

**PROSPECT OF INFORMATION AND COMMUNICATION  
TECHNOLOGY (ICT) IN BANGLADESH  
BASED ON OPTICAL FIBER**

**Mubashira Murtuza**

**ID: 2014-3-53-011**

**Supervisor**

**Iffat Alam**

**Senior Lecturer**

**Department of Electronics & Communications Engineering**

**East West University**

A project submitted in partial fulfillment of the requirements for the degree of  
Bachelor of Science in Information & Communications Engineering



**Department of Electronics & Communications Engineering**

**East West University**

**Dhaka-1212, Bangladesh**

**December 2019**

## **ABSTRACT**

Bangladesh has been connected to the information super highway which has made all sorts of communication systems and nationwide Internet backbone many times more efficient, speedy and powerful. How best Bangladesh might use the potential of submarine cable through optical fiber effectively to uplift the ICT sector and the economic sector in the changing world. Bangladesh has all the potentials to exploit the revolution in the ICT sector to the fullest extent. But, Bangladesh needs to face various challenges to develop specific solutions in this sector. The vastness of the submarine cable project through optical fiber as a whole, and the entire ICT sector in Bangladesh could not be covered in this short study. General overview of the SEA-ME-WE-4 and SEA-ME-WE-5 consortium cable project and ICT infrastructure scenario of Bangladesh have been studied here. The effect of submarine cable on ICT sector and economic sector in Bangladesh is discussed quite elaborately. If the recommendations made in this paper are fulfilled, it is hoped that Bangladesh can exploit the full advantages of Submarine Cable through optical fiber which will open the door of information super highway. This will ultimately help the country to achieve the target of ICT driven nation comprising knowledge based society.

# **ACKNOWLEDGEMENT**

First and foremost, I offer my heartiest gratefulness to the most Graceful and most Merciful Allah for bestowing His blessings and infinite magnanimity in completing the thesis paper. I have also arrived at this point of achieving a goal in my life through various interactions with and help from other people. I would not like to make effort to find best words to express my thankfulness other than simply listing those people who have contributed to this project itself in an essential way. This work has been carried out in the Department of Electronics & Communications Engineering at East West University, Bangladesh.

Next, my special thanks go to my supervisor Iffat Alam, Senior Lecturer, East West University, for her support and guidance throughout entire thesis work as well in my academic period. She patiently inspired me immensely throughout the process and undoubtedly, I could not have asked for a better advisor to help me complete the thesis work. The amount of relevant information and services available I required to complete the work. I could not have acquired it without her assistance. I would also like to thank all my respective instructors from East West University for their encouragement.

There are numerous other people too who have shown me their constant support and friendship in various ways, directly or indirectly related to my academic life. I will remember them in my heart and hope to find a more appropriate place to acknowledge them in the future.

# DECLARATION

I, Mubashira Murtuza, hereby declare that this thesis entitled “Prospect Of Information and Communication Technology (ICT) in Bangladesh Based on Optical Fiber” was developed for the purpose of pursuing and partial fulfillment of degree in B.sc in Information Communications Engineering under the supervision of Iffat Alam, Senior Lecturer, Department of Electronics & Communications Engineering, East West University, Dhaka, Bangladesh.

I also declare that no part of this thesis has been or is being submitted elsewhere for the award of any degree or diploma. The expositions put onward are based on elaborate readings and understanding various work done in the similar field Under the course “Research/Internship (ICE 498)”.

Countersigned

Signature of Student

.....

.....

(Iffat Alam)

(Mubashira Murtuza)

**Supervisor**

**Id: 2014-3-53-011**

# ACCEPTANCE

This thesis entitled “Prospect Of Information and Communication Technology (ICT) in Bangladesh Based on Optical Fiber” submitted by Mubashira Murtuza (ID: 2014-3-53-011) to the Department of Electronics & Communications Engineering, East West University, Dhaka, Bangladesh is accepted by the department in partial fulfillment of requirements for the Award of the Degree of Bachelor of Science in Information and Communication Engineering on Fall, 2019.

**Supervisor**

**Chairperson**

---

**Iffat Alam**

---

**Dr. Mohammed Moseur Rahman**

**Senior Lecturer**

**Professor & Chairperson**

**Dept. of Electronics & Communications  
Engineering**

**Dept. of Electronics & Communications  
Engineering**

**East West University, Dhaka,  
Bangladesh.**

**East West University, Dhaka,  
Bangladesh.**

# TABLE OF CONTENT

Chapter Name	Page
<b>CHAPTER 1- INTRODUCTION</b>	<b>1</b>
1.1 INTRODUCTION	1
1.2 EFFICIENCY OF OPTICAL FIBER	1
1.3 OBJECTIVE	2
1.4 SCOPE	3
1.5 RESEARCH METHODOLOGY	4
1.6 RESEARCH	5
<b>CHAPTER 2- LITERATURE REVIEWS</b>	<b>6</b>
2.1 INTRODUCTION	6
2.2.1 ICT Policy.	6
2.2.2 ICT Acts and Laws.	6
2.3 ICT INFRASTRUCTURE IN BANGLADESH	7
2.3.1 Bangladesh Scenario.	7
2.3.2 Organisational Reforms of ICT Sector.	7
2.3.3 Telecommunication Infrastructure.	7
2.4 SUMMARY	9
<b>CHAPTER 3- THEORETICAL MODEL</b>	<b>11</b>
3.1 INTRODUCTION	11
3.1.1 What Is Optical Fibber	11
3.2 NETWORK STRUCTURE	12
3.3 OPTICAL FIBER STRUCTURES	14
<b>CHAPTER 4- DEVELOPMENT</b>	<b>16</b>
4.1 INTRODUCTION	16
4.2 SEA-ME-WE-5 CONSORTIUM CABLE IN BANGLADESH	16
4.2.1 Submarine Cable Agreement.	16
4.2.2 The Route.	17
4.2.3 Commissioning of the Project.	17

4.3 EFFECT ON ICT SECTOR AFTER BEING CONNECTED TO SEA-ME-WE-5 SUBMARINE CABLE PROJECT THROUGH OPTICAL FIBER	18
4.3.1 Benefits of Consortium Submarine Cable Through Optical Fiber	18
4.3.2 Government Steps for ICT Development.	19
4.3.3 Policy and Pricing.	19
4.4 ICT APPLICATION	19
4.4.1 Utilizing Bandwidth for Data and Internet.	19
4.4.2 IPLC.	20
4.4.3 Prospects in Telecommunication Sector.	21
4.4.4 Access and Co-location.	21
4.4.5 Universal Availability of Medical Care.	21
4.4.6 Access to Education.	22
4.4.7 Economic Development and Employment.	22
4.4.8 Prospects of E-governance.	22
4.4.9 Effects on Public Utility Services.	22
4.4.10 Tourism.	23
4.4.11 Trade and Commerce.	23
4.4.12 Establishment of Cyber Centres	24
4.4.13.a Prospects in ICT Enabled Services	24
4.4.13.b Bangladesh Software Industry.	24
4.4.14 Human Resource Development.	25
4.4.15 Investigation of Criminal Cases, National Security and Defence.	25
<b>CHAPTER 5- RESULTS AND DISCUSSIONS</b>	<b>26</b>
5.1 INTRODUCTION	26
5.1.1 General.	26
5.1.2 Managing the Cable System.	26
5.1.3 Strengthening the Marketing.	26
5.1.4 Submarine Cable Tariff Fixation.	27
5.1.5 Access Network.	27
5.1.6 Redundancy for Terrestrial Optical Fibre Link.	27
5.1.7 Redundancy for Submarine Cable	27

5.2 PROJECTED REVENUE	28
5.2.1 General.	28
5.2.2 Capacity Sold to ISP.	28
5.3 ROLE OF BTCL	28
5.3.1 General.	28
5.3.2 Utilization Plan.	28
5.3.3 Likely Lease Plan.	28
<b>CHAPTER 6- CONCLUSIONS</b>	<b>30</b>
6.1 CONCLUSION	30
6.2 RECOMMENDATIONS	34
<b>Annex A</b>	<b>36</b>
<b>Annex B</b>	<b>37</b>
<b>Annex C</b>	<b>38</b>
<b>Annex D</b>	<b>39</b>
<b>REFERENCES</b>	<b>40-42</b>

<b>List of Figures</b>	<b>Page</b>
2.1 Bangladesh Submarine Cable Map	7
2.2 Submarine Cable Through Optical Fiber in Ocean	8
2.3 Submarine Cable Project Works Through Optical Fiber	9
3.1 Optical Fiber Basic	11
3.2 Optical Fiber	11
3.3 Fiber to the Home (FTTH)	12
3.4 Active Optical network (AON)	14
3.5 Passive Optical network (PON)	15
4.1 SEA-ME-WE-5	17
4.2 Sea Me We-5	20





# **CHAPTER 1**

## **INTRODUCTION**

### **1.1 INTRODUCTION**

Information and Communication Technology (ICT) encompasses the broad fields of data or information processing, transmission and communications by means of computer, telecommunication and other related technologies. ICT can be defined as computers, computer software and telecommunication equipment, transformed industries through innovative technologies, applications such as biotechnology, robotics, miniature motors, software production and high-performance materials. These modern tools are being increasingly used for organisational/personal information processing in all sectors of economy and society. ICT is taken as a revolution to demolish time and distance to bring the world closer. Breaking the rule of the game in international relation, ICT has emerged as the primary and the most forceful catalyst to drive the concept of global village.

### **1.2 EFFICIENCY OF OPTICAL FIBER**

Optical fiber can be used as a medium for telecommunication and computer networking because it is flexible and can be bundled as cables. It is especially advantageous for long distance communications, because light propagates through the fiber with little attenuation compared to electrical cables. This allows long distances to be spanned with few repeaters. The demand for fiber optic network infrastructure continues to grow as organizations position themselves and their communities for future growth. In addition to telecommunication companies, utilities and transportation agencies realize the benefits of installing a fiber network. Compared to alternatives such as coaxial cable, fiber provides more bandwidth and more flexibility at a similar price.

A dependable information system is essential for efficient management and operation of the public and private sectors. But there is a shortage of locally generated information needed for efficient performance of these sectors. In order to meet this objective, ICT use in every sector shall have to be accelerated in terms of information generation, utilization and applications. Considering the gravity and importance of ICT, the then government declared ICT as the thrust sector of the year of 2018-2019. Despite the problems that manifolds surrounding ICT in Bangladesh such as, average telephone density, comparatively high charge of Internet Service Providers (ISPs), complications in accessing internet in remote areas, comparative, low speed of voice and data communication system in the country, lack of computerization in various offices and sectors, lack of implication of cyber laws etcetera (etc), recent studies prescribed the Information and Communication Technology (ICT) sector as the ‘Country’s most potential service sector’ for important aspects like export t [1]. In the backdrop of all these, Bangladesh finally has been connected to the long cherished and much awaited South East Asia - Middle East - Western Europe-5 (SEA-ME-WE-5) consortium as fibre optic backbone within the country and pushing forward for a new connection of SEA-ME-WE 6 [2]. The high bandwidth submarine cable has opened a new era in ICT sector which not only encouraged telecommunication at a cheaper rate, but also had enormous opportunities in respect of software export, data entry, call centres etc in order to earn foreign currency.

### **1.3 OBJECTIVE**

The main objective of ICT Policy is to ensure access to information by every citizen, to provide service at affordable cost and to establish direct connectivity with the international communication backbone through joining the submarine cable network. With the compliance with this Information and Communication Technology (ICT) Division made it its main goal to take the country to a new height of excellence through building a new “Digital Bangladesh” identity by strengthening ICT sector [3].

ICT objectives are given below:

- a. In order to give a thrust to the ICT sector and expeditious development of Software industry and its export, required infrastructure facilities and legal frameworks will be created.

- b. Provide effective incentives for development of ICT sector to both local and foreign entrepreneurs.
- c. Develop an efficient ICT infrastructure that provides open access to international and national network.
- d. Telecommunication facilities to be made available to all segments of the society at affordable cost.
- e. Establish direct connectivity with the international communication backbone through joining the Submarine Cable Network.
- f. Extend start-up financial support to the local hardware and software industry.
- g. Promote and facilitate use of ICT in all sectors of the economy for transparency, good governance and efficiency improvement.
- h. Establish legislative and regulatory framework for ICT issues like IPR, data security and protection, digital signature, e-commerce, ICT education etc. as well as to ensure quality ICT education provided by different private organizations.
- j. Set up national database that is reliable and easily accessible to all the people of the country.
- k. Promote use of ICT by providing special allocations for ICT project implementation in the public sector. Train the decision markers in ICT use and promote an ICT culture.

## **1.4 SCOPE**

Bangladesh being connected to the SEA-ME-WE-5 consortium cable network is a remarkable uplift in the ICT sector beginning at 6<sup>th</sup> June 2014 to finished December 2016, being inaugurated in September 2017 and also in the economic sector [4]. Owing to this, international voice circuit has been increased. Besides, voice and data communication has become faster and quality of transmission is better than the satellite circuits. It is now possible to bring all the district towns under broadband internet services. The submarine cable connection provides large bandwidth with

affordable cost. As such internet facility can be spread all over the country. Broadband services, data transmission, call centre services, software export can be achieved at a cheaper rate. E-governance, e-commerce, e-education, and telemedicine services can be introduced. Most importantly the internet browsing speed has become very fast which is the prime demand of internet users. At present, the cable is approximately 20,000 kilometres long and can accumulate Broadband communication with a design capacity of 24terabits per second [5]. Since Entire ICT sector in Bangladesh cannot be covered in this short study so the main focus of the study will concentrate on -

- a. Highlighting the advantages for Bangladesh rather than having its own submarine cable and then the SEA-ME-WE4 consortium cable itself
- b. Enlightening on the ICT infrastructure scenario of Bangladesh where the policy issues, the ICT infrastructure development and different sectors of ICT infrastructure will be discussed
- c. The effect of submarine cable through optical fiber on ICT sector in Bangladesh will be discussed little elaborately
- d. Finally, some recommendations will be put forwarded to derive maximum benefit out of the SEA-ME WE4 &SE-ME-WE-5 consortium submarine cable project through optical fiber
- e. Connection of SEA-ME-WE 5 with twenty country along with Bangladesh .

## **1.5 RESEARCH METHODOLOGY**

Mostly “Explorative research” along with small scale “Descriptive research” and “Casual Study” were carried out while collecting data both from primary and secondary resources:

- **Explorative Research:** Extensive and relevant content analysis was carried out on the secondary data sources like books, journals, publications, research papers, presentation papers and internet websites.

- **Descriptive and Casual Research:** Interviews, telephone survey by self-administered questionnaire was the principle source of ‘Quantitative Data’.
- **Methods of Data Collection:** The research was conducted following both ‘Quantitative’ and ‘Qualitative’ data collection methods. Interviews (structured, telephone interviews) shall be the main source of ‘Quantitative Data’

For collecting ‘Qualitative Data’, “Content Analyses” was a common tool for obtaining the quantitative data

## **1.6 RESEARCH**

The thesis is structured in three parts as follows:

- a. Part I: Studies ICT infrastructure in Bangladesh and the submarine cable project itself through optical fiber and studies the fields of development
- b. Part II: Studies the prospect of ICT and economic Sector after being connected with the SEA-ME-WE-4 & SE-ME-WE-5 consortium submarine cable project
- c. Part III: Some recommendations will be put forwarded to derive maximum benefit out of the SEA-ME-WE-4 & SEA-ME-WE-5 consortium submarine cable project

# **CHAPTER 2**

## **LITERATURE REVIEWS**

### **2.1 INTRODUCTION**

The aim of this paper is to discuss the prospect of ICT infrastructure scenario in Bangladesh through optical fibre with a view to finding its effect on ICT sector and economic sector, and recommend measures to derive maximum benefit there from.

### **2.2 POLICY**

#### **2.2.1 ICT Policy**

The government has approved the National ICT Policy for the development of ICT sector within the framework of overall national development . National ICT policy has bestowed huge responsibility on Bangladesh Telecommunications Company Limited (BTCL) for building up a country-wide ICT infrastructure. The Vision and objectives of the ICT Policy are discussed in the subsequent paragraphs. ICT policy by amending the national ICT policy 2015 to make it time befitting due to the emergence of 5G technology and fourth industrial revolution national ICT policy 2018 on the cards [6].

#### **2.2.2 ICT Acts and Laws**

To create a smooth environment for e-commerce and to safeguard the dealings over the net and to check the threat to computer communication, the government has formulated the ICT law by the Parliament. The IT Act (for Electronic Transaction) [7] will provide a legal framework that recognizes digital signatures and other electronic documents and have enough provisions to check cyber crimes, which are not covered by any existing law of the land.

## 2.3 ICT INFRASTRUCTURE IN BANGLADESH

### 2.3.1 Bangladesh Scenario

ICT has the potential and has already been used to improve education, enhance political empowerment, help protect human rights, assist in environmental monitoring and maintenance. The impact of ICT in the economic, cultural, political and individual spheres of life has dramatically transformed societies in Bangladesh. Bangladesh being connected to the submarine cable through optical fibre has added a new dimension to the infrastructure of Telecommunication and ICT sectors of Bangladesh.

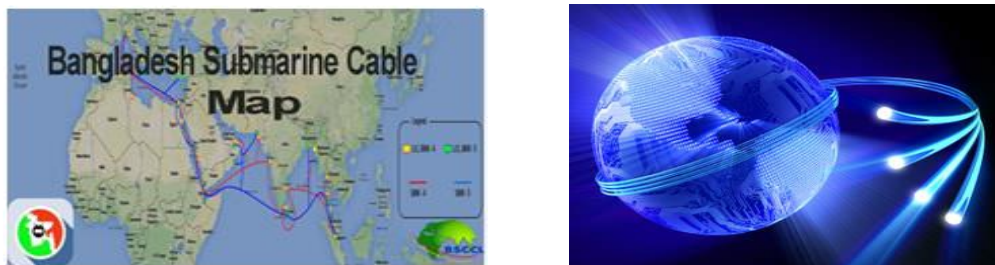


Figure: 2.1 Bangladesh Submarine Cable Map

### 2.3.2 Organisational Reforms of ICT Sector

Starting in 1997 with the collaboration of Bangladesh Association of Software and Information Services (BASIS) the government gradually reformed its various sectors/organisations to develop proficiency in meeting the challenges of the future world [8].

### 2.3.3 Telecommunication Infrastructure

Different fields of telecommunication infrastructure are discussed below:

a. **Telecommunication Sector:** The telecommunication sector has been liberalized for private investment in early 90s [9], resulting in appreciable rise in mobile telephone sets in the country. All analog exchanges at 64 district headquarters under BTCL have been converted to digital system [10]. A national Digital Data Network (DDN) has been implemented by BTCL, which will integrate the whole country under a single digital network for voice and data communications [11]. Details of ICT profile related to



telecommunication sector is given at Annex C.

b. **Cellular Phone Networks:** There are about half a dozen licensed cellular phone network operators including one government in Bangladesh [12]. Most of these were established in collaboration with foreign telecommunication companies. Due to the lack of availability of land-based networks in the country, they serve a major part of the total telephone traffic in rural and remote parts of Bangladesh as well as business users in large cities. State of cellular phone networks is given at Annex A.

c. **Microwave Network:** The microwave link network in Bangladesh is based on four geo-stationary ground satellite stations that are solely used for international telecommunication. These satellites primarily rely upon the Indian Ocean International Marine Satellite (INMARSAT) synchronous orbit satellites located above the Indian Ocean . BTCL has presently four Satellite Earth Stations located at Betbunia, Mohakhali ( Dhaka), Talibabad and Sylhet.



Figure: 2.2 Submarine Cable Through Optical Fiber in Ocean

d. **Optical Fibre Network** We are now connected with SEA-ME-WE-5 which construction beginning 6th June 2014 and finished December 2016 [13]. Optical fibre cable has been laid between Chittagong and Cox's Bazar with STM-64 capacity [13] . BTCL installed optical fibre network extending from Dhaka to Panchagarh. Another link is diverted to Bogra-Natore-Rajshahi-Chapainawabganj. A fibre optic communication link is under construction between Comilla - Brahman Baria - Moulavibazar - Sylhet. Based on SEA-ME-WE-5 consortium submarine cable [14]. It is expected that the nationwide internet backbone will be established

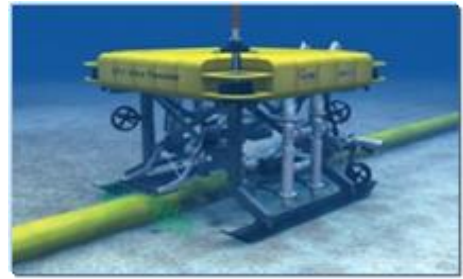


Figure: 2.3 Submarine Cable Project Works Through Optical Fiber

e. **Very Small Aperture Terminal (VSAT) Users:** With the intention of accelerating the growth of internet, the government licensed the use of VSAT satellites for data communication use in 2000 [13]. There are now about 150 operators consisting mostly of foreign organisations such as gas companies, embassies and financial institutions and some ISPs [13]. The ISPs are gradually shifting to submarine cable system. At present 70 ISPs are working through submarine cable although some of them are still keeping their VSAT connectivity in order to achieve redundancy [13]. State of existing PSTN operators, ISPs and VSAT providers in Bangladesh is given at Annex C.

f. **Voice over Internet Protocol (VOIP) Operation:** Government has decided to allow VOIP operation in a regulated way since it is a cheaper solution adopted in most of the countries in the world. There will be four VOIP platforms located at Dhaka, Chittagong, Sylhet and Bogra [15]. BTCL initiated to provide economy ISD facilities for 56 countries which was later on replaced by BTCL NWD phone on August,2019, however was a great start to something effective [16]. At the same time alternative to SEA-ME-WE-5 consortium cable should be planned for smooth functioning of VOIP operation.

## 2.4 SUMMARY

Digital Bangladesh is an intergral part of the government's vision 2021 which promise a prosperous and equitable middle income Bangladesh by its golden jubilee of independence. ICT minister Mustofa Jabbar said, Bangladesh has transformed into digital Bangladesh over the last 10 years due to farsightedness steps taken by PM [17]. The number of computers in the country is about 0.5 million with about 0.1 million internet users. Due to de-regulation of VSAT policy by the government in February 2000, the number of ISPs has grown to 195 with individual bandwidth ranging from 64 Kbps to 2 Mbps [9], offering broadband internet services through Digital Subscriber Line (DSL) / High-speed DSL (HDSL) modems. All 64 districts and 35 per cent of

upazillas of Bangladesh have been brought under internet coverage by BTCL through dial-up connections. The present bandwidth of some major ISPs is tabulated at Annex B.

# CHAPTER 3

## THEORETICAL MODEL

### 3.1 INTRODUCTION

#### 3.1.1 What Is Optical Fiber

An optical fiber is a flexible, transparent fiber made of high quality extruded glass (silica) or plastic, slightly thicker than a human hair. It can function as a waveguide, or “light pipe” to transmit light between the two ends of the fiber. The field of applied science and engineering concerned with the design and application of optical fibers is known as fiber optics [16].

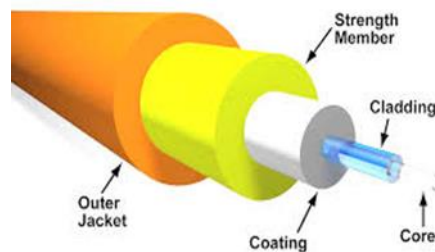


Figure: 3.1 Optical Fiber Basic

Optical fibers are widely used in fiber-optic communications, which permits transmission over longer distances and at higher bandwidths (data rates) than other forms of communication. Fibers are used instead of metal wires because signals travel along them with less loss and are also immune to electromagnetic interference.



Figure: 3.2 Optical Fiber

## 3.2 NETWORK STRUCTURE

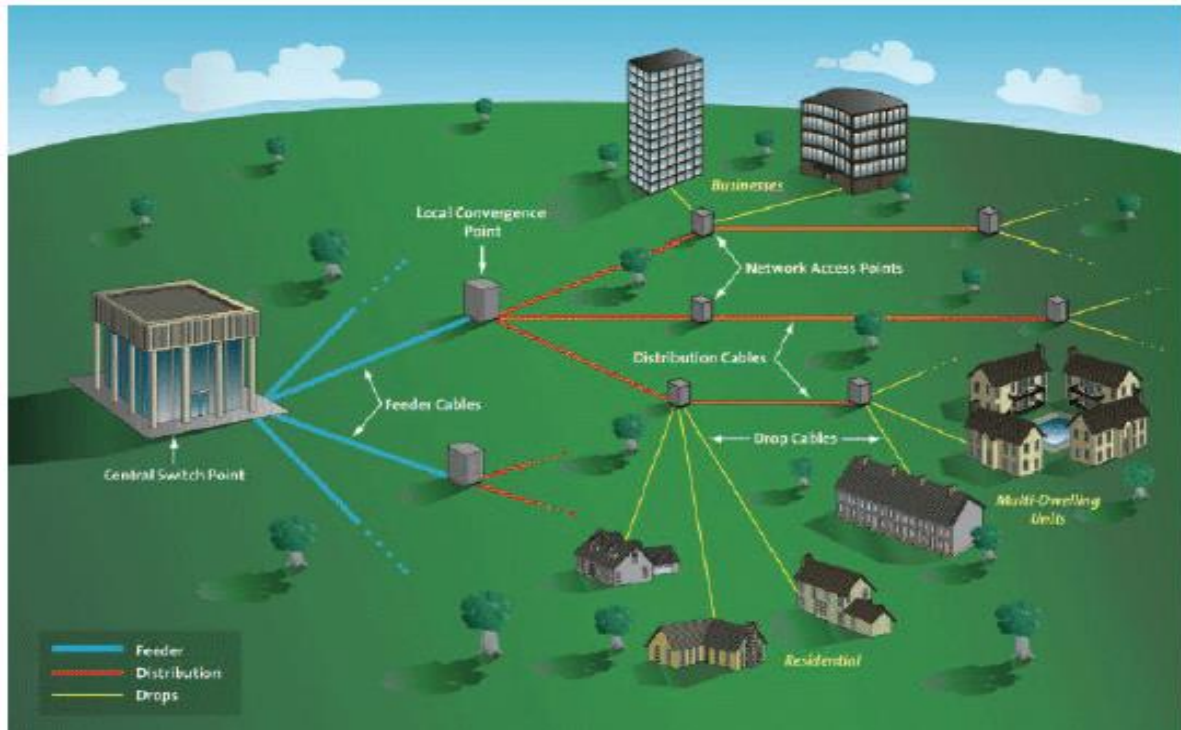


Figure: 3.3: Fiber to the Home (FTTH)

Basing on the termination point fiber network has many varieties. Those are as follows:

- a. **FTTN / FTTLA (fiber-to-the-node, -neighborhood, or -last-amplifier):** Fiber is terminated in a street cabinet, possibly miles away from the customer premises, with the final connections being copper. FTTN is often an interim step toward full FTTH and is typically used to deliver advanced triple-play telecommunications services [17].
- b. **FTTC / FTTK (fiber-to-the-curb/kerb, -closet, or -cabinet):** This is very similar to FTTN, but the street cabinet or pole is closer to the user's premises, typically within 1,000 feet (300 m), within range for high-bandwidth copper technologies such as wired Ethernet or IEEE 1901 power line networking and wireless Wi-Fi

technology [18]. FTTC is occasionally ambiguously called FTTP (fiber-to-the-pole), leading to confusion with the distinct fiber-to-the-premises system [18].

- c. **FTTP (fiber-to-the-premises):** This term is used either as a blanket term for both FTTH and FTTB, or where the fiber network includes both homes and small businesses.

- (1) FTTB (fiber-to-the-building, -business, or -basement): Fiber reaches the boundary of the building, such as the basement in a multi-dwelling unit, with the final connection to the individual living space being made via alternative means, similar to the curb or pole technologies.

- (2) FTTH (fiber-to-the-home): Fiber reaches the boundary of the living space, such as a box on the outside wall of a home. Passive optical networks and point-to-point Ethernet are architectures that deliver triple-play services over FTTH networks directly from an operator's central office.

- d. **FTTD (fiber-to-the-desktop):** Fiber connection is installed from the main computer room to a terminal or fiber media converter near the user's desk.
- e. For simplicity the fiber network is referred as FTTX, where X stands for termination point.
- f. **FTTE / FTTZ (fiber-to-the-telecom-enclosure or fiber-to-the-zone):** It is a form of structured cabling typically used in enterprise local area networks, where fiber is used to link the main computer equipment room to an enclosure close to the desk or workstation. FTTE and FTTZ are not considered part of the FTTX group of technologies, despite the similarity in name.

### 3.3 OPTICAL FIBER STRUCTURES

There are two types of network architecture for fiber management. Those are as follows:

- a. **Active Optical Network Architecture (Point to Point):** Active Optical Network Architecture (AON) rely on electrically powered network equipment to distribute the signal, such as a switch or router. Normally, signals need optical-electrical-optical transformation in the AON. Each signal leaving the central office is directed only to the customer for whom it is intended. Incoming signals from the customers avoid colliding at the intersection because the powered equipment there provides buffering. Active Ethernet (a type of Ethernet in the first mile) is a common AON, which uses optical Ethernet switches to distribute the signal, incorporating the customers' premises and the central office into a large switched Ethernet network. Such networks are identical to Ethernet computer networks used in businesses and academic institutions, except that their purpose is to connect homes and buildings to a central office rather than to connect computers and printers within a location. Each switching cabinet can handle up to 1,000 customers, although 400–500 is more typical [20]. This neighborhood equipment performs layer 2 switching or layer 3 switching and routing, offloading full layer 3 routing to the carrier's central office. The IEEE 802.3ah standard enables service providers to deliver up to 100Mbit/s, full-duplex, over one single-mode optical fiber FTTP, depending on the provider. Speeds of 1Gbit/s are becoming commercially available [20]. The figure below shows the Active Optical Network Architecture (AON):

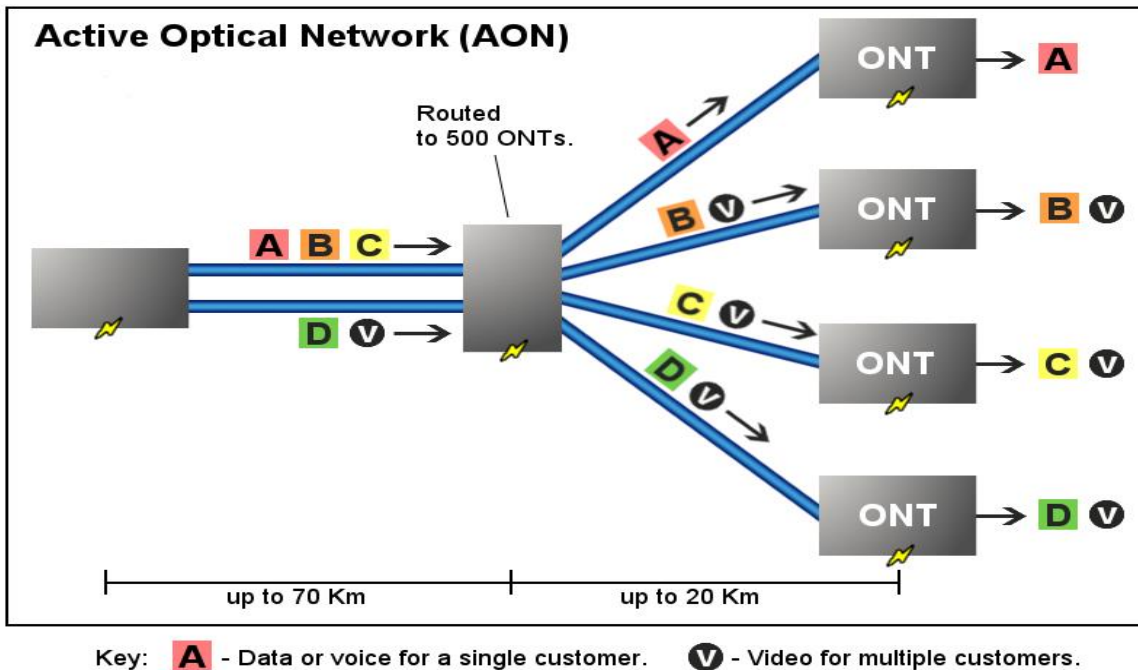


Figure: 3.4 Active Optical network (AON)

- b. **Passive Optical Network Architecture (Point to Multipoint).** A Passive Optical Network (PON) is a point-to-multipoint FTTP network architecture in which unpowered optical splitters are used to enable a single optical fiber to serve up to 128 customers [21]. A PON reduces the fiber and central office equipment required compared with point-to-point architecture. Downstream signal coming from the central office is broadcast to each customer premises sharing a fiber. Encryption is used to prevent eavesdropping. Upstream signals are combined using a multiple-access protocol, usually time division multiple access (TDMA). The figure below shows the Passive Optical Network Architecture (PON):



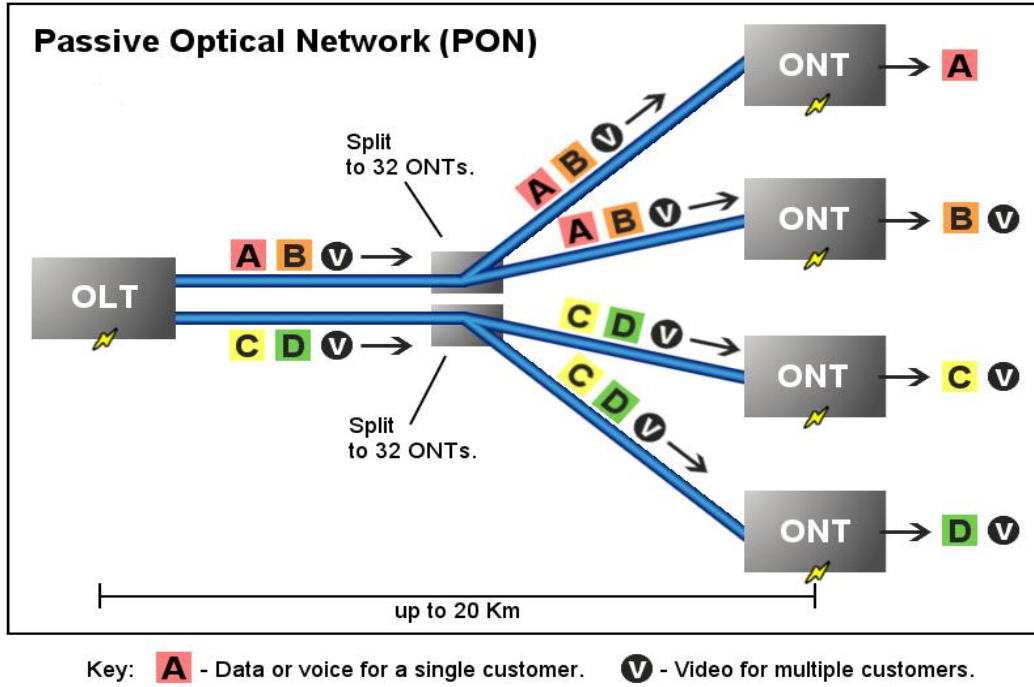


Figure: 3.5 Passive Optical network (PON)

# CHAPTER 4

## DEVELOPMENT

### 4.1 INTRODUCTION

A submarine communications cable is a cable laid on the sea bed between land-based stations to carry telecommunication signals across stretches of ocean and sea. The first submarine communications cables laid beginning in the 1850s carried telegraphy traffic, establishing the first instant telecommunications links between continents, such as the first transatlantic telegraph cable which became operational on 16 August 1858 [21]. Subsequent generations of cables carried telephone traffic, then data communications traffic. Modern cables use optical fiber technology to carry digital data, which includes telephone, Internet and private data traffic. Modern cables are typically about 1 inch (25 mm) in diameter and weigh around 2.5 tons per mile (1.4 tonnes per km) for the deep-sea sections which comprise the majority of the run, although larger and heavier cables are used for shallow-water sections near shore[22]. Submarine cables connected all the world's continents except Antarctica when Java was connected to Darwin, Northern Territory, Australia in 1871 in anticipation of the completion of the Australian Overland Telegraph Line in 1872 connecting to Adelaide, South Australia and thence to the rest of Australia [23].

### 4.2 SEA-ME-WE-5 CONSORTIUM CABLE IN BANGLADESH

#### 4.2.1 Submarine Cable Agreement

Bangladesh signed the much awaited and long cherished construction and maintenance agreement with 15 other international telecommunication companies in Dubai on March 27, 2004 for a high speed submarine cable that will herald ultra fast internet and low cost tele talk in 2005[24]. Now we are connected with SE-ME-WE-5 [24].

## 4.2.2 The Route

The consortium cable system has linked up South East Asia to Europe via Indian sub continent and Middle East with terminal stations in Singapore, Malaysia, Thailand, Bangladesh, India, Sri Lanka, Pakistan, United Arab Emirates, Saudi Arabia, Egypt, Italy, Tunisia, Algeria and France. This SEA-ME-WE-5 consortium cable has been connected to existing telecommunication networks in Europe [25]. The landing site in Bangladesh is located at Jhelongjha in Cox's Bazar which is 1260 kilometres (km) away from landing station at sea [25].



Figure: 4.1 SEA-ME-WE-5

## 4.2.3 Commissioning of the Project

The historic event that took place near the shore of the Bay of Bengal on May 22, 2006 will have a far-reaching effect on the progress and prosperity of Bangladesh [26]. On that day, the long awaited fibre optic submarine cable system at the landing station at Cox's Bazar connected Bangladesh to the global information super highway [26].

## **4.3 EFFECT ON ICT SECTOR AFTER BEING CONNECTED TO SEA-ME-WE-5 SUBMARINE CABLE PROJECT THROUGH OPTICAL FIBER**

### **4.3.1 Benefits of Consortium Submarine Cable Through Optical Fiber**

Bangladesh has already been connected with submarine cable through optical fiber. It is ready to provide following facilities:

- a. International voice circuits can be increased with various countries and Bangladesh can earn more foreign currency. It can handle 20 millions voice calls or broadcast 60,000 Tele Vision (TV) channels at the same time [27].
- b. The project can provide unprecedented high speed telecommunications links. The internet will be very fast and communication with other countries will be faster and cost effective. The delay factor involved in satellite communication will be eliminated.
- c. Bangladesh will get 10 Gigabyte bandwidth which is enough for its projected internet and telephony demand for the next 10 years and will eliminate the present congestion in overseas communication.
- d. The operation and maintenance of the submarine cable is full responsibility of the consortium and it is cheaper for Bangladesh.
- e. It will provide us with sufficient bandwidth for ICT expansion and software export/ data transmission at a much cheaper rate.
- f. It will contribute to break the digital divide between developed and developing countries. At present in Bangladesh 99.569 millions (Mobile Internet 93.793 millions, WiMAX 0.038 millions, ISP + PSTN 5.738 millions, till October,2019) people use internet which is 60 per cent of population or 1/12<sup>th</sup> of global average [28].

- g. Fast free access to the global ICT resources and server network in the advanced countries through high bandwidth services.

### **4.3.2 Government Steps for ICT Development**

The Government of Bangladesh has taken some important initiatives to develop ICT sector. Still we are waiting to see a fruitful change in our ICT. However, some remarkable steps of government are highlighted at Annex D to this paper.

### **4.3.3 Policy and Pricing**

Pricing has been done carefully considering the following issues:

- a. Facilitate development of ICT enabled services specially Call Centres and Business Process Outsourcing (BPO).
- b. Make Internet Protocol (IP) bandwidth cost-effective and at the same time make ready BTCL IP node and develop it as the most reliable and most attractive choice to the ISPs so that they do not prefer connecting to IP nodes abroad through International Private Leased Circuit (IPLC).
- c. Price for greater bandwidth has been made comparatively cheaper, so that retail business shifts to other service providers.
- d. Termination charges, collection charges etc to be kept low to increase greater utilization of the cable bandwidth and to facilitate penetration of broadband connections in order to meet the target set forth in the coming broadband policy.

## **4.4 ICT APPLICATION**

### **4.4.1 Utilizing Bandwidth for Data and Internet**

Demands for international bandwidth have a wide range of variation in terms of capacity, protocols, purpose, use, national policy etc. Taking into considerations of these aspects, the customer base needs to be segmented and a number of products have to be developed to meet

specific requirements of the customers. Proper attention should be given to take into account the indirect economic benefits as well as lost opportunities while pricing these products.

#### 4.4.2 IPLC



Figure: 4.2 Sea Me We-5

a. **IPLC Application** IPLC is a dedicated secure digital point to point private connection between two locations (usually two LANs) in two different countries that allows transmission of data, large internet packets, real-time video applications like video conferencing and such other information communication service. BTCL has been providing IPLC service through satellite since long and has policy guidelines and tariffs. Through submarine cable, bandwidth allocation for IPLCs will depend on the requirement and justification which may be from 64 Kbps to 2 Mbps [29].

b. **IPLC Strategy** Submarine cable has created a great opportunity for expanding IPLC use. The objectives for the strategy will be as follows:

- (1) Lower tariff.
- (2) Easy delivery of service and One-Stop Shopping arrangement (OSS).
- (3) Enhanced support service.
- (4) Encourage migration from VSAT to submarine cable through incentives.
- (5) Encourage long term and bulk use.

- (6) Encourage IT enabled services.

#### **4.4.3 Prospects in Telecommunication Sector**

Both public and private telecommunication sectors will get momentum. BTCL should promote cooperation of Private Licensed Telecommunication Operators (PLTO) to transform the underutilized resources in the public sector into countrywide information infrastructure. The PLTOs shall provide necessary finance and technology to construct countrywide National Information Infrastructure (NII) for use of all telecommunications and ISPs. BTCL will increasingly shift its role from service provider to individual subscribers towards infrastructure provider to all other telecommunication service providers and ISPs.

#### **4.4.4 Access and Co-location**

At present all cities and towns are covered by digital exchanges. All Upazilla exchanges will have digital exchanges by the end of this year. So, all telephone subscribers up to Upazilla level will have voice and Internet connectivity through the submarine cable. Rural growth centres will be brought under digital exchanges by installing suitable access network to extend benefits of submarine cable into the rural areas. Connectivity to private mobile and land phone operators is being further improved to allow access for all the existing subscribers and ensure access for the future growth. Co-location facility in BTCL premises at Dhaka and Chittagong will be allowed for customers who require higher capacity like E3/DS3 or STM-1 or higher.

#### **4.4.5 Universal Availability of Medical Care**

In this sphere ICT plays a vital role in National, Regional and Global situation, apart from person to person individual case. High bandwidth of submarine cable will be helpful in introducing telemedicine system network throughout the country for cost-effective delivery of health care services. It will be used for rural patient management, distant medical education and training health professionals and to develop mass awareness for disease prevention. International tele-

consultation through telemedicine for critical patients will be promoted in both private and public sector.

#### **4.4.6 Access to Education**

Through internet there has been an explosion of information, creation of transparency and a tremendous opportunity for acquiring knowledge and doing research in all disciplines. People have access to libraries, books and journals through internet. Distance education and virtual teachers are made possible widely by using ICT. In Bangladesh education and research can get a strong boost by exploiting all these opportunities through the high speed low cost internet facilities.

#### **4.4.7 Economic Development and Employment**

For any economic activity or development adequate ICT facility is a pre-condition for industrialization, increased productivity, trade and commerce etc. Bangladesh is experiencing the benefit that how ICT helps in the field of Garment Industries and Export Process Zone area. This has not only helped earning foreign exchange, but job creation as well. Data entry is another area where Bangladesh can earn huge foreign exchange and create job opportunities.

#### **4.4.8 Prospects of E-governance**

The government is considerably moving into e-governance for providing all needed information to citizens. It can make the government more efficient, transparent and effective. In e-governance, government can give information to public and public can have access to important information and documents of the government. The official website of the Government of Bangladesh is [www.bangladeshgov.org](http://www.bangladeshgov.org), currently contains links to President's office, Chief Adviser's office, ministries and agencies.

#### **4.4.9 Effects on Public Utility Services**



- a.. **Promotion of Human Rights:** ICT can be used to improve human rights and freedoms by providing a medium that bypasses communicative barriers of time and space, and thus promote vehicles that support increased levels of democracy to easy access of information.
- b. **Safety of Human Life:** For the human development activities safety of human life is essential. Whether it is natural disaster management or simply to contact a doctor or to call an ambulance, need of telecommunication is necessary.
- c. **Poverty Reduction :** ICT has tremendous prospect of poverty alleviation. Data entry software development can create thousands of jobs. With the limited facilities, apart from corporate level, Cyber Cafe, Fixed Phone, Village Phone and Mobile Phones have already created jobs and commercial activities.
- d. **Post Office:** All post offices in the country can work as cyber centres, in addition to their normal present duties. If post office based cyber centres are established, internet service will expand rapidly and mass people will get the benefit of ICT. Delivery of mail will be speedy and income of the post offices will also increase.

#### **4.4.10 Tourism**

To attract the tourists a reliable, comprehensive, on-line information system should be developed to provide instant and up-to-date information to the tourists for travel and accommodation. The partnership with both the local and foreign agencies relevant to tourism needs to be strengthened and encouraged to introduce on line reservation for travel and accommodation, booking and ticketing for arts and entertainment events and shopping.

#### **4.4.11 Trade and Commerce**

Trade and Commerce have also been greatly impacted by the deployment and increased importance of ICT and an international market has been created. Prospects of ICT in business sector are given below:

- a. **E-Commerce and E-Banking/On-line Banking** E-commerce and e-banking/On-line Banking is in nascent state in Bangladesh. In Bangladesh, Dhaka Bank, City Bank, Standard Chartered Bank, HSBC bank, Trust bank etc are providing any branch on-line banking facility to its customers. High-speed low cost internet facility can expand this service in many other banks also.
- b. **Business-to-Business (B2B) E-business** B2B e-business application already exists in export sectors of Bangladesh, especially in the Ready Made Garments (RMG) industries. The high speed low cost internet would enable them to seek information about potential buyers as well as raw material suppliers. It will enable them electronic transfer of payment and other facilities of e-commerce or e-business.
- c. **Business-to-Government (B2G) E-business** The government is a major buyer of goods and services from the private sectors. Transactions involving information collection, obtaining various governmental forms, registering activities can also be done on-line by the use of broadband internet facilities.

#### **4.4.12 Establishment of Cyber Centres**

It is possible to open a huge number of cyber centres in the small towns and villages in the country. The cyber centres can be a place where people will get opportunity to send and receive e-mail and can have telephonic talk over the internet. These are the places where people will have access to internet for information on agriculture and business, health service and can have education, entertainment and so on through high speed low cost internet.

#### **4.4.13.a Prospects in ICT Enabled Services**

Bangladesh has great potentialities for earning millions of dollars in foreign currency by providing ICT-enabled services to the foreign buyers. The prospective ICT enabled services are call centres, medical transcription, data entry, back office processing, insurance claim processing, salary processing, engineering design, translation, animation and many things more. With the commissioning of the submarine cable system, the materialization of all these activities will be much easier and more affordable.

#### **4.4.13.b Bangladesh Software Industry**

There is a good opportunity for local ICT companies to enter into joint venture agreements with foreign companies. To promote software export an ICT Business Promotion Council has been set up under the Ministry of Commerce and a Business Promotion Office has been set up by Export Promotion Bureau at Silicon Valley, USA.

#### **4.4.14 Human Resource Development**

Human resource is the most important component for ICT industry. The country can take advantage of its immense manpower to train and prepare programmers and IT professionals. Government has already started a project to develop computer programmers in Bangladesh. At present some public universities, private universities, colleges under the National University are offering computer science courses, producing around 20,000 computer science graduates per year [30]. Besides, all the universities are offering one year post-graduate diploma course for the graduates. Our unemployed educated persons can take this opportunity to build their career as IT professionals.

#### **4.4.15 Investigation of Criminal Cases, National Security and Defence**

Taking the advantage of faster and cheaper access to the internet, the law enforcing agencies can use ICT to ensure safety and security of life and property of the citizen. Agencies like police, National Board of Revenue and Anti-Corruption Commission can use ICT for quick disposal and monitoring of investigation of cases. Bangladesh Armed Forces can use ICT to the fullest extent to increase their efficiency and effectiveness.

# **CHAPTER 5**

## **RESULTS AND DISCUSSIONS**

### **5.1 INTRODUCTION**

#### **5.1.1 General**

It is very unfortunate that though the cable is in operation since May 2006, it has not yield a reasonable amount of revenue for BTCL. The project can generate huge amount of revenue provided it is managed properly. Some of the management / marketing problems mentioned in the subsequent paragraphs are to be addressed very carefully to make the project a success.

#### **5.1.2 Managing the Cable System**

As an interim arrangement, the management of the cable has been vested with the General Manager (GM) (Overseas) and an office under the GM (Overseas). Divisional Engineer (Telex) has been made responsible for selling the capacity. On the other hand, as some of the work is still under implementation, Project Director Submarine Cable is dealing with the expenditure/payment issues. BTCL being a government organisation, has to abide by the government rules and regulations which definitely delay the decision making process. It can be treated as a sub-operating area of BTCL and it should be managed separately. The best option should be a separate subsidiary company under the shadow of BTCL giving full administrative and financial authority to manage the cable.

#### **5.1.3 Strengthening the Marketing**

The marketing of the cable capacity is still traditional. Probable customers approach BTCL to buy capacity. Depending on the availability of circuits, access capacity and subject to fulfilment of conditions, BTCL may consider their applications. BTCL could never advertise the available services, price, available capacity etc. BTCL has no marketing team and it is being thought that capacity buyer will come to BTCL and place their demands and BTCL will provide the service if

possible. BTCL has so far activated 15 per cent of the capacity and using only 5 per cent of the capacity.

#### **5.1.4 Submarine Cable Tariff Fixation**

Submarine cable tariff is fixed under BTCL's traditional process. A proposal is initiated by BTCL, and then it goes to the Ministry of Post and Telecommunication. Then it is sent to the Ministry of Finance for final approval. This process takes a few weeks and even a few months. Though, the tariff of a service in the competitive market changes frequently depending on the market conditions. BTCL's tariff can not be revised without fulfilling the government rules and regulations. Submarine cable tariff fixation process should be given waiver and left with the cable management of the cable system.

#### **5.1.5 Access Network**

Most of the customers want submarine cable access up to his premises. But as BTCL could not build the access network, fails to serve the customer according to their requirements. To come out of the problems, BTCL should immediately take necessary measures to build its access network.

#### **5.1.6 Redundancy for Terrestrial Optical Fibre Link**

Optical fibre link of BTCL between Dhaka and Cox's Bazar has been cut due to subversive activities at least for 25 times within last two years which created a total cut off with the SEA-ME-WE-5 cable. For this reason the total loss is of Tk. 1200 millions. An expert team needs 8-10 hours time to rectify the fault. It is very urgent that BTCL should build a backup path for this large band width. As such, the first option for a backup line is with the government-owned Power Grid Company of Bangladesh (PGCB), which is asking for Tk. 19.40 crores as rental and other charges for a five-year term.

#### **5.1.7 Redundancy for Submarine Cable**

The landing station of Cox's Bazar is connected to the SEA-ME-WE-5 with a long section of 1260 km from the branching unit. This length is vulnerable for any natural disaster like tsunami, cyclone, anchoring large ships etc. If there is any cable interruption on the submarine cable, sometime it

needs more than a month to rectify the interruption. This will create a bottleneck in the ICT and Telecommunication sector of Bangladesh. We have to build a new connectivity to another submarine cable for safeguard of our communication.

## **5.2 PROJECTED REVENUE**

### **5.2.1 General**

BTCL's share in the consortium is 7.05 per cent and shall have right to use 10 Gigabyte capacity and shall have capacity of 64 STM-1. BTCL has already activated 15 per cent of the capacity and using 33 per cent of the activated capacity. Now BTCL using 5 per cent of the total capacity. It has been estimated very conservatively that if proper steps are taken for marketing of the services, BTCL could earn some projected revenue which are discussed in the subsequent paragraphs.

### **5.2.2 Capacity Sold to ISP**

ISPs are interested to get connectivity through the submarine cable for having faster and high capacity smooth service. From the selling BTCL will be earning annual revenue of Tk. 396.36 millions. If an effort is made, the sold capacity will doubled with in one year.

## **5.3 ROLE OF BTCL**

### **5.3.1 General**

BTCL works as a prime mover in the telecommunication sector of Bangladesh. It is noticeable that BTCL is one of the profitable government service sectors who has to face more open competition from its private counterparts. BTCL can connect its national highways to super highway and rent the space to other entrepreneurs and thus bring the country to the ICT world.

### **5.3.2 Utilization Plan**

The main task of BTCL is to plan deliberately to utilize the huge bandwidth available in the cable in a pragmatic and systematic way. BTCL held meetings and discussion with ISPs, PSTN and mobile phone operators and other users to ascertain their present and future requirement and to share ideas on utilization of the submarine cable. This utilization plan has been prepared to address the following terms of references:

- a. Determine requirement for voice, data, video, entertainment and similar other broadband services by BTCL and other service providers for next 10 years.
- b. Facilitate overall ICT activities to enhance the socio-economic growth of the country.
- c. Follow the consortium guideline for marketing.
- d. Determine surplus cable capacity and make effective use of that.

### **5.3.3 Likely Lease Plan**

After fulfilling the requirement of the country, excess capacity may be leased out to overseas operators. For the next two years, capacity can only be sold on lease basis and not as Indefeasible Right of Users (IRU). To make better and greater utilization of the submarine cable new services like Internet Protocol Virtual Private Network (IP VPN), virtual telephone network abroad and various kinds of broadband service may be introduced in the country. Connectivity with different countries may be established through SEA-ME-WE-3&4 by exchanging equivalent SEA-ME-WE-5 capacity.

# CHAPTER 6

## CONCLUSIONS

### 6.1 CONCLUSION

The government has approved the National ICT Policy for the development of ICT sector within the framework of overall national development and declared ICT as the thrust sector for the purpose of development. The main objective of ICT Policy is to ensure access to information by every citizen, to provide service at affordable cost and to establish direct connectivity with the international communication backbone through joining the submarine cable network. Finally government signed submarine cable network contract with SEA-ME-WE-4&5 consortium. To create a smooth environment for e-commerce and to safeguard the dealings over the net and to check the threat to computer communication, the government has drafted the ICT law which is in the process of enactment by the Parliament.

Bangladesh signed the much-awaited and long cherished construction and maintenance agreement with 15 other international telecommunications companies for a high-speed submarine cable that will herald ultra fast internet and low cost Tele-Talk. The SEA-ME-WE-5 consortium cable have linked up countries from Singapore to France via Malaysia, Thailand, Bangladesh, Sri Lanka, India, Pakistan, United Arab Emirates, Saudi Arabia, Egypt, Tunisia, Algeria and Italy with 19 landing stations. The project cost in the consortium is much cheaper than Bangladesh having its own Submarine cable. Bangladesh has got an initial capacity of 10 Gbps, which will cater for next few years. The capacity can be enhanced up to 100 Gbps through some incremental payment to the consortium. This consortium cable has provided us with sufficient bandwidth for ICT expansion and software export/data transmission at a much cheaper rate. Based on SEA-ME-WE-5 consortium cable, it is expected that the nationwide internet backbone will be established.

Bangladesh being connected with Submarine cable is now capable of providing unprecedented high speed telecommunications links. The internet will be very fast and as such communication



with other countries will be faster and cost effective. The delay factor involved in satellite communication shall be eliminated. It will contribute to break the digital divide between developed and developing countries. Bangladesh will get 10 GB bandwidth which is enough for its projected internet and telephony demand for the next 10 years and will eliminate the present congestion in overseas communication. The Government of Bangladesh has taken some important initiatives to develop the ICT sector. Import Duties, Taxes and Value Added Tax (VAT) have been withdrawn from all computer hardware and software in 1998 [31]. Price for greater bandwidth has been made comparatively cheaper so that retail business shifts to other service providers.

BTCL works as a prime mover in the telecommunication sector of Bangladesh. The main task of BTCL is to plan deliberately to utilize the huge bandwidth available in the cable in a pragmatic and systematic way. The utilization plan for the cable capacity has been prepared by BTCL to address some of the important terms of references. After fulfilling the requirement of the country, excess capacity in the main stream may be leased out to overseas operators. To make better and greater utilization of the submarine cable new services like IP VPN, virtual telephone network abroad and various kinds of broadband services may be introduced in the country. It is very unfortunate that though the cable is in operation since May 2006, it has not yield a reasonable amount of revenue for BTCL. The project can generate huge amount of revenue provided it is managed properly. Some of the management / marketing problems like managing the cable system, strengthening the marketing operation, tariff fixation process and access network etc are to be addressed very carefully to make the project a success.. It has been estimated very conservatively that if proper steps are taken for marketing of the services, BTCL could earn revenue from the fields like selling of capacity to ISP, sale of IPLC, enhanced revenue from bilateral traffic, sale of wet segment etc. Bangladesh should plan for redundancy of terrestrial optical fibre link and should establish a new link as alternative means for uninterrupted flow of information.

Demands for international bandwidth have a wide range of variation in terms of capacity, protocols, purpose, use, national policy etc. Proper attention should be given to take into account the indirect economic benefits as well as lost opportunities while pricing these issues. Submarine cable has created a great opportunity for expanding IPLC use. It has opened up a new era in both public and private telecommunication sectors. BTTB will increasingly shift its role from service

provider to individual subscribers towards infrastructure provider to all other telecommunication service providers and ISPs. Connectivity to private mobile and land phone operators is being further improved to allow access for all the existing subscribers and ensure access for the future growth. Private operators in the country will be allowed to develop access network for data communication only. Co-location facility at Dhaka, Chittagong and other big cities will be allowed for this purpose.

It will promote radical advancement in economy, medical service, education, business and human resource development. It will be possible to open a huge number of cyber centres in the small towns and villages in the country. To make the government more efficient, transparent and effective, e-governance has to be implemented extensively. Both public and private telecommunication sectors will also get momentum. High bandwidth of submarine cable will be helpful in tele-medicine, while specialist doctors from abroad will be able to guide and instruct in diagnosis and operation in Bangladesh. The other public utility services such as promotion and safety of human life, post office, tourism and poverty reduction will get into momentum. High-speed low cost internet facility can expand e-commerce and e-banking or on-line banking, the high speed internet access will ensure more interaction to different communities and community security to the urban people. Videoconferencing to accelerate decision making, reducing the cost of travel and accommodation will result in huge cut in the cost of governance.

Bangladesh has great potentialities for earning millions of dollars in foreign currency by providing ICT-enabled services to the foreign buyers. The prospective ICT enabled services are call centres, medical transcription, data entry, back office processing, insurance claim processing, salary processing, engineering design, translation, animation and many things more. High-speed low cost internet facility will provide easy access to libraries, books and journals throughout the world. Thus distance education and virtual teachers are made possible widely by using ICT. At present, some 83 firms in ICT sector are developing software and exporting software products from Bangladesh. Human resource is the most important component for ICT industry. The country can take advantage of its immense manpower to train and prepare programmers and IT professionals. Government should take necessary steps to make the mission, which can usher in a new era in the country's march towards progress.

After commissioning of the submarine cable project, a remarkable uplift in the ICT sector and also in the economic sector of the government can be expected. If the recommendations made in this paper are fulfilled, it is hoped that Bangladesh can exploit the full advantages of submarine cable which will open the door of information super highway. This will ultimately help the country to achieve the target of ICT driven nation comprising knowledge based society.

## 6.2 RECOMMENDATIONS

In order to make Bangladesh an ICT driven nation and derive maximum benefits from the SEA-ME-WE-5 consortium submarine cable project through optical fiber, the following recommendations are made for further implementation:

- a. Government should take necessary steps as per cyber law and ICT law immediately for an effective utilisation.
- b. Government should take necessary steps for the followings:
  - (1) Proper use of bandwidths of submarine cable of Global information superhighway should be ensured.
  - (2) High-speed internet connectivity should be made available in all educational institutions with nominal cost to accelerate the pace and quality of education.
  - (3) E-governance should be implemented with high priority. This will focus on more transparency in work and more people will be associated with ICT.
- c. Success of the cable will depend on the marketing of the wet segment. An organized marketing team composed of BTCL technical personnel should be formed. Setting up an offshore marketing office or appointment agents outside Bangladesh is very essential.
- d. BTCL should immediately build up the access network to provide services up to the premises of the customers. It will facilitate BTCL to serve the market.
- e. BTCL should take necessary steps to stop subversive activities of cutting the cable link and should establish alternative optical fibre link in addition to the existing one for uninterrupted flow of information.

# Annex A

DATED 20 JUNE 2019

## CELLULAR PHONE NETWORKS AND PRESENT BANDWIDTH OF MAJOR ISPs

1. States of cellular phone networks is given below:

- a. Grameen Phone : 70.0 million
- b. Airtel : 44.7 million
- c. City Cell : nil
- d. Bangla Link : 33.4 million
- e. Teletalk : 3.7 million

2. The present bandwidth of some major ISPs is tabulated below:

Name of ISP	Download (Mbps)	Upload (Mbps)
(a)	(b)	(c)
Aftab IT Ltd.	2	1.5
Agni Systems	4.5	1.5
BOL Online	6	4
BTCL	2	30
Grameen Cyber Net	4	2
Information Services Network	4	1.5

Sources: <http://www.btcl.com.bd/en/236/article015>

# Annex B

DATED 20 JUNE 2019

Serial	Service Providers	State
1.	PSTN Operators	16 PSTN Operators exist apart from BTCL
2.	Category A ISP	94 License holder operating in the country at Dhaka, Chittagong and Sylhet
3.	Category B ISP	20 License holder operating in the country at Dhaka, Chittagong and Sylhet in each location of District Area Excluding Dhaka/Chittagong/Sylhet City Area (Multi Exchange)
4.	Category C ISP	16 License holder operating in each location excluding District Town Area and Dhaka, Chittagong or Sylhet City Area (Multi Exchange)
5.	Category D ISP	77 License holder operating anywhere within the country (Nationwide)
	<b>Total ISP</b>	<b>207</b>
6.	VSAT Providers	24 Existing VSAT Providers License
7.	VSAT Providers with HUB	8 Existing VSAT Providers License

## STATE OF EXISTING PSTN OPERATORS, ISPs AND VSAT PROVIDERS IN BANGLADESH

Source: BTCL Website

# Annex C

DATED 20 FEBRUARY 2019

## GOVERNMENT STEPS FOR ICT DEVELOPMENT

1. The Government of Bangladesh has taken some important initiatives to develop ICT sector. Still we are waiting to see a fruitful change in our ICT. However, some remarkable steps of government are highlighted below:

**a. Fiscal Support**

- (1) Import duties, taxes and Value Aided Tax (VAT) withdrawn from all computer hardware and software in 1998.
- (2) Tax holiday allowed for five consecutive years.
- (3) 15 per cent price preference for locally developed software.
- (4) Banking procedures amended and simplified.
- (5) Working capital loan without collateral.
- (6) Equity participation fund (Taka 5,000 million or US\$ 80 million).
- (7) 100 percent remittance of profit and capital gains for foreign investors.

**b. Other Steps**

- (1) Quick implementation of the recommendations of JRC reports (a high powered committee for software export).
- (2) IT cell at Export Promotion Bureau (EPB) for monitoring the ICT related exports.

## Annex D

(3) Government transformed all the four Bangladesh Institutes of Technologies (BIT) to Science and Technology Universities. At the same time, it put all the BITs, universities and Colleges under National University offering undergraduate degree in IT related fields.

(4) Government established one ICT Incubator Centre at the BSRS Bhaban at Kawran Bazar on November 01, 2002. This space is exclusively allocated to the private sector ICT related organizations and entrepreneurs involved/engaged in software and IT enable services working for markets both inside and abroad. At present, about 48 IT/software related companies have set up operations in this facility. The facility has been provided with 24-hour power supply and internet gateway facility.

(5) Government also established ICT Business Promotion Council under Ministry of Commerce and a Business Promotion Office by EPB at Silicon Valley, USA.

(6) Government has also undertaken a project to establish a Hi-tech Park near Kaliakoir, which will house software and ICT-enabled service industries, electronics related equipment and products etc.

Sources : Jamilur Reza Chowdhury, Vice Chancellor, BRAC University, International Seminar on ICT Policy Reform and Rural Communication Infrastructure.



## REFERENCES

1. <https://thefinancialexpress.com.bd/trade/ict-most-potential-service-sector-but-challenges-remain-study-1542431757>, accessed 17 December 2018
2. [http://www.bscl.com/doc/up\\_file/IMC\\_GM\\_1570678152-84.pdf](http://www.bscl.com/doc/up_file/IMC_GM_1570678152-84.pdf), accessed 21 September 2019
3. [https://mof.portal.gov.bd/sites/default/files/files/mof.portal.gov.bd/page/3ef1111d\\_f0d6\\_41ea\\_aca9\\_6afb61228825/G-3\\_09\\_28\\_ICT%20%20Division\\_English.pdf](https://mof.portal.gov.bd/sites/default/files/files/mof.portal.gov.bd/page/3ef1111d_f0d6_41ea_aca9_6afb61228825/G-3_09_28_ICT%20%20Division_English.pdf), accessed 13 July 2019
4. [http://www.bscl.com/com\\_history](http://www.bscl.com/com_history), accessed 24 September 2018
5. <https://sdsia.co/2017/01/30/second-submarine-cable-still-submerged-in-btcls-negligence/>, accessed 27 September 2019
6. <http://lict.gov.bd/main/pdetails/30>, accessed 8 September 2018
7. [http://e-cab.net/wp-content/uploads/2016/08/E-Commerce\\_Policy\\_Framework\\_for\\_Bangladesh7.pdf](http://e-cab.net/wp-content/uploads/2016/08/E-Commerce_Policy_Framework_for_Bangladesh7.pdf), accessed 11 August 2019
8. <https://basis.org.bd/publication/70703b24ff126cd156b5699a6505fe8a.pdf>, accessed 12 September 2019
9. [http://www.btrc.gov.bd/sites/default/files/journal\\_file/information\\_and\\_communication\\_technology\\_status\\_issues\\_and\\_future\\_development\\_plans\\_in\\_bangladesh.pdf](http://www.btrc.gov.bd/sites/default/files/journal_file/information_and_communication_technology_status_issues_and_future_development_plans_in_bangladesh.pdf), accessed 2 September 2019
10. <http://www.btcl.com.bd/en/236/article015>, accessed 7 September 2018
11. <http://www.btcl.com.bd/en/229/article008>, accessed 7 September 2018
12. <http://www.btrc.gov.bd/content/mobile-phone-subscribers-bangladesh-january-2019>
13. Md.Harun or Rashid managing director, BTCL(Internet Version). Internet Subscribers in Bangladesh - December 2017". Bangladesh Telecommunication Regulatory Commission. December 2017.Jump up to: a b "A short history of the Bangladesh ISP Industry", Internet Service Providers Association Bangladesh, accessed 27 September 2019
14. [https://ictd.portal.gov.bd/sites/default/files/files/ictd.portal.gov.bd/annual\\_reports/7cc31b50\\_1550\\_4d95\\_9382\\_8edf028fd1d0/Draft%20Annual%20Report%20%20ICTD.pdf](https://ictd.portal.gov.bd/sites/default/files/files/ictd.portal.gov.bd/annual_reports/7cc31b50_1550_4d95_9382_8edf028fd1d0/Draft%20Annual%20Report%20%20ICTD.pdf), accessed 2 September 2019
15. <http://www.btcl.com.bd/external/page/en/english>, accessed 7 January 2019
16. <https://books.google.com.bd/books?id=XJ5HE-5wAHQC&pg=PA355&ots=fylaIQeKmR&dq=The%20field%20of%20applied%20science%20and%20engineering%20concerned%20with%20the%20design%20and%20application%20of%20optical%20fibers%20is%20known%20as%20fiber%20optics.&pg=PA355#v=onepage&q=The%20field%20of%20applied%20science%20and%20engineering%20concerned%20with%20the%20design%20and%20application%20of%20optical%20fibers%20is%20known%20as%20fiber%20optics.&f=false>, accessed 13 November 2019
17. <https://www.exfo.com/en/resources/glossary/fiber-node-fttn/>, accessed 18 September 2019
18. <https://www.networksecurity.org/members-area/glossary/f/fttn.html>, accessed 27 September 2019
19. [http://dictionnaire.sensagent.leparisien.fr/Fiber\\_to\\_the\\_x/en-en/](http://dictionnaire.sensagent.leparisien.fr/Fiber_to_the_x/en-en/), accessed 27 October 2019

20. <http://m.hg-fibercable.com/ftth-fiber-cable/ftth-12-core/ftth-fiber-to-home.html>, accessed 27 October 2019
21. [https://books.google.com.bd/books?id=jJNPDwAAQBAJ&pg=PA118&lpg=PA118&dq=The+first+submarine+communications+cables+laid+beginning+in+the+1850s+carried+telegraphy+traffic&source=bl&ots=HQ\\_rb2tJyZ&sig=ACfU3U3qPiJFOt6ANPnuNKVma1OjfA7LQ&hl=en&sa=X&ved=2ahUKEwiBiqmx77XmAhXLzjgGHTqxABUQ6AEwEXoECAkQAQ#v=onepage&q=The%20first%20submarine%20communications%20cables%20laid%20beginning%20in%20the%201850s%20carried%20telegraphy%20traffic&f=false](https://books.google.com.bd/books?id=jJNPDwAAQBAJ&pg=PA118&lpg=PA118&dq=The+first+submarine+communications+cables+laid+beginning+in+the+1850s+carried+telegraphy+traffic&source=bl&ots=HQ_rb2tJyZ&sig=ACfU3U3qPiJFOt6ANPnuNKVma1OjfA7LQ&hl=en&sa=X&ved=2ahUKEwiBiqmx77XmAhXLzjgGHTqxABUQ6AEwEXoECAkQAQ#v=onepage&q=The%20first%20submarine%20communications%20cables%20laid%20beginning%20in%20the%201850s%20carried%20telegraphy%20traffic&f=false), accessed 27 September 2019
22. <http://vzwpluspunt.be/machine-equipment/13762.html>, accessed 20 May 2019
23. <https://portal.engineersaustralia.org.au/system/files/engineering-heritage-australia/nomination-title/HRP.Overland%20Telegraph.Nomination.pdf>, accessed 27 September 2019
24. [https://books.google.com.bd/books?id=DIFwPrqYZbYC&lpg=PA66&ots=Nt4tP0\\_NHp&dq=submarine%20cable%20agreement%20with%20dubai%20and%20bangladesh%20in%202004&pg=PA66#v=onepage&q=submarine%20cable%20agreement%20with%20dubai%20and%20bangladesh%20in%202004&f=false](https://books.google.com.bd/books?id=DIFwPrqYZbYC&lpg=PA66&ots=Nt4tP0_NHp&dq=submarine%20cable%20agreement%20with%20dubai%20and%20bangladesh%20in%202004&pg=PA66#v=onepage&q=submarine%20cable%20agreement%20with%20dubai%20and%20bangladesh%20in%202004&f=false), accessed 7 September 2019
25. <http://www.bscccl.com/iplc>, accessed 22 June 2019
26. <http://archive.thedailystar.net/2006/05/20/d60520011510.htm>, accessed 31 August 2019
27. <https://bit.ly/34lysub>, accessed 2 September 2019
28. <http://www.btrc.gov.bd/content/internet-subscribers-bangladesh-october-2019>
29. [http://www.btcl.com.bd/files/img/form/IPLC\\_Terms\\_Conditions\\_2008.pdf](http://www.btcl.com.bd/files/img/form/IPLC_Terms_Conditions_2008.pdf), accessed 5 April 2019
30. [https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=2ahUKEwifnuXTgLfmaAhV0zDgGHUy\\_AewQFjAAegQIBBAC&url=https%3A%2F%2Fwww.adb.org%2Fsites%2Fdefault%2Ffiles%2Fpublication%2F528471%2Fbangladesh-computer-engineering-education-2018.pdf&usg=AOvVaw1stsCIIUJQe29g3OpQQDY6](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=2ahUKEwifnuXTgLfmaAhV0zDgGHUy_AewQFjAAegQIBBAC&url=https%3A%2F%2Fwww.adb.org%2Fsites%2Fdefault%2Ffiles%2Fpublication%2F528471%2Fbangladesh-computer-engineering-education-2018.pdf&usg=AOvVaw1stsCIIUJQe29g3OpQQDY6), accessed 5 December 2019
31. [https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=10&cad=rja&uact=8&ved=2ahUKEwiQ2qrlh7fmAhVRzTgGHczoAykQFjAJegQIAxAC&url=http%3A%2F%2Fnbr.gov.bd%2Fuploads%2Ffacts%2F18.pdf&usg=AOvVaw1WYwJeUL\\_7E5qLS3NthVRF](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=10&cad=rja&uact=8&ved=2ahUKEwiQ2qrlh7fmAhVRzTgGHczoAykQFjAJegQIAxAC&url=http%3A%2F%2Fnbr.gov.bd%2Fuploads%2Ffacts%2F18.pdf&usg=AOvVaw1WYwJeUL_7E5qLS3NthVRF), accessed 8 December 2019

## FIGURE REFERENCES

Figure: 2.1

1. [https://www.google.com/search?q=Bangladesh+Submarine+Cable+Map&sxsrf=ACYBGNTTrh-BOqAerNytVDDXqftC1dFgeUA:1576821096054&source=lnms&tbn=isch&sa=X&ved=2ahUKEwiI0LeqxMPmAhXfyDgGHQZgB-QQ\\_AUoAnoECBgQBA&biw=1366&bih=657#imgrc=ESGJwKmygOuwuM](https://www.google.com/search?q=Bangladesh+Submarine+Cable+Map&sxsrf=ACYBGNTTrh-BOqAerNytVDDXqftC1dFgeUA:1576821096054&source=lnms&tbn=isch&sa=X&ved=2ahUKEwiI0LeqxMPmAhXfyDgGHQZgB-QQ_AUoAnoECBgQBA&biw=1366&bih=657#imgrc=ESGJwKmygOuwuM)
2. <https://www.google.com/url?sa=i&source=images&cd=&ved=2ahUKEwiK7qf0xMPmAhW->

xzgGHVvGBU4QjRx6BAgBEAQ&url=http%3A%2F%2Ffiber.vocom.com%2Finventory%2F&psig=AOvVaw2rp77HUwuZN5G\_mASDLBSS&ust=1576907609327226

Figure:2.2

[https://www.google.com/search?q=Submarine+Cable+Through+Optical+Fiber+in+Ocean&sxsrf=ACYBGNNH\\_9QFHCp4RUm-pRBPnbVCFOIA:1576821404212&source=lnms&tbm=isch&sa=X&ved=2ahUKEwjKkrC9xcPmAhVWxDgGHSx1CzgQ\\_AUoAnoECA0QBA&biw=1366&bih=657](https://www.google.com/search?q=Submarine+Cable+Through+Optical+Fiber+in+Ocean&sxsrf=ACYBGNNH_9QFHCp4RUm-pRBPnbVCFOIA:1576821404212&source=lnms&tbm=isch&sa=X&ved=2ahUKEwjKkrC9xcPmAhVWxDgGHSx1CzgQ_AUoAnoECA0QBA&biw=1366&bih=657)

Figure: 2.3

[https://www.google.com/search?q=Submarine+Cable+Project+Works+Through+Optical+Fiber&sxsrf=ACYBGNSu\\_nFniTWTyPQ\\_cXEGMAPw5kVnag:1576821725174&source=lnms&tbm=isch&sa=X&ved=2ahUKEwjNkLbWxsPmAhXpwjgGHY8YBXgQ\\_AUoAXoECA0QAw&biw=1366&bih=657](https://www.google.com/search?q=Submarine+Cable+Project+Works+Through+Optical+Fiber&sxsrf=ACYBGNSu_nFniTWTyPQ_cXEGMAPw5kVnag:1576821725174&source=lnms&tbm=isch&sa=X&ved=2ahUKEwjNkLbWxsPmAhXpwjgGHY8YBXgQ_AUoAXoECA0QAw&biw=1366&bih=657)

Figure: 3.1

<https://community.fs.com/blog/the-difference-between-fiber-optic-cable-twisted-pair-and-cable.html>

Figure: 3.2

[https://www.google.com/search?q=Optical+Fiber&sxsrf=ACYBGNQRgdQ3gwo2YxW4P8reSOrvSE4TmA:1578052388450&source=lnms&tbm=isch&sa=X&ved=2ahUKEwiLq7OgrfmAhXezzgGHRUoCVUQ\\_AUoAXoECBgQAw&biw=1366&bih=657](https://www.google.com/search?q=Optical+Fiber&sxsrf=ACYBGNQRgdQ3gwo2YxW4P8reSOrvSE4TmA:1578052388450&source=lnms&tbm=isch&sa=X&ved=2ahUKEwiLq7OgrfmAhXezzgGHRUoCVUQ_AUoAXoECBgQAw&biw=1366&bih=657)

Figure: 3.3

<https://www.broadband4europe.com/europe-reaches-nearly-30-mln-ftthb-subscribers/>

Figure: 3.4

<http://www.fiberopticsshare.com/ftth-access-networks-aon-vs-pon.html>

Figure: 3.5

<http://www.fiberopticsshare.com/ftth-access-networks-aon-vs-pon.html>

Figure: 4.1

<https://jabledhasan183.wordpress.com/2012/01/19/new-submarine-cable-connected-by-2014/>

Figure: 4.2

<http://www.smartcitiesworldforums.com/news/smart-cities-middle-east/smart-infrastructure-me/139-sea-me-we-5-subsea-cable-is-complete-developed-by-a-16-nation-consortium>

