Bhutan

Data Collection Survey for Digital Promotion Policy in Bhutan Final Report

July 2021

Japan International Cooperation Agency (JICA)

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List of Abbreviations

ADB	Asian Development Bank
ADSL	Asymmetric Digital Subscriber Line
ADSS	All Dielectric Self-Support Cable
ATM	Automatic Telling Machine
BCA	Bhutan Telecommunications Authority
BCAA	Bhutan Civil Aviation Authority
BHMIS	Bhutan Health Management & Information System
BICMA	Bhutan Infocomm and Media Authority
BIPS	Bhutan Immediate Payment System
BPC	Bhutan Power Corporation
BTL	Bhutan Telecom Limited
BTS	Burland Technology Solutions
CAGR	Compound Annual Growth Rate
CBDC	Central Bank Digital Currency
CC	Community Center
COPD	Chronic Obstructive Pulmonary Disease
COVID-19	Coronavirus Disease 2019
CSI	Cottage and Small Industry
CST	College of Science and Technology
CT	Computerized Tomography
DCS	Data Centre Services Private Ltd
DHI	Druk Holding & Investment Ltd.
DHIS2	District Health Information System version-2
DITT	Department of Information Technology and Telecom
DoMSHI	Department of Medical Supplies and Health Infrastructure
DrukREN	Druk Research and Education Network
EBPM	Evidence-based Policy Making
EHR	Electronic Health Record
EMR	Electronic Medical Record
ePIS	e-Patient Information System
ERP	Enterprise Resource Planning
EU	European Union
FDI	Foreign Direct Investment
FINAP	Financial Inclusion National Action Plan
FMS	Fiber Monitoring Systems
G2C	Government-to-Citizen
GCIT	Gyalpozhing College of Information Technology
GDC	Government Data Centre

GDP	Gross Domestic Products
GNH	Gross National Happiness
GNI	Gross National Income
GoB	Government of Bhutan
GST	Goods and Services Tax
HLC	High-Level Committee
ICT	Information and Communication Technology
IDA	International Development Association
IFAD	International Fund for Agricultural Development
IFOAM	International Federation of Organic Agriculture Movements
IoT	Internet of Things
ITU	International Telecommunication Union
ISP	Internet Service Provider
JICA	Japan International Cooperation Agency
JNEC	Jigme Namgyel Engineering College
LDC	Least Development Country
MoAF	Ministry of Agriculture and Forest
MoH	Ministry of Health
MoHCA	Ministry of Home and Cultural Affairs
MoIC	Ministry of Information and Communication
MRI	Magnetic Resonance Imaging
NCDs	Non-Communicable Diseases
NCGS	National Credit Guarantee Scheme
NET	New Edge Technologies
NFIS	National Financial Inclusion Strategy
NFLS	National Financial Literacy Strategy
NKRA	National Key Result Areas
NTF	National Task Force
OECD	Organisation for Economic Co-operation and Development
OPGW	Optical Ground Wire
PHR	Personal Health Record
PoC	Proof of Concept
POS	Point of Sales
RCP	Rural Communication Programme
RBHSL	Royal Bhutan Helicopter Services Limited
RMA	Royal Monetary Authority
RUB	Royal University of Bhutan
SME	Small and Medium Enterprises
STD	Subscriber Trunk Dialing
TFP	Total Factor Productivity

TICL	Tashi Infocomm Limited
ToT	training of trainers
TVET	Technical and Vocational Education and Training
T-WAN	Thimphu Wide Area Network
UAV	Unmanned Aerial Vehicles
UNDP	United Nations Development Programme
UNICEF	United Nations Children and Education Fund
USF	Universal Service Fund
VC	venture capital
WFP	World Food Programme

1. Outline and Objectives of the Survey

1.1. Background and purpose

The Kingdom of Bhutan (hereafter referred to as “Bhutan”) is a small country in South Asia surrounded by steep mountains, with a population of about 760,000 (2019), which dispersed over a limited land area of about 38,000 square kilometers. It has long been known as a "country of happiness" and has been providing free medical care and part of public education. It is a country with an internationally rare development index, Gross National Happiness. Gross Domestic Product (GDP) has grown steadily over the past decade, almost doubling its GDP, but its current GDP is about US$2.5 billion, and its market size is still limited. Logistics costs are high, and the development of information and communication technology (ICT) infrastructures is far from being advanced compared with neighboring countries. Financial infrastructures are not in a favorable position for business activity. As a result, foreign companies invest only US$13 million (2019) into the country. Major industries include agriculture, mining and manufacturing, and hydroelectric power generation. In particular, the sale of electricity through hydroelectric power generation led by the government and related construction sectors has been driving economic growth. However, industries other than hydroelectric power generation are limited, and many goods are imported from India and other countries, and the country has a chronic trade deficit. Even in the case of hydroelectric power as described above, the “coexistence” with India would be indispensable from the construction of facilities to the sale of electricity.

In recent years, Bhutan has been plagued by social problems such as unemployment among young people, especially in urban areas. The overall unemployment rate in 2018 was 3.4%. On the other hand, the one of the younger generations from 15 to 24 years old was 15.7%, and young people living in urban areas who have graduated from higher educational institutions are the main cause of this figure. Some of them have become drowned in drugs and alcohol. This phenomenon requires not only consideration of symptomatic treatment, such as the creation of simple employment opportunity. We need to reconsider the social and industrial structures in Bhutan that could generate a situation where promising human resources who should support the future of the country lose their opportunities, will not find hope for living, and will be unable to find a place where they can exert their potential in society.

The Bhutanese government has been trying to diversify its industries from the viewpoint of job creation. However, the young people mentioned above are hoping to find employment in certain governmental agencies and state-owned enterprises. On the other hand, there are a few who are trying to create new businesses independently. However, the momentum is not as strong as it is to be expected. In fact, we can find a motivation in the policy proposal by the government of Bhutan (GoB) that Bhutanese youth may have such a spirit or ambition potentially, GoB could fill the gap between the expectation from the Bhutanese industrial society to the youth and actual skill in the younger generation who just gradate from educational institutions, and they will make more contribution to the future of Bhutan with appropriate support.

Looking at the status of foreign direct investment (FDI), GoB has been considering

policy reform to attract more FDI, which could lead to creating new industries in Bhutan. In fact, we can see the latest technology park to accommodate foreign tenants such as Thimphu Tech Park. At the time of the Coronavirus Disease 2019 (COVID-19), however, the annual number of new investments was around 15 (approximately US$70-95 million), which was smaller than that of neighboring countries.

His majesty, the King of Bhutan, in his speech at the 112th National Day on December 17, 2019, stressed the importance of attractive employment opportunities for the next generation and the need to create new industries, and the importance of technological innovation to realize that. This was a trigger for the Bhutanese government and the Bhutanese people to rethink the future direction in which the country should proceed. Subsequently, the Bhutanese government began to formulate “the 21st Century Economic Roadmap”, reviewing the fundamental elements to define the future of the Bhutanese economy, and seeking to create a self-sustaining growth and attractive opportunity as a path for the Bhutanese economy in the 21st century.

In this roadmap, GoB sorts out and analyzes various social issues Bhutan is currently facing with an truly open mind, which are, for example, the unemployment issues among younger people, structural problems in its industry mainly developed and led by the government itself and lack of vitality of the private sector, constant and excessive burden on the public finances by free medical care, and the excessive distribution cost to cover the national land. While the Gross National Happiness (GNH) index will continue to be an important development indicator for the country, it is considered most important as a KPI for economic policy to raise Gross National Income (GNI) per capita to create attractive employment opportunities and foster new industries. Specifically, a highly ambitious plan has been presented to quadruple the current GDP from around USD2.5 billion to US$10 billion over the next decade. This goal would be almost impossible to be achieved by following the conventional methods. The roadmap says that, for that goal, it is important to make aggressive investments in increasing total factor productivity as well as utilizing private sector potential, and it is estimated that "investment of as much as BTN2 trillion (approximately USD27 billion) will be required over the next 10 years." 85% of the investment needs to be made up of private sector investments, including FDI. This demonstrates the firm determination of the GoB to transform the industrial structure for the whole nation by thinking outside of the box, spurring creativity and innovation by private sector.

The direction of specific measures was also mentioned. For example, the digital transformation to realize the reform of logistics cost, opening up the medical services to the private sector, diversifying and revitalizing financing methods including private venture capitals (VC) for startups, as well as the introduction of digital currencies (e.g., the Israeli YOZMA Group) leading to encouraging international investment and supporting the formation of networks for Bhutanese entrepreneurs, were sorted out. In order to improve the international competitiveness of exporting business, the reduction of import tariffs was also mentioned.

There is also a will to incorporate the concept of “Sandbox” and “Prototyping” into policies to promote the development of new businesses and to lead to the creation of new industries. In addition, there are indications that they will consider the possibility to set up “Digital

Nomad Visa" to promote FDI by referring to Estonia's advanced effort, which has been successfully inviting startups from all over the world although the country size is relatively small as Bhutan is. The importance of fostering the young people who will play a key role in leading new industries was also confirmed, and plans have been made to fundamentally review the ideal form of education and vocational training, including the acquisition of cutting-edge knowledge mainly in the digital field from abroad.

However, each of these directions is being described in a comprehensive manner, and it would be difficult to say that the course of action to achieve the target of "USD10 billion by 2030" is concretized. As stated in the Roadmap, the GoB will formulate an action plan for industrial development while pursuing challenges beyond conventional wisdom based on the concept of "prototyping" or "agile-type" approach.

The current 12th Five-Year Plan (2018-2023) shows that the Bhutanese government aims for economic and social development centered on technological innovation ahead of the Roadmap. One of the eight priority programs is the Digital Drukyul (Digital Bhutan) Program, which has been designated as one of the priority programs. It also states that the government will work to create 16 employment opportunities using digital technologies. However, it is questionable whether there is an appropriate measure and system to effectively facilitate inter-sectoral collaboration. In this sense, the formulation of the "21st Century Economic Roadmap" provides a powerful impetus for realizing Digital Drukyul.

With these series of policy commitments, it can be said that the Bhutanese government now stands at a major crossroads in determining the future of Bhutan.

In light of the above background, this survey will analyze the overall picture of the Digital Drukyul (Digital Bhutan) program, the current status and challenges of ICT infrastructure, and the potential and bottlenecks for developing new industries in Bhutan in order to examine effective measures to create attractive employment opportunities for young people. Based on this, pilot projects utilizing digital technology will be considered, which lead to the development of new industries; which could be investigated through grasping Bhutan's "weaknesses" as business needs; and which could also be applied to foreign markets. Candidates for partners, which could be Japanese companies, that can cooperate in the implementation of the pilot project will also be considered.

Through the surveys above, the final report will be compiled to contribute to creating the new industrial structure and drawing a picture of Bhutanese societal future toward the realization of the "21st Century Economic Roadmap."

1.2. Outline of the Survey

This survey was originally scheduled for approximately eight months from February to October 2020, but the survey period was extended to July 2021 in consideration of the postponement and cancellation of the field survey due to the pandemic of COVID-19, increase in the survey time related to online-based survey activities from Japan, and the expansion of the

survey scope.

In addition to the initial five members in the survey team, four members participated since 2021 and the survey team consisted of nine people in total.

Figure 1 Survey schedule

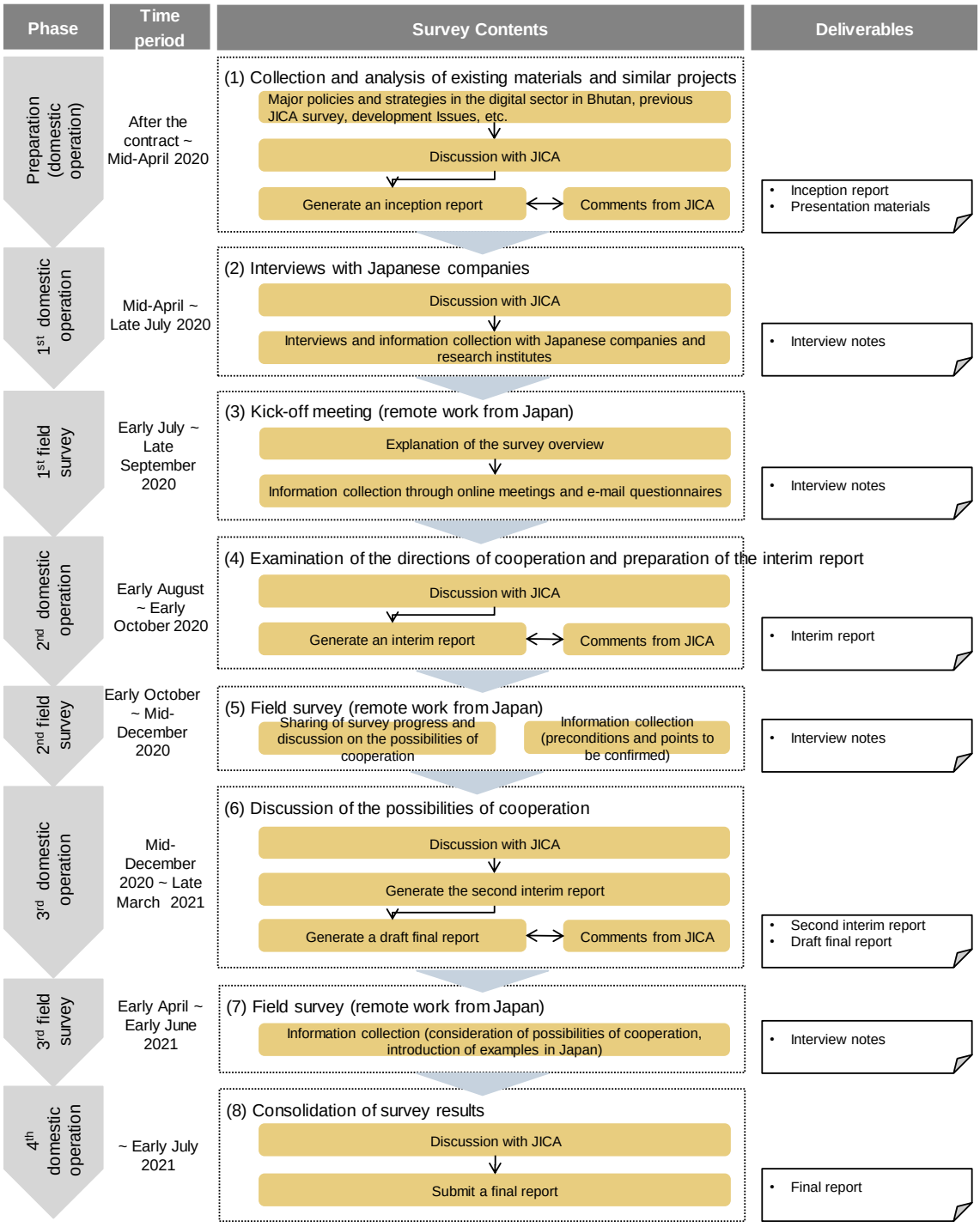


Figure 2 List of survey team members

担当業務	Name	Organization	Notes
Chief/Digital Policy and Industrial Promotion 1	Michikazu KOSHIBA	Mitsubishi UFJ Research and Consulting	
Deputy Chief /Digital Policy and Industrial Promotion 2	Satoshi YAMAWAKI	Castalia	
Information and Commutation Infrastructure	Mitsuhiko ISHIDA	ABeam Consulting	
Digital Contents / Business Development (Digital Currency1)	Tomoko KUNIMITSU	Mitsubishi UFJ Research and Consulting	
Study of Digital Enterprises in Japan and Business Coordination / Business Development (Health Information2)	Junko MAKINOUCHI	Mitsubishi UFJ Research and Consulting	
Business Development (Health Information1)	Ritsuko YAMAGATA	Mitsubishi UFJ Research and Consulting	Participated from February 2021
Business Development (Drone1 / Health Information3)	Yu HASEGAWA	Mitsubishi UFJ Research and Consulting	Participated from February 2021
Business Development (Drone2)	Yuri NARISAWA	Mitsubishi UFJ Research and Consulting	Participated from February 2021
Business Development (Digital Currency2)	Atsushi MORISAWA	Mitsubishi UFJ Research and Consulting	Participated from February 2021

2. Core Issues in Bhutan and Awareness of Problems in This Survey

2.1. Core Issues in Bhutan

2.1.1. Geography and population: Geographical constraints of steep mountainous regions, small and dispersed populations

Bhutan is a mountainous country with a population of approximately 760,000 people in 2019 on a land area of 38,394 km^2 (about the same as Kyushu, Japan) as that of Kumamoto City[1]. In addition to the steep topography in which the national elevation varies from 200 m to 7,000 m, and the population is widely dispersed throughout the country[2]. Thimphu, the capital and the largest city in Bhutan, only has a population of 110,000 in 2017.

Under these circumstances, the road transportation network is considered particularly important for the people of Bhutan to distribute daily necessities and services. However, the road network in Bhutan is far from stable as it has simply four north-south roads connected to one national east-west highway. There are a number of 3,000 m-high passes along the course of the east-west highway, and tunnels and elevated roads have not been fully developed, so many lines are all crooked. Although the road situation has improved in recent years, it still takes a long time for people in remote areas to get to the roads. The Department of Local Governance, the Ministry of Home and Cultural Affairs (MoHCA) points out the following issues: “the roads are quite rough and often become not pliable for cars and pick-up trucks as the season changes from spring to summer due to floods, from autumn to winter due to snowfall.” and “today, farmers in the rural areas are not able to access adequate markets for their farm products, and urban residents are running short of local organic farm products, and become dependent on imported substitutes.”

Similar issues have been identified with respect to telecommunications networks. According to the Bhutan Infocomm and Media Authority (BICMA), while USD2.4 million has been spent on setting up internet communications in 760 villages nationwide, the population is so scattered that it is difficult to guarantee 100% connectivity. While 3G and 4G coverage is steadily increasing, a local carrier also mentions that it is very challenging to achieve 4G coverage across all the country. These geographical constraints, limited population size and dispersed housing can be regarded as fundamental factors that create various social challenges.

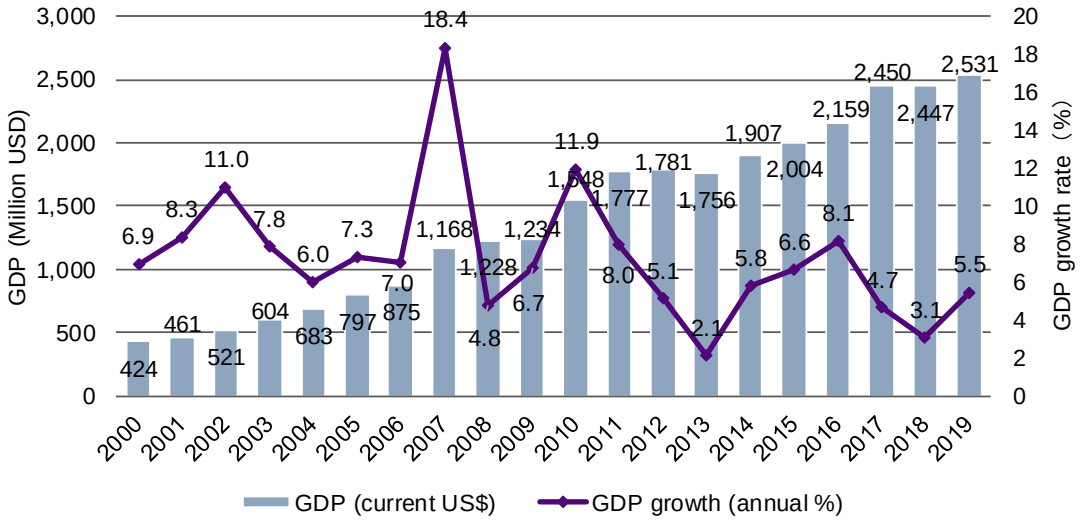
2.1.2. GDP, GNI and poverty rate: anxiety about steady economic growth and slowing growth over the past two decades

Since 2000, Bhutan's GDP has increased six-fold from about USD420 million to USD2.5 billion in the last 20 years, and nearly doubled in the last 10 years, with an average GDP growth rate of 7.3% per year. With this steady growth, the GNI per capita has also increased to

[1] World Bank World Development Indicators
[2] National Statistics Bureau (2018)

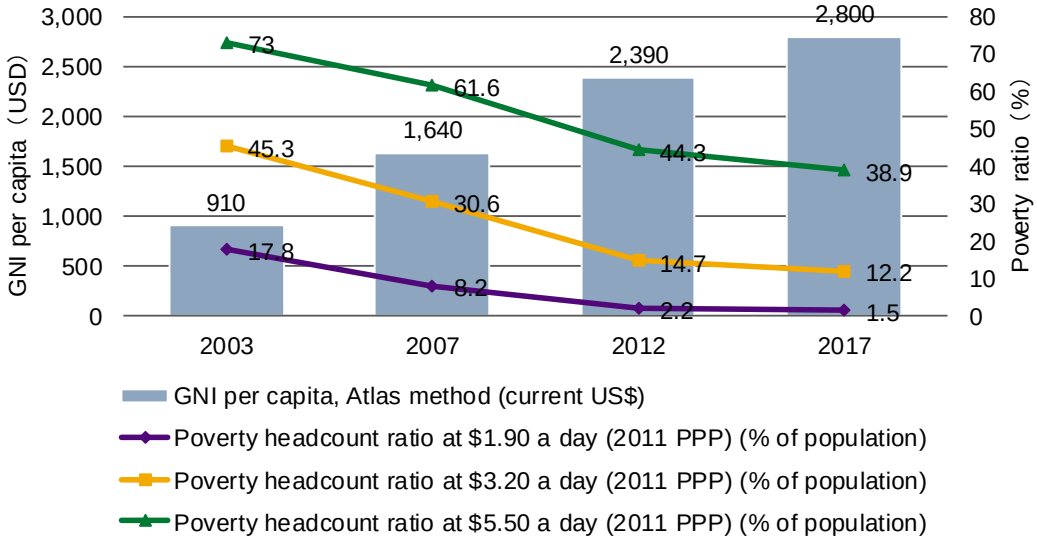
USD2,800 in 2017 and the poverty rate has declined significantly. As a result of this progress, in December 2018, the UN General Assembly decided that Bhutan would graduate from Least Developed Countries (LDCs) in 2023[3]. However, the growth rate in the last five years has slowed slightly to 5.6%, and there are concerns about the further economic constrains due to the COVID-19 pandemic from 2020.

Figure 3 GDP and GDP growth rates (2000-2019)



Source: World Bank, World Development Indicators

Figure 4 GNI per capita and poverty rate



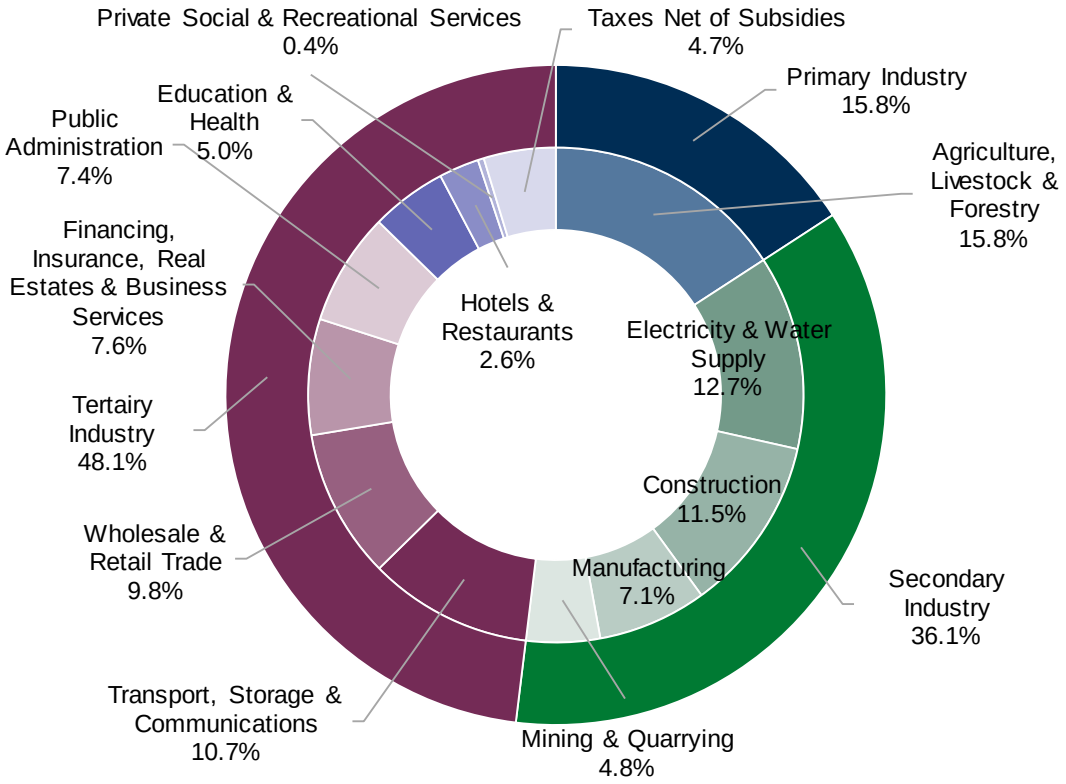
Source: World Bank, World Development Indicators Database

[3] United Nations, 73rd Session of the General Assembly, https://undocs.org/en/A/73/L.40/Rev.1 Accessed on June 24, 2021.

2.1.3. Industrial structure: fragile industrial infrastructure depending on secondary industry (mainly electricity) and primary industry

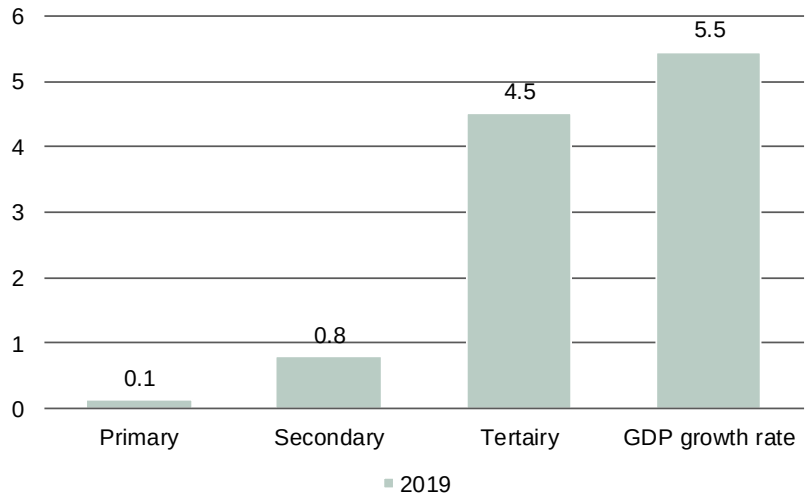
The breakdown of Bhutan's GDP by industry in 2019 shows that the primary industry such as agriculture, livestock & forestry, and the secondary industry, including electricity & water supply, and construction consist of relatively major part of its GDP portion. While these industries have supported the Bhutanese economy, the Ministry of Agriculture and Forest (MoAF) recognizes that even though agriculture is the largest industry in Bhutan, "most of farming are small-scale and run by families and not enough to make it a solid industry." While primary and secondary industries account for a small proportion of the GDP growth rate, tertiary industry is already the driver of economic growth.

Figure 5 Share of each sector in GDP (2019)



Source: Prepared by the survey team based on the National Statistics Bureau (2020a)

Figure 6 GDP growth rates (%) and each sector's contribution (% points) (2019)



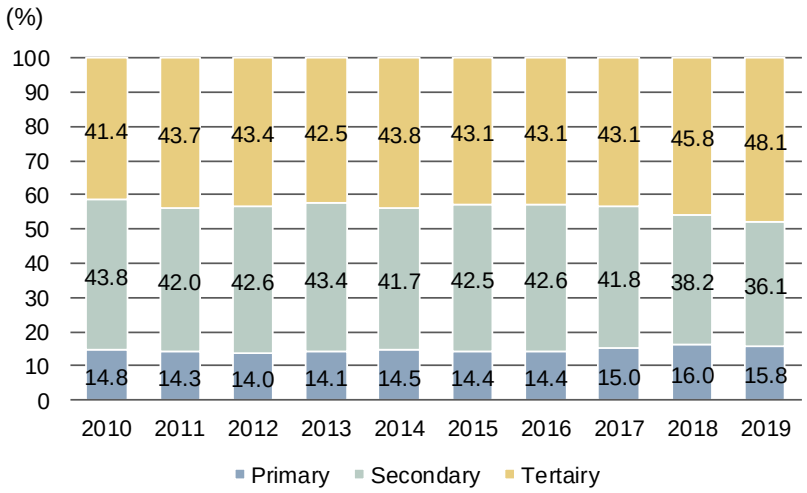
Source: National Accounts Statistics (2020a)

The shares of tertiary industry in GDP has increased gradually over the past decade, from 41.4% in 2010 to 48.1% in 2019, but its pace is still slow. During the interview in this survey, a private telecommunications carrier stated that although they had tried to introduce a small-scale Enterprise Resource Planning (ERP) system a few years ago, they had to abandon it due to the limited customer needs[4]. In addition, it has been pointed out that while online shopping has been spreading gradually in Bhutan in recent years, there are no major domestic logistics providers. Since retailers are delivering goods by themselves, they need to charge higher delivery costs[5]. Furthermore, secondary industry has been declined during this period, including manufacturing industry. This survey reveals that, in the medical industry, for instance, all medical devices are imported from abroad since there is no domestic medical device manufacturers in the country. Besides, there are only one or two engineers in Bhutan who can maintain respiratory and dialysis equipment. As no domestic engineers cannot maintain and repair Computerized Tomography (CT) or Magnetic Resonance Imaging (MRI), they have to rely on specialist engineers from India.

In the process of national economic growth, the industrial structure is generally shifted gradually from primary to secondary and tertiary industries. Although Bhutan is in a transitional phase of such changes, the process seems to be slow.

[4] From an interview with telecommunications carrier
[5] As above

Figure 7 Trends in the share of each sector in GDP (2010-2019)

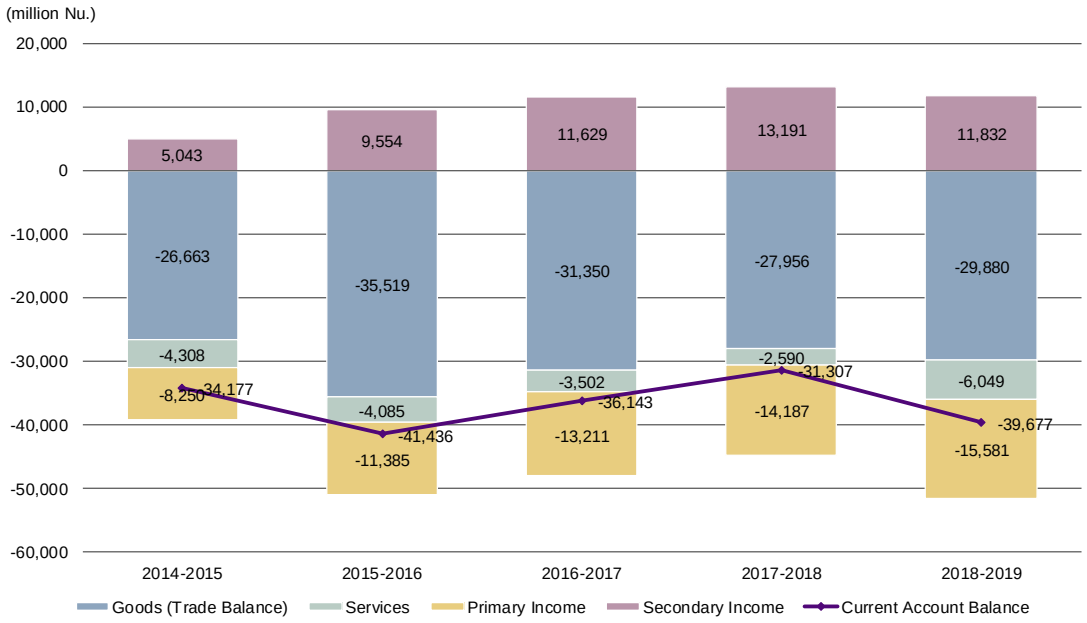


Source: National Accounts Statistics (2020a)

2.1.4. Trade: weak international competitiveness in exports and chronic trade deficits

One of the major challenges facing the Bhutanese economy is the chronic and large current account deficit. All items of income balance excluding the secondary income balance (public and private grant assistance, donations, receipt of grants, etc.) are in deficits, with the trade balance deficit being particularly striking.

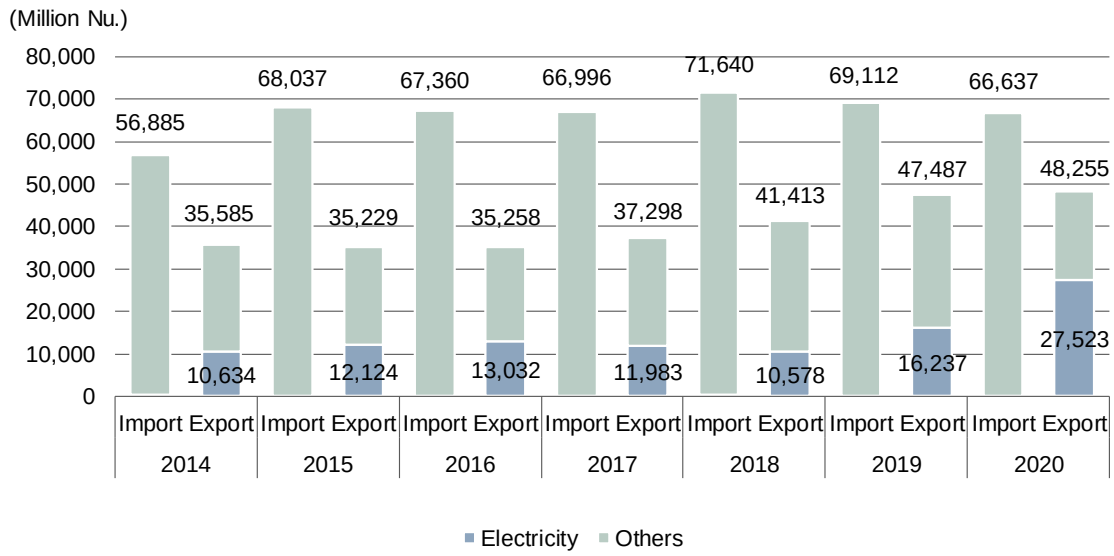
Figure 8 Current account trend (2014-2019)



Source: National Statistics Bureau (2020b)

The trade value trend is shown in the figure below. Although the value of exports is gradually increasing, there is still a large excess of imports. In addition, between one-fourth and one-third of the export value is accounted for mainly by electricity sales to India, and in 2020 in particular, electricity accounted for more than 50% of the export value.

Figure 9 Trade value trend (2014-2020)



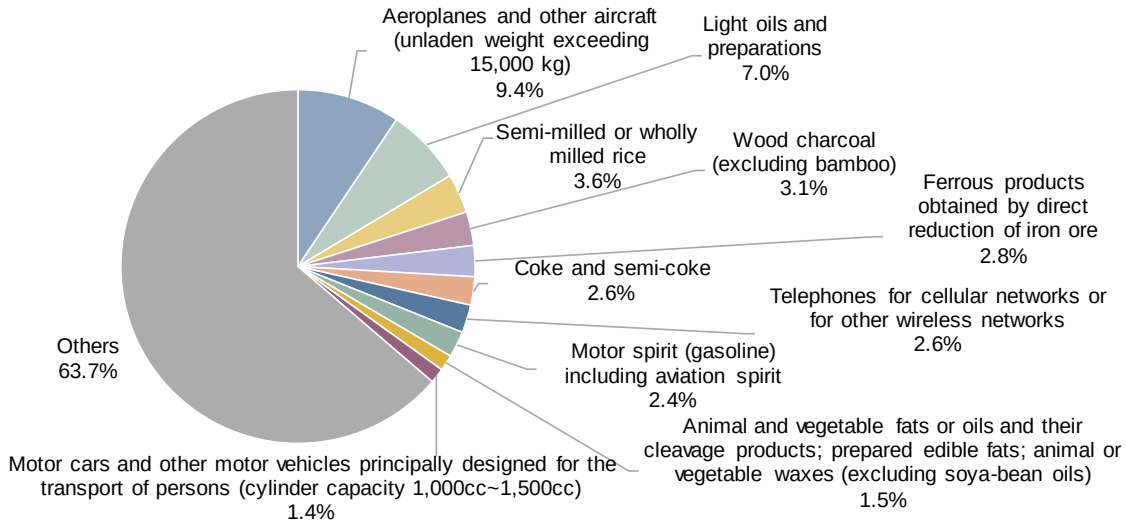
Source: Department of Revenue and Customs, Ministry of Finance (2021)

The breakdown of the major import items shows that the main import items are airplanes & other aircraft and light oils & preparations. Bhutan relies on imports from abroad for a variety of raw materials and products. From the perspective of industrial development, the government seems to be aware of the necessity of reducing cost of importing raw materials to stimulate manufacturing and other industries (Department of Industry, Ministry of Economic Affairs, 2018).

COVID-19 has also revealed that it was too vulnerable to rely excessively on other countries. For example, even if a local telecommunications company planned to invest in facilities to expand their networks, they faced difficulties receiving some equipment from Europe when the global supply chain failed due to the lockdown, such as the closure of an Indian port or airport[6]. In response to the lockdown, the need for self-sufficiency in food production has increased since Bhutan relies on imports from India for about half of its rice[7].

[6] From an interview with telecommunications carrier
[7] From interviews with colleges and startup support institutions

Figure 10 Top 10 imports (2020)

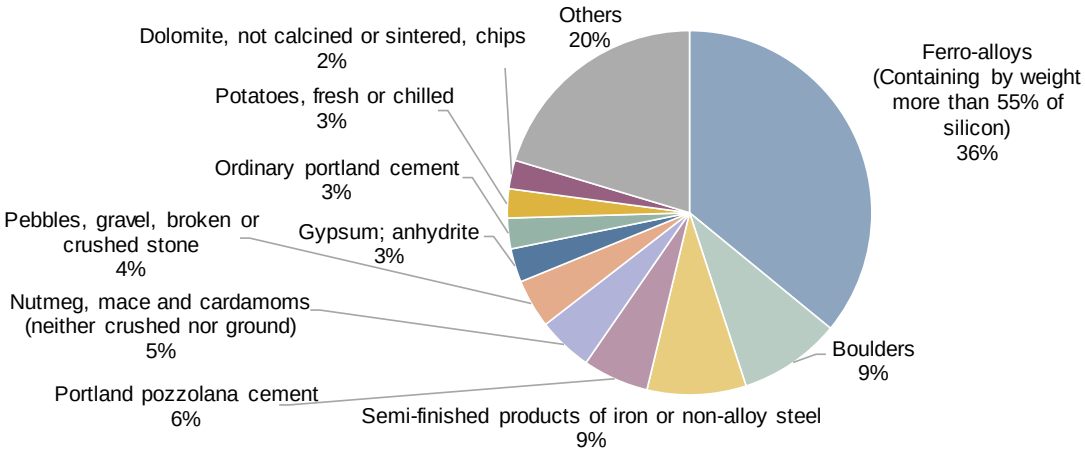


Source: Department of Revenue and Customs, Ministry of Finance (2021)

On the other hand, besides electric power, mineral resources and related processed goods such as ferrous alloys, rocks, cement, and gravel account for a large proportion of exports. Agricultural products such as nutmeg and cardamom are also major export products, but they are limited considering the share of agriculture in GDP. Japanese companies that have engaged in agricultural business in Bhutan pointed out that Bhutan tended to lose to competition when it comes to price, as export costs are high (it is difficult to discount agricultural products even if they get information on foreign products' prices). Inadequate organizations and systems such as cargo pickers and agricultural cooperatives as well as insufficient processing facilities can also contribute the issue. While the government is promoting organic agriculture, the organic certification system in Bhutan is limited to the domestic one, therefore, even if Bhutan exports these products to other countries including Japan, they will not be certified as organic products. In order to obtain international certification, membership fees must be paid to certification bodies such as the International Federation of Organic Agriculture Movements (IFOAM), attend training sessions, and invite inspectors from outside of the country such as India every year. It is revealed, during the interview, that there are few products that have actually obtained international organic certification because it is costly and impractical[8].

[8] From an interview with a Japanese company with business experiences in Bhutan

Figure 11 Top 10 exports (2020, excluding electricity)



Source: Department of Revenue and Customs, Ministry of Finance (2021)

India is the largest trading partner for both imports and exports. In particular, nearly 80% of imports come from India. Bangladesh is also a relatively huge market for export, where large quantities of citrus fruits, nutmeg, cardamom, and other spices are exported from Bhutan.

Figure 12 Top 10 importers (2020)

Country	Amount of Import (BTN)	Percentage
India	51,197,864,999	77.0%
France	6,270,320,667	9.4%
China	2,133,833,154	3.2%
Thailand	1,270,730,426	1.9%
Singapore	1,044,283,339	1.6%
Germany	682,792,065	1.0%
Bangladesh	440,464,247	0.7%
Japan	377,234,849	0.6%
United Arab Emirates	357,108,831	0.5%
United States of America	196,763,459	0.3%
Others	2,484,726,209	3.7%

Source: Department of Revenue and Customs, Ministry of Finance (2021)

Figure 13 Top 10 exporters (2020)

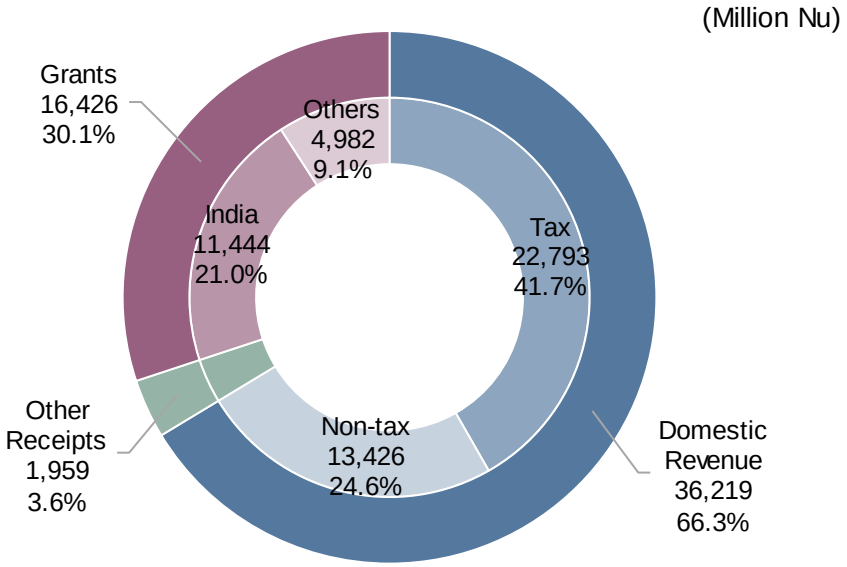
Country	Amount of Export (BTN)	Percentage
India	15,989,551,354	77.1%
Bangladesh	3,955,021,389	19.1%
Nepal	358,944,388	1.7%
Italy	169,359,208	0.8%
Viet Nam	46,547,083	0.2%
Turkey	42,902,381	0.2%
Japan	39,593,676	0.2%
United Arab Emirates	39,144,950	0.2%
United Kingdom	20,024,455	0.1%
Hong Kong	12,586,277	0.1%
Others	58,568,390	0.3%

Source: Department of Revenue and Customs, Ministry of Finance (2021)

2.1.5. Public finance: large proportion of development assistance and costs of healthcare and other social services

As shown in the figure below, foreign aid accounts for a large percentage of the government revenue – 30% of the total government revenue, with India accounting for more than 20%.

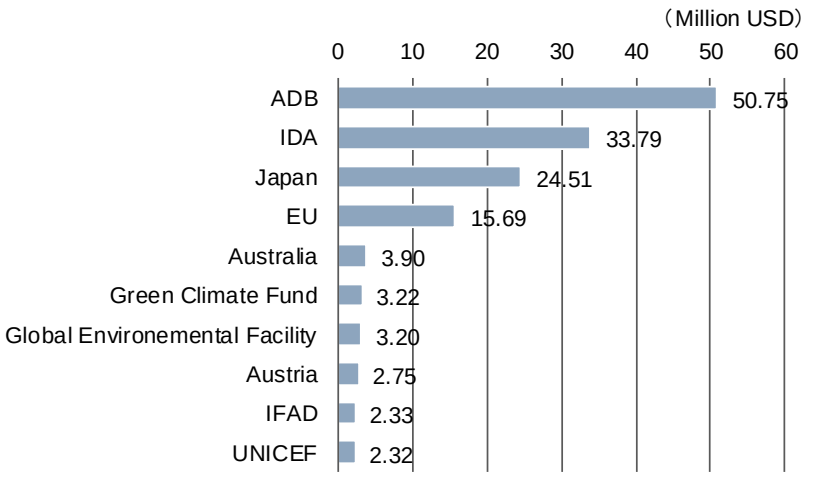
Figure 14 Breakdown of the government revenue (FY2019-2020)



Source: Department of Public Accounts, Ministry of Finance (2021)

Except India, Bhutan receives a particularly large amount of development assistance from Asian Development Bank (ADB), International Development Association (IDA), Japan, and the European Union (EU). Bhutan is about to graduate from the LDC in 2023, but at the same time, this means that the fiscal management which does not reply on aid will be required gradually. Therefore, how to increase revenues other than aid will be an issue for the near future.

Figure 15 ODA to Bhutan by Organisation for Economic Cooperation and Development (OECD) member countries and international organizations (average from 2018−2019)[9]

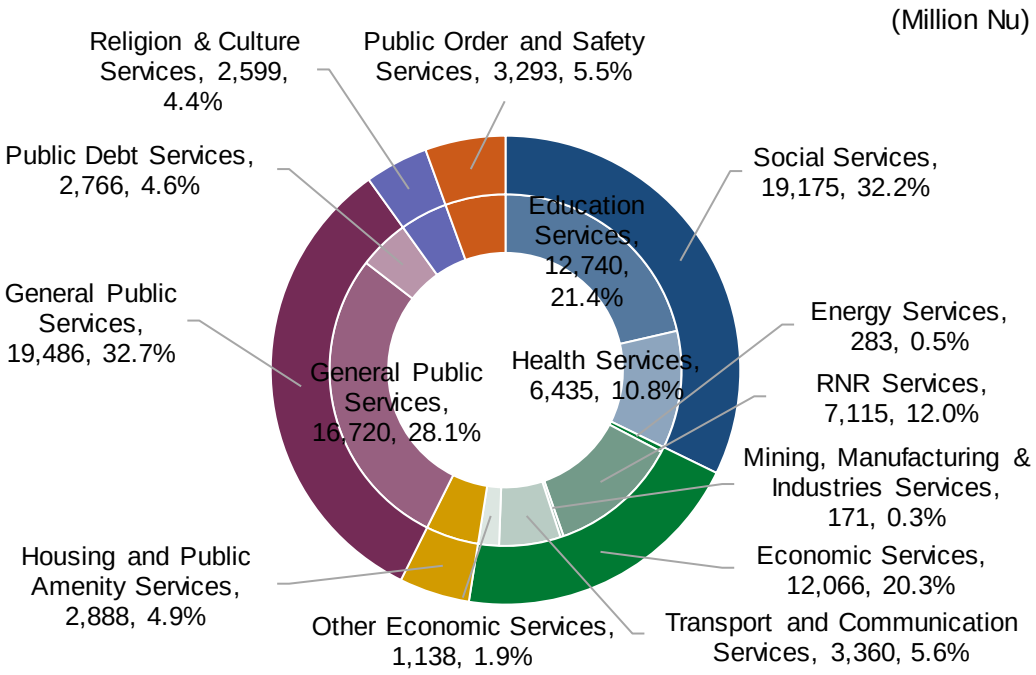


Source: OECD, Aid at Glance database

On the other hand, major items of government expenditures include general administrative services, free healthcare and education (the education fee is free up to the secondary education, same as the first year of high school in Japan), and renewable natural resources, etc. These public services are becoming a financial burden under the relatively limited freedom of revenue.

[9]This is the average for 2019-2020 and not the breakdown of 9.1% for "Other donors" in Figure 14.

Figure 16 Breakdown of government expenditures (FY2019-2020)



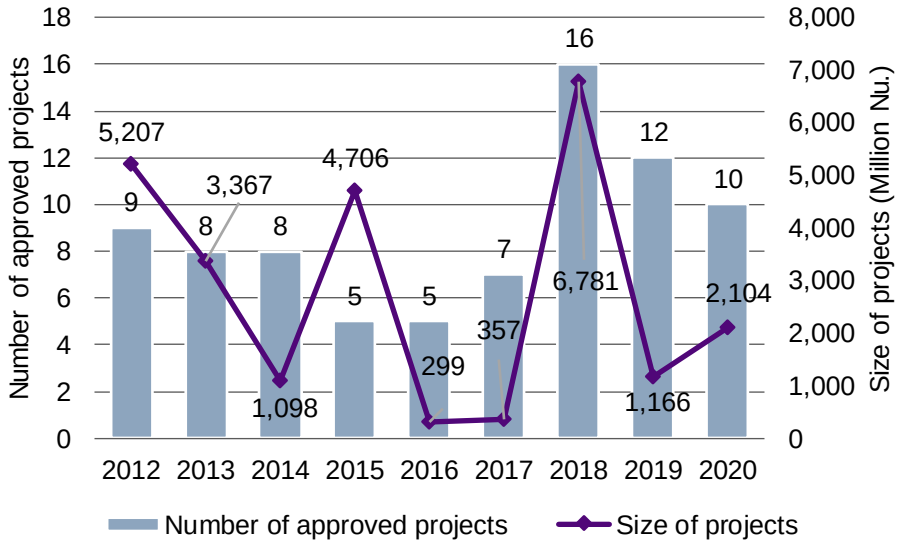
Source Department of Public Accounts, Ministry of Finance (2021)

2.1.6. Investment: limited FDI and difficulties in advanced technology transfer

New FDI projects in Bhutan has remained at the level of less than 10 projects per year and around BTN3 billion per year. The numbers increased to 16 projects and around BTN7 billion before COVID-19 (in 2018). Nevertheless, it must be said that this is a very small scale compared with neighboring South and Southeast Asian countries. The hotel industry accounts for about 40% and the IT industry accounts for 20% of the total projects so far.[10]

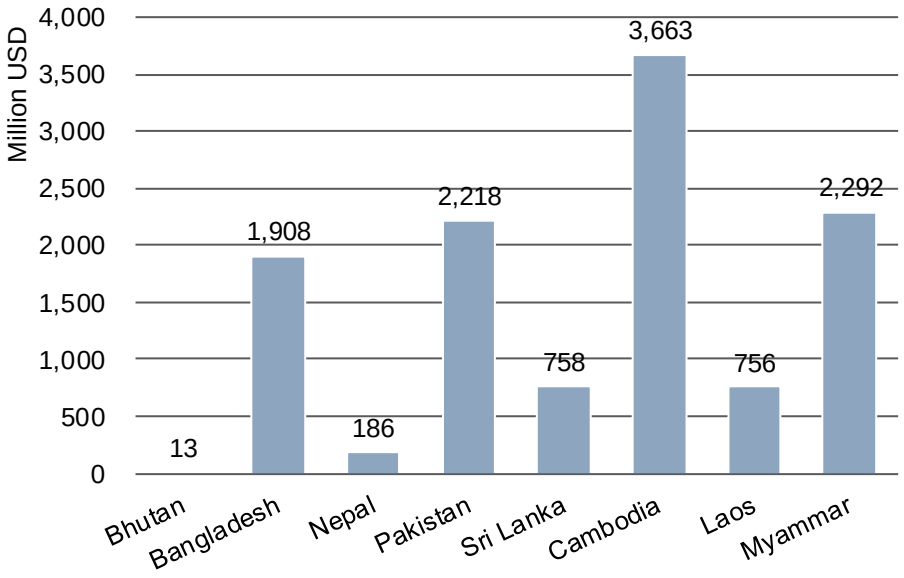
[10] Department of Industry, Ministry of Economic Affairs (n.d.)

Figure 17 New FDI projects in Bhutan (2012-2020)



Source: Department of Industry, Ministry of Economic Affairs (n.d.)

Figure 18 Net FDI inflows in Bhutan and neighboring countries (2019)

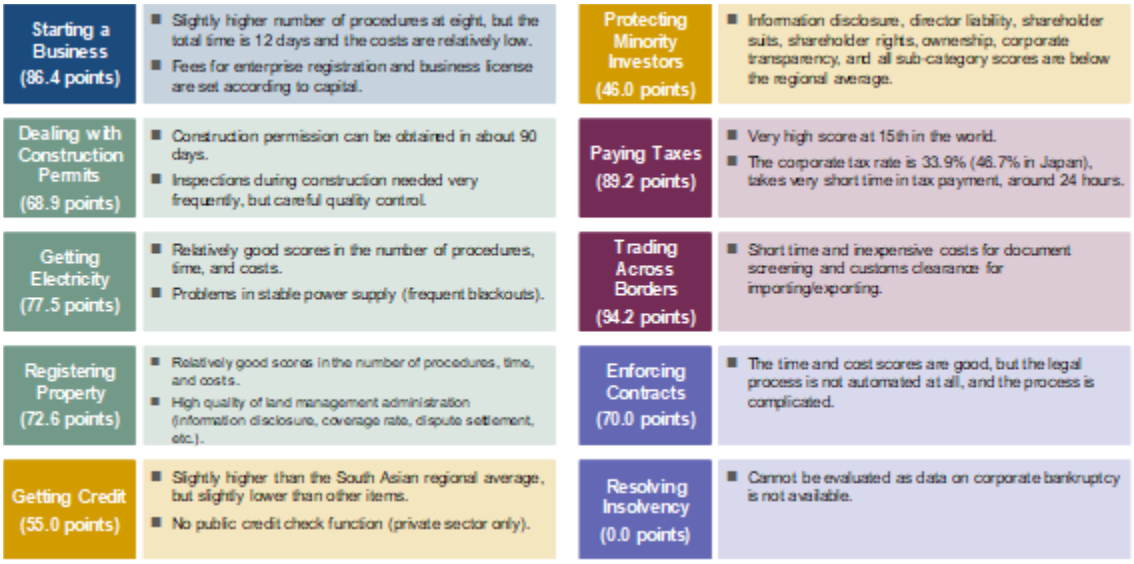


Source: World Bank, World Development Indicators

Actually, the World Bank's Doing Business 2020 values Bhutan's low-time and low-cost business environment. The scores on such environment in Bhutan are not as low as those in neighboring South Asian countries. In particular, the scores for time and cost for startup, tax payment, and trade procedures are good. However, according to the organizations that support FDI companies in Bhutan, the actual operation is complicated in some cases, and there are

opinions that it is difficult for FDI companies to independently handle the registration of FDI and submission of reports to the government after registration.

Figure 19: Bhutan's Doing Business 2020



Source: World Bank (2019)

The GoB intends not only to diversify its economy, but also to utilize FDI for the development of cottage and small industries (CSI). In 2019, FDI rules and regulations was deregulated for this purpose. However in Bhutan, market development costs can be relatively high due to the small population dispersed within the country and limited infrastructure connecting the various regions. In addition, given the difficulty of playing a role as a production and sales hub in the landlocked mountainous country, it is hard to promote FDI by deregulation alone. In this regard, it has been pointed out that marketing to attract FDI is the biggest challenge in an interview with a facility for FDI companies. In addition, the representative of the facility acknowledged that there was a significant shortage of human resources who can develop software in Bhutan, particularly for FDI companies in the IT industry. Even if an FDI company enters into Bhutan, the Bhutanese staffs employed by the company would not be engaged in operations requiring high IT skills. Instead, they are often engaged in image editing and data cleaning at the request of their overseas parent company. Therefore, it is possible that the transfer of knowledge by FDI is limited at this moment.

Bhutan's FDI regulations (excerpt)

- ✓ The maximum foreign investors' shareholding is set at 74% in many sectors.
- ✓ Shall retain 100% of the foreign equity invested in the company for a minimum of three years from the date of start of commercial operations of the FDI business.
- ✓ Net currency earnings shall be accumulated for the preceding three successive years.

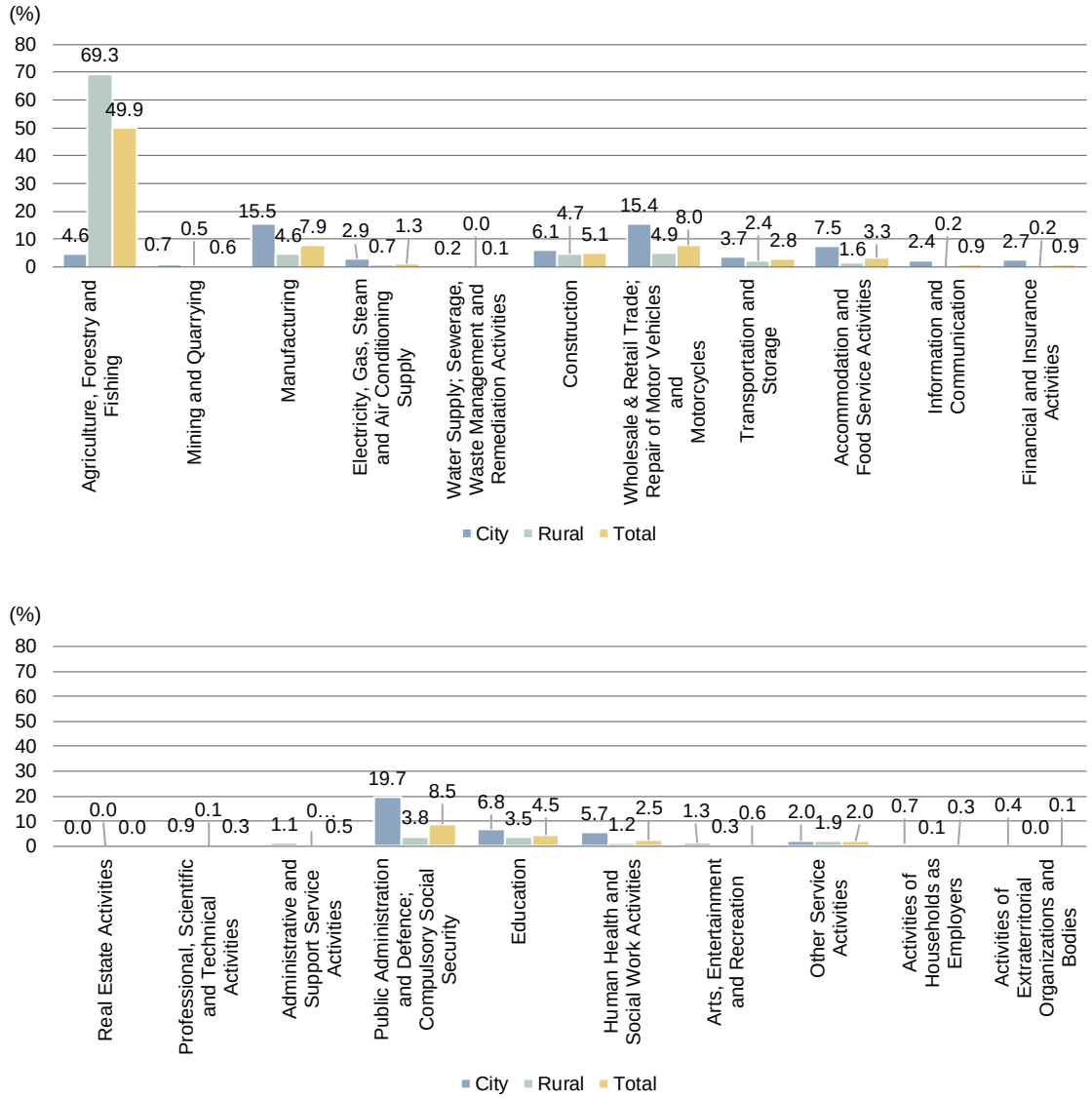
- ✓ Shall attain the ratio of 5:1 (Five Bhutanese regular employees for each expatriate employed) by the 5th year of commercial operations.
- ✓ Deregulation in 2019 allowed entry into small businesses in the production of value-added agro-based products, forest-based production and souvenirs/ceramics (up to 49% foreign investors' equity)
- ✓ Non-Entry Sectors (for reasons such as protection of domestic industry)
    - ・News media
    - ・Distribution services including wholesale, retail and micro trade
    - ・Mining for sale of minerals in primary or raw form
    - ・Hotel 3 star and below
    - ・General health services
    - ・Industries that do not meet the Certificate of Origin requirements
    - ・Activities in the Prohibited List of the GoB

Source: Ministry of Economic Affairs (2019)

2.1.7. Employment: high unemployment rate among youth and social unrest, mismatch between job preference and job opportunities

The biggest source of employment in Bhutan is agriculture, where about half of the employed population is engaged. Except agriculture, manufacturing, construction, wholesale and retail, and administrative services account for a certain proportion, and the variety of industries are relatively ensured in urban areas. According to interviews with MoAF, however, agriculture is regarded as physically tough and a low-status work, and it tends to be a "last choice" for young people with high educational status. Similarly in the construction industry, a Japanese construction company operating in Bhutan commented that it became difficult to employ Bhutanese workers each year. Many young people who avoid physical labour are moving from rural to urban areas to look for clerical jobs. While an increasing number of young people are going to the United States, Canada, Australia, the Middle East, and Southeast Asia to gain better job opportunities, the cases of acquiring such administrative positions is limited at the destination (Hirayama 2019).

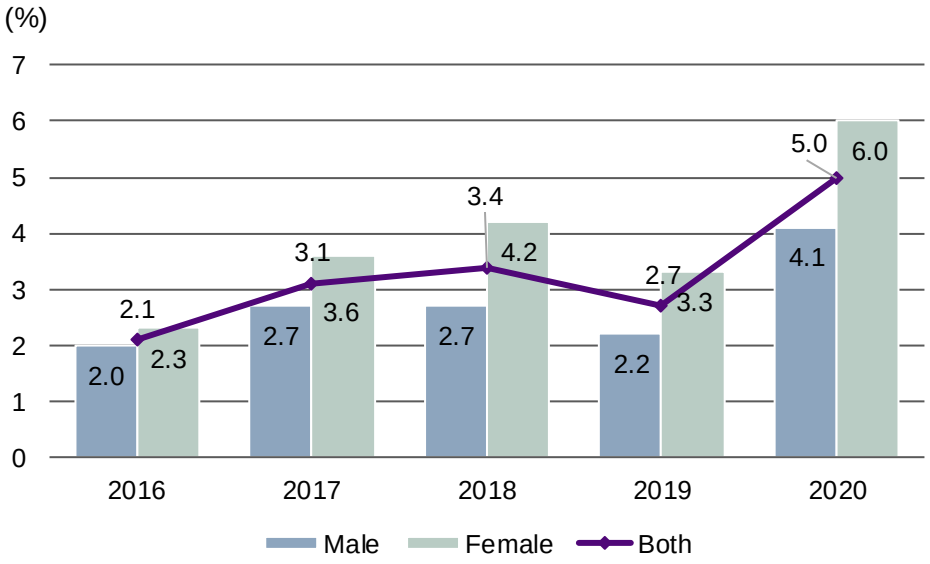
Figure 20 Percentage of employment by industry (2020)



Source: National Statistics Bureau (2020c)

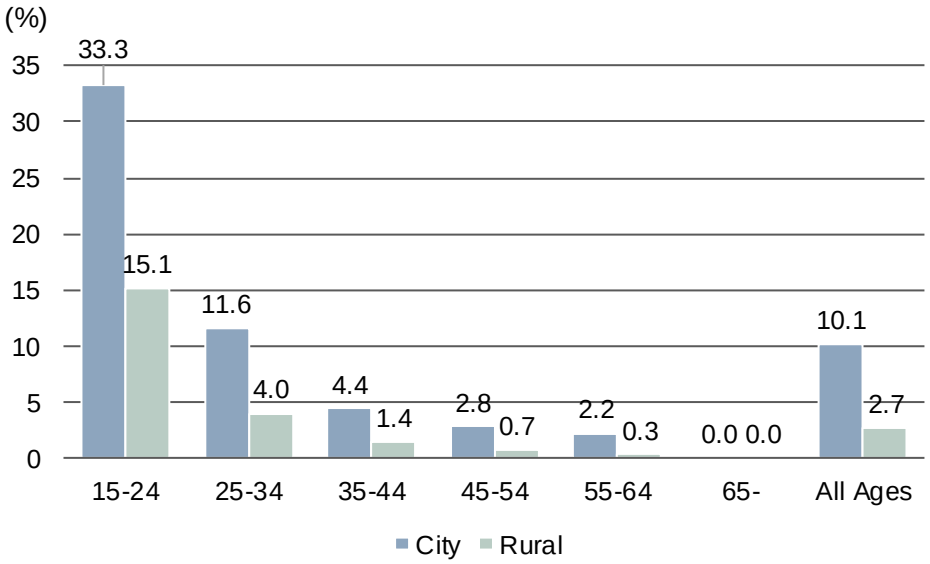
The unemployment rate in Bhutan is 3-4% (6% in 2020 due to COVID-19) as a whole, which is not particularly high, but there is concern that the unemployment rate is high among urban youth, especially those who have completed higher secondary education. The royal family and the GoB are concerned by the fact that some young people are unable to find the preferred job and are turning to alcohol and drugs without hope for the future, which could lead to social unrest in the future.

Figure 21 Unemployment rate (2016-2020)



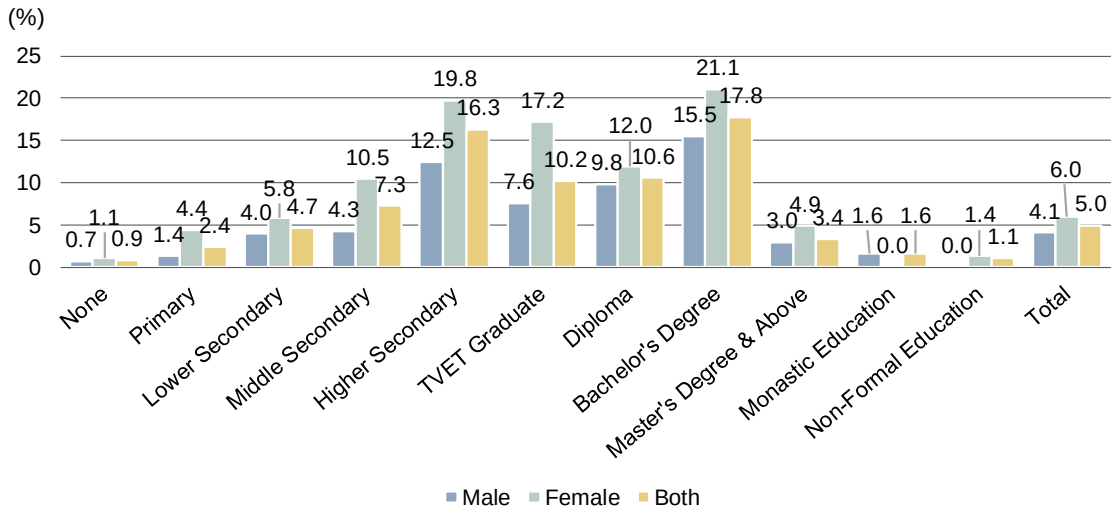
Source: National Statistics Bureau (2020c)

Figure 22 Unemployment rate by age group (2020)



Source: National Statistics Bureau (2020c)

Figure 23 Unemployment rate by educational status (2020)



Source: National Statistics Bureau (2020c)

The high unemployment rate of the young population is strongly linked to the economic structure of Bhutan, which shows that there is a mismatch between the job preference and job opportunities. In particular, in the interviews with higher educational institutions, it was pointed out that although the number of young people who study IT at the institutions and want to find a job in the IT field is increasing, the number of such private companies is limited. In April 2014, the GoB and the United Nations Development Programme (UNDP) surveyed 1,128 unemployed people aged 17-29 (response rate: 98.8%). 67% of respondents were living in Thimphu, 50% were bachelor's or above, and 57% were seeking jobs for more than a year. More than 80% of respondents wanted to work for government agencies or state-owned enterprises, and more than half wanted jobs in industries such as finance, education and tourism, which does not account for a percentage in Bhutan's GDP.[11]

[11] As a limitation of the survey, it is necessary to bear in mind the possibility of sampling bias from the viewpoint of computer literacy, since the target population is young people who are registered in the job portal of the Labor Bureau.

Figure 24 Preferred labor sectors

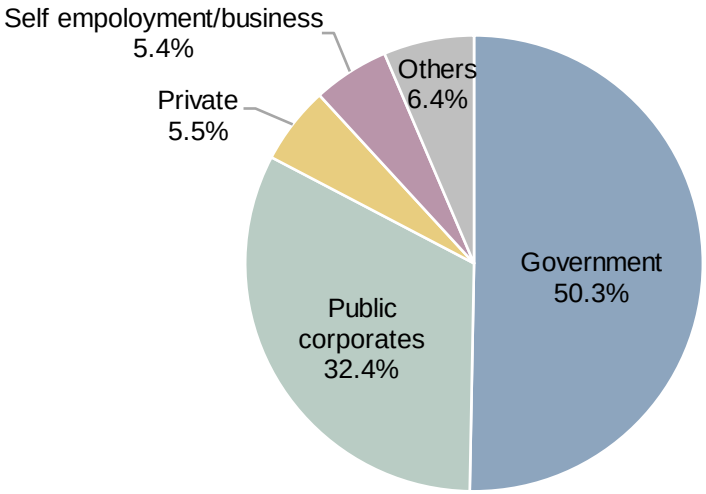
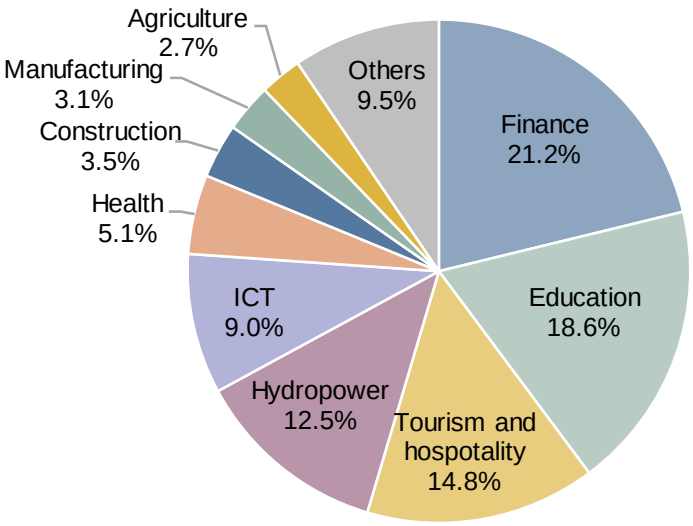


Figure 25 Proffered industries



Source: Ministry of Labor and Human Resources (2014)

2.1.8. Education and human resource development: huge gap between supply from higher education institutions and demand in industrial sector on ICT professionals

In Bhutan, doctors, teachers, and engineers are the most popular careers, and in many cases, especially when their parents are doctors, their children want to be doctors as well. As mentioned earlier, a large number of Bhutanese people wish to work as public servants, however it is rare to start their own business by themselves. One reason for this is that Bhutanese school education does not provide an opportunity so that Bhutanese youth fosters their mindset to

challenge new business.[12]

The star occupations mentioned above are broadly consistent with Bhutan's higher education, especially a postgraduate school for a master course which has been provided for long, and they appear to be established as an object respected by the Bhutanese people. On the other hand, the Gedu College of Business Studies of the Royal University of Bhutan (RUB) was established in 2008 to provide relevant curricula, however, higher education on business talent is still insufficient.

Figure 26 Higher education institutions in Bhutan

Name RUB: Royal University of Bhutan KGUMSB: Khesar Gyalpo University of Medical Sciences of Bhutan	Year of establishment	Subject area	Student Admission in 2020		
			Diploma	Bachelor	Master
RUB: College of Language and Culture Studies	1961	Culture, language, and literature	○	○	○
RUB: College of Natural Resources	1992	Agriculture, forestry and natural resource management	○	○	○
RUB: College of Science and Technology	2001	Architecture, engineering, IT		○	○
RUB: Gedu College of Business Studies	2008	Business		○	○
RUB: Gyalpozhing College of Information Technology	2017	IT		○	
RUB: Jigme Namgyel Engineering College	1972	Engineering, IT	○	○	
RUB: Paro College of Education	1975	Language, pedagogy	○	○	○
RUB: Samtse College of Education	1968	Education		○	○
RUB: Sherubtse College	1968	University		○	
RUB: Yonphula Centenary College	2017	English		○	
KGUMSB: Faculty of Nursing and Public Health	1974	Nursing, medical science	○	○	
KGUMSB: Faculty of Postgraduate in Medicine	2014	Medical science			○
KGUMSB: Faculty of Traditional Medicine	1967	Traditional medicine	○	○	○
Jigme Singye Wangchuck School of Law	2017	Legal science		○	○
Royal Institute of Management	1986	Financial management, administration, law	○		○
Arura Academy of Health Sciences	2015	Home economics	○		
Norbuling Rigter College	2017	Language, politics, sociology		○	
Royal Thimphu College	2009	University		○	

Source: Department of Adult and High Education, Ministry of Education (2021)

Focusing on institutions of higher education on ICT professionals, specialized courses are being provided at domestic technical universities, and the environment for ICT professional training is gradually being developed[13]. In 2017, the Gyalpozzing College of Information Technology (GCIT), the first university specializing in IT opened, and in 2020, they had the first graduation.

[12] From interviews with youth support agencies

[13] Although detailed information is not collected in this survey, ICT education in pre-higher education is also important as a prerequisite. Currently, PP-XII (equivalent to a Japanese high school) is mandatory, and training of trainers (ToT) is underway to increase the number of teachers who can teach coding (Ministry of Education 2020).

However, these institutions of higher education are not in a position to produce human resources who can be of immediate use in the field of business. At present, the level of programming used in university classes is not high enough from the point of view of the business scene, and teachers at local university say that if they are to work in a Japanese company, they will need to receive further education one more year after graduation. Furthermore, opportunities for industry-university collaboration are also limited, and domestic telecommunications companies accept students from technical universities as interns and cooperate in the development of university curriculum. However, these are cooperative activities private corporations accepted through proactive request from universities, which would be rather passive in nature, and do not constitute in-depth collaboration such as incorporation of professional knowledge by universities into private corporations to develop novel and innovative services.

On the other hand, there was a pessimistic view from the university side that although there are many excellent students, Bhutan has no opportunity to make the most of their educational background. Which should come first to produce excellent graduates or to develop an industry that sufficiently accepts graduates, it is which-came-first-the-chicken-or-the-egg question. In any case, it is necessary to close the gap between institutions on education/research and industrial arena through closer cooperation.

Despite this gap, as of 2018, there are 2,616 ICT professionals employed in Bhutan (including 1,220 in large enterprises, 618 in IT parks, 360 in small and medium enterprises (SME), 309 in governmental organizations, and 109 in RUBs)[14]. In order to develop these ICT professionals, the Department of Information Technology and Telecommunications (DITT), which is in charge of information and communication technology within the Ministry of Information and Communications (MoIC), is currently promoting the creation of opportunities for vocational training for ICT professionals. DITT itself provides specialized trainings for ICT professionals and has eight IT training institutions, including Athang Training, Software & Animation Service, and G.P.Y. Computer Training Institute.

Learning from the interviews with government organizations, they were also aware of the problems in the technical and knowledge level of human resources development for ICT professionals. According to BICMA, which is in charge of ICT and media regulation, there is no organization that can provide specialized training, even including technical colleges. Although some employees have the opportunity to participate in the training program provided by the International Telecommunication Union (ITU), it appears that basically they only learn from each other through on-the-job training. The Ministry of Health (MoH) also confirmed that the World Health Organization (WHO), ADB, the Southeast Asian Network, and others supported the shortage of health information specialists. According to local doctors, there are no doctors or nurses with PhDs in health information science, and there are no medical engineering courses at universities, so they had to go abroad to study them.

Similar observations have been made by private companies, such as: “Although there

[14] Department of Information Technology, Ministry of Information and Communication (2018)

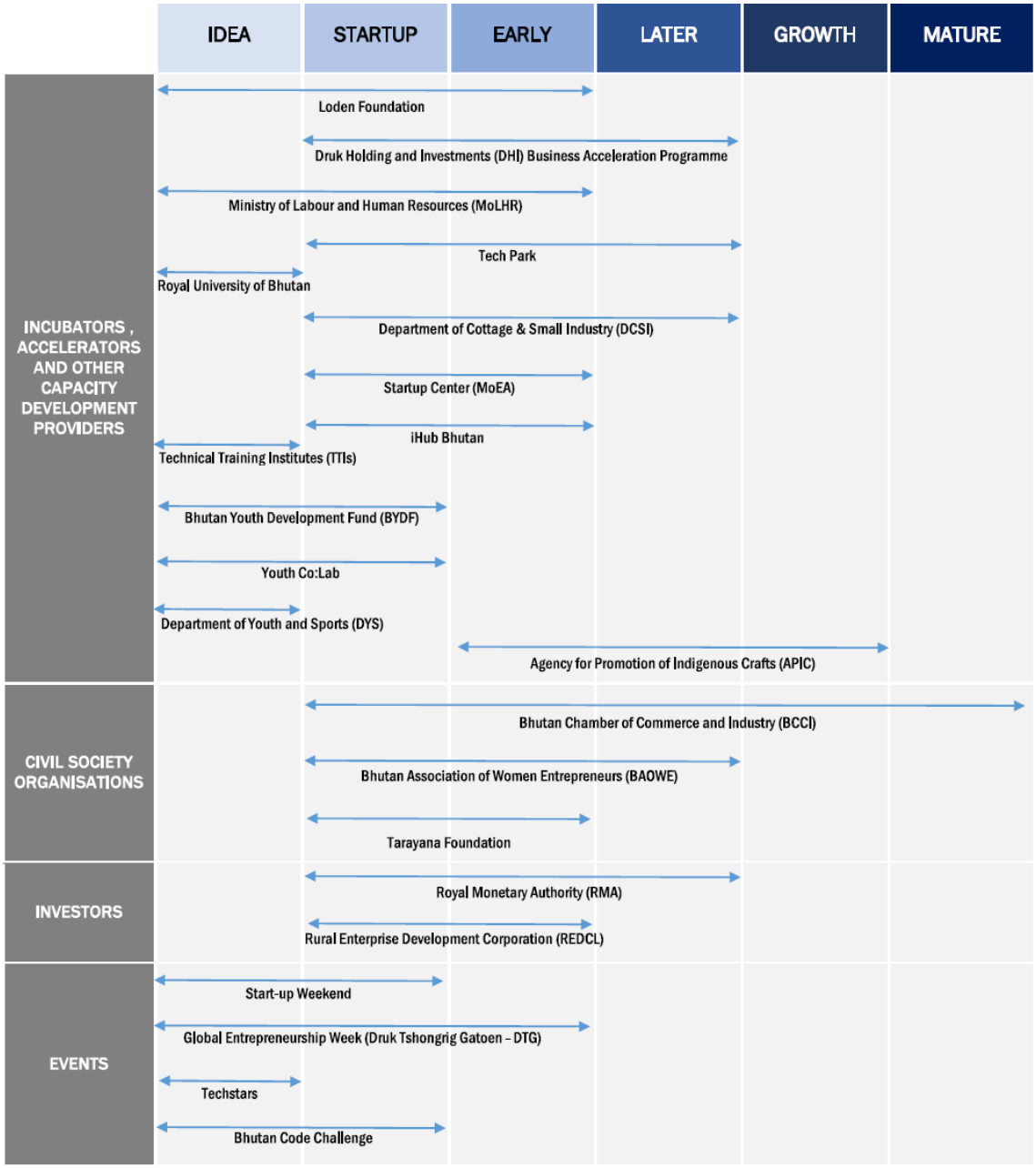
are plenty of staffs capable of day-to-day operation and maintenance, they do not have highly specialized personnel capable of dealing with serious network troubles, and it is necessary to invite experts from India (a major telecommunications carrier)," "Our company as a startup was considering a new business utilizing a block chain in Bhutan, but there were no skilled engineers and had to abandon the plan (Bhutanese entrepreneur)."

2.1.9. Startup awareness and ecosystem: weak entrepreneurial mindset and limited entrepreneurial support ecosystem

Bhutan's lack of diversification of industry and limited choice of work, its limited FDI and limited access to overseas business trends, and its well-established social environment for where Bhutanese people wish to work as doctors, teachers, and civil servants have weakened mindset of starting a business. In recent years, however, Bhutan has seen an increase in the number of organizations supporting business startups, as illustrated in the figure below, and efforts have been made to support companies. There are two incubation centers in the public (office space only) and one in the private sector, both of which are at Thimphu, and there are voices of desire to install them in rural areas.[15]

[15]From interviews with private industry promotion organizations

Figure 27 Entrepreneur support organizations by categories/growth stages



Note: This figure has been developed based on desk research and therefore may entail omissions in the coverage of the active institutions.

Source: ITC (2020)

The Loden Foundation has been recognized by national stakeholders as an organization that has driven these changes. The foundation began supporting entrepreneurs in 2007 and has supported over 190 entrepreneurs to date. Specifically, it provides interest-free and unsecured loans (up to BTN1.5 million) for entrepreneurship, mentoring and training programs linking foreign mentors with Bhutanese entrepreneurs. One interview with the foundation in this survey showed that some entrepreneurs have come to serve as role models for younger

generation, which has made some change on starting a business in the generation. They also shared their view that if the business of entrepreneurs receiving assistance is likely to grow further both domestically and internationally, they would focus on supporting scale-up efforts, such as building networks to expand sales channels and purchasing equipment to expand production.

A number of other international development agencies are also supporting this trend. The World Bank Group established Thimphu Tech Park through a public-private partnership, which is now run by the state-owned Druk Holding & Investment Ltd. (DHI). UNDP is also working with local innovators to organize "the Startup Weekend Bhutan", which promotes the social business by startups.

In addition, activities to foster entrepreneurship are also being introduced in higher education institutions. For example, in College of Science and Technology (CST), an optional subject called "Entrepreneurship Development" is provided in all departments as an initiative to support university ventures and startups, and "the Materials and Procurement Management", a diploma course of Jigme Namgyel Engineering College (JNEC), makes the "Entrepreneurship" an essential module. In this regard, the Loden Foundation taught entrepreneurship to more than 2,000 Bhutanese in 21 educational institutions only in 2019 to share the potential of "entrepreneurs as new career paths."

Thus, although various training and coaching programs are being developed for entrepreneurs in the seed and early stages, it has been pointed out that support for further growth and overseas expansion is to be limited (ITC 2020). According to Bhutanese entrepreneurs who run businesses abroad, Bhutanese entrepreneurs generally do not even recognize foreign business opportunities, and this would be one of the challenges of the current Bhutanese business ecosystem.

A "gap" between the government and the private sector was also perceived. For the government, private companies seem to be passively waiting for work from the government, while private companies find that bureaucratic government does not support the growth of private companies adequately[16]. Specifically, some from private corporations said that the government should provide incentives, including tax incentives, for private companies to focus on exports.

Financial challenges are also deep-rooted. Entrepreneurs have said that even if they have ideas, they cannot start a business without sufficient capital[17], and that it is difficult to obtain a loan from a commercial bank without a security even though they want to expand their business[18]. In addition to the Loden Foundation, DHI, Tarayana Foundation, RENEW, and BAOWE are providing interest-free, low-interest loans. In 2020, the government launched a system called "the National Credit Guarantee Scheme[19]" to combat COVID-19, and the government has become a guarantor, enabling entrepreneurs to receive loans of up to BTN30

[16] From interviews with FDI companies
[17] From interviews with Bhutanese working in Japan
[18] From interviews with local entrepreneurs
[19] the National Credit Guarantee Scheme website, https://www.ncgs.gov.bt/, Accessed on July 3, 2021

million from commercial banks. However, all of these projects are “aid-like” and it will take more time for the concept of “investing” in new businesses based on understanding risks associated to penetrate.

2.2. Awareness of the Core Issues in the Survey

The “Core Issues of Bhutan” outlined in this chapter reaffirmed that Bhutan faces a number of very disadvantages in achieving economic development, including geographical constraints, small population size, and a limited infrastructure network. It is unlikely that new industries will emerge spontaneously other than businesses targeting a limited domestic market. With dependence on imports for raw materials, many constraints make it hard to promote exports. It is also struggling to attract FDI under the aforementioned adverse conditions.

While the country's GDP has grown steadily, reducing poverty and improving people's livelihoods significantly, it is difficult to admit that the fiscal base has become solid. It is necessary to strengthen autonomous public finance through the creation of new industries. However, the private sector is not yet sufficiently developed, and it must be said that the future growth is in an unstable state. In particular, we cannot confirm the existence of a company capable of surely grasping the trend of new digital technologies advancing around the world, including India and China, and developing international business.

Looking at the human resources that would support these new industries, the attractive employment opportunities for the younger generation, who have received higher education and now have more contact with the international society, are still limited to such types of occupations as public servants, doctors and teachers. As a result, the high unemployment rate in the younger age group with high education has become obvious, and this could be a source of social unrest. Consequently, industrial development appears to be delayed further, and even if we want to create a new industry, it would be difficult to put it into practice.

In order for Bhutan, which has fostered a spiritual culture, to maintain its reputation and dignity and continue to develop as “a country of happiness,” it is essential to create an environment in which the people of Bhutan, including the young people who will bear the future of Bhutan, can feel even more attractive. It would be the key, as an attractive alternative to jobs such as civil servants, whether starting a business as an individual and industrial promotion using new digital technologies will be a viable alternative or not. Ten years ago, the term “entrepreneurship” was not widely used in Bhutan. Since then, there has happened trial-and-errors in various institutions of industry, government, and academia, and now we are coming into the stage where we can discuss what needs to be done and how the business ecosystem needs to be changed. Nevertheless, Bhutan will have difficulty overcoming the underlying vicious cycle and achieving sustained growth unless the country takes a hard-to-manage approach to the changes that are occurring at a rapid pace of innovation in the world.

Based on this awareness of all the issues mentioned above, this survey examines the “first steps” to be taken to resolve the “core issues” and proposes specific actions. In the next

chapter, the 12th Five-Year Plan and the 21st Century Economic Roadmap will be summarized as a problem awareness of the GoB and as a high-level policy to respond to the challenges. Subsequently, in Chapter 4 onwards, JICA's concrete action plan and the possibility of its cooperation are proposed.

3. Efforts by the Government of Bhutan to Address the "Core Issues"

This chapter provides an overview of GoB's perceptions and related policies on the core issues discussed in Chapter 2.

3.1. The 12th Five-Year Plan and Digital Drukyul (Digital Bhutan)

3.1.1. Evolution of the five-year plan in Bhutan

Bhutan has been modernizing its economy based on a five-year plan since 1961. As shown in the table below, the development area has been gradually expanded to agriculture and forestry, mining, power generation, and tourism, with an initial focus on basic areas such as road construction and education. In particular, since the 1980s Bhutan has pursued economic development that is in harmony with the natural environment and their unique culture, and a major feature of the 8th Five-Year Plan is the incorporation of the GNH Index, an innovative development index. In recent years, new initiatives have been actively introduced in the practical aspect, such as mid-term reviews in the third year of the five-year plan period and the adoption of results-based planning to maximize the effects.

Figure 28 Evolution of the Five-Year Plan in Bhutan

Plan (Year)	Major goals	Priority areas	
1st Five-Year Plan (1961-1966)	■ Development of basic infrastructure	■ Roads ■ Education	Development of basic infrastructure, including investment in road construction and education
2nd Five-Year Plan (1966-1971)	■ Build on the foundations laid in the first plan	■ Roads ■ Education ■ Agriculture	
3rd Five-Year Plan (1971-1976)	■ Improvement of agriculture and livestock production, social services ■ Balanced regional development ■ Setting up small and medium scale industries	■ Agriculture ■ Roads ■ Education ■ Power & Mining ■ Health	Priority areas expands to agriculture and forestry, mining, power, and tourism.
4th Five-Year Plan (1976-1981)	■ Concentration on growth in agriculture, livestock, forests and small industries	■ Agriculture ■ Industry and mines ■ Education ■ Public Works ■ Forestry	
5th Five-Year Plan (1981-1986)	■ Economic self-reliance ■ Sustained rate of growth ■ Greater distributional equity among regions ■ Participatory planning	■ Industry ■ Power ■ Power Sector ■ Public Works ■ Agriculture ■ Education	
6th Five-Year Plan (1987-1992)	■ Achieve economic self-reliance ■ Improving governance through organizational development programmes ■ Rural development ■ Consolidation of development programmes	■ General Public Services ■ Agriculture ■ Transpor & Communication ■ Education ■ Power ■ Public Works ■ Mining ■ Health	Shift to a plan that emphasizes Bhutanese identity (pursuit of national identity, self-reliance of the country)
7th Five-Year Plan (1992-1997)	■ GNH base development ■ Economic development and self-reliacence ■ Living standard and quality of life ■ Decentralization	■ Health & Education ■ Communication ■ Agriculture ■ Finance ■ Trade & Industry	
8th Five-Year Plan (1997-2002)	■ Balanced and sustainable development ■ Decentralization ■ institutional strengthening	■ Health & Education ■ Power ■ Finance ■ Agriculture ■ Roads ■ Communication	GNH is included for the first time in the five-year plan
9th Five-Year Plan (2002-2008)	■ Improve the quality of life and income ■ Enhance good governance ■ Promote private sector growth ■ Preserve and promote culture ■ Environmental conservation ■ Accelerate economic growth	■ Local Governance ■ Communication ■ Trade & Industry ■ Agriculture ■ Health ■ Education ■ Finance	GNH became the pillar of the development philosophy of the five-year plan. Gradually shift to a central government-led structure to involving local governments
10th Five-Year Plan (2008-2013)	■ Poverty Reduction	■ Finance ■ Local Governance ■ Works & Human Settlement ■ Education ■ Agriculture ■ Health	Emphasis on poverty reduction. Set a mid-term review in the third year
11th Five-year Plan (2013-2018)	■ Self-reliance and inclusive growth ■ Socio-economic development	■ Local Governance ■ Finance ■ Works & Human Settlement ■ Agriculture ■ Home & Culture ■ Education ■ Health	Adoption of Results Based Planning. Focus on comprehensive social development and multidimensional poverty reduction

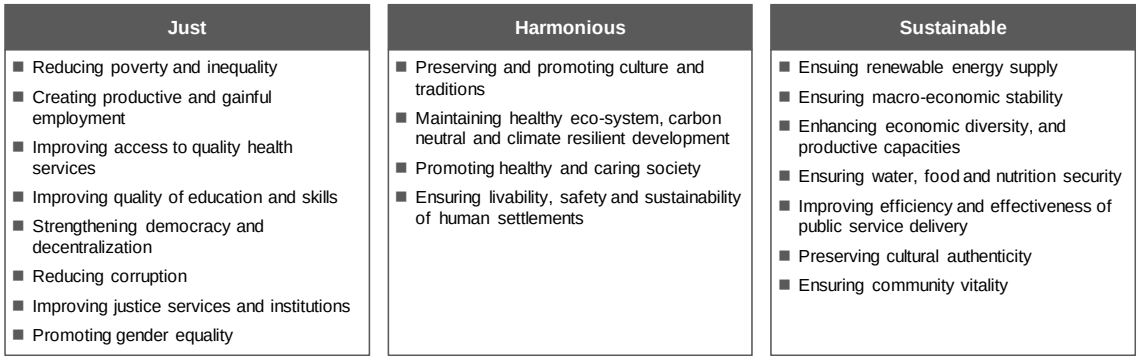
Source: developed by survey team based on 12th Five-Year Plan and Hirayama (2019)

3.1.2. The 12th Five-Year Plan

The 12th Five-Year Plan covers the period from 1 November 2018 to 31 October 2023. As mentioned earlier, Bhutan is scheduled to graduate from the LDC in 2023, and this plan is the last five-year plan for Bhutan as an LDC. This five-year period is extremely important in ensuring sustainable growth after graduation from LDC.

The objective of the 12th Five-Year Plan is "just, harmonious and sustainable society through enhanced decentralization." Seventeen National Key Results Areas (NKRA) have been set as outcomes necessary to achieve this. The 12th Five-Year Plan is characterized by flagship programs to address the national priorities that strongly affect NKRA.

Figure 29 The 12th Five-Year Plan for a "Fair and Harmonious Sustainable Society"



Source: developed by the survey team based on the 12th Five-Year Plan

Figure 30 NKRA and GNH Domains

NKRA	Nine domains of GNH: 1) Psychological wellbeing, 2) Health, 3) Time use, 4) Education, 5) Cultural diversity, 6) Good governance 7) Community vitality, 8) Ecological diversity, 9) Living standard								
	1	2	3	4	5	6	7	8	9
Macroeconomic stability									X
Economic diversification									X
Reducing poverty & inequality						X			X
Preservation of culture	X				X		X		
Healthy ecosystem						X		X	
Carbon neutrality, climate & disaster resilient						X		X	
Quality education & skills				X					X
Food & nutrition security									X
Infrastructure, communication & public services			X			X			
Gender equality	X			X		X			
Productive & gainful employment			X			X			X
Corruption reduced						X			
Vibrant democracy & decentralization						X			
Healthy & caring society	X	X					X		
Sustainable human settlements					X		X		X
Effective justice services	X					X			
Sustainable water		X						X	X

Source: The 12th Five-year Plan

Figure 31 Flagship programs for the 12th Five-Year Plan

	Flagship programme	Lead agency	Budget (million Nu.)
1	Water	National Environment Commission	3,000
2	Digital Drukyul	Ministry of Information and Communication	2,557
3	Startup and CSI	Ministry of Economic Affairs	1,200
4	Tourism	Tourism Council of Bhutan	1,566
5	Organic	Ministry of Agriculture and Forestry	1,000
6	Provisions for other flagships	-	5,677
Total			**15,000**

Source: The 12th Five-year Plan

3.1.3. Digital Drukyul

Digital Drukyul is one of the flagship programs of the 12th Five-Year Plan. The aim is to harness the power of ICT to transform Bhutan into a smart and inclusive society. According to

the plan of the program, the Bhutanese government has invested BTN650 million (approximately JPY1 billion) to build a domestic fiber-optic network. Telecommunications carriers have also worked to popularize mobile phone connections under the supervision of BICMA and MoIC. As a result, 97% of households today own mobile phones (64.6% use smartphones) [20]. Based on this foundation, more than 100 public services have been digitalized or mobile, and the Bhutan Immediate Payment System (BIPS), an online payment system between banks, has been implemented.

Digital Drukyul aims to further develop the digitalized efforts accumulated over the years and achieve digital transformation in public service delivery. In particular, the health, education, and economic (business) sectors are the prioritized areas where digitalization can be expected to significantly improve services, based on the current awareness of social issues in Bhutan.

Figure 32 Focused areas in Digital Drukyul

Sector	Recognition of current issues and concerns	Initiatives in Digital Drukyul
Health	There is no ePIS or record system implemented in any of the health facilities in the country, which could potentially be contributing to the high costs of healthcare services.	Improving the quality of health through the implementation of ePIS in all hospitals down to the district level which is expected to enhance the quality of healthcare.
Education	The learning gap outcomes in education continues to be a subject of debate and deliberation for policy makers, academia, parents, and children.	All schools will be provided with usable connectivity and empower teachers to leverage digital content to enhance teaching learning outcomes across the country through Digital Schools.
Economy (Business)	Despite the growth of the business sector accelerated by trade and industry, the processes are still seen as cumbersome and impeding.	Improve citizens' satisfaction of public services through end-to-end integrated online citizen services, integrated online business licensing and online single customs-trade approvals that is expected to free up millions of productive mandays back to [the citizens].
ICT infrastructure	[The] fixed broadband connections is just over 2.1%, while [the] mobile broadband connections are over 84%. This translates to lower average speeds that citizens ultimately experience.	Providing high speed connectivity using reliable fiber optics wherever possible and other WiFi technologies where not possible

Source: developed by the survey team based on the Digital Drukyul blueprint material

The program consists of the following seven components. Many components are expected to be in the final stage of system development as of February 2021, although there are some delays due to the urgent response to COVID-19 in 2020 particularly regarding MoH-managing items.

[20] From the Digital Drukyul blueprint material

Figure 33 Components and progress of Digital Drukyul

Component	Budget (million Nu.)	Budget allocation (%)	Competent authority	Progress status (as of February 2021)
Digital Identity	450	17.6	Department of IT&Telecom, Ministry of Information and Communication	■ Finalized drafting Electronic Signature Rules and regulation ■ Reviewed census and immigration data to be used ■ Recollecting all citizen biometric data through pilot project ■ In the process of identifying the experts to develop the Digital Identity Solution
Integrated Citizen Services	150	6.0	Public Service and Grievance Redressal Division, Cabinet and Dzongkhag Development Commission	■ Government-to-Citizens (G2C): Completed BPR for 10 key services ■ Tender formalities in progress for developing the re-engineered system ■ Parallel Corpus(DDC): Translating common English texts to Dzongkha. Translated 16,000 sentences, Translation under progress to translate 300,000 sentences
Digital Schools	66	2.5	Ministry of Education	■ Learning Management System: System development completed and online testing & preparation for hosting under progress ■ Education Management Information System: System is under development. Delayed due to national lockdown
Electronic Patient Information System (ePIS)	500	19.6	Ministry of Health	■ Some delays due to the COVID-19 pandemic ■ At the final stage of completing the tender formalities
Government Initiated Network	925	36.2	Department of IT&Telecom, Ministry of Information and Communication	■ Fiber connection: 240 Offices are connected to the government's fiber optic backbone network ■ Druk Research and Education Network (DrukREN): Tendering formalities completed for some of the equipment/under progress for few equipment ■ Ring Closure: Out of 4 rings, 1 connected, 1 under progress
Enhancement of ICT Sector's Capacity and Capability	156	6.1	Department of IT&Telecom, Ministry of Information and Communication	■ Provided online training for ICT professionals (95 in total) ■ First draft of guidelines for the certification of ICT professionals inline with ISO/IEC 17024 (International Standard for Personnel Certification) ■ Completed the development of training materials for digital literacy and advocacy for online services
e-Business	280	11.0	Ministry of Economic Affairs and Department of Revenue Customs	■ Business Licensing Process Transformation: Process alignment in progress ■ e-Registration platform is under development by UNCTAD and recently completed an online training
(Program Management)	30	1.2	Department of IT&Telecom, Ministry of Information and Communication	—

Source: developed by the survey team based on the Digital Drukyul blueprint material and materials for interviews with MoIC on February 26, 2021.

3.2. 21st Century Economic Roadmap

3.2.1. Background and process

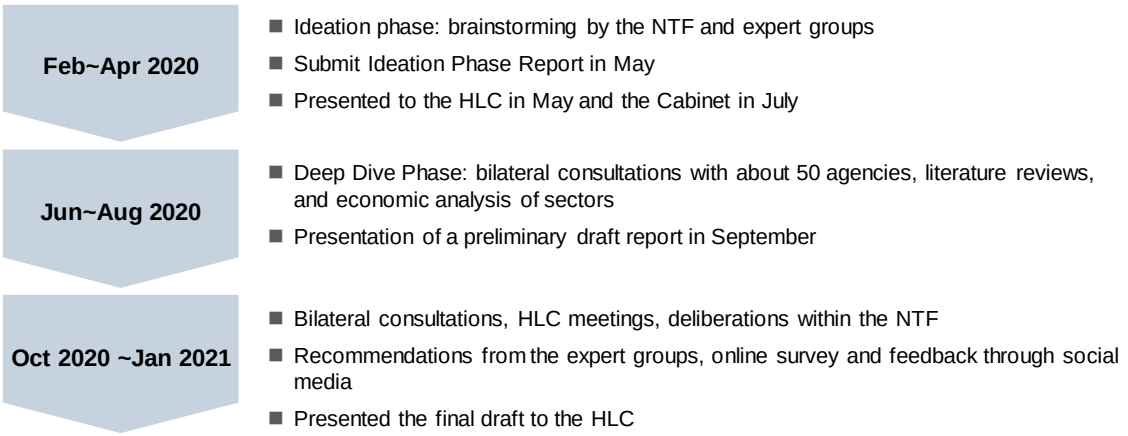
On 17 December 2019, at the 112th National Day of the second year of the 12th Five-

Year Plan, His Majesty the King delivered a speech that included the following messages.

The world is changing rapidly. We can't afford to avoid what we don't yet understand and hope for the best. Such an attitude will cost us our national objective of self-reliance. We have to create economic opportunities for the next generation. It's time to recalibrate ourselves to succeed in the fast-paced world. The government, lawmakers, the private sector, the people, and experts in various fields must work collectively to chart out a clear economic roadmap for the 21st century- this will help every individual and entity to understand their respective roles and work towards a common national objective. "

This speech strongly emphasized that now is the turning point for Bhutan to survive in the 21st century, and an unprecedented governance structure was introduced to prepare a roadmap to guide Bhutan's future. Firstly, a High-Level Committee (HLC), which includes all political party representatives and the heads of the three branches of the Government and the constitutional bodies, was established. Secondly, the HLC constituted a National Task Force (NTF), mostly composed of private-sector members with diverse expertise. The final draft of the roadmap was completed on 15 March 2021, after the following phases.

Figure 34 Process for formulating the 21st Century Economic Roadmap



Source: developed by the survey team based on the 21st Century Economic Roadmap (Final Draft)

3.2.2. 21st Century Bhutanese economy illustrated in the roadmap

While acknowledging the achievements of its past efforts, such as significant poverty reduction, extension of life expectancy, and improvement of primary school enrollment rates, the roadmap pointed out that it cannot overcome the pressing issues if Bhutan stays with the achievements.

Among the various challenges, youth unemployment and related social issues are highlighted. The unemployment rate of 3.4% in Bhutan is not remarkably high, but it stands out

at 15.7% among young people aged 15-24, especially among those with educational status equal to or higher than diplomas and bachelor's degrees[21]. This trend is believed to be exacerbated by the recent economic impact of the COVID-19 pandemic. In addition, there is concern that the labour force participation rate has been declining from 68.6% in 2010 to 62.6% in 2018. The labour force participation rate indicates the ratio of employed persons and unemployed persons (those who are seeking jobs) to productive population. In other words, this decline indicates that job seekers are exiting from the labour market itself (i.e., a decrease in the willingness to work).

A factor behind this is Bhutan's industrial structure. In Bhutan, agriculture absorbs more than half of the workforce, but agriculture accounts for a smaller share of GDP. Secondary industries, which contribute the most to GDP than agriculture, account for the smallest share of the workforce. This asymmetry of employment and GDP is a characteristic of developing economies in the midst of structural changes, but the fact that the growing sectors does not generate sufficient employment results in the low productivity of the economy as a whole. As one proof, Bhutan's Total Factor Productivity (TFP)[22] growth rate was 1.08% between 2008 and 2014, which had long been less than 1%.

On the other hand, the world surrounding Bhutan is changing definitely and rapidly. With the evolution of various types of automation and AI through technological innovation, traditional employment is being replaced and the ability to cope with diversification and customization is becoming more and more important. In Bhutan, the creation of future employment, wealth and competitiveness is driven by the development of human resources with diverse expertise who can survive under the global megatrend. This means improving the quality of the individual workforce and, at the same time, shifting the workforce appropriately to high-growth sectors.

Based on the recognition above, the roadmap stated that Bhutan have to make a major transition of an economic structure that promotes private sector growth, and set a goal of reaching per capita income of USD12,376 by 2030, the threshold level for high-income countries. This will require GDP to grow from about USD2.5 billion at present to about USD10 billion, four times the current level, and an average annual growth rate of as much as 14% over the next decade. In order to realize this, Bhutan should focus on creating an environment that fosters the capabilities of young population who will lead the future and seeks economic opportunities through the use of new technologies. The following five strategic priorities have been identified.

a. Build a strong and inclusive economy by promoting a dynamic and engaged private sector
b. Improve the regulatory environment through an effective but facilitating bureaucracy
c. Bridge the technological divide within Bhutan and with the frontier to support innovation, creativity and enterprise
d. Build a knowledge-based society through a strong education system and technology

[21] The roadmap refers employment statistics for 2018 as the latest figures.
[22] TFP is a qualitative factor of production that cannot be measured by quantitative factors such as labour and capital. This means long-term technological progress and improvement of efficiency of production.

e. Reap the demographic dividend by instilling a culture of hard work, dynamism and excellence in whatever we do

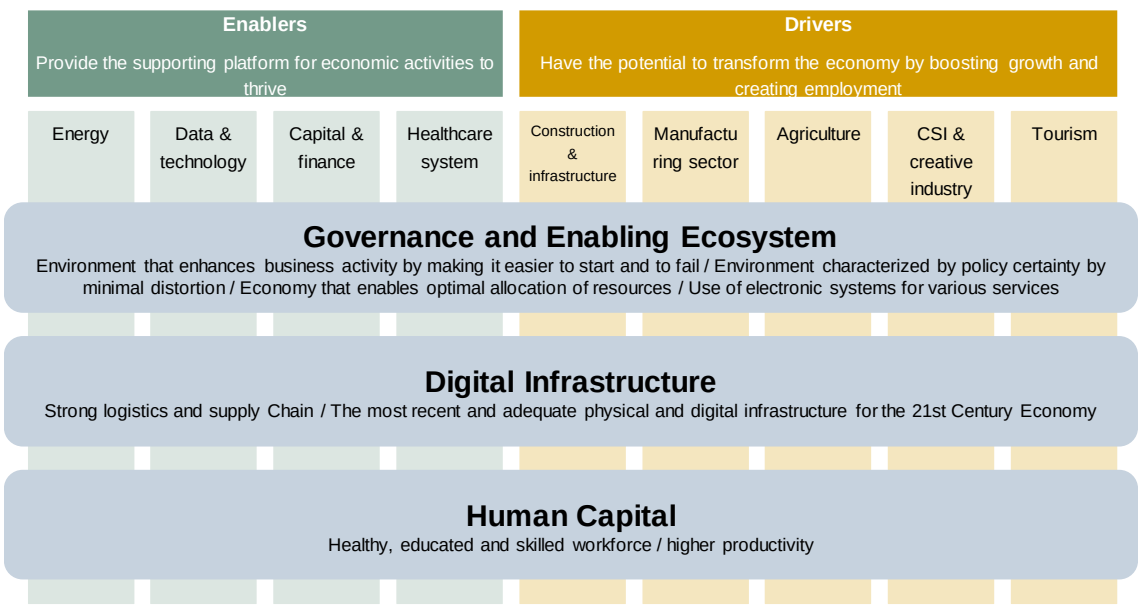
3.2.3. Transformation of Bhutan toward the realization of the roadmap

In order to achieve the above growth targets, it is estimated that investment of as much as BTN2 trillion will be required over the next 10 years. With previous government budgets, BTN300 billion could be financed by the government, but the remaining BTN1.7 trillion investments need to be financed by the domestic private sector or FDI.

Encouraging such large-scale private investment requires a transformation that is not just a collection of individual improvements. The biggest point toward the realization of the roadmap is that the relevant government agencies will not move into silos and overlook the interrelationships between sectors. In this regard, it is admitted that the current 12th Five-Year Plan is proceeding with a fairly sectoral approach, and proposed that a clear narrative to connect each dot should be formed in order for the current plan to produce better results.

Therefore, interventions are considered by the combination of three common lenses (Governance and Enabling Ecosystem, Digital Infrastructure, and Human Capital) and economic activities roughly divided into Enabler (providing a platform to support economic activities) and Driver (sectors that have the potential to transform the economy by boosting growth and creating employment).

Figure 35 Viewpoints of interventions in the 21st Century Economic Roadmap



Source: developed by the survey team based on the 21st Century Economic Roadmap Final Draft

The fundamental principle for considering all interventions are: a shift in the governance

such as “allow first, and regulate later” and “generally allowed unless explicitly disallowed,” an operational design based on “Digital by Default,” and a mechanism to actively create innovation through the “Sandboxing” approach[23]. These institutional reforms are supported by the three types of digital infrastructure shown in the table below and the educational system with technical and vocational education and training (TVET) as the main stream.

Figure 36 Three necessary digital infrastructures to achieve the roadmap

Type of infrastructure	Description
Physical infrastructure	■ Affordable and fast connectivity ■ Rolling out 5G ■ Data Centers ■ Smart Cities ■ Internet of Things (IoT) and data (usage of devices and access to data)
Virtual infrastructure	■ Cloud infrastructure ■ Syncing cloud and physical infrastructure
Organizational infrastructure	■ National Digital ID ■ Conducive regulations (privacy, data sharing, intellectual property rights, content moderation) ■ IoT (Mechanism for analyzing and utilizing data) ■ Capability (technology education and research) ■ Leveraging the platform economy

Source: developed by the survey team based on the 21st Century Economic Roadmap Final Draft

The specific measures of individual sectors also show the attitude unconstrained by existing methods. For example, in the field of ICT, they acknowledge the insufficient domestic human resources and propose a new work visa for the global digital nomads in order to utilize foreign human resources in the short to medium term. Regarding financial system, collateral-based loans have long been the mainstream, but the roadmap suggested financing based on prospects for future cash flow for creating an environment that makes it easier for SMEs and entrepreneurs to raise funds. In addition, a willingness to actively introduce new financing schemes including VC, private equity funds, and decentralized finance in virtual currencies is presented. In terms of industrial development, it also mentioned exemption from customs duties and Goods and Services Tax (GST) on raw material imports to improve the competitiveness of the manufacturing sector. In the area of healthcare, which is provided for free under the Constitution, there is a possibility of systematic reforms such as cost sharing and full-scale private-sector participation in order to sustain the provision of services in the future, as well as the introduction of new services such as delivery of medicines to remote areas by drones.

[23] The Royal Monetary Authority (RMA)'s Regulatory Sandbox for Fintech Guidelines are presented as an example.

3.3. Consideration of the Government of Bhutan's Efforts to Address the Core Issues

Despite the difficulty of geographical conditions and neighborhood diplomacy represented by China's occupation of Tibet in 1959, Bhutan has steadily modernized itself in accordance with its five-year plans since the 1960s. Especially since the 1980s, Bhutan has developed a unique development philosophy of GNH and pursued development most-suited for Bhutan, which was leading to the improvement of various development indicators. However, their recent policies show the GoB's strong will of not clinging to its achievements in the past, but maintaining Bhutan's uniqueness and making the country a more prosperous in a rapidly changing world.

The 12th Five-Year Plan selected flagship programs to be focused on in order to consolidate the socioeconomic infrastructure for sustainable growth after graduation from LDC. In particular, Digital Drukyul, which secured the second largest budget after the water sector, is expected to bring digital transformation as an indispensable measure to greatly improve the quality of life and revitalize economic activities.

On the other hand, the 21st Century Economic Roadmap, which was formulated during the latest five-year plan period, has revealed the importance of the fundamental restructuring of social modalities and systems that go beyond the mere utilization of cutting-edge technologies. This is evident in the "agile" approach, which seeks to introduce new technologies and services smoothly by accumulating trials rather than regulating, as well as in the non-sanctuary considerations of immigration, finance, taxation and healthcare. This approach is almost unprecedented in other countries, and there may be arguments for and against it in Bhutan as a means of forcing the people to make a dramatic change. However, it will be promoted under the powerful leadership of His Majesty the King and the national leaders who responded to the message.

The Roadmap describes the direction of Bhutan's economic policy over the next 10 years. At present, many measures have been proposed for each sector. The detailed implementation plan will be entrusted to the GNH Committee and the relevant agencies, but the challenges in implementing the plan are as follows.

A) Consideration of specific actions
   - How can we create a process toward a knowledge-based economy through digital transformation? Can we take the same measures as those taken in other preceding countries in digital transformation? What kind of action can be a trigger to lead the way toward the future goal?

B) Selection and concentration
   - Within constraints on financial and human resources, what will be addressed and to what extent, and how to prioritize when investments are focused on some specific areas?

C) Balance between cultural preservation and knowledge imports
   - The culture of Bhutan is a national bond. In the past, Japan actively adopted the

state-of-the-art systems and technologies of Europe and the United States under the slogan of "Japanese spirit with Western Knowledge," and cultivated and grown its own technologies. How can Bhutan foster the private sector with the idea of “Bhutanese spirit with foreign knowledge” and how can Japan support this?

In the following chapters, we will examine what specific actions can be developed to support the realization of the growth that the GoB is aiming for, based on the “Core Issues of Bhutan” described so far and the related efforts by the GoB, taking into account Japan's experience and strengths.

4. Direction of Action

4.1. Transformation of Bhutan's Industrial Structure

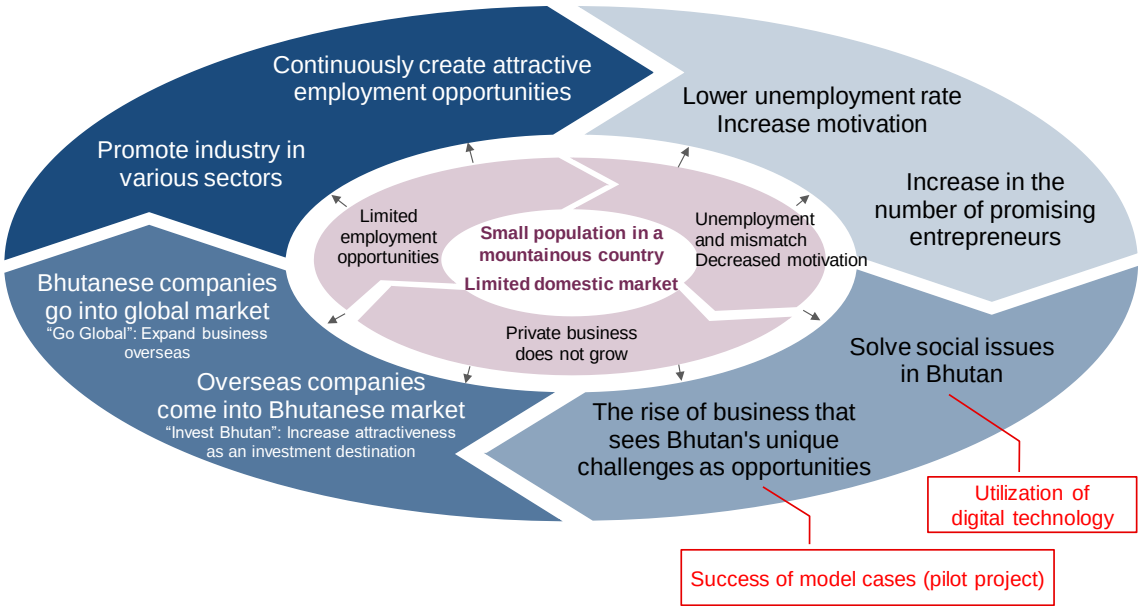
4.1.1. Shift from a negative spiral to a positive spiral

Bhutan has a bottleneck in that the size of the domestic market is limited and the development of industrial infrastructure is costly due to the geographical constraints of steep mountainous terrain and the small and dispersed population. This makes it difficult to develop private industries and there is a lack of attractive job opportunities. This has resulted in unemployment, mismatches, and low motivation among young people and an increasing tendency to seek stable employment in the public sector. As a result, a negative spiral is occurring that is inhibiting the creation of new industries. In order to develop Bhutanese industry and create an environment where attractive employment opportunities can be sustained, it is necessary to break out this negative spiral of the industrial structure and shift it into a positive spiral. As mentioned earlier, the 21st Century Economic Roadmap points out the necessity to fundamentally restructure social modalities and structures, and now is the time for us to shift to a positive spiral.

The transition to a positive spiral cannot be achieved overnight, but it is only here that Bhutan's strengths can be realized. In other words, because Bhutan has a high degree of trust in the royal family and the government, and effective governance, the country is well-positioned to think from scratch and quickly implement in society what cannot be done in larger countries because of strict regulations and vested interests. The commitments of the Bhutanese government expressed in the 21st Century Economic Roadmap strongly support this.

In the “consideration of specific actions”, as pointed out in the previous section, we would like to propose a direction for solving problems using digital technology based on the idea that Bhutan's unique bottleneck is a business opportunity. In other words, pilot projects in promising areas will be examined in order to create successful examples (model cases) that will become the catalysts. In Bhutan, where public works are the mainstay of the economy, the success of businesses in the private sector that have adopted digital technology is expected to create a tidal wave of private-sector-led businesses and strongly support the shift to a positive spiral.

Figure 37 Shifting from a negative spiral to a positive spiral



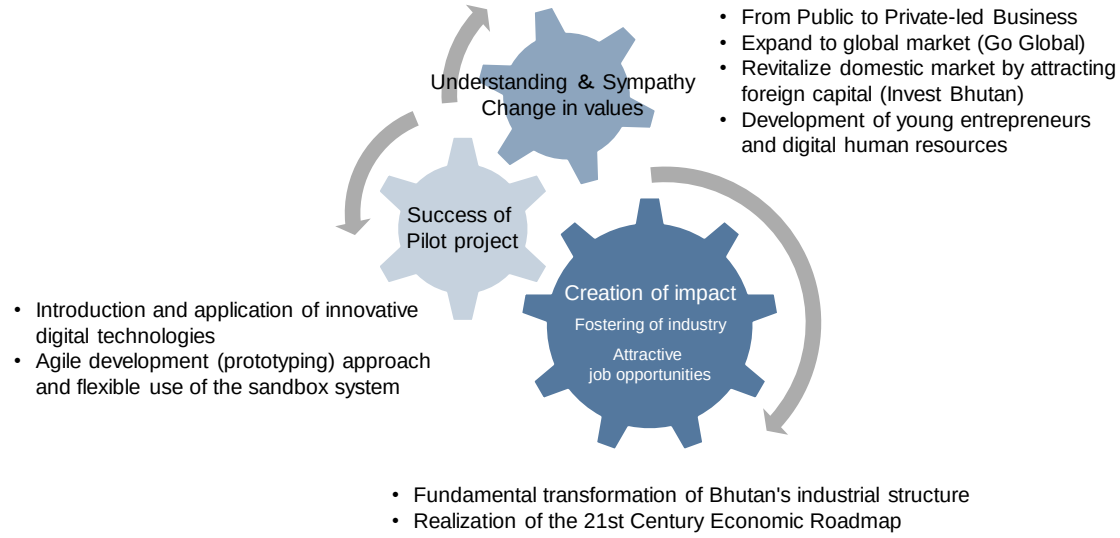
4.1.2. Attitudes and values to be pursued

Before taking specific actions, it is necessary to carefully demonstrate to all stakeholders that the bottleneck unique to Bhutan has been solved and that the future of new industry development can be seen on that occasion, and to gain understanding and sympathy. In other words, supporting Bhutan's business activities that contribute to solving social and development issues will have an impact on the creation of attractive employment opportunities, and will greatly contribute to the realization of the 21st Century Economic Roadmap. The main directions for these efforts are to break away from dependence on public works projects and foster industries centered on private sector-led businesses, to promote the entry of Bhutanese companies into international markets (Go Global), and to develop the industrial infrastructure so that Bhutan can become an attractive market as a demonstration of the business of foreign companies or as a place for business expansion (Invest Bhutan). In addition, it is necessary to consider human resource development for young local entrepreneurs and digital human resources, as well as the formation of the ecosystem surrounding them, in order to create a sustainable momentum that does not end temporarily with positive spiraling.

Leading a pilot project to success by utilizing innovative digital technologies is a challenge that cannot be reached with a waterfall approach based on conventional wisdom and precedents. This is where values such as "allow first and regulate later" and "generically allowed unless explicitly disallowed" are important, and it is essential to attempt to create new industries through an agile development (prototyping) approach. In addition, for the social implementation of innovative technologies and business models, it is necessary to flexibly operate and utilize the sandbox system of regulations. The continued promotion of these approaches will require understanding, acceptance and support of the new values not only by policymakers but also by

society as a whole.

Figure 38 Attitudes and values toward creating impact



4.1.3. Creation of model cases and formation of a digital ecosystem through pilot projects

In the pilot project, efforts will be made to realize the values of Go Global and Invest Bhutan. We propose pilot projects in four areas: (1) Drone logistics and (3) Support for entrepreneurs, as measures to realize Go Global, and (2) Medical and health data infrastructure and (4) Improvement of entrepreneurial environment (Digital currency), as measures to realize Invest Bhutan. These are the areas of great significance for JICA because it will contribute to solving social and development issues in Bhutan, and because there is a need (market) for such industries in the world.

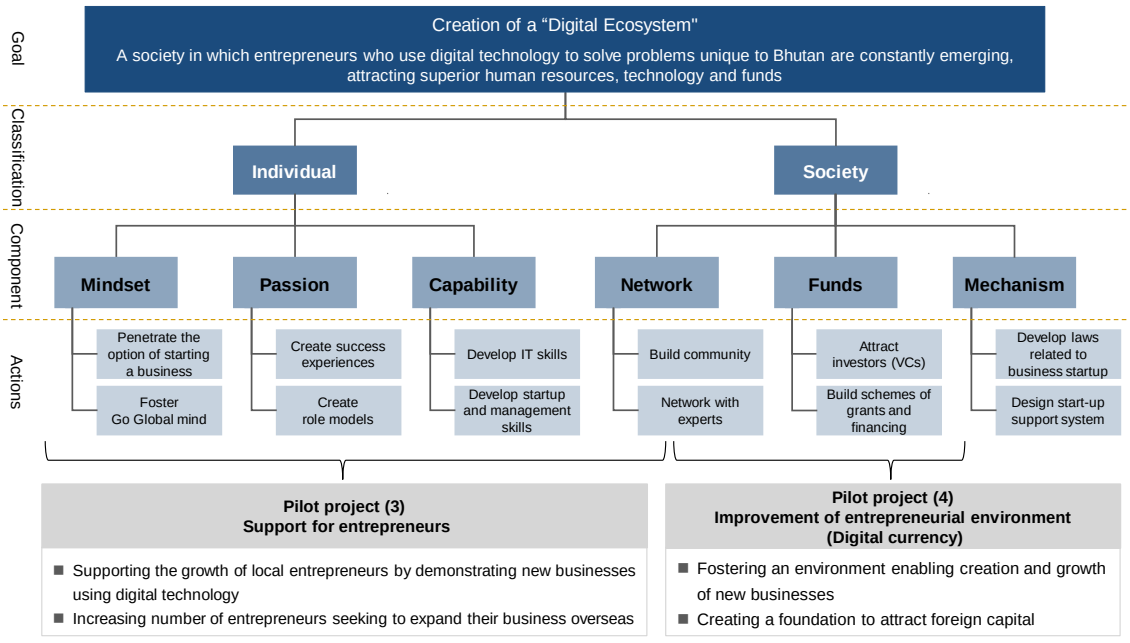
"(1) Drone logistics" and "(2) Medical and health data infrastructure" are projects focused on creating model cases of Go Global and Invest Bhutan centered on the utilization of digital technology by Japanese companies. These are expected to create an impact not only on solving social issues through digital technology but also on industrial development and job creation. If such businesses are implemented from scratch and the ideal situation is realized in Bhutan, it has the potential to become a "moonshot" driving positive spiral. It is no exaggeration to say that a flexible response to laws and regulations will affect the success or failure of each project. We would like to proceed with the study by flexibly utilizing the sandbox system based on the aforementioned agile development approach. The background of each project and the detailed basis for the proposal are described in 4.2.1 and 4.2.2.

Figure 39 Positioning of pilot Projects (1) and (2)

Pilot project	Reason for selection (expected impact)	
	Solving social issues	Industrial development and job creation
(1) Drone logistics	■ Overcoming various access issues caused by geographical constraints (e.g. improving availability of goods such as pharmaceuticals and daily necessities)	■ Development of internationally competitive industries (model case of Go Global) ■ To generate new logistics demand and create employment opportunities ■ Accelerate the domestic economy as an infrastructure that contributes to the development of other sectors
(2) Medical and health data infrastructure	■ Solving medical and health-related problems (e.g. prevention and treatment of infectious and non-infectious diseases, establishment of an autonomous health system, reduction of medical expenses)	■ Accelerate the entry, investment, and product/service development in Bhutan by foreign companies through developing the medical and health data infrastructure as a common asset for all humankind (model case of Invest Bhutan).

On the other hand, the pilot projects of (3) Support for entrepreneurs and (4) Improvement of the entrepreneurial environment (Digital currency) aim at fostering Bhutan entrepreneurs and developing the financial infrastructure that serves as the foundation for the ecosystem, so that projects like the model case can be created in a sustainable manner. Through these projects, entrepreneurs who use digital technology to solve problems unique to Bhutan are constantly emerging, aiming to form a "Digital Ecosystem" that develops by attracting superior talents, technology and funds.

Figure 40 Positioning of pilot projects (3) and (4)



4.2. Plan for Pilot Projects

4.2.1. Drone logistics

< Summary >

The main objective of this pilot project is to build a drone logistics network to ensure stable and resilient logistics, including in remote areas of Bhutan. The government will aim to revitalize Bhutan's economy by overcoming unique geographical issues, improving access to medical supplies and daily necessities, and promoting industrial development in various sectors centering on the drone logistics industry. In addition, it would be possible to create attractive employment opportunities by collaborating with Japanese drone companies that already have strong track records in Japan and overseas, because the Japanese companies can transfer their drone technology and develop local operators. If Bhutan is recognized as a drone developed country, it can be expected to attract foreign investments and innovative technologies.

Figure 41 Pilot project outline (Drone logistics)

Pilot Project (1): Drone logistics	
Why Drone logistics?	■ **Overcoming geographic challenges:** Potential to solve access issues in remote areas due to steep mountainous and inadequate road networks (using unique issues as "business resources" and "opportunities") ■ **Typical industrialization of Go Global**: Potential to become an internationally competitive industry that can be expanded to other countries (there are few successful examples of drone logistics businesses in the world, so it will lead to branding as a unique industry in Bhutan) ■ **National policy support:** Promotion of the drone business has been incorporated into the government's development plan, and local startup companies have begun considering the business. ■ **High interest from Japanese companies:** They expect that there are potential needs that match the drone business and have high motivation to develop business in Bhutan.
Impact created	■ **Overcoming various access issues** caused by geographical bottlenecks (improving the availability of goods such as medicines and daily necessities) ■ **Revitalization of economy and creation of employment opportunities** enabled by the drone logistics industry ● Creation of new demand and employment opportunities in the drone industry ● Promotion of industrial development in various sectors through the drone logistics infrastructure ● Revitalization of the drone industry through the inflow of foreign capital and technology (acceleration of the Invest Bhutan trend) ● Promotion of value transformation among entrepreneurs as a Go Global model case
Draft concept	■ Construction of a drone logistics network ● Location: Connecting remote areas with significant access issues with urban areas ● Goods: (1) medical supplies, (2) daily necessities and educational supplies ● Competitive advantage: Rapidity, on-demand, low initial cost (vs. ground or helicopter transportation) ● Major issues to be overcome: deregulation, business profitability, flight at high altitude and in bad weather ■ Proposed project plan: Verify the feasibility of the project by transporting medical supplies, which are in high demand in society, in locations with low technical hurdles. At the same time promote deregulation. Expand the use cases and service areas according to the regulatory environment and the technical progress.

< Why drone logistics? >

Bhutan has the inherent geographical bottlenecks of access, and the GoB has been promoting a digital promotion policy under the concept of Digital Drukyul in order to solve this social issue through the use of digital technology. In particular, NKRA in the 12th Five-Year Plan aims to reform logistics using ICT, and "Project for Formulation of Comprehensive Development Plan for Bhutan 2030" aims to use unmanned aerial vehicles (UAVs) or drones. Drones can efficiently build logistics networks without developing large-scale infrastructure such as roads

and railways, so there are high expectations as a solution to physical access improvement. The GoB has been considering drug delivery to remote areas as an action for the 21st Century Economic Roadmap. In addition to the potential of drones and the national policies, there is a high possibility of growth as a representative industry of Go Global and the interest of Japanese companies. Therefore, we propose a pilot project centering on the building of a drone logistics network.

The global drone logistics market is expanding, projected to grow from US$500 million in 2020 to US$39 billion in 2030, with the compound average growth rate (CAGR) of 53.8%[24]. Through this pilot project, Bhutan can accumulate capabilities in the drone logistics business and export business model to countries facing similar problems.

< Impacts and prospects >

The construction of a drone logistics network is expected to improve access to goods such as medical supplies and daily necessities, and realize economic revitalization and creation of employment opportunities with the drone logistics industry. It would be better to consider the transportation of medical supplies first, in terms of what is to be carried by drones (use cases). This is because it is more possible to obtain the understanding of the GoB and the general public from the viewpoint of high public contribution to people's health. In terms of economic, it is advantageous to transport high value-added goods because of the considerable cost per flight at present. That's why cases have been accumulated in other countries from the transportation of medical supplies. The perspectives for identifying use cases are shown in the figure below. Since there are reports that more frequent flights in response to diverse use cases could increase the profitability of the business, the expansion of the scope of transportation to daily necessities should be considered as a future scale-up project.[25]

[24] MarketsandMarkets, "Drone Package Delivery Market," Available at: https://www.marketsandmarkets.com/Market-Reports/drone-package-delivery-market-10580366.html (accessed June 25, 2021)

[25] JSI Research & Training Institute, Inc., What should you deliver by unmanned aerial systems? (January 2018), Available at: https://publications.jsi.com/JSIInternet/Inc/Common/_download_pub.cfm?id=19145&lid=3 (accessed June 28, 2021)

Figure 42 Perspective for identifying use cases

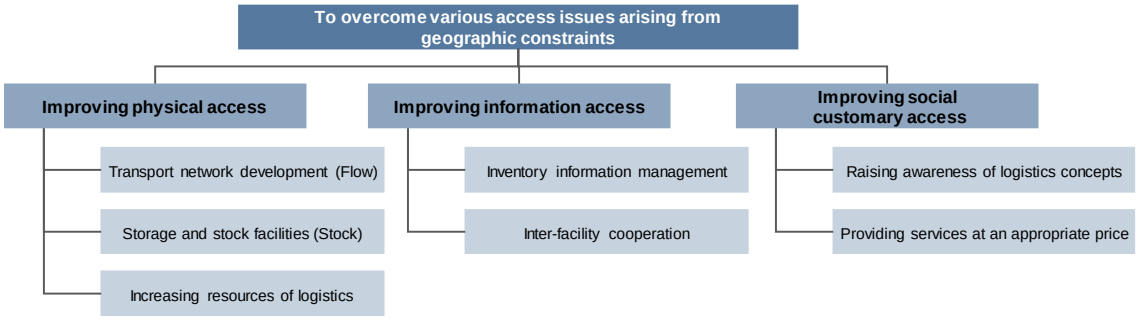
	Politics, policies and regulations	Business	Marketability	Technology and infrastructure
Medical supplies	**(+) It is more public and possible to obtain the understanding of the government, people and the general public.** (-) Need licenses for the delivery of medical supplies	**(+) As a high-value-added commodity, there is a high possibility of building a sustainable business model (although it may be a public project rather than a private business)**	**(+) Public contribution and great social impact** (+/-) Experience benefits without people's logistics concept (high acceptability)	(+/-) Use the drone's benefits such as speed, on-demand, and non-face-to-face access (+/-) Easy to get inventory information
Daily necessities, Educational materials	(+/-) Discussion from the viewpoint of constructing a distribution network	(-) Difficulty of recovering transportation costs from people (Affordable pricing)	(+) **Large number of beneficiaries and high impact on society**	(+/-) Use the drone's benefits such as on-demand delivery and frequent delivery (-) Difficult to manage information of inventory and demand
Local specialties	(+/-) Discussion from the viewpoint of constructing a distribution network	(-) Difficulty of recovering transportation costs from people (Affordable pricing)	(-) Limited market size and demand volume depends on the season (-) Need to raise awareness of logistics concepts	(+/-) Use the drone's benefits such as on-demand delivery

Impact on business feasibility: (+)Positive, (+/-)Neutral, (-)Negative

< Issues and roadmap >

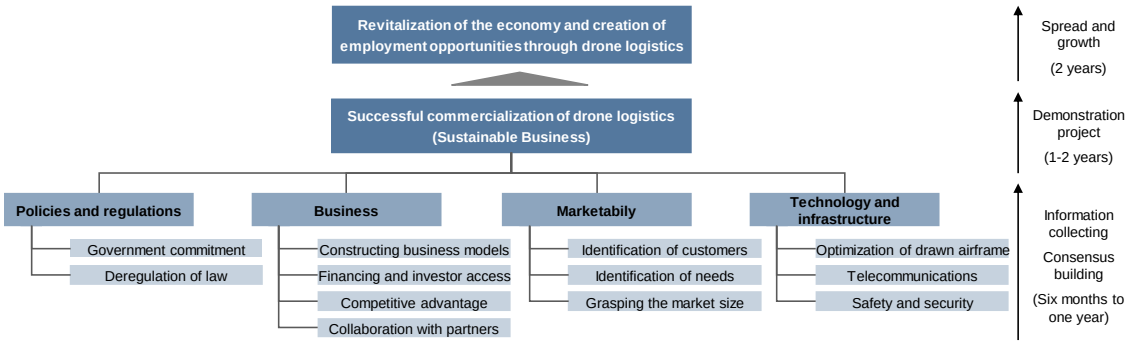
In order to overcome access issues due to geographical constraints, it is necessary not only to overcome physical barriers, but also to resolve issues from various perspectives such as information exchange and enlightenment of logistics concepts. In particular, the development of logistics network is effective as a fundamental improvement measure for physical access, and it is expected that the use of drone will contribute to the creation of impact in a short period. Therefore, the development of logistics network will be prioritized in this pilot project.

Figure 43 Important elements for solving access issues



In order to overcome geographical access issues, it is important to solve each of the above problems and establish a pilot project as a business. The factors for successful commercialization and the perspectives of research related to these are shown in the figure below. It is envisioned that it will take six months to a year to examine the information on each issue and build consensus, and then the demonstration project will be conducted for one to two years before moving on to the phase of expanding the business.

Figure 44 Key elements for the success of the pilot project and viewpoint of the survey (Drone logistics)



Politics, policies and regulations	■ **Government commitment**: cooperation and support from relevant government agencies such as MoIC, BCAA, MoHCA, and MoH etc. ■ **Deregulation**: deregulation of the General Aviation law and other regulations, permission for private companies, special permission for logistics, deregulation of flight zones, etc.
Business	■ **Build a business model, funds, investments**: establish a sustainable business model (pricing, revenue flow, etc.), procure initial capital ■ **Competitive Advantages**: alignment with existing logistics systems such as helicopters and car transport ■ **Cooperation and Partnerships**: participation of Japanese companies as business implementor, appropriate cooperation with local partners
Marketability	■ **Identification of customers**: medical institutions/educational institutions/residents/others, areas for a pilot project (flight areas) ■ **Analysis of challenges and needs**: medical supplies (ex. samples (blood, sputum, wiping, etc.), diagnostic reagents, rapid test kits, gauze, alcohol, drugs, vaccines, etc.), daily necessities, educational materials, local specialties, etc. ■ **Understanding market size**: size of logistics market, estimation of replacement rate to drone logistics, new demand estimation of drone logistics
Technology and infrastructure	■ **Optimization of drone aircraft**: development of drone aircraft optimal for local climate and topography, battery development, cost reduction ■ **Telecommunications and Power Infrastructure**: securing LTE networks and power sources, minimum IT literacy ■ **Safety and security management**: establishment of safety management and data security management systems and procedures for drone flight

In terms of policies and regulations, the current drone regulations governed by the Bhutan Civil Aviation Authority (BCAA) are quite strict. Applications are limited to video and photography, surveying, telemedicine, cabling, agriculture and monitoring, and logistics businesses require special permits. The GoB has begun some pilot projects of survey and grid inspections, but there is no systematic pilot project of logistics. In addition, BCAA has not allowed private companies to make drone flights, and only applied to limited projects by the government and government-affiliated companies. Promoting government understanding and deregulation is the key to realize this project. For specific discussions, it is necessary to identify and organize items such as local needs, identification of customers, competitive advantages, and safety management, and propose this project as a sustainable business that benefits Bhutanese society.

Zipline, a drone-based blood transport company in Africa, explains why Rwanda was chosen as its first base as follows[26]. "*The main reason for choosing Rwanda is that the government is supportive of all new challenges, including healthcare*." They also mentioned "*And in this small, hillside, and poor infrastructure country, drones can deliver as fast as 10 times faster than*

[26] WIRED, "Flying Beyond Africa Skies Zipline," Available at: https://wired.jp/special/2017/zipline/ (accessed June 25, 2021)

conventional roads. Even a small number of delivery centers can cover a large part of the country." With regard to the government's support, they emphasized "*the regulations for unmanned aerial vehicle (UAVs) were also addressed much faster than in the United States. Even in the world's first attempt, they said, "try it out first and see if it works"*." In this pilot project in Bhutan, we aim to build a business model through an agile development approach based on the same values as Zipline and the Rwandan government, with the cooperation of the Bhutanese government. It is essential to share this viewpoints and approach with the government and to jointly study whether drone logistics can be demonstrated with medical supplies and scaled up to the distribution network including daily necessities.

< Stakeholders >

The potential stakeholders in this pilot project are as follows. In particular, it is necessary to propose a specific business model for what to deliver from where to where with how often, and how to build a business, and then seek to reach a consensus with GoB. Discussions on the deregulation should be made with MoIC and MoHCA, which are involved in the formulation of aviation regulatory policies, to consider feasible projects that balance the government's intentions with this proposal. It is also necessary to have discussion with local drone companies and other logistics companies to confirm the possibility of cooperation. The discussion with other government agencies and aid agencies will be held to consider how to scale up the project.

Figure 45 Things to be confirmed and adjusted with stakeholders (Drone logistics)

Stakeholder	Name and outline	Benefits	Incentive measures and matters to be checked and adjusted
Japanese firm (Candidate)	■ Company A (operator) ■ Company B (operator) ■ Company C (operator and manufacturer) ■ Company D (manufacturer) ■ Company E (manufacturer)	■ Contribution for solving development Issues ■ Accumulation of knowledge and evidence (implementation of PoC) ■ Challenge of reverse innovation ■ Trach record of business related to deregulation	■ Sorting out local needs ■ Restructuring existing logistics businesses ■ Development of financing schemes ■ Verification of technical hurdles ■ Promoting government understanding and commitments
Local government agencies	■ MoH ■ DoMSHI ■ MoIC、BCAA、MoHCA (MoE, Ministry of Work and Human Settlement, Department of Forests and Park Services etc.)	■ To overcome various access issues arising from geographical constraints (to improve availability of goods such as pharmaceuticals and daily necessities) ■ Revitalization of the economy and creation of employment opportunities through the drone industry ■ Getting foreign capital and technology transfers	■ Recognition and balance of local needs ■ Presentation of specific business models ■ Presentation of merits through collaboration with Japanese companies
Local partners (Candidate)	■ Company X ■ Company Y ■ Company Z	■ Projects for technology transfer and human resource development ■ Flight license support	■ Presentation of specific business models ■ Presentation of merits through collaboration with Japanese companies
Other	■ RBHSL (helicopter) ■ De-suung (civil volunteers) ■ Bhutan Postal Service ■ Telecommunications carriers ■ Residents	■ Supplementation of logistics network by emergency delivery ■ Solving social issues and improving access ■ Supplementing the distribution network with drone logistics ■ Increasing the use of communication lines ■ Improving access to social services	■ Restructuring existing logistics businesses and presentation of coexistence models ■ Presentation of specific business models ■ Presentation of expected number of communication line usage ■ Organizing and analyzing local needs and raising awareness of logistics concepts

< Expected support and cooperation from GoB and external organizations >

The consensus from the GoB on this pilot project and consideration of deregulations on drone flights is needed for promoting this project. In particular, discussions with relevant organizations such as MoIC, BCAA, and MoHCA are required to scrutinize the feasibility of private companies' participation and the simpler procedures of logistics business. Cooperation from the MoH and Department of Medical Supplies and Health Infrastructure (DoMSHI) is essential to investigate needs in terms of medical and healthcare, and deregulations of medical delivery.

< Survey results >

We sorted out the viewpoints and items of the survey in the four important areas for the success of the pilot project. And we have investigated them through desktop research, interviews with both Japanese and Bhutanese parties, and questionnaires to local residents. The survey items with viewpoints are as follows.

Figure 46 Survey items and method (Drone logistics)

(++): Focused research, (+): General research, N/A: Not applicable

Survey items		Survey methods		
Classification	Viewpoints	Desktop	Interview	Question naire
Politics, policies and regulations	■ **Government commitment:** promotion for understanding of MoH and DoMSHI, and to discuss deregulation with MoIC, BCAA, etc. ■ **Deregulation:** ● Understanding the General Aviation Law and other regulations (civil law, drug delivery regulation, biosafety, etc.), status of approvals for private companies, deregulation of flight areas and periods ● Identification of flight route, load, flight time, etc., and confirmation of application process for permission and necessary documents, etc. ■ **Coordination with other support agencies:** Confirmation of the progress and prospects of existing projects such as UNDP and UNICEF	(+)	(++)	N/A
Business	■ **Build a business model:** consider sustainable business model (pricing, revenue flow, etc.), and source of initial fund through collaboration with the GoB and existing logistics companies. ■ **Competitive Advantage:** Discussion with RBHSL and Bhutan Postal Service to develop complementary logistics services ■ **Cooperation and Partnerships:** Selection of Japanese business implementor and selection of local partners such as drone operators and logistics companies.	(+)	(++)	N/A
Marketability	■ **Identification of customers:** medical institutions/educational institutions/residents/others, areas for a pilot project (flight areas) ● Confirmation of access to health services through interviews with various organizations ● Conducting a questionnaire survey of the residents in the candidate areas ■ **Review challenges and needs:** ● Selection of delivery products through surveys of the GoB and the general public Ex. Medical supplies (ex. samples (blood, sputum, wiping, etc.), test reagents, rapid test kits, gauze, alcohol, medicines, vaccines, etc), daily necessities, educational materials, local specialties, etc. ● Confirmation of current status and issues of transportation of medical supplies (logistics companies, frequency of transportation, transportation time, temperature control, etc.) ■ **Understanding market size:** size of logistics market, estimation of replacement rate to drone logistics, new demand estimation of drone logistics	(+)	(+)	(++)
Technology and infrastructure	■ **Optimization of drone aircraft:** development of drone aircraft optimal for local climate and topography and battery development through collaboration with Japanese drone companies ■ **Telecommunications and power infrastructure:** Consultation with telecom operators, understanding and securing of LTE networks and power sources, and confirmation of IT literacy of related organizations and drone operators ■ **Safety and Security Management:** Establishment of safety management and data security management systems and procedures for drone flights through consultations with the government and Japanese drone companies	(+)	(++)	N/A

The results of the survey based on these perspectives are shown in the figure below. As mentioned above, the regulations on drone flights are strict, and there are obstacles to the entry of private companies. In addition, helicopters are used to transport goods and passengers to remote areas, which could compete with this pilot project. In the future, it will be necessary to discuss with Royal Bhutan Helicopter Services Limited (RBHSL), which handles the helicopter transportation, to find a way of collaboration. From the viewpoint of marketability, we were able to confirm that there was a considerable demand through a questionnaire survey of residents. However, it is necessary to examine whether it can be realized as a business from the perspectives of cost and technogies while carefully examining the frequency and location of transportation.

The results of the questionnaire are detailed in Appendix 6.6.2.

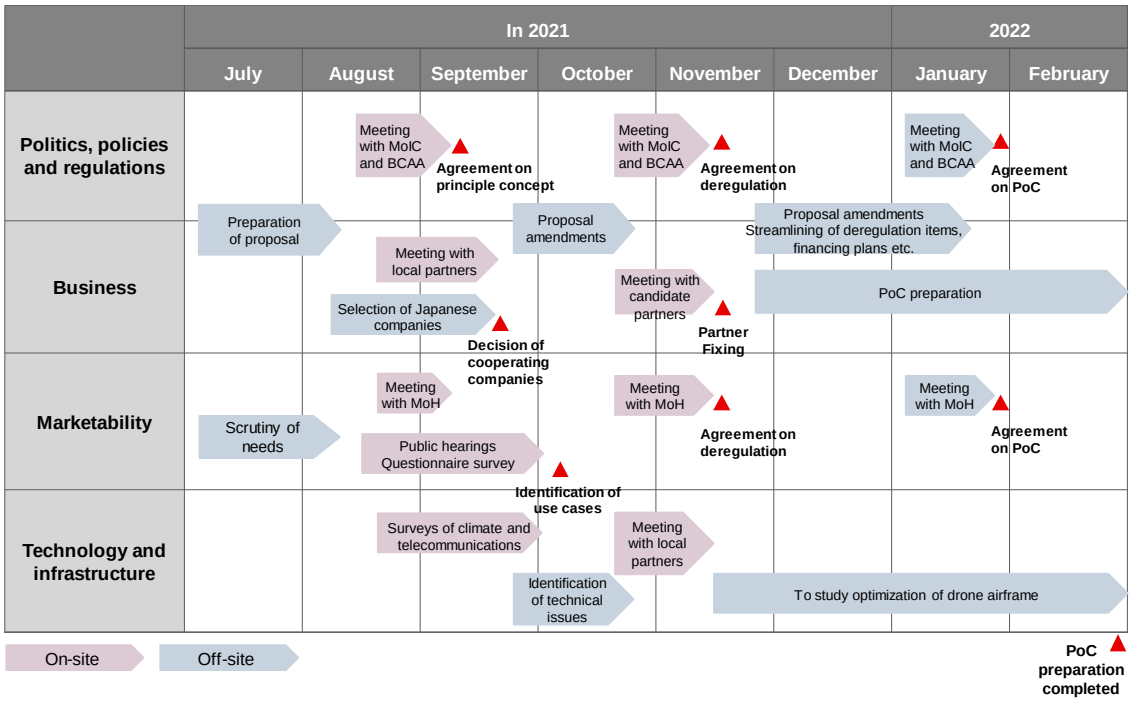
Figure 47 Survey results (Drone logistics)

Classification	Survey results
Politics, policies and regulations	■ **Government commitment:** Had interviews with MoIC and BCAA. MoIC responded positively that a pilot project for or in collaboration with the GoB is feasible. In the near future, we will present a specific proposal and discuss it with MoIC. ■ **Deregulation:** • In general, Bhutan's drone regulations are strict. The BCAA's "General Aviation Unmanned Aircraft System Operations" stipulates that drone flights shall be permitted only to government agencies, and there have been no cases in which BCAA has permitted drone flights to private companies. • To date, use of drones has been largely limited to research and study purposes. • The transmission grid inspection by a government-affiliated private company, a power company owned by a government agency, has been gaining approval of drone flight. Because the transmission grid is located in a forested area far from the city, and the drone inspection reduces time and labor costs rather than inspection by walk.
Business	■ **Build a business model:** Need for consultations with the GoB and existing logistics companies. Japanese drone companies suggested that it is necessary to consider the following: initial financing; economic rationality by transporting high value-added goods; and demonstration project that involves evaluation of the economic efficiency of drone logistics. ■ **Competitive Advantage:** Residents use of RBHSL for helicopter transport. Segregation of services is required. ■ **Cooperation and Partnerships:** Refer to Appendix 6 for details of interviews with local drone companies Y and Z.
Marketability	■ **Customer Identification:** There is a need for frequent transport according to the public questionnaire in candidate areas. Currently, the people mainly delivers daily necessities by horse or helicopter. Many residents take advantage of the free delivery by helicopter. ■ **Review challenges and needs:** ①Deliveries: High needs for daily necessities by residents. In remote areas, medicines are supplied for a year. When the stock runs out, residents order them from the regional hospital. In some cases, stock-outs occur, though not often. ②Transportation of medical supplies: Only basic medical equipment and medicines are stored in the village clinics (Out Reach Clinics), and their transportation capacity is low.
Technology and infrastructure	■ **Optimization of drone aircraft:** Development of drone aircraft optimal for local climate and topography and battery development ■ **Telecommunications and power infrastructure:** Need for consultation with telecommunications carriers. Local drone operators have high IT literacy and may cooperate as drone operators. ■ **Safety and Security Management:** It is necessary to establish a system and procedures for safety management and data security management related to drone flight.

<Next step>

The future survey schedule is proposed as shown in the figure below. Key milestones are discussions with the GoB like MoIC and BCAA, aiming to reach an agreement on the pilot project and on cooperation for the implementation of the Proof of Concept (PoC). It would be better to promote the preparation of the PoC by the first half of 2022. It continues to need to carefully examine the survey items sorted out in the previous section and promote discussions with relevant organizations and companies to build a business model for the pilot project.

Figure 48 Future survey plan (Drone logistics)



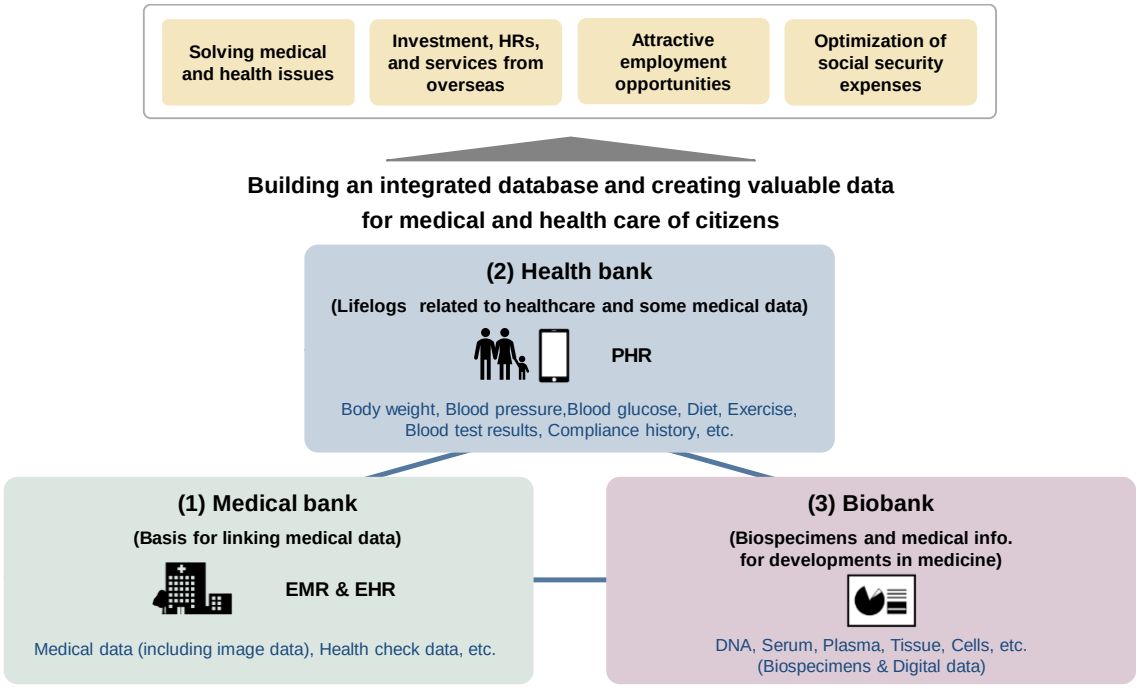
4.2.2. Medical and health data infrastructure

< Summary >

In this pilot project, the implementation of Personal Health Records (PHRs) and biobank will be examined in cooperation with Electronic Medical Records (EMRs) and Electronic Health Records (EHRs). EMR/EHR is under consideration in Bhutan as an e-Patient Information System (ePIS). PHR records personal physical information and lifestyles through devices such as wearable devices and smartphones and allows individuals to manage data. A biobank stores biological samples such as DNA, blood, tissues and cells in conjunction with clinical information for the purpose of research and drug discovery of advanced medicine such as personalized medicine and precision medicine. By integrating these three banks, Medical bank (EMR/EHR), Health bank (PHR) and Biobank, we aim to create valuable data and solve social issues related to medical and health care.

Figure 49 Pilot project outline (Medical and health data infrastructure)

Pilot Project (2): Medical and health data infrastructure	
Why medical and health data infrastructure?	■ **Increased burden of disease:** ● Double burden of infectious and Non-Communicable Diseases (NCDs) ● Increased burden due to aging ■ **Fragile health care systems:** shortage of doctors, lack of access to basic medical care, low level of medical technology, lack of advanced medical care, etc. ■ **Tight health financing:** ● Free of charge for medical expenses (to be transported to an Indian hospital at the expense of the national government for cases that cannot be handled domestically) ● Fiscal constraints caused by increasingly serious NCDs and aging population **-> Possibility of solving problems by building infrastructure for medical and health data** ● Application to medical and pharmaceutical research, improvement of medical technology, development of new services (improvement of medical standards) ● Realization of regional medical care and telemedicine by linking medical data between facilities (improvement of medical access) ● Reducing the burden of disease and reducing medical costs through preventive medicine
Impact created	■ Solving medical and health issues ● Improving the well-being of the public (prevention and treatment of infectious diseases and NCDs) ● Creation of a foundation for an autonomous healthcare system (human resource development, improvement of research capability and medical technology, etc.) ■ Invitation of investment, human resources, and services from overseas (Invest Bhutan) ■ Creation of attractive employment opportunities ■ Reducing social security costs and medical costs
Draft concept	■ Building an integrated database for the medical and health care of the people ● Medical bank: Electronic Medical Records (EMR) and Electronic Health Records (EHR) at medical institutions ● Health bank: Data acquired by individuals through wearable devices, mobile applications, etc. (PHR) ● Biobank: Biospecimens and digital data from about 750,000 Bhutanese people ■ Unique value proposition: Designing the desired architecture from scratch to maximize the value and promote the use of health data.



< Why medical and health data infrastructure? >

In Bhutan, there is a double burden of infectious diseases and non-communicable diseases (NCDs). While infectious diseases have long been a major health issue, NCDs have

become more serious in recent years. Aging is also expected to progress sooner or later. On the other hand, the health system is generally weak due to the shortage of doctors, weak access to basic medical services (especially physical access in mountainous areas due to steep terrain), low level of medical technology (due to lack of human resources, absence of medical faculty, weak research infrastructure, etc.), and lack of advanced medical care. Therefore, cases that cannot be treated with domestically are transported to hospitals in India at the expense of the government. Moreover, because Bhutan offers free medical services, there are concerns that the cost of medical care will increase due to the increase in NCDs and the aging population. In light of this situation, the 21st Century Economic Roadmap proposes a shift away from free provision of medical services by encouraging private sector participation in non-essential medical services. This does not hinder economic access to healthcare, but provides the public with better healthcare options and improves the well-being of the public. In addition, as a result of COVID-19, there is a growing awareness that the national health system is not autonomous (facing the situation where it is impossible to treat patients in Bhutan who are seriously ill but difficult to transport them abroad), and there is a growing momentum toward reforming the health system.

In Bhutan, the MoH introduced the Bhutan Health Management & Information System (BHMIS) in 2013, and District Health Information System version-2 (DHIS2) has been installed and managed on an online basis by all District Health Offices. Regarding EMR, the government announced the "National e-Health Strategy and Action Plan" in 2018 and is promoting the introduction of ePIS nationwide. However, the pandemic of COVID-19 has affected the progress of ePIS deployment. For this reason, most medical records are still maintained on a paper basis. In hospitals, paper-based inpatient records are stored, and in outpatients, patients usually bring their own records to which the printed-out CT and X-ray image data are attached.

In recent years, various PHR services have begun to be provided in various countries. Some PHR service providers are attempting to link with EMR/EHR and can contribute to the further development of health services. In high-income countries, however, EMR/EHR has been designed without considering linkages with PHR, making it difficult to associate, manage and utilize data subsequently. In addition, strict regulations are often a barrier to integrate EMR/EHR with PHR in these countries. It is therefore hoped that the first technologies and services developed in Bhutan and other low- and middle-income countries will spread as reverse innovations around the world. In Bhutan, the use of mobile phones, including smartphones, has increased dramatically, but it is unclear whether users download apps and record their own PHR. At the moment, there are no moves to link PHR with EMR/EHR because EMR/EHR is not yet in place, and it has been pointed out that it will take several years to achieve this. On the other hand, COVID-19 has accelerated the development of digital health, and the MoH has introduced the "Druk Trace" app to monitor the status of people in isolation, and the "StayHome Bhutan" app to monitor the symptoms of patients. Thus, it can be said that Bhutan has been almost ready for full-scale PHR implementation. In this pilot project, PHR will be examined in the following areas: 1) Maternal and Child Health Handbook and related services, 2) NCDs prevention and early detection, with the aim of obtaining data from the cradle to the grave (life-course data).

Biobanks are being established around the world, particularly in Europe. For example, UK Biobank collects 500,000 biospecimens, genomic data, and medical and health information from British citizens between the ages of 40 and 69 years, building and providing the world's largest medical and health information resources to researchers worldwide. It also linked to medical information, morbidity, mortality, etc in the National Health Service (NHS) registry and national databases in the United Kingdom. In Europe, the trend toward harmonization of biobanks throughout Europe, called Biobanking and Biomolecular Resources Research Infrastructure (BBMRI), is attracting attention. In Japan, too, the movement to integrate the biobanks established individually by universities and medical institutions is accelerating, and the National Center for Biobank Network (NCBN) is working to consolidate the biobank data of the six National Centers for advanced and specialized medical research, for example. However, there are many challenges in managing biobanks. Obstacles include ethical issues related to the utilization of biological samples, complicated review procedures, quality control of stored samples, and clarification and standardization of procedures for the transfer of stored samples. These issues present barriers to the effective utilization of biobank data. When establishing a biobank, it is important to establish a regulatory and governance system that reflects the opinions from various perspectives such as providers of samples and information, data users, administrators and others, from the initial stage of the establishment of the biobank, and to establish a system that enables it to operate transparently.

< Impacts and prospects >

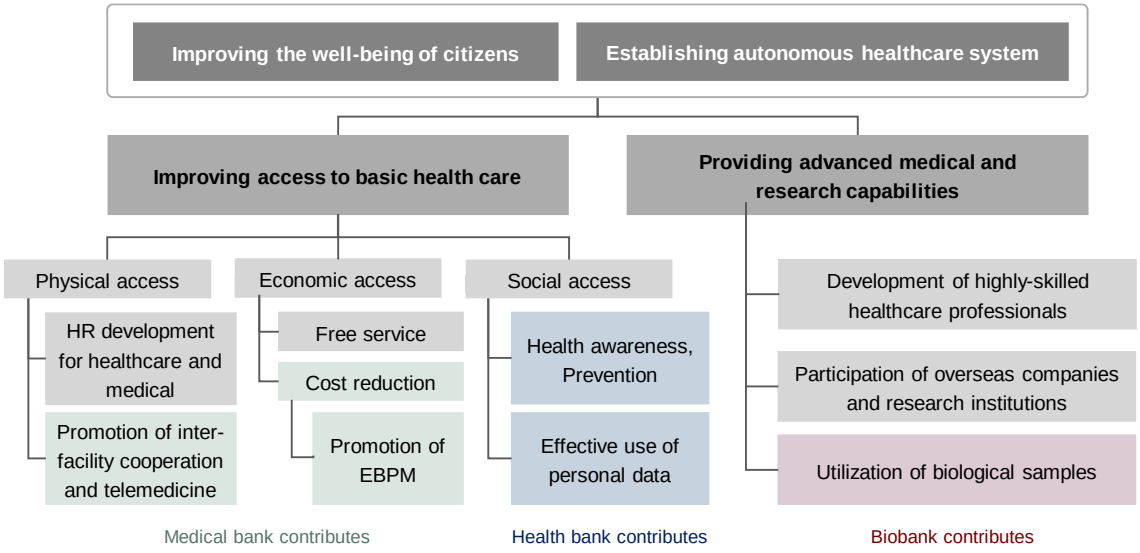
Establishment of an integrated data platform among Medical bank, Health bank and Biobank would realize improvement in the level of medical care and access to medical care, thereby improving the well-being of the Bhutanese people. This kind of integrated medical and health database is unmatched in the world, but there is no existing base in Bhutan (and therefore no vested interest), so it is possible to design the desired architecture from scratch. By leveraging Bhutan's strengths of high government governance and high public trust, Bhutan can strongly promote its implementation, and is expected to attract foreign investment, human resources and services as the world's first model. The table below sorted out the purpose of use, value proposition, impact, etc. of each bank and their combined operation.

Figure 50 Purpose of data use, value proposition, expected impact

	Data owner	Purpose of data utilization	Unique value proposition	Impact created	Requirements and notes
	■ (Same below)	■ All of the followings	■ Constructing a globally unique integrated database from scratch ■ Promoting secondary use of data ■ Obtaining life course data (from birth to death)	■ Solving medical and health-related problems ■ Accelerating HRs and services as well as investment from overseas ■ Attractive job opportunities ■ Optimizing social security expences and streamlining of GNH surveys	■ Construction of (1) is the highest priority, and the roadmap needs to be drawn up before proceeding
(1) Medical bank (EMR/EHR)	■ Medical institutions	■ Sharing medical records within and between medical institutions ■ Medical research such as epidemiological data analysis	■ Unified and interoperable system throughout the country (ePIS)	■ Improving physical access by promoting cooperation between medical institutions and realizing telemedicine ■ Reducing medical expenses through promotion of EBPM	■ In addition to system maintenance (hard), improvement in the level of medical care (soft) is also essential
(2) Health bank (PHR)	■ Individual ■ Operating entity (public/ private)	■ Prevention of onset and aggravation of diseases ■ Medical research and development of new solutions	■ Bhutan's unique parameters such as happiness index	■ Raising health awareness and promoting prevention ■ Reducing medical costs by preventing onset and aggravation of diseases ■ Promoting home care	■ Possible to create useful data without depending on (1) and (3), while value can be maximized with the others
(3) Biobank	■ Biobank operators (public/ private)	■ Research on advanced medical care such as personalized and precision medicine ■ Drug discovery	■ Three-generation cohort with a population close to 750,000	■ Reducing the burden of disease through the provision of advanced medical care and the introduction of new drugs ■ Developing medicine and pharmacy ■ Accelerating foreign investment (if any added value unique to Bhutan)	■ Requiring the quality of medical data associated with bio samples (= Medical bank functions) ■ Requiring data infrastructure capable of managing genome data and a facility capable of storing bio samples appropriately

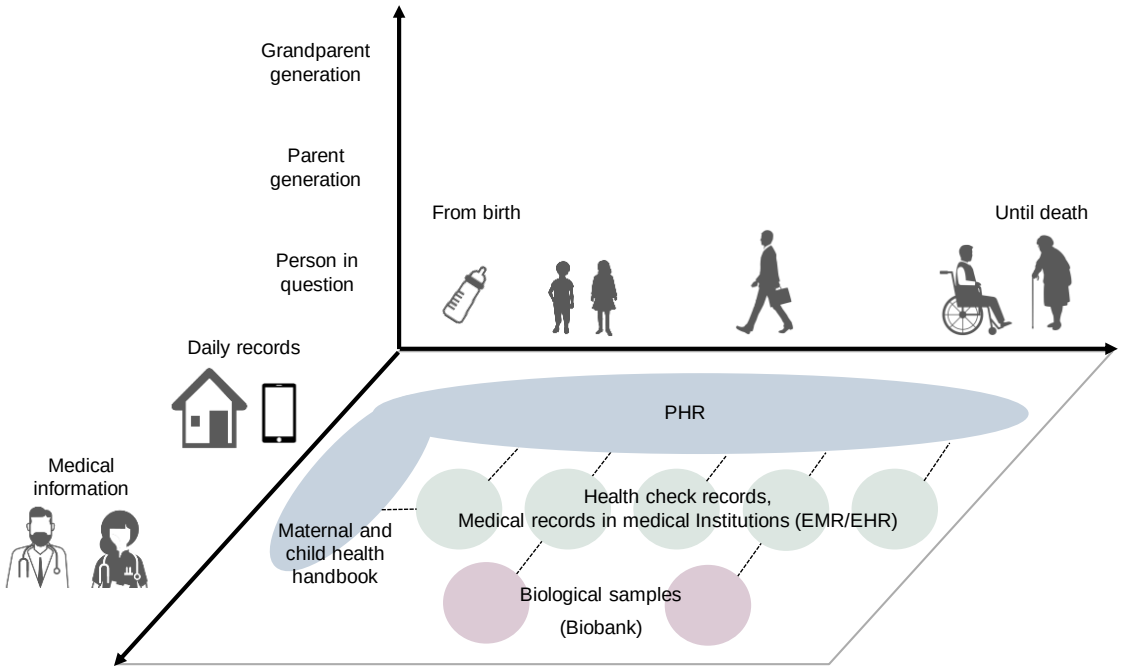
The impact created by an integrated data base can be roughly categorized into four. With regard to the first impact of "solving issues related to medical and health care," for example, the improvement of physical access to medical care can be expected by promoting cooperation between medical institutions and telemedicine through the Medical bank, and the improvement of individual health awareness and prevention of lifestyle-related diseases and dementia can be promoted in Health bank. In addition, if personalized medicine and precision medicine can be realized through Biobank, a significant improvement in the disease burden can be expected.

Figure 51 Relevance of the project to elements of medical and health-related challenges



Regarding the second impact, "attracting investment, human resources, and services from abroad," if each bank functions in an integrated manner and can obtain a series of data from various perspectives, such as "from daily records to medical records," "from birth to death (life-course data)," and "grandparents to their own generation (three-generation cohort)," it will be possible to analyze the pathology of individual diseases, analyze the effects of lifestyle on diseases (causality and correlation), and perform stratified analysis by various parameters. This analysis will lead to the development of new treatment methods and drug discovery (personalized medicine, precision medicine, etc.) and health services. In other words, integrative, sequential data linkages, rather than fragmentary data, maximize the value of the data and create new business opportunities.

Figure 52 Image of an integrated medical and health data infrastructure

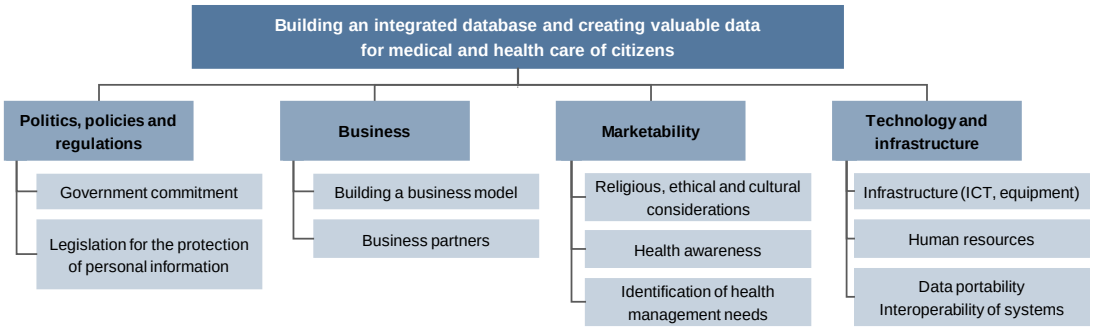


When business opportunities arise, it is expected that the participation of overseas companies and research institutions will advance, as well as the strengthening of research infrastructure and human resource development in Bhutan. Bhutanese companies can also develop innovative products and services and export business models to the world as a business originating in Bhutan. In other words, as the medical and health data business grows into a major industry, the third impact of "creation of attractive employment opportunities" will be realized. In addition, the fourth impact of "reduction of social security costs including medical costs" will be realized by promoting Evidence-based Policy Making (EBPM) based on Medical bank data and health promotion and prevention of onset and aggravation of diseases by Health bank. In the GNH survey conducted every five years in Bhutan to determine the degree of well-being of Bhutan's people, acquiring data through the PHR app could help improve the efficiency of data collection and its accuracy, and could also be used to verify the effectiveness of health policies. By using GNH indicators as parameters for health and medical data, Bhutan can create data unique to Bhutan and, for example, develop new mental health treatments and services.

< Issues and roadmap >

In order to create these impacts, the pilot project must be established as a sustainable business. The elements for successful business and the perspectives of research related to these elements are shown below.

Figure 53 Key elements for the success of the pilot project and viewpoint of the survey (Medical and health data infrastructure)



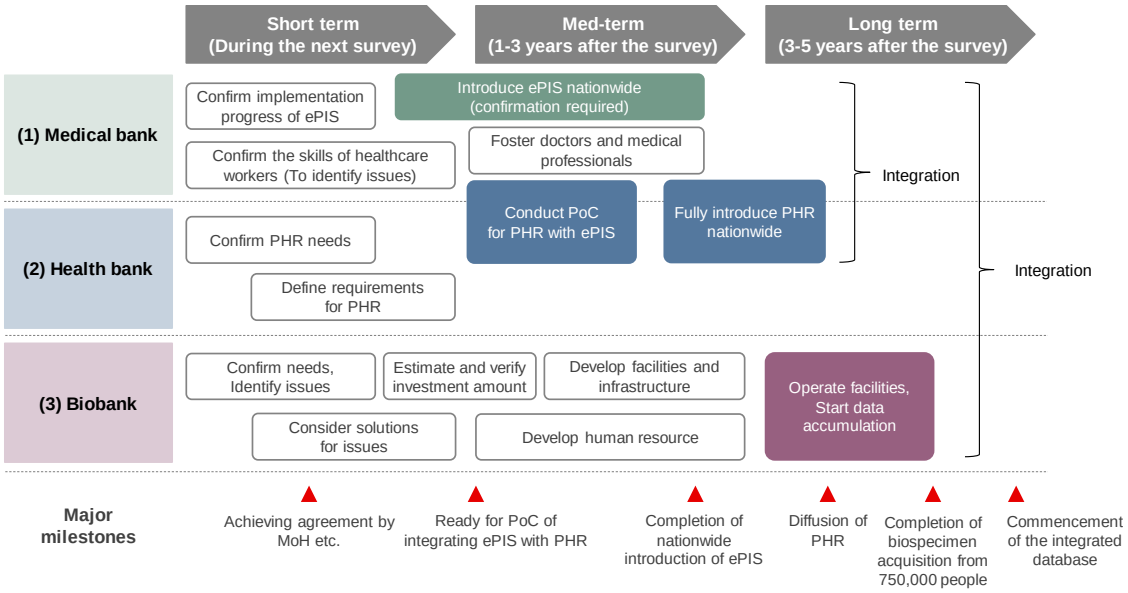
Politics, policies and regulations	■ **Government commitments:** Cooperation and support of MoH and other relevant government agencies, intention to introduce PHR, possibility of collaboration with ePIS, and policy on biobank ■ **Legislation:** Personal information protection and other regulations
Business	■ **Build a business model:** establishment of a sustainable business model (revenue flow, etc.), procurement of initial capital, and incentive designs for users ■ **Business partners:** Participation of implementers from Japan and foreign companies, and appropriate collaboration with local partners and support agencies (ADB, etc.)
Marketability	■ **Religious, ethical and cultural considerations:** Acceptability of handling individuals' health information, considerations (e.g., whether disparities are generated or not), ethical issues ■ **Health awareness:** Fostering people's awareness of managing their own health (the essence of implementing) ■ **Identification of health management needs:** Identification of health issues of particular concern in Bhutan
Technology and infrastructure	■ **Infrastructure:** ICT infrastructure required for data storage and management (capacity of servers, clouds, etc.), and facilities capable of storing biological samples appropriately ■ **Human resources:** The ability to properly handle medical and biospecimen information (data analysis, EBM, etc.), and the possibility of collaboration with overseas physicians ■ **Portability and interoperability:** portability of EMR data formats and interoperability of EHR systems

One of the most important points in promoting this pilot project is the status of laws and regulations concerning the protection of personal information. In the consultations with the government, it was confirmed that ePIS, EHR and PHR are highly interested in collaborating with each other, and that they are also aware of issues related to personal information. Therefore, continuing consultations will be needed to promptly deal with such matters. Biobank needs to be verified from an ethical, religious and cultural standpoint to be acceptable to the government and people of Bhutan. In other words, the possibility that genome-related research may not be compatible with Bhutanese Buddhist views and that ethical review procedures may be complicated and hinder the utilization of data is assumed to be risks. Other important points, such as the possibility that there may not be enough human resources to carry out advanced research on the Bhutanese side, are not confirmed. Therefore, it is necessary to confirm them quickly through desktop surveys and discussions with local stakeholders. For technical issues such as data portability and system interoperability, the lessons that can be applied to Bhutan should be first examined, referring to the advanced e-Health cases from Finland and Estonia.[27]

[27] In Finland, a comprehensive health and social system called KanTa has been implemented in phases since 2010. KanTa integrates EMR, EHR, PHR and other social welfare data in an interoperable manner. Estonia, which promotes e-government, has also introduced an e-Health system that integrates electronic medical records, image data, prescriptions, referral letters, and emergency medical services with the national ID.

The proposed roadmap for building an integrated medical and health data infrastructure is shown in the chart below. The most important point is that the Medical bank functions first. While monitoring the progress of ePIS, which is currently being introduced, efforts will be made to form consensus with stakeholders toward linkage with Health bank and Biobank. For Health bank, the needs of the users of the data (pharmaceutical companies, etc.) should be carefully examined while confirming the needs of the local government and residents. Based on this, we will define the requirements for PHR services and proceed with selection of service providers. When ePIS is first implemented, implement PoC project for collaboration with PHR and verify the effects. As biobank require large-scale investment and human resource development, and Medical bank must function, actual operations will not be until four years later. Depending on the current level of medical care and the number of healthcare professionals, the realistic target of the overall integration as a medical and health data infrastructure will be around 2030.

Figure 54 Roadmap for creating impact (Medical and health data infrastructure)



< Stakeholders >

Possible stakeholders are as follows. First and foremost, it is important for the MoH and other government agencies to reach a consensus on this concept. Private companies will play a leading role in developing PHRs. However, the roadmap and detailed plans will be refined in consultation with the local government on what kind of PHRs are required. To date, interviews have been conducted with five Japanese companies that are considered to be capable of providing effective solutions in Bhutan. It was confirmed that all of them can modify apps, etc. in response to Bhutan's problems. It is necessary to select a company that can take the initiative in new business development and job creation in Bhutan, in line with the government's policy.

The understanding and cooperation of the people of Bhutan is also important in

promoting this project. Insufficient data collection like less data entry into Health bank and less samples into Biobank would reduce the value that this business could create as a whole. In addition to emphasizing the benefits of high quality medical services from the use of the data provided, strong incentive as a return for the data provided should be designed, such as granting points for shopping and tax breaks and exemptions.

Figure 55 Things to be confirmed and adjusted with stakeholders (Medical and health data infrastructure)

Stakeholder	Name	Benefits	Incentive measures and matters to be confirmed and adjusted
Local government agencies	■ MoH ■ Public medical institution ■ GNH Committee	■ Improving the well-being of the public and strengthening the health system ■ Fostering industries through the investment, human resources, and services from overseas ■ Creating attractive employment opportunities and branding as the world's first business model ■ Reducing social security costs and improving the efficiency and accuracy of GNH survey	■ Quantitative simulation of impact and cost (clarify cost-effectiveness) ■ Support for development of necessary medical equipment and infrastructure
Local partners (Candidate)	■ Operator/engineer (TechPark)	■ Developing new products and services ■ Data usage fees and other revenues from pharmaceutical and insurance companies	■ Matching Japanese companies ■ Acquiring and transferring cutting-edge technologies
Japanese firm (Potential providers of PHR apps)	■ Company C (pregnancy and childbirth) ■ Company L (telemedicine consultation) ■ Company M (PHR) ■ Company E (dementia) ■ Company M (digital maternal and child health handbook)	■ Contributing to Solving Development Issues ■ Verification of Service Model (PoC) and Achievement ■ Challenge of reverse innovation (contributing to the construction of the world's first model)	■ Government support (deregulation)
Japanese research institutes	■ K University	■ Contributing to creation of the world's first medical and health data, promotion of medical research and creation of academic knowledge	■ Matching with partners to realize the concept
Support organizations	■ ADB (Supporting ePIS development)	■ Creating synergies between this pilot project and the ePIS	■ Identifying synergies ■ Presentating value maximization simulation
Bhutanese citizens	■ (both data providers and beneficiaries of services)	■ Enjoying high-quality medical services ■ Improving access to medical care ■ Reducing the burden of disease by promoting disease prevention	■ Health promotion practices ■ Awareness and dissemination of benefits ■ Direct incentive design (granting points, tax reduction, etc.)

< Expected support and cooperation from GoB and external organizations >

The Bhutanese government should first provide an understanding of the overall picture and roadmap of the pilot project and commit itself to develop the business from scratch and implement it in the society. Because no one has been involved in such business in the world, we expect GoB to provide an environment in which the sandbox system can be utilized flexibly, enabling us to take agile development approach.

In addition, collaboration with ADB, which is currently supporting the development of ePIS software, and an organization which is commissioned to develop ePIS, is also essential. The division of roles will be discussed as a partner for the pilot project.

< Survey results >

The concept of this pilot project has been developed through interviews with local stakeholders and Japanese companies. Initially, the study aimed to create valuable data through the integration of EMR/EHR (Medical bank) and PHR (Health bank). Since the latter half of the study period, however, the integration of biobank has been considered based on the proposals of an external expert. As noted above, biobank dealing with genetic information require special consideration in terms of ethical, religious and cultural acceptability by GoB and Bhutanese people. In addition, it has been pointed out in the interview that biobank cannot provide valuable data unless the Medical bank functions and the standards of medical care by healthcare professionals are improved accordingly. Depending on future research, the portion of Biobank might be separated and the original plan of only integrating Medical and Health bank might be back on the table. This is a priority issue that should be decided early in the next step.

The summary of the survey results is shown in the chart below.

Figure 56 Survey results (Medical and health data infrastructure)

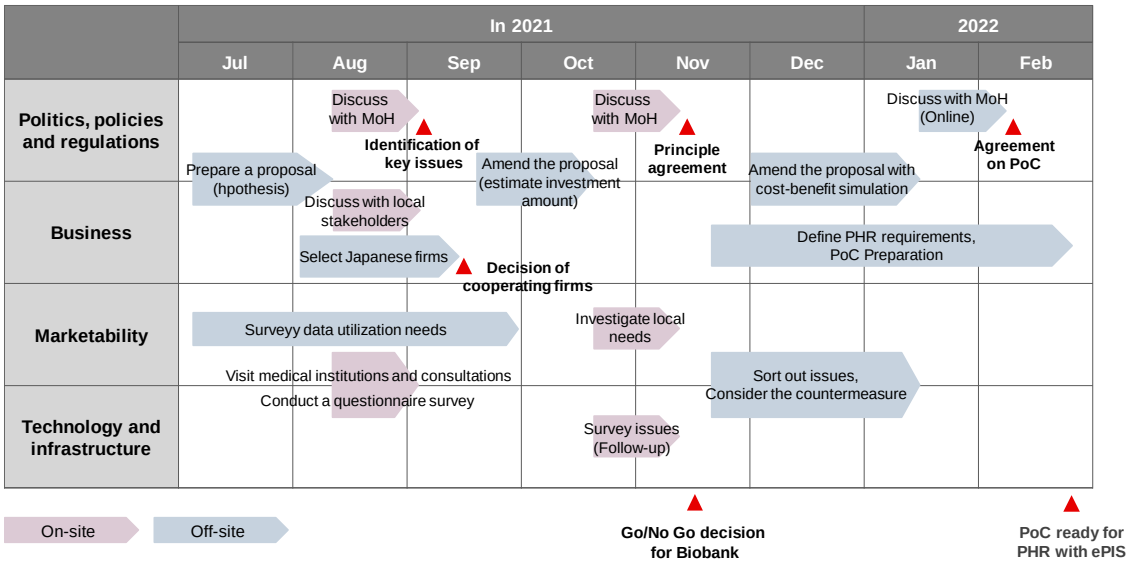
(++): Focused research, (+): General research, N/A: Not applicable

Survey items		Survey methods		
Classification	Viewpoints	Desktop	Interview	Question naire
Politics, policies and regulations	■ Implementation progress of ePIS, Possibility and method of collaboration with PHR ● Development and introduction of ePIS have been delayed due to COVID-19 ● MoH is interested in coordinating with the PHR but it has not been specifically considered ■ Current status and challenges of digitalization in healthcare sector ● There is a shortage of health information specialists. ● MoH wants to integrate all health information system to cope with overlapping data ■ Current status of the act on the protection of personal information ● Personal information is strictly regulated for research purpose and must be reviewed by the ethics committee in MoH, but it is not strictly managed for clinical purpose	(+)	(++)	N/A
Business	■ Possibility of participation of Japanese and foreign companies as business entities ● Japanese firms are interested in PHR development in conjunction with EMR ■ Possibility of Japanese companies investing mainly in the Biobank business ● There seems no economic value to the biobank unless medical standards are improved and the EMR/EHR functions properly ● Future potential because Bhutan's unique advantage could be established ■ Appropriate local partners ● Thimphu TechPark, an ePIS software developer, is one of the candidate partners	(+)	(++)	N/A
Marketability	■ Individual health management awareness (to be surveyed from now) ■ Information management needs and sssues at medical institutions ● Despite the high need for information coordination such as image data, the system is not implemented. ● There is a strong need for eHealth (computerization) and mHealth (mobility) ■ Current status and challenges of medical standards and the skills of medical personnel ● There are cases where patients mainly suffering from severe illness cannot be handled domestically and are transported to India	(+)	(++)	N/A
Technology and infrastructure	■ Current status and challenges of medical equipment and ICT infrastructure, mainly in medical institutions ● The development of the DrukREN (Drug Research and Education Network) is progressing as an internet environment with medical institutions, academic and research institutions. 26 organizations in 10 out of 20 prefectures are connected. ● The deployment of medical devices at medical institutions is controlled by MoH, but the maintenance personnel are limited (requiring Indian engineers for CT and MRI), which hinders activities with innovation or creativity. ● There is no opportunity in Bhutan to develop human resources for medical ICT.	(+)	(++)	N/A

< Next step >

The future survey schedule is proposed as shown in the figure below. A major milestone is go/no-go decision on Biobank business by the end of 2021. The next goal should be to prepare for the PoC business of PHR services in conjunction with ePIS by the first half of 2022. Key items to be investigated include the current state and future schedule of ePIS implementation, regulations and governances for protecting personal information, religious, ethical and cultural considerations, citizen's awareness of managing their own health, medical care levels at medical institutions, and issues related to digital human resources.

Figure 57 Future survey plan (Medical and health data infrastructure)



4.2.3. Support for entrepreneurs

< Summary >

Both approaches, fostering individual entrepreneurs and improving the environment for society as a whole, are necessary in order to develop internationally competitive Bhutanese companies. In this pilot project, we propose the first approach; fostering individual entrepreneurs. Specifically, this pilot project aims to create a digital ecosystem in which Bhutanese entrepreneurs who wish to enter overseas markets can grow by themselves, attracting outstanding human resources, technologies and funds from overseas. It could be achieved through supporting entrepreneurs who use digital technology to resolve various Bhutan issues. We also propose a separate pilot project for the development of entrepreneurial environment (Digital currency), in particular, focusing on issues such as financing (see 4.2.4).

Figure 58 Pilot project outline (Support for entrepreneurs)

Pilot project (3): Support for entrepreneurs	
Why support for entrepreneurs?	■ **Development of export industries:** In view of the chronic trade deficit, development of overseas markets by private companies is essential ■ **Support for overseas business expansion**: insufficient support for entrepreneurs considering overseas business ■ **Fostering the Go global mindset:** Many entrepreneurs focus only on businesses in Bhutan
Impact created	■ Reduce the trade deficit by diversifying industries and increasing exports by private companies. ■ Bhutanese companies with international competitiveness are fostered. ■ The number of entrepreneurs seeking to expand their business overseas increases.
Draft concept	■ Short-term: Identify entrepreneurs who are looking for an overseas market and support their overseas expansion. ■ Medium-term: Foster a global mindset of entrepreneurs and increase the number of entrepreneurs who wish to expand overseas. ■ Long-term: Develop highly skilled engineers. It also supports the business development in Bhutan for entrepreneurs living abroad.

< Why support for entrepreneurs? >

Bhutan has been facing a chronic trade deficit due to the limited number of industries with international competitiveness. It is, therefore, urgent to foster private companies that actively develop overseas markets. Originally, entrepreneurship had not taken root in Bhutan, but in recent years the number of entrepreneurs has been increasing, thanks to the support provided by several organizations. However, most of them are in the seed and early stages, and they do not usually obtain management know-how and networks as well as access to financial support for their businesses to be grown. Also, it can be said that there are almost no measures to support overseas expansion. While many Bhutanese entrepreneurs are seeking to develop new product and service models in Bhutan, their entrepreneurial experiences in tackling social issues in Bhutan can be applied to other countries facing similar problems. In particular, entrepreneurs in the "digital" sector are likely to be able to develop their business without being significantly affected by unfavorable conditions in Bhutan, such as high export costs.

< Impacts and prospects >

In this pilot project, priority will be given to programs targeting entrepreneurs in Bhutan who already have an overseas orientation and are engaged in a few activities to expand overseas. Specifically, we propose to support the commercialization of their businesses and collaborate with overseas partners to produce concrete results, and at the same time, identify issues for the formation of an ecosystem. It is also necessary to have a seminar to foster the values of “Go Global” for those who are not strongly overseas-oriented, aiming to expand their overseas businesses in the future. In addition, as there are some Bhutanese entrepreneurs who already doing business overseas, they could promote the formation of a digital ecosystem by considering their business development in Bhutan and/or other countries as well as asking them to participate in the pilot project as a role model. Efforts will also be made to develop "digital human resources" with the ability to implement ICT, IoT, AI, block chains and other digital technologies into products and services. In the future, it is strongly hoped that some Bhutanese entrepreneurs using their advanced digital skills emerge, and they help attract foreign investment. The above four approaches and the direction of the study are summarized in the figure below.

The presence of local partners is also important in the other pilot projects. In particular, when local start-ups become business partners for other pilot projects, it will also be considered how they can collaborate in this pilot project, stimulating their ownership, in order to create synergies.

Figure 59 Targets and direction of support for entrepreneurs

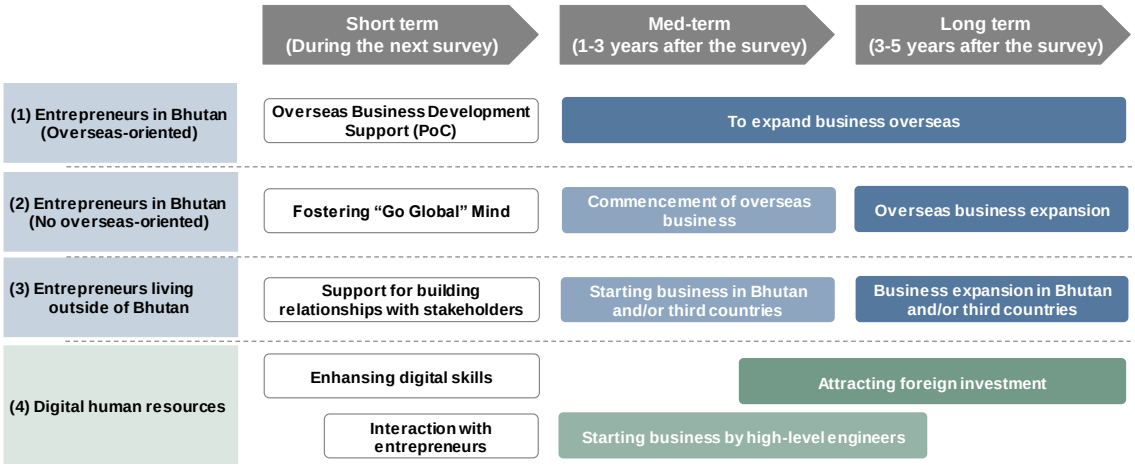
Classification of targets and expected numbers	Approach	Considerations	Priority
(1) Entrepreneurs in Bhutan (Overseas-oriented) Medium	✓ Revitalization of business targeting overseas markets ✓ Business creation with overseas partners	• Implementation of POC • Mentoring & coaching • Networking	High
(2) Entrepreneurs in Bhutan[1] (No overseas-oriented) Large	✓ Stimulating interest in businesses targeting overseas markets ✓ Fostering "Go Global" value	• Mentoring & coaching • Seminar	Medium
(3) Entrepreneurs living outside of Bhutan Small	✓ Stimulating entrepreneurs as a role model ✓ Starting business in Bhutan and/or in third countries	• Supporting business in Bhutan (It there are appropriate entrepreneurs)	Low
(4) Digital human resources[2] Small	✓ Enhancing digital skills used in the workplace ✓ Creation of collaboration opportunities with entrepreneurs	• Training	Medium

1) It also includes those who have not started business yet, 2) We suppose the number of digital human resources is insufficient, but it will be further examined

< Issues and roadmap >

Activities related to human resource development need to produce the short-term result, while keeping an eye on the overall roadmap for medium-to long-term measures. As shown in the figure below, this pilot project tries to approach to various stakeholders both within and outside the country using different approaches. However, in order to maximize the results within a limited period of time, it is also necessary to focus on certain measures that are considered to be more effective, while discussing the priority with the relevant local agencies.

Figure 60 Roadmap for creating impact (Support for entrepreneurs)



< Stakeholders >

Possible stakeholders are shown in the figure below for each approach.

Figure 61 Things to be confirmed and adjusted with stakeholders (Entrepreneurs living in Bhutan)

Stakeholder	Name	Benefits	Incentive measures and matters to be confirmed and adjusted
Japanese entrepreneurs/ Support group for entrepreneurs	■ Entrepreneurs in Japan and LMICs ■ Overseas business development support specialists ■ Providers of capital	■ Experience and knowledge in fostering entrepreneurs in LMICs ■ Promoting collaboration with entrepreneurs supporting in other countries	■ Support by GoB ■ Promotion of collaboration with GoB and related organizations
Local government agencies	■ Ministry of Economic Affairs ■ Ministry of Information and Communication	■ Developing export industries	■ Presentation of export product/service models by entrepreneurs
Local partners	■ (Public Offering)	■ Specific plans for overseas expansion, market expansion and marketing strategies ■ Relations with overseas institutions ■ Overseas business experience (as a PoC) ■ Triggers for turning to overseas markets	■ Support for the formulation of overseas expansion business plans, sales channel expansion and marketing strategies (through mentoring & coaching) ■ Introduction of overseas organizations and support for building relationships ■ Support for the implementation of overseas business (PoC) ■ Providing opportunities to meet successful entrepreneurs overseas
Support organizations	■ UNDP ■ Other private organizations	■ Further growth of entrepreneurs who have been supported	■ Identify areas where synergies can be expected while avoiding duplication of support

Figure 62 Things to be confirmed and adjusted with stakeholders (Entrepreneurs living outside of Bhutan)

Stakeholder	Name	Benefits	Incentive measures and matters to be confirmed and adjusted
Local government agencies	■ Ministry of Economic Affairs ■ Ministry of Information and Communication	■ Development of new industries in Bhutan ■ Bhutan branding overseas	■ Introduction of products and services by entrepreneurs who succeed overseas
Local partners	■ Bhutanese conducting businesses overseas ■ (Bhutaneses who are returning to Bhutan temporarily due to COVID-19)	■ Business experience in Bhutan ■ Synergies with their overseas businesses	■ Support for business development in Bhutan ■ Support for business expansion overseas (third countries)

Figure 63 Things to be confirmed and adjusted with stakeholders (Digital human resources)

Stakeholder	Name	Benefits	Incentive measures and matters to be confirmed and adjusted
Japanese companies and universities	■ Digital-related companies ■ Colleges and universities with digital programs	■ Experience of teaching engineers in LMICs ■ Chances to hire excellent Bhutanese engineers	■ Providing training for Bhutanese engineers ■ Interview with Bhutanese engineers
Local government agencies	■ Ministry of Information and Communication	■ Increasing the number of digital human resources	■ Presentation of engineer development plans
Local partners	■ ICT Colleges ■ TechPark	■ Producing engineers with capabilities that can be used immediately	■ Introduction of Bhutanese engineers participating in the seminar
Support organization	■ Organization already engaged in the development of digital human resources	■ Opportunities to continuously train engineers	■ Providing training for Bhutanese engineers

< Expected support and cooperation from GoB and external organizations >

We expect the GoB to consider changing regulations to support entrepreneurs who seek business chances overseas and lowering import tariffs to strengthen international competitiveness in export-oriented businesses. There are also entrepreneurs who choose to start a business overseas for a variety of reasons, but still wish to start their business in Bhutan if they have an opportunity in the future. Several measures including a sandbox system should be promoted to help them start business in their home country, Bhutan. For entrepreneur support organizations, it would also be appreciated if they would help advertise the overseas business development program (PoC) to prospective participants as well as introduce potential participants in seminars to foster a “Go Global” mindset. We would also like ICT colleges to recommend participants for the training to enhance their digital skills. It would be nice if some organizations, which have already provided IT skill trainings, could give an advise on the training content or serve as lecturers.

< Survey results >

Here are the survey methods and viewpointss in which the survey team has paid attention to, considering the roadmap for creating impact.

Figure 64 Survey items and methods (Support for entrepreneurs)

(++): Focused research, (+): General research, N/A: Not applicable

Survey items		Survey method		
Classification	Viewpoints	Desktop	Interview	Question naire
(1) (2) Entrepreneurs in Bhutan (Overseas oriented and No overseas-oriented)	■ **Background :** Work history and reasons for aiming to start a business ■ **Current business overview:** Products and services provided, size of company, progress of business, and challenges ■ **Future plans:** Willingness to expand overseas business, and specific overseas expansion plan (if any)	(++)	(++)	N/A
(3) Entrepreneurs living outside of Bhutan	■ **Background:** Business experience in Bhutan and reasons for aiming to start a business overseas ■ **Current business overview:** Products and services provided, size of company, progress of business, and challenges ■ **Future plans:** Business plan in the country they live and possibility of starting businesses in Bhutan and/or other countries	N/A	(+)	N/A
(4) Digital human resources	■ **ICT colleges:** Content of class, career paths of graduates, and collaboration with private companies ■ **Organization supporting digital human resources:** Programming training provided ■ **Private digital-related companies:** Technical level of staff, educational content for staff	(+)	(+)	N/A

The results of the survey based on the above perspectives are as follows.

Approach 1 and 2: Entrepreneurs living in Bhutan (with or without an overseas orientation)

With the help of the Loden Foundation, which has provided loans to more than 190 entrepreneurs since 2008, several entrepreneurs were recommended based on the criteria in order to identify the business mindset of entrepreneurs in Bhutan. Based on this list, we interviewed three entrepreneurs online. However, since the criteria for selection were not limited to "overseas-oriented," as a result of interviews, it has not been possible to identify entrepreneurs who have internationally competitive products and services with full-fledged business plans. Subsequently, we, through desktop research, identified an entrepreneur that actively considered expanding overseas business. Through the interview, however, he did not seem to have any concrete plans in the short-period of time.[28]

Approach 3: Entrepreneurs living outside of Bhutan

An interview was also conducted with an digital-related entrepreneur living overseas. She has business experiences in several Asian countries and is currently operating her business in Singapore, where a sandbox system is in place. In the past, she went back to Bhutan and tried to expand the business there, but her plan failed due to regulatory barriers and a lack of engineers. However, it became clear, during the interview, that she wanted to return to Bhutan to start a business someday.

[28] Criteria for selecting entrepreneurs include: 1) considering expanding businesses overseas; 2) addressing Bhutan's social challenges; 3) using digital technology for the business growth; 4) being an innovative business that has not been launched by a major company; 5) having a clear vision for the future; 6) having strong leadership and teamwork; and 7) prospects for sales.

Approach 4: Digital human resources

We have also conducted interviews with ICT colleges, organizations working for digital human resources development and ICT companies, although the primary objective of the interviews is not only for this pilot project. As described in 2.1.8, the gap has become clear between the educational content in ICT colleges and the needs in the labor market. The development of digital human resources, therefore, has become an urgent task.

< Next step >

The next steps for the four approaches are proposed as follows.

Approach 1: Entrepreneurs living in Bhutan (with an overseas orientation) [Priority for consideration: High]

First, we propose to identify Bhutanese entrepreneurs living in Bhutan who are unable to do business overseas due to a lack of funds or networks even though they have business models targeting overseas markets. It is necessary to support their overseas expansion plans through PoC. Specifically, we propose that, in cooperation with JICA Bhutan office, applicants be invited to participate in the "Overseas Expansion Support Program" or PoC with "Go Global" at the forefront. We also expect some organizations with a lot of experience supporting entrepreneurs and ICT colleges to share the information on public recruitment and encourage those who are qualified to apply. Once selecting entrepreneurs, through public recruitment, we suggest supporting formulating their overseas expansion business plans, market expansion plans and marketing strategies through regular mentoring (e.g., bi-weekly online interviews). In addition, with JICA's and external advisors' networks, it must be important to connect them with overseas partners. We also make suggestion to encourage the entrepreneurs to start exporting goods/services to other countries as a trial, and the plan and strategy will be refined based on the lessons learned from the trial. In doing so, we propose to consider how to support innovative businesses with digital technology, solving social issues in Bhutan, while taking into account the local context.

Approach 2: Entrepreneurs living in Bhutan (no overseas orientation) [Priority: Medium]

This approach focuses on fostering "Go Global" mindset of Bhutanese social entrepreneurs who are engaged in business in Bhutan. For example, we suggest organizing a seminar to stimulate interest in business overseas with external advisors served as lecturers. This seminar is intended to provide them with opportunities to meet and talk to foreign entrepreneurs in Silicon Valley as well as Bhutanese entrepreneurs with overseas business experience. If some participants are considered to have internationally competitive products or services, they could be transferred to approach 1. In the medium to long term, we hope that some entrepreneurs will start businesses targeting overseas markets based on the knowledge and experience gained through this

seminar.

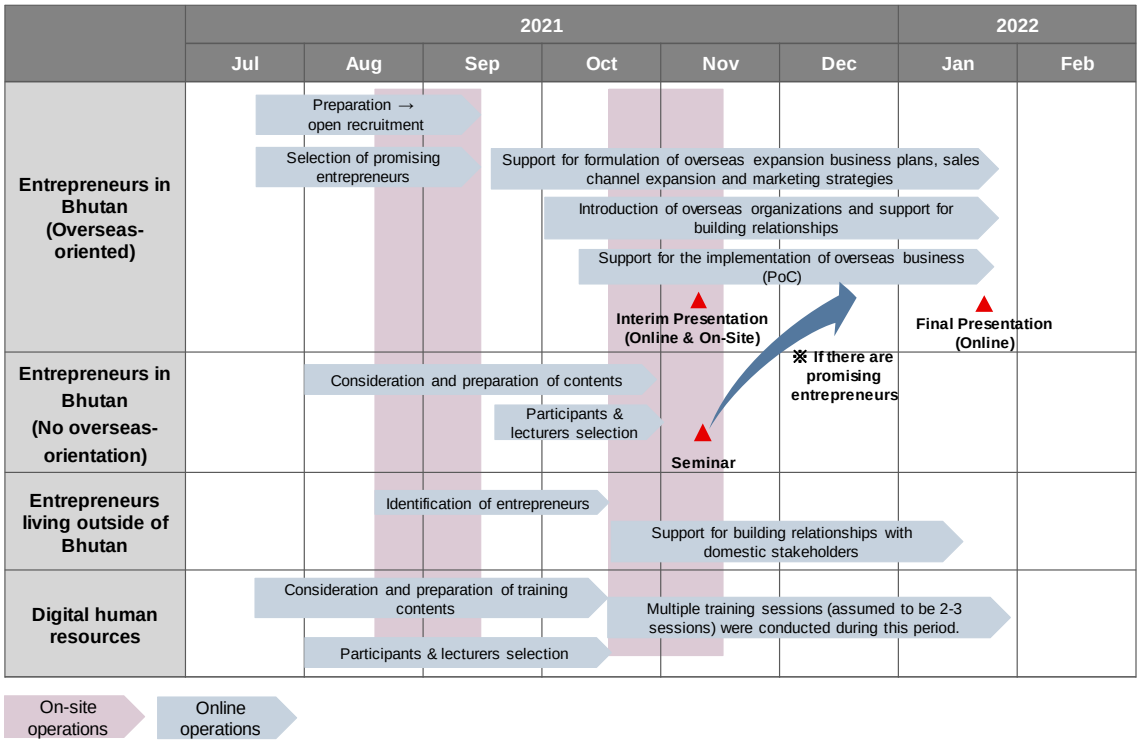
Approach 3: Entrepreneurs living outside of Bhutan [Priority: Low]

We suggest identifying Bhutanese entrepreneurs living abroad, including those temporarily returning to Bhutan due to the COVID-19 pandemic and support them to import their business back into Bhutan or expand their business into third countries by helping them build relationships with Bhutanese stakeholders. They can also be a role model for other entrepreneurs working only in Bhutan, so we would like them to cooperate in measures related to approach 2 above.

Approach 4: Digital human resources [Priority: Medium]

Finally, we propose providing practical skills training and opportunities for collaboration with entrepreneurs, as it is essential to develop digital human resources, even though it could be a long-term measure. In terms of training, we suggest holding multiple half-day courses on-line and on-site, with the help of external advisers as lecturers, cooperating with local organizations which have experiences providing programing education. The contents will include an overview of programming, an introduction to the latest IT trends, and specific themes such as Python and machine learning.

Figure 65 Future survey plan (Support for entrepreneurs)



4.2.4. Development of entrepreneurial environment (Digital currency)

< Summary >

In this pilot project, the development of a digital fund-raising system using virtual currency based on blockchain will be studied to help entrepreneurs raise funds and acquire the management know-how and knowledge of overseas markets necessary for "Go Global". In addition, the system will be linked to digital IDs to prevent opaque capital inflows. Furthermore, through the use of data, this pilot aims to (1) contribute to the development of an environment for the creation and growth of new businesses, and (2) contribute to the establishment of a foundation for attracting foreign capital on a continuous basis (contributing to industrial development and job creation).

Figure 66 Pilot project outline (Digital currency)

Pilot project (4): Improvement of the entrepreneurial environment (Digital currency)	
Why is improvement of the entrepreneurial environment (Digital currency)?	■ **Financing issues** • Entrepreneurs find it difficult to raise funds using general approaches such as bank loans ■ **Access issues for foreign investors and entrepreneurs** • Building networks with overseas investors and entrepreneurs is also an urgent issue in order to accumulate a mindset and knowledge for developing business from a global perspective.
Impact created	■ **Contributing to the development of an environment conducive to the creation and growth of new businesses** ■ **Contributing to the establishment of a foundation that attracts foreign capital on an ongoing basis**
Draft concept	■ **Creation of a digital fund-raising system (a new funding platform that attracts foreign investors)** • Digital fund-raising system in which foreign investors participate. Promoting the possibility of new foreign investment by using virtual currency • Achieve access to world experts (KOL) (provide Bhutanese entrepreneurs with knowledge and networks to create innovative businesses) ■ **Introduction of digital IDs as a prerequisite** • The introduction of digital IDs (both foreign investors and Bhutanese) contributes to preventing uncertain inflows of funds and to understanding and responding to regulatory authorities (RMA) in the event of unforeseen circumstances. • Contribute to business creation by utilizing data linked to digital IDs

< Why digital currency? >

One of the current issues surrounding Bhutanese entrepreneurs is that they have limited access to financing. Interviews with Bhutanese entrepreneurs conducted for this study revealed that while special financial schemes such as the National Credit Guarantee Scheme (NCGS), a support program for small and medium-sized enterprises (SMEs) by the Ministry of Finance, have been established under COVID-19, it is still difficult for entrepreneurs to raise funds through general methods such as loans from commercial banks. Considering this situation, there is a need for assistance in raising funds through unconventional schemes for starting a business, meeting urgent financial needs, or raising funds for business expansion. In addition, from the perspective of financial inclusion, the GoB has set the securing of alternative financing methods as one of its strategic goals[29]. Therefore, the expansion of financing schemes is a meaningful way in terms of

[29] National Financial Inclusion Strategy (NFIS) 2018-2023

supporting the government's efforts. (Contribution to output).

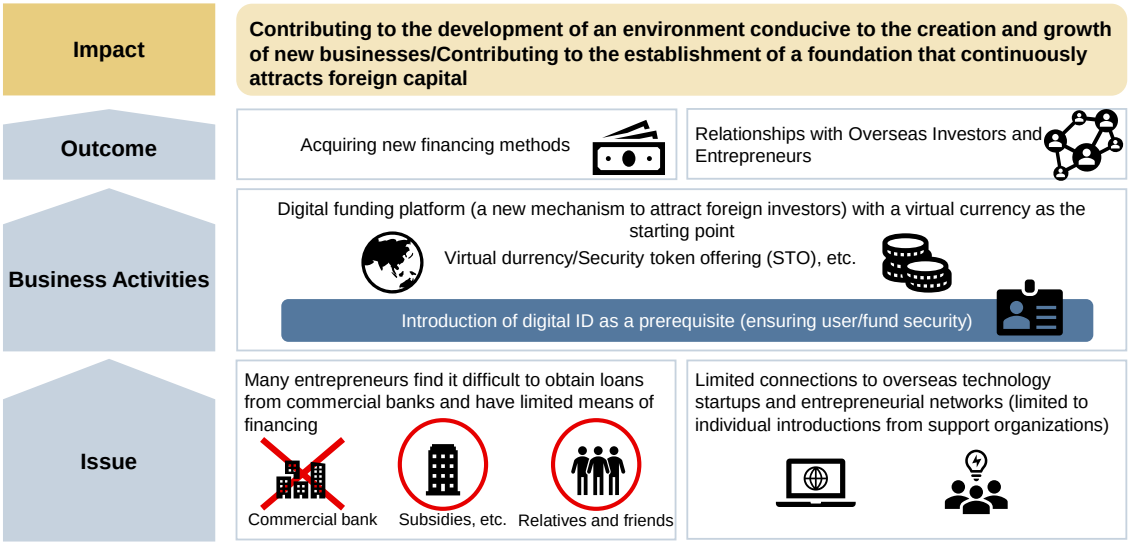
One other related issue is the limited networking between Bhutanese entrepreneurs and overseas investors, entrepreneurs, and business people. According to the same interview survey, Bhutanese entrepreneurs have had opportunities to be introduced to overseas experts in Silicon Valley and other areas through support organizations such as the Loden Foundation. However, it is difficult for Bhutanese entrepreneurs to have free access to foreign investors, entrepreneurs, and business people on a daily basis. Under these circumstances, if Bhutanese entrepreneurs can accumulate knowledge and experience to enter overseas markets by developing a network that allows them to work closely with overseas investors, entrepreneurs, and business people, this could contribute greatly to their entry into overseas markets. Based on the above ideas, we propose the establishment of a fund-raising system using virtual currency as a pilot project proposal.

< Impacts and prospects >

In recent years, there have been several examples of the use of blockchain-based virtual currencies to raise funds for businesses that solve social issues in emerging and developing countries[30]. By using this system in a variety of areas in this nascent stage, Bhutanese entrepreneurs can access "social investors" around the world who are interested in businesses that solve social issues. Moreover, such investors are difficult to reach with traditional methods of supporting entrepreneurial development. On the other hand, there is concern that the stance of the local government may be a barrier to the feasibility of such an approach. However, the RMA, which is in charge of fintech policies, has shown great interest in this pilot project during the discussions in our survey, and since the RMA's interest has been confirmed, the pilot project has the potential to become a moonshot initiative in supporting entrepreneurs in Bhutan.

[30] SunExchange: https://thesunexchange.com/ (South African solar power startup: the company has built a business model that uses digital currency to attract investment from around the world)

Figure 67 Impacts created by digital currency

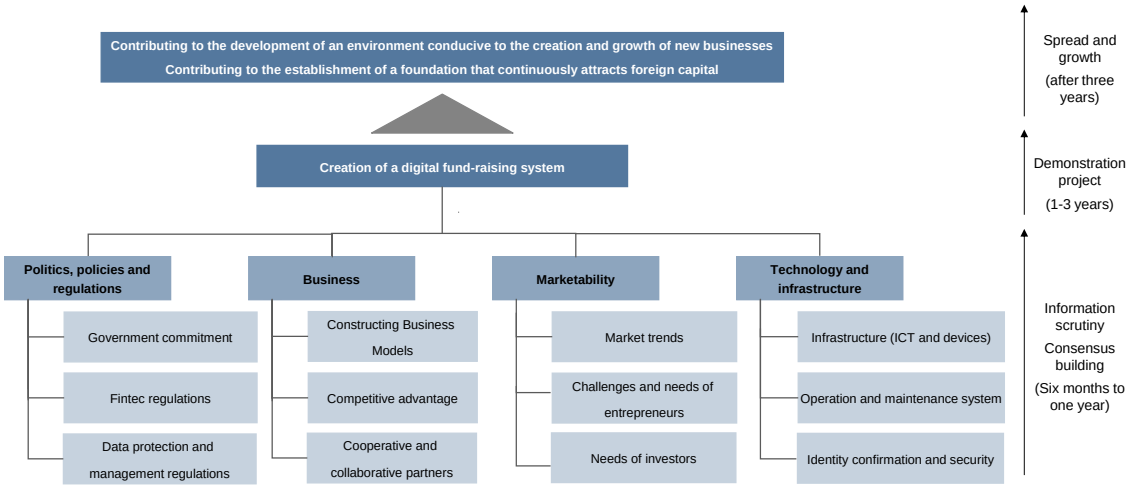


< Issues and roadmap >

The following chart summarizes the key points to make the pilot project successful and create impact. The most important aspect of the pilot project is to obtain permission from the RMA, the financial supervisory agency, which has expressed interest in the idea of developing a digital fund-raising system and has requested a specific business plan. Considering this situation, the next step is to present a simple proposal to the RMA and obtain their agreement to cooperate in the pilot study. Then, after reflecting the RMA's request in the detailed plan, we will aim to obtain permission to implement this pilot project at an early stage.[31]

[31] In addition, the RMA has shown great interest in conducting pilot projects to introduce blockchain technology for electricity trading and tokenized virtual currencies (carbon credits) to offset carbon emissions.

Figure 69 Key elements for the success of the pilot project and viewpoint of the survey (Digital currency)



< Stakeholders >

The stakeholders envisaged in the project is shown in the table below, and the RMA will be the main party to be consulted. In addition, as of June 2021, ADB is conducting a pilot study on CBDC[32], and there are some examples of CBDC projects that are linked to digital IDs for data collection and utilization in other countries. Therefore, the survey team will consider collaborating with ADB to share information on their CBDC project and to cooperate in our pilot project.

[32] There are two types of Central Bank Digital Currencies (CBDC): whole-sale CBDC (for settlement of large amounts of funds between financial institutions) and general-use CBDCs (for a wide range of users such as corporations and households). In recent years, the latter type of CBDC has been attracting global attention from the perspective of financial inclusion, especially as it can provide financial services such as payments to users in developing countries who do not have bank accounts.

Figure 70 Things to be confirmed and adjusted with stakeholders (Digital currency)

Stakeholder	Name	Benefits	Incentive measures and matters to be confirmed and adjusted
Japanese firms (Candidate)	■ Company A	■ Knowledge and experience in the introduction of advanced digital currency overseas (actual results) ■ Enhancing corporate value through the resolution of social issues in Bhutan	■ Government support ■ Promotion of collaboration with local government and related organizations (support by research team for self-sustaining business operations)
Local government agencies	■ RMA ■ MoIC	■ Entrepreneurial development (industrial development) ■ Possibility of investment by Japanese companies through pilot projects ■ Promotion of digitization of public services (promotion of use of digital ID)	■ Presentation of the specific impact of introducing a fund-raising system (sharing of case studies from other countries, etc.) ■ Japanese funds and specific technical assistance ■ Security assurance (introduction of robust system, sharing of image for utilization, etc.)
Local partners (Candidate)	■ Commercial banks	■ Possibility of investment from Japan through collaboration with Japanese companies ■ Increasing corporate value through business synergies	■ Identify potential areas of collaboration and projects. ■ Sharing of concrete image of investment from Japanese companies in terms of funds and technology
Support organizations	■ ADB	■ Increasing development impact through donor coordination ■ Possibility of using ODA	■ Identify areas where synergies can be expected while avoiding duplication of support ■ Propose measures for cooperation with ADB, including the use of JICA's existing projects (e.g., industrial human resource development)
Other	■ Entrepreneur	■ Increased possibility of support from foreign investors	■ Building a digital platform suitable for advisory support as well as fund-raising from overseas

< Expected support and cooperation from the GoB and external organizations >

It is of utmost importance to obtain permission from the RMA to implement the pilot project. In addition, the survey team will obtain information from this agency on the future direction of fintech regulation. The RMA has already developed a FinTech Regulatory Sandbox Framework as a FinTech deregulation measure. While the RMA's open attitude toward fintech has been confirmed through this survey, it is also necessary to ensure the intentions of the government, such as the RMA, regarding the prospects, the operational status, and issues of these regulations, so that we can reflect them in our business design.

Furthermore, from the perspective of data protection and management regulations including personal information, we will check the status of introduction and maintenance of digital IDs promoted by the MoIC in the framework of Digital Drukyul. Besides, discussions will be held with this agency regarding collaboration in a pilot project. In particular, we believe that it is necessary to obtain information from the MoIC regarding the future prospects for cooperation between the financial sector and digital ID, and the data governance policy.

< Survey results >

Initially, this pilot project was to conduct the necessary survey for the introduction of CBDC to improve financial access for rural Bhutanese. For this reason, this survey mainly focused on the existing digital payment services in Bhutan and the status of financial access for the Bhutanese people. In the latter half of the survey period, the RMA expressed a strong interest in the development of a digital fund-raising system for entrepreneurs, and it became clear that the ADB had started a pilot study for the introduction of CBDC.

Based on the RMA's interest and the status of the ADB's project, this pilot project has shifted its concept from the introduction of CBDC to the establishment of a digital fund-raising system for the purpose of solving entrepreneurs' financing problems and forming a network with overseas experts. Against this backdrop, we propose conducting the necessary surveys for the establishment of this system. From the discussions with the RMA and the interviews with entrepreneurs in this survey, the following table summarizes the survey items to be confirmed in the next step.

Figure 71 Survey items and method (Digital currency)

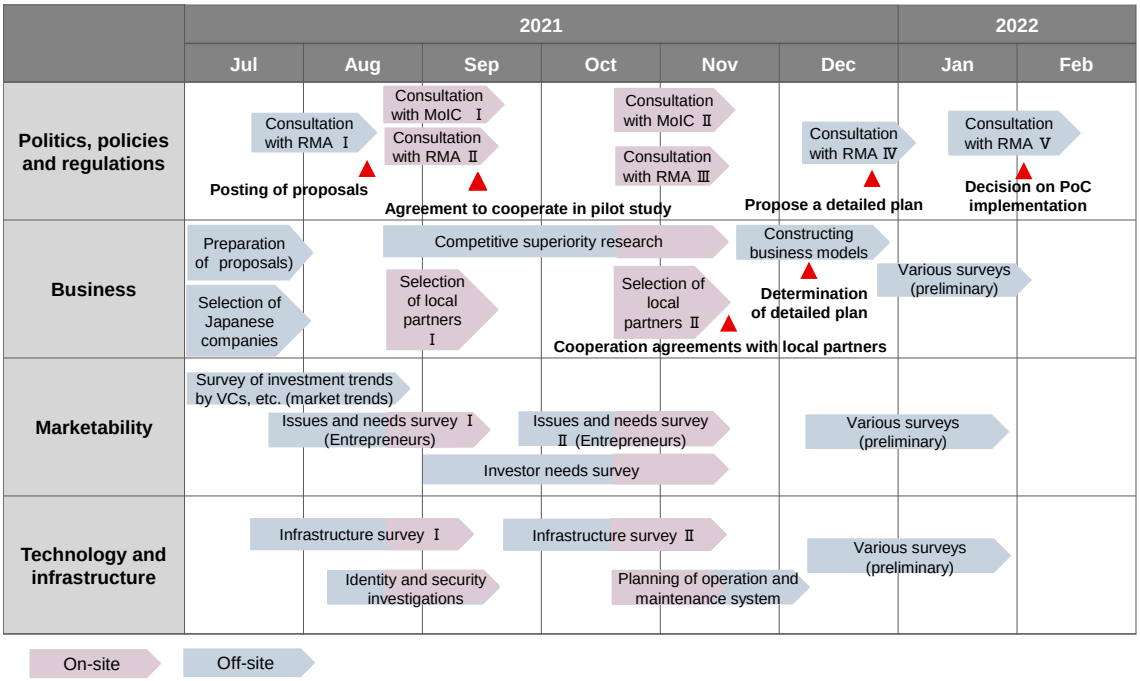
(++): Focused research, (+): General research, N/A: Not applicable

Survey items		Survey method		
Classification	Viewpoints	Desktop	Interview	Question naire
Politics, policies and regulations	■ **Government commitment**: Stimulate interest and understanding of RMA ■ **FinTech regulation**: Review of current deregulation measures (FinTech Regulatory Sandbox Framework), challenges and prospects ■ **Data protection and management regulations**: (1) Confirmation of the status and prospects of data protection and utilization regulations; (2) Understanding of government initiatives related to data governance	(++)	(++)	N/A
Business	■ **Build a business model:** Establish a sustainable business model (target customers, financing and repayment models, etc.) ■ **Competitive advantages**: Confirmation of details of existing loan services by commercial banks and supporting institutions (ADB, etc.), and availability and prospects of alternative services ■ **Cooperation and partnership:** Selection of Japanese companies to serve as business entities, selection of local partners such as telecommunications and IT companies to handle local operations	(+)	(++)	N/A
Marketability	■ **Market trends:** (1) Understanding the approaches, issues, and prospects of international VCs, accelerators, and incubators in the Bhutanese market; (2) Confirming international trends and growth potential of fund-raising systems ■ **Challenges and needs:** Identify the status of entrepreneurs' use of loan services, as well as the issues and needs of these services (from the user's perspective) ■ **Investor needs**: Identify potential areas for investment and areas of significance for solving development issues	(+)	(++)	(+)
Technology and infrastructure	■ **Infrastructure (Information technology and devices):** Summary of the Internet environment, penetration and usage of various devices such as smartphones, and confirmation of the status of the base registry and other facilities (including design concepts) ■ **Operation and maintenance system:** Establishment of operation manuals and maintenance systems for system monitoring, emergency and recovery responses, backups, and user inquiries ■ **Identity confirmation and security:** Introduction of eKYC, security measures, preparation of information disclosure regulations, etc.	(+)	(++)	N/A

< Next step >

The schedule for the future survey is proposed in the figure below. First, it is necessary to reach an agreement on cooperation with the RMA for the pilot study through close discussion, and then consider collaboration with other relevant government agencies such as the MoIC. Collaboration with local partners would be needed in gathering information on the infrastructure and the operation of fintech regulations in Bhutan.

Figure 72 Future survey plan (digital currency)



5. Possibility of Cooperation by JICA

5.1. Selection and Cooperation with Companies to Implement Pilot Projects

The pilot projects of (1) drone logistics, (2) medical and health data infrastructure, and (4) development of the entrepreneurial environment (digital currency) should be studied from specialized and practical perspectives from planning to implementation phases. Therefore, it is desirable to plan each project together with Japanese companies with actual business experience and capabilities. It is necessary for them to tackle the bottlenecks in Bhutan, to create a business and industry from scratch without being bound by precedents, and to embody the concept by taking the initiative with JICA and local stakeholders. Detailed selection processes are yet to be determined, however, companies should be selected mainly from the following viewpoints.

Figure 73 Viewpoints and methods of company selection and incentive design

	Points
Viewpoint of evaluation	■ Positiveness to create businesses and industries from scratch in Bhutan without being precedented ■ Mindset to be committed to the success of the pilot project ■ Awareness of contributions to mid- to long-term industrial development and job creation ■ Willingness to invest the business by themselves
Selection method	■ Approach to companies related to each pilot project area, mainly companies that conducted interviews in this survey ■ Ask for submission of a simple proposal for a pilot project to foster Bhutan's industry ■ One company to be selected for each pilot project after evaluation and screening by JICA
Incentive design	■ Execution of PoC projects and accumulation of evidence through the PoC projects by regarding the challenges in Bhutan as business resources ■ Opportunity to develop a new business while enjoying the trust of the local government to JICA and that of the Bhutanese people to the local government

It is necessary to carefully design the incentive for each company so that they can benefit from participating in this pilot project. While welcoming companies that are willing to take part in with their own investment, it is highly likely that financial support for initial investment will leverage project quick implementation. Thus, if the pilot project appears to be more feasible and the realistic plan will be prepared, the financial support for the company should be considered. Assumptions for the division of roles between JICA and Japanese companies are given below.

Figure 74 Roles of JICA and Japanese companies for the pilot project

Action Items	JICA*	Japanese firm
Planning and implementation of pilot projects	■ Formulation of a pilot project roadmap (from the perspective of solving local development issues and promoting the economy in Bhutan over the medium to long term) ■ Advice on business model and PoC implementation plan	■ Formulation of a pilot business model and a PoC plan (consideration of a sustainable business model) ■ Implementation of pilot projects and establishment of a local project implementation structure (human resources development, technology transfer, etc.)
Consultation with local stakeholders and basic research	■ Arrangement of interviews with local stakeholders ■ Conducting surveys from the perspectives of regulatory and policy trends (e.g., reorganization of deregulation policies), stakeholders (e.g., competitors and potential partners), and marketability (e.g., needs surveys and customer identification)	■ Consultation from professional and technical standpoints ■ Conducting surveys from the perspectives of business (cost-benefit simulation) and technology and infrastructure (compatibility of products and services)

*: Including survey teams

Regarding the pilot project of (3) Support for Entrepreneurs, several PoC projects will be initiated to build a model case in order to encourage Bhutanese entrepreneurs living in Bhutan to expand their business to overseas. Details are given in section 4.2.3.

5.2. Infrastructure to Support the Implementation of Pilot Projects

For the pilot projects described in Chapter 4, particularly for projects that utilize specific digital solutions, it is assumed that a certain level of ICT infrastructure will be required. The specific criteria vary depending on the projects and its adopting solutions, but for example, drone logistics requires an ICT infrastructure that can accurately capture flight information even in remote areas. A data management system that can appropriately manage a huge amount of diverse and long-term data is critical for medical and health data construction. Regarding digital currency, the stability and speed of the network is essential to immediately complete financial transactions. The importance of these ICT infrastructure has been reiterated in the Digital Drukyul and the 21st Century Economic Roadmap, both of which have a comprehensive list of necessary items.

On the other hand, the government and its responsible ministry, MoIC, explore when and to what extent to develop the infrastructure. MoIC commented in the online interview, “it's difficult for us to say to what extent ICT infrastructure should be prioritized. We will need to have something concrete based on our “current” situation, but it's difficult for us to see the future -- how staying with the existing infrastructure would limit our potential for economic growth.” Reflecting this voice, the roadmap also calls for concrete plans such as the National Digital Transformation Strategy and Implementation Plan and the National Cyber Security Strategy and Implementation Plan as an entry point of data/technology utilization.

It is considered worthwhile to provide technical assistance for infrastructure development planning and to dispatch advisors to that end toward the achievement of the roadmap by 2030 and beyond that. It is necessary to bear in mind that infrastructure development requires

a large amount of funds and a certain period of time, and does not proceed in the same timeline as the pilot projects mentioned in Chapter 4. Yet, it can be expected that the experience gained in carrying out specific projects will be linked to the medium-to long-term plan, which will lead to more efficient infrastructure investment based on the use of digital technology in the real world.

JICA's strengths are its extensive experience in developing ICT infrastructure in low- and middle-income countries through loans compared to other development agencies, and a deep understanding of Bhutanese society deriving from working closely with Bhutan’s socioeconomic development for many years. It should be emphasized that the significance of examining the cooperation in infrastructure development that can only be achieved by a combination of technical knowledge, deep understanding of society itself to which we are going to apply new technologies, and an environment where fresh lessons can be extracted from specific projects implemented in parallel.

6. Appendix

6.1. Overview of Social Development Status

6.1.1. Gross National Happiness (GNH)

GNH is the core philosophy of the Bhutanese government. Bhutan is characterized by its aim of balanced development. GNH consists of the following four pillars and nine domains.

Figure 75 GNH components

Four pillars of GNH	✓ Sustainable and equitable socio-economic development ✓ Environmental conservation ✓ Preservation and promotion of culture ✓ Good governance
Nine domains of GNH	✓ Living standards ✓ Education ✓ Health ✓ Environment ✓ Community vitality ✓ Time-use ✓ Psychological well-being ✓ Good governance ✓ Cultural resilience and promotion

Source: GNH Centre Bhutan website

According to the previous GNH survey conducted in 2015, 91.3% of Bhutanese respondents answered, “very happy,” “happy,” or “fairly happy” in over half of the survey items, which is higher than the results of the 2010 survey. The results of the GNH survey to be conducted in 2020 will be published in 2021.

Figure 76 Change from 2010 to 2015 GNH Index

	Definition of group	GNH survey in 2010		GNH survey in 2015 (change from 2010)	
	Sufficiently in:	Percentage of population who are:	Average sufficiency of each person across domains	Percentage of population who are:	Average sufficiency of each person across domains
Deeply happy	77-100%	8.3%	81.5%	8.4% (+0.1)	80.9% (-0.6)
Extensively happy	66-76%	32.6%	70.7%	35.0% (+2.4)	70.8% (+0.1)
Narrowly happy	50-65%	48.7%	59.1%	47.9% (-0.8)	59.1% (±0.0)
Unhappy	0-49%	10.4%	44.7%	8.8% (-1.6)	45.2% (-0.5%)

Source: Center for Bhutan Studies & GNH Research (2016)

6.1.2. Health

General health indicators are improving, as shown in the table below. The cost of healthcare services is free and available to everyone, but there remains an inequality of access to

healthcare facilities and services. One of the challenges is the increase in NCDs. In 2019, three major causes of death were ischemic heart disease, chronic obstructive pulmonary disease (COPD), and stroke. In addition, cirrhosis was in the fifth cause[33]. In recent years, drug dependence in young people has also been a social issue.

Figure 77 Key health indicators

Index name	Value	Year
Life expectancy at birth	71.8 years old	2019
Total fertility rate	1.95	2019
Infant mortality rate	23.8 per 1,000 live births	2019
Neonatal mortality rate	16.6 per 1,000 live births	2019
Maternal mortality rate	183 per 100,000 live births	2017
Suicide mortality rate	4.6 / 100,000	2019
Access to improved water sources	36.2%	2017
Access to basic drinking-water	97.2% (although many are out of water)	2017
Vaccination rate (DTP with D3)	97%	2019

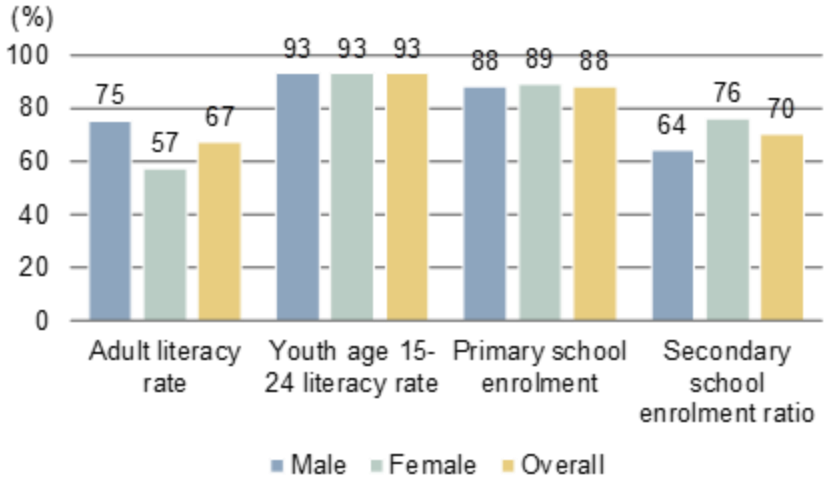
Sources: World Bank, World Development Indicators

6.1.3. Education

The literacy rate of young people is high, and the gender gap is also small. The education system is 7-2-2-2 years, and classes are conducted in English. Tuition fee is free, but education is not mandatory, and parents can choose whether to send their children to school. In addition, the turnover rate of teachers is high at about 3.5%, which is considered to be due to the fact that teachers cannot transfer to the desired region and are willing to study in master's programs and abroad.

[33] IHME website, available at http://www.healthdata.org/Bhutan (accessed on 3 July 2021)

Figure 78 Literacy and enrollment rates



Source: National Statistics Bureau (2018)

6.1.4. Agriculture

Agriculture remains the main industry in Bhutan, accounting for 16% of GDP and 50% of employment, as noted in Chapter 2. The main agricultural products are rice, cardamom, and soybean oil. The self-sufficiency rate of rice, which is the staple food, remains at 47% in 2017, due to the fact that many agricultural lands are not suitable for rice cultivation and that rice imports from neighboring countries are inexpensive. In general, young people are increasingly leaving from agriculture, and according to National Statistics Bureau (2018), for example, only 44% of young people between the ages of 20 and 24 are employed in agriculture, compared with 68% in the age group of 50 and 54.

6.1.5. Finance

Bhutan's financial sector consists of five commercial banks, three insurance companies, one pension fund, six microfinance institutions, nine brokers, and three private lenders. The figure below shows the major financial institutions in Bhutan. In Bhutan, an electronic funds transfer and payment system that electronically transfers payroll, dividends, and utilities payments was just introduced in 2010. In 2016, JCB Co., Ltd partnered with the Bank of Bhutan.

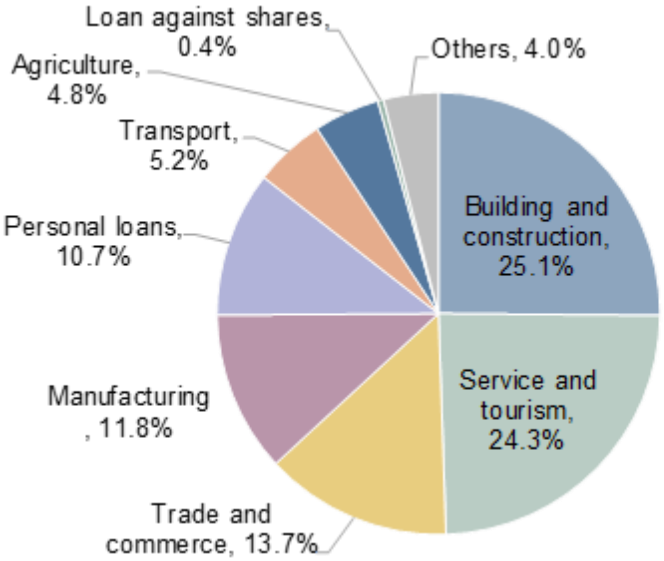
Figure 79 Financial institutions in Bhutan

Banks	Non-Banks	Stock Exchange and Microfinance Institutions
■ Bhutan National Bank Ltd. ■ Bank of Bhutan Ltd. ■ Druk PNB Bank Ltd. ■ T Bank Ltd. ■ Bhutan Development Bank Ltd.	■ Royal Insurance Corp of Bhutan Ltd. ■ Bhutan Insurance Ltd.	■ Royal Securities Exchange of Bhutan Ltd (RSEBL) ■ Respect, Educate, Nurture and Empower Women (RENEW) ■ Rural Enterprise Development Corporation Ltd (REDCL) ■ Bhutan Association of Women's Entrepreneurs (BAOWE) ■ Bhutan Association of Women's Entrepreneurs (BAOWE)

Source: Prepared by survey team based on State of Financial Inclusion Report 2019

Looking at the amount of loans by industry in the figure below, "Construction (including housing)," "Services and tourism," "Trade and commerce," "Manufacturing (hydroelectric power generation)" and "Personal loans" are the major destination. Agriculture accounts for 16% of GDP but only 5% of loans.

Figure 80 Lending by sector (2019)



Source: Royal Monetary Authority (2019)

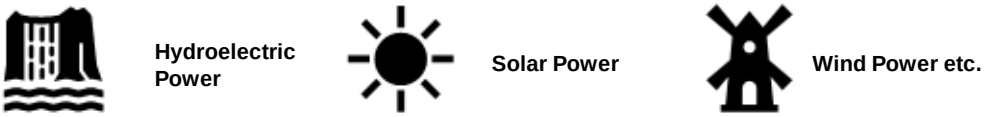
6.1.6. Resilience

Bhutan is prone to natural disasters, with glacial lake collapses leading to frequent flooding, landslides, forest fires and earthquakes. 24 out of the 562 glacial lakes, for example, are at risk of collapse. Landslides occur frequently in specific locations and are a factor in delays in distribution of goods. There are many problems to be solved in order to take adequate measures.

6.1.7. Energy

According to Hirayama (2019), the rate of households electrified in 2017 was 99.97% by constructing transmission lines and promoting the use of self-sustaining, distributed power sources such as small hydro and solar power generation. Electricity from small and medium-sized power plants is consumed in Bhutan, and electricity from large hydropower plants is essentially exported to India. Exports of electricity to India are about 2.43 times larger than domestic consumption. Hydropower, solar power, and wind power generation are the main types of power generation in the country, and their operation status and characteristics are as follows.

Figure 81 Various power generation modes in Bhutan



	Hydroelectric power generation	Solar power generation	Wind power, etc.
Operating Status	■ For exports to India, in addition to the 6 plants[1] currently in operation or under construction, the construction of 7 plants has been decided (a construction plan for 4 of these has been agreed as of 2014).	■ It has been introduced by the government and international organizations since the 1980s.	■ With support from Norway through the Asian Development Bank, the first wind power generator was completed and put into operation in 2016 (Komai Haltech (Japan) received the construction order). ■ Approximately half of the 300 households in 6 villages in Rubesa have been supplied with this electricity.
Features	■ Many large-scale hydropower plants are suitable for development (canyons with high water volume and narrow river width, hard bedrock). ■ In the rainy season, a large amount of snowmelt water is used to maintain a stable amount of water, but in the dry season, it is difficult to maintain power generation at some power plants (especially small-scale hydropower generation).	■ Attracting attention as an electricity dissemination method is suitable for mountainous terrain and population distribution in Bhutan. ■ Himalayan sunshine is the source of energy.	■ The Bhutanese government is considering further installation of wind turbines, but negotiations with land owners are challenging (many of the planned locations are privately owned). ■ In addition, the use of biomass energy is also promoted.

Note:1.As of the end of 2018, 3 are in operation and 3 are under construction with scheduled for starting operation by the end of the year.

Source: developed by survey team based on Hirayama (2019)

6.2. Support for digitization by major donor agencies

The table below shows the various programs/projects using digital technology by the major donors in Bhutan.

Figure 82 List of strategies, programs, and projects by major donors

Organization	Strategies and Programs/Projects	Source
World Bank	■ Supports establishing the Thimphu Tech Park, which is the first IT park in Bhutan. ■ Ongoing projects utilizing digital technology include supporting rural youth entrepreneurship, improving community connectivity, developing parking facilities in Thimphu, and investing in Mountain Hazelnuts Ventures. ■ Bhutan Country Partnership Strategy (2020-2024) is now being developed and focus areas would be economic diversification, resilience enhancement, capital development and digitalization.	Interview on July 30, 2020
UN Group	■ With a slogan "a just, harmonious and sustainable Bhutan where no one is left behind", the UN plans to mobilize around USD 120 million to achieve four outcome areas by 2023.	United Nations Sustainable Development Framework for Bhutan 2019-2023
UNDP	■ Has an innovation team within UNDP Bhutan, which contains two pillars: future of work and waste. ■ No strategy documents in terms of technology usage, but has a portfolio which focuses on eGovernment.	Interview on October 9, 2020
WFP	■ Conducts projects utilizing digital technology in the fields of disaster prevention, agriculture, and nutrition. ■ Specifically, WFP implements modeling research on earthquakes and glacial lake outbursts, prototype development of EduTrition to help children learn about nutrition in a game-like style, and operates pilot study with PLUS, which supports the design of menus for school lunches.	Interview on July 15, 2020
ADB	■ Sets the three Pillars of ADB Country Partnership Strategy: Bhutan, (2019–2023) and Pillar 2 includes improving digital connectivity to foster regional integration.	Bhutan: Country Partnership Strategy 2019–2023
Japanese government	■ The basic policy is to support the development of a self-reliant and sustainable country with a balance between rural and urban areas, and focus areas are sustainable economic growth and vulnerability reduction. ■ JICA focuses on agricultural and rural development, economic infrastructure development, social development and good governance.	Policy on Country Development Cooperation: Bhutan

6.3. ICT infrastructure

6.3.1. Governing body

As for the governing body, MoIC holds jurisdiction over the ICT and transport sector in Bhutan. The ministry is responsible for developing reliable and sustainable network and system in terms of information, communications and transport and providing the means of access to

services based on them with easier and affordable manner. As one of the departments of MoIC, DITT is mainly responsible for the administration of ICT infrastructure in the country.

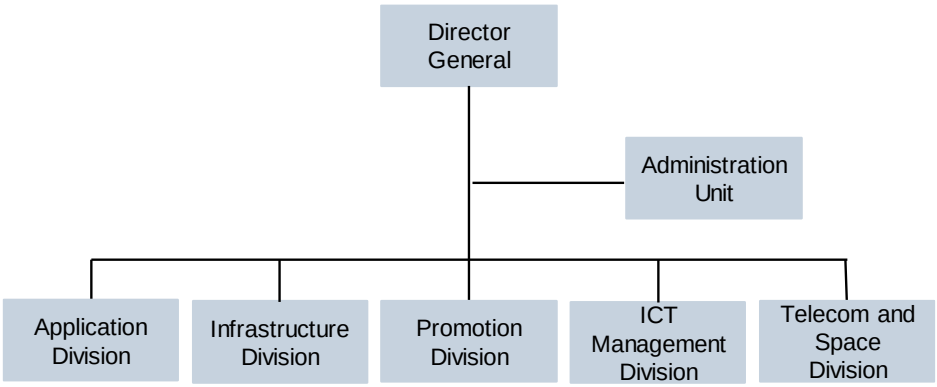
BICMA is also an administrative agency for ICT infrastructure as a regulatory body in charge of ICT and media. It was formerly under MoIC with the name of Bhutan Communications Authority (BCA), and then had become independent following the issue of the Information, Communications and Media Act of Bhutan 2018.

In this section, an overview of these two are illustrated as the organizations which are in charge of ICT infrastructure.

<Department of Information Technology and Telecom (DITT)>

As shown in the table below, DITT consists of five divisions namely, Application Division, Infrastructure Division, Promotion Division, ICT Management Division, and Telecom and Space Division.

Figure 83 Organization chart of DITT



Source: developed by the survey team based on information obtained from DITT website[34]

While the mandates of DITT broadly cover the various aspects of ICT sector to realize the country's ICT vision, "ICT enabled knowledge society as a foundation for Gross National Happiness"[35] , Infrastructure Division and Telecom and Space Division are particularly in charge of ICT infrastructure matters, as the table below shows.

Mandates of DITT[34]
✓ Frame ICT policies, regulations, standards and legislation
✓ Drive innovation, development and adoption of ICTs
✓ Promote ICT as an industry and overarching enabler of national development
✓ Support development of reliable ICT infrastructure in the country
✓ Determine appropriate technologies and systems suitable for Bhutan's contexts

[34] DITT, "About Us", Available at: https://www.dit.gov.bt/about-us (accessed on October 1, 2020).
[35] DITT (2014)

✓ Facilitate good governance and shared national consciousness by the use of ICTs
✓ Develop sustainable and affordable ICT facilities and services for all Bhutanese to improve their living standard.

Figure 84 Mandates of DITT divisions regarding ICT infrastructure

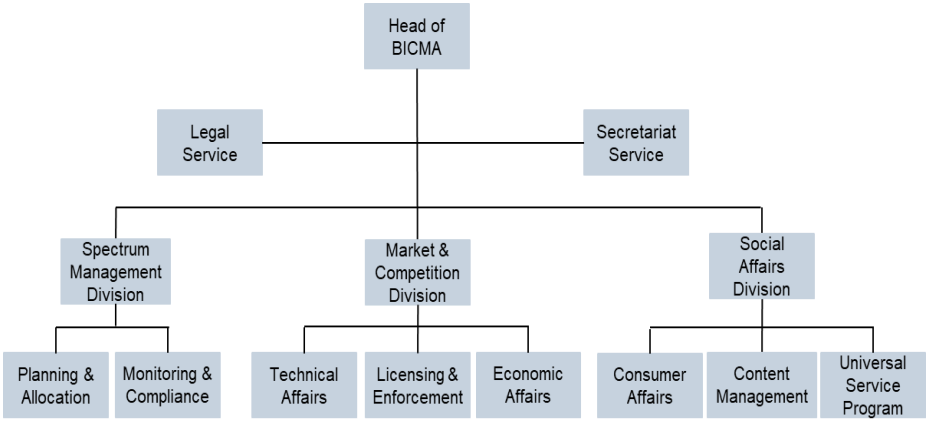
Division	Mandates
Infrastructure Division	■ Design and implement Government infrastructure ■ Formulate policies, protocols, standards, and specifications for networks, systems, services, and security
Telecom and Space Division	■ Develop policies, legislations, regulations, standards, and plans for telecommunications ■ Administrate the national network and radio frequency ■ Coordinate with international and regional telecommunication bodies, such as ITU and APT

Source: developed by the survey team based on information obtained from DITT website[34]

< Bhutan InfoComm and Media Authority (BICMA)>

Figure below is the organization chart of BICMA.

Figure 85 Organization chart of BICMA



Source: developed by the survey team based on information obtained from BICMA website[36]

The mission of BICMA is "To foster an environment for fair and sustainable competition, stimulate innovation, encourage investment, and ensure that all Bhutanese have access to quality ICT & Media services at affordable prices founded on the principles of Gross National Happiness"[37] and three divisions contribute to realizing it respectively. Figure below shows their

[36] BICMA, "Background", Available at: https://www.bicma.gov.bt/bicmanew/?page_id=53 (accessed October 1, 2020)
[37] BICMA, "Vision and Mission", Available at: https://www.bicma.gov.bt/bicmanew/?page_id=65 (accessed on October 1, 2020).

roles regarding ICT infrastructure.

Figure 86 Mandates of BICMA divisions regarding ICT infrastructure

Division	Mandates
Spectrum Management Division	■ Formulate regulations allocation and usage of radio-frequency spectrum ■ Plan, allocate, license, and monitor the usage of radio-frequency spectrum
Social Affairs Division	■ Realize universal access of ICT services with a secure, reliable, efficient, and affordable manner ■ Develop and administrate universal service plan and universal service fund ■ Formulate the universal service programme in light of the regional and international best practices
Market and Competition Division	■ Develop technical regulations, standards, and specifications ■ Facilitate interconnection and sharing of ICT facilities among licensees ■ Review and support technological innovation to improve the ICT standards ■ Maintain and promote the ICT market by encouraging competition while protecting users via controlling tariff, rate, fees and charges for licensed services

Source: developed by the survey team based on information obtained from BICMA website[38]

6.3.2. Laws, regulations, and policies

The following are the laws, regulations, and policies related to ICT infrastructure developed by MoIC and BICMA for the ICT field in Bhutan.

<Information, Communications and Media Act of Bhutan>[39]

Information, Communications and Media Act of Bhutan broadly regulates the ICT infrastructure affairs as it is applied to all the ICT sector including both providers and users of ICT services and facilities. This act was issued by DITT in 2018 with repealing the same act issued in 2006 to administrate and promote the ICT sector in Bhutan along the up-to-date situation of the field. Besides, establishment of BICMA is also stipulated with specifying its functions, mandates, and powers. The followings are regulated with regard to ICT infrastructure in particular.

- ✓ Roles, mandates, and authority of MoIC to govern the ICT sector
- ✓ Licensing, installation, and utilization of ICT infrastructure
- ✓ Management and utilization of radio frequency
- ✓ Universal service fund and its definitions, purposes, and regulations
- ✓ Definitions, rules, and regulations of e-Governance, e-commerce, and e-Signature
- ✓ Cyber-security and protection of consumer, privacy, and data

[38] BICMA, "Divisions", Available at: https://www.bicma.gov.bt/bicmanew/?page_id=65 (accessed October 1, 2020)
[39] DITT, "ICT Guidelines/Acts", Information, Communications and Media Act of Bhutan, Available at: https://www.dit.gov.bt/sites/default/files/ICM%20Act%202018_0.pdf (accessed 1 October 2020)

- ✓ Operations and liability of internet service providers

<Rules and Regulations Governing the Establishment and Administration of the Universal Service Fund>[40]

In order to determine the conditions for establishment and administration of USF which is defined in the section 190 of the Information, Communications and Media Act of Bhutan, BICMA issued this document in 2019. While the former stipulates the categories of universal service and the establishment of USF with its rules and regulations, the latter mentions the Criteria for determining universal services, usage of USF, and implementation of the universal service programmes. According to the document, the universal services are identified as follows whereas its criteria for determination is also regulated.

The universal service includes:

- ✓ Public voice telephony services together with free calls to emergency services and directory assistance,
- ✓ Internet access together with free internet access for schools and hospitals, and
- ✓ Such other ICT facilities or ICT service as the Government may specify through a policy directive issued by the Bhutan Telecommunication and broadband policy

The criteria for determining universal services are:

- ✓ Services that are beneficial to public health or public safety
- ✓ Services that is consistent with the public interest, convenience and necessity.

In addition, it also specifies how the USF should be utilized as listed below with the guideline of implementing the universal service programmes which is proposal-based ones conducted by licensed ICT providers.

- ✓ Universal service programmes of the Royal Government of Bhutan
- ✓ Financing the implementation of the National ICT projects that are not covered by donors or GoB funding
- ✓ Meeting the Authority's programmes if there are no other appropriations from any other sources.

Although the Information, Communications and Media Act of Bhutan stipulates a wide range of matters related to ICT in general, there are many areas in which details have not been determined. Some government officials indicated the view that these matters would be determined in accordance with the decisions of government's policies in each field. In addition, the 21st Century Economic Roadmap has proposed a shift in thinking such as "allow first, and regulate later" and "generally allowed unless explicitly disallowed." This trend can be seen worldwide in the fast-paced ICT sector. On the other hand, BICMA also mentions a lack of technical human

[40] BICMA, "Rules and Regulations", Available at: https://www.bicma.gov.bt/bicmanew/data/publications/rules-regulations-guidelines/Rules_and_Regulations_on_Universal_Service_Fund_2019.pdf (accessed October 1, 2020)

resources in the formulation and implementation of laws and regulations and a lack of equipment and supplies for monitoring. Thus, it can be said that there are difficulties in the timely formulation of laws and regulations.

As for USF, it is funded by telecom operators to be paid as the license fee and utilized as the financial assistance for introducing services to realize the universal service in telecommunication field. On the other hand, since the fund is not applicable for the operating purposes after the introduction, the running cost is entirely borne by the operators. Although the government expects operators' efforts from the viewpoint of social contribution, the operators expect it can become applicable to the operational costs since the running costs are huge burden in particular the regions where profits are small due to limited population.

<ICT infrastructure-related policies>

To date, MoIC has developed ICT-related policies and master plans. Major policy documents related to ICT infrastructure are listed in the table below.

Figure 87 Policies on ICT infrastructure

Policy	Year of formulation	Overview
National Broadband Mater plan	2008	■ With the goal of spreading the broadband network nationwide by 2015, the current state of network installation and the capacity of each network are analyzed and future forecasts are proposed. The improvement plans are also presented based on them. ■ As for the access network, a list of suitable technologies for Bhutan is provided based on the ITU recommendations.
Bhutan Information and Communications Technology Policy and Strategies	2009	■ It presents Bhutan's ICT development policy in all areas, such as infrastructure, human resources development, applications, and the private sector, together with the responsible agency, budget, and implementation timing. ■ As for ICT infrastructure measures, it emphasizes the promotion of a free and competitive market and the provision of low-cost, reliable and stable telecommunications environments throughout the country.
Bhutan Telecommunications and Broadband Policy	2014	■ It presents policies, guidelines and action plans for the development of the telecommunications industry and the provision of broadband services. ■ It has a broad set of goals, including providing communications services to all citizens, strengthening laws and regulations, creating a competitive environment for private sector development, and promoting investment.
ICT Roadmap (revised)	2015	■ Supported by World Bank, ICT Roadmap formulated in 2011 was reviewed. ■ Although it is not focused on ICT infrastructure, it has been pointed out that there are projects that have not been realized or have not been achieved, in addition to reviewing the vision and goals of ICT development. As conclusion, it is recommended that the road map should be incorporated into the specific master plan aligning with the 12th Five-Year Plan.

Source: developed by the survey team based on each policy document

Each policy document presents a number of issues necessary for the development of the ICT infrastructure in Bhutan, and it can be seen that there are sufficient awareness of the challenges and measures to be taken. On the other hand, since most of them are comprehensive, it seems not sufficient to present concrete plans and actions based on the relations and priorities of each measure. Although Bhutan Information and Communications Technology Policy and Strategies refers in detail to the timing and budget of implementation, it was formulated in 2009,

more than 10 years ago. Also, the National Broadband Mater Plan was developed in 2008. Given the development speed of ICT field, it seems necessary to revise them or formulate a new master plan.

6.3.3. Network infrastructure

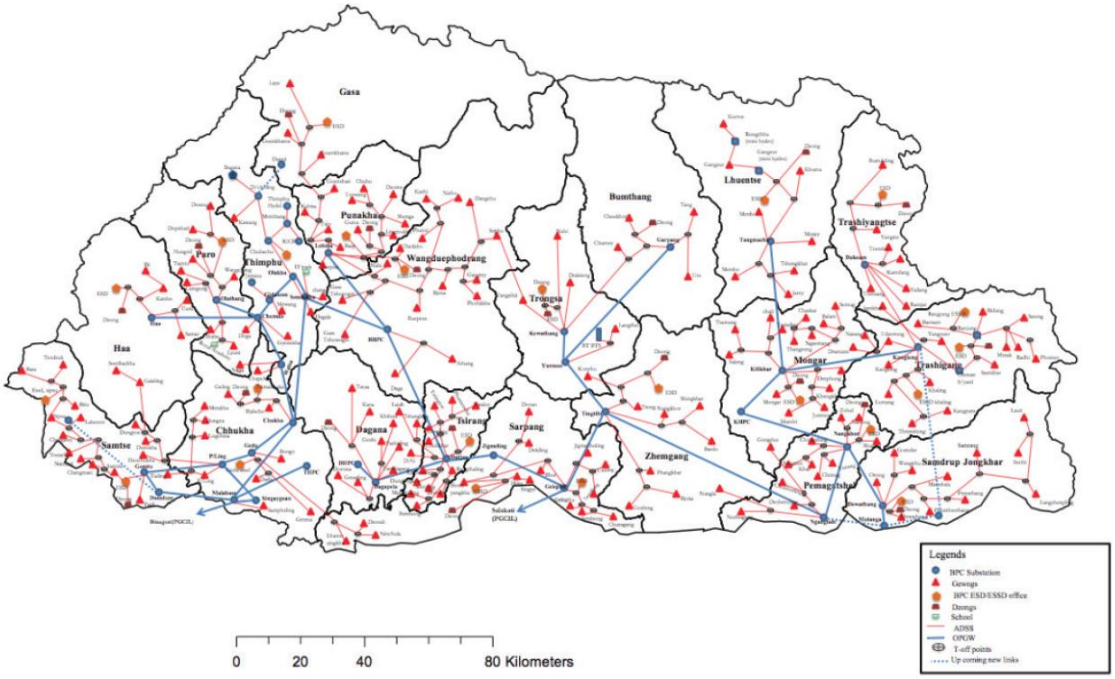
<National backbone network>

With putting importance on establishing the core backbone network throughout Bhutan, MoIC launched the National Broadband Masterplan Implementation Project[41] in 2015 to lay the optical fiber cables over the country with assistance from India. It has covered all 20 Dzongkhags and 201 out of 205 Gewogs so far with offering the broadband access to those areas. While 18 Dzongkhags are connected with optical ground wire (OPGW) cables, remaining 2 Dzongkhags, namely Trashi Yangtse and Gasa, and all the Gewogs are connected through all-dielectric self-supporting (ADSS) cables. Remaining 4 Gewogs, which are Naro, Soe, Laya, and Lunana, located in northern remote area are also considered to be connected in the near future. Figure below illustrates the layout of the national optical fiber network in Bhutan.

Besides, as a part of the Digital Drukyul flagship program, it has been promoting the connection of five national ring networks, which is also supported by India. It is expected that this project will contribute to enhancing the redundancy and leading to the realization of more reliable network.

[41] DITT, "Projects", National Broadband Master Plan Implementation Project, Available at: https://www.dit.gov.bt/projects (accessed on October 1, 2020).

Figure 88 National optical fiber network



Source: DITT (2019)

The national fiber cables are solely owned by MoIC and leased to telecom companies and internet service providers (ISPs) without any charge in order to maintain and encourage the fair competition among players and affordable price of telecommunication services.

As for the operation and maintenance of the network, Bhutan Power Corporation (BPC) is in charge with maintenance fee paid by MoIC since the OPGW cables are laid over the BPC's power transmission lines. As manual detection of cable breakages was said to be one of the causes of unreliable network, MoIC decided to install fiber monitoring systems (FMS) to make the maintenance work smarter and quicker by online detection and improve the reliability. This installation was funded by the USF.

<Government network>

Network connections between government and other public offices are also being developed. Thimphu Wide Area Network (T-WAN)[42] was initiated to develop in 2007 to connect Dzongkhags, gewogs and regional offices via point-to-point direct connection. The network has already been established among central government and Dzongkhag-level offices and now gewogs are being involved.

Besides, MoIC is also laying connections to community centers (CCs) located in each Gewog. Those CCs were built to provide ICT equipment, services, and trainings as well as the internet access for communities and 200 out of 205 CCs have been connected through either

[42] DITT, "Projects", Thimphu-Wide Area Network, Available at: https://www.dit.gov.bt/projects (accessed on October 1, 2020).

optical fiber cable or asymmetric digital subscriber line (ADSL) so far.

Furthermore, in the 12th Five-Year Plan, it has been expanding the government network to schools, medical institutions (hospitals and Basic Health Units), Renewable Natural Resources Centers, etc. with assistance provided by the Government of India.

<Educational institution network (DrukREN)>

The GoB has also been establishing a high-speed network for educational and research institutions. Under the 12th Five-Year Plan, according to MoIC, its expansion to schools and hospitals is ongoing as the bidding specifications for the necessary equipment and devices have been finalized. This project is also supported by the government of India.

<International gateway>

For international gateways, two gateways have been established, connected to India via Phuentsholing and Gelephu, respectively. However, since both of them are converged at Siliguri, India, network redundancy seems not sufficient. In fact, several parties mentioned in the interviews that is one of the factors hindering the reliability of communications. In order to overcome this situation, the government is seeking to establish a third international gateway, which is a priority in the 12th Five-Year Plan[43]. According to MoIC, while negotiations are still underway, the route from Gelephu to Kuakata in Bangladesh via Agartla, India and Comilla, Bangladesh is currently under consideration with the Government of India and the Government of Bangladesh. In the past, however, it was considered to be a leading candidate to connect to Cox Bazaar in Bangladesh via India from Samdrup Jongkhar in eastern Bhutan. Therefore, it seems that the negotiations toward the realization of the plan are not necessarily proceeding smoothly. Although this is a unique and common challenge for landlocked countries, it seems particularly struggling to negotiate an acceptable amount of interconnection fees to be paid to India and Bangladesh. As for the submarine cable, Kuakata is one of the connecting points of the cable "SeaMeWe-5"[44] and is connected from Bangladesh to Malaysia, Singapore, etc. on the east. Therefore, it is expected to establish a different route and lead to improve the reliability of communication as a result.

<Challenges and future plans>

Overall, efforts made by MoIC and BICMA on Bhutan's network infrastructure has contributed to the development of the ICT sector in Bhutan. However, several challenges have also been identified.

- ✓ <u>Intrinsically difficult to expand the ICT network</u>

[43] UNESCAP (2019)

[44] The South East Asia-Middle East-West Europe 5. It is a submarine cable of approximately 20,000 km connecting 16 countries: Singapore, Malaysia, Indonesia, Myanmar, Bangladesh, Sri Lanka, Pakistan, UAE, Oman, Djibouti, Yemen, Saudi Arabia, Egypt, Turkey, Italy and France.

As the government is accelerating the delivery of e-government services, universal access is becoming increasingly important with higher demand. In Bhutan, however, disseminating ICT network to all the citizens affordably is always a challenge because of its geographical features where the country is landlocked and surrounded by rugged and mountainous landform with sparse population. In particular, mountainous and depopulated areas require time and money to transport and install equipment, so investment is likely to be large. On the other hand, it is not easy to recover the investment and operation cost because of the small number of users. In interviews with operators, it was revealed that they found difficult to expand their services to those areas although each company had sufficient understanding of the importance of universal access and the efforts of the government.

- ✓ Unreliable network due to insufficient redundancy, frequent breakages and time-consuming recovery

  Instability of the network was the most frequently pointed out through the interviews. In the local consultant's inspection survey, many respondents also pointed out that they were dissatisfied with the stability of communication services. There seem several reasons for this. First, it has been pointed out that there remain areas in which redundancy is insufficient in the core networks. Therefore, if a problem occurs on a certain line, the communication could be greatly affected. Especially, as facilities located upstream of the network generally accommodate many areas and services, the impact of a failure is likely to be large.

  In addition, it has been pointed out that damage to the core fiber cables frequently occurs due to a variety of factors, including ad hoc construction and maintenance work, natural disasters such as landslides and forest fires, vandalism, and damage from wild animals such as rodent. Besides, since many of the power transmission towers and cables are deployed inaccessible locations and the database for managing network facilities is not in place, repair and resuming normal conditions are burdensome and time-consuming work. As a result, communication failures often occur not only in remote areas but even in Thimphu.

- ✓ Lack of capacity due to the increase in traffic in recent years

  According to telecom operators, many users complain that the communication speed is slow, especially from urban users. This would be because the number of users as well as the data communication volume are larger in urban areas. Though there are complaints from rural users as well, the number of such complaints is fewer because their usage is basically light volume, such as text and voice messages. Besides, since the COVID-19 pandemic, tight network has emerged as an urgent issue because the remote working and online schools are getting popular and the return of Bhutanese living abroad has increased dramatically.

- ✓ Lack of human resources

  Lack of human resources and expertise make network operation and maintenance difficult. Especially in the event of serious network troubles, there are cases where experts are invited from India, which is considered to be a hindrance to timely and efficient maintenance. It is worried that rapid technological advances in network systems will further exacerbate this problem.

In order to achieve higher quality and reliability in communications and universal services, the government is continuously expanding the backbone network and enhancing the existing network during the implementation period of 12th Five-Year Plan. In addition to the aforementioned issues, it is also important to improve the resilience of ICT infrastructures by making networks and backup systems redundant, encouraging network operators to establish business continuity and contingency plans, and conducting training and drills for employees.

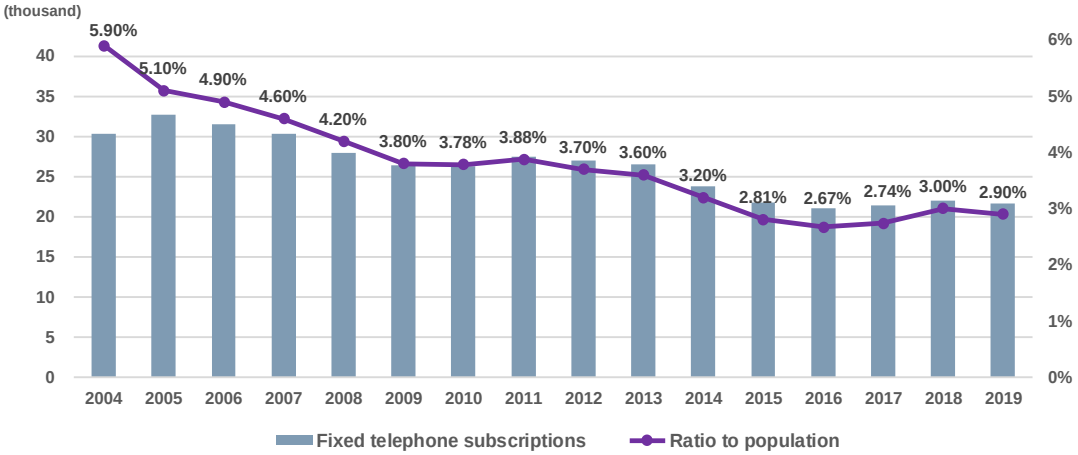
6.3.4. Wired communication

<Fixed line telephony>

Fixed telephone service is the monopoly of state-owned company, Bhutan Telecom Limited (BTL). As of December 2019, there were 21,581 fixed telephone subscribers with a penetration rate of around 2.9%[45]. As shown in the Figure below, the number of subscriptions for fixed telephone services, total of analog and digital services, has been declining in recent years due to the spread of mobile phones. Its penetration rate has remained at about 3% of the population. Fixed telephone services are shifting from analog to digital with the dissemination of optical fibers.

[45] Policy and Planning Division of MoIC (2020)

Figure 89 Fixed telephone subscriptions (2004-2019)



Source: developed by the survey team based on Annual Info-Comm and Transport Statistical Bulletin (11th edition, 2020).

The table below shows the tariff of BTL's fixed line service.

Figure 90 Tariffs on BTL's fixed line

Classification	Rate (BTN/min)
Subscriber trunk dialing (STD)	1.5
Within the city (no area code = within the same area)	0.6
From fixed-line phones to B-Mobile (BTL mobile phones)	3.0
From fixed-line phones to Tashi Cell (third-party mobile phones)	3.0
International call	7.5～400 (Depending on the region)

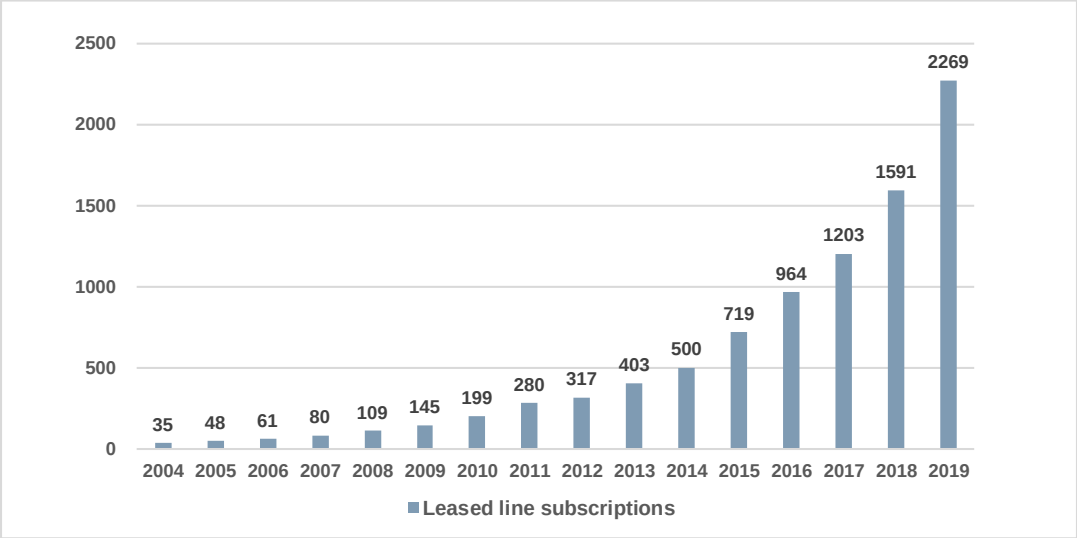
Source: developed by the survey team based on information obtained from BTL website[46]

<Leased line service and broadband service>

There are two types of fixed internet services available in Bhutan, namely leased line service and broadband service. The former provides a connection through dedicated cables whereas the latter service is generally offered via optical fiber cables or ADSL. As shown in the figure below, the former service subscription has been growing steadily. This is probably because smaller companies and organizations are becoming capable of using the service following the gradual tariff reduction though they are typically utilized by the governmental institutes and large private companies.

[46] BTL "VOICE", https://www.bt.bt/vo ee/ (accessed October 1, 2020)

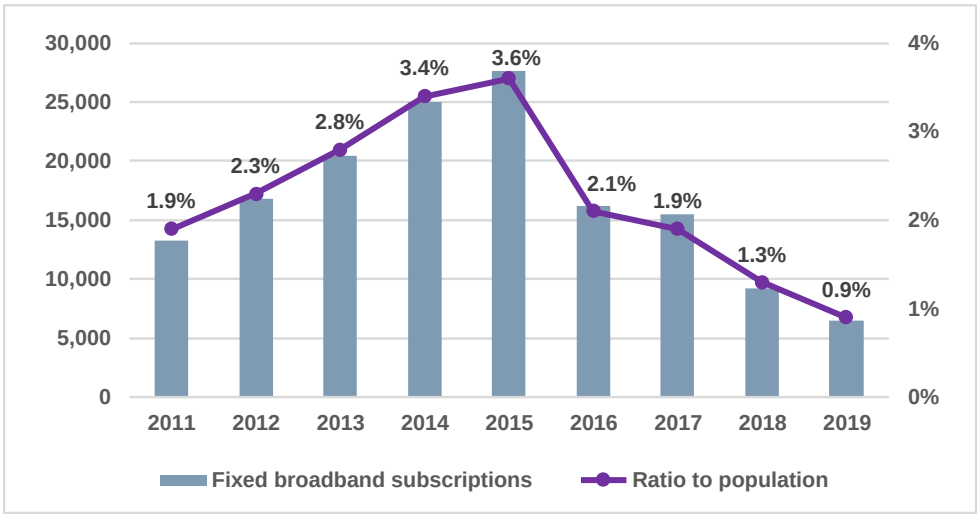
Figure 91 Leased line subscriptions (2004-2019)



Source: developed by the survey team based on Annual Info-Comm and Transport Statistical Bulletin (11th edition, 2020).

On the other hand, the broadband service subscription has been sharply declining from 2016 (see Figure below). It seems affected by the rapid expansion of mobile broadband coverage and subscription.

Figure 92 Fixed broadband subscriptions (2011-2019)



Source: developed by the survey team based on Annual Info-Comm and Transport Statistical Bulletin (11th edition, 2020).

As of the end of 2019, while all the seven licensed ISPs provide leased line service, four of them which are BTL, DrukCom, Supernet InfoComm, and DataNet Wifi provide broadband service as the table below shows. Besides, only three ISPs, namely BTL, Tashi Infocomm Limited (TICL), and, Nano offer their services nationwide and the remaining providers focus on a limited

area which are either a dzongkhag or a town. BTL is the leading operator for both broadband and leased line services occupying approximately 95% and 51% respectively.

Figure 93 List of fixed line ISPs

Operator	Fixed-line Internet				Operational areas
	Broadband		Leased line		
	Number of users	Ratio(%)	Number of users	Ratio(%)	
Bhutan Telecom Limited	8,195	94.8	1,153	50.8	Nationwide
Tashi Infocomm Limited	-	-	792	34.9	Nationwide
DrukCom Pvt. Ltd	139	1.6	2	0.1	Thimphu and Phuentsholing
Supernet Infocomm	30	0.3	50	2.2	Phuentsholing
Bitcom Systems	-	-	11	0.5	Thimphu
DataNet Wifi	279	3.2	109	4.8	Phuentsholing
Nano	-	-	152	6.7	Nationwide
Total	**8,643**	**100.0**	**2,269**	**100.0**	—

Source: developed by the survey team based on DITT (2019) and Policy and Planning Division, MoIC (2020)[47]

The table below is the current tariffs of leased line service offered by BTL and TICL. TICL proposes standard package and premium package whereby its customer service and maintenance support are more intensive for premium customers.

Figure 94 Tariffs of leased line services (BTL & TICL)

Bandwidth Speed	Monthly fee (BTN)		
	BTL	TICL (standard)	TICL (premium)
1	1,286	1,350	2,000
2	2,572	2,700	4,000
3	3,858	4,050	6,000
4	5,144	5,400	8,000
5	6,430	6,750	9,350
20	25,720	27,000	29,600
50	64,300	-	-

[47] While data on broadband service (the number of subscribers and the market share) is cited from DITT Annual Report July 2018 - June 2019, that of leased line service is quoted from Annual Info-Comm and Transport Statistical Bulletin (11th Edition, 2020) due to data availability.

100	128,600	-	-

Source: developed by the survey team based on information obtained from BTL and TICL websites[48]

The table below shows BTL's current tariffs of fixed broadband service.

Figure 95 Tariffs of fixed broadband service (BTL)

Post-Paid			Pre-Paid	
Data (MB)	**Monthly charge (BTN)**	**Data (MB)**	**Data (MB)**	**Monthly fee (BTN)**
13,824	**499**	0.054	8,192	**399**
29,184	**799**	0.041	15,360	**599**
50,688	**1,199**	0.035	32,768	**1,099**
69,120	**1,599**	0.035	46,080	**1,499**
99,840	**2,199**	0.033	63,488	**1,999**
153,600	**2,999**	0.029	81,920	**2,499**

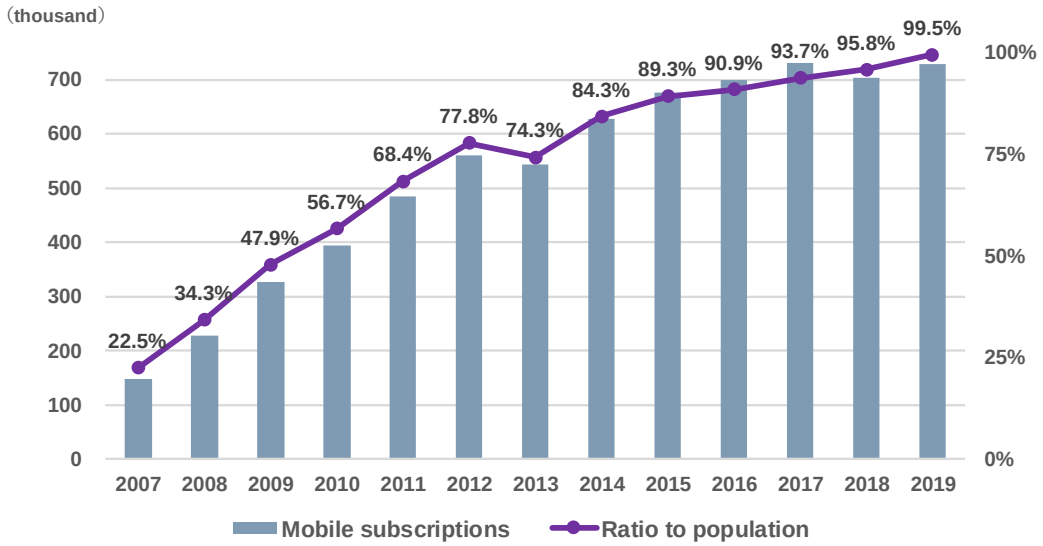
Source: developed by the survey team based on information obtained from BTL website

6.3.5. Wireless communication

Mobile network is the essential means of communication in Bhutan as it covers all the Dzongkhags and Gewogs with the highest penetration rate at almost 100% of the population in 2019 as the Figure below illustrates.

[48] BTL, "DATA", Available at: https://www.bt.bt/voice/ , TICL, "Leased Line", Available at: https://www.tashicell.com/leased-line/internet-leased-line-rates (accessed on October 1, 2020).

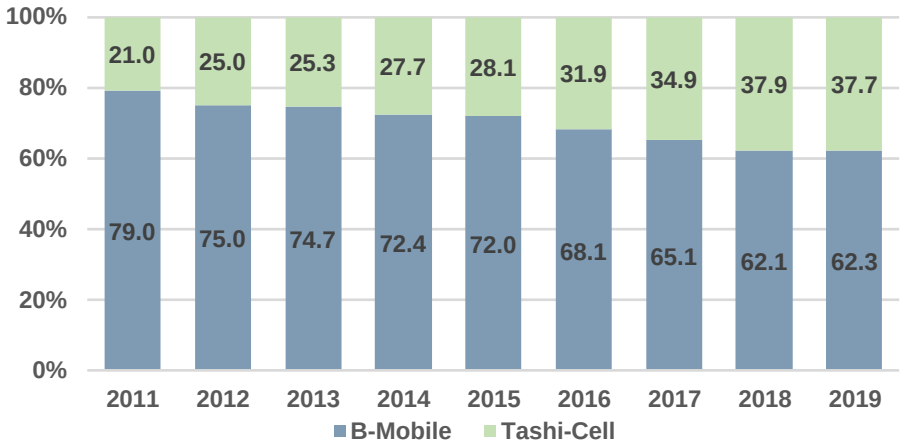
Figure 96 Mobile phone subscriptions (2007-2019)



Source: developed by the survey team based on Annual Info-Comm and Transport Statistical Bulletin (11th edition, 2020).

Two licensed telecom carriers, BTL and TICL, provide mobile services. BTL, as a state-owned company, initially launched the service in 2003 with its flagship brand "B-Mobile" ahead of TICL and thus, became the dominant player. Then TICL, which is a private company incorporated in 2007 under the conglomerate corporation Tashi Group, entered the market as the first private cellular company in Bhutan under its brand name "TashiCell". As illustrated in the figure below, although BTL has an overwhelming market share at first, the gap has been narrowing in recent years.

Figure 97 Market share of mobile phone operators (2011-2019)



Source: developed by the survey team based on Annual Info-Comm and Transport Statistical Bulletin (11th edition, 2020).

A wide variety of services are offered by both operators from voice to data package, different data volume and valid periods, and 2G (Edge and general packet radio service (GPRS)) to broadband service, such as 3G and 4G (LTE). 4G service is currently available throughout the country as well. The table below summarizes the current tariffs of mobile services offered by BTL and TICL.

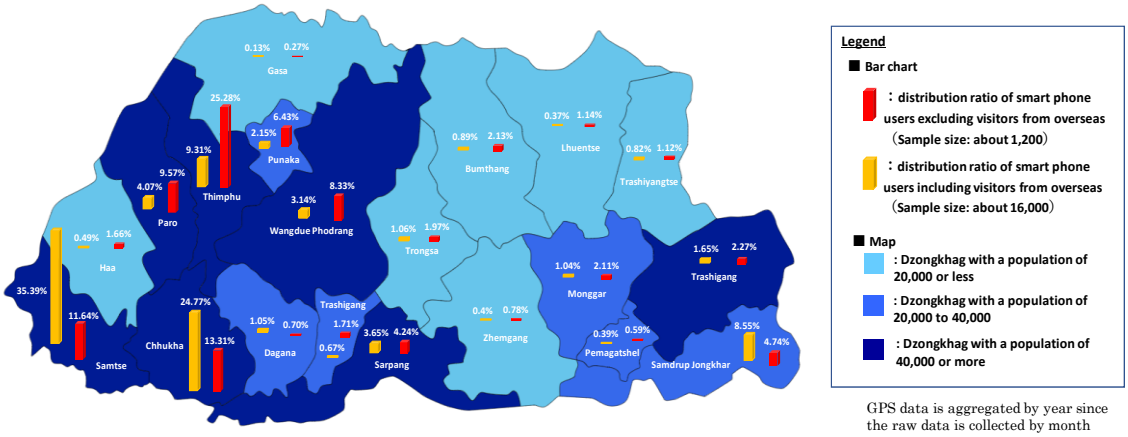
Figure 98 Tariff of mobile services (BTL & TICL)

Operator	Category	Data (MB)	Charge (BTN)
BTL	Prepaid data plan (days)	260	19
		410	20
	Prepaid Data Plan (Week)	520	39
		660	49
	Prepaid Data Plan (Month)	1,330	99
		2,720	199
		4,500	299
		8,260	499
	Postpaid data plan (month)	2,790	199
		4,610	299
		8,460	499
TICL	Prepaid data plan (days)	213	19
	Prepaid Data Plan (Week)	563	49
	Prepaid Data Plan (Month)	1,280	99
		2,656	199
		4,219	299
		7,500	499
		22,500	777
	Postpaid data plan (days)	213	20
	Post Paid Data Plan (Weekly)	563	50
	Postpaid data plan (month)	1,280	100
		2,656	200
		4,219	300
		7,500	500
		22,500	777

Source: developed by the survey team based on information obtained from BTL & TICL website

Though the number of subscribers of mobile service is identified, the penetration level of each type of devices is unsure. The figure below is a result of analyzing GPS data derived from mobile application software to grasp how smart phones in particular are distributed.

Figure 99 Distribution ratio of smartphone users by Dzongkhag



GPS data is aggregated by year since the raw data is collected by month

Source: developed by the survey team based on the anonymous smartphone location data (as of 2019) owned by Research & Innovation, ABEAM, Inc.

According to the analysis, distribution ratio of smart phone users is much higher in western regions of Bhutan compared with eastern Dzongkhags if visitors from abroad are excluded. Thimphu, Chukha, Samtse, and Palo indicate particularly high ratio. On the other hand, once visitors from foreign countries are included, ratios of Dzongkhags adjoining India are drastically increased. Those are Chukha, Samtse, and Samdrup Jongkhar that have functions of the gateway for those who travel by land from / to India and Bhutan. Thus, it implies that foreign smart phone users would be a lot in those areas.

<Rural Communications Program (RCP)>

RCP is a long-running program of BICMA that has contributed to the rapid growth of the mobile market in Bhutan by providing mobile services to villages where the telecommunication services were unavailable. It also contributes to improve the existing communication environment in rural areas, by expanding 3G and 4G services to the areas where only 2G service was available.

The RCP has been continuously implemented since 2009, and by now (Phase V) the network has been established in 760 villages at a cost of USD2.4 million. Funding is provided through USF and both BTL and TICL participate in the implementation of the program. Phase V has been implemented since January 2019 to provide 2G, 3G and 4G communication services to targeted villages. Phase VI is also planned and will be conducted in other villages to expand the coverage.

<Special offer for students to counter COVID-19>

Since COVID-19 pandemic has forced many schools to be closed and in order to provide online classes, students have to access the internet from home with consuming a lot of data. Consequently, it imposed financial burden on some students. Thus, special data packages for students were offered to mitigate it by BTL and TICL with an approval from the government as

shown in the table below.

Figure 100 Special tariff of mobile services for students (BTL & TICL)

Operator	Category	Data (MB)	Charge (BTN)
BTL	7 days (7am - 6 pm)	700	45
	30 days (7am - 6 pm)	1,600	95
	30 days (7am - 6 pm)	3,500	195
	30 days (7am - 6 pm)	9,900	495
	30 days (7am - 6 pm)	27,000	695
TICL	30 days	1,300	97
	30 days	4,300	297
	30 days	8,000	497

Source: developed by the survey team based on information obtained from BTL & TICL website

6.3.6. Data center

The Government Data Centre (GDC) was established in Bhutan's first IT park, Thimphu Tech Park, as an international standard level data center. It was built through GDC Project as a part of the 11th Five-Year Plan's e-Government Initiative with financial support from the Government of India. As shown in the table below, GDC provides a variety of data-related services as a Tier 2 level national data center based on the TIA-942 standard of the American Telecommunications Industry Association. Although it is a data center managed by the government (DITT), the actual operation is outsourced to Data Centre Services Private Ltd (DCS) which is a joint venture of Burland Technology Solutions (BTS) in the United Kingdom and New Edge Technologies (NET) in Bhutan. According to MoIC, the government secures some portion of GDC space for the government and pays a usage fee to DCS, while the remaining space is open to the private sector.

One of the purposes of GDC is to integrate data and information of government agencies to reduce duplication of government staff duties, improve the quality of government services, and optimize government resources. The use of GDC by government agencies is regulated by Information, Communications and Media Act of Bhutan 2018, while transfer of data by government agencies is ongoing to date. Since operating costs are funded by the government through annual budget, usage of GDC for the government agencies is free of charge.

Since GDC is the first government data center, several issues to be tackled are observed, such as enhancing security measures, developing human resources for both management side and technical operation side, securing redundancy for both data storages and communication paths. Expansion of data capacity is also an urgent issue as the demand is growing caused by sharp increase of data amount as well as the promotion of Digital Drukyul program. Based on these situations, GDC is planning to enhance its capacity of both data storage and network. Besides,

establishment of a disaster recovery center in a different area from GDC is also under consideration although it is not included in the 12th five-year plan.

In Bhutan, although most data service providers do not have their own data centers and use the data centers abroad, BTL also operates its own data center in Phuntsholing. This data center offers services such as collocation, hosting, and cloud computing for the private sector, with the Tier 3 accreditation from the U.S. Uptimes Institute, which rates data centers.

Figure 101 Overview of data centers in Bhutan

Item	GDC	BTL
Service	collocation, hosting, storage, data backup	collocation, hosting, cloud
Address	Thimphu Tech Park	Phuntsholing
Administrator	DITT(MoIC)	BTL
Operator	DCS (joint venture of BTS and NET), Commissioned by the Government	BTL
User	Government agencies and private companies	Private companies
Source of income	Usage fees from the government (annual budget) and from private companies	Usage fees from private companies
Quality standard	Tier 2 (TIA-942, US)	Tier 3 (Uptimes Institute standards, US)
Site area	1,000 square feet	5,000 square feet (2 floors)
Security	Surveillance cameras and videos, biometrics, IC cards, Building Management System	Surveillance cameras, IC cards, Building Management System
Power receiving facility	Two systems	Two systems
Power generation facility	Generator (36-hour fuel stockpile), UPS	Two generators (12,000 liters of fuel stockpiled) and a UPS (redundant configuration)
Air-conditioning facility	Redundant configuration	Redundant configuration
Communication facility	Multiple paths	Multiple paths
Operation	Resident monitoring (24/7)	Resident monitoring (24/7)

Source: developed by the survey team based on the GDC and BTL websites, news articles, etc.

Figure 102 Suitability of Bhutan as the data center location

Evaluation items	Standards of evaluation	Evaluation
Natural environment	The frequency of natural disasters and climatic conditions in the area (In general, it is preferable to a cooler area because of the importance of cooling efficiency. However, it is considered inappropriate if the area can be affected by heavy snowfall or snowstorm).	Since there are many areas with low temperatures, it is likely to find a suitable area by selecting the locations with few earthquakes, floods, landslides, snowstorms, etc.
Social environment	Social, political, and economic stability of the area (existence of riots, crimes, corruption, etc.)	Compared to neighboring countries, Bhutan is politically and socially stable, and its security is rather good.
Regulations	Land acquisition and construction regulations, tax regimes and preferential treatment	It could be difficult because the standards for environmental protection are strict. In fact, domestic telecommunication companies mention that they have difficulties to install their own fiber cables.
Site Location	The price and ownership of the land in the construction site, the surrounding environment (safety and availability of necessary infrastructure), and accessibility to the area (ease of transporting materials and equipment during construction and of visiting the site by relevant parties)	Road infrastructure is insufficient. With only one international airport, there are few direct flights from overseas. Transporting equipment and materials and visiting the site could be time consuming and costly, especially for the areas in high altitudes.
Electric power	Availability, capacity, and cost of electricity supply (receiving power from multiple power companies on different grids is preferable) In recent years, the type of power supply is also evaluated in consideration of the environmental issue.	The electricity is cheaper and more stable than neighboring countries. Besides, Bhutan is highly conscious of environment protection.
Communications	Availability, capacity and cost of communication lines (multiple routes from different IPSs are preferable)	Stability and redundancy needs to be improved. In particular, the lack of redundancy in international gateways is a risk.
Labor force	Possibility and requirements of securing workers for construction and operation and maintenance (e.g. labor wages)	Construction workers and IT engineers can be secured because of the large number of Indians entering the country.

Source: developed by the survey team based on the standards of the Uptime Institute, TIA-942, and Data Center Facility Standard

In light of the above, Bhutan as a location for data centers is expected to be competitive in terms of natural environment, electricity supply, and social stability which is already recognized by MoIC. On the other hand, it is not necessarily superior in terms of regulatory, access, and reliability of communications. While there is room for the government to consider updating the regulations to attract players overseas, the reliability of communications, especially the international gateway, could be a major impediment. Therefore, by establishing a third international gateway which is currently under negotiation, the possibility of attracting data center operators is expected to increase. Besides, If the reliability of communications is increased, attracting data center users could be also expected by providing reasonable services that take advantage of the superiority of electric power cost. The accessibility is also important for Bhutan since it affects the transport of construction materials and the securing of labor. Therefore, selecting an appropriate area in light of the accessibility as well as climate features, fragility to natural disasters, environmental conditions, etc. is necessary to take into careful consideration.

6.4. Background information on the pilot project (details)

6.4.1. Drone logistics

The background information on drone logistics is reported as follows.

<Medical and healthcare>

Figure 103 Medical access and inventory management of medical supplies

Items	Results
Medical access	■ There is a group of doctors and health workers who visit rural areas on a regular basis, and health workers visit village clinics from nearby health facilities. They bring the necessary medical supplies by horse. ■ Many medical facilities (Basic Health Unit or Public Health Centers) are connected by roads, and cars are used to deliver medical supplies. ■ According to the resident questionnaire in Lunana , drugs are supplied for a year. Not often, but out of stock occurs. In that case, the residents request replenishment from Dzongkhag Health Officer of Gasa Regional Hospital which is paid by Dzonghag Livestock. ■ According to the resident questionnaire in Chukha, medicines are supplied for one year, and vaccines and some products are sent from local hospitals every two months. In addition, in the event of an emergency, they go to the local hospitals to get medical supplies by themselves.
Medical emergency response	■ In the event of an emergency, contact the 112 Hotline (Medical Emergency Hotline). Hotline 112 may deploy ambulances or seek assistance from the BEAR. BEAR is the only emergency medical service provided by a helicopter in Bhutan. ■ BEAR uses Royal Bhutan Helicopter Services Limited (RBHSL) helicopters to cover all of Bhutan. It provides services mainly in non-road areas and in emergencies. ■ In general, these emergency services transport patients from district hospitals to national or regional hospitals, and transport samples as needed.
Laboratory tests	■ The Royal Centre for Disease Control, based in Thimphu, is responsible for disease prevention and control. Other health-care-associated laboratories are located in the eastern Monger Region Hospital and the southern Gulev Central Region Hospital. ■ Laboratory tests and delivery of reagents and specimens are often done through emergency networks between community hospitals and regional hospitals.
Inventory control	■ The DoMSHI under the MoH is responsible for laws and regulations relating to the transport of medical supplies (including biosafety). ■ DoMSHI and Thimphu's central frozen warehouse manages the supply of key supplies from local and district hospitals to remote village clinics. ■ DoMSHI uses a system called eBMSIS (Electronic Bhutan Medical Supplies Inventory System). The system enables timely procurement, sorting, and delivery of medical supplies across the country. Procurement requests are entered into the eBMSIS system. However, medical institutions that do not have an Internet environment submit bills of quantities in hard copy to DoMSHI.

<Daily necessities, educational materials, etc.>

Delivery of daily necessities to remote areas with no roads is often carried out using horses/yaks (highlands) or by porters. In the questionnaire of residents, there were many cases of using logistics services including helicopters for the delivery of daily necessities.

<Competitor/Partner>

The stakeholders which may be competitor or partner are listed below. The RBHSL and Bhutan Postal Corporation may become a partner if each role of delivery is clarified. After presenting a business model of this pilot project to them, we should discuss the possibility of collaboration in detail.

We summarized the information of local drone companies which can collaborate as a local drone operator in 6.5.1 of on-site hearing.

Figure 104 Competitors/Partner organizations

Organization name	Organization Profile
The Royal Bhutan Helicopter Services Limited (RBHSL)	■ RBHSL was established in 2015 as a state-owned company to provide efficient and affordable helicopter transport services for search and rescue, aviation medical support, fire fighting, cargo and passenger transport. ■ In response to COVID-19, RBHSL was responsible for the delivery of vaccines that required safe and timely transport. ■ GoB use RBHSL's helicopter services to transport emergency patients and the fees are paid by the GoB to RBHSL. ■ RBHSL is currently transporting supplies for the residents of Lunana. Lunana is a 7-10 day walk from the nearest road, but the residents of Lunana are able to pay for the helicopter transport because of the good income from selling medicinal herbs (cordyceps).
De-suung	■ De-suung is a training program established under His Majesty the King to encourage all citizens to be active in the greater role of nation building. De-suung has about 15,000 volunteers working who are working in the field of border patrolling during COVID-19 times, social works of sorts, drinking water supply project, fire and natural disaster fighting. ■ Although De-suung is not a governmental organization but it holds some special projects under His Majesty the King. The clearance for pilot project may be accelerated if collaborated with the De-suung.
Bhutan Postal Corporation Limited (Bhutan Postal Service)	■ The Bhutan Post Service operates a postal service in Bhutan. There are currently 43 post offices nationwide (four central post offices and 39 post offices). ■ In this pilot project, cooperation in small-lot transportation may be possible.

<Reference cases in other countries>

It should be effective to consider a sustainable business model for this pilot project by referring to precedent cases of drone businesses in other countries and reviewing the important points. The past reference information is effective as a use case. The Rwandan government's support has had a significant impact on Zipline's business implementation and there are many useful points from the perspective of collaboration with government agencies.

Figure 105 Reference examples in other countries

Company/ organization	Country	Activities	Lessons learnt for Bhutan
Zipline	Rwanda and Ghana	Delivery of blood and medical supplies	■ Track record of remote-areas delivery and emergency assistance ■ Sustainable business model and high profitability
Matternet	Switzerland and Haiti	Delivery of medical supplies	■ Track record of medical supplies delivery in mountainous and remote areas ■ Experience of a pilot project in Bhutan
UPS	United States	Delivery of daily necessities and prescription drug	■ Highly profitable business and mechanism for scale-up of business
UNICEF	Vanuatu	Vaccine delivery	■ Experience in building a cold chain
UNDP	Maldives	Sensing, agriculture and afforestation businesses	■ Performance in businesses other than logistics

6.4.2. Financial inclusion

< Government measures for financial inclusion >

Financial inclusion is one of the priority areas for the GoB to achieve sustainable and inclusive social and economic growth. In this context, the RMA developed the National Financial Inclusion Strategy (NFIS) and the National Financial Literacy Strategy (NFLS). The RMA has

also established a working group to promote the strategic plan for financial inclusion as outlined in the Financial Inclusion National Action Plan (FINAP) 2019-2023. The strategic objectives of the four priority areas of NFIS are as follows:

Figure 106 Priority areas and strategic objectives of the National Financial Inclusion Strategy (NFIS)

Pillar	Strategic Objectives
1. Appropriate Financial Products and Services	■ Increase access to and usage of savings and insurance for unserved and underserved populations
2. Financial Accessibility/Proximity	■ Increase access points through branches, ATMs, POS and agents ■ Promote and leverage digital financial services
3. Financing for Economic Growth	■ Strengthen and promote priority economic activities, particularly in the agricultural and non-agricultural CSI sector. ■ Promote the development of innovative credit mechanisms and alternative sources of financing
4. Financial Capabilities and Consumer Protection	■ Develop and implement the National Financial Literacy Strategy Framework ■ Develop and implement consumer protection guidelines for fair market conduct

107Source: Developed by the survey team based on National Financial Inclusion Strategy (NFIS) 2018-2023

The financial system in Bhutan has been rapidly digitized in recent years. While promoting the aforementioned measures, the government started to establish Automatic Telling Machine (ATM) and Point of Sales (POS) in mid-2010 and started to develop financial infrastructure to shift from cash and checks to electronic financial transactions.

<Overview of major institutions and services in payment systems>

As of 2019, Bhutan has five commercial banks and two licensed e-money issuers providing digital payment services through ATMs, POS, mobile banking, debit cards, and credit cards. It has 274 ATMs and 997 POS terminals across the country, and a total of 344,253 debit cards have been issued. In addition, five companies provide payment services through mobile applications, with a total of 190,703 subscribers. Furthermore, more than 400 e-commerce companies (16 domestic and 384 international) are registered in the country. In Bhutan, as in other countries, digitalization is accelerating as a means of payment. On the other hand, paper-based payment methods, such as checks and cash, are still the main means of payment for people[49].

<Financial access for citizens>

Looking at financial access points across the country, the number of branches has not changed significantly over the past few years, although the number of PoS has increased (see table below). Several Japanese companies with business experience in Bhutan have pointed out that Bhutan's financial system still has some inconveniences, making bank transfers and other transactions difficult.

[49]Royal Monetary Authority of Bhutan (2020a)

Figure 108 Major access point indicators

Access Points		Numbers			Per 10,000 Adults		
		2017	2018	2019	2017	2018	2019
Population (18 years old+)		—	—	—	496,044	504,220	515,224
Branches	Total Branches	170	170	174	3.43	3.36	3.38
	Total Bank Branches	98	98	105	1.98	1.94	2.04
	Total Insurance Branches	68	40	36	1.37	0.79	0.70
	Total MFI Branches	29	32	33	0.58	0.63	0.64
	Total Extension offices	66	70	81	1.33	1.38	1.57
Other Access Points	Total Agents	2,333	2,396	2,442	47.03	47.33	47.40
	Total ATMs	188	246	274	3.79	4.86	5.32
	Total POS	759	779	1,035	15.3	15.39	20.09

Source: Developed by survey team based on State of Financial Inclusion Report 2019

In order to promote financial inclusion in this context, the GoB has expressed interest in CBDCs. the RMA is conducting a pilot project on CBDCs in collaboration with the ADB and has commissioned a US consulting firm to conduct this pilot study. the project consists of four phases, and the overall project duration is about six months. As of April 2021, needs assessment is in process as Phase 1. After Phase 1, the design, implementation, and testing phases are planned, and the possibility of introducing a small-scale CBDC project in partnership with the private sector is under consideration.

6.5. Results of the interview on the pilot project

6.5.1. Drone logistics

<Interviews with Japanese firms>

Figure 109 Summary of the interview (Drone logistics, with Japanese firms)

Company	Overview of products and services	Points of the interview
Company A [Operator]	■ Focusing on drone logistics business as a flight operator with ANA's airline experience ■ Having the implementation projects in Japan and Zambia and aiming to expand to Asian and African countries	■ Needs to investigate local needs, funding scheme, aviation and commercial laws, public concept of logistics and local partners, etc. ■ Good to deliver medical supplies as they have a high social purpose and are easily agreed by the public
Company B [Operator]	■ Providing Unmanned Traffic Management (UTM) systems for aircraft management ■ Main business is logistics, civil engineering survey, forest survey, infrastructure inspection etc. ■ Their offices in 20 locations overseas	■ It is important to create value that differs from terrestrial logistics such as rapid transportation ■ Logistics is more difficult for drones than survey and inspection but a reverse innovation model can be built
Company C [Operator and Manufacturer]	■ Providing industrial automation solution by combining autonomous UAVs with cloud data analysis services ■ Having an experience of pilot project with JICA in Zambia	■ Needs further research into local needs and plenty funding for the pilot project is required ■ There is a possibility of hybrid projects combining logistics and inspection
Company D [Manufacturer]	■ Research and development for the structure design technology of industrial drones ■ Establishment of a local subsidiary in China to carry out licensing business	■ Needs to investigate the local flight environment and logistics situation in advance to verify the potential for social impact ■ Plan to make a logistics package model in Japan and could bring it to Bhutan with a minimum of local training
Company E [Manufacturer]	■ Manufacturing and providing industrial drone and providing solution service with autonomous technology ■ Expanding their business in South East Asia	■ Needs to investigate laws and regulations on drone flight and safety ■ The logistics business, which requires more safety in flight, is an area where Japanese companies have an advantage

<Interviews with local stakeholders>

Figure 110 Summary of the interview (Drone logistics, with local stakeholders)

Organization	Organization Profile	Points of the interview
Policy & Planning Division of MoIC (Government Agencies)	■ Manage aviation law and involve in national policy and regulatory decision making including drone business.	■ MoIC has never approved for the drone flight by private companies. A private company needs an involvement of MoIC or another government agency for realizing drone business. The business must be for GoB or in cooperation with GoB. ■ MoIC showed the positive response to this pilot project and expected for the technology transfer and the training for Bhutanese companies by Japanese companies. ■ In the near future, JICA is supposed to present a specific pilot project proposal and discuss it again with MoIC. It might be necessary to contact the relevant ministries and agencies via MoIC.
BCAA (Government Agencies)	■ Manage aviation regulations and applicable procedures for drone services.	■ Since the role of BCAA is regulatory management and is not involved in policy decision-making, the meeting with MoIC is needed. ■ There has been no experience in drone logistics, and the flight period is limited mainly for photographic applications. In the past, only government agencies have been approved for drone flight. But in the case of collaboration with GoB, there is a possibility that private companies may also be approved. ■ GoB may also be interested in the delivery of medical supplies. The MoH is considering a similar concept.
Company Y (candidate partner)	■ Established as a government-affiliated company to strengthen technology and generate innovation, which addresses national and government-level projects.	■ They are interested in introducing new technologies, developing human resources, and expanding overseas. They see drones as an potential area. ■ In the drone field, they have started to conduct inspections of electric power facilities such as transmission grids. ■ As a government-affiliated company, it is possible for them to lobby the GoB for deregulation in collaboration with Japanese companies.
Company Z (candidate partner)	■ Bhutan's first drone start-up company ■ Focus on 1) Talent Development, 2) Industrial solution/services and 3) R&D.	■ After the meeting with relevant government agencies, getting an approval has been the biggest challenge for drone business. ■ Since helicopters are an existing service for logistics, they mentioned that it is necessary to examine scenarios in accordance with the needs of the field, such as the advantages of drone logistics, the segregation of helicopter services, and the appropriate prices. ■ The company is considering the feasibility study of Thimpu to Gasa in the use case of medical supplies transportation.

6.5.2. Medical and health data infrastructure

<Interviews with Japanese firms (for Health bank)>

Figure 111 Summary of the interview (Medical and health data infrastructure, for Health bank)

Company	Overview of products and services	Points of the interview
Company C	■ Developing PHR apps specializing in pregnancy and childbirth in Tanzania ■ The database with medical checkup information can be viewed by two apps: one for midwives and the other for pregnant women	■ They are willing to offer PHR apps in Bhutan ■ If the health issues in Bhutan are clarified, it is possible to modify the app other than maternal and child health field
Company L	■ Providing a platform in Japan for easy consultation with doctors 24-hour, 365-day using a smartphone ■ Conducting PoC in Myanmar and considering a remote medical services for Palestinian Refugees, India and low-income households in the US	■ They are willing to consider PoC in Bhutan ■ Need to investigate whether the local government is interested in providing medical advice either by Bhutanese doctors alone or in conjunction with overseas doctors
Company M (startup)	■ Developing PHR communication platform in Japan to promote communication between patients, healthcare professionals, nursing care providers, companies, etc.	■ Their priority is to develop business in Japan ■ If the local government is willing to consider the integrated PHR and EMR model from scratch, the English version of the application development is feasible and interesting
Company E	■ Providing smartphone applications in the field of dementia to visualize brain and body health data in Japan ■ It helps maintain brain function and detect early signs of dementia as well as providing useful information for daily life	■ The first step is to build a platform in Japan, but there are possibilities of introducing it in Bhutan ■ Potential for developing new apps tailored to Bhutan's needs in areas of their strength (insomnia, central nervous system, cancer)
Company M (trading company)	■ Operating digital maternal and child health handbook service in Indonesia ■ Providing reliable information to pregnant women and mothers. Also possible for physicians to provide advice via the Q&A function of the app.	■ They prioritize profitability in Indonesia ■ Bhutan could be a potential candidate if they could work with MoH

<Interviews with Japanese specialists (for Biobank)>

Figure 112 Summary of the interview (Medical and health data infrastructure, for Biobank)

Organization	Organization Profile	Points of the interview
Professor N, K University	■ Mr. N is a businessman, an investor, and value and health economist, and a visiting professor at the University ■ Engaging in a wide range of activities, including the development of genetic test kits for general consumers, R&D of health AI, and research for social implementation on self-care systems in an aging society	■ Bhutan has the potential to create a national cohort. It is compact, closed, and contains a range of genomic information easy to analyze ■ The idea is to jointly establish a research facility in Bhutan and Japan to attract research institutes around the world, with certain conditions when taking research results. It would also be better to set up biomedical data scientist training schools to attract people from Asia and the world ■ In addition to the pharmaceutical industry, the insurance industry may also be interested in preventive medicine. However, ethical and reputation risks need to be reconciled. ■ Differences in genome information between Bhutan and Japanese are meaningless. Environmental data and changing information about life are of great significance.
Industry group S	■ The working group of the research and development committee within the organization is examining how to utilize biobanks as an industry ■ Seven member companies and the National Center Biobank Network are collaborating on the construction and utilization of a combined database of disease-specific information	■ The Biobank assume that the Medical bank functions. In other words, in situations where there are few specialists and accurate diagnosis are not recorded correctly, the diagnosis result (medical information) and biobank information are not linked and are of no use. Under such circumstances, the Biobank has no economic value. ■ On the other hand, the Health bank (PHR) that can be constructed on a zero basis without depending on the level of healthcare has a certain significance if it can be valuable on its own. ■ If life-course data can be obtained and stored on a standard electronic medical record, and information of families and others can be linked, it will be very useful, even if the population is 750,000. It is only possible to build an information base from scratch, which could be superior to Bhutan. ■ Storage and management of biological samples requires appropriate facilities, administrators, and budgets. Basic data such as those possessed by biobanks in any country should be prepared first. If Bhutan can establish its own indices of happiness in the data base, it could be used for mental health measures.

<Interview with Japanese firms (for other purposes)>

Figure 113 Summary of the interview (Medical and health data infrastructure, for other purposes)

Organization	Organization Profile	Points of the interview
Company A	■ Developing communication tools for healthcare professionals. Projects are being implemented in about 10 low-and middle-income countries using JICA's Public-Private Partnership projects and the budget of the Ministry of Internal Affairs and Communications in Japan ■ The target disease has spread from acute care for stroke and myocardial infarction, which was originally fields with their strength, to trauma and cancer. With regard to COVID-19, implementing CT image data as AI training data has been promoted with AI startup ■ A PHR application is also provided free of charge. The information in the app can be shared with the communication tool for health professionals above	■ In order to design a solution that utilizes imaging data, it is prerequisite that a certain amount of diagnostic imaging equipment be in operation in the target country and that relevant policies are in place for handling data. They feel Bhutan has a high hurdle ■ It is important to confirm the adequacy of medical resources (CT, X-rays, supply of pharmaceutical products, etc.) in the local medical facility and diagnostic techniques by specialists ■ In Bhutan, the requirement is for the MoH to cooperate fully in the construction of the system or for pharmaceutical companies and medical device manufacturers to provide supports ■ When a Japanese doctor living in Bhutan, described later, talked to the head of ICT and Planning at the MoH, they said the company's products could complement the ePIS
Company M	■ Developing a mobile cardiotocogram (CTG) for remote confirmation of data on fetal heart rate and uterine contraction and constructing a referral network using the system in Japan, Thailand, Myanmar, and Zambia ■ Considering the introduction of the tool in Bhutan, and have been visiting local medical facilities	■ Despite the perception that digitization and mobile health are important in the local community, implementation progress has been slow. One of the reasons is the increase in load due to the dual management of paper and electronics during the transition period. ■ As an Internet environment with medical facilities, academic institutions, and research institutes in Bhutan, development of the DrukREN (Drug Research and Education Network) is in progress. At present, 26 organizations in 10 out of 20 districts are linked ■ It takes a long time to get into business. They want to start with a demonstration project using external budgets ■ Data sent and received by the product can be transmitted over 3G

<Interviews with local stakeholders>

Figure 114 Summary of the interview (Medical and health data infrastructure, with local stakeholders)

Organization	Organization Profile	Points of the interview
MoH	■ Advocating the National eHealth Strategy, which makes use of ICT in various sectors ■ Some apps are also being implemented for COVID-19 countermeasures	■ ePIS is being developed by Thimphu TechPark with the support of the GoB and ADB, but progress has been slow due to COVID-19 ■ Willing to collaborate between EMR and PHR. It helps public surveys be conducted more efficiently.
Japanese physician living in Bhutan	■ Working at a Bhutanese medical institution as a doctor ■ Have a strong interest in digitization in the country's healthcare sector	■ No significant change in the prevalence of medical equipment ■ Although there is a high need for information coordination, including image data, only the diagnostic imaging equipment is installed as a "point" and the function of linking data as "line" (information system) is required. Before the PHR-EHR integration, it would be better to develop EMR first. ■ There are few specialist physician, and some cases are transported to India without being treated domestically. For example, there is no neurosurgeon in Bhutan and only one cardiologist. All India's counterpart hospitals are private, which causes adverse issues. Some Bhutanese are traveling to India only to take medical images. ■ Personal information related to medical care needs to be reviewed by ethics committee in MoH for research purpose, but not strictly managed for clinical purpose ■ In terms of communication among healthcare professionals, for example, when seeking advice from a Thimphu radiologist on a case that a local radiologist cannot handle, images stored in a DVD are transported by bus or taxi for eight hours or a day

6.5.3. Support for entrepreneurs

<Interviews with local stakeholders>

Figure 115 Summary of the interview (Support for entrepreneurs)

Company name	Outline of services provided	Future plan in Bhutan	Future plans overseas
Company A	■ Started business from the sales of mineral raw materials and construction. Then, the retail, wholesale and e-commerce businesses have become new areas of business from around 2018. There are about 70 employees today ■ Has started not only sales but also in-house production (mushroom cultivation and production of baked confectionery)	■ The first aim is to replace imports domestically as Bhutan relies heavily on imports	■ Intends to export mushrooms based on the concept of Brand Bhutan, and plans to cultivate and export mushrooms as a first step
Company B	■ Bhutan's largest private consulting and multimedia company ■ Has four divisions: consulting, training, multimedia, and digital technology ■ 90% of jobs come from GoB	■ Plans to create an online platform for distribution of Bhutan's movies and documentaries	■ Plans to expand business in Europe, Southeast Asia, the United States, etc. in the future
Company C	■ Founded as an online bus ticket platform in 2016. It currently offers taxi reservations, car deliveries and baggage delivery services ■ 2,000 taxi drivers are registered nationwide, and a distributed system is adopted to increase drivers' incomes	■ Plans to build delivery services and e-commerce utilizing drivers	■ Targeting tourists from Bangladesh to Bhutan, while this plan was postponed by COVID-19 ■ Aims to expand business in other countries such as India
Company D	■ Automated and simplified recruitment, application, and recruitment activities through online platform E-LaYog ■ User fees are collected from both companies and applicants.	■ Aimes to develop digital solutions from a variety of perspectives ■ Plans to develop mobile apps that provide information on transportation, etc. and automate medical treatment reservations at medical institutions	■ The priority is to stabilize the business in Bhutan first ■ May consider overseas expansion after five years

6.5.4. Development of entrepreneurial environment (Digital currency)

<Interviews with Japanese firms>

Figure 116 Summary of the interview (Development of entrepreneurial environment (Digital currency))

Company	Overview of products and services	Points of the interview
Company A	■ A demonstration experiment on the introduction of a local currency using blockchain technology is underway in Hokkaido and Yamaguchi prefectures ■ Engaged in the creation of regional development/tourism industry through the utilization of data such as resident data, medical institution data, and purchasing behavior	■ Positive attitude toward business in Bhutan ■ Smart nation and entrepreneur support projects using digital currency can be proposed ■ It is also possible to propose a competition to help match Bhutan's IT engineers with the international recruitment market (human resources development using the company's platform).
Company B	■ Experience in implementing central bank digital currencies overseas ■ Experience in building an identity authentication platform (eKYC) in Southeast Asia	■ Positive attitude toward business in Bhutan ■ They have already proposed the introduction of CBDC to more than 20 central banks around the world (not yet to Bhutan).
Company C	■ Operate Q&A services and provide related services (e.g., provide solutions for building, managing, and operating FAQ sites) ■ Group company contracted to develop blockchain systems in Southeast Asia	■ While expressing interest in Bhutan, the synergy with existing businesses is limited.

Company	Overview of products and services	Points of the interview
Company A	■ A demonstration experiment on the introduction of a local currency using blockchain technology is underway in Hokkaido and Yamaguchi prefectures ■ Engaged in the creation of regional development/tourism industry through the utilization of data such as resident data, medical institution data, and purchasing behavior	■ Positive attitude toward business in Bhutan ■ Smart nation and entrepreneur support projects using digital currency can be proposed ■ It is also possible to propose a competition to help match Bhutan's IT engineers with the international recruitment market (human resources development using the company's platform).
Company B	■ Experience in implementing central bank digital currencies overseas ■ Experience in building an identity authentication platform (eKYC) in Southeast Asia	■ Positive attitude toward business in Bhutan ■ They have already proposed the introduction of CBDC to more than 20 central banks around the world (not yet to Bhutan).
Company C	■ Operate Q&A services and provide related services (e.g., provide solutions for building, managing, and operating FAQ sites) ■ Group company contracted to develop blockchain systems in Southeast Asia	■ While expressing interest in Bhutan, the synergy with existing businesses is limited.

<Interviews with local stakeholders>

Figure 117 Summary of the interview (Development of entrepreneurial environment (Digital currency))

Organization	Organization Profile	Points of the interview
Government Agency (RMA)	■ Central bank and regulator of the financial sector	■ Openness to Fintech ■ Expressing interest in establishing a fund-raising system for entrepreneurs using virtual currency ■ A pilot study is underway with the Asian Development Bank（ADB） to introduce a central bank digital currency（CBDC）

6.6. Demand for the Utilization of Digital Technologies in Remote Areas

6.6.1. Background and implementation procedures

The COVID-19 pandemic prevented the survey team from conducting field surveys from the beginning of the project. While conducting survey through online meetings and email communication, it gradually became clear that there was a limitation of information collection in such remote work. For example, it was very difficult to hear opinions from the viewpoint of local people as they hardly communicate with the survey team members online. Therefore, a local consultant in Bhutan visited the selected remote areas and collected information directly from the residents, thereby acting as an alternative to the field survey.

Figure 118 Outline of field visit by a local consultant

Item	Description
Purpose	Confirm the needs of residents in the proposed pilot projects using digital technologies: ■ What are the recognition of the people who live in remote areas about the business that are expected to have an impact on the country ‘s growth through the introduction of digital technology (logistics, finance and healthcare services)? ■ How have the above issues changed by COVID-19? ■ To what extent do they use ICT in their daily lives?
Period of visit	Late April to early June 2021
Place to visit	■ Visit Gewog which is considered to be the most difficult to access to various social services even in the country (see schedule table for specific Gewog names). ■ In a Gewog, visit places where people get together such as temples, schools, and Basic Health Units
Survey method	Questionnaire
Points of concern	Implement the following infection control measures: ■ Frequent hand washing ■ Physical condition management (e.g., temperature checking, well-planned dates, avoid long-time travel) ■ Wear a mask (including a car, same applies to drivers). ■ Securing physical distance ■ Use of private rooms if accommodation is required ■ Sharing the travel plan in advance (to provide safety information in a timely manner)

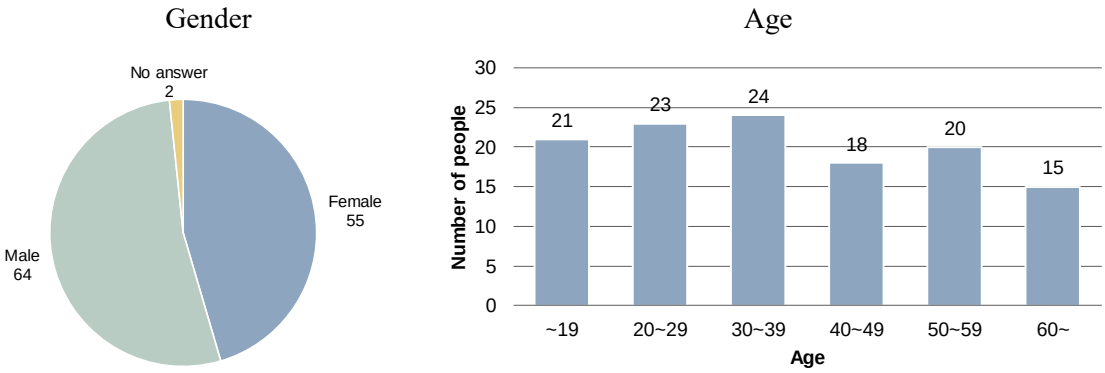
Figure 119 Schedule of the visit and results of collecting questionnaire

	Period of visit	Gewog (Dzongkhag)	Village	Number of collected questionnaire	Remarks
1	28 Apr 2021 ~15 May 2021	Lunana (Gasa)	Lhedi	20	Due to bad weather conditions, the helicopter returning from Lunana did not operate for a week and the consultant needed to stay unexpectedly.
			Shangsa	10	
			Tasho	10	
			Thangza	21	
			Tshojong	20	
2	27 May 2021 ~6 Jun 2021	Getana (Chukha)	Bachu	12	
			Eusay	10	
			Gata	10	
Total				**121**	

6.6.2 and 6.6.3 show the results of the questionnaire. All units of data shown in graphs are the number of people. In addition, since there may be cases of not answering or invalid answers, the total number of responses is not necessarily same as the total number of questionnaires collected.

6.6.2. Results 1: Attributes of respondents and the use of ICT in daily life

Figure 120 Attributes of respondents



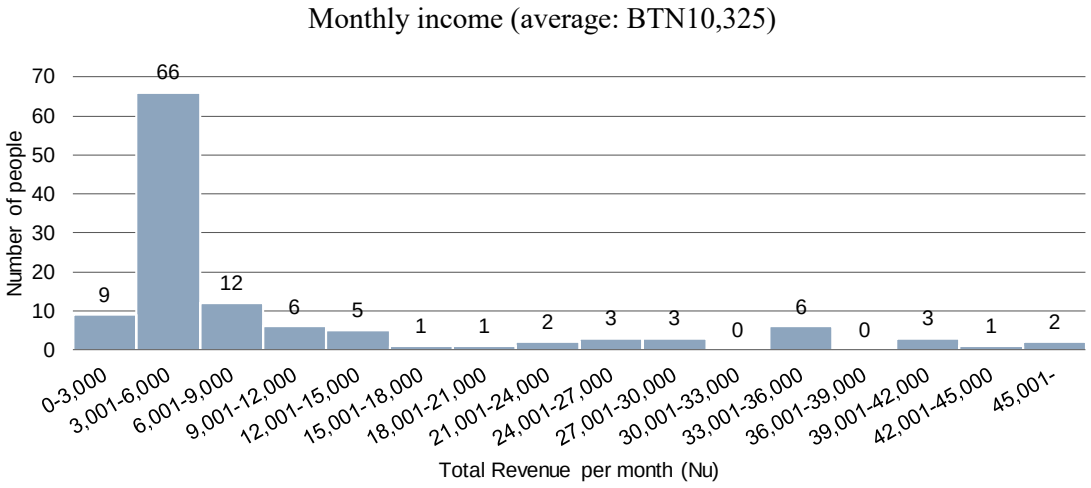
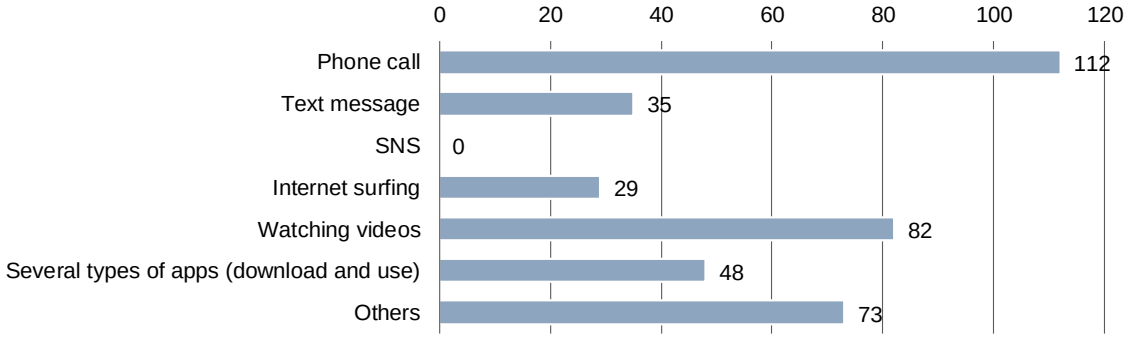


Figure 121 Degree of ICT utilization in daily life (Question 1~4)

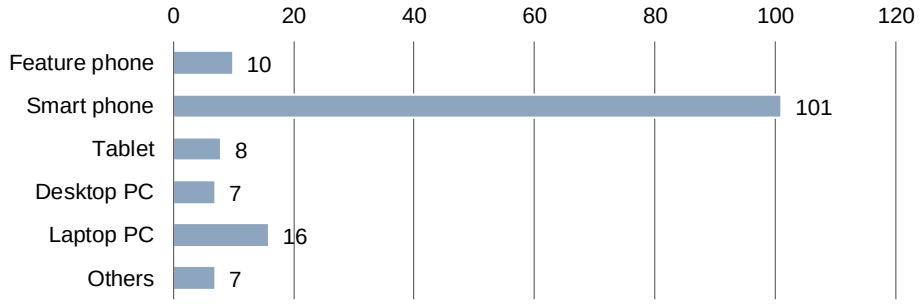
Question 1: Do you usually use communication services? If yes, what kind of services do you use? (Multiple answers allowed)



[Descriptive answers when selecting "Others"]

- I don't use
- Names of specific services (Facebook, Whatsapp, Instagram, and Youtube, etc.)

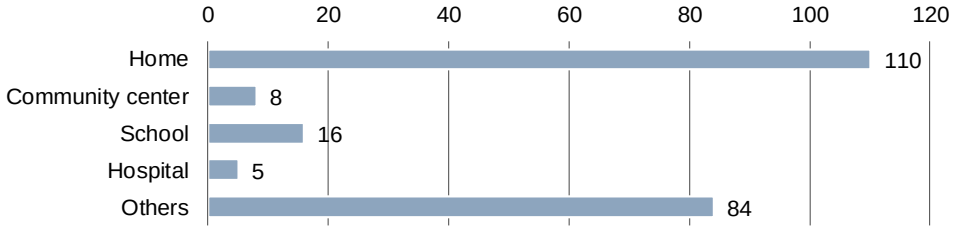
Question 2: If Question 1 is yes, what kind of communication devices do you have? (Mark all that apply)



[Descriptive answers when selecting “Others”]

- None

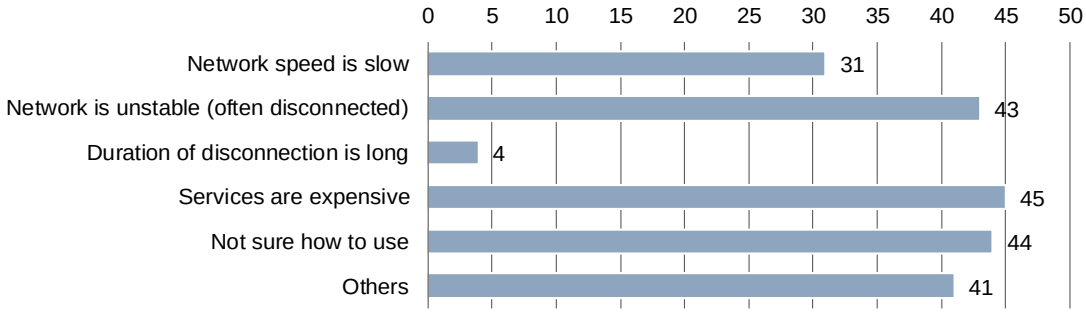
Question 3: If Question 1 is yes, where do you usually use communication services? (Mark all that apply)



[Descriptive answers when selecting “Others”]

- While going around/traveling
- Workplace
- Farm
- Shop

Question 4: Do you have any problems or complaints regarding communication services? (Mark all that apply)



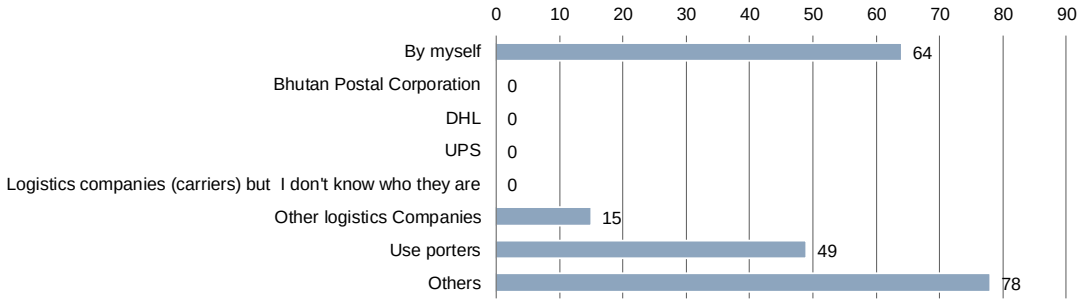
[Descriptive answers when selecting “Others”]

- Difficult to charge phone battery with solar panels.
- Difficult to recharge data packages.
- No problem

6.6.3. Results 2: Logistics needs

Figure 122 Logistics services usage (Questions 5~21)

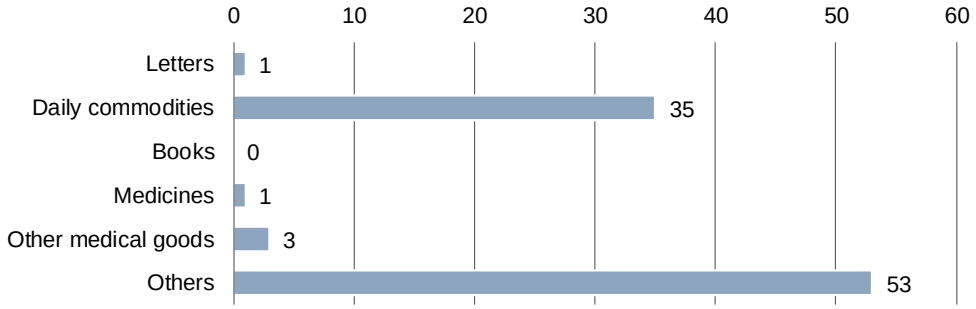
Question 5: How do you send and receive parcels and letters (goods)? (Mark all that apply)



[Descriptive answers when selecting "Others"]

- Royal Bhutan Helicopter Service
- Ask local people who own cars or go out to town
- I don't send any goods

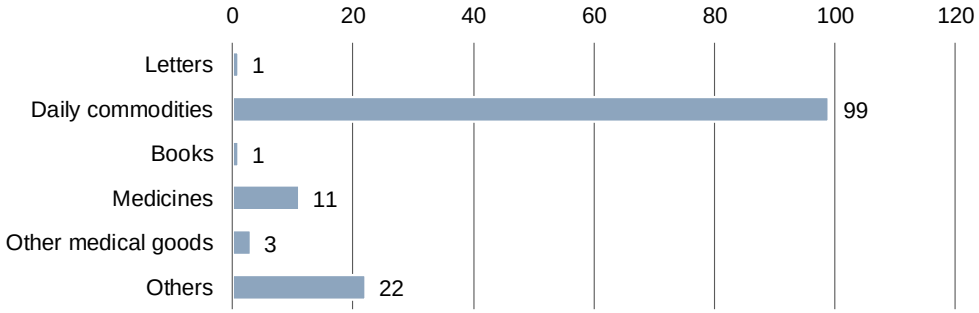
Question 6: What kind of goods do you send? (Mark all that apply)



[Descriptive answers when selecting "Others"]

- Agricultural products (cardamom, mushrooms)
- Agricultural equipment
- Battery chargers for mobile phones and clothing
- Administrative documents
- I don't send any goods

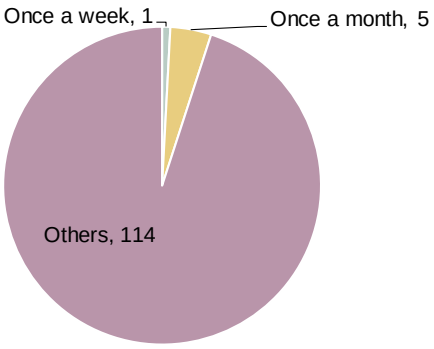
Question 7: What kind of goods do you receive? (Mark all that apply)



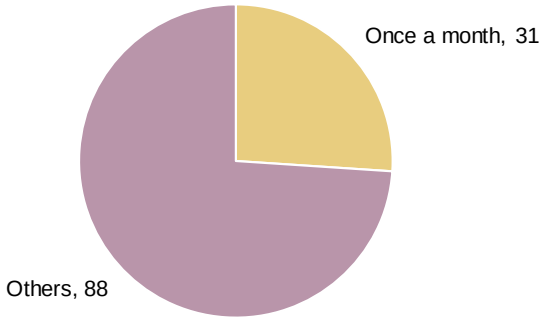
[Descriptive answers when selecting "Others"]

- School equipment
- Agricultural equipment (seeds, fertilizers, insecticides)
- Feminine care products and cosmetics
- Clothing
- Baby care products
- TV
- I don't receive any goods

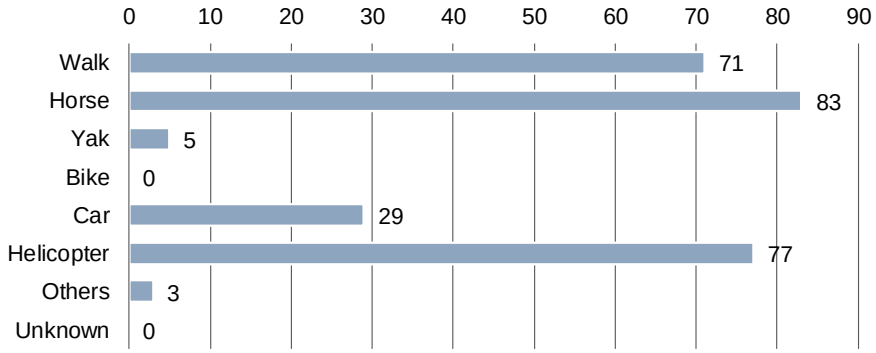
Question 8: How often do you send the goods? (Mark one closest to current situation)



Question 9: How often do you receive the goods? (Mark one closest to current situation)



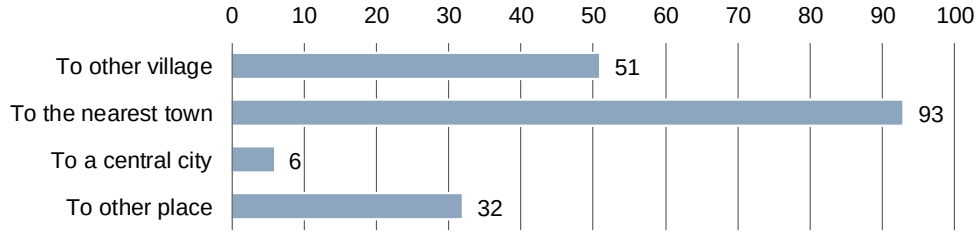
Question 10: Which means of transportation do you or the carriers use? (Mark all that apply)



[Descriptive answers when selecting "Others"]

- Pony

Question 11: To which place do you send the goods? (Mark all that apply)

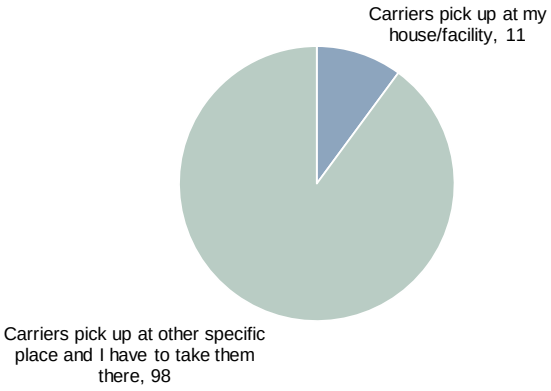


Question 12: Which place are the goods delivered from? (Mark all that apply)

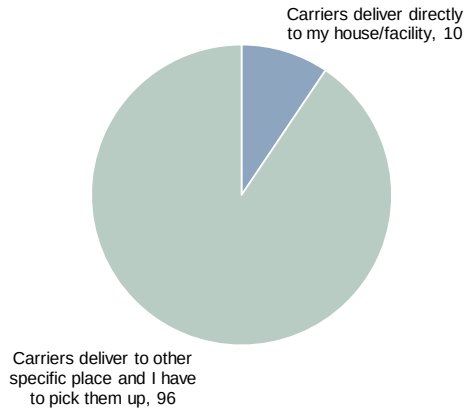
[Descriptive answers when selecting "Others"]

- Gasa
- Punaka
- Paro

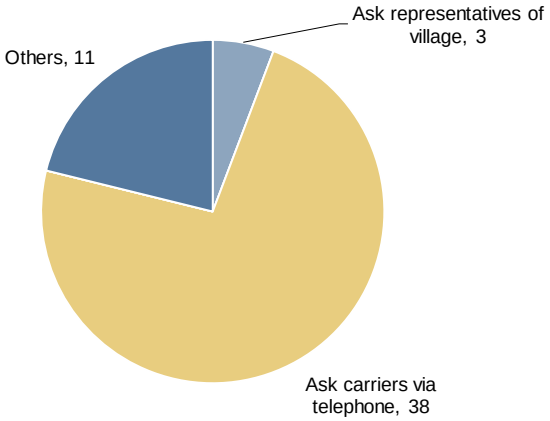
Question13: Where do the carriers pick up the goods when you want to send them? (Mark one closest to current situation)



Question 14: To which place do the carriers deliver the goods when you want to receive them? (Mark one closest to current situation)



Question 15: When you want to send goods, how do you request the pick-up by carriers? (Mark one closest to current situation)

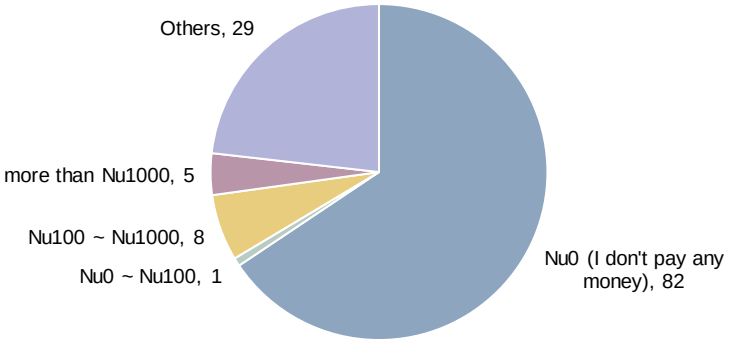


[Descriptive answers when selecting “Others”]

- Ask verbally when meeting in village

- Contact by SNS
- Visit a car owner's home
- Ask other people who can contact a carrier

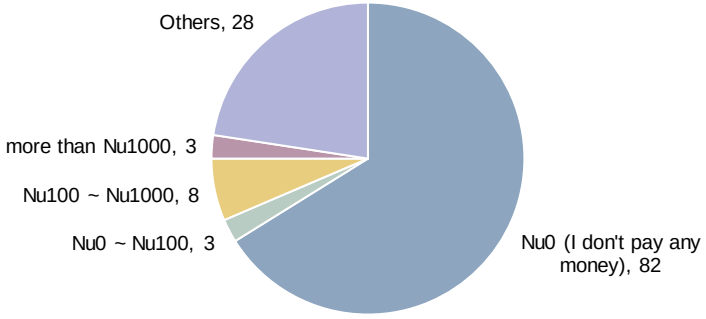
Question 16: How much do you pay per a delivery on average for sending? (Mark one closest to current situation)



[Descriptive answers when selecting “Others”]

- 3,000 Nu (1 horse)
- 8,000 Nu per delivery
- Depend on the weight of the luggage

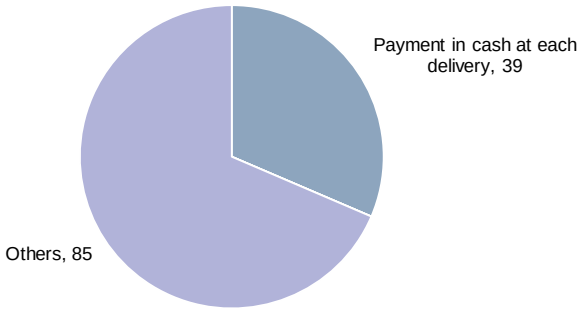
Question 17: How much do you pay per a delivery on average for receiving? (Mark one closest to current situation)



[Descriptive answers when selecting “Others”]

- 3,000 Nu (1 horse)
- 8,000 Nu per delivery
- Depend on the weight of the luggage

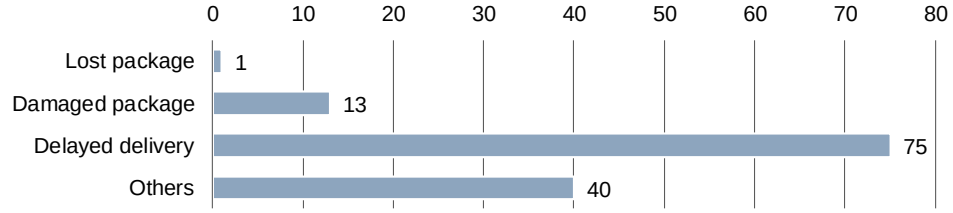
Question 18: How do you pay for a delivery? (Mark one closest to current situation)



[Descriptive answers when selecting "Others"]

- No charges
- Pay after the agricultural products are sold
- Pay in kind (local brew)

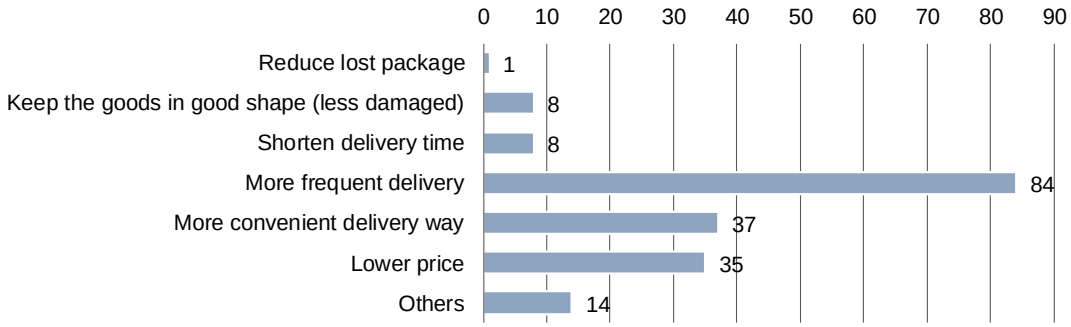
Question 19: Have you had any problems in logistics services? (Mark all that apply)



[Descriptive answers when selecting "Others"]

- Delays due to bad weather and road block
- No problem

Question 20: What would you like to improve in the current logistics services? (Mark all that apply)



[Descriptive answers when selecting "Others"]

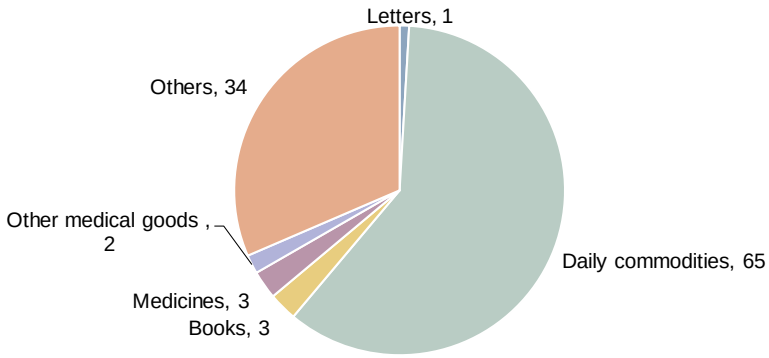
- Increase the amount of luggage that can be carried by helicopter
- Repair the road

Question 21: How long does it take to get to the following facilities from your house: grocery store, clinic, district hospital? (Write average time)

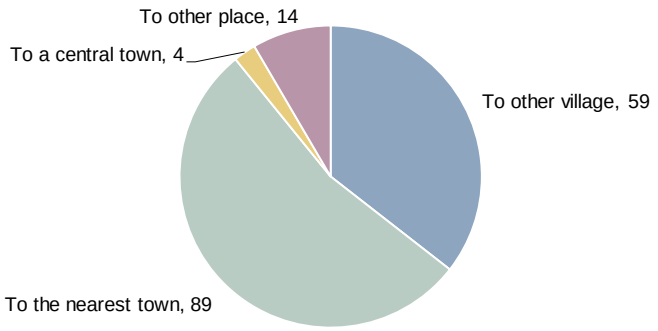
Grocery	5 minutes ~ maximum 3 hours by walk
Clinic	5-minute ~ maximum 4 hours by walk
District hospital	・7-8 days ・7~9 hours by car

Figure 123 Demand for drone logistics (Question 22~29)

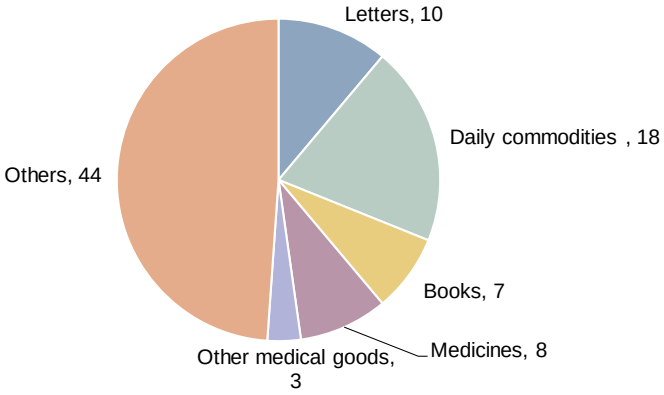
Question 22: What goods would you like a drone to send from your house/facility? (Mark one closest to your thought)



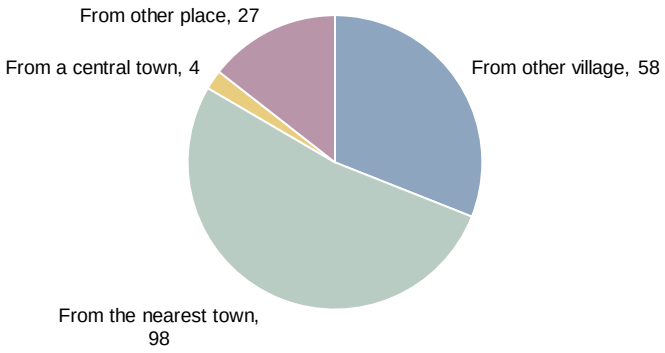
Question 23: To which place would you like a drone to deliver the above goods? (Mark one closest to your thought)



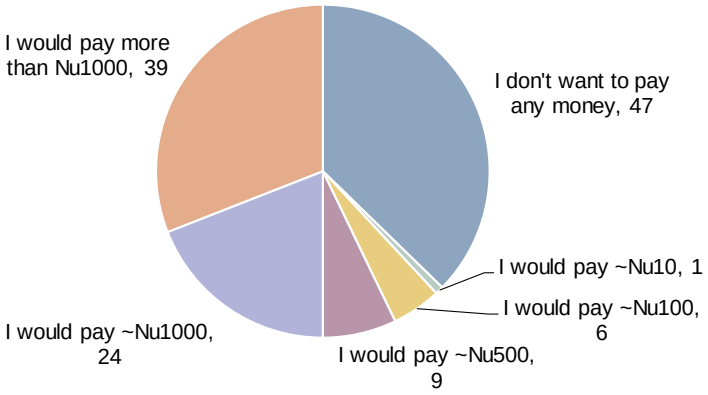
Question 24: What goods would you like a drone to deliver to your house/facility? (Mark one closest to your thought)



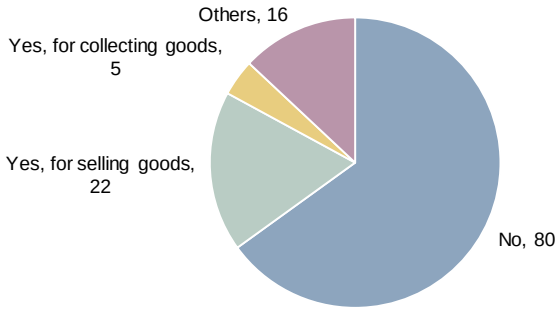
Question 25: From which place would you like a drone to deliver the above goods? (Mark one closest to your thought)



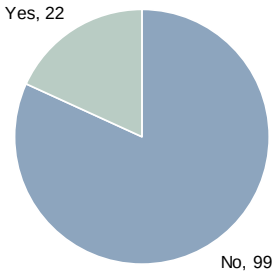
Question 26: If a drone could deliver on demand whatever you want, what is the maximum amount you can pay for the service (per a delivery)? (Mark one closest to your thought)



Question 27: Would you like to use the drone delivery service for your work?



Question 28: If you make a living by selling goods to a city, would you like to increase the frequency of delivery from your village to the city?



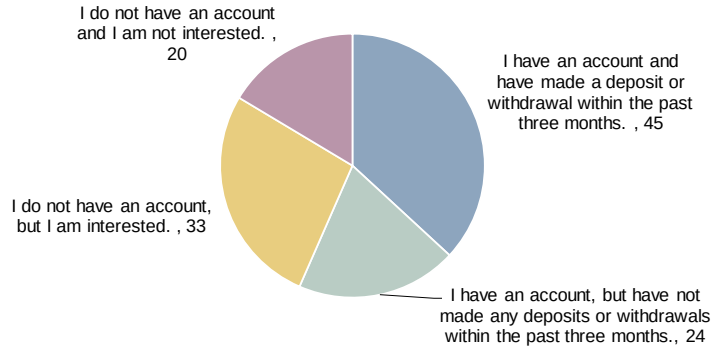
Question 29: If Question 31 is yes, what would be the expected frequency of delivery from your village to the city?

Current frequency	Once ~ four times a year
Desired frequency	Weekly, monthly, twice a year

6.6.4. Results 3: Financial needs

Figure 124 Use of financial services (Questions 30~39)

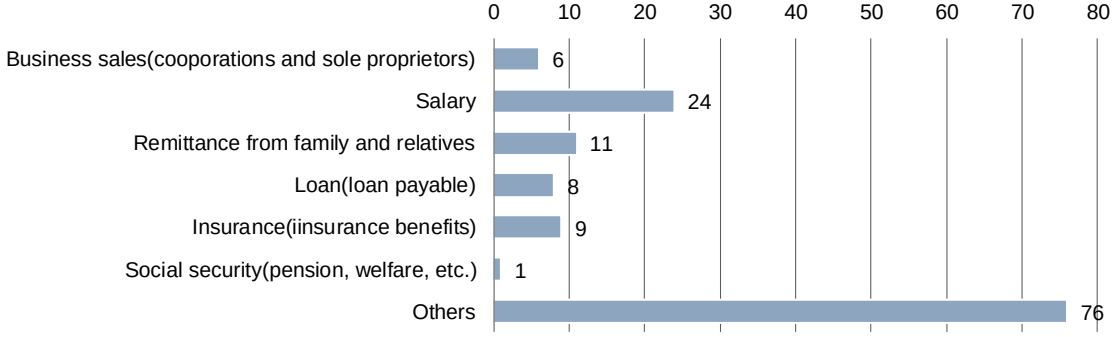
Question 30: Do you have a financial account such as bank account?



Question 31: If you have an account, which financial institution is your main account?

- Bank of Bhutan
- Bhutan National Bank
- Bhutan Development Bank

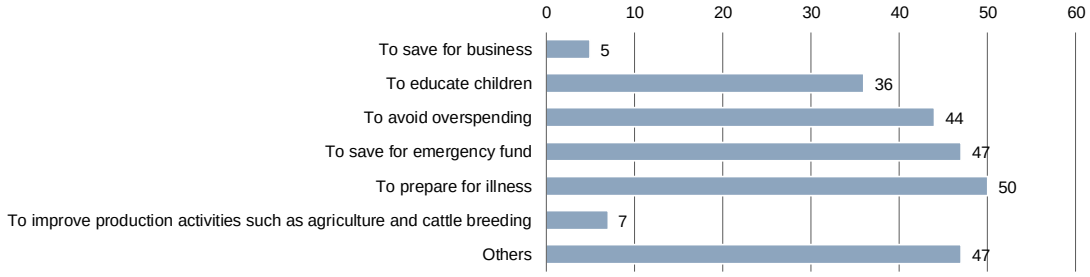
Question 32: What kind of money do you receive in your financial account?



[Descriptive answers when selecting “Others”]

- Sales of agricultural products
- Remittance from customers
- I don’t have bank account

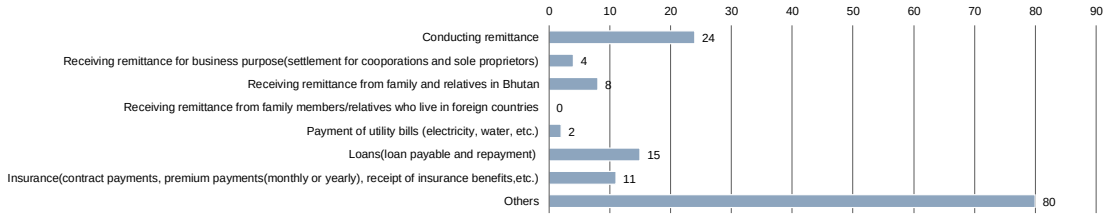
Question 33: What is the reason you have an account at a financial institution? (Mark all that apply)



[Descriptive answers when selecting “Others”]

- To save for the future/children
- To spend money wisely
- For convenience
- Security reasons
- For use of digital payments (mBoB)
- I'm taking a bank loan.
- I don’t have bank account

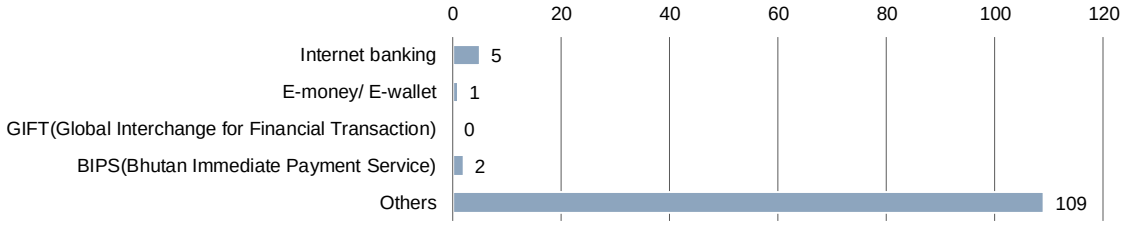
Question 34: What financial products and services have you used in the last 12 months? (Mark all that apply)



[Descriptive answers when selecting "Others"]

- Remittance to family members, etc.
- Deposit
- Payment of telephone bills
- Payment of land contracts
- None

Question 35: What kind of digital payment services do you use?



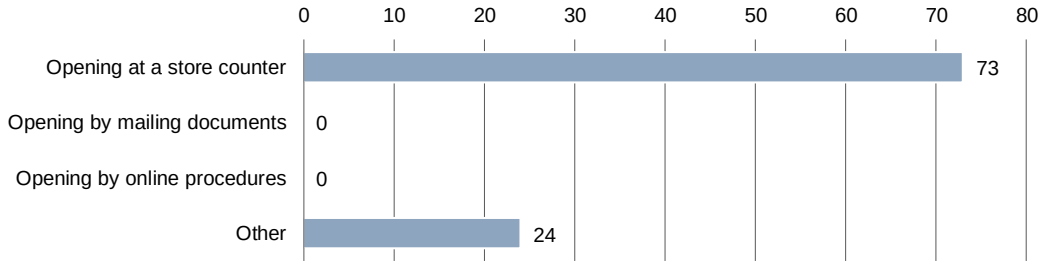
[Descriptive answers when selecting "Others"]

- mBoB
- mPay
- BDB ePay
- None

Question 36: Can you tell me up to five e-money providers you know of?

- B wallet
- B-Ngul
- mPay
- I don't know

Question 37: How did you open your own financial account?



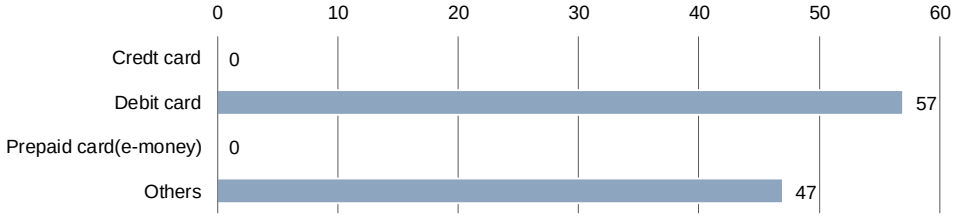
[Descriptive answers when selecting “Others”]

- None

Q.38: What is the distance from your home to the ATM you use in your daily life?

- 7~8 hours
- Minimum of 14 hours
- There is no ATM.

Q39: What kind of cards do you have?



[Descriptive answers when selecting “Others”]

- None

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