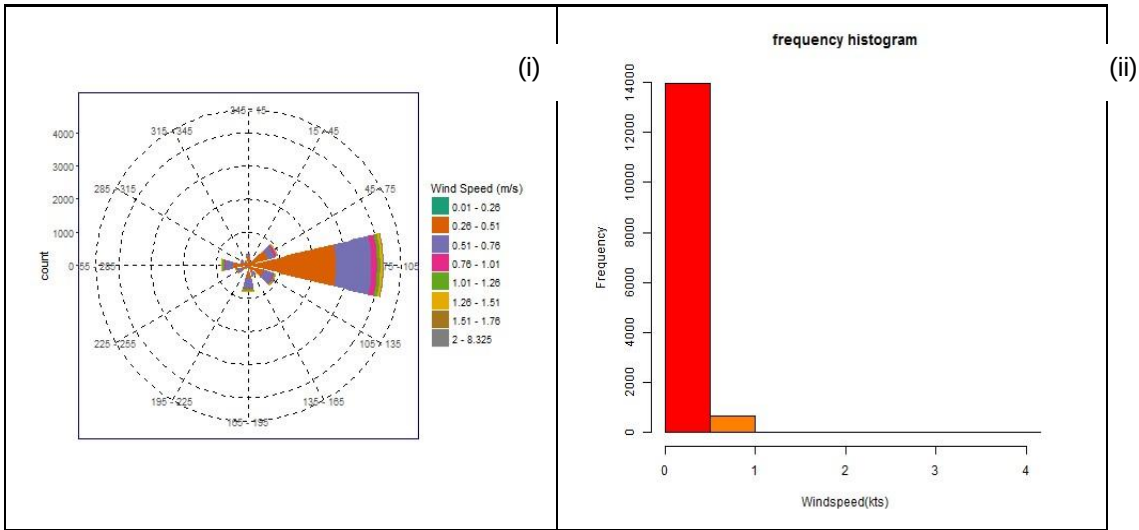
Distribution of (i) wind direction and (ii) wind speed of Sylhet during Winter Season



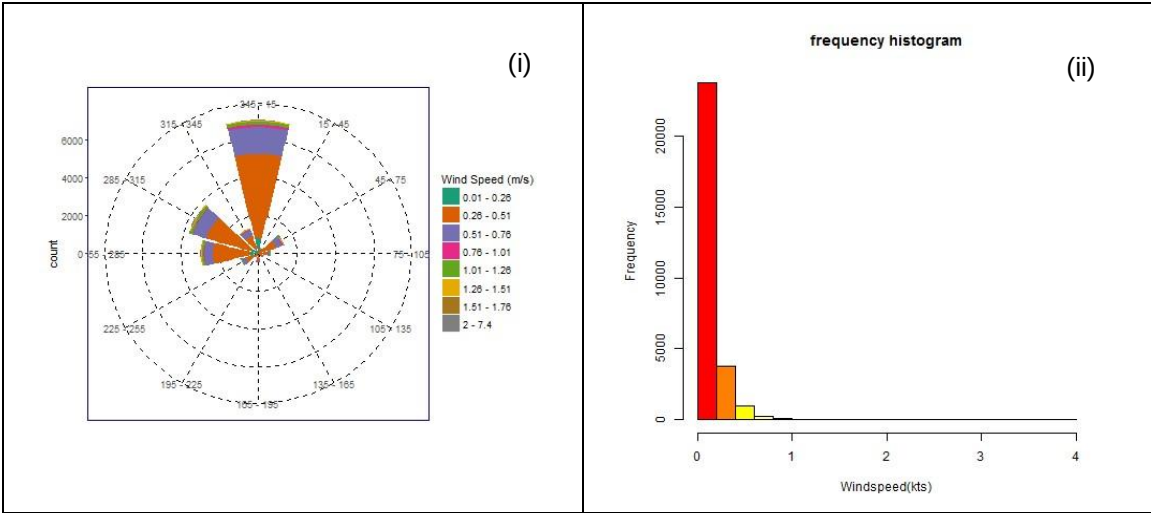
Distribution of (i) wind direction and (ii) wind speed of Sylhet during Pre-monsoon Season



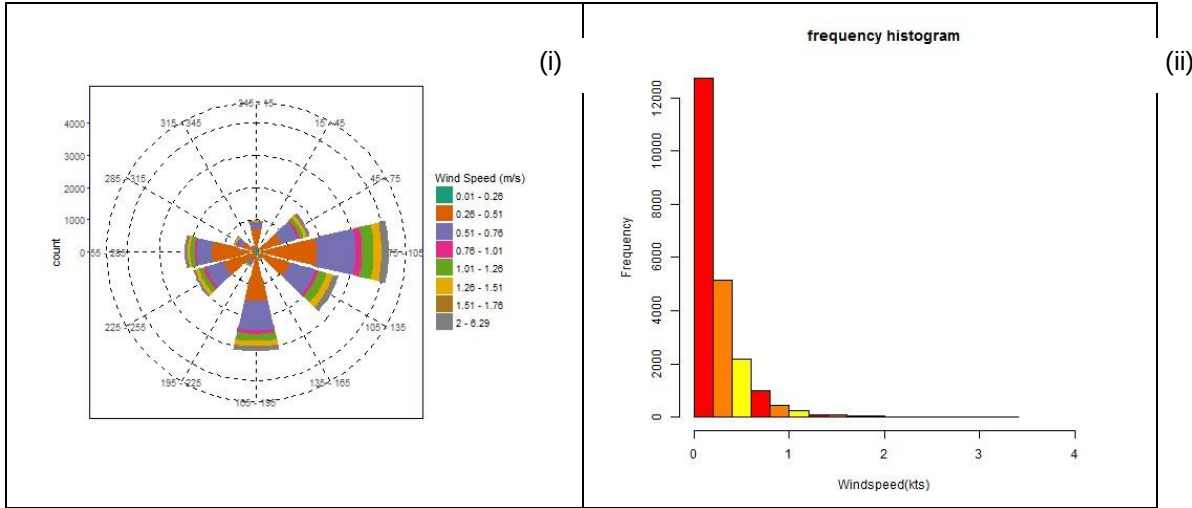
Distribution of (i) wind direction and (ii) wind speed of Sylhet during Monsoon Season



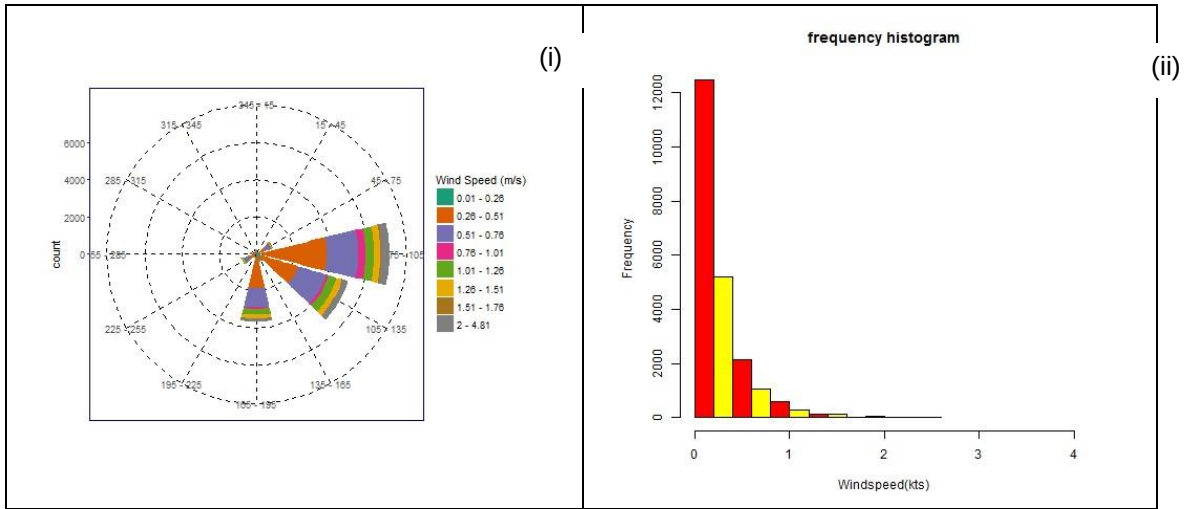
Distribution of (i) wind direction and (ii) wind speed of Sylhet during Post-monsoon Season



Distribution of (i) wind direction and (ii) wind speed of Rajshahi during Winter Season

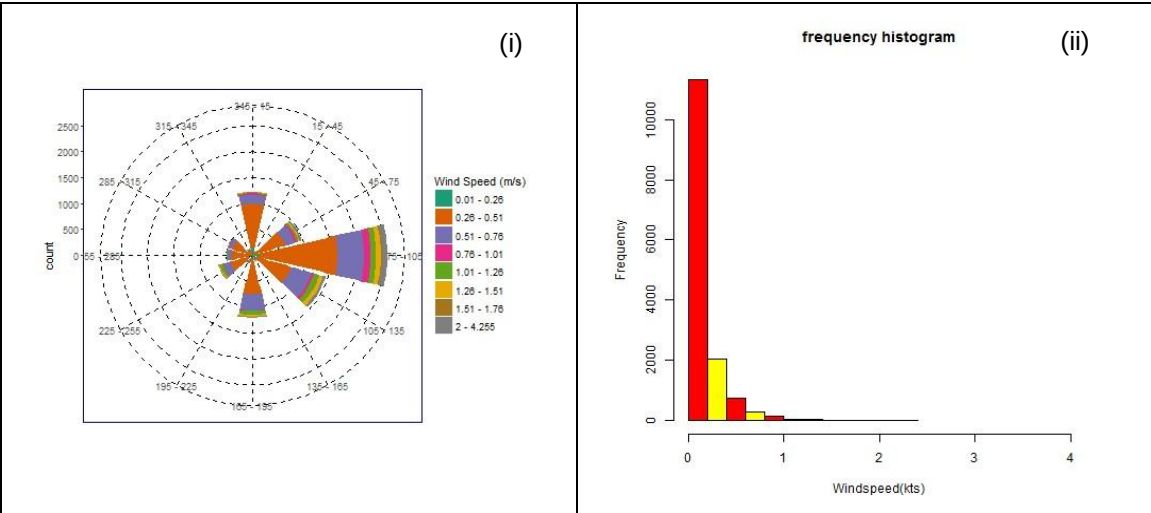


Distribution of (i) wind direction and (ii) wind speed of Rajshahi during Pre-monsoon season



Distribution of (i) wind direction and (ii) wind speed of Rajshahi during Monsoon Season

CAPEX/BMRE for upgradation and modernization of existing core network infrastructure and strengthening of overall network capacity by Robi Axiata Ltd. (Robi).



Distribution of (i) wind direction and (ii) wind speed of Rajshahi during Post-monsoon Season

Annex 5: EMF Radiation Examination Results of Mobile Tower



বাংলাদেশ টেলিযোগাযোগ নিয়ন্ত্রণ কমিশন

আইইবি ভবন, রমনা, ঢাকা-১০০০, বাংলাদেশ।

মোবাইল টাওয়ারের EMF Radiation পরিবীক্ষণের ফলাফল

সম্প্রতি বিটিআরসি কর্তৃক ঢাকা শহর ও জামালপুর জেলা সদরে মোবাইল ফোন অপারেটর কর্তৃক স্থাপিত টাওয়ার হতে নিঃসৃত EMF Radiation এর মাত্রা পরিবীক্ষণ করা হয়। পরিবীক্ষণ কার্যক্রমে International Commission on Non-Ionizing Radiation Protection (ICNIRP), World Health Organization (WHO) এবং International Telecommunication Union (ITU) এর Standard অনুসরণ করে EMF Radiation এর মাত্রা পরীক্ষা করা হয়।

ঢাকা শহরের রমনায় EMF Radiation পরিবীক্ষণের ফলাফল নিম্নরূপঃ

Parameters	Values
Location (within 5 meters from the tower)	Lat: 23.73399 Long: 90.40154 IEB Building
Standard Value (W/Sq.m) [ICNIRP-GP]	2.871
Measured Value (W/Sq.m) [Max]	0.1061
Exposure Ratio (Measured/ICNIRP limit) in %	3.69%
Compliant (Yes/No)	Yes

জামালপুর জেলা সদরে EMF Radiation পরিবীক্ষণের ফলাফল নিম্নরূপঃ

Parameters	Values
Location (within 5 meters from the tower)	Lat: 24.93236 Long: 89.93926
Standard Value (W/Sq.m) [ICNIRP-GP]	2.871
Measured Value (W/Sq.m) [Max]	0.0268
Exposure Ratio (Measured/ICNIRP limit) in %	0.93%
Compliant (Yes/No)	Yes

ICNIRP এর মানদণ্ডের সাথে পরীক্ষালব্ধ তথ্য-উপাত্তের তুলনামূলক বিশ্লেষণ করে দেখা যায় যে, উক্ত স্থান সমূহে EMF Radiation এর মান গ্রহণযোগ্য মানের চেয়ে অনেক কম রয়েছে। ফলে WHO এবং ICNIRP এর মানদণ্ড অনুযায়ী তা জনস্বাস্থ্য কিংবা পরিবেশের জন্য ক্ষতিকর নয়।


Dr. Shamsuzzoha
Deputy Director
Engineering & Operations Division
Bangladesh Telecommunication
Regulatory Commission



বাংলাদেশ টেলিযোগাযোগ নিয়ন্ত্রণ কমিশন

আইইবি ভবন, রমনা, ঢাকা-১০০০, বাংলাদেশ।

৬। যশোর বিজ্ঞান ও প্রযুক্তি বিশ্ববিদ্যালয়ের ভবনের ছাদে EMF Radiation পরিবীক্ষণের ফলাফল-

Parameters	Values
Location	Lat:23.23281 Long:89.12496 Roof Top
Standard Value (W/Sq.m) [ICNIRP-GP]	2.106
Measured Value (W/Sq.m) [Avg]	0.0537
Exposure Ratio (Measured/ICNIRP limit) in %	2.55%
Compliant (Yes/No)	Yes

৭। যশোর সদর হাসপাতালের ছাদে EMF Radiation পরিবীক্ষণের ফলাফল-

Parameters	Values
Location	Lat:23.16818 Long:89.20882 Roof Top
Standard Value (W/Sq.m) [ICNIRP-GP]	2.106
Measured Value (W/Sq.m) [Avg]	0.0532
Exposure Ratio (Measured/ICNIRP limit) in %	2.53%
Compliant (Yes/No)	Yes

৮। যশোর নিউ মার্কেট এলাকায় আবাসিক ভবনের ছাদে EMF Radiation পরিবীক্ষণের ফলাফল-

Parameters	Values
Location	Lat:23.17616 Long:89.20949 Roof Top
Standard Value (W/Sq.m) [ICNIRP-GP]	2.106
Measured Value (W/Sq.m) [Avg]	0.0676
Exposure Ratio (Measured/ICNIRP limit) in %	3.21%
Compliant (Yes/No)	Yes

Kamrul Hossain
29/10/2022
মোঃ কামরুল হাসান হিরু
সহকারী পরিচালক (ইএমভও)

29/10/22
ড. শামসুজ্জোহা
উপ-পরিচালক



বাংলাদেশ টেলিযোগাযোগ নিয়ন্ত্রণ কমিশন

আইইবি ভবন, রমনা, ঢাকা-১০০০, বাংলাদেশ।

৩। খুলনা শহরে ডিসি অফিস ভবনের ছাদে (এ স্থানে সাধারণ জনগণের নিয়মিত যাতায়াত নেই) EMF Radiation পরিবীক্ষণের ফলাফল-

Parameters	Values
Location	Lat: 22.81608 Long: 89.56994 DC Office Building
Standard Value (W/Sq.m) [ICNIRP-GP]	2.106
Measured Value (W/Sq.m) [Avg]	0.4119
Exposure Ratio (Measured/ICNIRP limit) in %	19.56%
Compliant (Yes/No)	Yes

৪। খুলনা মেডিক্যাল কলেজ হাসপাতালের নিকটবর্তী ভবনের ছাদে EMF Radiation পরিবীক্ষণের ফলাফল-

Parameters	Values
Location	Lat: 22.83057 Long: 89.53591 Roof Top
Standard Value (W/Sq.m) [ICNIRP-GP]	2.106
Measured Value (W/Sq.m) [Avg]	0.0446
Exposure Ratio (Measured/ICNIRP limit) in %	2.12%
Compliant (Yes/No)	Yes

৫। খুলনা বিশ্ববিদ্যালয়ের নিকটবর্তী ভবনের ছাদে EMF Radiation পরিবীক্ষণের ফলাফল-

Parameters	Values
Location	Lat: 22.80469 Long: 89.53814 Roof Top
Standard Value (W/Sq.m) [ICNIRP-GP]	2.106
Measured Value (W/Sq.m) [Avg]	0.0242
Exposure Ratio (Measured/ICNIRP limit) in %	1.15%
Compliant (Yes/No)	Yes

Kamrul
Hossain
20/10/2020
মোঃ কামরুল হাসান হিরু
সহকারী পরিচালক (ইএডও)

21/10/20
ড. শামসুজ্জোহা
প্রশাসনিক



বাংলাদেশ টেলিযোগাযোগ নিয়ন্ত্রণ কমিশন

আইইবি ভবন, রমনা, ঢাকা-১০০০, বাংলাদেশ।

ইঞ্জিনিয়ারিং এন্ড অপারেশন্স বিভাগ

খুলনা বিভাগে জুলাই-আগস্ট ২০১৯ সময়কালে মোবাইল টাওয়ারের EMF Radiation পরিবীক্ষণের ফলাফল

সম্প্রতি বিটিআরসি কর্তৃক খুলনা বিভাগের খুলনা শহর, যশোর জেলা সদর ও বাগেরহাট জেলার সুন্দরবন এলাকায় মোবাইল ফোন টাওয়ার হতে নিঃসৃত EMF Radiation এর মাত্রা পরিবীক্ষণ করা হয়। পরিবীক্ষণ কার্যক্রমে International Commission on Non-Ionizing Radiation Protection (ICNIRP), World Health Organization (WHO) এবং International Telecommunication Union (ITU) এর মানদণ্ড অনুসরণ করা হয়েছে। পরীক্ষালব্ধ তথ্য-উপাত্তের তুলনামূলক বিশ্লেষণ করে দেখা যায় যে, উক্ত স্থান সমূহে EMF Radiation এর মান গ্রহণযোগ্য মানের চেয়ে অনেক কম রয়েছে। ফলে ITU, WHO এবং ICNIRP এর মানদণ্ড অনুযায়ী তা জনস্বাস্থ্য কিংবা পরিবেশের জন্য ক্ষতিকর নয়। বিশেষতঃ সুন্দরবন এলাকায় স্থাপিত টাওয়ারের প্রভাবের বিষয়টি বহুল আলোচিত। বিটিআরসি'র অনুসন্ধান এবং পরিমাপে সুন্দরবন এলাকায় মোবাইল টাওয়ার স্থাপনে ক্ষতিকর কোন প্রভাব পরিলক্ষিত হয়নি। নিম্নের সারণীতে উপরে উল্লেখিত এলাকার ৮টি স্থানে পরিবীক্ষণের ফলাফল সর্বসাধারণের অবগতির জন্য প্রকাশ করা হল।

উল্লেখ্য যে, টাওয়ারের নিকটবর্তী স্থানে প্রাপ্ত সর্বোচ্চ মান নিম্নের ছক সমূহে দেখানো হয়েছেঃ

১। বোদ্ধমারী, মংলা, বাগেরহাট (সুন্দরবন এলাকা) EMF Radiation পরিবীক্ষণের ফলাফল-

Parameters	Values
Location	Lat: 22.40050 Long: 89.65406 Green Field
Standard Value (W/Sq.m) [ICNIRP-GP]	2.106
Measured Value (W/Sq.m) [Avg]	0.0015
Exposure Ratio (Measured/ICNIRP limit) in %	0.07%
Compliant (Yes/No)	Yes

২। জয়মনি, মংলা, বাগেরহাট (সুন্দরবন এলাকা) EMF Radiation পরিবীক্ষণের ফলাফল-

Parameters	Values
Location	Lat: 22.37071 Long: 89.64303 Green Field
Standard Value (W/Sq.m) [ICNIRP-GP]	2.106
Measured Value (W/Sq.m) [Avg]	0.0038
Exposure Ratio (Measured/ICNIRP limit) in %	0.18%
Compliant (Yes/No)	Yes

Kamrul
29/10/2019
মোঃ কামরুল হাসান হিরু
সহকারী পরিচালক (ইএওও)

২৯/১০/১৯
ড. শামসুজ্জোহা
উপ-পরিচালক

CAPEX/BMRE for upgradation and modernization of existing core network infrastructure and strengthening of overall network capacity by Robi Axiata Ltd. (Robi).



বাংলাদেশ টেলিযোগাযোগ নিয়ন্ত্রণ কমিশন

আইইবি ভবন, রমনা, ঢাকা-১০০০, বাংলাদেশ।



৯। ফেনী সদর হাসপাতাল সংলগ্ন এলাকায় মার্কেটের ছাদে EMF Radiation পরিবীক্ষণের ফলাফল-
পরিবীক্ষণের তারিখঃ ০৯/১০/২০১৯।

Parameters	Values
Location	Lat:23.02859 Long:91.40596 Roof Top
Standard Value (W/Sq.m) [ICNIRP-GP]	2.106
Measured Value (W/Sq.m) [Avg]	0.4039
Exposure Ratio (Measured/ICNIRP limit) in %	1.92%
Compliant (Yes/No)	Yes

[Signature]
০৬/১১/২০১৯
আমির হোসেন
সহকারী পরিচালক (ইএডও)

[Signature]
০৬/১১/২০১৯
ড. শামসুজ্জোহা
উপ-পরিচালক

ফোনঃ +৮৮ ০২ ৯৬১১১১১, ফ্যাক্সঃ +৮৮ ০২ ৯৫৫৬৬৬৭৭, ৯৫৬৭৭৫৫৫, ই-মেইলঃ info@btrc.gov.bd, ওয়েবঃ www.btrc.gov.bd



বাংলাদেশ টেলিযোগাযোগ নিয়ন্ত্রণ কমিশন

আইইবি ভবন, রমনা, ঢাকা-১০০০, বাংলাদেশ।



৬। চট্টগ্রাম শহরে, ওয়ারলেস গেট, কাউতলা স্কুল ভবনের ছাদে EMF Radiation পরিবীক্ষণের ফলাফল-
পরিবীক্ষণের তারিখঃ ০৮/১০/২০১৯।

Parameters	Values
Location	Lat:22.35817 Long:91.80468 Roof Top
Standard Value (W/Sq.m) [ICNIRP-GP]	2.106
Measured Value (W/Sq.m) [Avg]	0.03212
Exposure Ratio (Measured/ICNIRP limit) in %	1.53%
Compliant (Yes/No)	Yes

৭। ফেনী লাল পোল এলাকায় আবাসিক ভবনের ছাদে EMF Radiation পরিবীক্ষণের ফলাফল-
পরিবীক্ষণের তারিখঃ ০৮/১০/২০১৯।

Parameters	Values
Location	Lat:22.98536 Long:91.41299 Roof Top
Standard Value (W/Sq.m) [ICNIRP-GP]	2.106
Measured Value (W/Sq.m) [Avg]	0.05537
Exposure Ratio (Measured/ICNIRP limit) in %	2.63%
Compliant (Yes/No)	Yes

৮। ফেনী পুলিশ লাইন স্কুল সংলগ্ন এলাকায় আবাসিক ভবনের ছাদে EMF Radiation পরিবীক্ষণের ফলাফল-
পরিবীক্ষণের তারিখঃ ০৯/১০/২০১৯।

Parameters	Values
Location	Lat:23.0203 Long:91.38755 Roof Top
Standard Value (W/Sq.m) [ICNIRP-GP]	2.106
Measured Value (W/Sq.m) [Avg]	0.1367
Exposure Ratio (Measured/ICNIRP limit) in %	6.49%
Compliant (Yes/No)	Yes

ড. শামসুজ্জোহা
জুল-পরিচালক

ফোনঃ +৮৮ ০২ ৯৬১১১১, ফ্যাক্সঃ +৮৮ ০২ ৯৫৫৬৬৭৭, ৯৫৬৭৭৫৫, ই-মেইলঃ info@btrc.gov.bd, ওয়েবঃ www.btrc.gov.bd



বাংলাদেশ টেলিযোগাযোগ নিয়ন্ত্রণ কমিশন

আইইবি ভবন, রমনা, ঢাকা-১০০০, বাংলাদেশ।



৩। চট্টগ্রাম শহরে, দুই নং গেইট এলাকায় EMF Radiation পরিবীক্ষণের ফলাফল-
পরিবীক্ষণের তারিখঃ ০৭/১০/২০১৯।

Parameters	Values
Location	Lat: 22.36593 Long: 91.82552 Roof top
Standard Value (W/Sq.m) [ICNIRP-GP]	2.106
Measured Value (W/Sq.m) [Avg]	0.4151
Exposure Ratio (Measured/ICNIRP limit) in %	19.71%
Compliant (Yes/No)	Yes

৪। চট্টগ্রাম মেডিক্যাল কলেজ বিশ্ববিদ্যালয় এলাকায় EMF Radiation পরিবীক্ষণের ফলাফল-
পরিবীক্ষণের তারিখঃ ০৭/১০/২০১৯।

Parameters	Values
Location	Lat: 22.35901 Long: 91.83146 Roof Top
Standard Value (W/Sq.m) [ICNIRP-GP]	2.106
Measured Value (W/Sq.m) [Avg]	0.4818
Exposure Ratio (Measured/ICNIRP limit) in %	22.88%
Compliant (Yes/No)	Yes

৫। চট্টগ্রাম শহরে, গ্রীনভিউ রেসিডেনসিয়াল এলাকায় আবাসিক ভবনের ছাদে EMF Radiation পরিবীক্ষণের ফলাফল-
পরিবীক্ষণের তারিখঃ ০৮/১০/২০১৯।

Parameters	Values
Location	Lat: 22.34700 Long: 91.78594 Roof Top
Standard Value (W/Sq.m) [ICNIRP-GP]	2.106
Measured Value (W/Sq.m) [Avg]	0.1271
Exposure Ratio (Measured/ICNIRP limit) in %	6.04%
Compliant (Yes/No)	Yes

ফোনঃ +৮৮ ০২ ৯৬১১১১১, ফ্যাক্সঃ +৮৮ ০২ ৯৫৫৬৬৭৭, ৯৫৬৭৭৫৫, ই-মেইলঃ info@btrc.gov.bd, ওয়েবঃ www.btrc.gov.bd



বাংলাদেশ টেলিযোগাযোগ নিয়ন্ত্রণ কমিশন

আইইবি ভবন, রমনা, ঢাকা-১০০০, বাংলাদেশ।



ইঞ্জিনিয়ারিং এন্ড অপারেশন্স বিভাগ

অক্টোবর ২০১৯ সময়কালে চট্টগ্রাম বিভাগের বিভিন্ন স্থানে মোবাইল টাওয়ার হতে EMF Radiation পরিবীক্ষণের

ফলাফলঃ

সম্প্রতি বিটিআরসি নিজস্ব যন্ত্রপাতি ব্যবহার করে কর্তৃক চট্টগ্রামে জেলায় চট্টগ্রাম বিশ্ববিদ্যালয়, চট্টগ্রাম মেডিক্যাল কলেজ বিশ্ববিদ্যালয়, হাটহাজারী, দুই নং গেইট এলাকায় এবং ফেনী শহরের লাল পুল, পুলিশ লাইন এবং ফেনী জেনারেল হাসপাতাল এলাকায় মোবাইল ফোন টাওয়ার হতে নিঃসৃত EMF Radiation এর মাত্রা পরিবীক্ষণ করে। পরিবীক্ষণ কার্যক্রমে International Commission on Non-Ionizing Radiation Protection (ICNIRP), World Health Organization (WHO) এবং International Telecommunication Union (ITU) এর মানদণ্ড অনুসরণ করা হয়েছে। পরীক্ষার তথ্য-উপাত্তের তুলনামূলক বিশ্লেষণ করে দেখা যায় যে, উক্ত স্থান সমূহে EMF Radiation এর মান গ্রহণযোগ্য মানের চেয়ে অনেক কম রয়েছে। ফলে ITU, WHO এবং ICNIRP এর মানদণ্ড অনুযায়ী তা জনস্বাস্থ্য কিংবা পরিবেশের জন্য ক্ষতিকর নয়। বিটিআরসি'র অনুসন্ধান এবং পরিমাপে বর্ণিত এলাকায় মোবাইল টাওয়ার স্থাপনে ক্ষতিকর কোন প্রভাব পরিলক্ষিত হয়নি। নিম্নের সারণীতে উপরে উল্লেখিত এলাকার ৯টি স্থানে পরিবীক্ষণের ফলাফল সর্বসাধারণের অবগতির জন্য প্রকাশ করা হল।

উল্লেখ্য যে, টাওয়ারের নিকটবর্তী স্থানে প্রাপ্ত সর্বোচ্চ মান নিম্নের ছক সমূহে দেখানো হয়েছে।

১। চট্টগ্রাম বিশ্ববিদ্যালয় এলাকায় EMF Radiation পরিবীক্ষণের ফলাফল-

পরিবীক্ষণের তারিখঃ ০৭/১০/২০১৯।

Parameters	Values
Location	Lat: 22.47145 Long: 91.78544 Roof top
Standard Value (W/Sq.m) [ICNIRP-GP]	2.106
Measured Value (W/Sq.m) [Avg]	0.56
Exposure Ratio (Measured/ICNIRP limit) in %	1.23 %
Compliant (Yes/No)	Yes

২। হাটহাজারী, চট্টগ্রাম এলাকায় EMF Radiation পরিবীক্ষণের ফলাফল-

পরিবীক্ষণের তারিখঃ ০৭/১০/২০১৯।

Parameters	Values
Location	Lat: 22.47538 Long: 91.81344 Roof top
Standard Value (W/Sq.m) [ICNIRP-GP]	2.106
Measured Value (W/Sq.m) [Avg]	0.02340
Exposure Ratio (Measured/ICNIRP limit) in %	1.11%
Compliant (Yes/No)	Yes

ফোনঃ +৮৮ ০২ ৯৬১১১১১, ফ্যাক্সঃ +৮৮ ০২ ৯৫৫৬৬৭৭, ৯৫৬৭৭৫৫, ই-মেইলঃ info@btrc.gov.bd, ওয়েবঃ www.btrc.gov.bd

Annex 6: Initiative to Emergency Response and Disaster Management Plan



Annex 7: Questionnaire for Environmental and Social Survey

Environmental and Social Impact Assessment (ESIA) of

CAPEX/BMRE for upgradation and modernization of existing core network infrastructure and strengthening of overall network capacity by Robi Axiata Limited (Robi).

Questionnaire for Environmental and Social Survey Conducted by Enviro Consultants Ltd.

Date: 29.07.2020

Name of the respondent : Gopal Debnath (01713013979)
Occupation / Designation : Managing Director (Mediasoft, Data System Ltd;)
Address: BDBL Bhaban, 5th Floor, 12 Kazi Nazrul Islam Avenue, Karwan Bazar, Dhaka-1215 :

1. Either he/they is aware of 4G mobile network? Yes. But regarding Robi BMRE 4G Expansion work not aware about it.
2. How 4G network will brings benefits to people? It will benefit to people in many ways.
 - i. Competition with the operation
 - ii. Provide data-based internet
 - iii. Call media
3. What will be impact on socio-economy development due to 4G network?
 - i. Benefit to social media
 - ii. Improve life style
 - iii. Reduce transportation and movement expenses
4. What will be the negative impact of 4G network?
 - i. Micro level expense may increase due to fast exhaust data due to high speed
 - ii. Birds, insect and living things may get health impact due to 4G network
 - iii. Radiation impact
5. Any impact on air, water, and soil?
 - i. No idea of any impact on air, water and soil.
6. Positive impact of 4G network:
 - i. Source of earning will increase using 4G network
 - ii. Voice call reducing after implementing 4G network
7. What will be the possible health effect of 4G network?
 - i. Huge positive Impact on health sector due to implementation of telemedicine facilities at the grass level to top level as a result man hour will increase which contribute to national economy.

Environmental and Social Impact Assessment (ESIA) of
**CAPEX/BMRE for upgradation and modernization of existing core network
infrastructure and strengthening of overall network capacity by Robi Axiata Limited
(Robi).**

Questionnaire for Environmental and Social Survey Conducted by Enviro Consultants Ltd.
Date: 29.07.2020

Name of the respondent : Susanta Paul (01819283728)
Occupation / Designation : Chairman (Open Communication Ltd.)
Address: House-506/B, Level-3, Rd No 35, Mohakhali DOHS, Dhaka-1206, Bangladesh

1. Either he/they is aware of 4G mobile network? Yes. Well-known about Robi 4G BMRE Expansion work.
2. How 4G network will brings benefits to people? It will benefit to people in many ways.
 - i. Data transfer speed will increase for Bank, Corporations and Financial Institutions
 - ii. Outsourcing business will increase
 - iii. Business revenue will increase
3. What will be impact on socio-economy development due to 4G network?
 - i. Benefit to social media
 - ii. Improve life style
 - iii. Improve health services
 - iv. Increase social communications
 - v. Reduce transportation and movement expenses
4. What will be the negative impact of 4G network?
 - i. Radiation impact on human health (Brain, nervous system, reproduction etc)
 - ii. Radiation impact increases with height from the ground surfaces
 - iii. Bad Impact on green coconut and other trees. It reduces the water inside the green coconut. Green color become radish on the surface of the green coconut
 - iv. Birds, insect and living things may get health impact due to radiation from 4G network
5. Any impact on air, water, and soil?
 - i. No idea regarding any impact
6. Positive impact of 4G network:
 - i. GDP increases due to 4G network
 - ii. Voice call will reduce and data use application and call will increase
 - iii. GHG emission will reduce drastically due to reduction of fuel use for transportations
7. What will be the possible health effect of 4G network?

CAPEX/BMRE for upgradation and modernization of existing core network infrastructure and strengthening of overall network capacity by Robi Axiata Ltd. (Robi).

- i. Positive Impact on health sector due to implementation of telemedicine facilities at the grass level to top level as a result man hour will increase which contribute to national economy.
- ii. Many health problem and diseases will reduce

Environmental and Social Impact Assessment (ESIA)

of

CAPEX/BMRE for upgradation and modernization of existing core network infrastructure and strengthening of overall network capacity by Robi Axiata Limited (Robi).

Questionnaire for Environmental and Social Survey Conducted by Enviro Consultants Ltd.

Date:

Name of the respondent : Anup Kumer Paul (01722830646)
Occupation / Designation : Web Developer
Address: : 51/H Ka, Khilkhet, Dhaka

1. Either he/they is aware of 4G mobile network?

Answer: Yes

2. How 4G network will bring benefits to people?

Answer: It will benefit to people in many ways.

- High spectral efficiency
- High voice quality.
- Easily access internet, streaming media, video calling etc.
- Very low latency.
- Simple protocol architecture.
- Efficient multicast/broadcast.

3. What will be impact on socio-economy development due to 4G network?

Answer: Some socio-economy impact has been discussed as below

- Fast communication and easily accessible to the IT world
- Less Expenditure of ICT industry
- For fast communication, freelancers get more access to freelance marketplace and earn more foreign currency.

4. What will be the negative impact of 4G network?

Answer: Some negative impact has been discussed as below

- Power usage is more.
- It is very expensive and hard to implement.
- Higher data prices for consumers.
- Over radiation can be occurred a human being mental imbalance

5. Any impact on air, water, and soil?

- Increase temperature
- Air pollution
- Problems in cultivation

6. Any Negative impact on Green coconut and other fruits?

- Green coconut can be wasted by the 4g radiation
- Fruit tree loses their pollination

7. Positive impact of 4G network

- Fastest communication
- Increase public demand
- Faster Live streaming
- Faster Growing economy
- The revolution of the ICT industry

8. What will be the possible health effect of 4G network?

- May damage brain cell for over radiation
- Mental imbalance
- May be caused to cancer

Environmental and Social Impact Assessment (ESIA)

of

CAPEX/BMRE for upgradation and modernization of existing core network infrastructure and strengthening of overall network capacity by Robi Axiata Limited (Robi).

Questionnaire for Environmental and Social Survey Conducted by Enviro Consultants Ltd.

Date: 08.08.2020

Name of the respondent : Abdullah Al Mamun
Occupation / Designation : Senior officer, Bank Asia
Address : Ashulia, Dhaka
Mobile : 01935293034

1. Is he aware of 4G mobile network?
Yes, he has basic knowledge about 4G mobile network
2. How 4G network will bring benefits to people?
 - Facilities will be improved because of competition among mobile operator
 - Voice call must be improved
 - Large file transfer
 - Remote access to business applications
3. What will be impact on socio-economy development due to 4G network?
 - Improvement of Communication
 - Expansion of Business
4. What will be the negative impact of 4G network?
Don't have any idea.
5. Positive impact of 4G network:
 - Fully-mobile use of applications that require true broadband speeds
 - Security (no need authenticates onto another, possibly public, network)
 - Productivity gains
 - Personal and team productivity
 - Management effectiveness and innovation
 - Process efficiency and effectiveness
6. What will be the possible health effect of 4G network?
 - Community mobilization and health promotion
 - Mobile telemedicine
 - Patient monitoring

Environmental and Social Impact Assessment (ESIA)

of

CAPEX/BMRE for up-gradation and modernization of existing core network infrastructure and strengthening of overall network capacity by Robi Axiata Limited (Robi).

Questionnaire for Environmental and Social Survey Conducted by Enviro Consultants Ltd.

Date: 06.08.2020

Name of the respondent : Sheik Akter Hossain
Occupation / Designation : Proprietor,
Address : Mascot Plaza, Uttara, Dhaka
Mobile : 01735781145

1. Either he/they are aware of the 4G mobile network?

Yes.

2. How 4G network will bring benefits to people?

As a clothing shop owner, he thought that 4G will bring customer in one platform. Individuals can purchase products from the home. It will help to expand their business and customers will be able to communicate effectively.

3. What will be the impact on socio-economy development due to 4G network?

- Communication will be easier.
- Create new business

4. What will be the negative impact of 4G network?

- No idea.

5. The positive impact of the 4G network:

- Create more job
- Improvement of treatment facilities
- Call expenses may reduce by using software.

6. What will be the possible health effect of 4G network?

- Telemedicine facilities improvement

Environmental and Social Impact Assessment (ESIA)

of

CAPEX/BMRE for up-gradation and modernization of existing core network infrastructure and strengthening of overall network capacity by Robi Axiata Limited (Robi).

Questionnaire for Environmental and Social Survey Conducted by Enviro Consultants Ltd.

Date: 08.09.2020

Name of the respondent : Razib Khan
Occupation / Designation : Lab Incharge, Gazipur Diabetic Society
Address : Gazipur Sadar, Gazipur
Mobile : 01710105983

1. Either he/they are aware of the 4G mobile network?

Yes.

2. How 4G network will bring benefits to people?

Being a health technician, he thought that 4G will bring significant changes in the health sector especially in the operation of various machines in the lab to identify and trace diseases that are operated by the network.

3. What will be the impact on socio-economy development due to the 4G network?

- Communication will be easier.
- Create new business
- Bring revolution in the health sector

4. What will be the negative impact of the 4G network?

- No specific idea.

5. The positive impact of the 4G network:

- Improvement of treatment facilities
- Voice call might be better.

6. What will be the possible health effect of the 4G network?

- Improvement and ease of Telemedicine facilities

Environmental and Social Impact Assessment (ESIA)

of

CAPEX/BMRE for up-gradation and modernization of existing core network infrastructure and strengthening of overall network capacity by Robi Axiata Limited (Robi).

Questionnaire for Environmental and Social Survey Conducted by Enviro Consultants Ltd.

Date: 08.09.2020

Name of the respondent : Selim Mahmud
Occupation / Designation : House owner (next to mobile tower)
Address : Tongi, Gazipur
Mobile : 01713535422

1. Either he/they are aware of the 4G mobile network?

Yes but no broad idea

2. How 4G network will bring benefits to people?

- Information will be available.
- Security for the house will be enhanced

3. What will be the impact on socio-economy development due to the 4G network?

- Communication will be calmer.
- Create new business

4. What will be the negative impact of the 4G network?

- Being a house owner next to the mobile tower no such effect has been observed.

5. The positive impact of the 4G network:

- Voice call might be better.
- Video streaming will be smoother.

6. What will be the possible health effect of the 4G network?

- No idea.