Kingdom of Bhutan
Bhutan Telecom Ltd.

Preparatory Survey Report
on
The Project for Building the Disaster Resilient Emergency Mobile Network

November 2017

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

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PREFACE

Japan International Cooperation Agency (JICA) decided to conduct the preparatory survey and entrust the survey to the team consisting Pantel International Co., Ltd., Kokusai Kogyo Co., Ltd., KDDI Foundation., and Japan Recom Ltd..

The survey team held a series of discussions with the officials concerned of the Royal Government of Bhutan and Bhutan Telecom Ltd., and conducted field investigations. As a result of further studies in Japan, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Royal Government of Bhutan and Bhutan Telecom Ltd. for their close cooperation extended to the survey team.

November, 2017

Itsu Adachi
Director General,
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Executive Summary

1. Country Summary

The Kingdom of Bhutan (referred to hereafter as "Bhutan") is a constitutional monarchy with a land area of approximately 38,394 km^2 located in the southern slope of Himalaya Mountains, bordering China in north, India in east, west and south. The population count for approximately 770,000 (2015 World Bank) comprising Tibetan, East Bhutan natives, and Nepalese ethnic groups, and religions that include Tibetan Buddhism and Hinduism. The administration is divided into 20 *Dzongkhags* (districts) with administrative units composed of 15 *Dungkhags* (sub-districts) and 205 *Gewogs* (villages).

As for the economic situation of Bhutan, there has been a steady transition from a self-sufficient economy to a market economy due to the promotion of a modernization policy since the 1960s, and an average GDP growth rate of 9% was achieved between 2002 and 2008 (9th 5-Year Plan, extended one year to 2008), followed by a strong average economic growth rate of between 5% and 10% until 2015 due to, for example, the construction of a large-scale hydroelectric power station and the export of electricity to India. The GDP in 2014 was 1.959 billion US dollars and the GDP per capita was 2,560.5 US dollars. In addition, GNI per capita is 2,380 US dollars (2015 World Bank, World Development Indicator Database) and it was ranked 132nd of 182 countries in the United Nations Development Program "UNDP Human Development Index 2015."

As for the composition of GDP by industry (2014), agriculture and forestry accounted for 16.77%, construction 15.46%, electricity and water supply 14.15%, social welfare 10.84%, transportation and communications 9.63%, and manufacturing 8.12%.

Bhutan advocates a unique principle of economic development called Gross National Happiness (GNH) rather than the approach that emphasizes an excessive emphasis on economic growth. GNH advocates the importance of development that contributes to the happiness of the people with four pillars: (a) Economic growth and development, (b) the protection of cultural heritage and inheritance and promotion of traditional culture, (c) the conservation and sustainable use of a rich natural environment and (d) good governance.

2. Project Background, Details and Outline

Bhutan is located in the east of the Himalaya Mountains with a steep topography of over 3,000 meters in altitude in half of its land area, and it is exposed to various natural disasters such as earthquakes, floods from glacial lakes, landslides, and cyclones. The country must have a disaster-resistant and stable means of communication that connects regional communities.

The Government has prioritized the development of communications infrastructure in the “11th Five-Year Plan (2013 to 2018)”, and has stated the establishment of a resilient communications system as disaster prevention measure in the E-Government Master Plan. Although Bhutan

Telecom (BTL) has almost completed backup preparations for landline phone equipment, the number of contractors is decreasing every year (ownership rate of 5.9% in 2004 to 2.8% in 2015), while the number of mobile telephone subscribers has increased rapidly since the start of the service in 2003 (87.1% as of 2015). Mobile phones have become an important means of communication among citizens of Bhutan. However, at the time of the Great Nepal earthquake in April 2015, communication by mobile phone became difficult due to line congestion within Bhutan, which drew attention to the vulnerability of the backup system in relation to mobile phone communication.

3. Overview of Survey Results and Project Details

In order to improve this situation, and in order to enable the provision of a telecommunications service that operates with stability even during major natural disasters based on a request made by the Government of Bhutan, a plan will be prepared to install the equipment and materials needed to construct a new core system for parallel operation with the existing core system in operation in Thimphu. Specifically, the installation of the new core system in Jakar for parallel operation in poor configuration with the existing core system in Thimphu, which are separated by a great distance, will ensure physical redundancy and will raise the disaster resilience of the mobile phone service.

The equipment required in the project in order to establish redundancy are as follows.

Table 1 Systems to be installed in Jakar within the framework of the project

System	Function	Relevant technology	Relevant service	Quantity
Home Subscriber Server (HLR/VLR)	Storage and management of subscriber information such as positional data, authentication information, and telephone numbers	GSM, WCDMA	Voice, packet, prepaid, Post-paid, SMS	1 set
Home Subscriber Server (HSS)		LTE	Packet, prepaid, Post-paid, SMS	
Mobile Switching Center (MSC)	Call processing, connection, disconnection, and routing in circuit switching	GSM, WCDMA	Voice, prepaid, Post-paid, SMS	1 set
Gateway GPRS Support Node (GGSN/ PDN-GW)	Call processing, interface with external packet networks, address conversion, billing processing, and security in packet switching	GSM, WCDMA, LTE	Packet, prepaid, Post-paid	1 set
Serving GPRS Support Node (SGSN/MME)	Call processing in packet switching, packet call processing to terminals, terminal position management, and mobility processing	GSM, WCDMA, LTE	Packet, prepaid, Post-paid	1 set

System	Function	Relevant technology	Relevant service	Quantity
Base station controller (BSC)	Control of radio base stations	GSM	Voice, packet, prepaid, Post-paid, SMS	1 set
Radio Network Controller (RNC)	Control of radio base stations	WCDMA	Voice, packet, prepaid, Post-paid, SMS	1 set
Multimedia Gate Way (MGW)	Conversion between circuit switching and packet switching	GSM, WCDMA	Voice, prepaid, Post-paid	1 set
Mobile Packet Backbone Network (MPBN)	Packet Transmission equipment for exchanges data between the existing and the new core system	GSM, WCDMA, LTE	Voice, packet, prepaid, Post-paid, SMS	1 set
Intelligent Network (IN(SDP, CCN, AIR))	Management of vouchers and service categories of prepaid mobile phones	GSM, WCDMA, LTE	Prepaid, voice, packet	1 set
Short message center system	Storage, delivery, transfer, and other processing of SMS	GSM, WCDMA, LTE	SMS, prepaid, post-paid	1 set
Operation System	Monitoring and control of networks and services in general	GSM, WCDMA, LTE	Voice, packet, prepaid, Post-paid, SMS	1 set
Accessories including provisioning gateway	Consoles enabling to set various data of mobile core system and accessories.	GSM, WCDMA, LTE	Voice, packet, prepaid, Post-paid, SMS	1 set

4. Project Implementation Period and Estimation of Approximate Project Costs

The project implementation period is estimated to be approximately 16 months from contracting with the Consultant for consulting services with regard to the designing, tendering, cost estimating and supervising the procurement and construction works to the completion of construction works. Japan's Grant Aid Project covers the new mobile core system including procurement and installation works, while the cost for other works must be borne by BTL, such as power augmentation, transmission upgrade and civil works as well as interconnection works.

5. Project Evaluation

(1) Relevancy

The government gives the direction for developing telecommunications infrastructure in the "Bhutan Telecommunications and Broadband Policy", which also covers the followings in disaster prevention concerned.

- Prevent, reduce, and manage disasters by leveraging telecom and ICT infrastructure
- Working with disaster related organizations/agencies to build a robust disaster communication system

· Carriers are obliged to comply with international standards and best practices of emergency response plans

In addition, "e-Gov. Master Plan (2013 - 2018)" strengthens countermeasures such as broadband communication and improvement of reliability of international communication lines, provision of emergency information of disaster prevention measures office (DDM), disaster countermeasure Improvement in the reliability of communication services has been proposed.

The project, with which a new mobile core system is installed in an area distant from the existing system and conducting parallel operation in pool configuration, enables BTL to continue the mobile phone service even if the existing core system is greatly affected by the influence of a large-scale earthquake and other natural disasters, which greatly contributes to the improvement of the reliability of the communication infrastructure described above.

(2) Efficiency

The new core system will be installed in Jakar for parallel operation with the existing system in the project. Even if the system in Thimphu is suspended due to a natural disaster, the new core system in operation in Jakar enables BTL to continue the mobile phone service throughout Bhutan.

This means that the mobile core system will be made more resistant to disasters, and the mobile phone service interruption time will be 15 minutes or less annually after completion of the project, of which figure is expected to be improved from 10 hours or more before installation of the new core in Jakar.

Government agencies including disaster response agencies as well as police-fire departments greatly depend on BTL mobile phones as a means of communication, and even during large-scale natural disasters such agencies use mobile phones as a means of communication for prompt rescue operations and reconstruction activities in order to reduce the loss of life and to abate secondary disasters.

(3) Need for proper network management by BTL

There is normally a surge in mobile phone traffic during disasters and large-scale events. The processing capability of the mobile network is determined in the design stage by the throughput with reference to traffic intensity and packet volume during peak hours in normal times. Therefore, if traffic exceeds this processing capacity, there is a risk that the system will go down. Telecommunications operators prepare for such situations by partly restricting the use of mobile phones by normal users. In parallel with the Project, BTL has requested the technology transfer cooperation from Japan in establishing and implementing a business continuity plan for the whole communications service. The technology transfer also requires a business continuity plan in connection to mobile phone services that are widely used among people of Bhutan.

The project is essential in terms of physically securing redundancy by dispersing mobile core

systems, and the Project is deemed to be valid as a Japanese Grant Aid Project. Furthermore BTL is desired to start from what BTL can cope with in developing mobile business continuity plan in order to control unpredictable huge traffic congestion, prior to implementing Technology Transfer Cooperation Project with Japan.

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Kingdom of Bhutan

Location of Project Site

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Abbreviations

Abbreviation	Formal Name
3GPP	Third Generation Partnership Project
ADSL	Asymmetric Digital Subscriber Line
ADSS	All-Dielectric Self-Supporting cable
AIR	Account Information and Re-charge
ARIB	Association of Radio Industries and Business
BCP	Business Continuity Plan
BICMA	Bhutan InfoCom and Media Authority
BPC	Bhutan Power Corporation
BSC	Base Station Controller
BTL	Bhutan Telecom Limited.
CCN	Charging Control Node
CRBT	Caller Ring Back Tone
DDM	Department of Disaster Management
DGM	Department of Geology and Mines
DHI	Druk Holdings and Investment Ltd.
DHMS	Department of Hydro-Meteorological Service
DITT	Department of Information Technology & Telecom
DLAN	Dzongkhag Local Area Network
E/N	Exchange Note
EC	Environment Clearance
e-Gov.	electronic government
EIA	Environment Impact Assessment
ETSI :	European Telecommunications Standards Institute
G2C	Government to Consumer
GDP	Gross Domestic Product
GDP/CAP	Gross Domestic Product/capita
GGSN	Gateway GPRS Support Node
GLOF	Glacial Lake Outburst Floods
GNH	Gross National Happiness
GNI	Gross National Income
GPON	Gigabit Passive Optical Network
GPRS	General Packet Radio Service
GSM	Global System for Mobile communications
HLR/ VLR	Home Location Register/Visitor Location register
HSS	Home Subscriber Server
IEC	International Electrotechnical Commission Standard
IEE	Initial Environment Examination
IEEE	Institute of Electrical and Electronics Engineers
IN	Intelligent network
ISO	International Organization for Standardization
ITU	International Telecommunication Union
IVR	Interactive Voice Response
LTE	Long Term Evolution
MCM	Mobile Contents Management
MGW	Multimedia Gateway

MIO	Message in one
MOFA	Ministry of Foreign Affairs
MoIC	Ministry of Information and Communications
MSC	Mobile Switching Center
NEC	National Environment Commission
NGN	Next Generation Network
NOC	Network Operation Center
Nu.	Ngultrum
OPGW	Optical fiber composite overhead Ground Wire
OSS	operation Support System
PDP	Packet Data Protocol
POP	Point of Presence
PSTN	Public Switched Telephone Network
RBP	Royal Bhutan Police
R-BSC	Remote Base Station Controller
RNC	Radio Network Controller
SAU	Spontaneous Access Use
SCC	Spontaneous Circuit Connection
SDH	Synchronous Digital Hierarchy
SDP	Service Data Point
SGSN	Serving GPRS Support Node
SMS	Short Message Service
TPS	Transaction per second
TWAN	Thimphu Wide Area Network
UNDP	United Nations Development Programme
UPU	Universal Postal Union
VAS	Value Added Service
WCDMA	Wideband Code Division Multiple Access

Chapter 1 Background and Details of the Project

1.1 Socioeconomic Status of Bhutan

1.1.1 General Situation of Bhutanese Society

Bhutan, located in the southern slope of Himalaya Mountains, has an approximate land area of 38,394 km^2 and bordering China in north, India in east, west and south. Steep mountainous area over 3,000 m high occupies the land by 44.6%, middle-high mountain areas of 1,200-3,000 m high by 40.3%, and the remainders are below 1200 m, while the climate varies by the altitude. For example, the climate is roughly divided into alpine tundra climate in the northern Himalayas, monsoon climate in the central, subtropical climate in the southern Talai plain, and there is a rainy season, starting in June and ending in September, and a dry season. The rainfall is about 3,000-5,000 mm annually on average in the south, 1,200 – 2,000 mm in Himalayan Slope, and 500 – 1,000 in Inland Central Valley Region. The population count for approximately 780,000 (as of 2015, National Statistics Bureau of Bhutan), while ethnic groups include Tibetans, East Bhutan natives, and Nepalese ethnic groups. Religions such as Tibetan Buddhism and Hinduism are practiced.

As for the administrative boundaries in Bhutan, the country is divided into of 20 *Dzongkhags* (districts). Each of the prefectural governments basically has a *Dzong*, which serves as both the administrative and religious center (administrative organization, judicial agency, and monastery). A Dzongkhag consists of administrative units called *Dungkhags* (sub-districts) and *Gewogs* (villages). As of 2015, there are 15 Dungkhags and 205 Gewogs in Bhutan.

Table 1.1-1 Outline of Bhutan

Area	38,394 km^2
Administrative unit	
Dzongkhags	20
Dungkhags	15
Gewogs	205
Currency	Ngultrum (Nu.)
Language	Dzongkha

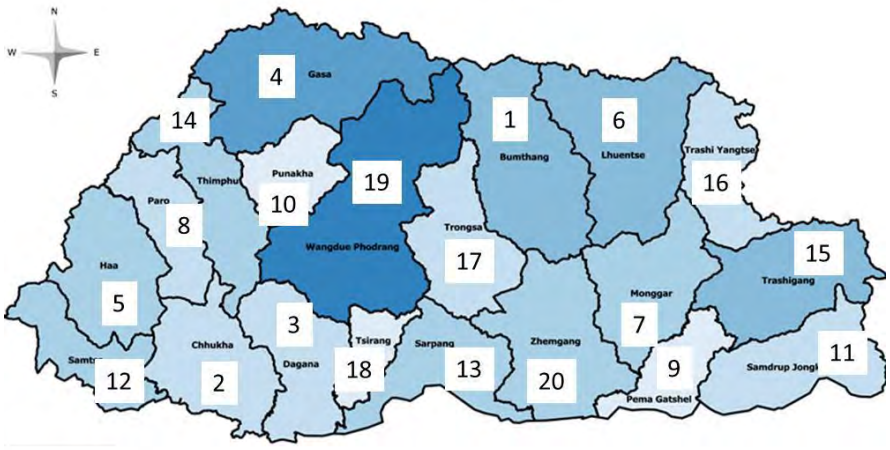


Figure 1.1-1 Map of Kingdom of Bhutan

Table 1.1-2 Names and populations of Dzongkhags

No.	Dzongkhag	Population (2015)
1	Bumthang	19,546
2	Chhukha	91,310
3	Dagana	22,914
4	Gasa	3,780
5	Haa	13,790
6	Lhuentse	18,008
7	Mongar	45,503
8	Paro	44,186
9	Pema Gatshel	16,023
10	Punakha	21,746
11	Samdrup Jongkhar	49,648
12	Samtse	72,889
13	Sarpang	52,880
14	Thimphu	128,652
15	Trashigang	59,812
16	Trashiyangtse	21,515
17	Trongsa	16,472
18	Tsirang	22,368
19	Wangdue Phodrang	38,682
20	Zhemgang	22,063
	Total	781,787

Source: National Statistics Bureau of Bhutan

1.1.2 Economic Conditions of Bhutan[1]

As for the economic situation of Bhutan, there has been a steady transition from a self-sufficient economy to a market economy due to the promotion of a modernization policy since the 1960s, and an average GDP growth rate of 9% was achieved between 2002 and 2008 (9th 5-Year Plan, extended one year to 2008), followed by a strong average economic growth rate of between 5% and 10% until 2015 due to, for example, the construction of a large-scale hydroelectric power station and the export of electricity to India. The GDP in 2014 was 1.959 billion US dollars and the GDP per capita was 2,560.5 US dollars. In the ranking of the UN Development Program (UNDP) Human Development Index 2015, Bhutan was ranked 132nd of 182 countries with a GNI per capita of 2,380 US Dollars (2015 World Bank, World Development Indicator Database).

As for the composition of GDP by industry (2014), agriculture and forestry accounted for 16.77%, construction 15.46%, electricity and water supply 14.15%, social welfare 10.84%, transportation and communications 9.63%, and manufacturing 8.12%. The major industries are agriculture and tourism. Approximately 70% of the population is engaged mainly in small-scale, regionally self-sufficient, labor-intensive agriculture..

[1] Reference: Web site of the Ministry of Foreign Affairs

Bhutan advocates a unique principle of economic development called Gross National Happiness (GNH) in contrast to Gross National Product (GNP). Rather than placing excessive emphasis on economic growth, Bhutan focuses on the importance of development that contributes to the happiness of its people with four pillars: (a) Economic growth and development, (b) the protection of cultural heritage and inheritance and promotion of traditional culture, (c) the conservation and sustainable use of a rich natural environment and (d) good governance.

Table 1.1-3 Major economic indexes of Bhutan

Year	2013	2014	2015
GDP market price (Nu. million)	105,378.3	119,545.7	132,021.3
GNI (Nu. million)	98,145.4	111,307.4	120,321.5
GDP growth rate (%)	2.142	5.7	6.5
GDP per capita (Nu.)	144,353.9	160,464.1	174,400.7
Final consumption (Nu. million)	79,934.4	82,900.7	96,496.8
Inflation rate (%)	8.77	8.27	4.58
Exchange rate (Nu./US$)	58.6	61.5	64.1

Source: National Statistics Bureau of Bhutan

1.2 Status of and Issues to Tackle in the ICT Sector

1.2.1 Composition of the ICT Sector in Bhutan

The communications sector comprises the Department of Information Technology & Telecom (DITT) in the Ministry of Information and Communications (MoIC), which is a policymaking institution, Bhutan InfoComm and Media Authority (BICMA), which is a regulatory organization of ICT, telecommunications and media. The current status of the organizational structure in the communications sector is as follows:

Table 1.2-1 Composition of Communications Sector

Organization name	Major roles	Remarks
Department of Information Technology & Telecom (DITT)	- Policy making and implementation in the information and communications sector	
Bhutan InfCom and Media Authority (BICMA)	- Licensing, regulatory and compliance authority - Supervision of telecommunications and media services - Issuance of telecommunications and broadcasting business licenses - Development of fair competition environment (system development) - Realization of universal services	
Telecommunications carriers	- Bhutan Telecom Limited (BTL) ・ Supply of fixed-line phone services ・ Supply of mobile phone services	- Incorporated from part of operating section of MIC in 2000 as a 100% state-owned

Organization name	Major roles	Remarks
	(since 2003) ・ Supply of Internet services	company (Druk Holdings and Investments)
	TashiCell ・ mobile phone service (since 2008) ・ Supply of Internet service	- Launched as a mobile phone business in 2008 with private capital only
	NANO and Drukcom ・ Supply of Internet service	- Private capital companies

Source: Interview with the Study Team

1.2.2 Changes in Telecommunications Services in Bhutan

The situation of telecommunications services in Bhutan is characterized by a gradual decrease in fixed-line phones, widespread use of broadband services using optical fiber and ADSL, and a sharp increase in mobile phones. In particular, mobile phones are the most popular means of communications in Bhutan as shown by the ratio between mobile phone owners and the population, which was 87% as of the end of 2015.

Table 1.2-2 Status of public telecommunications services in Bhutan

		2011	2012	2013	2014	2015	Remarks
No. of fixed-line subscribers	Fixed-line phones *	27,490	27,005	26,485	23,823	21,811	
	Broadband communications *	13,113	16,666	20,391	24,904	27,606	
Number of mobile phone subscribers	Total number of subscribers **	492,079	556,792	545,942	616,536	676,448	
	Market share of BTL (%)*	77%	76%	74%	73%	72%	
Population ***		732,246	743,711	754,637	765,008	774,830	
Mobile phone penetration (%)		67%	75%	72%	81%	87%	

Note: Source * BTL, ** BiCMA, *** World Bank

BTL, a state-owned company corporatized from the government telecommunication department under the then MIC, is gradually losing its market share in the mobile cellular service sector. However, BTL maintains a monopoly on the fixed-line communications service and will therefore serve as a state company to develop communications networks and services according to the communications policy of Bhutan.

1.2.3 Status of Telecommunications Infrastructure in Bhutan

The long-distance backbone network in Bhutan, managed by MoIC, consists of optical fibers that connect Thimphu and approximately 20 Dzongkhag (district) capitals in a loop. MoIC has allocated a pair of of these optical fibers to BTL and TashiCell. The maximum transmission capacity is 320 gigabits (which can accommodate a maximum of five million telephone circuits).

Using these optical fibers, BTL connects intra-city access networks to provide a fixed-line phone service, and provides a mobile phone service by connecting a mobile core system installed in Thimphu

with mobile phone base stations installed all over Bhutan.

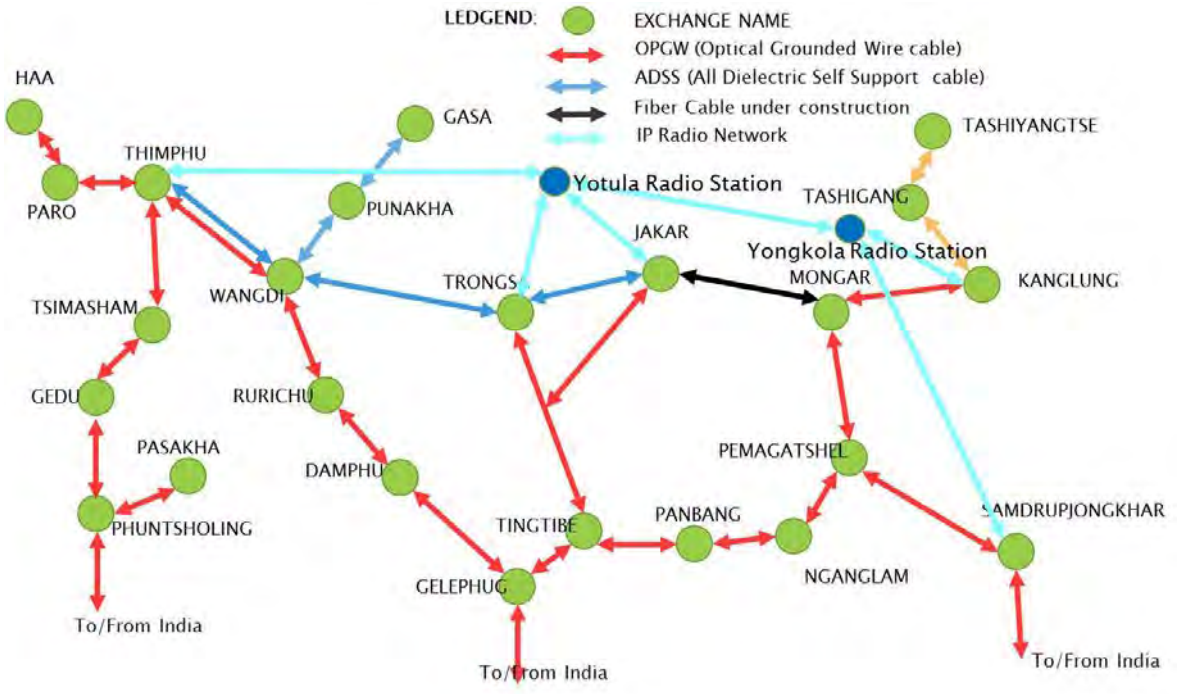


Figure 1.2-1 Backbone networks of BTL

The backbone network used by BTL, which is relatively resilient to faults and disasters, combines with the microwave transmission network owned by BTL to connect the telephone exchange offices in a loop starting from Thimphu. Access lines to mobile phone base stations are provided as wireless and wired communications from nearby exchange offices.

1.2.4 Mobile Phone Infrastructure of BTL

The following table shows the networks and frequency bands of BTL mobile phones.

Table 1.2-3 Mobile phone infrastructure of BTL

Technology	Year of introduction	Design capacity	Number of Dzongkhags with service coverage	Number of base stations	Frequency band
GSM (2nd generation)	2003	23,040 subscribers	All (20)	320	Uplink: 890.2 - 900.2 MHz Downlink: 935.2 - 945.2 MHz
W-CDMA (3rd generation)	2008	500,000 subscribers	All (20)	136	Uplink: 1710 - 1730 MHz Downlink: 1815 - 1825 MHz
LTE (4th generation)	2012	100,000 subscribers	7	78	Uplink: 833.9 - 843.9 MHz Downlink: 878.9 - 893.9 MHz

Source: BTL

1.2.5 Development Plan

The Government of Bhutan has adopted the “11th Five-year Plan (2013 - 2018)” that aims to implement e-Gov. projects such as G2C, set up a government data center, improve the nationwide intranet system,

build a Thimphu Wide Area Network (TWAN) and a Dzongkhag Local Area Network (DLAN), and utilize mobile technologies to provide many online services such as financial payments over a smooth and seamless network.

The Department of IT and Telecom under the Ministry of Information and Communications of Bhutan has adopted the following policies in the 2016 Bhutan Telecommunications and Broadband Policy:

- Disaster prevention, mitigation, and management by means of the use of Telecom and ICT Infrastructure
- Construction of a robust disaster communications system in collaboration with relevant partners
- Obligation of carriers to comply with international standards and best practice in emergency response planning.

In addition, the "e-Gov Master Plan (2013 - 2018)" aims to ensure wider bandwidth and redundancy of international communications lines, strengthen response measures by the Department of Disaster Management (DDM) during emergencies, such as information supply, and ensure redundancy of disaster response networks.

1.2.6 Current Status and Issues to Tackle

Bhutan is located on the east of the Himalaya Mountains with a steep topography of over 3,000 meters in altitude in half of its land area, and it is exposed to various natural disasters such as earthquakes, floods from glacial lakes, landslides, and cyclones. The country must have a disaster-resistant and stable means of communication that connects regional communities to prevent the isolation of communities nationwide during disasters.

Having identified in its "11th Five-year Plan (2013 - 2018)" the development of a communications infrastructure as a priority item, the Government of Bhutan formulated the Bhutan Telecommunication and Broadband Policy in 2003, and made the E-Government Master Plan in response to the 11th Plan for the establishment of a robust communications system as a disaster prevention measure.

Although the Government of Bhutan has almost completed a backup system preparation for fixed-line phone equipment, the number of fixed-line phone subscribers is decreasing year by year (the penetration rate dropped from 5.9% in 2004 to 2.8% in 2015). On the other hand, the number of mobile phone subscribers has been sharply increasing since the service started in 2003 (the penetration rate rose from 3.7% in 2004 to 87.1% in 2015). Mobile phones have become a major means of communications for citizens of Bhutan. At the time of the Great Nepal Earthquake in April 2015, however, users had difficulty in communicating using mobile phones due to network congestion in Bhutan, which drew attention to the vulnerability of the backup system for mobile phone communication.

1.3 Background, Details, and Summary of Japanese Grant Aid Cooperation

1.3.1 Background of Request

BTL and the private company TashiCell have installed a mobile core system respectively in the national capital Thimphu to monitor and control communication services to mobile phone users nationwide. It

has been pointed out that all mobile phone services provided by these companies may suffer a system failure if a disaster strikes and severely damages Thimphu. As a 100% state-owned company and a public property of Bhutan, BTL is planning to build a disaster-resistant communications network by ensuring a redundant configuration by means of the installation of other mobile core system and by dispersing the mobile core systems so that communication is possible during emergencies.

1.3.2 Details of Request

The initial request made by BTL was for the installation of a new mobile core system in the new exchange building on the premise of the BTL headquarter in Thimphu and then BTL plans to transfer existing mobile core system to Jakar, about 200 km east of Thimphu, in order to ensure the redundancy of mobile core systems. However, the existing mobile core system was suffering from many failures, causing frequent interruptions in providing the mobile phone service. As an emergency measure, BTL replaced the component module that had many failures in the existing core system. Even after this emergency measure was taken, redundancy of the mobile core system was not achieved. To achieve redundancy, therefore, BTL requested the implementation of the project in Jakar.

This request made by BTL can be summarized as follows:

(1) Install a new mobile core system in the BTL Jakar exchange office.

(2) Conduct parallel operation of the existing and the new core system in pool concept.

The following table summarizes the request made by BTL.

Table 1.3-1 Details of request made by BTL

Item	Description
(1) Project purpose	To improve the reliability of the mobile communications system and prevent interruption to mobile communications lines during disasters.
(2) Project output	Installation of the new core system in a location far from Thimphu
(3) Details of requested equipment	The required new core system has an equivalent configuration to the existing core system installed in the BTL headquarters, including the following major components: (1) Mobile Switching Center (MSC) (2) Multimedia Gateway (MGM) (for voice packet communications) (3) Gateway GPRS Support Node (GGSN) (4) Serving GPRS Support Node (SGSN) (5) Home Location Register (HLS)/Visitor Location register(VLS) for 2G, 3G (6) Home Subscriber Server (HSS) for LTE (7) Base Station Controller (BSC) (8) Radio Network Controller (RNC) (9) Short Message Server (SMS) system (10) Prepaid-type billing information management server (requires parallel operation with the First Core System in an Intelligent Network (IN)) (11) Ancillary items for the above
(4) Project site	BTL Jakar exchange office in Bumthang
(5) Implementing agency	BTL

1.4 Trends of Development Assistance from Japan

1.4.1 Assistance Policies of Japan

Japan's Official Development Assistance specifies the provision of support for sustainable economic growth and the vulnerability mitigation from the perspective of supporting nation building that has a balance between rural and urban areas, and that is self-reliant and sustainable.

For the former policy, the 11th Five-year Plan of Bhutan specifies "sustainable and equal socioeconomic development" as one of the major items of the development goals, and the Government of Bhutan is providing support for life improvement in rural areas through agricultural and rural development including agricultural mechanization and horticultural crop development, improvements to roads and bridges, the development of basic infrastructure in rural areas including rural electrification, and local administrative capacity building for the improvement of basic social services in rural areas in an effort to mitigate socio-economic disparity between urban and rural areas. In addition, the Government is supporting industrial development and employment expansion by providing infrastructure for industrial promotion.

For the latter policy, because Bhutan is an inland country surrounded by steep mountains with a limited scale of land and economy, the Government of Bhutan is planning to support measures against environmental problems and climate change by improving the urban environment and taking measures for climate change and disaster prevention, because Bhutan is vulnerable to both natural disasters caused by climate change and the deterioration of natural and urban environments due to socioeconomic changes.

The project aims to mitigate vulnerabilities, which is one of the above policies, by ensuring a redundancy of mobile phone services widely used by citizens of Bhutan in order to enable the provision of stable communications services even in emergencies.

1.4.2 Relevant Japan's Official Development Assistance Projects

Table 1.4-1 shows past assistance projects in the information and communications sector, including technical cooperation, loan, and grant aid projects.

Table 1.4-1 Past implementation of Japanese technical cooperation, loan projects and grant aid projects in the information and communications sector in Bhutan

Cooperation type	Time of implementation	Project name	Amount	Outline
Technical cooperation	April 2014 to March 2017	Technical Cooperation Project for Optical Fiber Techniques in Telecommunications Engineering	--	Technology transfer regarding design, execution management, operation, and maintenance of optical fiber networks to BTL engineers

Cooperation type	Time of implementation	Project name	Amount	Outline
Technical cooperation	June 2003 to October 2005	Expansion of Subscriber Line Network Development and Human Resource Development Project	--	Development of human resources for subscriber line telephone construction in general through transfer of subscriber line construction technology
Grant aid	FY1995 to FY1998	Telecommunications Network Improvement Project in Western Region	E/N amount of 2.178 billion yen	Construction of long-distance lines using microwave transmission system
Grant aid	FY1991 to FY1994	Telecommunications Network Improvement Project	E/N amount of 3.742 billion yen	Construction of long-distance lines using microwave transmission system

Source: Country-specific data book from the Web site of the Ministry of Foreign Affairs of Japan

1.5 Trends of Development Assistance from Other Donors

At present, no other major donor or international aid organization has been found to provide support in the telecommunications sector. In the past, the International Telecommunication Union (ITU) and the Universal Postal Union (UPU) provided assistance together with the Government of India. The outline of this support is as follows:

(1) Project name: Satellite Connectivity to Remote Areas and E-Service for Development
(2) Year of implementation: 2003 to 2006
(3) Implementing agency: Bhutan Post and BTL
(4) Assistance organizations/country: ITU, UPU, and Government of India
(5) Scale of implementation: Approx. US$ 1 million
(6) Details of implementation: Installation of Internet terminals in 38 post offices nationwide connected via satellite communications to Thimphu

Source: ITU

Chapter 2 Description of the Project

2.1 Outline of the Project

2.1.1 Overall Goal and Project Purpose

The Government of Bhutan, which addresses importance to the impact of information and communication technology on the life of its citizens and the economy, has adopted the “11th Five-year Plan (2013 - 2018)” that aims to implement the e-Gov. project and to develop and upgrade the information and communication infrastructure in pursuit of the further promotion of the information and communication industry and services. Furthermore, the "e-Gov Master Plan (2013 - 2018)" aims to ensure broadband services and redundancy of international communications links, strengthen capability of defusing disaster-related information by DDM during emergencies, and developing disaster-proof networks.

The goal of the project is to improve the reliability of the mobile communications system and thus avoid outage of the mobile communication service when a disaster strikes. The goal is consistent with the Government of Bhutan’s policy of constructing a disaster-resistant communications network by ensuring redundancy of the communications network in consideration of the status quo in which the mobile phone service is more widely used by Bhutanese citizens than the fixed-line telephone service.

BTL’s mobile core systems are concentrated in the machine building in Thimphu. If a big natural disaster strikes Thimphu and causes severe damage to the same building, BTL mobile phone service as well as the fixed-line telephone service in Western Bhutan around Thimphu will face outages. TashiCell, a private company that provides mobile phone services, also has a mobile core system in Thimphu in a similar manner to the BTL mobile phone network. Therefore, TashiCell's mobile phone service will also come to a stop. The administrative organizations and disaster related agencies of Bhutan depend heavily on the BTL mobile phone service. The service is required to be provided even at the time of a disaster.

The purpose of the project is to install the new mobile core system in the Jakar exchange office away from Thimphu and to have parallel operation of the two systems run under pool concept so that BTL, a state-owned company, can ensure continuity of the mobile phone service even during disasters.

2.1.2 Outline of Mobile Core System in Thimphu

So far, BT has introduced three generations of mobile phone technologies: 2G (GSM), 3G (WCDMA), and 4G (LTE).

(1) 2G (GSM)

GSM, a very old system introduced in Europe in 1992, has undergone continuous functional enhancement, such as the introduction of GPRS (General Packet Radio Service) and EDGE (Enhanced Data for Global Evolution) and offers sufficient performance in voice and low-speed data communications and low terminal prices. With few exceptions, GSM still continues to be used in countries and regions around the world.

The allocation of radio frequencies is unified around the world and serves as a global infrastructure for international roaming. Most of the 3G and 4G terminals sold in the world also support GSM technology. Many of the terminals sold in Bhutan are found to support only GSM.

(2) 3G (WCDMA)

WCDMA, offering high-speed data communications, is becoming a major technology in Bhutan where mobile broadband communications needed on smartphones, etc. are rapidly becoming popular. WCDMA is also superior to 2G (GSM) in terms of efficiency in frequency usage and capacity.

(3) 4G (LTE)

LTE, a newcomer among commercialized mobile phone technologies, offers far better frequency usage efficiency, data communications speed, and capacity than WCDMA. In recent years, LTE is being introduced worldwide including in developing countries and is expected to be part of the global infrastructure for mobile broadband communications in the near future. In Bhutan, too, LTE was first installed in the national capital Thimphu on a trial basis in 2012 and expansions are ongoing nationwide in a phased manner. LTE from BTL supports only data communications (packet communications) at present and does not support voice communications. However, BTL is planning to start voice services based on VoLTE (Voice over LTE) in the near future. Mobile broadband communications are being established as an essential tool in everyday life.

(4) Mobile core system

The mobile core system of the mobile phone service operated by BTL has been installed in Thimphu and is switching, monitoring, and controlling all the originating and terminating voice calls and packets from and to the GSM, WCDMA, and LTE terminals of BTL subscribers nationwide. The figure below shows the conceptual diagram.

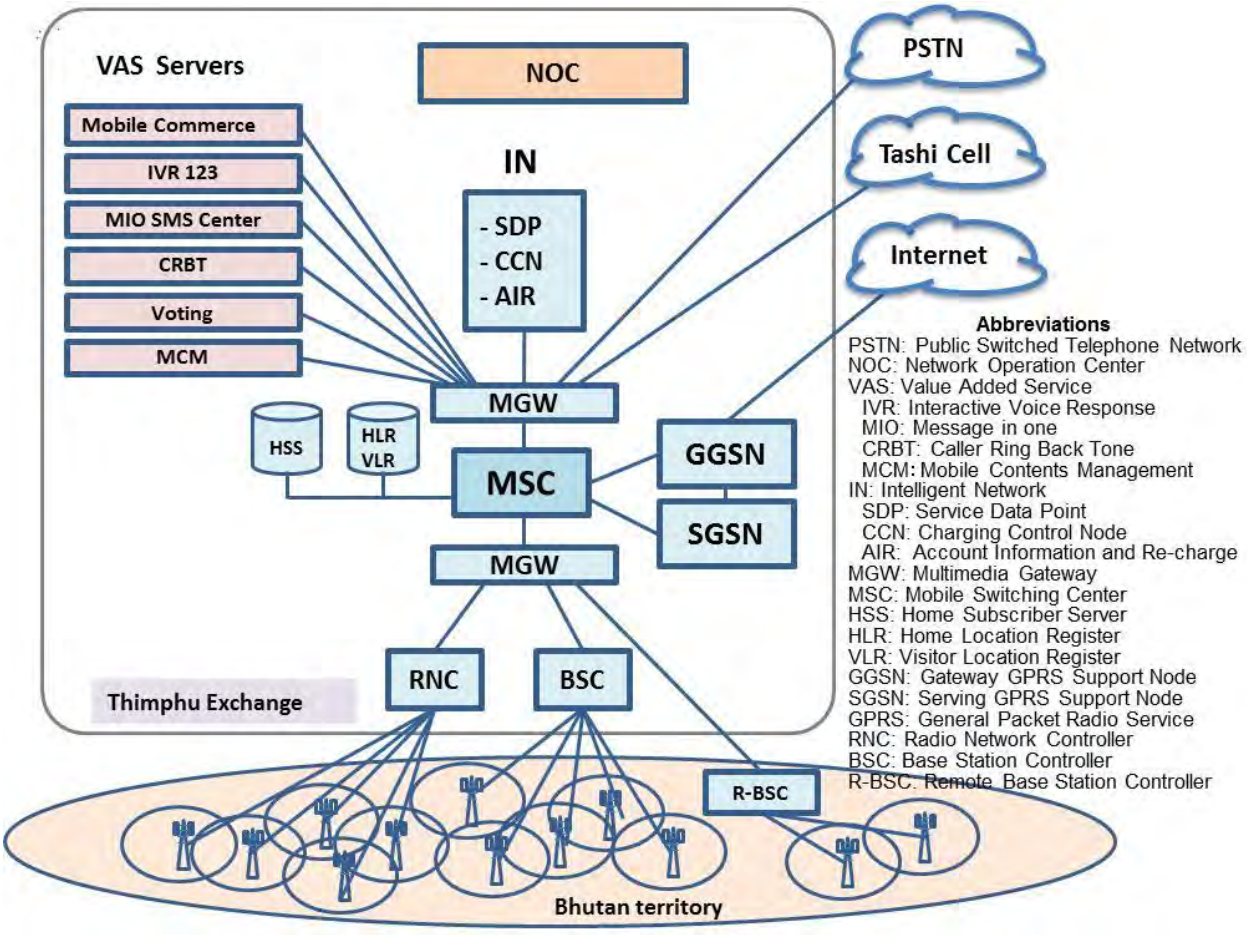


Figure 2.1-1 Mobile phone network operated and managed by BTL

2.2 Project Outline

In order to achieve the overall goal of the Project, the new mobile core system shall be installed in the BTL Jakar exchange office to enable parallel operation with the existing core system in Thimphu.

BTL has been operating, maintaining, and inspecting the mobile core system in Thimphu since 2003 up to the present and has acquired the required technical capabilities. Therefore, there is no plan for any soft-component for technical acquisition during project implementation.

2.3 Draft Design of Cooperation Project

2.3.1 Design Policies

(1) Compliance with international standards

The standardization of communications equipment is promoted by international organizations. the existing core system of the mobile phone service in Thimphu is standardized according to ITU, ETSI, ARIB, and 3GPP. The final purpose of the project is to improve the disaster resistance of the mobile phone service by realizing parallel operation in poor configuration with the existing core system in Thimphu. Therefore, equipment that ensures interconnection with the existing core system according to the international standards shall be selected.

(2) Measuring instruments and spare parts

No measuring instruments or spare parts shall be procured in the project because (1) the mobile core system to be procured in the project shall be operated, maintained, and inspected by the operation system; (2) the important panels in the units of the mobile core system to be installed in Jakar shall be made redundant; and (3) parallel operation with the existing core system in Thimphu is planned.

(3) Policies on natural environmental conditions

The project shall be implemented inside the Jakar exchange office. The natural environment around it shall not be considered.

(4) Policies on socioeconomic conditions

Road/road permission from the authorities is required for long journey that is accompanied by accommodation in Bhutan. The contractors and a consultant are required to work in close collaboration with BTL in the implementation period.

(5) Policies on procurement conditions including third countries

The communications equipment to be procured and installed in the project shall be procured from Japan or third countries. European countries and the U.S.A. shall be added to the supplying countries due to the need for price reduction and securing of competitiveness in Japanese Grant Aid Cooperation Schemes.

(6) Policies on utilization of local suppliers

The main equipment to be procured in the project is relatively small precision equipment. In view of equipment performance and quality assurance, such equipment is normally installed, adjusted, and tested by engineers dispatched from a manufacturer or its authorized distributors or suppliers. In order to make it an efficient and economic, works related to electrical workers, civil workers, etc. shall be hired from local subcontractors to assist in the work of carrying in, unpacking, and installing the equipment, if necessary.

(7) Policies on operation and maintenance

Regarding the design of communications equipment to be procured in the project, in view of BTL's past experience in operations and maintenance, BTL already has skills and expertise required for post-delivery operations and maintenance.

(8) Policies on procurement methods and project schedule

In consideration of the volume of procurement, equipment procured from Japan or a third country to Bhutan shall be transported in containers to the neighboring country of India (Kolkata) using marine transportation before being transported to the Project site on trucks from India. Attention must be paid to inland transportation because the roads to the Project site consist of steep mountain roads that are

unpaved in many areas. The required transportation period from Japan (or a third country) to the Project site is estimated to be approximately three months.

The major landing port for cargo to Bhutan is via Kolkata port in India. Equipment and materials to be transported to Bhutan by ship from a major international location and will land at the Kolkata port, a major port in India. Later, they will be transported to the project site in Bhutan by land after crossing the India-Bhutan border (Phuentsholing). The examination of the transportation plan must give attention to the road conditions in Bhutan, which do not allow transportation in 40-feet containers (use of 20-feet containers allowed).

Materials and equipment are expected to be transported from Japan and/or third countries to Bhutan and therefore the estimated transportation time is approximately 60-80 days from loading onto a ship to arrival at the site including customs clearance.

2.3.2 Basic Plan

(1) Overall plan

The overall plan of the project is to install the new mobile core system in Jakar that enables parallel operation with the existing core system in Thimphu, Bhutan, in order to ensure continuation of the mobile phone service even if a natural disaster strikes Thimphu that causes the existing core system to fail. Fig.2.3-1 shows the outline diagram of the project.

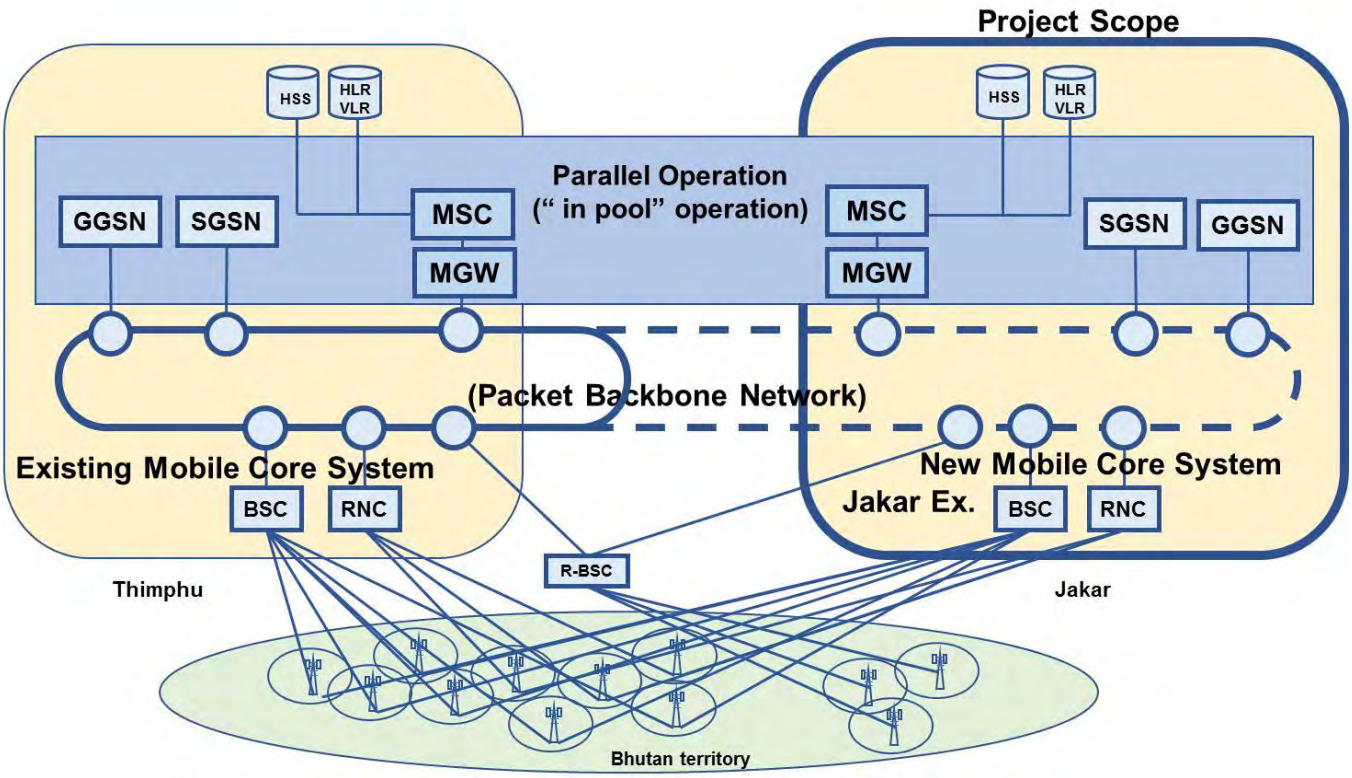


Figure 2.3-1 Outline diagram of the project

(2) Applicable standards

The following international standards apply to the materials and equipment to be adopted.

Table 2.3-1 International standards to be considered in procurement

	Standard name	Applied to:
(a)	International Telecommunication Union (ITU) Recommendations	Communications equipment
(b)	European Telecommunications Standards Institute (ETSI) Recommendations	Communications equipment
(c)	3GPP Release Notes (standardized technical specifications between members)	Communications equipment
(d)	Association of Radio Industries and Businesses (ARIB) Standards	Radio communications equipment
(e)	Institute of Electrical and Electronics Engineers (IEEE) Reports	Electric, electronic, and computer equipment
(f)	International Electrotechnical Commission (IEC) Standards	Electric equipment
(g)	International Organization for Standardization (ISO) Standards	All industrial products

(3) Design specifications for mobile core system design

The equipment to be procured shall comply with the following mobile core system requirement specifications.

Table 2.3-2 System requirement specifications of Mobile Core System

Equipment	Capacity
Mobile Switching Center (MSC)	20,000 concurrent accesses 500,000 subscribers
Multimedia Gateway (MGW)	20,000 Erlangs
Home Location Register/Home Subscriber Server (HLR/HSS)	HLR/VLR (for 2G/3G): 500,000 subscribers HSS (for LTE): 100,000 subscribers Database for subscribers: 500,000 for 2G/3G 100,000 for LTE
Short Message Server (SMS)	50 transactions per second

Table 2.3-3 Design specifications for Mobile Switching Center (MSC) and Multimedia Gateway (MGW)

No.	Examination target item/MSC&MGW parameter	Required value
1	2G	30%
2	3G	70%
3	Traffic per subscriber in MSC	25mE
4	Busy hour traffic per subscriber	1.5
5	Traffic per subscriber in MGW	25mE

No.	Examination target item/MSC&MGW parameter	Required value
6	Ratio of outgoing voice traffic	50%
7	Ratio of incoming voice traffic	50%
8	Ratio of prepaid mobile terminals	100%
9	Short message service	0.5
10	Circuit switching fallback (switching to voice line such as 3G) ratio/standard setting	28%

Table 2.3-4 Design specifications for GPRS Support Nodes and Multimedia Gateways

Equipment name	Required specifications
SGSN/MME	Number of simultaneously attached users (SAU): 450,000 Number of packet data protocols (PDP): 400,000
GGSN/PDN-GW	Number of packet data protocols (PDP): 400,000 Number of IP sessions: 2,000,000

2.3.3 Draft Design and Equipment List

Equipment to be made redundant shall be the basic service for voice and data (packet) communications, SMS (Short Message Service), which is useful during disasters, prepaid subscription charging information management system (IN: Intelligent network), which is required for originating and terminating call control, and network operation monitoring systems. Other systems that provide additional services shall not be made redundant.

Table 2.3-5 shows the systems required in the project.

Table 2.3-5 Systems to be installed in the project

System	Function	Relevant technology	Relevant service	Quantity
Home Subscriber Server (HLR/VLR)	Storage and management of subscriber information such as positional data, authentication information, and telephone numbers	GSM, WCDMA	Voice, packet, prepaid, Post-paid, SMS	1 set
Home Subscriber Server (HSS)		LTE	Packet, prepaid, Post-paid, SMS	
Mobile Switching Center (MSC)	Call processing, connection, disconnection, and routing in circuit switching	GSM, WCDMA	Voice, prepaid, Post-paid, SMS	1 set
Gateway GPRS Support Node (GGSN/ PDN-GW)	Call processing, interface with external packet networks, address conversion, billing processing, and security in packet switching	GSM, WCDMA, LTE	Packet, prepaid, Post-paid	1 set
Serving GPRS Support Node (SGSN/MME)	Call processing in packet switching, packet call processing to terminals, terminal position management, and mobility processing	GSM, WCDMA, LTE	Packet, prepaid, Post-paid	1 set

System	Function	Relevant technology	Relevant service	Quantity
Base station controller (BSC)	Control of radio base stations	GSM	Voice, packet, prepaid, Post-paid, SMS	1 set
Radio Network Controller (RNC)	Control of radio base stations	WCDMA	Voice, packet, prepaid, Post-paid, SMS	1 set
Multimedia Gate Way (MGW)	Conversion between circuit switching and packet switching	GSM, WCDMA	Voice, prepaid, Post-paid	1 set
Mobile Packet Backbone Network (MPBN)	Packet Transmission equipment for exchanges data between the existing and the new mobile core system	GSM, WCDMA, LTE	Voice, packet, prepaid, Post-paid, SMS	1 set
Intelligent Network (IN(SDP, CCN, AIR))	Management of used and remained units, service level etc. of prepaid mobile phones	GSM, WCDMA, LTE	Prepaid, voice, packet	1 set
Short message center system	Storage, delivery, transfer, and other processing of SMS	GSM, WCDMA, LTE	SMS, prepaid, post-paid	1 set
Operation System	Monitoring and control of networks and services in general	GSM, WCDMA, LTE	Voice, packet, prepaid, Post-paid, SMS	1 set
Accessories including provisioning gateway	Consoles enabling to set various data of mobile core system and accessories.	GSM, WCDMA, LTE	Voice, packet, prepaid, Post-paid, SMS	1 set

The figure below shows the configuration diagram.

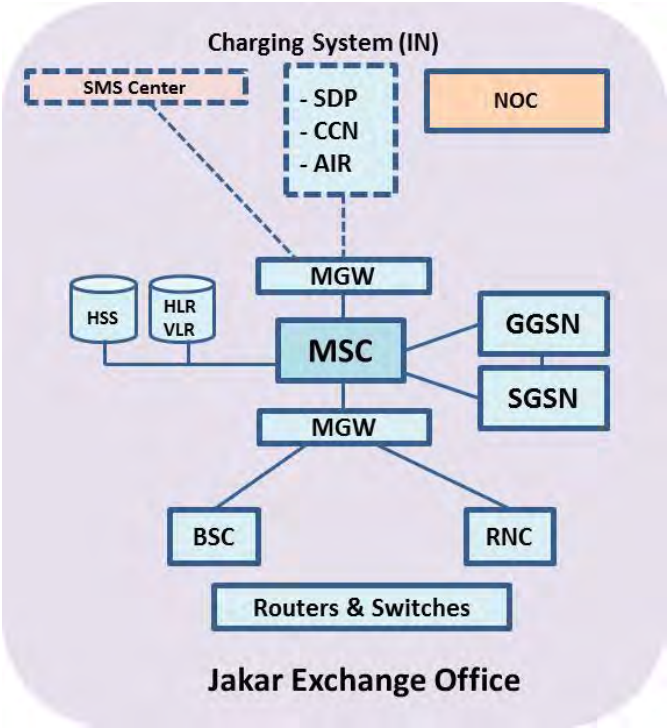


Figure 2.3-2 Conceptual configuration diagram of equipment to be installed in the project

2.3.4 Implementation Plan/Procurement Plan

(1) Implementation policy

The project shall be implemented in the framework of Japanese Grant Aid Cooperation. Therefore, the implementation of the project shall start after receiving approval from the Government of Japan, signing of Exchange of Notes (E/N) by the Governments of Bhutan and Japan, and the conclusion of a Grant Agreement (G/A) between the Japan International Cooperation Agency (JICA) and a counterpart government organization (which shall be signed on the same day as the E/A). The following paragraphs describe the basic items and the particular points for consideration for the implementation of the project.

(2) Project implementing agency

BTL shall be the implementing agency of the project on the Bhutan side. To ensure that the project proceeds smoothly, BTL must not only maintain close contact with the Japanese consultants and contractors, but also hold detailed discussions with them. For this purpose, BTL must appoint a responsible person for the project.

(3) Consultant

To ensure that the equipment provided by the Project is smoothly procured and installed at the Project Site, BTL is required to hire a consultant in order to implement the project along with the guideline of Japanese Grant Project. The consultant shall develop detailed designs and conduct construction supervision in relation to the project. The consultant shall prepare tender documents and conduct tendering for BTL.

(4) Contractor

A contractor, a Japanese corporation, selected in an open bid process according to the guideline of Japanese Grant Project, shall procure and install equipment and provide initial operation guidance in the project. Following the completion of the project, it will be necessary for the contractor to provide after-sales services such as initial operation guide, troubleshooting, etc. and so the contractor must give due consideration to liaison and coordination after delivery of the said equipment and facilities.

(5) Necessity of dispatching engineers

BTL staff has acquired the techniques for operating and maintaining the mobile core system and there will be no particular technical difficulties in the maintenance of the said equipment. However, a high-level technology is expected to be needed for the installation and post-installation adjustment and testing of equipment to be procured in the project. Therefore, engineers dispatched from the equipment supplier shall provide technical guidance for operation and maintenance at the time of installing the procured new equipment.

(6) Precautions on implementation and procurement

Although workers (laborers) for installation work can be secured in Bhutan, there are a few skilled workers or engineers that have special technical knowledge of working process, quality, and safety

management. Therefore, a Japanese contractor will dispatch engineers or skilled workers from Japan or a third country to Bhutan if required.

2.3.5 Implementation Classification and Procurement/Installation Classification

Table 2.3-6 shows the classification of financial responsibilities shared between the Japanese side and the Bhutanese side (draft).

Table 2.3-6 Financial responsibilities between the Japanese side and the Bhutanese side (draft)

No.	Financial Responsibility	Borne by		Remarks
		Japan	Bhutan	
1.	Materials and equipment consisting of the new core	○		
2.	Securing of installation location for equipment and removal of obstacles		○	Must be completed before start of equipment installation work.
3.	Preparation of ancillary facilities such as cable racks for the Project Site		○	
4.	Replacement of an engine generator at Jakar exchange		○	
5.	Strengthening backbone between Thimphu and Jakar		○	
6. *	Transportation of materials and equipment and handling of the customs clearance procedure and various taxes			
	(1) Transportation up to the landing port of Bhutan	○		
	(2) Tax exemption and customs clearance procedure at the landing port		○	
	(3) Transportation from the landing port to the Project Site	○		
7.	Securing of land for temporary material and equipment storage yard		○	
8.	Installation and adjustment/testing of materials and equipment	○		
9.	Initial operation guidance and maintenance/management guidance for the procured equipment	○		
10.	Interconnection of the new core with the existing core system		○*	
11.	Check of parallel operation with the mobile core systems		○*	
12.	Tax exemption for grant aid cooperation		○	
13.	Effective operation and maintenance of equipment and materials supplied in grant aid cooperation		○	
14.	Payment of expenses not included in grant aid cooperation		○	

No.	Financial Responsibility	Borne by		Remarks
		Japan	Bhutan	
15.	Assistance in application for visas for Japanese SV (issue of invitation letters, etc.) during installation work period		○	
16.	Necessary measures for acquiring the following permissions: - Permission for installation work - Permission for access to restricted areas		○	
17.	Payment of fees based on banking arrangement		○	
18.	Public Announcement and press release		○	

Remarks * : BTL shall be responsible for providing BTL's users with mobile communications services and BTL is required to cope with various works which affect directly the services even if engineers being dispatched from a vender.

2.3.6 Implementation and Procurement Supervision Plans

(1) Basic policies for implementation and procurement supervision

The consultant organizes a project consultant team, if necessary, in charge of the project and to smoothly conduct tendering and implementation/procurement management tasks based on the Guidelines for Japanese Grant Aid and the details of the draft design, while the team includes foreign and domestic engineers in various telecommunication engineering works for easing project implementation. The team shall participate in accordance with the work progress such as equipment installation and field testing and adjustment in an effort to ensure the execution of working process management, quality management, as-built management, and safety management based on the plan. Furthermore, the team is responsible for conducting a pre-shipment inspection of equipment to prevent troubles from occurring after delivery of the equipment. The following paragraphs describe the major precautions required in implementation and procurement supervision.

(2) Work process supervision

The team shall require a contractor to meet the due dates for completion of work specified in a contract and supervise the progress every week and every month. If a schedule delay is expected, the team shall call the attention of the contractor to this matter and shall require the submission of a document/letter for countermeasures and their implementation. A planned schedule and schedule progress shall be compared mainly in terms of the following items:

1) Confirmation of completed volumes (factory manufacturing and shipment volumes of equipment)
2) Confirmation of equipment delivery results
3) Confirmation of planned and actual number of engineers, skilled workers, laborers, etc.

(3) Qualify and as-built management

The team shall conduct quality and as-built management including the following items so that procured equipment meets the quality and as-built standards specified in contract documents. If the

predetermined quality or as-built state is not likely to be secured based on the check and verification results, the team shall require the contractor to correct, rectify, or modify the equipment immediately.

1) Verification of equipment specifications
2) Verification of manufacturer drawings and specifications of equipment
3) Attendance at factory inspections or verification of factory inspection results
4) Verification of installation manuals
5) Trial run, adjustment, and testing of equipment and verification of inspection manuals
6) Supervision of site installation and trial run of equipment and attendance during adjustment, testing and inspection

(4) Labor supervision

The team shall prevent work-related accidents on site and third party injuries and accidents during the construction period by means of thorough consultation with a safety manager of the contractor. The precautions for on-site safety supervision are as follows:

1) Establishment of safety management regulations and appointment of managers
2) Selection of driving routes and ensuring safe driving of construction vehicles, and transport machines, etc.
3) Welfare programs for laborers and encouragement for acquiring holidays

Fig. 2.3-3 shows the correlations of parties concerned in the project.

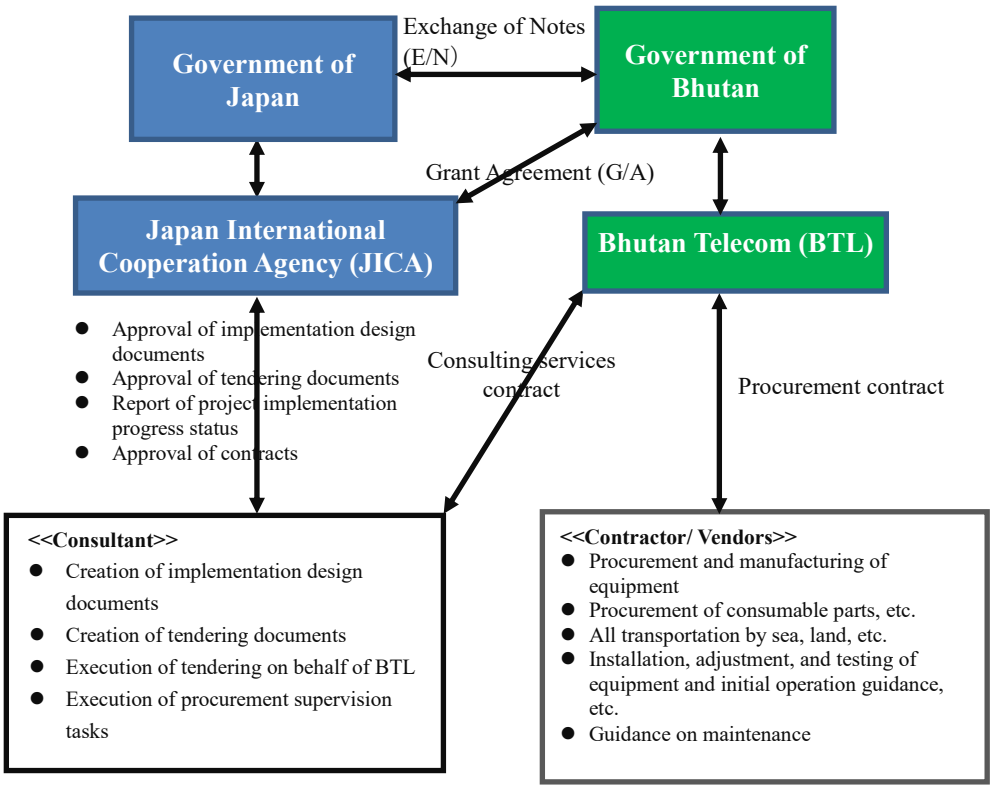


Figure 2.3-3 Project implementation correlation

(5) Contractor

The contractor shall not only procure and supply equipment but also install the equipment. For the sake of installation, the contractor must ensure that local subcontractors understand the need to ensure the work schedule, quality, as-built state and safety measures specified in the contract agreement. Therefore, the contractor shall dispatch engineers experienced in similar overseas tasks to Bhutan to provide training and education to subcontractors.

2.3.7 Quality Management Plan

In order to ensure that the contractor secures the quality and as-built state of manufacturing and installation specified in the contract documents (such as technical specifications and detailed design documents), the implementation supervisors of the consultant shall supervise and verify the quality and as-built state of materials and equipment to be procured in the project based on the following items. If such quality or as-built state are not likely to be secured, the consultant shall require the contractor to correct, rectify, or modify the materials and equipment immediately.

(1) Attendance at factory inspections of materials and equipment or verification of factory inspection results
(2) Verification of methods of packing, transportation, and temporary storage on site
(3) Verification of implementation drawings and installation manuals of materials and equipment
(4) Trial run, adjustment, testing of materials and equipment and verification of inspection manuals
(5) Supervision of site installation of materials and equipment and attendance during trial runs, adjustment, testing and inspection
(6) Verification of equipment installation implementation drawings and manufacture drawings and as-built state on site

2.3.8 Equipment Procurement Plan

In the project, equipment shall be procured from Japan and/or a third country.

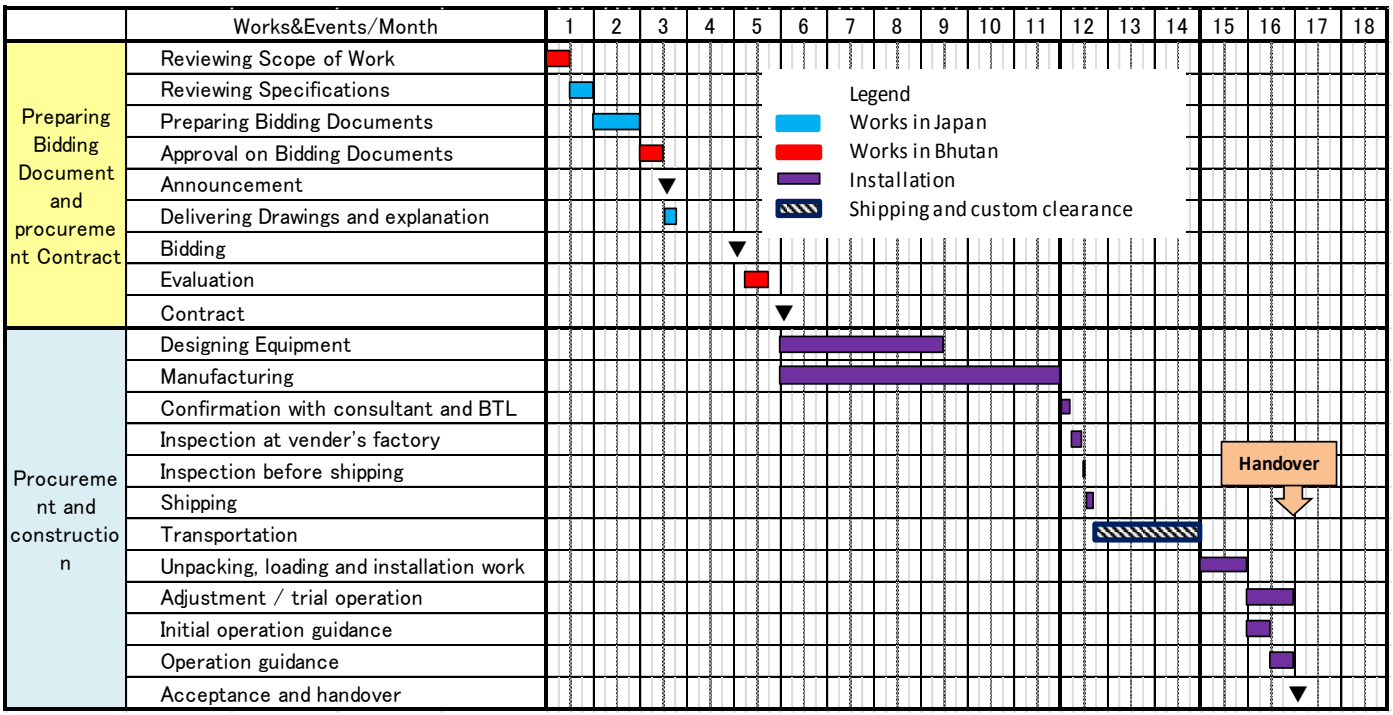
2.3.9 Initial Operation Guidance and Operation Guidance Plan

BTL has been operating and maintaining the existing core system since 2003 and therefore has sufficient experience, although BTL often depended on equipment vendors for troubleshooting. After installation, adjustment, and testing of equipment to be procured by Japan, therefore, engineers from equipment vendors shall provide initial operation guidance on the operation, troubleshooting, and daily inspection methods for the said equipment. The initial operation guidance and operation guidance shall be provided before equipment delivery for an estimated approximate period of two weeks.

2.3.10 Implementation Schedule

The following project implementation schedule has been adopted based on the Guidelines for Japanese Grant Aid. The schedule of the project shall be 16.0 months long including the detailed design (*e.g. Preparation of bidding documents and procurement contract*) after conclusion of a consulting services contract.

Table 2.3-7 Project implementation schedule



2.4 Project Operation and Maintenance Plan

There are 15 engineers engaged in the operation and maintenance of the existing core system at BTL. These engineers have already learned the operation and maintenance methods for the System scheduled for installation, which is not a new technology for them. Approximately 15 engineers in Thimphu and 10 engineers in Jakar will be needed for parallel operation after installation. Therefore, it is possible to prepare staffs for operations and maintenance in Jakar by assigning some of the existing engineers to Jakar and by hiring some new engineers or moving staffs from other sections.

2.5 Approximate Project Cost

(1) Approximate project cost

Japan's Grant Aid Project covers the new mobile core system including installation and cabling works, while the cost for other works must be borne by BTL, and major items are estimated as shown in the following table.

Table 2.5-1 Estimated costs borne by BTL

No.	Responsibilities	Approximate cost (Nu. Million)	Remarks
1	Power augmentation	1.6	No.4 in Table 3.3-6
2	Transmission upgrade	12.5	No.5 in Table 3.3-6
3	Civil works	1.0	
4	Interconnection works	12.0	No.10,11 in Table 3.3-6
	Total	**27.1**	

(2) Prerequisites for project cost estimation

1) Estimation timing: February 2017

2) Exchange rate: 1 US$ = 113.97 JPY

1 Nu. = 1.665 JPY

1 Euro= 121.83 JPY

Chapter 3 Project Evaluation

3.1 Prerequisites for Project Implementation

The new core system shall be installed in Jakar in the project that shall enable parallel operation with the existing core system in Thimphu. There is no need constructing a facility nor acquire land for it because the existing power supply system and other facilities in the existing machine room in the Jakar exchange office shall be fully utilized in the project, except for some that are currently out of order and needed to be replaced. The responsibilities borne by BTL for the implementation of the project shall include: (1) Connection of the existing mobile core system to the new mobile core system for parallel operation and functional confirmation, (2) transmission upgrade, (3) securing warehouses for storing procured materials and equipment, (4) securing spaces for installing equipment procured in the project, and (5) securing backbone systems with a redundant configuration between Thimphu and Jakar. Note that BTL experienced in the technologies and facilities and there looks little impact on the overall schedule.

3.2 Responsibilities of BTL for achieving Overall Goal of the Project

After the introduction of GSM technology in 2003, BTL enhanced the existing core system each time at the introduction of WCDMA in 2008 and LTE in 2012 and provided the mobile phone service based on these enhancements. In June 2017, moreover, BTL carried out a large-scale replacement of the modules for the existing core system. Therefore, BTL must have considerable experience in operating and maintaining the modules of the mobile core system.

The existing core system in Thimphu provides services under the responsibility of BTL. It is desirable that BTL shall provide an interconnection work between it and the new core system installed in Jakar in the project. Based on past experience in operating and upgrading mobile core system for 15 years, it is expected that BTL has sufficient technical capability for interconnecting works of the new core with the existing core system.

At present, BTL has 15 persons in the department for the operation and management of the mobile phone service. After the new core system in Jakar is integrated into the mobile phone network, it is expected that approximately 10 persons will need to be assigned to Jakar.

3.3 External Conditions

The external conditions needed for the achievement of the overall plan include (1) no abrupt price changes in the communications equipment market, (2) no occurrence of political instability, riots, etc., and (3) no occurrence of large natural disasters.

3.4 Evaluation of Project

3.4.1 Relevance

The project is concluded to be appropriate as a Japanese grant aid cooperation project as stated below.

(1) Beneficiaries

Mobile phones are widely used by Bhutanese citizen, for whom mobile phone services are an accessible means of communications. 87% of the population holds a mobile phone with services provided by BTL and TashiCell. BTL, which has a share of over 70% in the mobile phone market, is providing mobile communications services additionally to fixed telephone as a state-owned telecommunication operator according to the national communications policies and is characterized as a public property of Bhutan.

Both BTL and TashiCell have mobile core system respectively in Thimphu for providing mobile phone services. If a large natural disaster strikes Thimphu, the mobile phone service of both BTL and TashiCell will be seriously damaged and the recovery of the service may take several months in consideration of the equipment procurement time.

After a mobile core system is installed for parallel operation in a geographically remote region in the project which will create a physically redundant configuration for the mobile core systems, the mobile phone service can continue to be available even if Thimphu suffers extensive damage. Even TashiCell subscribers may easily regain communications if they sign up to BTL temporarily.

Therefore, the beneficiaries of the project shall be all the citizens of Bhutan.

(2) Urgency

Bhutan, together with Northern India and Nepal, is located on the Himalayan thrust, a plate border where the Indian Plate is colliding with and sinking under the Eurasian Plate, and is likely to suffer large-scale natural disasters such as earthquakes. Earthquakes that occurred recently are as follows:

Table 3.4-1 Recent earthquakes that struck Bhutan and the surrounding region

Date	Place of occurrence	Magnitude	Damage scale
September 21, 2009	Narang Gewog, Mongar Dzongkhag	6.1	12 dead, 7,290 people had to sleep outdoors, and were not admitted into a shelter
September 18, 2011	Sikkim state, India	6.9	1 dead, 14 injured Total amount of damage: 1,197.63 million Nu.

In Nepal, a neighboring country, an earthquake of magnitude 8.1 occurred on April 25, 2015. Fortunately, Bhutan did not suffer any major damage but was assessed as being at massive risk to a large earthquake.[2]

As described so far, earthquakes frequently occur in Bhutan, and the mobile core systems are concentrated in Thimphu and those face the risk of earthquakes. Thus, it is an urgent measure to install the new mobile core system in a geographically remote region and to ensure redundancy so as to improve the disaster resistance of the service and it is highly meaningful.

[2] Reference: Design and Implementation of the National Seismic Monitoring Network in the Kingdom of Bhutan, Kyoto University Disaster Prevention Research Institute Annals No.58-B, August 2015

(3) Maintenance Capability

As described in Paragraph 4-2, after the introduction of the GSM technology in 2003, BTL enhanced the mobile core system each time at the introduction of WCDMA in 2008 and LTE in 2012 and provided the service based on these enhancements. Therefore, BTL is deemed to have a sufficient maintenance capability for this system.

(4) Profitability of Plan

The project aims to achieve redundancy and the geographic separation of BTL mobile core systems. Although it does not change the number of subscribers that can be accommodated, it is likely to double the traffic processing capacity and improve the ratio of unconnected voice calls and ratio of packet losses. Therefore, no significant increase in revenue can be expected. Since the business of BTL depends largely on the mobile phone services, securing the continuity of the mobile phone service has a great significance for BTL.

(5) Environmental and Social Considerations

The project shall be implemented inside an existing exchange office. There is no impact on the neighborhood or ambient environment.

3.4.2 Feasibility of the Project under the Japanese Grant Aid Cooperation Scheme

There is no particular problem to implementing the project under the scheme of Japanese Grant Project. After the completion of the project, however, there are plans for parallel operation in poor configuration between the existing core system and the new core system to be installed in the project. Therefore, special attention must be paid to the interface conditions in the procurement of the system for the project.

3.4.3 Effectiveness

(1) Quantitative effects

The quantitative effect of the project is expressed by interrupted time of mobile core systems, of which interruption causes an outage of whole of BTL's mobile phone service, on average per year. The following figures give the durations of outage time before and after the project completion.

Table 3.4-2 durations of outage time before and after the project completion

Index name	Reference value (2017)	Target value (2020 or later)
Duration of interrupted mobile core systems	10 hours per year or more	15 minutes or less per year

(2) Qualitative effects

After the new core system is installed in a geographically remote region that enables parallel operation with the existing core system in the project, the call/packet processing capacity for mobile phones can

be doubled. Moreover, mobile phone services can be continued if one of the mobile core systems suffers a major malfunction or fails due to damages or other reasons.

The administrative agencies including disaster preventing organizations and the police and fire departments largely depends on BTL mobile phones as a means of communications. The project will enable these organizations to use mobile phones as a means of communications even after a large disaster strikes and carry out quick relief and restoration activities, which are expected to alleviate human suffering and prevent secondary disasters.

In sum, the project is expected to have a high relevance and high effectiveness.

3.5 Necessity of immediate Action for Business Continuity Plan in mobile service

Since the mobile core systems are concentrated in Thimphu, a city with a high risk of natural disasters, it is exceedingly important to achieve a geographic and physically redundant configuration from the viewpoint of increasing mobile phone service reliability. To ensure the business continuity of the services, however, it is extremely important to ensure the appropriate operation of the geographic and physically redundant configuration and the network. BTL, being acutely aware of this necessity, requested technical cooperation from Japanese government for establishing a Business Continuity Plan (BCP). However, it is desirable to establish part of the BCP that can be implemented in advance without waiting for the technical cooperation. In particular, measures should be urgently taken against traffic congestion.

The importance of taking anti-disaster measures for communications facilities and exchange office buildings and establishing networks in a redundant configuration cannot be overly stressed. Equally important is the establishment of a BCP in facility operations. Most of administrative and disaster preventing organizations such as DDM, Police-Fire Department, etc. depend on the BTL service as a means of communications during disasters. It is expected that the BTL communication network including fixed-line telephones will be the only infrastructure for the entire country for disaster prevention and post-disaster rehabilitation activities. Therefore, BTL is required to establish a higher-level BCP plan.

The BCP of BTL needs to cover the following elements in addition to those required for an ordinary BCP such as conservation of data.

- Congestion countermeasures and communications restrictions
- Prioritization and connection of important subscribers and urgent calls
- Conservation of important data such as subscriber information
- Collaboration with relevant organizations (such as disaster preventing organizations, TashiCell, and broadcasting companies)
- Integrated training and exercises in relation to the above
- Development of laws

A system failure occurs if a very heavy traffic loads onto communications equipment, particularly control-related units such as switching devices. Once a system failure occurs, many hours are required

to restart the system during which time the service is suspended. A measure to prevent such a situation is to monitor the traffic and, when a dangerous level is coming, block the traffic at the input point of processing.

3.5.1 Importance of Congestion Countermeasures

Congestion countermeasures are extremely important measures taken by most telecommunications operators in the world to ensure the stability of communications networks. Realization of the Gross National Happiness of Bhutan is supposed to prevent a system failure caused by unexpected heavy traffic congestions and ensure communications of such prioritized users as disaster related agencies, rescue, fire, police, etc. The measures avoiding system downtime are equivalent to road traffic management. Ambulances, fire engines, and police cars are prioritized to use roads while disregarding the traffic rules in emergencies and restricting the passage of general vehicles when roads are congested, as necessary.

3.5.2 Communications Restriction

Normally, a combination of the following three methods of communications restriction shall be applied as congestion countermeasures.

(1) Restriction of originating calls at base stations
(2) Restriction of originating calls at switching device
(3) Restriction of terminating calls at switching device

Voice and data communications shall be separately restricted. For each, the restriction shall be phased in, for example, from 50% to 90%. Normally, data communications are restricted less than voice communications because the former sometimes alleviate congestion by means of disaster message boards, etc. During restrictions, the handling of communications from important subscribers and emergency calls from general users shall be prioritized and shall not be restricted.

BTL has only one unit of switching device and uses a centralized-control network. Applying a restriction on the switching device will affect the entire country. Therefore, partial restrictions on the switching device and meticulous restrictions on the base stations will be required. Adequate examination and verification in advance are important.

When applying restrictions, it is important to:

(1) Secure alternative means of communication, such as a disaster message board; and
(2) Notify users in a timely manner to acquire their understanding and cooperation

Notification and education during non-emergency times are also necessary.

If critical damage occurs on one of the mobile core systems in the physically redundant configuration completed in the project, the traffic will be handled by the other mobile core system. In such a case, there will be a sharp increase in originating calls from general users and terminating calls to users so that there still remains a possibility in which the entire system fails unless appropriate traffic control is exercised.

Appendix 1:

Member List of the Study Team

Organization	Name	Position/Responsibility
JICA	Mr. Tomoyuki NAITO	Team Leader
	Mr. Keitaro TANAKA (Dec. 2016 - Feb. 2017)	Cooperation Planning
	Mr. Masayuki FURUKAWA (Mar.2017 – Jun. 2017)	
	Mr. Masato MIKAMO (Jul.2017 – Nov. 2017)	
Consultants	Mr. Norifumi TANAKA	Team leader of Consultants/Communication Development Planning 1
	Mr. Yoshiyuki YAGIRI	Deputy Team leader of Consultants/Communication Development Planning 2/ Equipment plan and Cost estimation
	Mr. Takayoshi HAMANO	Mobile Network/Backup System
	Mr. Shiro MAKITA	Equipment Planning
	Mr. Tetsuo YAMASHITA	Software
	Mr. Masaru SOMEYA	Operation and Maintenance Planning

Appendix 2 Study Schedule

（Fist Survey）

			JICA	Consultants					
Staff of Survey Member			Team Leader: Tomoyuki Naito Adiministiration: Keitaro Tanaka	Network Olanning: Norifumi TANAKA	Equipment plan and Cost estimation Yoshiyuki YAGIRI	Equipment Planning: Shiro MAKITA	Mobile Network: Takayoshi HAMANO	Software: Tetsuo YAMASHITA	Operation & maintenance: Masaru SOMEYA	Stay in
Year	Day/Month									
2017	12-Jan (Thu)	AM	Arraival at the Paro Int'l Airport in Bhutan, Coutesy call on the JICA Bhutan Office							Timphu
		PM								
	13-Jan (Fri)	AM	Courtesy call on BTL, Explanation and Discussion on Inception Report with BTL and JICA in Thimphu							Timphu
		PM								
	14-Jan (Sat)		Site Invetigation on Jakar exchange office	Preparation of discussion papers for BTL	Site investigation on Jakar exchange Office			Preparation of the documents for the proposal to BTL		Trogsa/ Thimphu
	15-Jan (Sun)									
	16-Jan (Mon)	AM		Discussion with BTL				Discussion with BTL		Jakar/ Thimphu
		PM								
	17-Jan (Tue)	AM	Discussion with BTL and JICA for the M/D							Timphu
		PM								
	18-Jan (Wed)	AM	Discussion with BTL and JICA for the M/D							Timphu
		PM								
	19-Jan (Thu)	AM	Signing of the M/D							Timphu
		PM	Arrangement of visiting to the related organizations							
	20-Jan (Fri)	AM	Site investigation at the BTL head office, Collection of questionaire and arrangement of visiting to the related organizations, Interview with JICA at the Bhutan InfoComm and Media Authority (BICMA) and World Bank							Timphu
		PM								
	21-Jan (Sat)		Leave for Japan	Leave for Japan	Stay in Thimphu					Timphu
	22-Jan (Sun)		Arrival in Japan	Arrival in Japan	Stay in Thimphu					
	23-Jan (Mon)	AM			Discussion with DITT of DoIC					Timphu
		PM			Discussion with DDM					
	24-Jan (Tue)	AM			Discussion with DoHMS		Site investigation at NOC in BTL			Timphu
		PM			Collection of the technical information and materials for the New core system					
	25-Jan (Wed)	AM			Discussion with BTL	Discussion with Fire station of Police	Discussion with BTL	Discussion with Fire station of Police	Discussion with BTL	Timphu
		PM			Discussion with NEC	Discussion with DGM			Discussion with NEC	
	26-Jan (Thu)	AM			Procurement Research	Existing Network Research, Collection of the technical information and materials for the New core system				Timphu
		PM								
	27-Jan (Fri)	AM			Procurement Research	Existing Network Research, Collection of the technical information and materials for the New core system				Timphu
		PM								
	28-Jan (Sat)				Stay in Thimphu					Thimphu
	29-Jan (Sun)				Site investigation at the Jakar exchange office			Site investigation on the Jakar exchange office		Trongsa/ Thimphu
	30-Jan (Mon)	AM				Collection of the technical information			Collection of the technical information	Jakar/ Thimphu
		PM								
	31-Jan (Tue)	AM				Collection of the technical information			Collection of the technical information	Jakar/ Timphu
		PM								
	1-Feb (Wed)	AM				Discussion with BTL			Discussion with BTL	Timphu
		PM								
	2-Feb (Thu)	AM			Procurement Research	Collection of the technical information and Preparation of the documents for discussion				Timphu
		PM								
	3-Feb (Fri)	AM			Procurement Research	Collection of the technical information and Preparation of the documents for discussion				Timphu
		PM								
	4-Feb (Sat)			Arrival in Bhutan	Compiling collecting information					Thimphu
	5-Feb (Sun)			Internal meeting and preparation of discussion paper						Thimphu
	6-Feb (Mon)	AM		Preparing document for Discussion						Timphu
		PM		Collecting supplementary information and discussion with BTL						
	7-Feb (Tue)	AM		Discussion on Scorp of Work and Demarkation between Grant PJ and Works by Bhutan Side with BTL						Timphu
		PM								
	8-Feb (Wed)	AM		Collecting Supplementary information						Timphu
		PM		Reporting JICA Bhutan Office						
	9-Feb (Thu)	AM		Leave for Japan						
		PM								

Remarks: GNHC: Gross National Happiness Commission
DGM: Department of Geology and Mines
DHMS: Department of Hydro-Met Service
DITT: Department of Information, Technology and Telecom,
BTL: Bhutan Telecom Ltd.
DoR: Department of Roads
DoDM: Department of Disaster Management
NEC: National Environment Commission
BICMA: Bhutan InfoComm and Media Authority

（Second Survey）

			JICA	Consultants			
Staff of Survey Member			Team Leader: Tomoyuki Naito Cooperation Planning Keitaro Tanaka	Network Planning: Norifumi TANAKA	Equipment plan and Cost estimation Yoshiyuki YAGIRI	Mobile Network: Takayoshi HAMANO	Stay in
Year	Day/Month						
2017	21-Aug (Mon)			Departing for Bhutan			
	22-Aug (Tue)	AM		Arriving at Bhutan			
		PM		Visiting JICA Bhutan office			Thimphu
	23-Aug (Wed)	AM		Explaining Draft version of Final Report			Thimphu
		PM					
	24-Aug (Thu)	AM		Surveying on the existing mobile core system in BTL new machine building			Timphu
		PM					
	25-Aug (Fri)	AM		Discussion on the role of BTL in the project implementation			Timphu
		PM					
	26-Aug (Sat)			Visiting Nishioka Memorial Museum for JICA ex-expert			Timphu
	27-Aug (Sun)		Arriving at Bhutan	Summarizing discussion			Timphu
	28-Aug (Mon)	AM	Explaining the project and Process and procedure of Japan's Grant Aid Project to GNHC and BTL: Bhutan				Timphu
		PM					
	29-Aug (Tue)	AM	Discussion on the project and Process and procedure with GNHC and BTL: Bhutan				Timphu
		PM					
	30-Aug (Wed)	AM	Surveying on the existing mobile core system in BTL new machine building				Timphu
		PM					
	31-Aug (Thu)	AM	Signing on Mibutes of Discussion				Timphu
		PM					
	1-Sep (Fri)		Reaving for Japan				

Appendix 3. List of Parties Concerned in the Recipient Country

Organization	Name	Position
Bhutan Telecom Ltd (BTL)		
Thimphu Head Office	Mr. Tshewang Gyeltshen	Chief Executive Officer (CEO)
	Mr. Karma Tshewang	Director, Techinical Department
	Mr. Chimi Dorji	Director, Business Department
	Mr. Jichen Thinley	General Manager, Corporate Planning and Strategy Division
	Mr. Jambay Sither	General Manager, Operation Division
	Mr. Dorchu Dukpa	Dupty General Manager, Access Network
	Mr. Sangay Choeda	Dupty General Manager, Core Network
	Mr. Wangdi	Manager, Core Network
	Mr. Karma Wangdi	Manager, Corporate Planning Division
	Ms. Boby Gurung	Engineer, Core Network
	Mr. Sonam Tobgay Tshering	Marketing Officer
	Mr. Sonam Tashi	Deputy General Manager
	Mr. Sonam Phuntsho	Deputy General Manager, NOC
	Mr. Tshering Dhendup	Manager, Internet Services
	Mr. Phuntsho Gyanden	Engineer, Soft Switch
	Mr. Chencho Nidup	Asst. Engineer, DWDM Equipment Room
	Ms. Chimi	Technical Officer, Transmission Centre
	Ms. Tashi Tshomo	Manager, Procurement Corporate Services Division
	Mr. Jangchu Dorji	Manager, Civil Section
	Mr. Karma June	DO, Corporate Services Division
	Mr. Dawa Sonam	General Manager, DC & Cloud Division
	Ms. Sigye Dema	Marketing Officer
Jakar Exchange	Mr. Ugyen Chophel	Regional Manager (Central Region)
	Mr. Sangay Duba	Manager（Jakar Exchange)
	Mr. Tandin Wangdi	Technical Officer（Jakar Exchange)
Gross National Happiness Commission (GNHC)		
	Mr. Rinchen Wangdi	Chief Program Coordinator
	Ms. Kuenzang L. Sangay	DCPO, DCD
Bhutan InfoComm and Media Authority (BICMA)		
	Mr. Chencho Dorji	Director General
	Mr. Wangay Dorji	Chief
Department of Hydro-Met Services (DOHMS)		
Thimphu Head Office	Mr. Karma Dupchu	Chief
	Mr. Sangay Tenzin	Head, Flood Monitoring and Command Room
	Mr. Pema Wangdi	Engineer
	Mr. Bikash Pradhan	Engineer
	Ms. Pema Syldon	Engineer
Chamkhar Meterological Station	Mr. Ugyen Dorji	Technician
Kujey Hydrological Station	Mr. Ugyen Thinley	Technician
	Mr. Dungchu Wangdi	Technician
	Mr. Sangay Tshering	Technician
Royal Bhutan Police (Fire Services Division)		
	Mr. L.B.Pradhan	Superintendent of police, Fire Division
	Mr. Ugyen Wangdi	Officer Commander
National Environment Commission (NEC)		
	Mr. Tenzin Khorlo	Chief, Environment services Division
Department Of Geology and Mines (DGM)		
	Mr. Jamyang Chophel	Sr. Engineer Geologist and Project Manager
Department Of Disaster Management (DoDM)		
	Mr. Chhador Wangdi	Director
Department Of Information Technology & Telecom (DITT)		
	Mr. Jigme Tenzing	Director
	Mr. Sonam Phuntsho	Chief ICT Officer
	Mr. Pema Dhendup	ICT Officer
Bhutan Power Corporation Ltd. (Jakar)		
	Mr. Gyeltshen	Senior Manager
Ericsson India		
	Mr. Naveen Yadav	Sr. Engineer
	Mr. Syeo Ali Nowaz	Project Manager
World Bank		
	Mr. Yoichiro Ishihara	Resident Representative
JICA Bhutan Office		
	Mr. Koji Yamada	Chief Representative
	Mr. Sho Takano	Representative (Deputy)
	Mr. Kota Wakabayashi	Representative
	Ms. Tomoko Miyata	Project Formulation Advisor
	Mr. Krishna Subha	Local Staff
JICA (FTTX PROJECT)		
	Mr. Junya Yamaguchi	Chief Advisor

APPENDIX 4. (1)

Minutes of Discussions
on the Preparatory Survey for the Project for
Building the Disaster Resilient Emergency Mobile Network

In response to the request from the Royal Government of Bhutan (hereinafter referred to as "RGoB"), Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched the Preparatory Survey Team for the Outline Design (hereinafter referred to as "the Team") of the Project for Building the Disaster Resilient Emergency Mobile Network (hereinafter referred to as "the Project") to Bhutan, headed by Tomoyuki Naito, Senior Advisor, JICA, from January 12 to January 19, 2017. The Team held a series of discussions with the officials of the RGoB and conducted a field survey. In the course of the discussions, both sides have confirmed the main items described in the attached sheets.

Thimphu, January 19, 2017

Tomoyuki Naito
Leader
Preparatory Survey Team
Japan International Cooperation Agency
Japan

19/1/17

Tshewang Gyeltshen
Chief Executive Officer
Bhutan Telecom
Bhutan

Rinchen Wangdi
Chief Program Coordinator
Gross National Happiness Commission
Bhutan

ATTACHMENT

1. Objective of the Project

   The objective of the Project is to make the communication network redundant by establishing the second mobile core system, thereby contributing to making the country resilient against disaster.

2. Title of the Preparatory Survey

   Both sides confirmed the title of the Preparatory Survey as "the Preparatory Survey for the Project for Building the Disaster Resilient Emergency Mobile Network".

3. Project Site

   Both sides confirmed that the site of the Project is the Jakar exchange of the Bhutan Telecom which is shown in Annex 1.

4. Responsible Authority for the Project

   Both sides confirmed the authorities responsible for the Project are as follows:

   4-1. The Bhutan Telecom (hereinafter referred to as "BT") will be the executing agency for the Project (hereinafter referred to as "the Executing Agency"). The Executing Agency shall coordinate with all the relevant authorities to ensure smooth implementation of the Project and ensure that the undertakings for the Project shall be managed by relevant authorities properly and on time. The organization chart of BT is shown in Annex 2.

   4-2. The Gross National Happiness Commission (hereinafter referred to as "GNHC") shall be official signer of Grant Agreement for the Project on behalf of the RGoB.

5. Items Requested by the Government of Bhutan

   5-1. As a result of discussions, both sides confirmed that the items requested by the Government of Bhutan are as follows:

   a) Equipment;

   Second mobile core system for securing the resiliency against disaster in Bhutan. (hereinafter referred to as "the Second Core")The component details of the Second Core system shall be clarified during the technical investigation by the Team.

b) Soft Component;

Services of experts in the initial set up of the Second Core for BT's operation and maintenance.

5-2. JICA will assess the feasibility of the above requested items through the survey and will report the findings to the Government of Japan. The final scope of the Project will be decided by the Government of Japan.

6. Procedures and Basic Principles of Japanese Grant

6-1. The Bhutanese side agreed that the procedures and basic principles of Japanese Grant as described in Annex 3 shall be applied to the Project.

As for the monitoring of the implementation of the Project, JICA requires Bhutanese side to submit the Project Monitoring Report, the form of which is attached as Annex 4.

6-2. The Bhutanese side agreed to take the necessary measures, as described in Annex 5, for smooth implementation of the Project. The contents of the Annex 5 will be elaborated and refined during the Preparatory Survey and be agreed in the mission dispatched for explanation of the Draft Preparatory Survey Report.

The contents of Annex 5 will be updated as the Preparatory Survey progresses, and eventually, will be used as an attachment to the Grant Agreement.

7. Schedule of the Survey

7-1. The Team will proceed with further survey in Bhutan until February 9, 2017.

7-2. JICA will prepare a draft Preparatory Survey Report in English and dispatch a mission to Bhutan in order to explain its contents around August, 2017.

7-3. If the contents of the draft Preparatory Survey Report is accepted and the undertakings for the Project are fully agreed by the Bhutanese side, JICA will finalize the Preparatory Survey Report and send it to Bhutan around December, 2017.

7-4. The above schedule is tentative and subject to change.

8. Other Relevant Issues

8-1 Change of the Project Site

During the discussion, the Bhutanese side explained to the Team that the expected project site to install the Second Core is required to change from the original idea of BT headquarters in Thimphu to BT exchange in Jakar.

Due to the frequent and serious technical trouble of the existing core, BT faces since months ago, they recently decided to conduct the urgent upgrading of the existing core by own budget, in order to avoid sudden mass disruption of mobile network by unpredictable technical glitches.

By this recent happening, the BT hopes to install the equipment which might be newly procured under the Japan's Grant, to Jakar. BT explained to the Team that the overall idea to make the communication network redundant by establishing the second mobile core network would not be changed by this project site change. The Team will examine the details of this plan including the appropriateness of the Jakar site in order to secure the development effectiveness of Japan's Grant accordingly.

8-2 Confirmation of Fundamental Requirement

The Team confirmed that the fundamental requirement for the project is the development of the Second Core which enables the communication network redundant.

8-3 The Bhutanese side shall, at its own expense, provide the Team with the following items in cooperation with other organizations concerned;

(1) security-related information as well as measures to ensure the safety of the survey team;
(2) information as well as support in obtaining medical service;
(3) data and information necessary for the Survey;
(4) counterpart personnel;
(5) credentials or identification cards if necessary;
(6) entry permits necessary for the survey team members to conduct field surveys; and
(7) support in obtaining other privileges and benefits if necessary.

8-4 Design of Overall Mobile Core Network and its Redundancy

The BT explained that they will make sure the overall mobile core network design including Jakar site by document, and promised to hand it over to the Team by January 31, 2017. The team will provide feedback to the provided overall mobile core network design if necessary.

8-5 Securing Compatibility between First and Second Core

For the sake of appropriate design, specification, and the price estimation of the Second Core, the team will examine specifications and compatibility of equipment between the newly procured first core and the Second Core so that the risk of technical glitch of systems can be avoided. The BT side agreed to share all the specification and price list of the newly procured first core equipment to the Team by January 31, 2017, in order to meet with this requirement. This requirement includes the related software of the newly procured first core.

8-6 Implementing Schedule of the Newly Procured First Core System

The BT side agreed to share all the related schedule of the newly procured first core system to the Team for the sake of appropriate overall management.

8-7 Countermeasures for Communication Traffic Congestion

The BT side explained that the development of the second core should be prioritized than preparing operational countermeasures for communication traffic congestion. The Team explained that the countermeasures for communication traffic congestion is also a crucial matter to secure the sustainable network service provision, since communication service might be disrupted after the disaster due to communication traffic congestion if such countermeasure would not be applied. The team suggested some technical options as the countermeasure to BT, and both sides agreed to continue further investigation from sustainable network management viewpoint.

8-8 Tax Exemption

Bhutanese side confirmed that the customs duties, internal taxes and other fiscal levies imposed in Bhutan with respect to the purchase of the products and the services shall be exempted in accordance with the regulations of Exchange of Notes (E/N) between the two Governments.

For the sake of this smooth tax exemption procedures, the Team recommended BT and GNHC that BT and GNHC would begin necessary preparations of the application of tax exemption mentioned above and consultation with Department of Revenue and Customs (hereinafter referred to as "DRC") and relevant organizations, if any, based on the past E/N contents as soon as possible.

8-9 Major Undertakings to be Taken by the Bhutanese Side

The Bhutanese side agreed that the following undertakings should be taken by the Bhutanese side at the Bhutanese expenses under the Project if implementation of the Project is approved by the Government of Japan;

(1) to share all the necessary information of the newly procured first core equipment and system;
(2) to secure the necessary reinforcement and other measures to properly receive the second core to Jakar exchange including its surrounding infrastructures;
(3) to exempt tax as explained in 8-8;
(4) to secure land and space necessary for the implementation of the Project including land and space for site office;
(5) to arrange issuance of license, permission and other necessary procedures for the Project; and
(6) to provide security measures for all concerned working for the Project.

8-10 Relation between Disaster Management Related Agencies

Japanese side requested BT to submit written documents which clarify the relation between BT and disaster management related agencies to justify appropriateness of the Project.

8-11 Securing Budget and Staff for the Network Operation, Maintenance and Monitoring

The Team confirmed that the BT side will ensure appropriate budget and staff for the network operation, maintenance and monitoring in both Thimphu and Jakar offices in order to ensure the effectiveness of the Project.

8-12 Disclosure of Information

Both sides confirmed that the survey results excluding the Project cost will be disclosed to the public after the completion of the Survey. All the study results including the Project cost will be disclosed to the public after all the verification of contracts for the Project by JICA are concluded.

8-13 Misconduct

If JICA receives information related to suspected corrupt or fraudulent practices in the implementation of the Project, BT and relevant organizations shall provide

JICA with additional such information as JICA may reasonably request, including information related to any concerned official of the government and/or public organizations in Bhutan.

BT and relevant organizations shall not, unfairly or unfavourably treat the person(s) and/or company which provided the information related to suspected corrupt or fraudulent practices in the implementation of the Project.

Annex 1 Project Site

Annex 2 Organization Chart

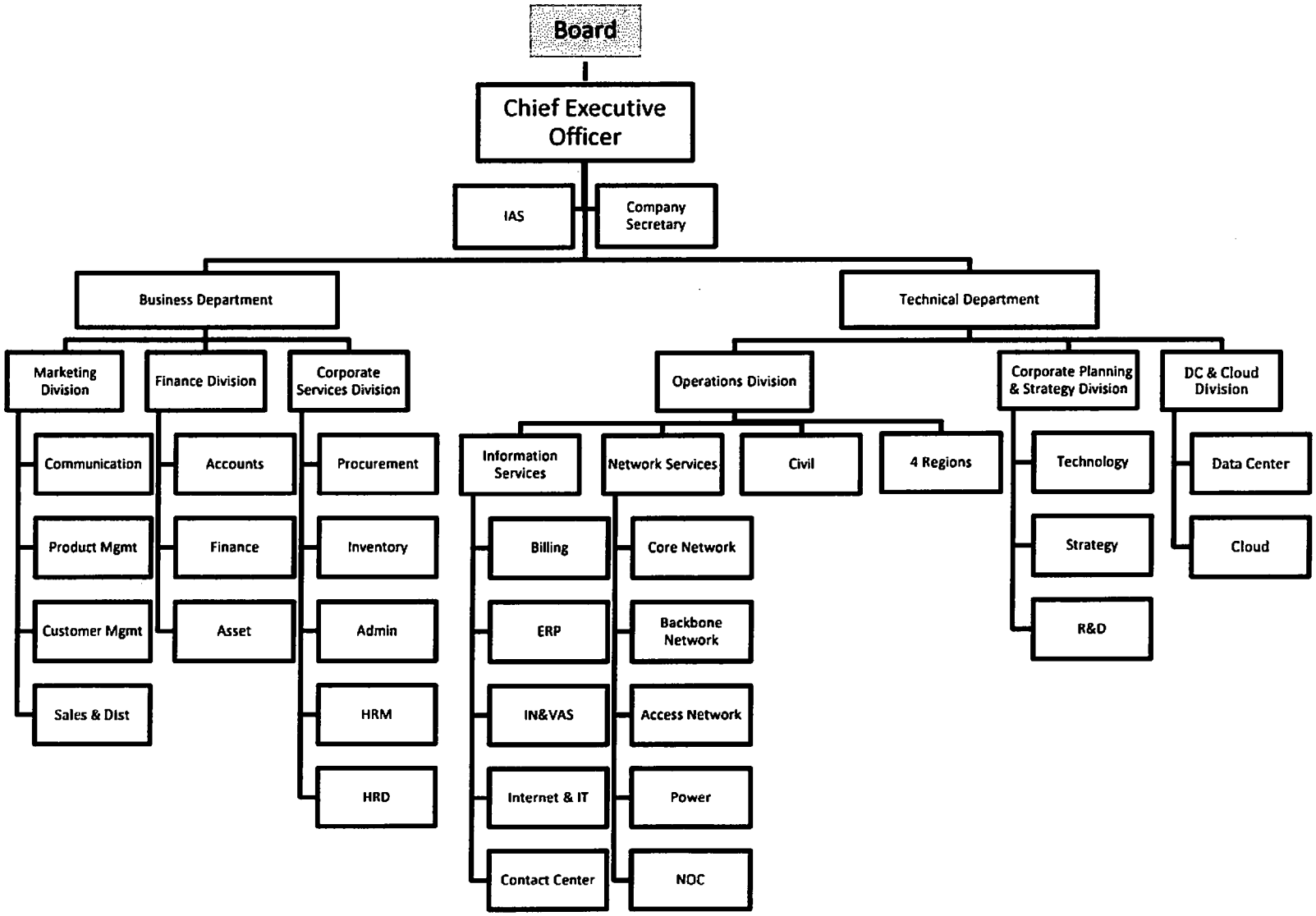
Annex 3 Japanese Grant

Annex 4 Project Monitoring Report (template)

Annex 5 Major Undertakings to be taken by the Government of Bhutan

ジェイカー
Jakar
Bhutan Telecom Office
Bathpalathang
Airport
Bumthang Chhu River
Wangchukling
アマンコラ・リゾート
Amankora Resort
Swiss Guest House
Bumthang, Kharsumphe
Google
地図データ ©2017 Google
© d-maps.com
Punakha
Paro
Thimphu
Haa
Wangdue Phodrang
Bumthang
Lhuntse
Trashiyangtse
Trongsa
Mongar
Trashigang
Zhemgang
Samtse
Chukha
Dagana
Tsirang
Sarpang
Pemagatshel
Samdrup Jongkhar
The boundaries shown on this map do not imply official endorsement or acceptance.

ANNEX 1


Board
Chief Executive Officer
IAS
Company Secretary
Business Department
Technical Department
Marketing Division
Finance Division
Corporate Services Division
Operations Division
Corporate Planning & Strategy Division
DC & Cloud Division
Communication
Product Mgmt
Customer Mgmt
Sales & Dist
Accounts
Finance
Asset
Procurement
Inventory
Admin
HRM
HRD
Information Services
Network Services
Civil
4 Regions
Billing
ERP
IN&VAS
Internet & IT
Contact Center
Core Network
Backbone Network
Access Network
Power
NOC
Technology
Strategy
R&D
Data Center
Cloud

Annex 3

JAPANESE GRANT

The Japanese Grant is non-reimbursable fund provided to a recipient country (hereinafter referred to as "the Recipient") to purchase the products and/or services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. Followings are the basic features of the project grants operated by JICA (hereinafter referred to as "Project Grants").

1. Procedures of Project Grants

Project Grants are conducted through following procedures (See "PROCEDURES OF JAPANESE GRANT" for details):

(1) Preparation

- The Preparatory Survey (hereinafter referred to as "the Survey") conducted by JICA

(2) Appraisal

-Appraisal by the government of Japan (hereinafter referred to as "GOJ") and JICA, and Approval by the Japanese Cabinet

(3) Implementation

Exchange of Notes

-The Notes exchanged between the GOJ and the government of the Recipient

Grant Agreement (hereinafter referred to as "the G/A")

-Agreement concluded between JICA and the Recipient

Banking Arrangement (hereinafter referred to as "the B/A")

-Opening of bank account by the Recipient in a bank in Japan (hereinafter referred to as "the Bank") to receive the grant

Construction works/procurement

-Implementation of the project (hereinafter referred to as "the Project") on the basis of the G/A

(4) Ex-post Monitoring and Evaluation

-Monitoring and evaluation at post-implementation stage

2. Preparatory Survey

(1) Contents of the Survey

The aim of the Survey is to provide basic documents necessary for the appraisal of the the Project made by the GOJ and JICA. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of

relevant agencies of the Recipient necessary for the implementation of the Project.

- Evaluation of the feasibility of the Project to be implemented under the Japanese Grant from a technical, financial, social and economic point of view.
- Confirmation of items agreed between both parties concerning the basic concept of the Project.
- Preparation of an outline design of the Project.
- Estimation of costs of the Project.
- Confirmation of Environmental and Social Considerations

The contents of the original request by the Recipient are not necessarily approved in their initial form. The Outline Design of the Project is confirmed based on the guidelines of the Japanese Grant.

JICA requests the Recipient to take measures necessary to achieve its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the executing agency of the Project. Therefore, the contents of the Project are confirmed by all relevant organizations of the Recipient based on the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Survey, JICA contracts with (a) consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey

JICA reviews the report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the feasibility of the Project.

3. Basic Principles of Project Grants

(1) Implementation Stage

1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes (hereinafter referred to as "the E/N") will be singed between the GOJ and the Government of the Recipient to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Recipient to define the necessary articles, in accordance with the E/N, to implement the Project, such as conditions of disbursement, responsibilities of the Recipient, and procurement conditions. The terms and conditions generally applicable to the Japanese Grant are stipulated in the "General Terms and Conditions for Japanese Grant (January 2016)."

2) Banking Arrangements (B/A) (See "Financial Flow of Japanese Grant (A/P Type)" for details)

a) The Recipient shall open an account or shall cause its designated authority to open an account under the name of the Recipient in the Bank, in principle. JICA will disburse the Japanese Grant in Japanese yen for the Recipient to cover the obligations incurred by the Recipient under the verified contracts.

b) The Japanese Grant will be disbursed when payment requests are submitted by the Bank to JICA under an Authorization to Pay (A/P) issued by the Recipient.

3) Procurement Procedure

The products and/or services necessary for the implementation of the Project shall be procured in accordance with JICA's procurement guidelines as stipulated in the G/A.

4) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the Recipient to continue to work on the Project's implementation after the E/N and G/A.

5) Eligible source country

In using the Japanese Grant disbursed by JICA for the purchase of products and/or services, the eligible source countries of such products and/or services shall be Japan and/or the Recipient. The Japanese Grant may be used for the purchase of the products and/or services of a third country as eligible, if necessary, taking into account the quality, competitiveness and economic rationality of products and/or services necessary for achieving the objective of the Project. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm, which enter into contracts with the Recipient, are limited to "Japanese nationals", in principle.

6) Contracts and Concurrence by JICA

The Recipient will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be concurred by JICA in order to be verified as eligible for using the Japanese Grant.

7) Monitoring

The Recipient is required to take their initiative to carefully monitor the progress of the Project in order to ensure its smooth implementation as part of their responsibility in the G/A, and to regularly report to JICA about its status by using the Project Monitoring Report (PMR).

8) Safety Measures

The Recipient must ensure that the safety is highly observed during the implementation of the Project.

9) Construction Quality Control Meeting

Construction Quality Control Meeting (hereinafter referred to as the "Meeting") will be held for quality assurance and smooth implementation of the Works at each stage of the Works. The member of the Meeting will be composed by the

Recipient (or executing agency), the Consultant, the Contractor and JICA. The functions of the Meeting are as followings:

a) Sharing information on the objective, concept and conditions of design from the Contractor, before start of construction.

b) Discussing the issues affecting the Works such as modification of the design, test, inspection, safety control and the Client's obligation, during of construction.

(2) Ex-post Monitoring and Evaluation Stage

1) After the project completion, JICA will continue to keep in close contact with the Recipient in order to monitor that the outputs of the Project is used and maintained properly to attain its expected outcomes.

2) In principle, JICA will conduct ex-post evaluation of the Project after three years from the completion. It is required for the Recipient to furnish any necessary information as JICA may reasonably request.

(3) Others

1) Environmental and Social Considerations

The Recipient shall carefully consider environmental and social impacts by the Project and must comply with the environmental regulations of the Recipient and JICA Guidelines for Environmental and Social Considerations (April, 2010).

2) Major undertakings to be taken by the Government of the Recipient

For the smooth and proper implementation of the Project, the Recipient is required to undertake necessary measures including land acquisition, and bear an advising commission of the A/P and payment commissions paid to the Bank as agreed with the GOJ and/or JICA. The Government of the Recipient shall ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the Recipient with respect to the purchase of the Products and/or the Services be exempted or be borne by its designated authority without using the Grant and its accrued interest, since the grant fund comes from the Japanese taxpayers.

3) Proper Use

The Recipient is required to maintain and use properly and effectively the products and/or services under the Project (including the facilities constructed and the equipment purchased), to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Japanese Grant.

4) Export and Re-export

The products purchased under the Japanese Grant should not be exported or re-exported from the Recipient.

Attachment I

PROCEDURES OF JAPANESE GRANT

Stage	Procedures	Remarks	Recipient Government	Japanese Government	JICA	Consultants	Contractors	Agent Bank
Official Request	Request for grants through diplomatic channel	Request shall be submitted before appraisal stage.	x	x				
1. Preparation	(1) Preparatory Survey Preparation of outline design and cost estimate		x		x	x		
2. Appraisal	(2)Preparatory Survey Explanation of draft outline design, including cost estimate, undertakings, etc.		x		x	x		
	(3)Agreement on conditions for implementation	Conditions will be explained with the draft notes (E/N) and Grant Agreement (G/A) which will be signed before approval by Japanese government.	x	x (E/N)	x (G/A)			
	(4) Approval by the Japanese cabinet			x				
3. Implementation	(5) Exchange of Notes (E/N)		x	x				
	(6) Signing of Grant Agreement (G/A)		x		x			
	(7) Banking Arrangement (B/A)	Need to be informed to JICA	x					x
	(8) Contracting with consultant and issuance of Authorization to Pay (A/P)	Concurrence by JICA is required	x			x		x
	(9) Detail design (D/D)		x			x		
	(10) Preparation of bidding documents	Concurrence by JICA is required	x			x		
	(11) Bidding	Concurrence by JICA is required	x			x	x	
	(12) Contracting with contractor/supplier and issuance of A/P	Concurrence by JICA is required	x				x	x
	(13) Construction works/procurement	Concurrence by JICA is required for major modification of design and amendment of contracts.	x			x	x	
	(14) Completion certificate		x			x	x	
4. Ex-post monitoring & evaluation	(15) Ex-post monitoring	To be implemented generally after 1, 3, 10 years of completion, subject to change	x		x			
	(16) Ex-post evaluation	To be implemented basically after 3 years of completion	x		x			

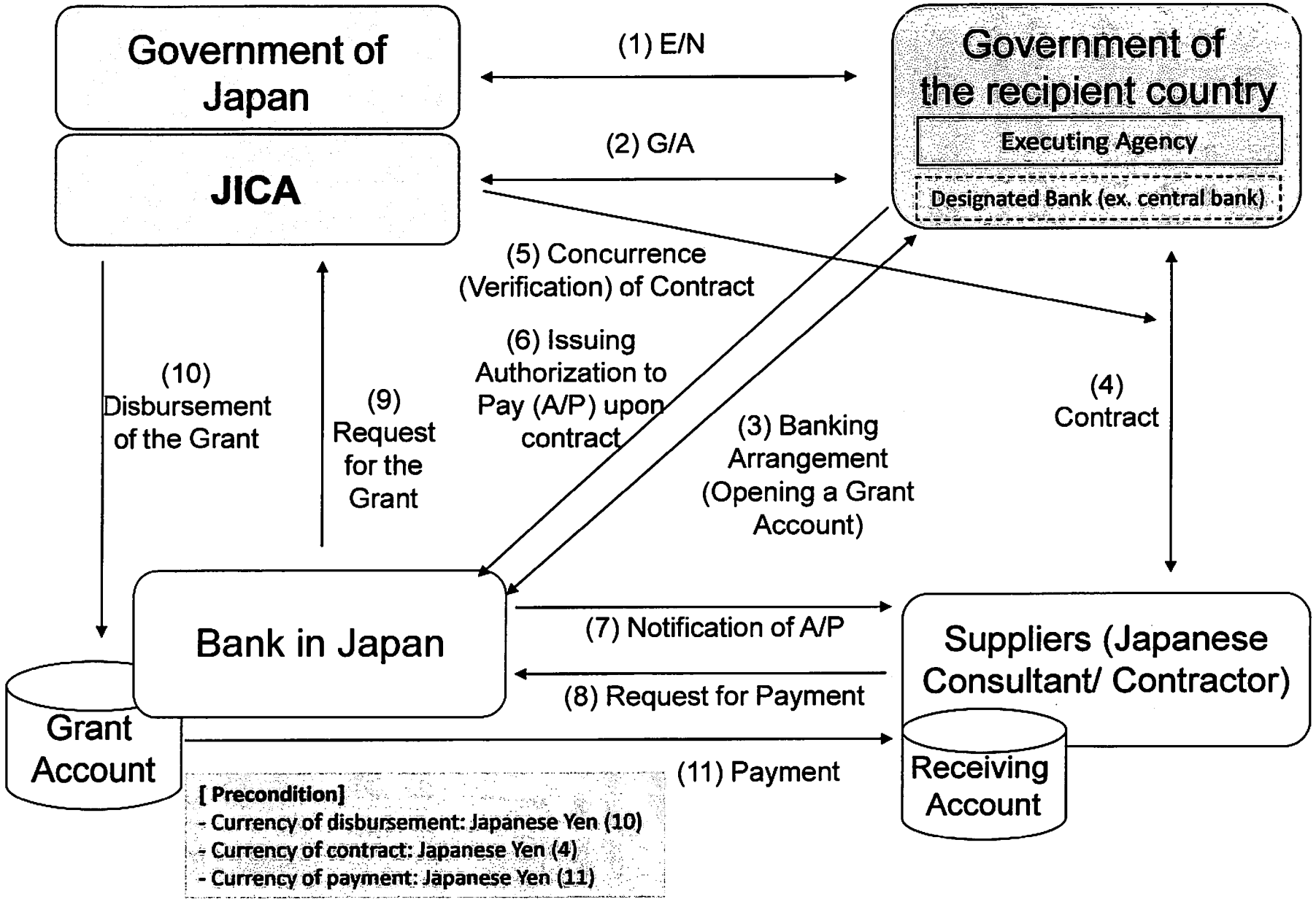
notes:

1. Project Monitoring Report and Report for Project Completion shall be submitted to JICA as agreed in the G/A.

2. Concurrence by JICA is required for allocation of grant for remaining amount and/or contingencies as agreed in the G/A.

Attachment 2

Financial Flow of Japanese Grant (A/P Type)



Project Monitoring Report
on
Project Name
Grant Agreement No. XXXXXXX

20XX, Month

Organizational Information

Signer of the G/A (Recipient)	Person in Charge (Designation) _____ Contacts Address: _____ Phone/FAX: _____ Email: _____
Executing Agency	Person in Charge (Designation) _____ Contacts Address: _____ Phone/FAX: _____ Email: _____
Line Ministry	Person in Charge (Designation) _____ Contacts Address: _____ Phone/FAX: _____ Email: _____

General Information:

Project Title	
E/N	Signed date: Duration:
G/A	Signed date: Duration:
Source of Finance	Government of Japan: Not exceeding JPY _____ mil. Government of (_____): _____

1: Project Description

1-1 Project Objective

1-2 Project Rationale

- Higher-level objectives to which the project contributes (national/regional/sectoral policies and strategies)
- Situation of the target groups to which the project addresses

1-3 Indicators for measurement of "Effectiveness"

Quantitative indicators to measure the attainment of project objectives		
Indicators	Original (Yr)	Target (Yr)
Qualitative indicators to measure the attainment of project objectives		

2: Details of the Project

2-1 Location

Components	Original *(proposed in the outline design)*	Actual
1.		

2-2 Scope of the work

Components	Original* *(proposed in the outline design)*	Actual*
1.		

Reasons for modification of scope (if any).

(PMR)

2-3 Implementation Schedule

Items	Original		Actual
	(proposed in the outline design)	*(at the time of signing the Grant Agreement)*	

Reasons for any changes of the schedule, and their effects on the project (if any)

2-4 Obligations by the Recipient

2-4-1 Progress of Specific Obligations

See Attachment 2.

2-4-2 Activities

See Attachment 3.

2-4-3 Report on RD

See Attachment 11.

2-5 Project Cost

2-5-1 Cost borne by the Grant(Confidential until the Bidding)

Components			Cost (Million Yen)	
	Original *(proposed in the outline design)*	Actual *(in case of any modification)*	Original[1),2)] *(proposed in the outline design)*	Actual
	1.			
Total				

Note: 1) Date of estimation:
2) Exchange rate: 1 US Dollar = Yen

2-5-2 Cost borne by the Recipient

Components			Cost (1,000 Taka)	
	Original *(proposed in the outline design)*	Actual *(in case of any modification)*	Original[1),2)] *(proposed in the outline design)*	Actual
	1.			

Note: 1) Date of estimation:
2) Exchange rate: 1 US Dollar =

Reasons for the remarkable gaps between the original and actual cost, and the countermeasures (if any)

(PMR)

2-6 Executing Agency

- Organization's role, financial position, capacity, cost recovery etc,
- Organization Chart including the unit in charge of the implementation and number of employees.

Original *(at the time of outline design)* name: role: financial situation: institutional and organizational arrangement (organogram): human resources (number and ability of staff):
Actual *(PMR)*

2-7 Environmental and Social Impacts

- The results of environmental monitoring based on Attachment 5 (in accordance with Schedule 4 of the Grant Agreement).
- The results of social monitoring based on in Attachment 5 (in accordance with Schedule 4 of the Grant Agreement).
- Disclosed information related to results of environmental and social monitoring to local stakeholders (whenever applicable).

3: Operation and Maintenance (O&M)

3-1 Physical Arrangement

- Plan for O&M (number and skills of the staff in the responsible division or section, availability of manuals and guidelines, availability of spareparts, etc.)

Original *(at the time of outline design)*
Actual *(PMR)*

3-2 Budgetary Arrangement

- Required O&M cost and actual budget allocation for O&M

Original *(at the time of outline design)*

Actual *(PMR)*

4: Potential Risks and Mitigation Measures

- Potential risks which may affect the project implementation, attainment of objectives, sustainability
- Mitigation measures corresponding to the potential risks

Assessment of Potential Risks *(at the time of outline design)*

Potential Risks	**Assessment**
1. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:
	Contingency Plan (if applicable):
2. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:
	Contingency Plan (if applicable):
3. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:

	Contingency Plan (if applicable):
Actual Situation and Countermeasures	
(PMR)	

5: Evaluation and Monitoring Plan (after the work completion)

5-1 Overall evaluation

Please describe your overall evaluation on the project.

5-2 Lessons Learnt and Recommendations

Please raise any lessons learned from the project experience, which might be valuable for the future assistance or similar type of projects, as well as any recommendations, which might be beneficial for better realization of the project effect, impact and assurance of sustainability.

5-3 Monitoring Plan of the Indicators for Post-Evaluation

Please describe monitoring methods, section(s)/department(s) in charge of monitoring, frequency, the term to monitor the indicators stipulated in 1-3.

Attachment

1. Project Location Map
2. Specific obligations of the Recipient which will not be funded with the Grant
3. Monthly Report submitted by the Consultant

Appendix - Photocopy of Contractor's Progress Report (if any)
- Consultant Member List
- Contractor's Main Staff List

4. Check list for the Contract (including Record of Amendment of the Contract/Agreement and Schedule of Payment)
5. Environmental Monitoring Form / Social Monitoring Form
6. Monitoring sheet on price of specified materials (Quarterly)
7. Report on Proportion of Procurement (Recipient Country, Japan and Third Countries) (PMR (final)only)
8. Pictures (by JPEG style by CD-R) (PMR (final)only)
9. Equipment List (PMR (final)only)
10. Drawing (PMR (final)only)
11. Report on RD (After project)

Attachment 6

Monitoring sheet on price of specified materials

1. Initial Conditions (Confirmed)

	Items of Specified Materials	Initial Volume A	Initial Unit Price (¥) B	Initial total Price C=A×B	1% of Contract Price D	Condition of payment	
						Price (Decreased) E=C−D	Price (Increased) F=C+D
1	Item 1	●●t	●	●	●	●	●
2	Item 2	●●t	●	●	●		
3	Item 3						
4	Item 4						
5	Item 5						

2. Monitoring of the Unit Price of Specified Materials

(1) Method of Monitoring : ●●

(2) Result of the Monitoring Survey on Unit Price for each specified materials

	Items of Specified Materials	1st ●month, 2015	2nd ●month, 2015	3rd ●month, 2015	4th	5th	6th
1	Item 1						
2	Item 2						
3	Item 3						
4	Item 4						
5	Item 5						

(3) Summary of Discussion with Contractor (if necessary)

-

-

-

Report on Proportion of Procurement (Recipient Country, Japan and Third Countries)
(Actual Expenditure by Construction and Equipment each)

	Domestic Procurement (Recipient Country) A	Foreign Procurement (Japan) B	Foreign Procurement (Third Countries) C	Total D
Construction Cost	(A/D%)	(B/D%)	(C/D%)	
Direct Construction Cost	(A/D%)	(B/D%)	(C/D%)	
others	(A/D%)	(B/D%)	(C/D%)	
Equipment Cost	(A/D%)	(B/D%)	(C/D%)	
Design and Supervision Cost	(A/D%)	(B/D%)	(C/D%)	
Total	(A/D%)	(B/D%)	(C/D%)	

Annex 5

Major Undertakings to be taken by RGoB

1. Specific obligations of the RGoB which will not be funded with the Grant

(1) Before the Tender

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	To open bank account (B/A)	within 1 month after the signing of the G/A	GNHC		
2	To issue A/P to a bank in Japan (the Agent Bank) for the payment to the consultant	within 1 month after the signing of the contract	BT		
3	To secure and clear the following lands and space with electricity, water supply, drainage and other incidental facilities necessary for the implementation of the Project 1) project site 2) project office	before notice of the bidding document	BT		
4	To obtain the planning, zoning permit (if necessary)	before notice of the bidding document	BT		
5	To submit Project Monitoring Report (with the result of Detail Design)	before preparation of bidding documents	BT		

(2) During the Project Implementation

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	To issue A/P to a bank in Japan (the Agent Bank) for the payment to the Supplier(s)	within 1 month after the signing of the contract(s)	GNHC		
2	To bear the following commissions to a bank in Japan for the banking services based upon the B/A				
	1) Advising commission of A/P	within 1 month after the signing of the contract(s)	GNHC		
	2) Payment commission for A/P	every payment	GNHC		
3	to ensure prompt customs clearance and to assist the Supplier(s) with internal transportation in recipient country	during the Project	BT		
4	To accord Japanese nationals and/or physical persons of third countries whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the country of the Recipient and stay therein for the performance of their work	during the Project	BT/GNHC		
5	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the country of the Recipient with respect to the purchase of the products and/or the services be exempted be borne by its designated authority without using the Grant	during the Project	BT		
6	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project	during the Project	BT		
7	1) To submit Project Monitoring Report after each work under the contract(s) such as shipping, hand over, installation and operational training	within one month after completion of each work	BT		
	2) To submit Project Monitoring Report (final)	within one month after signing of Certificate of Completion for the works under the contract(s)	BT		
8	To submit a report concerning completion of the Project	within six months after completion of the Project	BT		

(3) After the Project

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid 1) Allocation of maintenance cost 2) Operation and maintenance structure 3) Routine check/Periodic inspection	After completion of the construction	BT		

2. Other obligations of the RGoB funded with the Grant

NO	Items	Deadline	Amount (Million Japanese Yen)*
1	To provide equipment 1) To conduct the following transportation a) Marin (Air) transportation of the products from Japan to the recipient country b) Internal transportation from the port of disembarkation to the project site		
2	To implement detailed design, bidding support and procurement supervision (Consulting Service)		
3	To design backup of communication network		
	Total		XXX

*The Amount is provisional. This is subject to the approval of the Government of Japan.

Appendix 4 (2)

Minutes of Discussions
on the Preparatory Survey for the Project for
Building the Disaster Resilient Emergency Mobile Network
(Explanation on Draft Preparatory Survey Report)

With reference to the minutes of discussions signed between Bhutan Telecom and the Japan International Cooperation Agency (hereinafter referred to as "JICA") on January 19, 2017 and in response to the request from the Royal Government of Bhutan (hereinafter referred to as " RGoB") dated February 12, 2016, JICA dispatched the Preparatory Survey Team (hereinafter referred to as "the Team") for the explanation of Draft Preparatory Survey Report (hereinafter referred to as "the Draft Report") for the Project for Building the Disaster Resilient Emergency Mobile Network (hereinafter referred to as "the Project"), headed by Tomoyuki Naito, Senior Advisor, JICA, from August 21 to September 1, 2017.

As a result of the discussions, both sides agreed on the main items described in the attached sheets.

Thimphu, 31 August, 2017

Tomoyuki Naito
Leader
Preparatory Survey Team
Japan International Cooperation Agency
Japan

Chimmi Dorji
Officiating Chief Executive Officer
Bhutan Telecom
Kingdom of Bhutan

(Witness)
Norbu Wangchuk
Officiating Director
Gross National Happiness Commission

ATTACHEMENT

1. Contents of the Draft Report

   After the explanation of the contents of the Draft Report by the Team, the Bhutanese side agreed to its contents. As for description of "Urgency" in project evaluation (Chapter 4), both sides agreed that it is better to describe the fact that making communication network redundant has been national priority where RGoB made instruction to Bhutan Telecom (hereinafter referred to as "BTL") for requesting improvement of connectivity. In addition, quantitative key indicator targeted in year 2022 needs to be changed as follows based on ITU's international standard:

   Before: Duration of interrupted mobile phone services is 0 hour per year

   After: Duration of interrupted mobile phone core system is less than 15 min. / year

2. Cost estimation

   Both sides confirmed that the cost estimate described in the Draft Report is provisional and will be examined further by the Government of Japan for its approval.

3. Confidentiality of the cost estimate and technical specifications

   Both sides confirmed that the cost estimate and technical specifications in the Draft Report should never be duplicated or disclosed to any third parties until all the contracts under the Project are concluded.

4. Procedures and Basic Principles of Japanese Grant

   The Bhutanese side agreed that the procedures and basic principles of Japanese Grant as described in Annex 1 shall be applied to the Project. In addition, the Bhutanese side agreed to take necessary measures according to the procedures.

5. Timeline for the project implementation

   The Team explained to the Bhutanese side that the expected timeline for the project implementation is as attached in Annex 2. The team suggested that interconnection of the new core with the existing core system, where BTL shall be responsible, would be coordinated to be carried on during adjustment and trial operation so that engineers for both new core and existing core will be able to coordinate on the

ground.

6. Undertakings of the Project

Both sides confirmed the undertakings of the Project as described in Annex 3. With regard to exemption of customs duties, internal taxes and other fiscal levies as stipulated in 1. (1) No.5 of Annex 3, both sides confirmed that such customs duties, internal taxes and other fiscal levies include VAT, commercial tax, income tax and corporate tax, which shall be clarified in the bid documents by BTL during the implementation stage of the Project.

The Bhutanese side assured to take the necessary measures and coordination including allocation of the necessary budget which are preconditions of implementation of the Project. It is further agreed that the costs are indicative, i.e. at Outline Design level. More accurate costs will be calculated at the Detailed Design stage.

Both sides also confirmed that the Annex 3 will be used as an attachment of G/A.

7. Monitoring during the implementation

The Project will be monitored by the Executing Agency and reported to JICA by using the form of Project Monitoring Report (PMR) attached as Annex 4. The timing of submission of the PMR is described in Annex 3.

8. Project completion

Both sides confirmed that the project completes when all the equipment procured and installed by the grant is in operation. The completion of the Project will be reported to JICA promptly, but in any event not later than six months after completion of the Project.

9. Ex-Post Evaluation

JICA will conduct ex-post evaluation after three (3) years from the project completion, in principle, with respect to five evaluation criteria (Relevance, Effectiveness, Efficiency, Impact, Sustainability). The result of the evaluation will be publicized. The Bhutanese side is required to provide necessary support for the data collection.

10. Schedule of the Study

JICA will finalize the Preparatory Survey Report based on the confirmed items. The

report will be sent to the Bhutanese side around December 2017.

11. Environmental and Social Considerations

11-1 General Issues

11-1-1 Environmental Guidelines and Environmental Category

The Team explained that 'JICA Guidelines for Environmental and Social Considerations (April 2010)' (hereinafter referred to as "the Guidelines") is applicable for the Project. The Project is categorized as C because the Project is likely to have minimal adverse impact on the environment under the Guidelines.

12. Other Relevant Issues

12-1. Disclosure of Information

Both sides confirmed that the Preparatory Survey Report from which project cost is excluded will be disclosed to the public after completion of the Preparatory Survey. The comprehensive report including the project cost will be disclosed to the public after all the contracts under the Project are concluded.

12-2. Responsibility of transportation from the landing port to the Project site

Both sides confirmed that Japanese side will take financial responsibility for transportation from the landing port to the Project site. However, Bhutanese side will provide an alternative way of transportation in case road transportation is impossible.

12-3. Responsibility of interconnection of the new core with the existing core system

Both sides confirmed that Bhutanese side will be responsible for interconnection of the new core with the existing core system. The team suggested interconnecting work would be coordinated to be carried on during adjustment and trial operation so that engineers for both new core and existing core will be able to coordinate on the ground

12-4. Necessity for allocating additional human resources to Jakar exchange

The Team suggested that BTL start planning for allocating additional human resources to Jakar exchange office.

12-5. Necessity for future expansion of office building of Jakar exchange

The Team appreciated BTL's quick budget allocation and work on preparing space

for installing the equipment even before the official commencement of the Project. The Project is designed for utilizing existing office building of Jakar exchange of BTL and there would be no negative influence on project outcomes by using existing office.Both sides confirmed that the equipment will be installed to the existing office building. However, the Team did not deny the necessity of expanding the office bulding.

12-6. Visibility of the Project

Both sides confirmed that the outcome of the Project needs to be visible to people in Bhutan.

12-7. Openness of redundancy obtained from the Project

BTL confirmed that redundancy obtained from the Project will be open to the other telecom operator during emergency considering the fact that BTL is a state owned enterprise and from the perspective of humanity.

12-8. Clarification of roles among disaster management related agencies

The Team confirmed that Department of Disaster Management (DDM) coordinates for disaster management related agencies. BTL confirmed to share a written form to confirm the above if there is.

12-9. Continuity of Leadership

BTL committed that leadership and momentum to the Project would not change even when there is change in human resource.

Annex 1 Japanese Grant
Annex 2 Project Implementation Schedule
Annex 3 Major Undertakings to be taken by the Royal Government of Bhutan
Annex 4 Project Monitoring Report (template)

JAPANESE GRANT

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-Implementation of the project (hereinafter referred to as "the Project") on the basis of the G/A

(4) Ex-post Monitoring and Evaluation

-Monitoring and evaluation at post-implementation stage

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(1) Contents of the Survey

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relevant agencies of the Recipient necessary for the implementation of the Project.

- Evaluation of the feasibility of the Project to be implemented under the Japanese Grant from a technical, financial, social and economic point of view.
- Confirmation of items agreed between both parties concerning the basic concept of the Project.
- Preparation of an outline design of the Project.
- Estimation of costs of the Project.
- Confirmation of Environmental and Social Considerations

The contents of the original request by the Recipient are not necessarily approved in their initial form. The Outline Design of the Project is confirmed based on the guidelines of the Japanese Grant.

JICA requests the Recipient to take measures necessary to achieve its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the executing agency of the Project. Therefore, the contents of the Project are confirmed by all relevant organizations of the Recipient based on the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Survey, JICA contracts with (a) consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey

JICA reviews the report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the feasibility of the Project.

3. Basic Principles of Project Grants

(1) Implementation Stage

1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes (hereinafter referred to as "the E/N") will be singed between the GOJ and the Government of the Recipient to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Recipient to define the necessary articles, in accordance with the E/N, to implement the Project, such as conditions of disbursement, responsibilities of the Recipient, and procurement conditions. The terms and conditions generally applicable to the Japanese Grant are stipulated in the "General Terms and Conditions for Japanese Grant (January 2016)."

2) Banking Arrangements (B/A) (See "Financial Flow of Japanese Grant (A/P Type)" for details)

a) The Recipient shall open an account or shall cause its designated authority to open an account under the name of the Recipient in the Bank, in principle. JICA will disburse the Japanese Grant in Japanese yen for the Recipient to cover the obligations incurred by the Recipient under the verified contracts.

b) The Japanese Grant will be disbursed when payment requests are submitted by the Bank to JICA under an Authorization to Pay (A/P) issued by the Recipient.

3) Procurement Procedure

The products and/or services necessary for the implementation of the Project shall be procured in accordance with JICA's procurement guidelines as stipulated in the G/A.

4) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the Recipient to continue to work on the Project's implementation after the E/N and G/A.

5) Eligible source country

In using the Japanese Grant disbursed by JICA for the purchase of products and/or services, the eligible source countries of such products and/or services shall be Japan and/or the Recipient. The Japanese Grant may be used for the purchase of the products and/or services of a third country as eligible, if necessary, taking into account the quality, competitiveness and economic rationality of products and/or services necessary for achieving the objective of the Project. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm, which enter into contracts with the Recipient, are limited to "Japanese nationals", in principle.

6) Contracts and Concurrence by JICA

The Recipient will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be concurred by JICA in order to be verified as eligible for using the Japanese Grant.

7) Monitoring

The Recipient is required to take their initiative to carefully monitor the progress of the Project in order to ensure its smooth implementation as part of their responsibility in the G/A, and to regularly report to JICA about its status by using the Project Monitoring Report (PMR).

8) Safety Measures

The Recipient must ensure that the safety is highly observed during the implementation of the Project.

9) Construction Quality Control Meeting

Construction Quality Control Meeting (hereinafter referred to as the "Meeting") will be held for quality assurance and smooth implementation of the Works at each stage of the Works. The member of the Meeting will be composed by the

Recipient (or executing agency), the Consultant, the Contractor and JICA. The functions of the Meeting are as followings:

a) Sharing information on the objective, concept and conditions of design from the Contractor, before start of construction.

b) Discussing the issues affecting the Works such as modification of the design, test, inspection, safety control and the Client's obligation, during of construction.

(2) Ex-post Monitoring and Evaluation Stage

1) After the project completion, JICA will continue to keep in close contact with the Recipient in order to monitor that the outputs of the Project is used and maintained properly to attain its expected outcomes.

2) In principle, JICA will conduct ex-post evaluation of the Project after three years from the completion. It is required for the Recipient to furnish any necessary information as JICA may reasonably request.

(3) Others

1) Environmental and Social Considerations

The Recipient shall carefully consider environmental and social impacts by the Project and must comply with the environmental regulations of the Recipient and JICA Guidelines for Environmental and Social Considerations (April, 2010).

2) Major undertakings to be taken by the Government of the Recipient

For the smooth and proper implementation of the Project, the Recipient is required to undertake necessary measures including land acquisition, and bear an advising commission of the A/P and payment commissions paid to the Bank as agreed with the GOJ and/or JICA. The Government of the Recipient shall ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the Recipient with respect to the purchase of the Products and/or the Services be exempted or be borne by its designated authority without using the Grant and its accrued interest, since the grant fund comes from the Japanese taxpayers.

3) Proper Use

The Recipient is required to maintain and use properly and effectively the products and/or services under the Project (including the facilities constructed and the equipment purchased), to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Japanese Grant.

4) Export and Re-export

The products purchased under the Japanese Grant should not be exported or re-exported from the Recipient.

Attachment 1

PROCEDURES OF JAPANESE GRANT

Stage	Procedures	Remarks	Recipient Government	Japanese Government	JICA	Consultants	Contractors	Agent Bank
Official Request	Request for grants through diplomatic channel	Request shall be submitted before appraisal stage.	x	x				
1. Preparation	(1) Preparatory Survey Preparation of outline design and cost estimate		x		x	x		
2. Appraisal	(2)Preparatory Survey Explanation of draft outline design, including cost estimate, undertakings, etc.		x		x	x		
	(3)Agreement on conditions for implementation	Conditions will be explained with the draft notes (E/N) and Grant Agreement (G/A) which will be signed before approval by Japanese government.	x	x (E/N)	x (G/A)			
	(4) Approval by the Japanese cabinet			x				
3. Implementation	(5) Exchange of Notes (E/N)		x	x				
	(6) Signing of Grant Agreement (G/A)		x		x			
	(7) Banking Arrangement (B/A)	Need to be informed to JICA	x					x
	(8) Contracting with consultant and issuance of Authorization to Pay (A/P)	Concurrence by JICA is required	x			x		x
	(9) Detail design (D/D)		x			x		
	(10) Preparation of bidding documents	Concurrence by JICA is required	x			x		
	(11) Bidding	Concurrence by JICA is required	x			x	x	
	(12) Contracting with contractor/supplier and issuance of A/P	Concurrence by JICA is required	x				x	x
	(13) Construction works/procurement	Concurrence by JICA is required for major modification of design and amendment of contracts.	x			x	x	
	(14) Completion certificate		x			x	x	
4. Ex-post monitoring & evaluation	(15) Ex-post monitoring	To be implemented generally after 1, 3, 10 years of completion, subject to change	x		x			
	(16) Ex-post evaluation	To be implemented basically after 3 years of completion	x		x			

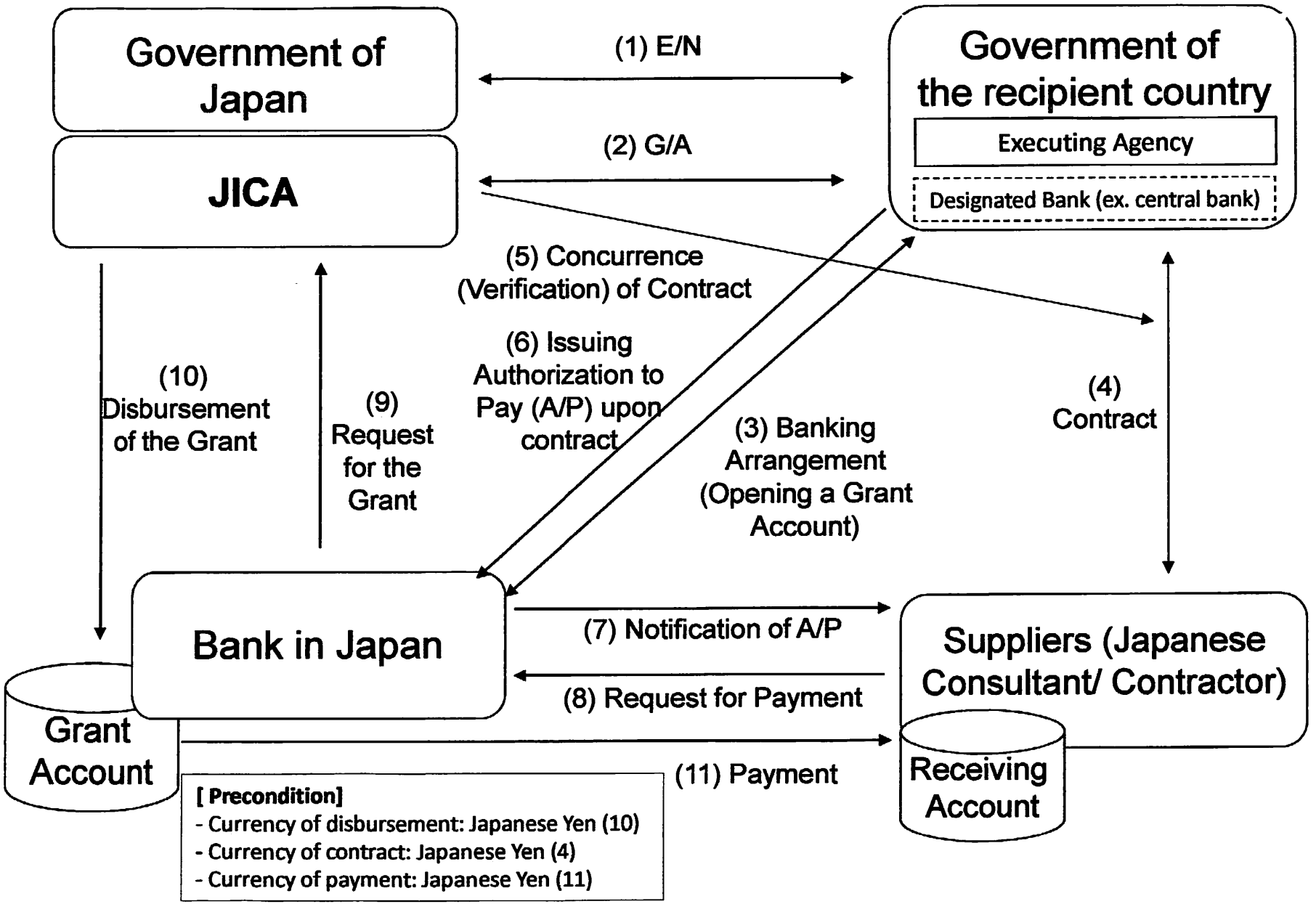
notes:

1. Project Monitoring Report and Report for Project Completion shall be submitted to JICA as agreed in the G/A.

2. Concurrence by JICA is required for allocation of grant for remaining amount and/or contingencies as agreed in the G/A.

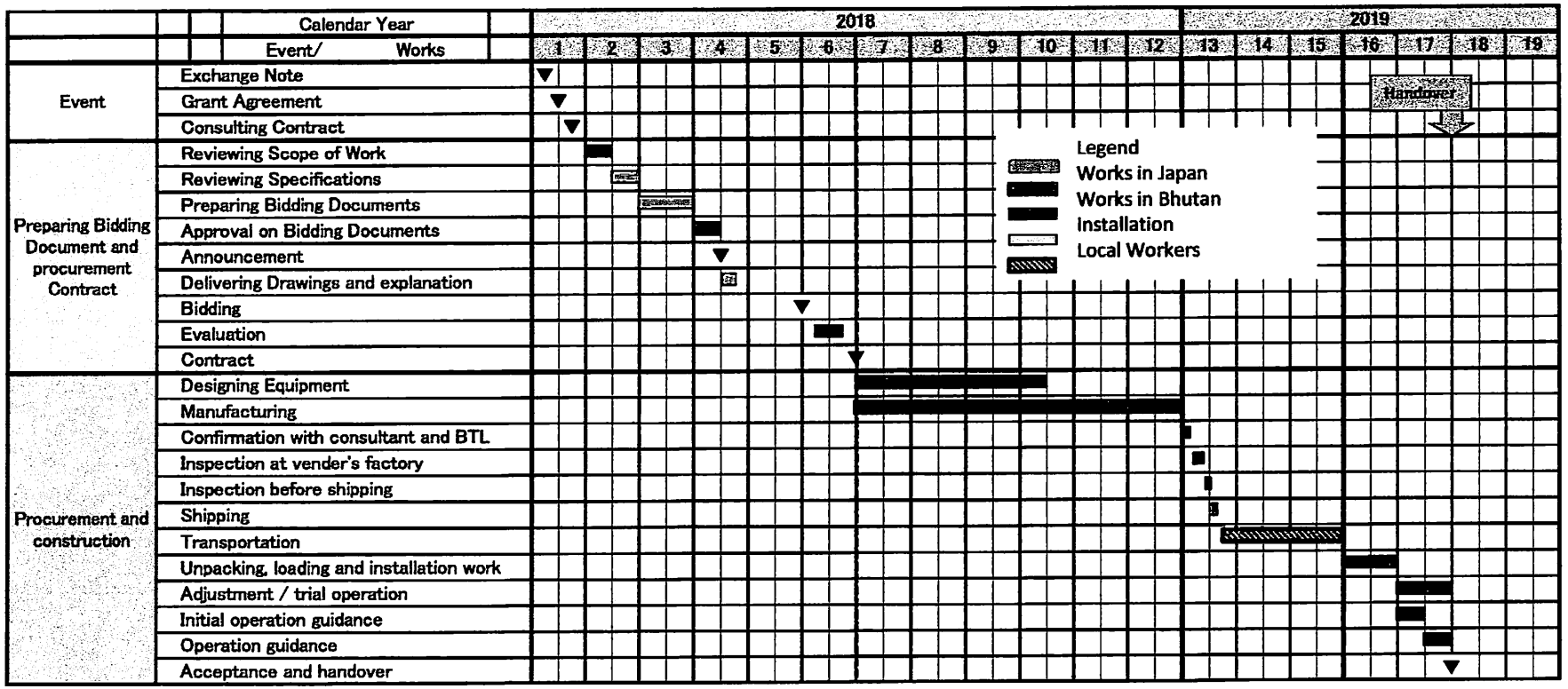
Attachment 2

Financial Flow of Japanese Grant (A/P Type)



Implementation Schedule

The following project implementation schedule has been adopted based on the Guidelines for Japanese Grant Aid. The schedule of the project shall be 16.0 months long including the detailed design (*e.g. Preparation of bidding documents and procurement contract*) after conclusion of a consulting services contract.



Note: Interconnecting work would be coordinated to be carried on during adjustment and trial operation so that engineers for both new core and existing core will be able to coordinate on the ground

Annex 3

Major Undertakings to be taken by RGoB

1. Specific obligations of the RGoB which will not be funded with the Grant

(1) Before the Tender

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	To open bank account (B/A)	within 1 month after the signing of the G/A	GNHC		
2	To issue Authorization of Payment (A/P) to a bank in Japan (the Agent Bank) for the payment to the consultant	within 1 month after the signing of the contract	BTL	N/A	
3	To obtain clearance for the implementation of the project such as an Environment Clearance (EC) if necessary	before notice of the bidding document	BTL	N/A	
4	To secure and clear the following lands and space with electricity, water supply, drainage and other incidental facilities necessary for the implementation of the Project 1) project site 2) project office	before notice of the bidding document	BTL	N/A	
5	To obtain the planning, zoning permit (if necessary)	before notice of the bidding document	BTL	N/A	
6	To submit Project Monitoring Report (with the result of Detail Design)	before preparation of bidding documents	BTL	N/A	

(2) During the Project Implementation

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	To issue A/P to a bank in Japan (the Agent Bank) for the payment to the Supplier(s)	within 1 month after the signing of the contract(s)	BTL	N/A	
2	To bear the following commissions to a bank in Japan for the banking services based upon the B/A				
	1) Advising commission of A/P	within 1 month after the signing of the contract(s)	GNHC		
	2) Payment commission for A/P	every payment	GNHC		
3	to ensure prompt customs clearance and to assist the Supplier(s) with internal transportation in recipient country	during the Project	BTL	N/A	
4	To accord Japanese nationals and/or physical persons of third countries whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the country of the Recipient and stay therein for the performance of their work	during the Project	BTL	N/A	
5	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the country of the Recipient with respect to the purchase of the products and/or the services be exempted (but coordination w/ tax institution will be required)	during the Project	BTL	N/A	
6	1) To submit Project Monitoring Report after each major work under the contract(s) such as shipping, hand over, installation and operational training	within one month after completion of each work	BTL	N/A	
	2) To submit Project Monitoring Report (final)	within one month after signing of Certificate of Completion for the works under the contract(s)	BTL	N/A	
7	To submit a report concerning completion of the Project	within six months after completion of the Project	BTL	N/A	
8	To secure warehouses for storing procured materials and equipment and points and places for installing equipment procured in the project	Before shipment of the equipment	BTL	N/A	
9	To replace the existing air conditioners with PAC	Before shipment of the equipment	BTL	N/A	
10	To connect the existing Mobile Core System to a new Mobile Core system for parallel operation and functional confirmation	Just after installation of the equipment	BTL	Nu. 12.0 Million	
11	To allocate adequate human resource to Jakar for operating a new Mobile Core system	Just after installation of the equipment	BTL	Salary for additional people	
12	To strengthen the last mile backbone network in Jakar from Garpang power substation to BTL office in Jakar and upgrading of transmission system in Jakar (DWDM)+ related civil works	Before/After installation of the equipment	BTL	Nu. 13.5 Million	
13	Publicity of the Project to people in Bhutan	At important occasions (e.g. E/N-G/A signing, Handing over ceremony)	BTL/GNHC	N/A	
14	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project	during the Project	BTL		

(3) After the Project

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid 1) Estimation and Allocation of maintenance cost 2) Operation and maintenance structure 3) Routine check/Periodic inspection	After completion of the construction	BTL		

Major Undertakings to be Covered by the Japanese Grant
(Confidential)

NO	Items	Deadline	Amount (Million Japanese Yen)[1]
1	1) To conduct the following transportation to provide equipment a) Marine (Air) transportation of the products from Japan or third country to the recipient country b) Internal transportation from the port of disembarkation to the project site		XXX
	2) To provide equipment with installation and commissioning		
2	To implement detailed design, bidding support and procurement supervision (Consulting Service)		XXX
	Total		**XXX**

Project Monitoring Report
on
Project Name
Grant Agreement No. XXXXXXX

20XX, Month

Organizational Information

Signer of the G/A (Recipient)	Person in Charge (Designation) _____ Contacts Address: _____ Phone/FAX: _____ Email: _____
Executing Agency	Person in Charge (Designation) _____ Contacts Address: _____ Phone/FAX: _____ Email: _____
Line Ministry	Person in Charge (Designation) _____ Contacts Address: _____ Phone/FAX: _____ Email: _____

General Information:

Project Title	
E/N	Signed date: Duration:
G/A	Signed date: Duration:
Source of Finance	Government of Japan: Not exceeding JPY _____ mil. Government of (_____): _____

1: Project Description

1-1 Project Objective

1-2 Project Rationale

- Higher-level objectives to which the project contributes (national/regional/sectoral policies and strategies)
- Situation of the target groups to which the project addresses

1-3 Indicators for measurement of "Effectiveness"

Quantitative indicators to measure the attainment of project objectives		
Indicators	Original (Yr)	Target (Yr)
Qualitative indicators to measure the attainment of project objectives		

2: Details of the Project

2-1 Location

Components	Original *(proposed in the outline design)*	Actual
1.		

2-2 Scope of the work

Components	Original* *(proposed in the outline design)*	Actual*
1.		

Reasons for modification of scope (if any).

(PMR)

2-3 Implementation Schedule

Items	Original		Actual
	(proposed in the outline design)	*(at the time of signing the Grant Agreement)*	

Reasons for any changes of the schedule, and their effects on the project (if any)

2-4 Obligations by the Recipient

2-4-1 Progress of Specific Obligations

See Attachment 2.

2-4-2 Activities

See Attachment 3.

2-4-3 Report on RD

See Attachment 11.

2-5 Project Cost

2-5-1 Cost borne by the Grant(Confidential until the Bidding)

Components			Cost (Million Yen)	
	Original *(proposed in the outline design)*	Actual *(in case of any modification)*	Original[1),2)] *(proposed in the outline design)*	Actual
	1.			
Total				

Note: 1) Date of estimation:
2) Exchange rate: 1 US Dollar = Yen

2-5-2 Cost borne by the Recipient

Components			Cost (1,000 Taka)	
	Original *(proposed in the outline design)*	Actual *(in case of any modification)*	Original[1),2)] *(proposed in the outline design)*	Actual
	1.			

Note: 1) Date of estimation:
2) Exchange rate: 1 US Dollar =

Reasons for the remarkable gaps between the original and actual cost, and the countermeasures (if any)

(PMR)

2-6 Executing Agency

- Organization's role, financial position, capacity, cost recovery etc,
- Organization Chart including the unit in charge of the implementation and number of employees.

Original *(at the time of outline design)* name: role: financial situation: institutional and organizational arrangement (organogram): human resources (number and ability of staff):
Actual *(PMR)*

2-7 Environmental and Social Impacts

- The results of environmental monitoring based on Attachment 5 (in accordance with Schedule 4 of the Grant Agreement).
- The results of social monitoring based on in Attachment 5 (in accordance with Schedule 4 of the Grant Agreement).
- Disclosed information related to results of environmental and social monitoring to local stakeholders (whenever applicable).

3: Operation and Maintenance (O&M)

3-1 Physical Arrangement

- Plan for O&M (number and skills of the staff in the responsible division or section, availability of manuals and guidelines, availability of spareparts, etc.)

Original *(at the time of outline design)*
Actual *(PMR)*

3-2 Budgetary Arrangement

- Required O&M cost and actual budget allocation for O&M

Original *(at the time of outline design)*

Actual *(PMR)*

4: Potential Risks and Mitigation Measures

- Potential risks which may affect the project implementation, attainment of objectives, sustainability
- Mitigation measures corresponding to the potential risks

Assessment of Potential Risks *(at the time of outline design)*

Potential Risks	Assessment
1. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:
	Contingency Plan (if applicable):
2. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:
	Contingency Plan (if applicable):
3. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:

	Contingency Plan (if applicable):
Actual Situation and Countermeasures	
(PMR)	

5: Evaluation and Monitoring Plan (after the work completion)

5-1 Overall evaluation

Please describe your overall evaluation on the project.

5-2 Lessons Learnt and Recommendations

Please raise any lessons learned from the project experience, which might be valuable for the future assistance or similar type of projects, as well as any recommendations, which might be beneficial for better realization of the project effect, impact and assurance of sustainability.

5-3 Monitoring Plan of the Indicators for Post-Evaluation

Please describe monitoring methods, section(s)/department(s) in charge of monitoring, frequency, the term to monitor the indicators stipulated in 1-3.

Attachment

1. Project Location Map
2. Specific obligations of the Recipient which will not be funded with the Grant
3. Monthly Report submitted by the Consultant

Appendix - Photocopy of Contractor's Progress Report (if any)
- Consultant Member List
- Contractor's Main Staff List

4. Check list for the Contract (including Record of Amendment of the Contract/Agreement and Schedule of Payment)
5. Environmental Monitoring Form / Social Monitoring Form
6. Monitoring sheet on price of specified materials (Quarterly)
7. Report on Proportion of Procurement (Recipient Country, Japan and Third Countries) (PMR (final)only)
8. Pictures (by JPEG style by CD-R) (PMR (final)only)
9. Equipment List (PMR (final)only)
10. Drawing (PMR (final)only)
11. Report on RD (After project)

Attachment 6

Monitoring sheet on price of specified materials

1. Initial Conditions (Confirmed)

	Items of Specified Materials	Initial Volume A	Initial Unit Price (¥) B	Initial total Price C=A×B	1% of Contract Price D	Condition of payment	
						Price (Decreased) E=C−D	Price (Increased) F=C+D
1	Item 1	●●t	●	●	●	●	●
2	Item 2	●●t	●	●	●		
3	Item 3						
4	Item 4						
5	Item 5						

2. Monitoring of the Unit Price of Specified Materials

(1) Method of Monitoring : ●●

(2) Result of the Monitoring Survey on Unit Price for each specified materials

	Items of Specified Materials	1st ●month, 2015	2nd ●month, 2015	3rd ●month, 2015	4th	5th	6th
1	Item 1						
2	Item 2						
3	Item 3						
4	Item 4						
5	Item 5						

(3) Summary of Discussion with Contractor (if necessary)

-
-
-

Attachment 7

Report on Proportion of Procurement (Recipient Country, Japan and Third Countries)
(Actual Expenditure by Construction and Equipment each)

		Domestic Procurement (Recipient Country) A	Foreign Procurement (Japan) B	Foreign Procurement (Third Countries) C	Total D
Construction Cost		(A/D%)	(B/D%)	(C/D%)	
	Direct Construction Cost	(A/D%)	(B/D%)	(C/D%)	
	others	(A/D%)	(B/D%)	(C/D%)	
Equipment Cost		(A/D%)	(B/D%)	(C/D%)	
Design and Supervision Cost		(A/D%)	(B/D%)	(C/D%)	
Total		(A/D%)	(B/D%)	(C/D%)	