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Project for The Formulation of Southern Central Regional Plan in Kingdom of Bhutan

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Abbreviations

(Organisation)

ADB	Asian Development Bank	MoIC	Ministry of Information and Communication
BCCI	Bhutan Chamber of Commerce & Industry	MoICE	Ministry of Industry, Commerce and Employment (3-36 略語入れる)
BDB	Bhutan Development Bank	MoIT	Ministry of Infrastructure and Transport
BNB	Bhutan National Bank	MoLHR	Ministry of Labour and Human Resource
BoB	Bank of Bhutan	MoU	Memorandum of Understanding
BSB	Bhutan Standards Bureau	MoWHS	Ministry of Works and Human Settlement
CSO	Civil Society Organization	NDMA	National Disaster Management Authority
DAHE	Department of Adult and Higher Education	NEC	National Environment Commission
DoST	Department of Surface Transport	NGO	Non-Government Organization
DHI	Druk Holdings and Investment Group	NLCS	National Land Commission Secretariat
DHS	Department of Human Settlement	NPO	Non-Profit Organization
DoC	Department of Culture and Dzongkha development	NSB	National Statistics Bureau
DPB	Druk PNB Bank	PCT	Project Core Team
EIP	Eco-Industrial Park	PHCB	Population and Housing Census of Bhutan
IUCN	International Union for Conservation of Nature	PWG	Project Working Group
JCC	Joint Coordination Committee	RCID	Royal Centre for Infectious Disease
JICA	Japan International Cooperation Agency	RGoB	Royal Government of Bhutan
JIP	Jigmeling Industrial Park	RMO	Road Maintenance Office
JSWNP	Jigme Sigye Wangchuck National Park	RUB	Royal University of Bhutan
JPT	JICA Project Team	TTP	Thimphu TechPark
LG	Local Government	TWG	Technical Working Group
LGAs	Local Government Administrations	UNDP	United Nations Development Programme
MoAF	Ministry of Agriculture and Forest	UNFCCC	United Nations Framework Convention on Climate Change
MoAL	Ministry of Agriculture and Livestock	UNIDO	United Nations Industrial Development Organization
MoE	Ministry of Education	WHO	World Health Organisation
MoEA	Ministry of Economic Affairs		
MoENR	Ministry of Energy and Natural Resource		
MoESD	Ministry of Education and Skills Development		
MoH	Ministry of Health		
MoHA	Ministry of Home Affairs		

(General Term)

BNT	Bhutanese Ngultrum	NIWRM	National Integrated Water Resource Management
BPO	Business Process Outsourcing	NLUP	National Land Use Plan
BRT	Bus Rapid Transit	NWFP	Non-wood forest products
BSB	Bhutan Standards Bureau	OC	Outreach Centre
BSC	Biological Soil Crust	OECD	Organisation for Economic Co-operation and Development
CMI	Common Minimum Infrastructure	OGOP	One Gewog One Product Programme
COVID-19	Corona virus disease 2019	OJT	On the Job Training
CNDP2030	Comprehensive National Development Plan 2030	PPTP	Public and Private Training Provide
CRRH	Central Regional Referral Hospital	ORC	Outreach Clinic
CS	Central School	PC	Personal Computer
CSI	Cottage and Small Industry	PCU	Passenger Car Unit
CP	Check Point	PES	Payment of Environmental Service
C/P	Counterpart	PHC	Primary Health Centre
DC	District centre	PHCB	Population and Housing Census of Bhutan
DCR	Development Control Regulation	PPP	Public-private partnership
DEM	Digital Elevation Model	PrR	Progress Report
DMAB	Disaster Management Act of Bhutan	PS	Primary School
DX	Digital Transformation	PSSGC	Preliminary Study on Sarpang-Gelephu Corridor
EAA	Environment Assessment Act	PVDP	Paro Valley Development Plan
EIA	Environmental Impact Assessment	PWS	Phibsoo Wildlife Sanctuary
ECR	Extended Classroom	RBP	Royal Bhutan Police
EIP	Eco-Industrial Park	RC	Regional Centre
e-PIS	e-Patient Information System	RCSP	Regional Centre Structure Plan
EWS	Early Warning System	R/D	Record of Discussion
FDI	Foreign Direct Investment	RDP	Regional Development Platform
F/S	Feasibility Studies	REDD	Deforestation and Forest Degradation in Developing Countries
FNCA	Forest and Nature Conservation Act	RO	Religious Organisation
FNCRR	Forest and Nature Conservation Rules and Regulations 2017	RNR	Renewable Natural Resource
FTZ	Free Trade Zone	RRH	Regional Referral Hospital
GC	Gewog centre	RSP	Regional Spatial Plan
GDP	Gross Domestic Production	RSSC	Royal Society for Senior Citizens
GIS	Geographic Information System	RRPD	Regional and Rural Planning Division
GNH	Gross National Happiness	SCR	Southern Central Region
GNHC	Gross National Happiness Commission	SCRP	Southern Central Regional Plan
G2C	Government to Citizen	SCRSP	Southern Central Regional Structure Plan
HDI	Human Development Indicator	SDC	Sub-district centres
HSP	Human Settlement Plan	SDF	Sustainable Development Fund
HSS	Hight Secondary School	SDGs	Sustainable Development Goals
HWC	Human-Wild Conflict	SEA	Strategic Environmental Assessment
ICT	Information and Communication Technology	SEO	Search Engine Optimization
IoT	Internet of Things	SEOs	Strategic Environmental Objectives
IT	Information Technology	SEZ	Special Economic Zone
IWMP	Integrated Watershed Management Program	SHEP	Smallholder Horticulture Employment Project
LAP	Local Action Plan	SMEs	Small and Medium sized Enterprises
LEDS	Low Emission Development Strategies	SNS	Social Network Service
LGA	Local Government Act	SOPs	Standard Operating Procedures
LGAs	Local Government Administrations	SPA	Spatial Planning Act
LSS	Lower Secondary School	SPB	Spatial Planning Bill
LUCs	Linked Urban Centres	SPF	Spatial Planning Framework
MDP	Mini Dry Port	SPS	Spatial Planning Standard
MICE	Meeting, Incentive Travel, Convention, Exhibition/Event	SWOT	S: Strengths; W: Weaknesses; O: Opportunities; T: Threats
M/M	Minutes of Meeting	TDS	Tax Deducted at Source
MLP	Multi-model Logistic Park	TTI	Technical training institute
MoU	Memorandum of Understanding	TVET	Technical and Vocational Education Training
MSH	Multi-stakeholder	VTI	Vocational training institute
MSS	Middle Secondary School	WS	Wild Sanctuary
NDC	Nationally Determined Contribution	12th FYP	12th Five-Year Plan
NEPA	National Environment Protection Act		
NHSP	National Human Settlement Policy		

13th FYP	13th Five-Year Plan
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CHAPTER 1 INTRODUCTION AND IMPLEMENTATION ARRANGEMENT

1.1 Background

1.1.1 The Project for Formulation of Southern Central Regional Plan

Bhutan has been facing an increasing rate of rural-urban migration mainly from the eastern to the western region. Due to the influence of population migration, in rural areas the number of workers has decreased and consequently fallow land is expanding. This has also caused a shortage in the capacity of public service providers. With the aim of promoting regionally balanced development, Comprehensive National Development Plan 2030 (hereafter “CNDP2030”) was formulated in 2019. After its approval, the implementation of the CNDP2030 was incorporated in the 12th Five-Year Plan (2018–2023: hereafter “12th FYP”) by the erstwhile Gross National Happiness Commission (GNHC). Also, the Royal Government of Bhutan (RGoB) plans to promote national development through a series of strategies proposed in CNDP2030.

Based on the Record of Discussion (R/D) agreed upon between the Ministry of Works and Human Settlement (MoWHS, renamed to Ministry of Infrastructure and Transport (MoIT)¹) and the Japan International Cooperation Agency (JICA), the Project for Formulation of Southern Central Regional Plan (hereafter “Project”) commenced with the kick-off meeting (October 25th, 2021).

The Project will formulate a set of plans composed for a regional plan for the three Dzongkhags (Sarpang, Tsirang, and Zhemgang) and a structure plan for the Sarpang-Gelephu corridor, thereby materializing the concept of Regional Centre² for the southern central region proposed in the CNDP2030. In addition, the Project aims to formulate general standards and guidelines for nationwide application of the same set of the Regional Plan and the Regional Centre Structure Plan (hereafter “Plans”) while implementing capacity development for the counterpart agencies.

1.1.2 Socio-economic condition in Bhutan and the Project Area

Since 1961, the RGoB has guided its economy through the Five-Year Plans in order to promote economic development. Bhutan's economy grew at an annual average rate of around 7% in 1998 to 2018. This growth was primarily driven by significant public investments in social infrastructure and hydropower, in addition to the steady performance of sectors such as tourism, construction, and manufacturing. As for the period of 12th FYP, which will be completed by October 2023, Gross Domestic Production (GDP) growth rate has been fluctuating from a peak of 5.8 % in 2019 to -10.0 % in 2020, 4.1 % in 2021³ due to the impact of Corona virus disease 2019 (COVID-19). Although GDP growth rate in the Project Area has not been published due to lack of statistics, it can be envisaged that the impact has not been low due to a close economic relationship with India.

The 13th Five-Year Plan (13th FYP) is expected to be ambitious in terms of investments given the focus on economic recovery and aspiration to make Bhutan a high-income country within the next 10 years. On the other hand, it is said that the Gross National Happiness (GNH), which is a concept by which Bhutan measures its economic and social development, would not be the only yardstick.

On 27th June 2022, the bill was passed to levy the revised Bhutan Sustainable Development Fund (SDF) for international guests from USD 65 to USD 200. The increase in the SDF is in line with Bhutan's ‘High Value, Low Volume’ tourism policy. The impact for the Project Area, especially Gelephu Thromde,

¹ The Ministry of Works and Human Settlement was renamed to the Ministry of Infrastructure and Transport by the Civil Service Reform Bill 2022, enforced from December 15th, 2022.

² In the Project, the term of Regional Centre is used same as the meaning of Linked Urban Centre.

³ <https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?locations=BT>

which has played an important role on international gateway, should be monitored. Such tourism policy may urge for the promotion of the regional branding to not only tourism destinations, but also in other productive areas.

1.1.3 Impact of COVID-19

As mentioned above, COVID-19 contributed to the temporal economic downturn in Bhutan. On the other hand, according to the World Economic Outlook Database of the IMF, it is expected that GDP growth rate at constant price in Bhutan from 2022 to 2027 will remain high at 4 % to 7 %.

From social viewpoint, the highly contagious nature of COVID-19 and the constraints of the health system in coping with a full-blown outbreak warranted stringent preventive action to minimize the spread of the disease. These measures adversely affected economic activities across the country, including the crucial tourism sector. Standard operating procedures (SOPs) has been prepared in some areas during the COVID-19 pandemic period. Based on the SOPs, the government eased COVID-19 restrictions starting 4th April 2022⁴.

SOPs are a set of instructions and directions necessary to be followed to complete a task for application in the entire country. Therefore, it would be proposed to improve the existing SOPs considering the experiences and lessons learned from the Project. It would be also proposed that SOPs have to be prepared and specified for a designated settlement area. As the population and medical facilities differ from places, the settlement area might have to be divided into different units and classified into different categories for applying the corresponding SOPs.

1.2 Objectives and Outputs

As described in the R/D and the Inception Report which was submitted to the erstwhile MoWHS and the JICA on September 2021, the expected goal by implementing the Project is as follows:

- Linked Urban Centre and Regional Centre concepts proposed in the CNDP 2030 will be adopted.

Under the goal, the following outputs are produced:

1) Output 1: Regional Plan

The Strategy and spatial structure for regional development in Sarpang Dzongkhag and surrounding Dzongkhags (Tsirang and Zhemgang): The Regional Plan consists of Regional Development Strategy and Regional Spatial Plan.

2) Output 2: Sarpang-Gelephu Regional Centre Structure Plan

The spatial plan for Sarpang-Gelephu Linked Urban Centre including settlements along the Sarpang-Gelephu corridor, between Sarpang Town and Gelephu Thromde.

3) Output 3: General Standards and Guidelines

General Standards and Guidelines for nationwide application (to be applied in the urban/regional development in other Linked Urban Centres)

1.3 Implementation Structure

(1) JCC, PCT and TWGs

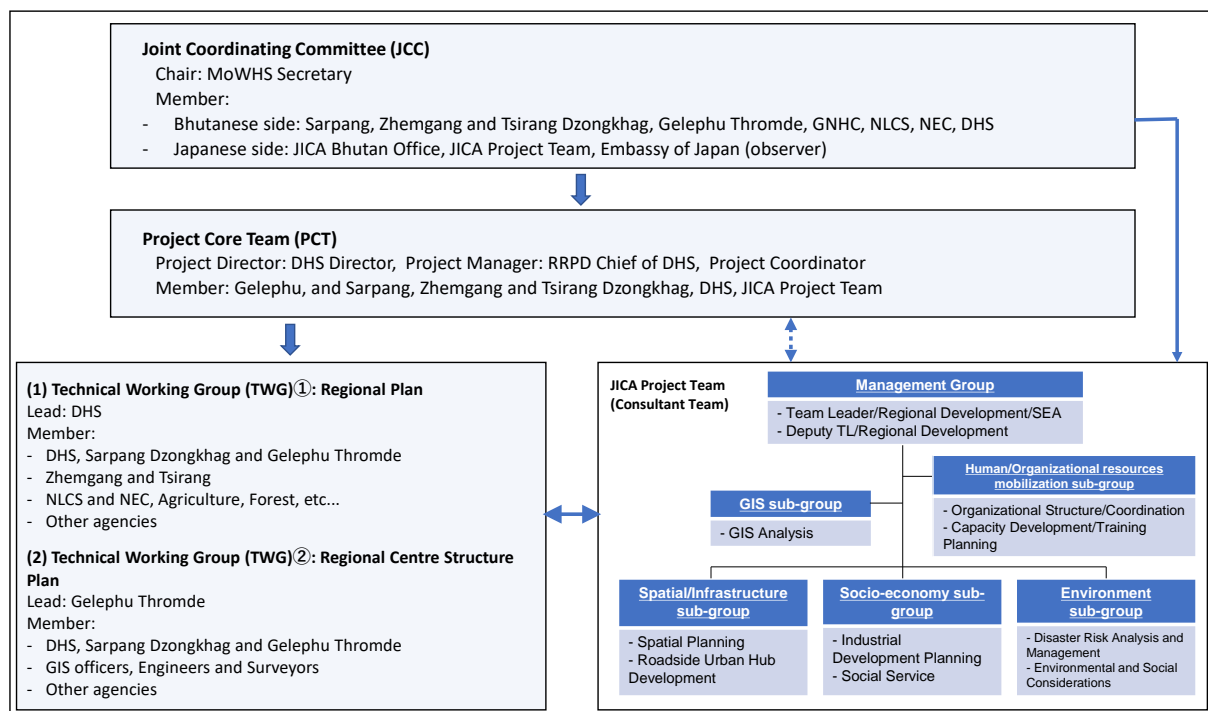
The Project is implemented by the JPT and the Bhutanese C/P team. The main counterpart organisation of the Royal Government of Bhutan is the erstwhile Ministry of Works and Human Settlement (MoWHS). It is in charge mainly of the implementation and supervision of the Project.

⁴ <https://www.bcci.org.bt/covid-19-preventive-measures-standard-operating-procedure-of-bcci/>

The Project implementation will be supervised by the Joint Coordination Committee (JCC), chaired by the erstwhile MoWHS Secretary. The JCC is composed of member representation from three Dzongkhags of the target area of the Project (hereafter “Project Area”), Gelephu Thromde, relevant agencies, ministries, JICA Bhutan office, JICA Headquarters and other members from the Japanese side. The JCC members and their roles are as specified in the R/D of the Project. Under the JCC, a Project Core Team (PCT) is formed as the Bhutanese counterpart organisation to work with the JPT and conduct internal coordination for the Bhutanese side on a daily basis. There are two Technical Working Groups (TWGs) to work on the Regional Plan and the Regional Centre Structure Plan (RCSP) with members from Department of Human Settlement, three Dzongkhags of the Project Area, Gelephu Thromde and other relevant agencies. The TWG1 is in charge of the Regional Plan and it is led by the Department of Human Settlement (DHS), and the TWG2 is in charge of the RCSP and it is led by Gelephu Thromde.

(2) Collaborative works

To implement the Project in close collaboration and cooperation and on a daily basis, the TWGs have worked closely with the six sub-groups managed by the JPT as follows: 1) Management, 2) Spatial-Infrastructure, 3) Socio-economy, 4) Environment, 5) Geographic Information System (GIS), and 6) Human/Organizational resources mobilization. These are informal groups to encourage free and open discussions with a smaller number of participants. The JPT also adopted a group structure for the ease of project operation and management together with the TWGs. The overall project implementation and management structure is illustrated in Figure 1.3.1.



Source: JICA Project Team

Figure 1.3.1 Project Implementation and Management Structure with JCC, PCT, TWGs and Sub-groups

1.4 Project Area and Administrative Setting

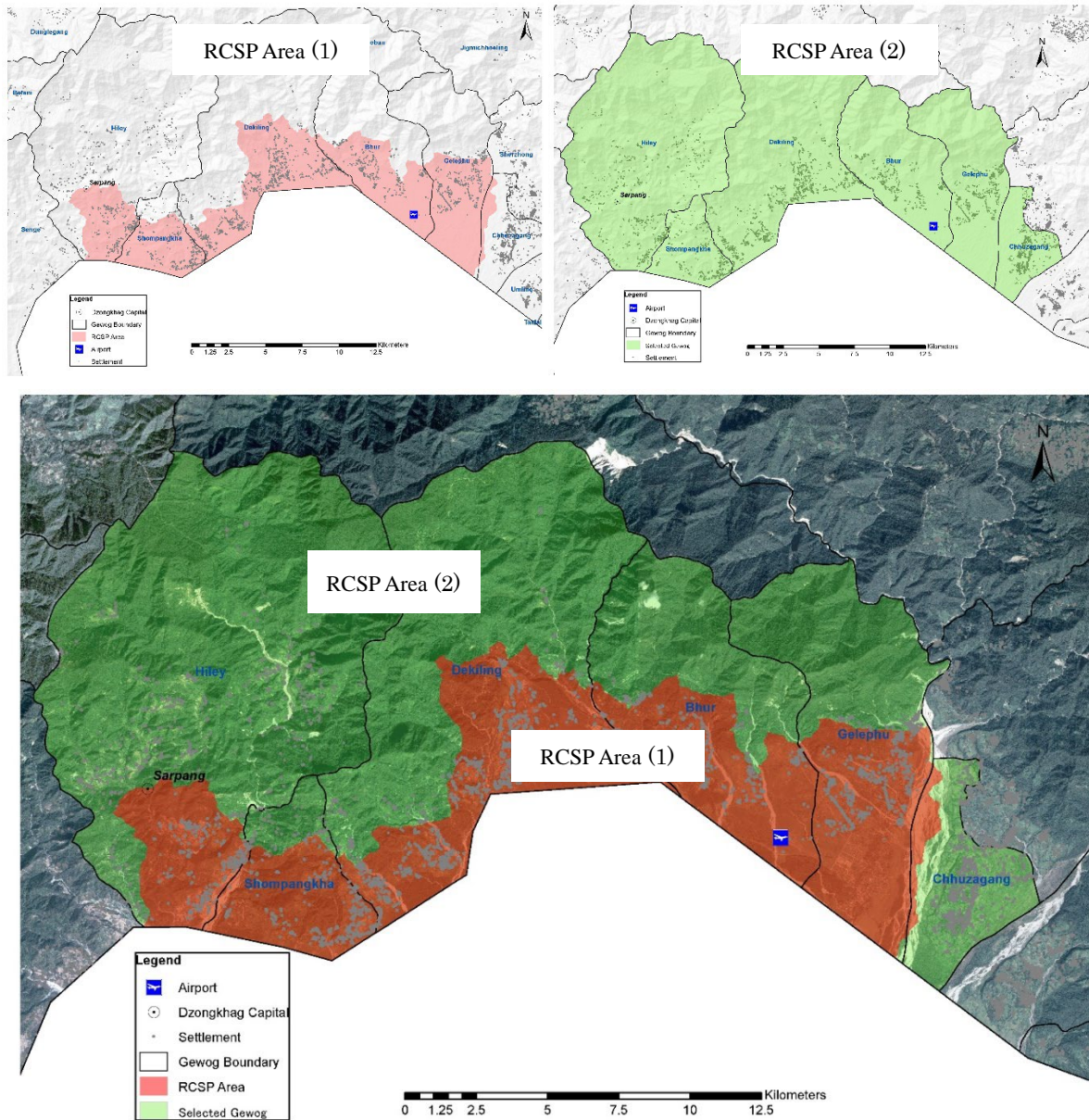
The Project shown in Figure 1.4.1 includes Sarpang and Zhemgang Dzongkhags which share borders with India in the southern region, and Tsirang Dzongkhag. The Project targets two types of area: three Dzongkhags for the Regional Plan corresponding to the output 1 and the corridor area for the RCSP (hereafter “RCSP Area”) for the output 2 as aforementioned.



Source: JICA Project Team

Figure 1.4.1 Project Area

While the extent of the Project Area has been identified by the Dzongkhag boundaries, the RCSP Area had not been defined. The JPT suggested two options namely RCSP Area (1) and (2) as shown in Figure 1.4.2 in the first JCC. Through the field survey by the JPT experts and several discussions on each option, the RCSP Area (1) was selected officially as the RCSP Area following its approval in the second JCC.



Source: JICA Project Team

Figure 1.4.2 Two Options on the Covering Area and Satellite Image on the RCSP Area Proposed by the JPT

1.5 Project Procedure

1.5.1 Regional Plan

(1) Regional Development Strategy

Regional Development Strategy will be developed based on the three pillars of 1) promoting industry to secure livelihood improvement, 2) life service delivery system for sustainable settlement, and 3) multi-stake holders' collaboration by forming a Regional Development Platform (RDP) to encourage the participation of local stakeholders in the revitalisation of the region.

Vision for each Dzongkhag should be elaborated through a series of discussions among stakeholders. Also, for the visions, the existing plans at macro and local level should be reviewed and analysed. To

ensure that the approved plans and related documents are reviewed holistically and in detail, the C/Ps and the JPT have been working together. To embody the vision for each Dzongkhag, development objectives will be framed with development concepts. The vision shall then be finalised through multi-stakeholder meetings and consultations associated with a participatory approach focussed on the individual Dzongkhag unit but with a common goal of regional development.

A vision, development objectives, and regional branding strategy for the entire south-central region, the Project Area, will also be developed. In particular, the vision and development objectives will be developed based on the development alternatives from the Strategic Environmental Assessment (SEA) process.

In the absence of a framework to discuss the macro level regional development including Dzongkhag and regional level, it is appropriate that central government C/Ps lead the process of developing the vision, development concepts and regional branding.

(2) Regional Spatial Plan

In the Regional Spatial Plan, it is proposed to cover regional spatial structure, economic development plan, holistic service delivery system, road network, disaster risk management, environmental management, etc. Each JPT expert has been collaborating with Bhutanese C/Ps sector-wise since the beginning of the Project. In order to avoid miscommunication of any form beyond the specific sector, the sub-groups carried out frequent discussions.

1.5.2 Regional Centre Structure Plan

There is no plan in Bhutan so far for a belt-like wide area connecting two urban centres. After consulting with C/Ps on the accuracy of the plan, it was agreed with C/Ps that the plan should be comparable to the “Valley Development Plan”.

Same or above as the Regional Spatial Plan, each expert of the JPT has been collaborating with Bhutanese C/Ps by sector, including the range of application of the Spatial Planning Framework (SPF) and the Spatial Planning Standard (SPS) in detail. This means that the RCSP require more specific and strict application in the view of the necessary accuracy.

The development of the RCSP will play an important role in providing a model for the development of similar plans for other areas in the country. The Sarpang-Gelephu corridor, which is endowed with a vast expanse of flat land, holds a great promise for economic development. It is therefore important to introduce appropriate development plans and regulatory and guidance measures specific to such area.

1.6 Contribution to SDGs

The Project pursues sustainable development of the Project Area. The United Nations Sustainable Development Goals (SDGs) consist of 17 goals for a sustainable society. Goal 11 defines the following as necessary conditions for sustainable cities and communities: creating career and business opportunities, providing safe and affordable housing, and building resilient societies and economies. It involves investment in public transport, creating green public spaces and improving urban planning and management in participatory and inclusive ways.

To meet these requirements, the Project will provide recommendations for improving economic aspects, creating safe urbanization areas, community development including public participation, public transport, parks and other recreational facilities.

CHAPTER 2 PARTICIPATORY APPROACH AND STRATEGIC ENVIRONMENTAL ASSESSMENT

2.1 Importance of Participatory Approach for Regional Development

2.1.1 Importance of participatory approach and SEA

A participatory approach is essential in the process of regional development planning. It enables understanding the needs and aspirations at grassroots level and provides opportunities to the residents for taking part in the process of planning and development. The residents may also realize their own development goals or self-fulfilment at higher levels. Therefore, the need for a participatory approach in the process of regional planning should be made necessary in the methodology to formulate regional development plan.

The participation in the planning procedure presents one of the best opportunities from the viewpoint of development management. The management at a regional level should be conducted well by the local administrations working with the residents, Civil Society Organizations (CSO), Non-Governmental Organisation (NGO), etc. based on the Regional Development Platform (hereafter “the Platform”) described in section 3.3.4.

Regional development planning is a continuous process where development plans are drawn up, individual projects are implemented, managed and operated; the process and effects are monitored and evaluated. In the process, new needs are identified from the monitoring and evaluation, and are reflected during the revision and updating of the plans. Participation in planning can provide added advantage while participating in the subsequent process of implementation, management and administration, monitoring and evaluation.

Although various types of methods were developed to ensure the participation of the residents, etc., the application of the SEA is the most appropriate in this Project, as it ensures the consistency with the CNDP2030. Also, the participatory development planning through the SEA will be the basis for operating the Platform proposed in the Project.

2.1.2 Application of participatory approach and SEA

According to “Strategy to Mainstream Citizen Engagement in World Bank Group Operations”¹, as the citizen engagement approaches, six steps such as 1) Consultation, 2) Collaboration, 3) Collecting, recording, and reporting on input from citizens, 4) Grievance redress mechanisms, 5) Citizen-led monitoring, and 6) Impact of technology on citizen engagement, are suggested. Among these steps, first three steps 1) to 3) should be ensured within the Project frame, because the Project mainly focus on the planning stage. Thereby, next three steps 4) to 6) will be realised taking advantage of the many activities conducted by the Project after the period would be finished.

It should be clearly demarcated the range of the application of participatory approach and SEA on the Regional Plan and the RCSP. Considering the different character between the Regional Plan and the RCSP in light of the areas covered by each plan, it is definitely validated to adopt the method of the SEA for the Regional Plan. The Plan includes the RCSP Area development perspective with a macro viewpoint and the local needs based on the consultation work with the local organisation and residents. That is, the SEA process adopted for the Regional Plan includes a part of the participatory approach targeted on the RCSP Area.

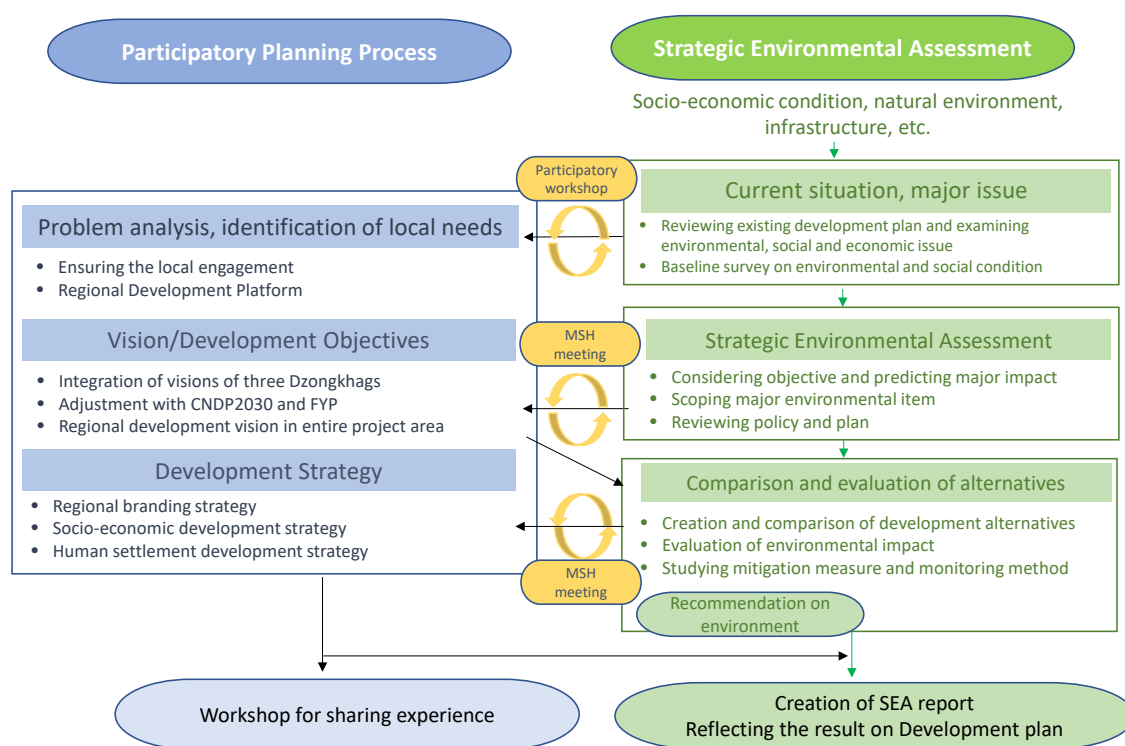
¹ https://consultations.worldbank.org/sites/default/files/materials/consultation-template/engaging-citizens-improved-resultsopenconsultationtemplate/materials/finalstrategicframeworkforce_4.pdf

The RCSP itself is more technical rather than that of the Regional Plan, while the many stakeholders have been involved in the planning process. Therefore, environmental and social consideration focusing on sectorial environmental planning have been done for the RCSP without the SEA method.

2.1.3 Ensuring the consistency in the process of formulating plans

The SEA methodology is applied to the formulation of plans and consensus building to ensure transparency in the planning process, and the environmental impacts that are important to Bhutan are assessed in parallel. In examining the development vision, medium- and long-term development objectives, etc., various efforts shall be made to apply a participatory approach to discuss different types of future scenarios. Both the Bhutanese side and the JPT will collaborate closely in the participatory planning process with the considerations of multiple scenarios or future projections.

These efforts will establish an autonomous mechanism whereby those who participate in the planning process will continue to involve in the updating and implementation of the Plans ensuring the consistency in the regional development. In addition, Multi Stakeholder Meeting (MSH) for participatory planning mentioned above will be based on the Platform and will involve Thromde/town officials, youth groups, and relevant donors, etc.



Source: JICA Project Team

Figure 2.1.1 Workflow Related to Application of SEA and Participatory Planning

2.1.4 Application of the SEA in the Regional Plan

Since the Project represents a spatial development planning involving multiple sectors, the concept and the conditions for the SEA mentioned above should apply to the Regional Plan strictly. There exist contents consisting of identifying environmental problems (scoping) in the Project Area, setting up broad alternatives with assessment criteria and holding MSHs meetings for collecting opinions from different stakeholders. Applicable guidelines should be carefully examined and discussed with the C/Ps, considering the comparison of the JICA guidelines with Bhutanese law, regulation and strategy.

On the other hand, for the RCSP, it would not be necessary to adopt the SEA method strictly for its formulation. The contents, which should be described in the plan, have been narrowed down to a certain

extent.

2.2 Development of SEA Objectives

2.2.1 Collection of baseline information

Baseline information provides the basis for predicting and monitoring environmental effects and helps to identify environmental problems and alternative ways of dealing with them. Both qualitative and quantitative information can be used for this purpose.

A “Natural conditions and socio-economic baseline survey” has been carried out to collect baseline information. Based on this survey, quantitative information necessary to set-up indicators and targets for SEA objectives were collected. Quantitative and qualitative indicator have created for evaluating environmental impact in line with the strategic environmental objectives. This evaluation is described in section 2.3.2 as a scoping work.

2.2.2 Identification of environmental and social problems in the Project Area

(1) Land

- Mountain areas with steep slopes and collapsed faults are vulnerable to landslides and erosion. Climate change and geological conditions might increase the probability of landslides and erosion.
- There will be more demand for land for infrastructure development, agriculture and industrial activities. The land demand issue will be more critical in areas nearby the floodplains of the braided rivers.
- Land fertility will be affected due to land degradation. It is important to note that the Detailed Soil Survey of Bhur Farm, Gelephu under Sarpang classified most of the soils as marginally suitable. Thus, additional agriculture activities may degrade the land.
- Arid exploitation from the braided rivers could impact the river stability, especially the banks. Thus, the banks could experience greater erosional activity.

(2) Water

- There will be increased run-off and solid discharge due to land use change and climate change in the basins of Punatsangchhu, Amochhu and Mangdechhu. Civil infrastructures could be affected by such changes.
- The Project Area would experience river pollution and water quality issues due to the exploitation of natural resources and development of land. It is important to note that the rivers are transboundary and such water quality alteration could lead to transboundary issues and conflicts.
- The Project Area will experience potential water conflicts. The National Integrated Water Resource Management (NIWRM) Plan 2016 already has registered cases of water conflicts in the Amochhu basin.
- The northern part of the Project Area which is mountainous is likely to experience flash floods and potential hyper-concentrated flows or mudflows.
- Arids exploitation from the rivers will affect the equilibrium and could impact the stability of river channel. The problems would be aggravated and it could lead to the development of neck points.

(3) Air

- The area would experience more air pollution due to the development. Deforestation, industrial/construction activities, vehicles, fires etc. will generate dust.
- There would be a potential transboundary air pollution. The region is close to the Indo-Bhutan border.

(4) Biodiversity

- There is a threat to biodiversity and biological corridors. There are three protected areas and two biological corridors. Any alteration on the biological corridors or protected areas could impact all the other protected areas.
- Exploitation of natural resources could lead to environmental degradation.
- As for the habitat, development activities may cause habitat loss and potential habitat fragmentation.
- There is potential of suffering ecological imbalance due to invasive species introduced by human activities.
- The illegal deforestation activities could take place.
- Local flora and fauna have not been properly inventoried yet.

(5) Waste

- There will be increasing waste generation due to urban population growth and industrial activities.
- There will be more waste loads into the rivers due to human waste (sewer) and littering.
- Due to the geographical conditions, it will be difficult to identify waste dumping sites.
- The issue related improper waste management will continue to exist.

(6) Climate Change

- Local climate could change from a temperate climate to a tropical monsoon climate.
- Heavy rains and potential thunderstorms will be more likely to occur.
- More marked seasonality will be observed.
- Potential wildfire and windstorms will be more likely to occur.
- Potential wildfire and windstorms.
- Districts along the southern border are considered to have a high risk of extreme heat events with implications for human health and agriculture.
- Rising temperatures and precipitation could also change transmission patterns for vector borne diseases and other cascading impacts.

(7) Culture and tradition

- There is a threat to the tradition and culture among the younger generations and the urban settlers due to the changing lifestyle.
- There would be destruction and loss of culturally important features and locations.

(8) Health and sanitation

- Prevalence of social issues such as alcohol addiction, mental health issues, substance abuse, teenage pregnancy, domestic violence, ageing population/care for the elderly, etc.
- Degradation of living standards due to extensive rural to urban migration and lack of appropriate infrastructure/sanitation measures in place.

2.2.3 Strategic environmental objectives

The strategic environmental objectives (SEOs) are set out under a range of topics and are used as standards against which the provisions of the Plan and the alternatives are evaluated in order to help identify provisions which are likely to result in significant environmental effects.

In the PrR, preliminary SEOs was set out according to the environmental area. Based on the field survey and discussion with stakeholders related to environment, the preliminary work is elaborated as below Table.

Table 2.2.1 Strategic Environmental Objectives

Environmental Area	Strategic Environmental Objectives
Land	<ul style="list-style-type: none"> • To protect and preserve the natural landscape • To promote effective utilization of the land in order to minimise the deforestation and denudation of vegetation caused by new development for construction projects, settlement and agricultural land, etc. • To maintain and improve the quality of soils
Water	<ul style="list-style-type: none"> • To limit water pollution to levels that do not cause damage to the natural systems and maintain and improve the quality of water resources • To maintain water abstraction, run-off and recharge within carrying capacity, including future capacity • To maintain and restore key ecological processes (hydrology, water quality)
Air	<ul style="list-style-type: none"> • To observe and maintain environmental air quality and noise pollution standards (ambient and emission standards)
Biodiversity	<ul style="list-style-type: none"> • To avoid damage to designated wildlife, habitat, geological sites and protected species, and conservation of protected areas • To maintain biodiversity and forest cover, avoiding irreversible losses • To ensure the sustainable management of key wildlife sites
Waste management	<ul style="list-style-type: none"> • To promote an integrated waste management scheme that considers all the steps from waste generation to waste treatment and disposal, enabling maximum material recovery • To ensure environmentally-sound use and management of hazardous/polluting substances and wastes • To make awareness raising and educational campaigns part of the overall waste management strategy
Climate change	<ul style="list-style-type: none"> • To achieve net zero carbon footprint in line with legislation and regulatory frameworks • To reduce vulnerability to the effects of climate change e.g., flooding etc. • To protect the atmosphere (Global warming) • To ensure minimum use of non-renewable resources • To encourage use of resources within limits of capacity for regeneration
Socio-economic aspects	<ul style="list-style-type: none"> • To mitigate existing trends and urbanization issues due to rural-to-urban migration • To mitigate economic and social disparities between urban and rural areas, in terms of income level, poverty rate and access to social services through well-balanced development and vitalization of rural areas • To promote public participation in decision making process involving sustainable development
Culture and tradition	<ul style="list-style-type: none"> • To preserve cultural and traditional artefacts/features • To value and protect local diversity and local distinctiveness • To protect and enhance the natural/cultural landscape everywhere and particularly in designated areas • To maintain and improve the quality of historic and cultural resources
Health and sanitation	<ul style="list-style-type: none"> • To create conditions to improve health and reduce health inequalities • To improve the quality of life of each individual and promote healthy living

	<ul style="list-style-type: none"> • To improve the basic access to sanitation • To protect and enhance human life • To maintain and improve local environmental quality • To develop environmental awareness, education and training
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Source: JICA Project Team

2.3 Determination of Scope of SEA

2.3.1 Introduction

The main works in the SEA process includes, but not limited to the following:

- 1) Preparatory works and scoping for SEA
 - (a) Establishment of a formation to implement SEA, including SEA Team, SEA Management Team and Task Force,
 - (b) Scoping and development of SEA Terms of Reference (TOR),
 - (c) Stakeholder analysis and participation strategy,
 - (d) Data collection and organization of information on environmental and social considerations.

- 1) Assessment of development plan
 - (a) Assessment of the development alternatives including ‘no action’
 - (b) Environmental assessment for the selected alternatives (the best development plan)

2) Stakeholder participation

Meaningful public participation is at the core of SEA.

3) Reporting and review

In this regard, SEA Guidelines stipulates: ‘Screening’ as the first step of SEA Process. In the case of the Project, however, it is not necessary to follow this step because it has been already determined that the SEA is carried out in the Project.

2.3.2 Scoping method

Identifying environmental problems is an opportunity to define key issues and improve the SEA objectives. The identification of environmental problems shall be based as much as possible on evidence related to baseline information, and on consultations with relevant agencies and stakeholders.

In order for the identification of the environmental problems to fully benefit to the formulation of SEA objectives, the several key strategic questions shown in Table 2.3.1 below shall be answered.

Table 2.3.1 Strategic themes and questions for identification of the environmental problems

Strategic theme	Strategic question
Intensity	How good or bad is the current situation in comparison with other environmental issues and other locations of the target area?
Trend	Do trends show that it is getting better or worse?
Sensibility	Are particularly sensitive or important elements of the receiving environment affected, e.g., vulnerable social groups, non-renewable resources, endangered species, rare habitats?
Reversibility	Are the problems reversible or irreversible, permanent or temporary? How far is the situation to irreversible impact?
Remedy	How difficult would it be to offset or remedy any damage?
Cumulative / indirect effect	Have there been significant cumulative or synergistic effects over time? Are there expected to be such effects in the future?

Indicator	How can the environmental problem be measured? How far is the current situation from any established thresholds or targets?
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Source: JICA Project Team based on European SEA directive

2.3.3 Determination of scope of SEA

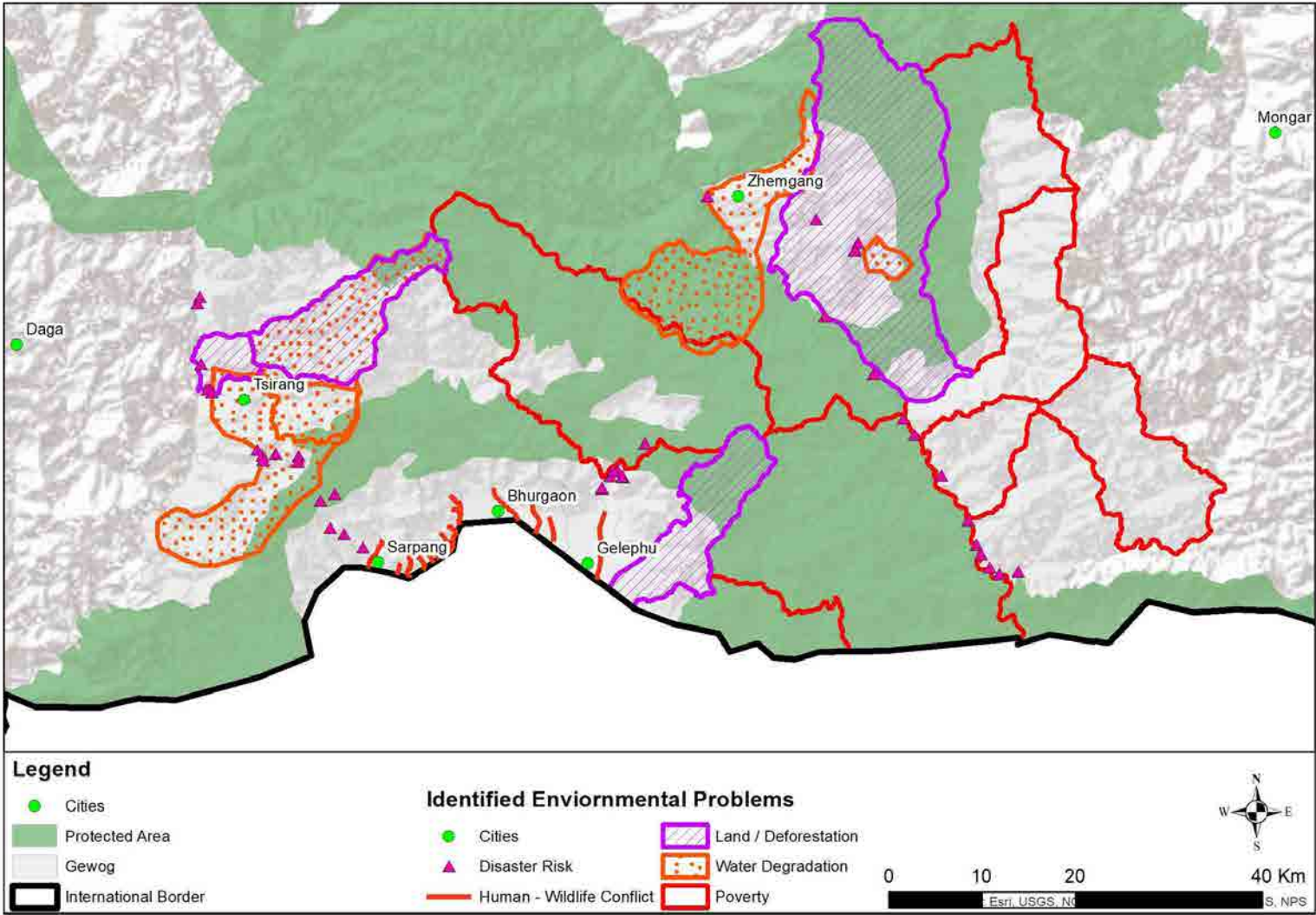
The identified major environmental problems identified are described in Table 2.3.2 and shown geographically on the map in Figure 2.3.1 where only the problems that have a strong geographical presence are displayed. On the map, the problems are grouped in five different categories in order to facilitate the analysis.

Table 2.3.2 SEA Scoping in the Project Area

Category	Environmental issue	Intensity	Trend	Sensibility	Reversibility	Remedy	Cumulative/ Indirect effect	Indicator
1. Land	1-01. Deforestation / Forest cover loss	Relatively in a good state overall	Around urban areas, the deforestation rate is increasing	Forest cover plays an enormous role in the ecosystem services	The situation is reversible up to a point, therefore it needs to be continuously monitored	It is critical to keep the forest cover intact and follow the necessary regulations regarding the forest cover protection and conservation	Deforestation has severe cumulative effects that will affect the ecosystem services, that will destruct the balance of the natural world	Percentage of forest cover loss
	1-02. Human wildlife conflict	Various regions are affected by different kinds of wildlife and the damages caused by wildlife have a major effect on the livelihoods of the people	Phenomenon that has been consistently increasing due to expansion of agriculture and urban settlements	Affecting livelihoods of farmers and people	It's critical to come up with necessary solutions that are effective in terms of cost and efficacy to address the issue and coexist with the nature	With effective collaboration and effective countermeasures	Further destruction of croplands, affecting the livelihood of farmers and people, and expansion of fallow land	Damaged crops by type, area, and by animal type
2. Water	2-01. Water source degradation	One of the most critical aspects for the environment, biodiversity, and human lives and activities to thrive	Due to climate change, forest degradation, deforestation, and other anthropogenic activities, the water sources are drying up	Water scarcity will affect all areas of life including the natural environment and human activities	The situation will be further exacerbated due to climate change and other anthropogenic activities unless water sources and watersheds are assessed and protected	Effective management of watersheds and management systems	Water sources drying will further exacerbate environmental degradation and affect the socio-economy	Watershed conditions

3. Biodiversity	3-01. Human-wildlife conflict	Due to expansion of human activities and habitat degradation, human wildlife conflicts have been increasing and affecting the wellbeing of both wildlife and humans	A phenomenon that has been consistently increasing due to expansion of agriculture and urban settlements	Affecting livelihoods of farmers and overall wellbeing of people and some animals	It's important to address the situation and come up with solutions that are suitable for the existing conditions in order to enable the coexistence of people and wildlife	With effective collaboration and effective countermeasures	Continuous and further destruction of wildlife, wildlife habitat and farmlands	Human-wildlife conflict incidences
	3-02. Deforestation / Forest cover loss	Habitat degradation in deforested areas and areas close to urban settlements	Habitat degradation is getting worse due to forest clearing, climate change and other anthropogenic activities	Due to habitat degradation and loss of continuous forest cover, the animals will be looking for food sources at farmlands and urban areas and create further destruction to humans	The issue will get further exacerbated, unless current situation is address in an inclusive way, taking into consideration both livelihoods of the people and conservation efforts	Actions must be taken towards enrichment of natural habitat, creation and protection of movement corridors for animals	This will further exacerbate the human-wildlife conflict and have high costs of countermeasures and economic losses due to damages to the farmlands and human settlements	Forest cover loss, habitat loss
4. Socio-economic aspect	4-01. Poverty rate	Relatively higher rates of poverty in the project area compared to the national average	Due to lack of employment opportunities in rural areas, the isolation created by natural disasters (roadblocks, access issues)	Affecting the livelihoods of the communities	Much support is needed for reversing the effects	Creation of job opportunities and training of relevant skills	The quality of life compromised, brain drain and outmigration of the younger generation	Percentage of the population that is poor
5. Climate change	5-01. Disaster risk	The situation is getting more intense and more frequent	Becoming worse in terms of magnitude and predictability	Creating roadblocks, access issues, and costs to human lives and capital	Quite difficult to reverse due to the magnitude and gravity of the problem	Effective countermeasures and early warning detection systems	Can have direct and indirect socio-economic effects	Landslides Floods Damaged crops by natural disasters

Source: JICA Project Team

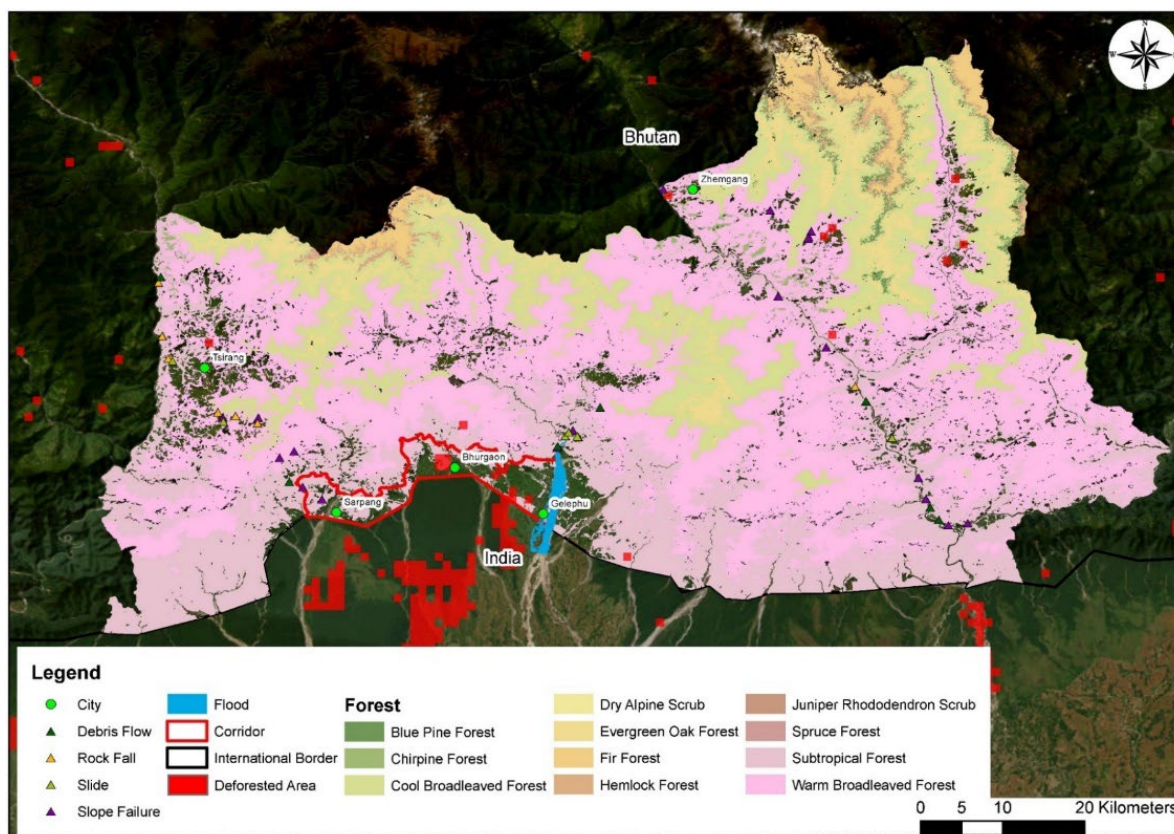


Source: JICA Project Team

Figure 2.3.1 Summary Map of Identified Social and Environmental Problems

1) Deforestation

As for forest cover change in Project Area, forest between 2000-2019² was taken as a reference (Figure 2.3.2). In the area from Jigmeling Industrial Park to Gelephu town, the deforestation rate is not in a critical situation. However, the current map can be taken as a reference of the entire Project Area and used for further monitoring purposes. On the other hand, the situation on the Indian side has accelerated at an alarming rate and bound to affect the biodiversity and the ecosystem in the surrounding areas, which might have some implications especially in the bordering areas of Bhutan, affecting migratory species such as elephants. According to the relative distribution of main land cover classes by each Dzongkhag, the forest cover in Sarpang has increased by 1.59%, in Tsirang 0.1%, while in Zhemgang has increased the most by 6.47%.



Source: JICA Project Team

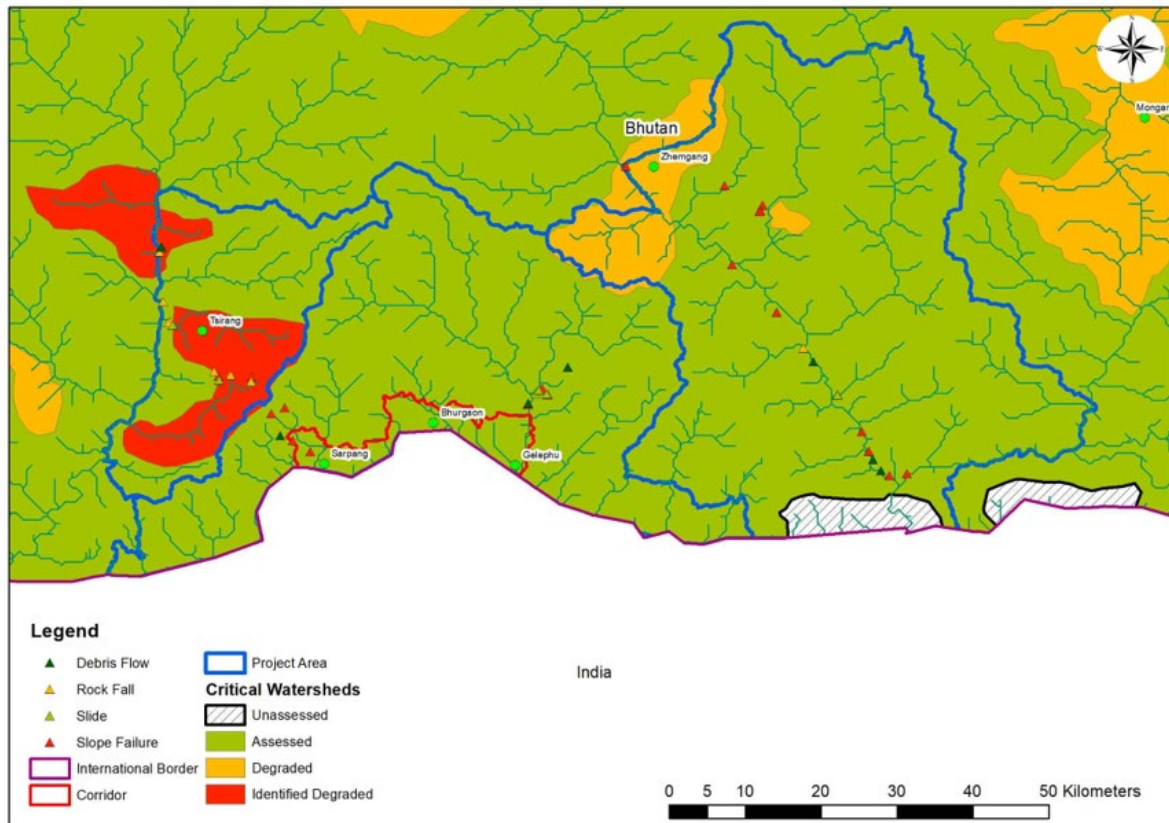
Figure 2.3.2 Deforestation Map

2) Water degradation assessment

According to the recent nationwide water source inventory to investigate the extent of the water sources drying phenomenon, it was revealed that most assessed springs the main problem was more related to mismanagement, same as deforestation. Figure 2.3.3 shows the critical watersheds in the Project Area. Further, in Tsirang, there was a study with more details “Watersource mapping and watershed assessment”, which further analyses the situation. Zhemgang has ranked second after Thimphu-Lingshi in terms of districts with potential water shortage by 2030³. According to the statistics, the water cover has decreased in all three Dzongkhags.

² Hansen et al., 2013. High-Resolution Global Maps of 21st-Century Forest Cover Change

³ NEC, 2016. National Integrated Water Resources Management Plan 2016

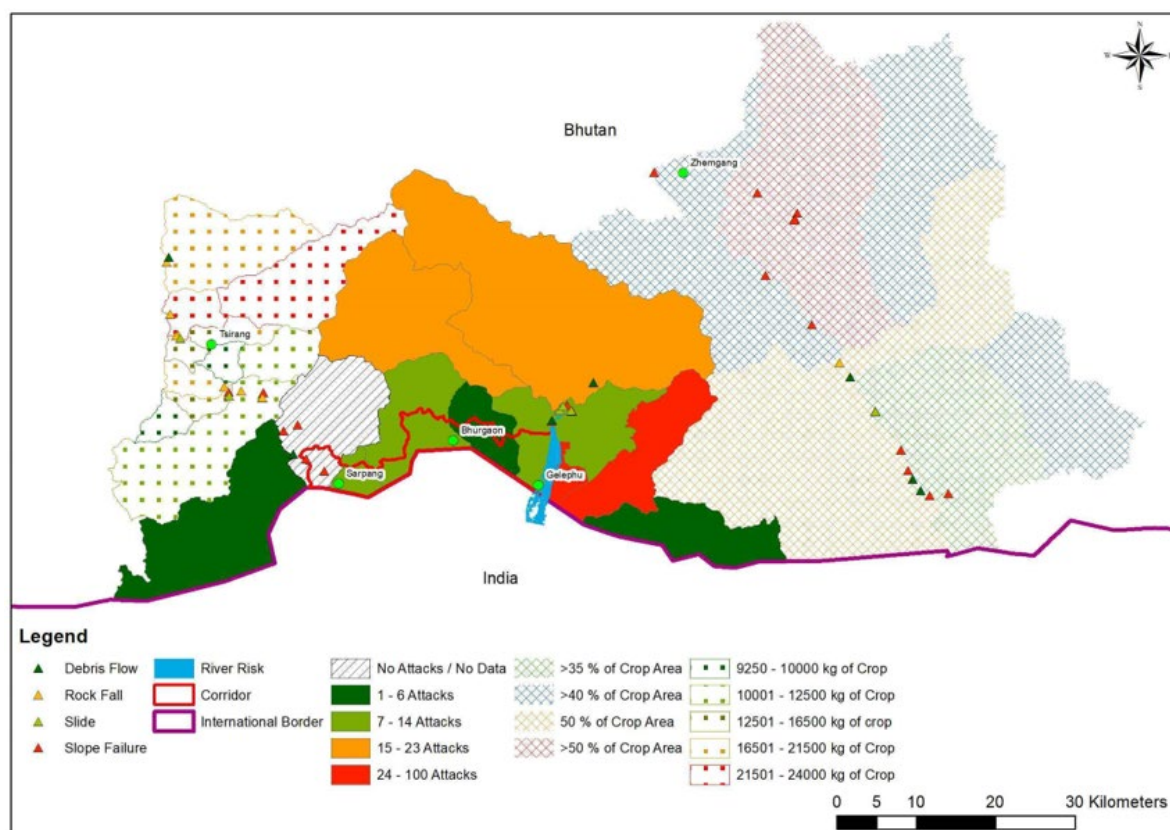


Source: JICA Project Team

Figure 2.3.3 Critical Watersheds Map

3) Human-wildlife conflict (crop damages)

Human-wildlife conflict is rising and becoming one of the most prevalent issues. Currently there are no compensation for the damages, therefore the reporting of the cases is not incentivized. The farmers and affected households report the cases voluntarily and can constitute a smaller portion of the existing condition. Nonetheless, the reporting is an essential part of the process. More effort and collaboration needed for the government and the communities are to keep reliable records in order to solve the recurring cases and find the best solutions. Each Dzongkhag has different record keeping methods. Figure 2.3.4 shows the crop damages in the three Dzongkhags. Human-wildlife conflict is prevalent in all three Dzongkhags in varying degrees and the types of animals do vary. There are a few different kinds of data for human-wildlife conflict from different departments such as agriculture and forestry being the main ones. Agricultural crop damage is one of the indicators of the human-wildlife conflict, and that is more elaborately documented than the other sources. Therefore, it could be taken as a basis.



Source: JICA Project Team

Figure 2.3.4 Map of Human-Wild Conflict

4) Biodiversity

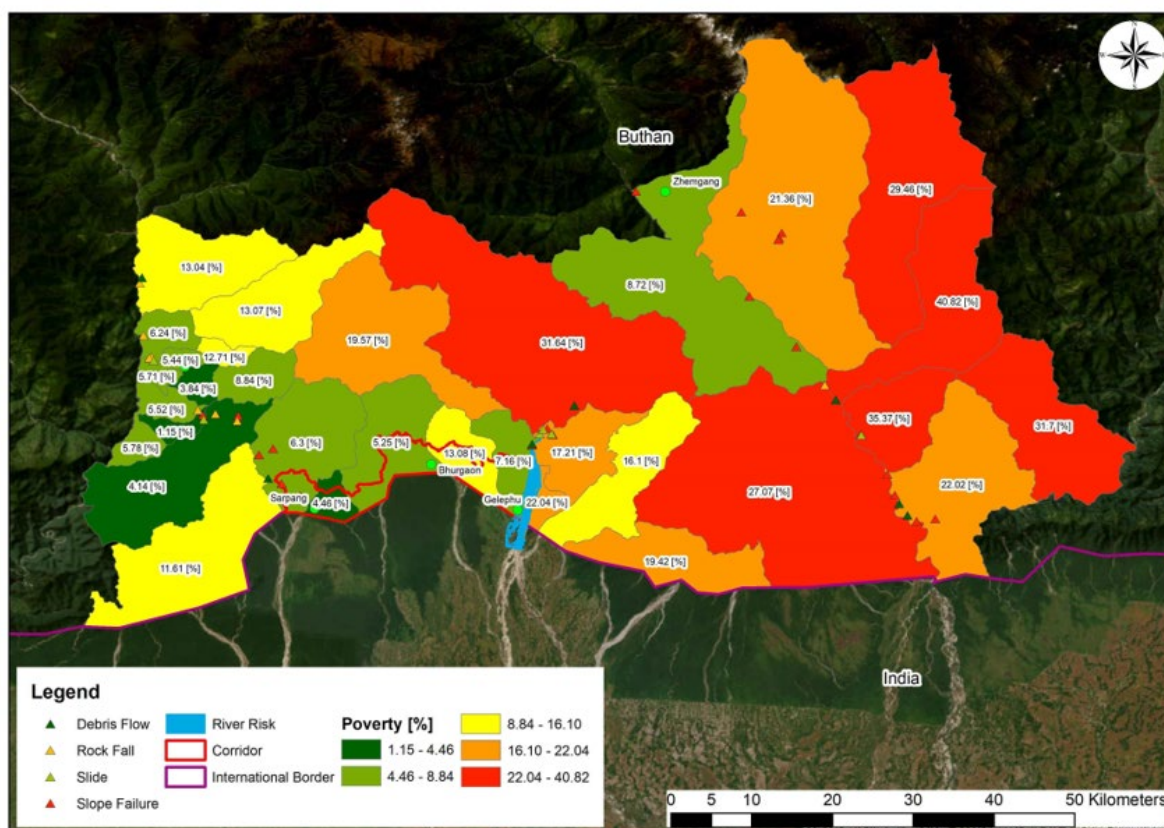
The Southern part of Bhutan has important migratory routes for elephants, which need to be taken into consideration as the elephants are endangered species and are under protection. The rising human elephant conflicts are tied to habitat degradation and loss as well as development activities.

5) Poverty

According to the Small Area Estimation of Poverty study (2019)⁴, the Gewog level poverty data is shown in Figure 2.3.5. The situation in the upper central and lower eastern and eastern parts are among the poorest Gewogs in the country. The prominent geographical disparity needs to be taken into account for policy making to boost economic growth, job creation in poor areas and narrow the income gap⁵.

⁴ NSB, the World Bank, 2019. Small Area Estimation of Poverty in Bhutan Poverty Mapping Report 2017.

⁵ NSB and WB, 2019. Small Area Estimation of Poverty in Bhutan, Poverty Mapping Report 2017



Source: JICA Project Team

Figure 2.3.5 Poverty Rate at Gewog Level

6) Climate Change

Due to climate change, the disaster risk occurrence is more likely to be further intensified in terms of frequency, magnitude and difficult in terms of predictability. Landslides, floods and other natural disasters have severe socio-economic implications. The land cover change is another evidence that supports the climate change.

2.4 Comparative Assessment of Broad Alternatives

2.4.1 Development potential analysis

(1) Project Area

1) Problem structure

Based on existing data, study reports and field survey, problems facing regional development in the Project Area are first enumerated. Neglecting relatively small problems and combining similar problems, comparatively more significant problems are identified and expressed in generic terms. Thus, 47 macro problems are identified as shown in Figure 2.4.1 by sector. The problem structure analysis is a method to clarify these interrelationships in a macroscopic way.

From the Figure 2.4.1, five problem phenomena are identified: 1) High poverty rate in Zhemgang, 2) Population and industry concentration in urban area, 3) Out-migration, especially youth, from rural area, 4) Large urban-rural disparities, and 5) Delay of community development. Macro problems related to these problem phenomena include high unemployment and vulnerable employment, undiversified economic structure, undiversified export goods and lack of employment opportunities in rural areas. Other fundamental problems to be addressed at the community level raised by the local administrations

are related to the improper management system for reliability of water, limited communication channels and capacity to remote communities and non-identified specific high-risk disaster area/sites. Moreover, inadequate road network in rural areas, especially rural roads not passable year-round only for seasonal use, is considered as a hindrance to regional accessibility.

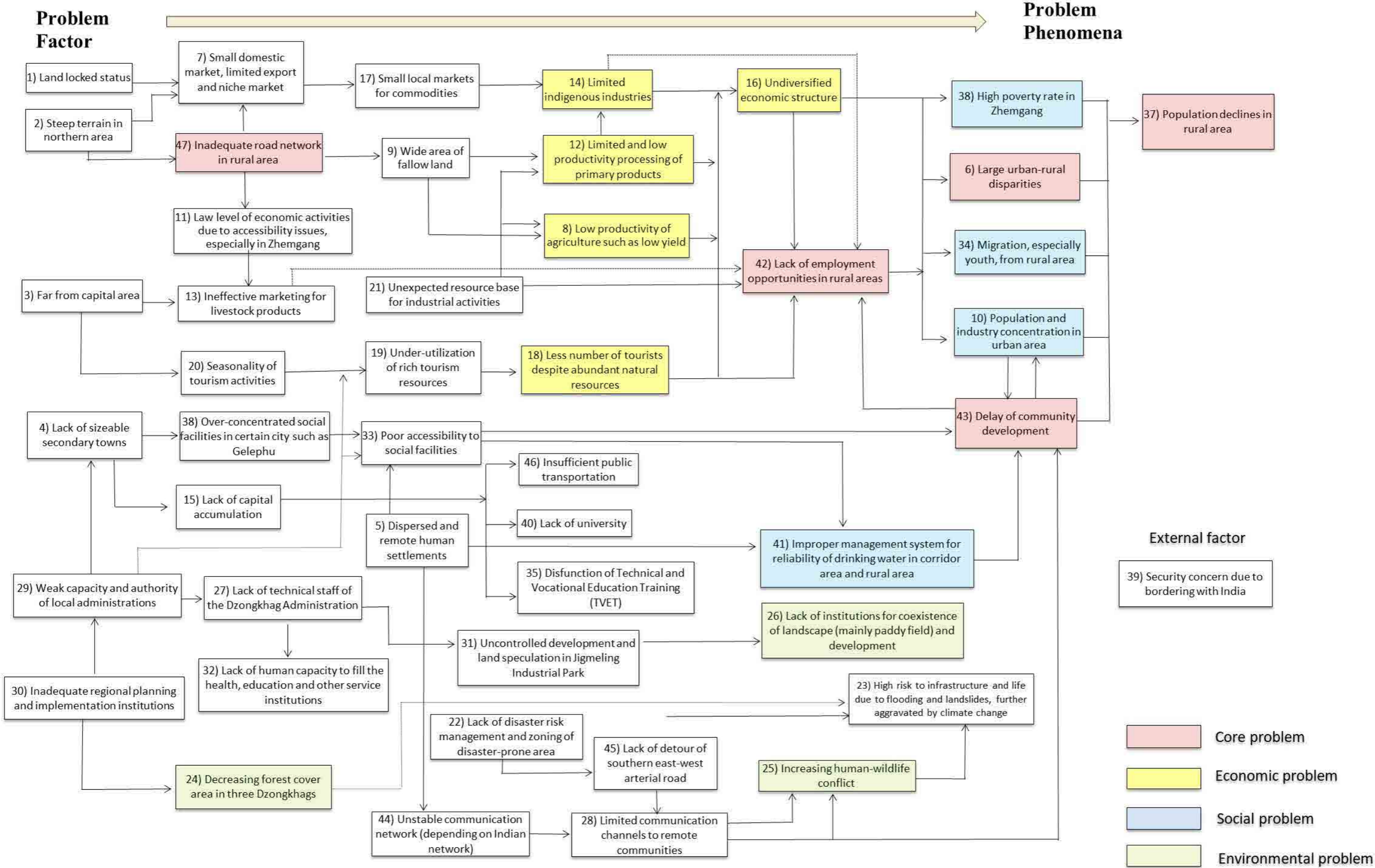


Figure 2.4.1 Macro Problem Structure of Regional Development in the Project Area

2) Development potential

Strength

Zhemgang Dzongkhag is connected with the Trongsa-Gelephu highway passing through it. The Tingtibi-Panbang highway has been a recent development bringing about much-needed accessibility. The Panbang Dungkhag office is also connected with the internal road from Panbang to Nganglam in Samdrup Jongkhar.

Tsirang Dzongkhag is located at a distance of two-hour drive from the southern international border with India. It is also two or three-hour drive from Dagana and Wangdue and Punakha respectively. It is about five-hour drive from Thimphu and Paro. Its proximity to the neighbouring Dzongkhags and international border provides it an edge over others in importing of materials and other commodities from the southern towns of Sarpang and Gelephu but also to access the larger population centres in towns of Thimphu, Paro, Wangdue and Punakha. One of the impacts of these attributes is that Tsirang has increased vegetable production to meet the demand of urban populations of its neighbouring cities and towns.

Sarpang Dzongkhag has road access to India through Assam state. It has a domestic airport established in Gelephu. The Dzongkhag also has a network of farm and feeder roads connecting villages. Recently, the Indian government considered investing in a railway link between Gelephu and Bongaigaon in Assam, India and later through India to Bangladesh. There are also plans to upgrade the domestic airport to an international one which will facilitate entry of large planes with freight. Besides, Bhutan will soon establish the additional international internet gateway from Bangladesh, through India, which will be routed through Gelephu. The transport and communication networks in the Dzongkhag are therefore fairly well provided.

Opportunity

Development models for the Project Area to pursue over the target horizon are examined. To facilitate this step, general methods to define broad development directions, presented in Figure 2.4.2, are elaborated. This method defines alternative directions of development by combining resources and markets.

		Market		Alternative:	A: Localization B: Export promotion C: Import processing D: Export processing
		Local	Export		
Resources	Local	A	B		
	Import	C	D		

Source: JICA Project Team

Figure 2.4.2 Broad Alternatives for Regional Development

Alternative A corresponds to the localization model. It implies the development based on local consumption of local products, but it may be applicable only to limited products such as food and simple processed products. Alternative B may be promising as the RCSP Area grow economically through fully operating the Industrial Park and other processing facilities for primary products in the Project Area. Alternative C is applicable when the local market is significantly large. This is not the case for the Project Area. Alternative D represents typical export processing, which does not automatically ensure promotion of indigenous industries; developing accessibility to neighbouring region and India should be achieved fully. As global value chains are developed, this alternative would become promising.

According to the problem structure presented, as the core problems in the context of regional development, “Population declines in rural areas” and “Lack of employment opportunities in rural areas” due to “Delay of community development” are identified. The promotion of local industry holds a key to tackle these core problems; for this, an accessible market is indispensable. The Project Area has a potential as a production base in the long-term, making the most of the vicinity to the Indian market, as well as domestic connectivity with Trongsa, Phuentsholing, and Thimphu.

(2) RCSP Area

The SWOT analysis on the RCSP Area, consisting of whole corridor area, Gelephu, Sarpang and intermediate belt area, is conducted in section 5.2.1. According to the analysis, although there are the weaknesses that need to be addressed in a realistic manner and the treats that are considered for proactive measures, the RCSP Area has the high potential for significant urban and industrial development while taking advantage of its strengths, such as its expanse of flat land and proximity to India. When the development of the RCSP Area is considered in relation to the overall development of the Project Area, the following issues should be noted.

- The RCSP Area has been a kind of an “isolated area” in the country, given the far from capital area and Phuentsholing in south-western region, and even eastern region;
- There is no large commercial city in Assam state of India, a neighbouring region with Gelephu thereby contributing less to international trade;
- The Zhemgang Town and Panbang Town is not well connected especially for industrial and social related activities. Also, they do not have good access to Gelephu, the centre of the RCSP Area.
- Poor accessibility between major cities in the RCSP Area and towns of three Dzongkhags cause poor economic integration, and
- Besides Jigmeling Industrial Park, the RCSP Area has no strong economic infrastructure to attract domestic/foreign investment.

In addition, according to the problem analysis, it can be said that most of environmental problems are realised among relevant stakeholders as urban issues in Gelephu and the RCSP Area. In general, these problems are related to infrastructure capacity (tangible) such as a waste dumping site, solid waste management facility, etc. and residents’ consciousness (intangible). It is realised that these environmental problems are not currently apparent, but could become apparent in the future. Traffic congestion and lack of parking space in Gelephu are classified as infrastructure problem in the structure.

2.4.2 Definition of development alternatives

(1) Definition of development alternatives

In formulating a development vision (described in section 3.1) in the Project Area, presenting the multiple development alternatives will help to examine the range of possibilities and options available for the target area by showing distinctly different concepts. Of these development alternatives, one specific alternative may be chosen as the optimal alternative for the region, but in most cases the optimal alternative may be defined as an intermediate one or a combination of several alternatives.

As the optimal alternative may have elements of each alternative, the concepts contained in each alternative help to clarify the development vision. Projects and ideas that fit the concepts of each alternative can be combined as appropriate and woven into a development scenario. This allows the analysis of the current situation and the assessment of development potentials and constraints to be linked to development strategies and projects.

(2) Hypothesis of the regional development in the Project Area for setting alternatives

It would be thought that the regional development in the Project Area have not been taken place as expected despite the fact that the RCSP Area has a wide range of flat area, rich and diverse natural resources, and its location being in proximity to Indian border which bestowed it with high potential for international trade.

Evaluating the potentials of the Project Area from a spatial/social/economic development perspective based on the problem analysis, trends of the past and geographic condition, the following points have been hypothetically noted as the core development directions by considering development alternatives in the Project Area.

- Export promotion, defined in the Figure 2.4.2, will be pursuit centred on the RCSP Area which has a sufficient potential of industrial hub;

- Connectivity between the RCSP Area and the towns of three Dzongkhags will be enhanced further to realize the regional integration as well as between neighbouring towns and villages;
- Localization, defined in the Figure 2.4.2, will be realized to develop local socio-economy with community cohesion evolved and multi-stakeholder collaboration enhanced;
- Accessibility to the domestic market, to Thimphu, Phuentsholing, Trongsa, etc., will be improved with a holistic view of the spatial development of the entire Project Area and surrounding area, and
- As the regional core cities, plural cities will be developed along with complementary functions such as potential relationship between Damphu and Mendelgang in Tsirang.

To enable efficient development of the Project Area, the development alternatives should be proposed according to the above hypothesis. In the SEA under this chapter, social and environmental aspects have been considered as well. In addition, it would be appropriate to consider alternatives based on spatial and industrial development perspectives.

2.4.3 Development of broad alternatives

(1) Setting up development alternatives for the Project Area

Considering macro development direction, four alternatives are presented below. These alternatives are suggested based on the review of the CNDP2030, field survey, existing conditions and perspective in the Project Area, respectively. In this case, macro alternatives primarily are defined on the basis of socio-economic possibilities. Especially, main difference between each alternative is how and how much the public investment can be utilised for the regional development. Since public investment can play the most important role as government measures for vitalising the region, allocation of public investment by sector or phase-wise should be defined clearly toward public and even private sector. Table 2.4.1 shows the development direction of each alternative from economic development perspective.

Table 2.4.1 Macro Development Alternatives from Economic Development Perspective

Alternative	Definition
A-1. Concentrated socio-economic activities in RCSP Area with high connectivity	Socio-economic activities such as industry, market, job opportunities, social service, infrastructure, etc. are concentrated in the RCSP Area. Capital accumulation will be promoted by industrial agglomeration and cluster development, then distributed to the whole Project Area. Development of manufacturing and tertiary industries as a basis of economic development, as well as the improvement of agricultural productivity, will be pursued for aiming at establishing industrial cluster on specific products through improved connectivity of products, goods and people.
A-2. Concentrated socio-economic activities in RCSP Area with large-scale infrastructure	Socio-economic activities such as industry, market, job opportunities, social service, infrastructure, etc. are concentrated in the RCSP Area same as A-1. Strong industrial agglomeration will be promoted and, then distributed to the whole area. In this alternative, in addition to existing planned infrastructure (dry port, Jigmeling industrial park, etc.), newly developed large-scale infrastructure (SEZ, agro-industrial parks, IT park) in the RCSP Area and around the area will be achieved, aiming to be one of the largest industrial regions in the country.
B. Well-balanced development in the Project Area	Upgrading of primary industry such as agriculture/livestock which are dispersed in the whole Project Area. Also, the whole Project Area activities would be enhanced and contributed by the RCSP Area (capital accumulation, technology, human resource, etc.). It is expected that disparity between urban and rural area will be rectified. Whereas A-1 and A-2 aims for a much higher rate of economic growth, its growth in B is expected to achieve moderately higher growth than the past trend. Local economic development with community cohesion would be enhanced through this

	alternative direction.
C. Continuing past trend (Zero option)	The past trend would continue to be followed in the future. Many development issues such as rural-urban economic disparities would remain unresolved and there is a risk of continued flat development strategy in the three Dzongkhags as a whole.

Source: JICA Project Team

(2) Development direction in each development alternative

As the interventions in economic activities by the public sector, two types of measures, namely soft components (legal/institutional measures) and hard components (preparation of infrastructure), are taken into account. While both of alternative A-1 and A-2 aim at high economic growth centred on the RCSP Area, the weight of the public investment for A-2 is larger than that of A-1. In addition, in perspectives of industrial characters, Alternative A-1 is categorised as industrial cluster while Alternative A-2 envisages the industrial agglomeration as principal industrial structure. On the other hand, soft components such as deregulation and provision of incentives, financial, technical and other support for enterprises/private sector are common in both alternatives.

Alternative B pursues inclusiveness in the entire Project Area. In this alternative, community development, which is minimum development unit for local people, is the most important development concept. This direction is the same way of maximising social and environmental considerations by the community cohesion.

Whereas alternative A-1 and A-2 aim for high-economic growth centred on RCSP Area through enhancement of physical/spatial condition, B pursue the well-balanced development from the viewpoint of rectifying urban-rural disparity through development of primary industry. In the alternative B, while public intervention on big conversion of the spatial status is limited, interventions in local community directly linked to the productivity of primary industry are promoted.

Table 2.4.2 Comparison of Three Broad Development Alternatives

	Alternative A-1	Alternative A-2	Alternative B
Main economic activities	<ul style="list-style-type: none"> • Primary industry • Agro-processing • Agro-related services 	<ul style="list-style-type: none"> • Manufacturing industry • Agro-processing • Various services 	Primary industry Agro-related services
Main economic driver	Industrial cluster development with domestic value chain	Industrial agglomeration with global value chain	Primary industry with highly inclusive community initiative
Resource	Mainly domestic resource and capital	Domestic/foreign resource and capital	Domestic resource
Main markets	Mainly neighbourhood and domestic markets	<ul style="list-style-type: none"> • Domestic market • Export markets 	Neighbourhood and domestic markets
Development direction	Glocalisation ⁶	Globalisation	Localisation
Regional income and its distribution	Middle income with well distributed	High income with the utilisation of profits gained in the RCSP Area to invest in the other areas	Low but equitably distributed income

Source: JICA Project Team

1) Alternative A-1

Planning concept

Alternative A-1 is oriented towards the high-economic development of the entire region through the concentration of people, goods and services, with the RCSP Area as a base for industrial/manufacturing development. In this alternative, labour productivity would be enhanced rapidly; high-economic growth would be achieved led by enhanced productivity of agriculture/livestock and a little later by

⁶ Glocalisation: Intermediate concept between globalisation and localisation

manufacturing/service industrial development. Also, identifying specific products suitable for industrial cluster is the most important as a first step for the development.

Socio-economy

From the spatial and social viewpoint, high-centralised development will be centred on the RCSP Area, connecting to the economic base such as Thimphu and India. Connectivity between the RCSP Area and major towns as well as among major towns in rural area should be enhanced to ensure that rural areas are not left behind. However, in this alternative, the migration from rural to urban areas including the RCSP Area may not be mitigated. The population of the whole Project Area would be expected to increase more than the past trend. This is because job opportunities would be created mainly in the RCSP Area, especially the Jigmeling Industrial Park, and peripheral RCSP Area.

In this regard, processing/marketing/distribution centres for primary product or secondary product produced in the rural area would be strengthened in the RCSP Area. Capital accumulation will be promoted by mainly industrial cluster development, and distributed to the whole Project Area. Industrial clusters shall be applied to utilise primary products such as agriculture/livestock products in this alternative.

Development intervention

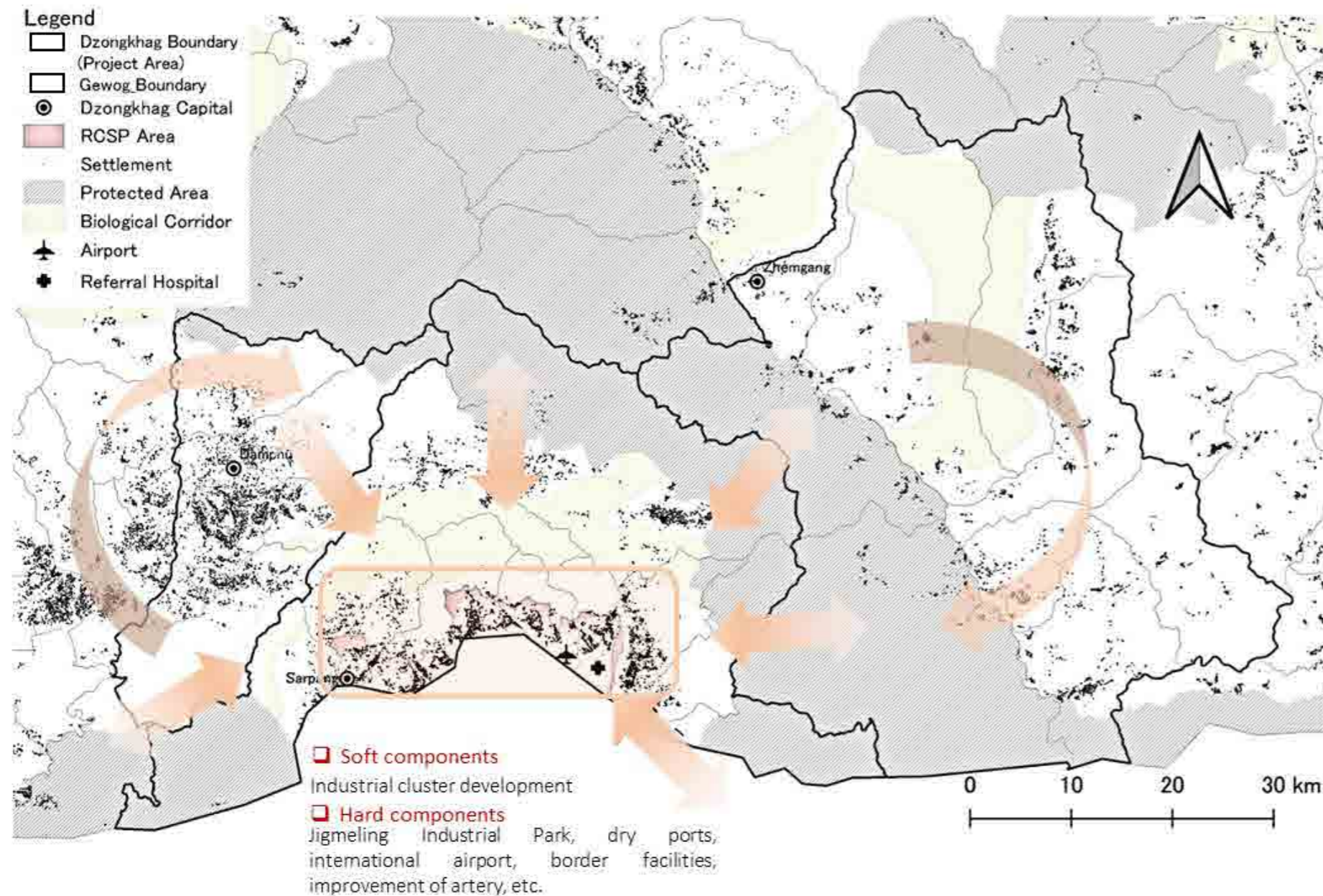
The connectivity between the RCSP area and major cities in rural area is a key for this development direction with improvement in terms of proper management of road condition and constructing new road such as national highway and Dzongkhag road. That's because high quality of transportation enables to mutually interact people, products, etc. to vitalise the regional economy.

Public investment would be mainly towards the RCSP Area, especially the two linked urban centres (Gelephu and Sarpang), new sub-urban centre(s) between the two, and Jigmeling Industrial Park.

alternative A-1 Concentrated Socio-economic activities in RCSP Area with high connectivity

Definition

Socio-economic activities such as industry, market, job opportunities, social service, infrastructure, etc. are concentrated in the RCSP Area. Capital accumulation will be promoted by industrial agglomeration and cluster development, then distributed to the whole area. Development of manufacturing and tertiary industries as a basis of economic development, as well as the improvement of agricultural productivity, will be pursued for aiming at establishing industrial cluster on specific products through improved connectivity of products, goods and people. The connectivity between the RCSP area and other areas is a key for this development direction with improvement in terms of proper management of road condition and remove a bottle neck of artery such as national highway and Dzongkhag roads. That's because high quality of transportation and communications enables to strengthen links for industrial clusters.



Source: JICA Project Team

Figure 2.4.3 Development Image of Alternative A-1

Socio-economic condition

Socio-economic frame

Item	2022-2030	2030-2035	2035-2045
Population growth (Project Area)	2.52%	0.94%	0.66%
Population growth (RCSP Area)	4.97%	0.82%	0.55%
Economic growth	Medium-High	Medium	Medium

Spatial development

Connectivity will be enhanced between major cities and the RCSP Area; urbanisation of the RCSP Area will be promoted.

Economic development

- Domestic investment will be promoted through improvement of connectivity.
- Industrial cluster shall be applied to make the most of specific primary products such as agriculture/livestock products and contribute to employment generation in urban/rural area.
- Processing/marketing/distribution centres for primary product or secondary product produced would be strengthened in the rural bases as well as the RCSP Area. Capital accumulation will be promoted by industrial agglomeration and cluster development and distributed to the whole area.

Employment generation by large public intervention

Newly employment opportunity would be created as a result of policy intervention such as industrial cluster and existing planned facilities.

Environmental condition

- Concerns on environmental deterioration due to lack of management in rural areas
- Necessary to establish an environmental management system
- Risks of aggravation of urban environment due to continued over-concentration

2) Alternative A-2

Planning concept

Alternative A-2 is also oriented towards the high-economic development of the entire Project Area through the concentration of people, goods and services, with the RCSP Area as a base for industrial/manufacturing development. In this alternative, labour productivity would be enhanced rapidly; high-economic growth would be achieved led by manufacturing/service industrial development. In this alternative, it can be said that large investment in large-scale infrastructure with rapid/immediate public investment is a key for accumulating industrial activities even from outside or neighbouring region.

It is important that expected large-scale infrastructure should be planned to develop mutually other existing infrastructure: existing highway, industrial park, hydro power plant, social facilities, etc. It is essential to achieve the highest economic growth among all alternative in harmony with the environmental consideration through the development of quality infrastructure to support growth, not to contribute to environmental deterioration due to the mega infrastructure.

Socio-economy

From the spatial and social viewpoint, high-centralised development will be centred on the RCSP Area, connecting to the economic base such as Thimphu and India. In this alternative, the migration from rural to urban areas including the RCSP Area may not be mitigated. The population of the whole Project Area would be expected to increase more than the past trend, and compared to A-1, the population accumulation in the RCSP would be more accelerated. This is because job opportunities would be created mainly in the RCSP Area, especially the Jigmeling Industrial Park, and peripheral RCSP Areas. In addition, other quality infrastructure development would be able to attract investors and people along with high economic development.

Development intervention

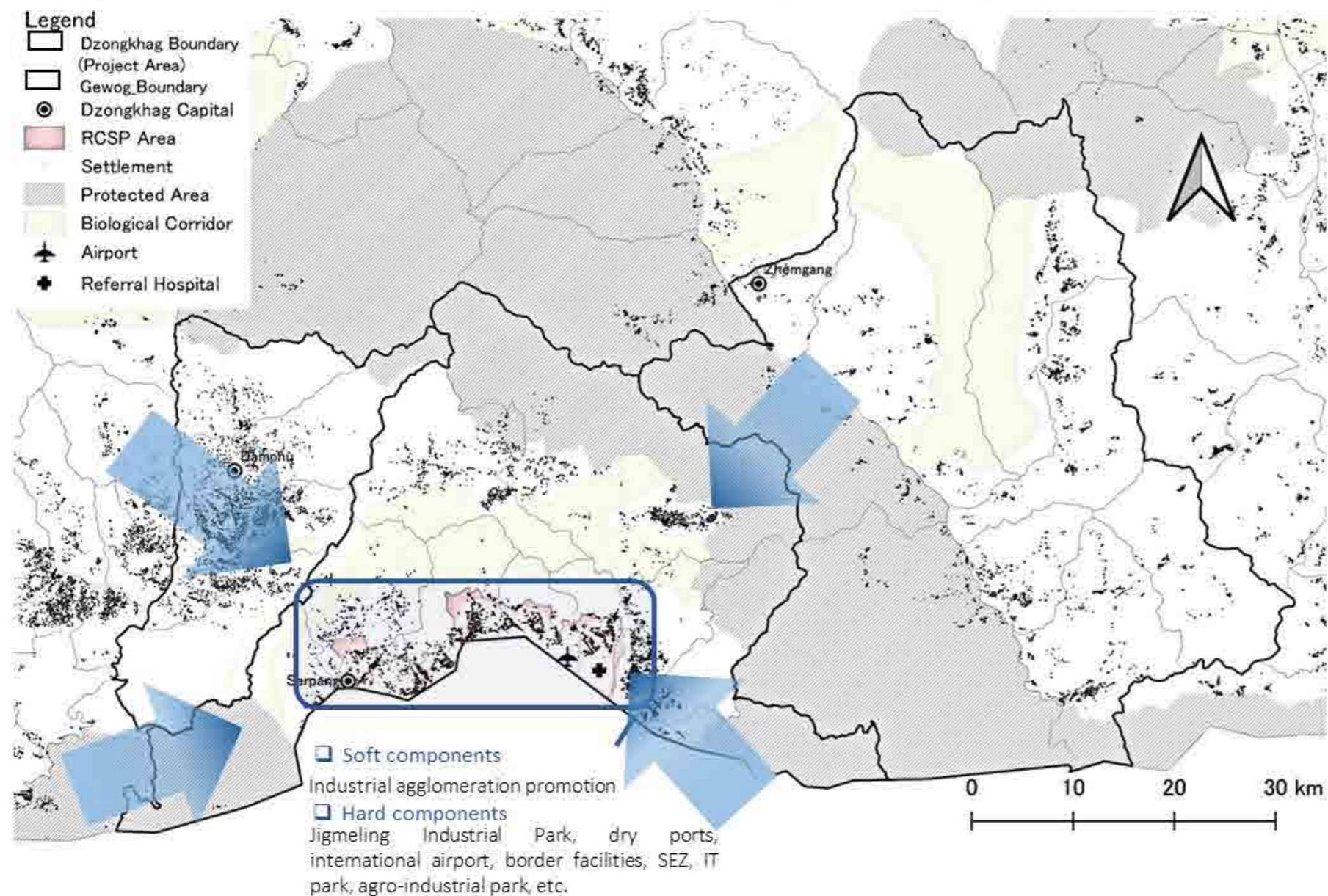
Public investment would be enormous due to infrastructure development, mainly in the RCSP Area, namely the two linked urban centres (Gelephu and Sarpang), new sub-urban centre(s) between the two, and Jigmeling Industrial Park. In this regard, functions of manufacturing, processing, marketing and distribution would be strengthened in the RCSP Area. Capital accumulation will be promoted through industrial agglomeration and distributed to the whole Project Area.

With the high-proficiency of the RCSP Area, which would be more enhanced in this alternative, it would promote private investment from neighbouring countries or regions. That is, it would accelerate a globalisation of the entire Project Area. Also, high growth of the economy would be achieved under the centralised initiative which is called top-down approach centred on public investment.

alternative A-2 Concentrated Socio-economic activities in RCSP Area with large-scale infrastructure

Definition

Socio-economic activities such as industry, market, job opportunities, social service, infrastructure, etc. are concentrated in the RCSP Area same as A-1. Public investment would be enormous due to infrastructure development, mainly in the RCSP Area, namely the two linked urban centres (Gelephu and Sarpang), new sub-urban centre(s) between the two, and Jigmeling Industrial Park. In this regard, functions of manufacturing, processing, marketing and distribution would be strengthened in the RCSP Area. It would accelerate a globalisation of the Project Area centred on the RCSP Area. Also, high growth of the economy would be achieved under the centralised initiative which is called top-down approach centred on large public investment.



Socio-economic condition

Socio-economic frame

Item	2022-2030	2030-2035	2035-2045
Population growth (Project Area)	2.55%	2.67%	1.78%
Population growth (RCSP Area)	5.05%	4.78%	2.89%
Economic growth	Medium-High	High	High

Spatial development

High-concentrated development will be centred on the RCSP Area, connecting to the economic bases such as Thimphu and India. establishment of new SEZs, agro-industrial parks, IT parks, railway, etc. will be planned to accelerate economic development.

Economic development

- Foreign and domestic investment will be promoted through large-scale infrastructure development in the RCSP Area.
- Intensive economic activities in the RCSP Area will be distributed to the entire Project Area.
- In this alternative, it is necessary to support manufacturing and heavy industries for products development with technology and market development.

Employment generation by large public intervention

Newly employment opportunity would be created as a result of policy intervention by large-scale infrastructure such as SEZ, agro-industrial park, IT-park, etc.

Environmental condition

- Necessary to establish an environmental management system
- Risks of aggravation of urban environment due to continued over-concentration
- Necessary to manage the environmental effect by large-scale infrastructure

Source: JICA Project Team

Figure 2.4.4 Development Image of Alternative A-2

3) Alternative B

Planning concept

Alternative B emphasises the rural development strategy, focusing on indigenous industry and people. In this alternative, the agriculture/livestock industry would be enhanced as the regional core industry. In addition to agriculture and agro-related industries, various service activities play an important role in creating job opportunities in rural areas and in economic growth based on the rural economy. In rural areas, infrastructure investment would be distributed to a wide-range in the Project Area.

Socio-economy

In general, investments in agricultural infrastructure may not contribute significantly to economic growth. The migration from rural to urban areas may be mitigated within the Project Area. However, the effect of reversing the rural-urban population migration trend may not be expected, and, as for Zhemgang having experienced significant population decline over the past decade, it would only contribute to alleviating the declining population trend.

Community cohesion between neighbouring communities will be strategically enhanced. The strengthening of the community cohesion will be supported by the expansion of social services and measures to support primary industries.

Development intervention

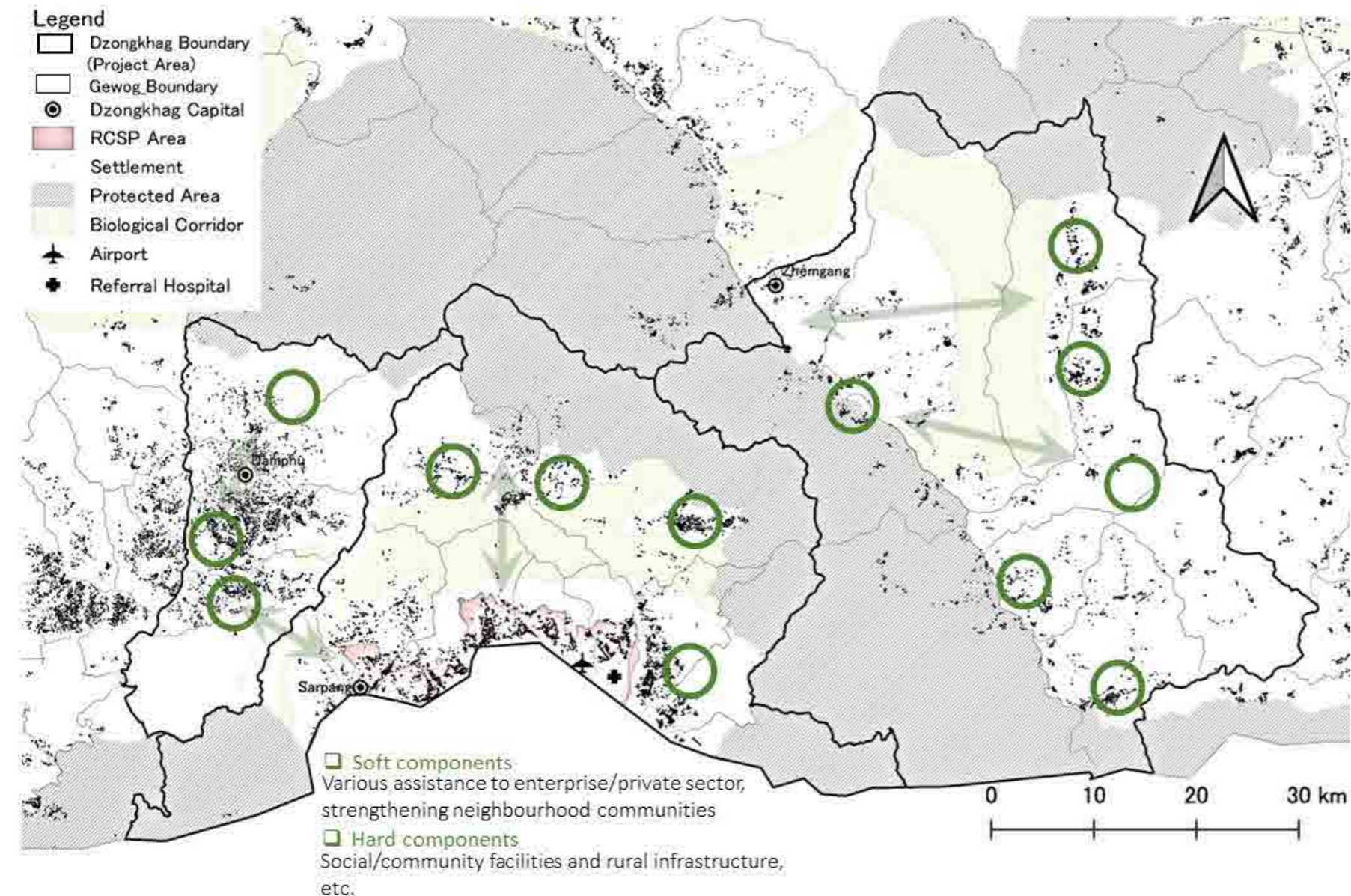
Public investment would be distributed to the entire Project Area including rural areas in a well-balanced manner. In this sense, small towns or villages in rural areas, which can be a base for the development of primary industry should be well developed with supportive infrastructure such as storage, intermediate processing plant, irrigation, farm road, etc. The primacy of the RCSP Area would be much smaller than Alternative A-1 and A-2.

Alternative B would be a community-based and bottom-up development approach based on local resources. This direction is consistent with localisation. Also, inclusiveness is equal to or at least better than Alternative A-1 and A-2; public investment would be smaller than other alternatives.

alternative B Well-balanced development in Project Area

Definition

Public investment would be distributed to the entire Project Area including rural areas in a well-balanced manner. In this sense, small towns or villages in rural areas, which can be a base for the development of primary industry should be well developed with supportive infrastructure such as social/community facilities and rural infrastructure, irrigation, farm road, etc. The primacy of the RCSP Area would be much smaller than Alternative A-1 and A-2. It would be said that alternative B can be a community-based and bottom-up development approach based on local resources. This direction is consistent with localisation. Also, inclusiveness is equal to or at least better than Alternative A-1 and A-2; public investment would be smaller than other alternatives.



Socio-economic condition

Socio-economic frame

Item	2022-2030	2030-2035	2035-2045
Population growth (Project Area)	2.40%	0.83%	0.54%
Population growth (RCSP Area)	4.97%	0.82%	0.55%
Economic growth	Medium	Low	Low

Spatial development

- Well-balanced development in rural/urban area with several rural base town
- Holistic development even in rural areas
- Vitalisation of scattered communities
- Aiming at holistic social service provision in entire Project Area

Economic development

- Primary industry will be well developed with high productivity.
- Rural areas will be developed as a producing base.
- Local resources will be utilised fully based on localisation.
- Proficiency of RCSP area is limited compared to A-1/A-2.
- Community cohesion would be enhanced through this alternative direction.

Employment generation by community development

- Existing planned infrastructure such as Jigmeling industrial park, etc. generate same job opportunities as A-1/A-2
- Possibility of reducing urban-rural disparities due to employment generation effort in rural areas
- Employment opportunities are distributed in the Project Area.

Environmental condition

- Concerns on environmental deterioration due to lack of management in rural areas
- Necessary to establish an environmental management system
- Risks of aggravation of urban environment due to continued over-concentration.
- Possibility to enhance environmental management by community intervention

Source: JICA Project Team

Figure 2.4.5 Development Image of Alternative B

4) Alternative C

As for Alternative C, it is the so called “Zero option”, which continues the past trend. It is assumed that there is no movement for establishment of Sarpang-Gelephu Regional Centre. As for the population trend in the Project Area, it would be continued in line with the past trend.

Looking at Bhutan as a whole, the trend of population movement from east to west would continue, and population decline in Zhemgang Dzongkhag would continue, while population growth in the whole Project Area would continue. Also, in disadvantaged rural areas where promising industries and job opportunities are limited, regardless of Dzongkhag, the deterioration of the areas and the outward migration of young people may be accelerated.

In the RCSP Area, the superiority of Gelephu Thromde would continue to remain, where the development of secondary and tertiary industry is significant within the RCSP Area.

(3) Socio-economic analysis of each alternative

The range of possibilities for socio-economic development is examined qualitatively as Table below.

Table 2.4.3 Socio-Economic Condition of Each Alternatives

Item		Alternative: A-1	Alternative: A-2	Alternative: B	Alternative: C
Popul ation	Project Area (Growth rate)	Higher growth rate more than past trend	Higher growth rate more than past trend	Slightly higher growth rate more than past trend	Same as past trend
	RCSP Area (Growth rate)	Higher growth rate more than past trend	Much higher growth rate more than past trend	Slightly higher growth rate more than past trend	Same as past trend
Employment generation		Medium-Large	Large especially in the RCSP Area	Low-Medium	Same as past trend
Economic growth		Medium-High	High	Medium	Same as past trend
Public investment		Medium-Large	Large	Medium	Same as past trend

Source: JICA Project Team

Population projections by macro-development alternatives are conducted up to 2045 based on the natural trend based on the latest demographic indicators and development condition of each.

Table 2.4.4 Development Conditions by Alternatives

Alternative	Sarpang Dzongkhag				Tsirang Dzongkhag	Zhemgang Dzongkhag
	Sarpang	Inter-area	Gelephu	Others		
Alternative: A-1	Full	Full	Full	++	++	++
Alternative: A-2	JIP	JIP	JIP	++	++	++
Alternative: B	JIP	JIP	JIP	+	+	+
Alternative: C	JIP	JIP	JIP	n	n	n

Source: JICA Project Team

Full: to assume full scale development. JIP: to assume only development of Jigmeling Industrial Park

'++: increase of 0.4 percent point over natural trend, +: increase of 0.2 percent point

'n: Natural trend based on the latest demographic indicators

Table 2.4.5 Population Projections by Alternatives

Alternative	Area	2022	2030	2035	2045
Alternative: A-1	Project Area	90,300	110,100	115,400	123,200
	RCSP Area	31,200	45,900	47,800	50,600
Alternative: A-2	Project Area	90,300	110,400	125,900	150,300
	RCSP Area	31,200	46,200	58,300	77,600
Alternative: B	Project Area	90,300	109,100	113,700	120,000
	RCSP Area	31,200	45,900	47,800	50,600
Alternative: C	Project Area	90,100	107,900	111,500	116,300
	RCSP Area	31,200	45,900	47,800	50,600

Source: JICA Project Team

Table 2.4.6 Population Projections (Growth Rate) by Alternatives

Alternative	Area	2022 - 2030	2030 - 2035	2035 - 2045
Alternative: A-1	Project Area	2.52	0.94	0.66
	RCSP Area	4.97	0.82	0.55
Alternative: A-2	Project Area	2.55	2.67	1.78
	RCSP Area	5.05	4.78	2.89
Alternative: B	Project Area	2.40	0.83	0.54
	RCSP Area	4.97	0.82	0.55
Alternative: C	Project Area	2.29	0.66	0.43
	RCSP Area	4.97	0.82	0.55

Source: JICA Project Team

(4) Industrial development condition of each alternative

The direction of industrial development is examined in each alternative. Based on the physical/spatial development direction and socio-economic condition of each alternative, promising industries to be pursued are listed in Table 2.4.7.

Table 2.4.7 Promising Industries and Products of Each Alternative

Term/Type	A-1	A-2	B	C
Near future/Short-term basis	<ul style="list-style-type: none"> • Agro-processing / food industries • Mineral-based industries • Forest-based industries 	<ul style="list-style-type: none"> • Agro-processing / food industries • Mineral-based industries • Forest-based industries 	<ul style="list-style-type: none"> • To focus on the primary industry such as agriculture and livestock • Agro-processing 	<ul style="list-style-type: none"> • To focus on the primary industry such as agriculture and livestock
Medium-long term basis	<ul style="list-style-type: none"> • Agro-processing / food industries • Mineral-based industries • Forest-based industries 	<ul style="list-style-type: none"> • (Mainly based on Economic Development Policy, Bhutan, 2016 *1) • Electronics • Electric vehicles and transport • Electrical transformers & equipment • Computer hardware • Building materials • Pharmaceuticals • Traditional and herbal medicines • Industries by communication technologies including 	<ul style="list-style-type: none"> • To focus on the primary industry such as agriculture and livestock • Agro-processing 	<ul style="list-style-type: none"> • To focus on the primary industry such as agriculture and livestock

		the Internet of Things (IoT) *2		
Hard components (infrastructure preparation)	<ul style="list-style-type: none"> • Jigmeling Industrial Park, • dry ports, international airport, border facilities, etc. 	<ul style="list-style-type: none"> • Jigmeling Industrial Park, • dry ports, agro-industrial parks, SEZs, international airport, border facilities, etc. especially in the Corridor Area 	<ul style="list-style-type: none"> • Agricultural infrastructure • Community facility such as health, education, security, etc. 	<ul style="list-style-type: none"> • Agricultural infrastructure
Soft components (legal / institutional framework, various assistance to enterprises)	<ul style="list-style-type: none"> • Various assistance to enterprises / private sector • Promotion of industrial cluster 	<ul style="list-style-type: none"> • Rules on the Fiscal Incentives for IPs & SEZ • Establishment of a specific entity for FDI promotion • Various assistance to enterprises / private sector • Promotion of industrial cluster 	<ul style="list-style-type: none"> • Various assistance to enterprises / private sector 	<ul style="list-style-type: none"> • -
Policy measures/approaches	<ul style="list-style-type: none"> • Industrial cluster, IPs 	<ul style="list-style-type: none"> • Industrial cluster, IPs, SEZs 	<ul style="list-style-type: none"> • - 	<ul style="list-style-type: none"> • -
Public investment	Medium-Large	Large	Medium	Low

*1: In the Economic Development Policy, Bhutan, 2016, the following sectors shall be treated as priority growth areas. Among these, the Five Jewels, namely, hydropower, cottage and small industries, mining, tourism, and agriculture, constitute the core growth areas in terms of their potential and impact to the society at large.

A: Five Jewels:

- 1 Hydropower
- 2 Cottage and Small Industries
- 3 Mining
- 4 Tourism
- 5 Agriculture (Organic farming, Agro-processing, Biotechnology, etc.)

B: Other sectors

- 6 High Quality Green Services (Education, Health services and traditional medicines, ICT, R&D, etc.)
- 7 Energy (Solar and wind energy, other sources of renewable energy)
- 8 Information, Media and Cultural Industry (Film and Creative Arts, Handicrafts, Textiles, etc.)
- 9 Transportation and Related Services
- 10 Construction
- 11 Manufacturing (Electronics, Electric vehicles & transport, Electrical transformers & equipment, Computer hardware, etc.)

*2: Industry 4.0 signifies the use of smart autonomous machines, fuelled by data with the ability to act independently on the data it has received, interconnected by communication technologies including the Internet of Things (IoT), and Internet of Services (IoS). I4.0 enables all entities involved within the value stream to communicate with each other and utilize data from the entire process flow without respect to borders among suppliers, manufacturers, customers, countries, etc.

2.4.4 Development potential of each alternative

(1) Alternative A-1 and A-2

Each alternative is proposed based on the spatial and industrial development direction of the region. Alternative A-1 and A-2 aim for the RCSP Area to drive the socio-economy of the region, while Alternative B is oriented toward balanced development throughout the region. Alternative A-1 and A-2 are elaborated based on the premise that the RCSP Area has already been outstanding to attract people, goods, and money to the Area.

1) FDI and economic development policies

As per the Foreign Direct Investment Policy 2019, the RGoB has been encouraging foreign direct

investment through tax incentives and business environment improvements, etc. The prioritised activities listed in the policy is as follows. 1) Agro-based production, 2) Forest-based production, 3) Solar and wind energy, 4) Water based production, 5) Pharmaceutical production, and 6) Other manufacturing industries (electronics, electricals, computer hardware and building materials).

According to the priority sectors in the Economic Development Policy 2016, the following sectors have been selected for the whole Bhutan, based on a SWOT analysis. A: Five Jewels (hydropower, CSIs, mining, tourism, and agriculture) and B: Manufacturing industries (electronics, electric vehicles and transport, electrical transformers, equipment, computer hardware, building materials, power intensive industries, pharmaceuticals, traditional and herbal medicines, mineral processing, wood-based industries, etc.).

Also, Investment Opportunity Study 2020 conducted by the former Ministry of Economic Affairs on the macro development potential of Bhutan calls for maximum utilisation of agro-based resources, livestock-based resources, forestry-based resources, and minerals-based resources.

Although there is no designation of areas where investments are to be preferentially introduced, the industrial development of the Project Area centred on the RCSP Area is consistent with above products and sectors in a large part.

2) Jigmeling Industrial Park

At present, the gross development area of the Jigmeling Industrial Park is 645 acre (261 ha) and the net industrial area is 427 acre (173 ha). Locations were classified accordingly by the development master plan assuming mineral-based, agro-processing based, forest-based, and other types of occupied companies. In fact, certain portion of the location applications were from ferro-silicon and ferro-alloy (steelmaking-related) companies, which are classified as mineral-based. As of the end of 2022, the Jigmeling Industrial Park had received applications from 70 to 80 companies, including joint venture with foreign capital and several companies had already started operations.

3) Border trading

Whole country

Table 2.4.8 displays the ranking and value of export products from Bhutan to India in 2021. The primary products include ferro-silicon and cement products, which are shipped from the Pasakha Industrial Estate near Phuentsholing. Table 2.4.9 illustrates the trade of steel and iron products between India and Bhutan. According to this table, there has been an increase in the demand for ferro-silicon in India in recent years, with a significant portion sourced from Bhutan⁷.

Table 2.4.8 Main Export Products from Bhutan to India in 2021

Sl. No.	Bhutan Trade Classification (BTC) Code	Commodity Description	Value in Million Nu.	Value in Million USD*
1	7202.21.00	Ferro-silicon	14,272.64	174.18
2	7202.30.00	Ferro-silico-manganese	2,136.20	26.0698
3	2523.29.30	Portland pozzolana cement	1,497.81	18.279
4	2518.10.20	Dolomite chips	1,390.76	16.9726
5	0908.31.00	Cardamoms (Neither crushed nor ground)	1,032.69	12.6027
6	2523.29.10	Ordinary portland cement	719.78	8.78405
7	2518.10.30	Dolomite lumps and slabs	717.98	8.76208

⁷ According to the Indian Ferroalloys Producers' Association (IFAPA), India's ferro-alloy (including ferro-silicon) industry has an installed capacity of 5.1 million tons per year. India is one of the major producers and consumers of ferrosilicon in the world. Ferro-silicon is an alloy of iron and silicon, primarily used as a deoxidizer and an alloying element in the steel industry. It helps in improving the strength and quality of steel. The demand for ferro-silicon in India is mainly driven by the growth of the steel sector, which is a key contributor to the country's industrial development. The construction, infrastructure, and automotive industries are major consumers of steel.

8	0701.90.00	Potatoes	500.70	6.11044
9	2849.20.00	Silicon Carbide	309.26	3.77415
10	2520.10.00	Gypsum anhydrite	291.80	3.56107
Other commodities			3,539.23	43.1921
Total Export			26,408.85	322.288

Source: Department of Trade, Ministry of Industry, Commerce and Employment

* Bhutanese Ngultrum to US Dollar is 0.0122USD@1 BTN as 19 June 2023

Table 2.4.9 Trade between India and Bhutan; Product: 72 Iron and steel

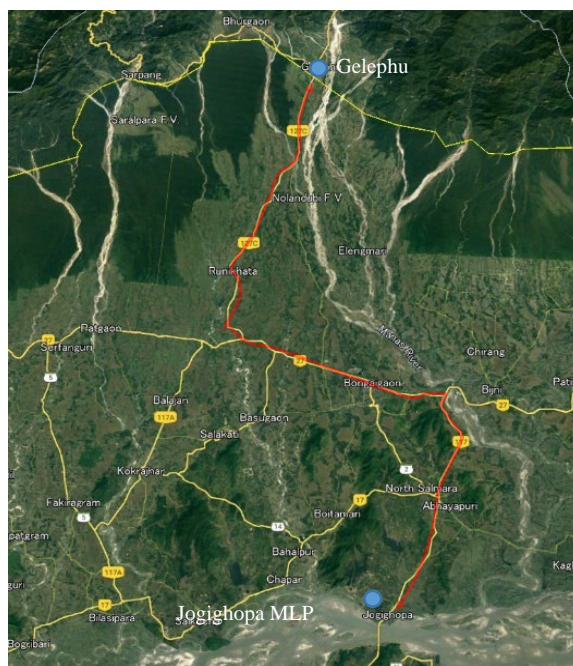
Unit: US Dollar thousand

Product label	India's imports from Bhutan				India's imports from world			
	2018	2019	2020	2021	2018	2019	2020	2021
Ferro-silicon, containing by weight > 55% of silicon	128,144	127,844	95,624	189,072	249,872	216,754	181,568	282,970
Ferro-silico-manganese	0	0	640	27,377	2,839	5,710	3,994	31,041
Ferro-silicon, containing by weight <= 55% silicon	2,422	1,228	2,360	6,013	44,255	28,358	25,771	40,570
Ferro-alloys (excluding ferro-manganese, ferro-silicon, etc.)	1,574	2,439	2,713	4,599	36,150	21,970	20,184	50,490
Semi-finished products of iron or non-alloy steel	21,117	23,433	25,841	2,432	24,415	30,499	39,194	16,793
Bars and rods, of iron or non-alloy steel, with indentations, ribs, groves, etc.	13	336	925	401	95,200	123,901	47,859	28,830
Non-alloy pig iron in pigs, blocks, or other primary forms	0	0	53	197	5,395	4,611	3,397	5,009

Source: Trade Map, International Trade Center

Trade between India and Bhutan has more than doubled from 484 million US dollars in 2014-15 to 1083 million USD in 2020-21. India - Bhutan border crossing at Gelephu will be one of the most important trading hubs.

Currently, the Jogighopa multi-modal logistic park (MLP), which has access functions to road, rail, shipping, and air routes, is under construction at a point about 95 km away from Gelephu in Assam. Thereby, truckloads of Bhutanese export consignments to Bangladesh and the rest of India are expected to be routed through Jogighopa port.



Source: Google Earth

Figure 2.4.6 Route from Gelephu to Jogighopa MLP

Trade at mini dry ports and check points (Monetary term: BTN)

The value of commodity exports and imports from Bhutan in 2022 is BTN 118,792 million and BTN 34,396 million, respectively, as Table 2.4.10 shows. India is the predominant destination for exports and imports, accounting for 78% and 72%, respectively.

Table 2.4.10 simultaneously shows the value of exports and imports by region (by Check point: CP and Mini dry port: MDP). As the table shows, Pasakha MDP in Phuentsholing Region has the largest export value, accounting for 52% of the national total. Samdrup Jongkhar Region and Samtse Region followed with 17.3% and 16.5%, respectively, while Gelephu CP accounted for 5.4%.

Meanwhile, Phuentsholing MDP in the Phuentsholing Region is the largest imports point, accounting for 61%, followed by Pasakha MDP with 14.0%, Samdrup Jongkhar Region with 8.1%, and Gelephu CP with 6.3%.

Table 2.4.10 Exports and Imports at Region/MDP/CP in 2022

Unit: BTN million

Region / Mini Dry port (MDP) / Check post (CP)	Exports				Imports			
	India	Other Countries	Total	Share (%) of total	India	Other Countries	Total	Share (%) of total
Gelephu Region / Gelephu CP	1,082	776	1,858	5.4	7,502	0	7,502	6.3
Paro Region	0	120	120	0.4	204	6,415	6,619	5.6
Phuentsholing Region	16,748	3,905	20,653	60.0	64,246	25,101	89,347	75.2
<i>Lhamoi Zingkha CP</i>	1	0	1	0.0	7	0	7	0.0
Pasakha MDP	15,891	1,977	17,868	51.9	16,619	0	16,619	14.0
Phuentsholing MDP	856	1,928	2,784	8.1	47,620	25,101	72,721	61.2
Samdrup Jongkhar Region	4,950	1,010	5,960	17.3	9,524	88	9,612	8.1
Samtse Region	3,917	1,742	5,659	16.5	3,568	137	3,706	3.1

Thimphu Region	0	144	144	0.4	49	1,957	2,006	1.7
Grand Total	26,699	7,697	34,396	100.0	85,093	33,699	118,792	100.0

Source: JICA Project Team based on the database of DRC's Bhutan Trade-Statistics 2022

Table 2.4.11 displays the import/export values of the major products handled by the Phuentsholing MDP in the Phuentsholing Region in 2022, which boasts the highest import value in the country. Regarding imports falling under the Bhutan Trade Chapter (BTC), 84 general machinery items like auto data processing machines and hydraulic turbines & water wheels constituted the largest share at 23.8%, followed by 85 electrical machinery products such as electrical transformers, smartphones, and electrical apparatus at 12.6%, 27 fuel products including petroleum oil and gasoline at 11.2%, 87 transportation machinery products like motor cars at 5.8%, and 73 steel products like structures, parts of structures, tubes, and pipes at 2.7%.

Conversely, in exports, salt, earth, and stones such as boulders, limestone, pebbles, and gravel accounted for the largest share at 48.3%, followed by 09 coffee, tea, spices such as cardamoms, ginger, and turmeric at 23.5%, 07 edible vegetables like vegetables, beans, and carrots at 15.2%, and 44 wood and wood products like particle board and plywood at 6.4%.

Table 2.4.11 Imports and Exports at Phuentsholing MDP in 2022

Imports

		Unit: BTN			
BTC* chapter	Major commodities	Total	Import COTI*	Import India	% of the total
Total		72,720,771,898	25,101,195,193	47,619,576,705	100.0
84 Nuclear reactors, boilers, machinery, and mechanical appliances; parts thereof.	Auto data processing machines, hydraulic turbines & water wheels, self-propelled bulldozers, agricultural machinery, etc.	17,335,858,999	13,253,680,856	4,082,178,143	23.8
85 Electrical machinery and equipment and parts thereof;	Electrical transformers, smartphones, electrical apparatus, insulated wire & cable, etc.	9,158,325,318	2,409,584,068	6,748,741,250	12.6
27 Mineral fuels, mineral oils, and products of their distillation;	Petroleum oil, gasoline, petroleum bitumen, etc.	8,112,162,633	294,028,925	7,818,133,707	11.2
87 Vehicles other than railway or tramway rolling-stock, and parts and accessories thereof.	Motor cars designed for the transport of persons, motor vehicles for the transport of good, parts and accessories of the motor vehicles, etc.	4,200,224,420	1,312,106,694	2,888,117,725	5.8
73 Articles of iron or steel.	Structures and parts of structures, tubes and pipes, bolts and nuts, grill, netting, and fencing, etc.	1,998,438,253	185,256,412	1,813,181,841	2.7
39 Plastics and articles thereof.	Tubes, pipes and hoses of plastics, other articles of plastics, polymers of ethylene in primary forms, tableware, and kitchen ware of plastics, etc.	1,713,166,165	284,593,479	1,428,572,686	2.4

10 Cereals.	Rice, maize, wheat, barley, seed, buckwheat millet	1,637,060,366	1,966,355	1,635,094,011	2.3
26 Ores, slag, and ash.	Manganese ores and concentrates, slag, and other waste from the manufacture of iron or steel, etc.	1,624,695,270	1,624,659,094	36,176	2.2
72 Iron and steel.	Flat-rolled products of iron, bars and rods of iron, angles of iron, wire of iron, etc.	1,576,248,857	24,702,466	1,551,546,391	2.2
94 Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings	Prefabricated building of wood, mattress supports article pf bedding, furniture and parts, luminaries, and lighting fittings, etc.	1,555,832,284	439,413,259	1,116,419,025	2.1
04 Dairy produce; birds' eggs; natural honey; edible products of	Processed cheese, fat, butter, natural honey, etc.	1,478,037,300	68,664,652	1,409,372,648	2.0
24 Tobacco and manufactured tobacco substitutes;	Cigarettes, chewing tobacco	1,355,737,970	83,117	1,355,654,853	1.9
Others		20,974,984,064	5,202,455,815	15,772,528,249	28.8

Exports

Unit: BTN

BTC* chapter	Major commodities	Total	Import COTI*	Import India	% of the total
Total		2,784,117,807	1,927,867,040	856,250,766	100.0
25 Salt; sulphur; earths and stone; plastering materials, limestone	Boulders, limestone, pebbles, gravel, crushed stone, etc.	1,344,755,099	1,236,489,014	108,266,085	48.3
09 Coffee, tea, maté and spices.	Cardamoms, ginger, turmeric, and other spices, etc.	653,434,163	609,550,533	43,883,630	23.5
07 Edible vegetables and certain roots and tubers.	Edible vegetables, beans, carrots, cabbages chilies, potatoes, etc.	422,563,048	-	422,563,048	15.2
44 Wood and articles of wood; wood charcoal.	Particle board, plywood, veneered panels, etc.	177,359,103	-	177,359,103	6.4
22 Beverages, spirits and vinegar.	Aerated waters, containing added sugar or flavoured, beer, etc.	61,145,631	6,101,955	55,043,676	2.2
08 Edible fruit and nuts; peel of citrus fruit or melons.	Oranges, apples, nuts, etc.	59,049,246	41,513,806	17,535,440	2.1
97 Works of art, collectors' pieces and antiques.	Paintings, drawings and pastels	11,340,832	11,340,832	-	0.4
84 Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof.	Concrete pumps, tower crane, other machinery for earth minerals or ores, etc.	11,161,790	6,768,825	4,392,965	0.4

72 Iron and steel.	Ferro-silicon, ferrous waste and scrap, etc.	7,457,700	-	7,457,700	0.3
33 Soap, organic surface-active agents, washing preparations	Essential oils, etc.	6,336,750	5,322,200	1,014,550	0.2
21 Miscellaneous edible preparations.	Homogenized composite food preparations, Supari (betel nut cuts/powder), etc.	5,891,839	3,328,744	2,563,095	0.2
Others		23,622,605	7,451,132	16,171,473	0.8

Notes: 1) BTC is an abbreviation of Bhutan Trade Classification. 2) COTI means Countries other than India.

Source: JICA Project Team based on the database of DRC's Bhutan Trade-Statistics 2022

Table 2.4.12 presents the import/export values of major products managed by the Pasakha MDP in the Phuentsholing Region in 2022, which holds the highest export value in the country. Regarding imports falling under the Bhutan Trade Chapter (BTC), 27 fuel products like coke, semi-coke, and petroleum coke constituted the largest share at 24.4%, followed by 72 iron and steel including ferrous products and semi-finished goods at 22.2%. Additionally, 44 wood and wood products, such as wood charcoal accounted for 17.2%, while 85 electrical machinery products, including boards and other bases equipped with electrical apparatus, made up 5.3%. Lastly, 39 plastics and articles like polyethylene, bottles, and polymers of ethylene, represented 3.6%.

On the other hand, in exports, 72 iron and steel products, such as ferro-silicon, ferro-silico-manganese, and semi-finished iron, or non-alloy steel products, dominated the share at 92.6%, making them the country's largest export commodities. They were followed by 28 inorganic chemicals, such as carbide and silicon dioxide, at 3.4%. Beverages, including water and malt-based beer, accounted for 2.0% of exports.

Table 2.4.12 Imports and Exports at Pasakha MDP in 2022

Imports

Unit: BTN					
BTC* chapter	Major commodities	Total	Import COTI*	Import India	% of the total
Total		16,619,203,677	-	16,619,203,677	100.0
27 Mineral fuels, mineral oils and products of their distillation;	Coke and semi-coke, petroleum coke, petroleum bitumen, etc.	4,061,408,084	-	4,061,408,084	24.4
72 Iron and steel.	Ferrous products obtained by direct reduction of iron ore, semi-finished product of iron, waste and scrap of cast iron, etc.	3,683,284,581	-	3,683,284,581	22.2
44 Wood and articles of wood; wood charcoal.	Wood charcoal, etc.	2,858,700,485	-	2,858,700,485	17.2
85 Electrical machinery and equipment and parts thereof;	Boards and other bases equipped with electrical apparatus, transformers, electric conductors, insulated wire & cable, etc.	881,450,226	-	881,450,226	5.3
39 Plastics and articles thereof.	Polyethylene, bottles, polymers of ethylene, box and cases, etc.	590,021,107	-	590,021,107	3.6

38 Miscellaneous chemical products.	Carbonaceous pastes for electrodes and similar pastes for furnace linings, etc.	467,401,232	-	467,401,232	2.8
10 Cereals	Maize, Rice, etc.	425,175,459	-	425,175,459	2.6
25 Salt; sulphur; earths and stone; plastering materials, limestone	Quartz, cement clinkers, etc.	374,531,068	-	374,531,068	2.3
15 Animal, vegetable or microbial fats and oils	Soya-bean oil, palm oil, animal fats and oils and their fractions, etc.	355,541,649	-	355,541,649	2.1
76 Aluminium and articles thereof.	Aluminium casks, drums, cans and other containers	336,286,192	-	336,286,192	2.0
11 Products of the milling industry; malt; starches	Malt, etc.	285,472,933	-	285,472,933	1.7
Others		2,299,930,661	-	2,299,930,661	13.8

Exports

Unit: BTN

BTC* chapter	Major commodities	Total	Export COTI*	Export India	% of the total
Total		17,868,302,601	1,976,943,174	15,891,359,427	100.0
72 Iron and steel.	Ferro-silicon, ferro-silico-manganese, semi-finished products of iron or non-alloy steel, etc.	16,554,345,452	1,823,749,287	14,730,596,166	92.6
28 Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, etc.	Carbides, silicon dioxide, calcium carbonate, etc.	605,030,420	5,268,308	599,762,112	3.4
22 Beverages, spirits and vinegar.	Waters, beer made from malts, etc.	361,276,452	1,888,143	359,388,308	2.0
25 Salt; sulphur; earths and stone; plastering materials, limestone	Boulders, limestone, pebbles, gravel, crushed stone, etc.	200,664,346	137,225,705	63,438,641	1.1
19 Preparations of cereals, flour, starch or milk; pastrycooks' products, etc.	Stuffed pasta, etc.	90,716,053	-	90,716,053	0.5
44 Wood and articles of wood; wood charcoal.	Wood charcoal, etc.	32,167,781	-	32,167,781	0.2
39 Plastics and articles thereof.	Articles of packing goods of plastic: carboys, bottles, flasks and similar articles, etc.	9,204,930	-	9,204,930	0.1
20 Preparations of vegetables, fruit, nuts or other parts of plants	Fruit and vegetable juice, etc.	8,811,731	8,811,731	-	0.0
Others		6,085,436	0	6,085,436	0.0

Notes: 1) BTC is an abbreviation of Bhutan Trade Classification. 2) COTI means Countries other than India.

Source: JICA Project Team based on the database of DRC's Bhutan Trade-Statistics 2022

Table 2.4.13 shows the import/export values of major products handled by the Gelephu CP in the Gelephu Region in 2022, which is situated in the RCSP Area. Regarding imports categorized under the Bhutan Trade Chapter (BTC), 27 fuel products like light oils, preparations, and motor spirit (gasoline) constituted the largest share at 29.5%. Following closely, 10 cereals such as semi-milled or wholly milled rice, broken rice, and buckwheat accounted for 11.7%. Additionally, 84 general machinery items, such as paper or paperboard-making machinery and vapor-generating boilers, represented 5.5%, while 15 animal, vegetable, or microbial fats and oils, including soybean oil, made up 5.4%. Lastly, 73 steel products like structures, parts of structures, and bridges contributed 5.0%.

Conversely, in exports, 22 beverages like undenatured ethyl alcohol of an alcoholic strength, whiskies, and rum, held the largest share at 31.4%. This was followed by 09 coffee, tea, and spices such as cardamoms, cumin seeds, and ginger, which accounted for 28.8%. Additionally, 08 edible fruit and nuts, such as oranges, nuts, and apples, made up 14.5%.

Table 2.4.13 Imports and Exports at Gelephu Check Point in 2022

Imports

Unit: BTN

BTC* chapter	Major commodities	Total	Import COTI*	Import India	% of the total
Total		7,502,085,009	239,222	7,501,845,787	100.0
27 Mineral fuels, mineral oils and products of their distillation;	Light oils and preparations, motor spirit (gasoline), petroleum bitumen, LPG, etc.	2,209,734,642	-	2,209,734,642	29.5
10 Cereals	Semi-milled or wholly milled rice, broken rice, cereals, buckwheat, etc.	878,264,157	-	878,264,157	11.7
84 Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof.	Machinery for making paper or paperboard, vapour generating boilers, table, floor, ceiling or roof fans, with a self-contained electric motor, etc.	412,569,711	239,222	412,330,489	5.5
15 Animal, vegetable or microbial fats and oils	Soya-bean oil, vegetable fats and oils, animal, vegetable or microbial fats and oils, etc.	402,424,706	-	402,424,706	5.4
73 Articles of iron or steel.	Structures and parts of structures, bridges and bridge-sections, towers, tubes and pipes, etc.	375,329,129	-	375,329,129	5.0
85 Electrical machinery and equipment and parts thereof;	Boars and other bases equipped with electrical apparatus, smartphones, electrical conductors, etc.	344,416,362	-	344,416,362	4.6
04 Dairy produce; birds' eggs; natural honey; edible products of animal origin	Milk and cream, processed cheese, fat content, etc.	258,744,485	-	258,744,485	3.4
07 Edible vegetables and certain roots and tubers.	Lentils, tomatoes, onions, shallots, leguminous vegetables, mushrooms, chillies,	188,686,557	-	188,686,557	2.5

	garlic, etc.				
19 Preparations of cereals, flour, starch or milk; pastrycooks' products, etc.	Sweet biscuits, stuffed pasta, pastries and cakes, etc.	174,247,548	-	174,247,548	2.3
72 Iron and steel.	Flat-rolled products of iron, bars and rods of iron, angles of iron, etc.	170,717,090	-	170,717,090	2.3
39 Plastics and articles thereof.	Carboys, bottles, flasks and similar articles, polymers of ethylene, fitting, tableware and kitchenware, etc.	170,458,057	-	170,458,057	2.3
23 Residues and waste from the food industries; prepared animal fodder	Preparations of a kind used in animal feeding, oil cake and other solid residues, flours, meals and pellets, of fish or other aquatic invertebrates, etc.	154,697,866	-	154,697,866	2.1
Others		1,761,794,700	0	1,761,794,700	23.5

Exports

Unit: BTN

BTC* chapter	Major commodities	Total	Export COTI*	Export India	% of the total
Total		1,858,403,859	775,907,375	1,082,496,484	100.0
22 Beverages, spirits and vinegar.	Undenatured ethyl alcohol of an alcoholic strength, whiskies, rum, ethyl alcohol and other spirits, etc.	583,508,121	-	583,508,121	31.4
09 Coffee, tea, maté and spices.	Cardamoms, seeds of cumin, ginger, etc.	534,320,102	275,687,371	258,632,731	28.8
08 Edible fruit and nuts; peel of citrus fruit or melons.	Oranges, nuts, apples, etc.	397,393,223	242,476,918	154,916,305	21.4
25 Salt; sulphur; earths and stone; plastering materials, limestone	Pebbles, gravel, crushed stone, boulders, stone chips and powder, etc.	269,332,865	257,743,087	11,589,779	14.5
23 Residues and waste from the food industries; prepared animal fodder	Brewing or distilling dregs and waste, etc.	31,923,758	-	31,923,758	1.7
72 Iron and steel.	Waste and scrap of tinned iron or steel, waste and scrap of cast iron, etc.	8,828,605	-	8,828,605	0.5
01 Live animals.	Fowls of the species Gallus domesticus (live poultry), goats, sheep, etc.	8,376,160	-	8,376,160	0.5
07 Edible vegetables and certain roots and tubers.	Edible vegetables, lentils, beans, cabbage lettuce, chillies, potatoes, beans, etc.	7,867,633	-	7,867,633	0.4

44 Wood and articles of wood; wood charcoal.	Fuel wood, wood sawn, plywood, etc.	3,770,412	-	3,770,412	0.2
39 Plastics and articles thereof.	Waste, parings, and scrap of plastics, etc.	3,381,930	-	3,381,930	0.2
Others		9,701,052	0	9,701,051	0.5

Notes: 1) BTC is an abbreviation of Bhutan Trade Classification. 2) COTI means Countries other than India.
Source: JICA Project Team based on the database of DRC's Bhutan Trade-Statistics 2022

Trade at Mini Dry Ports and Check Points (Quantity base)

Table 2.4.14 shows the trade volume (quantity base) between Bhutan and India through Phuentsholing and Gelephu. Most of the exports volume in Phuentsholing rely on Pasakha Industrial Park which is located 18 kilometres from Phuentsholing and has 267 acres. The Pasakha Industrial Park has character, which deal with mineral, cement, food, agro-product, etc. On the other hand, the RCSP Area has the same potential for promoting international trade with India as a trading centre.

Table 2.4.14 Trade between Bhutan and India (Phuentsholing and Gelephu)

Unit : Metric Ton

Region/Border	Import from India	Export from Bhutan	Remark
Phuentsholing	1,105,798	788,376	Imports are mainly various types of consumable goods to Thimphu and Paro and raw materials for the Pasakha Industrial Park. Exports are mainly products from the Pasakha Industrial Park and agricultural products.
Gelephu	39,234	6,154	Main imports are raw materials for the construction for hydroelectric power plant and raw materials for the construction of the Jigmeling Industrial Park; Exports are oranges, potatoes, and other agricultural products.

Source: Data Collection Survey on Transport Infrastructure Development for Regional Connectivity in and around South Asia, Final Report 2014

4) Prominent agriculture and livestock production in the Project Area

Table 2.4.15 displays the prominent agriculture and livestock production in the Project Area, which holds a significant share of the country. A higher percentage is observed in vegetables, fruits, spices, and livestock products, including cardamom, which ranks as the fifth largest export to India according to Table 2.4.8. Cardamom is in high demand in India as a raw material for pharmaceuticals and other products, with the demand in Assam. It is also anticipated that exports of agricultural products via Gelephu will expand in the future.

Table 2.4.15 Agriculture and livestock production in the Project Area (Tsirang, Sarpang, and Zhemgang Dzongkhags)

Agriculture and livestock product	Production share (%) of three dzongkhags in the whole country	Production	Unit	Major production area in order
(Agriculture product)				
Turmeric	56.5	75,929	KG	Zhemgang
Watermelon	56.4	53,182	KG	Zhemgang
Litchi	49.0	122,189	KG	Sarpang
Papaya	44.5	54,087	KG	Tsirang, Sarpang
Areca nut	44.3	4,916,574	KG	Sarpang
Banana	37.2	795,430	KG	Tsirang
Mandarin	36.6	6,759,287	KG	Tsirang, Sarpang, Zhemgang
Cardamon	31.4	530,858	KG	Tsirang, Sarpang, Zhemgang
Avocado	30.6	41,610	KG	Tsirang, Zhemgang

Jack fruit	30.2	75,070	KG	Zhemgang
Taro	27.6	20,794	KG	Tsirang, Sarpang, Zhemgang
Guava	26.5	136,453	KG	Tsirang
Tree tomato	26.0	56,312	KG	Sarpang, Tsirang
Tomato	25.4	52,265	KG	Sarpang, Tsirang
Mango	24.6	118,550	KG	Tsirang, Sarpang, Zhemgang
Ginger	23.7	878,136	KG	Zhemgang, Tsirang
(Livestock product)				
Pork	47.3	582,353	KG	Tsirang
Egg	42.0	42,410,767	Number	Sarpang, Tsirang
Fish	38.1	13,897	KG	Sarpang
Chicken	35.4	351,396	KG	Tsirang, Sarpang
Chevon	32.9	57,078	KG	Tsirang
Honey	22.8	8,492	KG	Sarpang, Tsirang
Beef	21.9	399,067	KG	Sarpang, Tsirang
Cheese	19.7	468,370	KG	Tsirang, Sarpang, Zhemgang
Milk	15.2	6,427,030	Liter	Tsirang, Sarpang, Zhemgang
Butter	14.6	219,936	KG	Tsirang, Sarpang, Zhemgang

Note: The combined population of the three dzongkhags accounts for 11.8% of the total population in the country as estimated in 2022.

Source: JICA Project Team based on Integrated Agriculture and Livestock Census of Bhutan 2022, NSB

Assam has the proximity to some neighbouring countries such as Bangladesh, Nepal and Bhutan with many border trading points. Especially, Gelephu has comparative advantage rather than other points due to the proximity, MLP at Jogighopa and railway planned from Assam to Gelephu.

5) Cottage and small industries

The ranking and the number of CSIs by Dzongkhag is shown in Table 2.4.16. The number of CSIs in Sarpang ranks fourth after Thimphu, Palo and Chhukha. Especially, the number of agro based and service industry are significant in Sarpang. In terms of agro based industry, the number may show not only the advantage of high productivity in the wide flat area in southern part of Sarpang, but also industrial potential as agglomeration of agricultural products. It is thought that the prosperity of service industry can show agglomeration of people and employment.

Table 2.4.16 Number of Cottage and Small Industries by Type and Dzongkhag as of 2021

Dzongkhag	Production & Manufacturing				Services	contract	All types
	Agro Based	Forest Based	Mineral Based	Other			
Bumthang	28	74	5	20	538	50	715
Chhukha	55	40	19	50	1861	162	2,187
Phuentsholing Thromde	14	17	2	28	1,090	59	1,210
Other than Phuentsholing Thromde	41	23	17	22	771	103	977
Dagana	16	17	8	13	325	62	441
Gasa	1	1	1		74	16	93
Haa	6	47	1	14	172	41	281
Lhuentse	11	19	1	5	176	30	242
Monggar	22	51	7	16	657	60	813
Paro	60	131	13	69	1,322	110	1,705
Pema Gatshel	11	25	6	7	430	45	524
Punakha	28	22	2	16	577	59	704
Samdrup Jongkhar	14	34	17	29	650	89	833
Samdrup Jongkhar Thromde	3	7	0	12	223	54	299
Other than Samdrup Jongkhar Thromde	11	27	17	17	427	35	534
Samtse	44	23	22	44	771	95	999
Sarpang	79	57	24	72	1090	114	1,436
Gelephu Thromde	9	10	4	20	601	75	719
Other than Gelephu Thromde	70	47	20	52	489	39	717

Thimphu	152	149	8	369	6,090	416	7,184
Thimphu Thromde	98	81	2	280	5,648	395	6,504
Other than Thimphu Thromde	54	68	6	89	442	21	680
Trashigang	36	53	10	23	456	77	655
Trashi Yangtse	6	86	2	5	206	60	365
Trongsa	10	12	1	2	341	71	437
Tsirang	28	15	1	5	258	44	351
Wangdue Phodrang	20	35	7	15	718	78	873
Zhemgang	17	25	4	4	279	54	383
Total	644	916	159	778	16,991	1,733	21,221

Source: Department of Cottage & Small Industry, MoEA

6) Location characteristics of the RCSP Area

The RCSP Area is located at a key transportation and logistics. In regional spatial structure proposed by the Regional Spatial Plan, Sarpang Town is expected to connect to Phuentsholing parallel to the border with India. Also, the connectivity between the RCSP and Zhemgang Town in Zhemgang would be improved for year-round traffic. Damphu Town in Tsirang can take advantage of the proximity to the RCSP Area for another market, in addition to the capital area, for agricultural products. Thereby, the RCSP Area will become more strategic centre for regional economic growth.

7) Supply of labour

The labour force for the Jigmeling Industrial Park and future industrial development in the RCSP Area will be supplied by Bhutanese nationwide and foreigners from India and other countries. There is also Technical Training Institute, Dekiling located near JIP, which is expected to employ graduates of the school.

At section 3.4.2, projection of number of employments in Sarpang under the alternative A-2 scenario shows the significant increase the employment in 2045 amount 53,000 (23,900 in 2022). The number of workers for the several proposed projects in the RCSP Area is estimated as shown in Table 2.4.17 and distributed over the following timeframes.

Table 2.4.17 The Number of Estimated Employments by Proposed Project

Existing or Proposed Projects in the RCSP Area	2030	2035	2045
Jigmeling Industrial Park	6,500	7,000	8,000
Agro-processing Park	100	150	300
Special Economic Zones (SEZs: Three locations)	-	4,000	10,000
IT park (Science Technology Park)	50	200	500
University (Sarpang Town)	-	-	1,200

Source: JICA Project Team

8) Logistic and transportation situation

Through the interview and field survey, logistic and transportation situation in three Dzongkhags has been analysed qualitatively because of lack of statistical data of production/consumption in monetary terms, goods shipped to market, transport volume, etc.

According to the surveys in Tsirang, agricultural/livestock products are mainly transported to the capital area from Tsirang, which shows the excellence of the agricultural/livestock industry and in Tsirang. On the other hand, it implies the limitation of internal transaction within the Project Area. Also, the survey shows the situation of lack of year-round road condition and access to market facilities nearby.

In Zhemgang, the survey shows almost the same result as Tsirang, but the product flow is mostly dominated from Zhemgang Town to Gelephu or Panbang. Main challenges in Zhemgang are poor road connectivity from Zhemgang to Gelephu, poor farm road connectivity from Gewog to Gewog, lack of public transportation.

As for Sarpang, productive volume of agricultural products is larger than livestock. They have faced bad road condition and lack of vehicle in terms of efficient logistic. In terms of logistic and transportation, light industrial products are promising.

Considering above conditions, alternative A-2, which aims to improve the connectivity within or adjacent to the Project Area, are high potentials with respect to streamlining of logistics and transportation.

9) Comprehensive industrial development as an alternative gateway

As of now, the volume of import is much higher than export in Gelephu, different from Phuentsholing. This shows there are less products, which are produced in the RCSP Area and its hinder land, to export to India. On the other hand, agricultural processing, wood processing, pharmaceutical manufacturing and high-tech industry are very promising, which have a potential to be exported.

Gelephu is expected to become a gate alongside Phuentsholing in the future. Currently, the majority of resources, including fuel, raw materials, and products exported from India to Bhutan are via Phuentsholing, therefore, it would be desirable to have a gate to share this responsibility.

10) Proposals for industrial development project in the SCRP

Establishment of special economic zone (SEZ)

Taking into account the relatively strong demand from the private sector, it proposes the establishment of a special economic zone over the medium to long term (2035-45). The scale of development is expected to be almost identical to that of Jigmeling Industrial Park, with a total gross area of 250 ha and a net industrial land area of 170 ha.

It is assumed that development would take place in two locations: about 60 ha between Jigmeling Industrial Park and the Gelephu Thromde, and 190 ha between Jigmeling Industrial Park and Sarpang Town. A diverse range of industries are expected to be introduced, including electronics and electrical systems, pharmaceuticals, and construction materials, in alignment with the Economic Development Policy 2016 and the Investment Promotion Policy 2019.

Establishment of agro-processing park

This park will focus on agro-processing, food production, and beverage production with a view to exporting to India, taking into consideration the supply capacity of agricultural products and raw materials, especially in Tsirang and Sarpang Dzongkhag. The development scale is expected to be around 50 acre (20 ha) gross and located halfway between Jigmeling Industrial Park and Sarpang Town.

(2) Alternative B

Alternative B is oriented toward balanced development throughout the region. Main activities proposed in this Alternative are vertical industrial cluster and community development through maximizing the local resources. To avoid overinvestment through the public intervention, local stakeholders should play in a key role for regional and community development.

1) Related policy and system

The objective of the 12th FYP is “Just, harmonious and sustainable society through enhanced decentralisation”. This objective is consistent, in a large part, with the concept of community forest, community-based tourism, etc. proposed in the CNDP2030. Both documents show that a community is a basic unit for ensuring the sustainability and harmonious regional development. It would be realised that decentralisation would lead to transferring the different stages of development to the local: budget, plan, implementation, monitoring and evaluation, etc. These policies and systems can encourage the local people to be engaged in the community-based activities which is proposed in Alternative B.

Also, the concept of Common Minimum Infrastructure (CMI)⁸ has been introduced to support the provision of cross-sectoral services in each local government. This is a framework for providing funds to distribute public infrastructure and facilities at Dzongkhag, Gewog, and Thromde level. It is understood that the provision of each service function will be carried out in collaboration with the central ministries, national agencies and local governments that have the respective lead responsibility.

In CNDP2030, introduction of the Holistic Service Delivery System, which consists of the regional centre (RC), the district centre (DC), and the Gewog centre (GC), is proposed. The SCRP has been following this concept for the inclusive social service provision as well.

2) Industrial cluster

Vertical industrial clusters based on primary products, which can enhance the added value at each stage of the value chain, is a key concept of well-balanced development in a rural area which is aimed at the Alternative B. Performing cluster is well organised with strong linkages between various players and stakeholders. The industrial cluster is generally composed of the operation of upstream (raw material suppliers, production inputs) and downstream (value added processing, packaging, marketing, and exporting) economic activities.

Especially, local organizations such as CSOs or local private firms who are engaged in value-chain activities should play a specific role as a player to add value in the process of both upper-stream and down-stream. Some good examples of the player in the Project Area are shown as follows. They can play an important role in establishing industrial cluster.

Khengrig Namsum Cooperative (Zhemgang Dzongkhag)

This is an agricultural group that was established in 2015 at the initiative of the MP of Zhemgang Council, with two members elected from one gewog. After receiving training in India, the group is divided into two groups, one for production and the other for sales of agricultural products. Currently, there are 16 members, 2 from each of the 8 gewogs. Their main activities are exporting ginger powder and turmeric powder to Australia, Europe, and Bangladesh. They procure vegetables from Gewog and subsequently supply them to 4 local schools as ingredients for school lunches.

Panbang Youth Group (Zhemgang Dzongkhag)

Youth agricultural group established in 2019 with assistance from Dzongdag. It currently has 17 members: 11 men and 6 women. The group is divided into agriculture (pineapple, buckwheat, hydroponic lettuce, and chili peppers), animal husbandry (cattle, pig, chicken, and carp farming), and off-farming (marketing and salon management).

Sherchok Women's Group (Gelephu Thromde)

A group of women, represented by a former government employee (retiring in 2019). There are currently 8 workers. Activities include buying fruits and vegetables that would otherwise be discarded by farmers, processing them into dried fruits, pickles, spices, etc., and selling them. While the primary market for their products is Thimphu, they are actively engaged in developing the necessary procedures to facilitate exportation.

Crystal Moon Products (Gelephu Thromde)

This is a women's youth group in Jigmeling. Representative is the same as Sherchok Women's Group.

Consisting of 5 members, the group engages in various activities while also maintaining employment in the city of Gelephu. They have a store along the street where they make and sell pickles and natural soaps. They also have a bring-and-sell shop in Thimphu.

⁸ The concept of CMI is "to reduce disparities in distribution of common public infrastructure and facilities among Dzongkhags, Gewogs, and Thromde.

Drongsep Yargay Detshen (Tsirang Dzongkhag)

The group was founded in 2004 with 7 members by setting up a membership fee. Currently there are 17 members working in the fields of education, health, culture, tourism, and agriculture. In collaboration with Gewog and Dzongkhag, the group also leases land and operates a sales store.

3) Cottage and small industries

As mentioned above, CSIs can represent the potential of local industry. In Zhemgang and Tsirang, the number of CSIs is not significant compared to Sarpang. By sector of CSIs, Tsirang has relatively high potential of agro-based industry; Zhemgang has high potential of forest industry. These may indicate that the original brand “Tsirang natural” which shows the organic products produced in Tsirang can attract investors even in a small scale. In Zhemgang, especially in Panbang Town, there are several factories producing bamboo handicrafts which is the most famous products in Bhutan.

4) Community cohesion

Public participation leading to the community cohesion, plays a pivotal role in community development. In the SCRP, the Regional Development Platform (RDP) has commenced after the agreement of MoU by all core members. This is the first initiative in Bhutan which is to include plural Dzongkhags in the single platform.

This initiative has a high potential to consolidate many types of players consigning of products, markets, logistics, etc. in supply chain and value chain into a set of frameworks. By this, not only simple cooperation within local people but also democratic decision-making system would be established in the contemporary community development.

2.4.5 Linkage between the SEA, broad alternative and the proposed interventions with social and environmental consideration.

The Broad development alternatives are considered based on spatial and industrial development perspective. On the other hand, as shown in Figure 2.3.1, there are some issues faced in the Project Area in terms of social and environmental consideration. Therefore, it is necessary to examine the impact caused by pursuing the development direction of each alternative, which is an important role of the SEA.

Table 2.4.18 Impact on Each Issue by Each Alternative

Alternative	Identified issues					
	Deforestation	Water degradation	Huma – wild life conflict	Biodiversity	Poverty	Climate change
Alternative: A-1	+	+	None	None	-	None
Alternative: A-2	None	None	+	None	-	None
Alternative: B	+	+	None	+	+	None
Alternative: C. (Zero option)	None	None	None	None	None	None

Source: JICA Project Team

+: Possibility of positive impact

-: Possibility of negative impact

2.4.6 Evaluation of each alternative

The three alternatives are compared from economic, social and environmental effects, and development management as shown in Table 2.4.14.

Table 2.4.19 Evaluation of Macro Development Alternatives by Selected Indices

Item	Alternative: A-1	Alternative: A-2	Alternative: B
Economic effects	<ul style="list-style-type: none"> Benefit of intensive economic activities in the RCSP Area will be distributed to the rest of the Project Area. Domestic investment will be promoted through improvement of connectivity. 	<ul style="list-style-type: none"> Benefit of intensive economic activities in the RCSP Area will be distributed to the rest of the Project Area. Domestic and foreign investment will be promoted through large-scale infrastructure project. 	<ul style="list-style-type: none"> Primary industry will be well developed. Rural areas will be developed as a producing base. Local resources will be utilised fully based on localisation.
Social effects	<ul style="list-style-type: none"> Possibility of increasing urban-rural disparities due to limited employment in rural areas Increase of employment opportunities in the RCSP Area and the whole Project Area Establishment of social service base in the RCSP Area Possibility of not improving poverty situation in Zhemgang 	<ul style="list-style-type: none"> Possibility of increasing urban-rural disparities due to limited employment in rural areas Increase of employment opportunities in the RCSP Area Establishment of social service base in the RCSP Area Possibility of not improving poverty situation in Zhemgang 	<ul style="list-style-type: none"> Possibility of reducing urban-rural disparities due to employment generation effort in rural areas Employment opportunities are distributed in the whole Project Area. Aiming at holistic social service provision in the whole Project Area Possibility of improving water source degradation in Zhemgang and Tsirang
Environmental effects	<ul style="list-style-type: none"> Concerns on environmental deterioration due to lack of management in rural areas Risks of aggravation of urban environment due to continued over-concentration Reduced wastes with total processing by industrial clusters 	<ul style="list-style-type: none"> Concerns on environmental deterioration due to lack of management in rural areas Risks of aggravation of urban environment due to continued over-concentration Necessary to manage the environmental effect by large-scale infrastructure Possibly increased waste generation due to excessive resource use 	<ul style="list-style-type: none"> Minimal adverse environmental effects due to stronger communities Possibility of establishing an environmental management system
Development management	<ul style="list-style-type: none"> Need to establish industrial cluster for primary products development with technology and market development Need to expand the ICT infrastructure and road connectivity in whole areas with RCSP Area. Need to monitor road 	<ul style="list-style-type: none"> Need to support manufacturing and heavy industries for products development with technology and market development Need to expand the ICT infrastructure and road connectivity in specific areas Need to expand 	<ul style="list-style-type: none"> Need to support primary industries for product development with competitiveness Need to expand the ICT infrastructure in rural area Need for infrastructure development in local towns/villages

	connectivity between RCSP Area and rural area	infrastructure capacity, especially, in the RCSP Area	
Development initiative	<ul style="list-style-type: none"> Public-private cooperation to formulate viable industrial clusters 	<ul style="list-style-type: none"> Public initiative to invite foreign capital investment 	<ul style="list-style-type: none"> Social and support services by local administrations under government policy

Source: JICA Project Team

2.4.7 Establishment of assessment criteria

As SEA is linked to the concept of sustainability, SEA could provide a framework for implementing the objective of sustainability, while proposing steps towards achieving it⁹. An assessment process that is robust and consistent must be based on widely approved and accepted criteria that increase the acceptance of the assessment outcomes. Criteria to support the assessment can be drawn from a wide range of sources, including:

- Policy frameworks established at international, national, or regional/local levels
- Technical criteria based on scientific methods
- Indicators based on state of the environment reporting
- Cultural values, based on a multi-stakeholder involvement

There are no one-size fits all standard SEA recipes, and it would be counterintuitive to the notion of enabling flexibility and adaptation of the SEA to different decision-making practices. Effective SEA approaches have to be adapted and applied to the specific context in which they should operate.

The function of a good-quality SEA process is to inform planners, decision makers and the affected public on the sustainability of strategic decisions, facilitate the search for the best alternative and ensure a democratic decision-making process. For this purpose, a good-quality SEA process is governed by the criteria¹⁰ shown in Table 2.4.15.

Table 2.4.20 Principles for Good Practice of SEA

Criteria	Description
Integrated	<ul style="list-style-type: none"> Ensures an appropriate environmental assessment of all strategic decisions relevant for the achievement of sustainable development. Addresses the interrelationships of biophysical, social and economic aspects. Is tiered to policies in relevant sectors and (transboundary) regions and, where appropriate, to project EIA and decision making.
Sustainably-led	<ul style="list-style-type: none"> Facilitates identification of development options and alternative proposals that are more sustainable.
Focused	<ul style="list-style-type: none"> Provides sufficient, reliable and usable information for development planning and decision making. Concentrates on key issues of sustainable development. Is customized to the characteristics of the decision-making process. Is cost- and time-effective.
Accountable	<ul style="list-style-type: none"> Is the responsibility of the leading agencies for the strategic decision to be taken. Is carried out with professionalism, rigor, fairness, impartiality and balance. Is subject to independent checks and verification Documents and justifies how sustainability issues were taken into account in decision making.
Participative	<ul style="list-style-type: none"> Informs and involves interested and affected public and government bodies throughout the decision-making process. Explicitly addresses their inputs and concerns in documentation and decision making.

⁹ Therivel et al., (1992). Strategic Environmental Assessment (SEA). Earthscan.

¹⁰ IAIA 2002. "SEA Performance Criteria," IAIA Special Publication Series No. 1. Available from <https://iaia.org/uploads/pdf/sp1.pdf>

	<ul style="list-style-type: none"> • Has clear, easily-understood information requirements and ensures sufficient access to all relevant information.
Iterative	<ul style="list-style-type: none"> • Ensures availability of the assessment results early enough to influence the decision-making process and inspire future planning. • Provides sufficient information on the actual impacts of implementing a strategic decision, to judge whether this decision should be amended and to provide a basis for future decisions.

Source: IAIA (2002)

2.5 Recommended Development Alternative

2.5.1 Planning concept for regional development in the Project Area based on development alternatives

Based on the Project activities including the SEA process till date, the hypotheses related to development directions recognised and presented in sector 2.4.2 (2), looks rational. Each development alternative is set up through consideration of the solution to resolve these issues. However, it is difficult to realise the development direction proposed in each alternative at the same time-frame due to associated constraints.

From the perspective of economic development, public intervention should play a complementary role in supporting economic activities led mainly by private initiatives. In this, it will be really important to understand the concept of maximizing the effectiveness of public interventions and their limitations.

In a short-term period, rapid development of concentrated area with aggressive public investment may cause competition with the existing industrial park and other industrial activities. As mentioned earlier, it is important to share the concept that public intervention should be complementary for economic activities. Therefore, such interventions, which has the potential to significantly alter the existing economy, should be prepared along with a medium, long-term perspective.

2.5.2 Outline of potential impact of each alternative

Section 2.4.3 shows the evaluation of the potential effect and a comparison of the development alternatives, highlighting their key features. The potential impacts of each development alternative can be summarized as below. In this regard, it is important to note that these potential impacts may fluctuate due to fluctuations in external economic and political conditions, however, these are uncertainties and cannot be considered in this analysis.

Alternative A-1 will be effective for high economic growth centred on the RCSP Area with industrial cluster, etc. through the improvement of connectivity. Negative impact will be limited except for social disparity; rural-urban migration may be accelerated in the same trend of the past.

Alternative A-2 will be effective for the highest economic growth centred on the RCSP Area with large-scale infrastructure built, but may accelerate existing social issues such as rural-urban migration and social disparities between urban and rural areas. The negative impacts will also be environment in nature, including large scale topographic modification, which may cause land deterioration and air pollution, etc., if careful considerations on environmental effect are not taken.

Alternative B will be effective for the conservation of culture, tradition and local communities through community cohesion, and it will have the fewest negative physical negative impacts. It may reach the goal of inclusive development aimed by the Sustainable Development Goals. However, there will be concern over slow economic growth.

2.5.3 Issues for achieving the development goal of each alternative

Each alternative has several issues to be solved to achieve the target of the development direction. Furthermore, some of the issues on one alternative are related to the intervention of another alternative. To comprehensively tackle these issues, plural development strategies are proposed in Chapter 3.

(1) Alternative A-1

The development goal of Alternative A-1 is mainly to achieve the formulation of industrial cluster based on primary products. To support this alternative, it will be necessary to identify promising primary products, rationalise the members/organisations of the cluster, and develop the infrastructure to connect the elements of the cluster.

Technological innovation for development of products and development of markets for new products are essential for the upgrading of industrial clusters, and this is also where government support measures play a role. These technological and market development may be realized in conjunction with foreign investment.

Community cohesion through enhanced connectivity should be realized during the preparation period until the cluster becomes a reality, further strengthening the cluster. Through stepwise development, connections between residents will be strengthened, transportation and communication infrastructure will be developed, and connections between the activities that structure of the industrial clusters will be enhanced. That is, the achievement of this alternative would be in relation with the progress of Alternative B.

(2) Alternative A-2

As for Alternative A-2, existing infrastructure such as Jigmeling Industrial Park, dry port, multi-modal hub, etc. should be fully utilised to demonstrate the effectiveness of the foreign and domestic investment prior to establishment of large-scale infrastructure proposed.

In addition, by creating export products, they should take the lead in marketing, leading to self-sustaining development. In preparation of promotion of global value-chain, commodities produced in the region would be consolidated in the RCSP Area with improved transportation system including debottlenecking the artery.

The role of the government is to develop infrastructure and promote investment, including foreign investment, resulting in inclusive development. The government also should support the community-based management system for environmental conservation to minimise the influence by large-scale infrastructure.

(3) Alternative B

Due to steep terrain, low population density, restraint of integrity of social condition, etc., most of the existing communities are scattered and difficult to benefit the government support. In addition, in the unit of community, there is neither strategic plan nor policy except for the local area plan, showing the limitation for taking advantage of indigenous resource. As proposed in Alternative B, community cohesion is important for community development from the strategic viewpoint.

The strengthening of neighbourhood communities will be supported by the expansion of social services and measures to support primary industries. To do this, each community should be well connected with core cities in the region or among communities within the region.

The role of the government is to provide the platform that enables to consolidate the local residents/organisations, even including the community-based committee organised by the residents/organisations, through the institutional and political intervention.

2.5.4 Combination of each alternative

(1) Stepwise development scenario on each alternative

From the economic, social and environmental perspectives, each alternative has its advantages and disadvantage. It is necessary to consider all impacts and not to prioritize only one option. To pursue a more appropriate direction by combining several factors and impacts, an analysis was conducted at each development phase. The short-term phase until 2030, the mid-term phase from 2030 to 2035, and the long-term phase from 2035 to 2045 were defined as the groundwork phase, the build-up phase, and the

fulfilment phase, respectively.

In alternative A-1, road network improvement activities are in line with Road Network Development Plan described at section 4.4, which is stepwise development strategy in order to debottleneck at land slide section or develop a candidate road as a tourism road, especially between rural area and the RCSP Area. The development effect of this alternative would be achieved in relatively early phases. It would be able to make it easy to establish industrial cluster through the road improvement.

In alternative A-2, in the stage of designing several large-scale infrastructures, it is necessary to build the consensus among many stakeholders as well as feasibility study including environmental assessment. In addition, it should be secured the huge amount of budget allocation more than the average of annual budget. Once the infrastructure building would be completed, high economic growth and capital accumulation would be realised.

In alternative B centred on community development, target communities are widely distributed in the Project Area, therefore, investment efficiency is relatively low compared to other alternatives. On the other hand, from social and environmental viewpoints, the overall bottom line is expected to increase and inclusiveness will be improved.

Table 2.5.1 shows the stepwise development scenario on each alternative.

Table 2.5.1 Stepwise Development Scenario on Each Alternative

Term/Type	Alternative: A-1	Alternative: A-2	Alternative: B
Short term to 2030	<ul style="list-style-type: none"> • Prioritize and design for improvement of specific road • Improvement of bottleneck road condition between rural area and the RCSP Area (e.g., Gelephu – Zhemgang road) • Promotion of domestic investment for the RCSP Area • Management for disaster risk related to climate change and human-wild life conflict 	<ul style="list-style-type: none"> • Consensus building and design for large-scale infrastructure • Environmental assessment for each infrastructure • Preparation for urban environmental problems such as wild-life conflict and deforestation, etc. in and surrounding the RCSP Area • Management for disaster risk related to climate change and human-wild life conflict 	<ul style="list-style-type: none"> • Promotion of institutional measure for community development • Preparation for community development plan consisting of holistic social service, livelihood, agriculture promotion, environmental management plan, etc. for communities
Medium term 2030 to 2035	<ul style="list-style-type: none"> • Improvement of road network between rural area and the RCSP Area • Establishment of processing/marketing/distribution centres for primary and secondary product in core cities in the Project Area • Establishment of industrial cluster for specific produces 	<ul style="list-style-type: none"> • Under construction of each large-scale infrastructure • Promotion of domestic/foreign investment for the RCSP Area • Establishment of processing/marketing/distribution centres for primary and secondary product the RCSP Area 	<ul style="list-style-type: none"> • Management for water source degradation problem in Zhemgang and Tsirang • Under construction of agricultural infrastructure, social service facility, etc. • Soft measure for livelihood activities for target community in Zhemgang • Under progress of holistic social service system
Long term 2035 to 2045	<ul style="list-style-type: none"> • Establishment of industrial cluster for several specific produces • Completion of holistic social service system 	<ul style="list-style-type: none"> • Establishment of all infrastructure planed • Establishment of industrial cluster (e.g., ICT industry) in the RCSP Area 	<ul style="list-style-type: none"> • Soft measure for livelihood activities for all community in the Project Area • Completion of holistic social service system

Source: JICA Project Team

(2) Recommended alternative

Consequently, the alternative to be pursued ultimately is alternative A-2. This alternative will realize most diversified economy in manufacturing and services together as well as population growth. Also, environmental impact can be minimized based on proper intervention.

As for the promotion of economic development, the most influential public investment is development of a large-scale infrastructure such as SEZ, etc. as proposed in alternative A-2. However, the infrastructure development should be done considering the social and environmental factors. To maximize the economic impact of infrastructure development, improvement to both tangible/intangible connectivity and urban-rural linkage has to be done within the Project Area, and even the neighbouring region.

In order to make the infrastructure effective as a saucer of commodities, production activities concerning primary and secondary products for community revitalisation should be promoted. In this context, the economic activities in the community especially in rural areas should be enhanced consecutively. Internalization of the supply chain with industrial cluster should be developed in order to contribute to local livelihood and create employment opportunities in rural areas, which are large number of populations in the Project Area.

(3) Combination of each alternative

Since each alternative has a different direction of development, it is necessary to organize the allocation of public investment over time to determine which alternative to pursue. By combining alternatives or by selecting the best alternative for each phase, the allocation of public investment can be optimized.

The recognition of promising primary products, the organization of members of industrial clusters, the improvement of various infrastructures including the ICT environment, and enterprise support for technology development especially for start-ups would be the role of the government.

The development of the neighbouring community, which Alternative B prominently pursues, is important for all alternatives, although the varying priorities of public investment to the community development across alternatives. It will be gradually realized through three phases through the governmental supports by the expansion of social services and support policies for primary industries.

Considering above points, the public investment allocation plan is shown in Figure 2.5.1. Red circle and line represent prioritised alternatives for the allocation by phase-wise.

1) Short-term (to 2030)

The measure of alternative A-1 such as improvement of the connectivity at Groundwork Phase will contribute to give a basis for a large-scale infrastructure and community development proposed by A-2 and B, respectively. As for the private investment, at the initial stage, the domestic invest should be promoted, then foreign investment can follow the trend that attention could be paid to this region as an investment destination. On the other hand, alternative A-2 is at the process of preparing large investment through environmental assessment, feasibility study (F/S), etc. As for the community development pursuit by alternative B, a community development plan should be prepared at the initial stage.

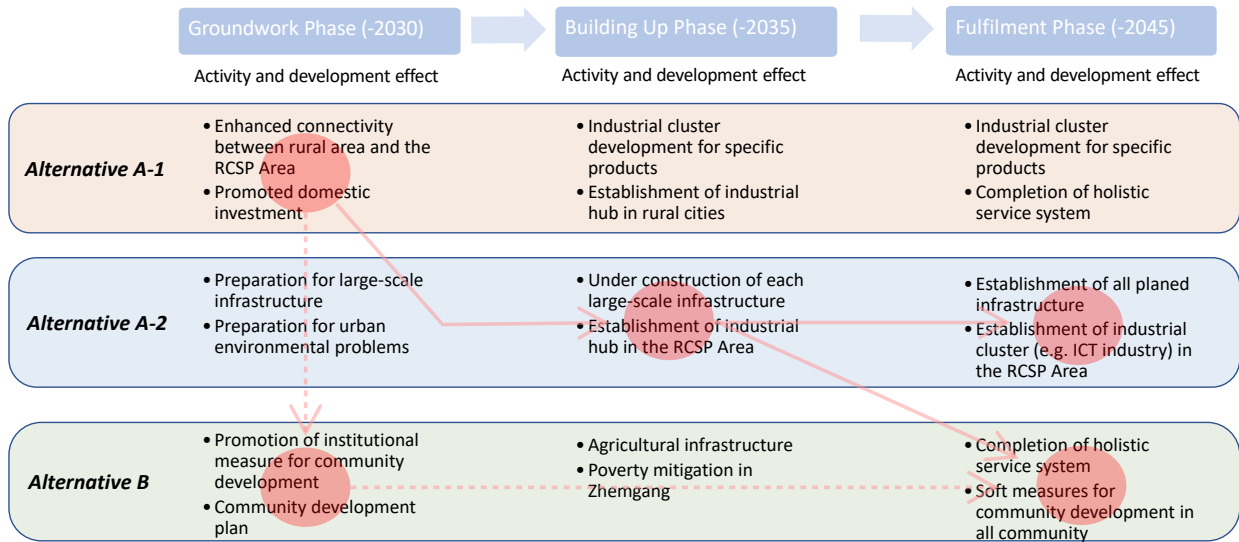
2) Mid-term (2030 to 2035)

At the second stage called Building Up Phase (2030 to 2035), alternative A-2 should be prioritised for the purpose of achieving strong economic growth in the region, based on the large public investment. Enhancement of connectivity would be continued from the Groundwork Phase. One of the significant problems in the region is the high poverty rate, especially in Zhemgang, which should be mitigated through improving livelihood activities.

3) Long-term (2035 to 2045)

At the final stage during the Project target period such as Fulfilment Phase, large investment toward large-scale infrastructure would be persisted at high level. As for the community-based issue such as

lack of social service, poverty, lack of employment, etc. should be solved up to the target year, 2045. Industrial cluster on several specific products will be established through high connectivity among the region achieved at the first and second stage.



Source: JICA Project Team

Figure 2.5.1 Public Investment Allocation Plan

CHAPTER 3 REGIONAL DEVELOPMENT STRATEGY

3.1 Vision for the Year 2045

3.1.1 What is a vision?

(1) Importance of a vision

A vision is important for a comprehensive development. For the Project Area, it will be established based on the pursuit of a regional vitalisation. The problem analysis/structures and review of policies and plans will provide critical inputs in setting a vision. In the process of visioning exercise, development alternatives and the framework for the SEA would be used in a flexible manner.

The vision for the Project Area should be shared by all the stakeholders including local residents, officers and experts of the local and central governments, and supporters of regional development such as donors, civil society organisations (CSOs), and business community etc. Sharing a vision helps to muster concerted efforts in undertaking new socio-economic activities through common interests to realise regional development. In order to initiate a basis for discussion, a draft vision will be proposed through collaboration between the C/Ps and the JPT and following it multi-stakeholder meetings will be conducted through the RDP and then finalise the vision and development objectives.

(2) Premises of developing a vision

In Bhutan, there are two national level development plans: the 12th FYP and the CNDP2030. The 12th FYP sets forth the implementation of the CNDP2030 as an important strategy. Except for the difference in time horizon and projects that were prioritised, they are consistent with each other. These plans would be considered for developing the vision for the Project Area. They will be reflected as a high-level development vision. Indeed, National Human Settlement Policy (NHSP) and the SPS require the lower plans to align with the provision of the higher plans so that there is harmony in the development at the national level.

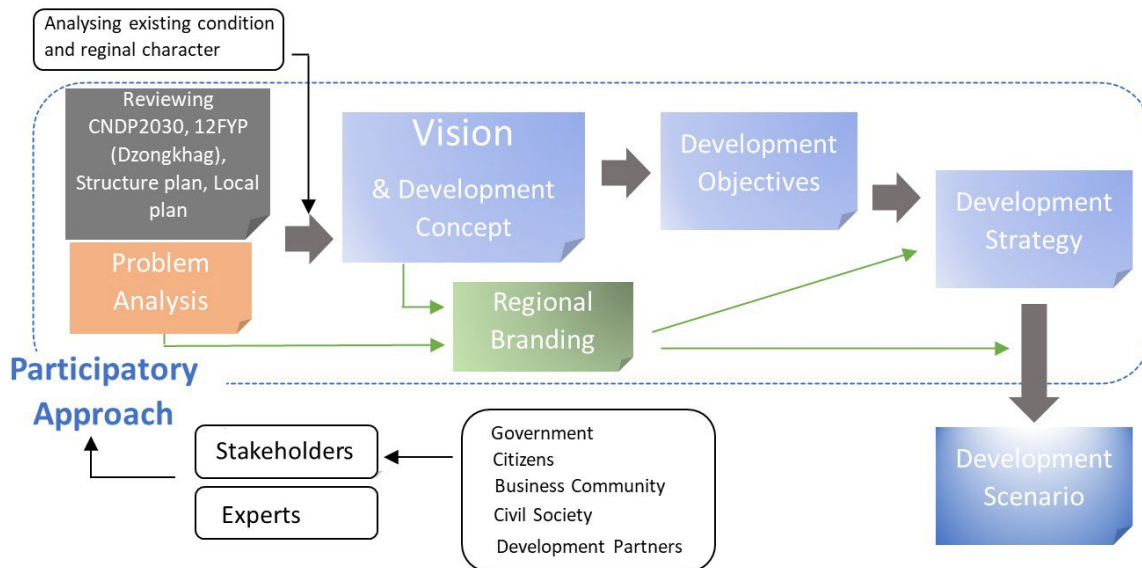
The ground realities such as local needs and indigenous characters will have to be integrated as much as possible in the Project.

The Structure Plan of Sarpang, Gelephu, Damphu and Zhemgang, and Local Area Plan and Action Area Plan of areas within the Project Area will be considered in formulation of the vision for the Project.

(3) Procedure of developing a vision

The vision for each Dzongkhag should be elaborated through a series of discussions among stakeholders. Also, the plans at macro and local level should be reviewed and analysed. To ensure that the approved plans and related documents are reviewed holistically and in detail, the C/Ps and the JPT have been working together through a modus operandi of sharing the tasks of reviewing the plans.

To embody the vision for each Dzongkhag, development objectives will be set up with development concepts. It shall then be finalised through multi-stakeholder meetings and consultations. It is important that the vision for each Dzongkhag is prepared through a participatory approach focussed on the individual Dzongkhag unit but with a common goal of regional development.



Source: JICA Project Team

Figure 3.1.1 Formulation Process of Visions for Three Dzongkhags

3.1.2 Reviewing existing policies and plans

(1) CNDP2030

The acronym GREENIST is the development vision of the CNDP2030, and it represents the eight objectives. Each objective has a particular target to realize its concept. These are summarized in Table 3.1.1.

Table 3.1.1 Objectives and Description of GREENIST proposed in the CNDP2030

Objective	Description
<i>Global happiness centre</i>	To promote well-being through use of local resources and share experience and knowledge with the international community.
<i>Richness and Diversity</i>	To promote diversity in urban and rural areas by creating National Capital Region and Linked Urban Centres.
<i>Eco-friendly green industry</i>	To promote green industries with comparative advantages e.g., hydropower, export-oriented agriculture and NWFP using renewable resources in keeping with a concept of zero-emission and a commitment to remain carbon neutral.
<i>Environmental management for livelihood and economy</i>	To ensure sustainable livelihood and living environment through management by communities and proper land use control system.
<i>Network society for integrated communication</i>	To link the entire country and society with road network consisting of east-west and north-south highways with further linkage to air transport, information technology and advanced means of transport.
<i>Innovative development model</i>	To develop innovative solutions for problems and constraints such as human-wildlife conflict, mountainous topography, and natural disasters etc. through appropriate technology characterized by environmentally symbiotic society, balancing economic growth and environmental conservation.
<i>Self-reliant society</i>	To pursue for a sustainable society through effective use of renewable energy, enhanced food supply from domestic agriculture produce and diverse human resources.
<i>Tradition and cultural life</i>	To pursue development that is inclusive and mindful of tradition and culture of the country.

Source: CNDP2030

*NWFP: Non-Wood Forest Product

One of the prominent features of the CNDP2030 is the planning process involving many stakeholders from different fields and adopting a participatory approach with the application of the SEA. In this process, the vision-GREENIST, development strategies and various projects were referred as the macro level objectives. Especially, “Network society for integrated communication” and “Traditional and cultural life” will be a key for establishing the vision for the Project Area. The former represents the high potential of RCSP Area that would enable vitalisation of regional economy through utilisation of Gelephu airport and information technology, road network, etc. The latter which pertains to the rich natural resources in the Project Area comprising of biodiversity, cultural heritage and traditional activities, could be a basis for branding the region.

(2) 12th FYP

A vision of 12th FYP is represented by “Harmonious and Sustainable Society through enhanced decentralization”. It defines ‘A Just Society’ as ‘a society where every citizen has equitable access to resources and opportunities to pursue and realize individual and national aspirations. A Harmonious Society is defined as ‘a society where every individual lives in harmony with oneself, community, nature, culture and traditions. And ‘A Sustainable Society’ is ‘a society able to sustain its social, economic and environmental development needs’.

(3) Draft concept note for 13th FYP

“A Dynamic, Prosperous, Inclusive and Sustainable Economy in Pursuit of GNH” would be the main objective of the 13th FYP. In the draft concept note, it seems that “transformation” is a key for further prosperity of the country that entails reallocation of resources to the most productive sectors, activities, rapid and significant changes of an economic model for ensuring sustainability, leveraging digital technology, etc. which can lead to new economic activities.

Different from the conventional planning model, the note mentions that it is important to adopt a dynamic planning approach and framework that accommodates national and government priorities while ensuring sustained and continuous long term economic growth. It will also ensure alignment of all future plans with Bhutan’s overall development goal.

Results based approach with clear theory of change will be used in planning for logical plan framework, and for monitoring and evaluation. This will be undertaken in a coordinated and participatory manner with a mix of top-down and bottom-up planning approaches.

(4) 12th FYP for three Dzongkhags

1) Zhemgang 12th FYP

Livelihood and economy

As of 2015, the average annual household income of the Zhemgang Dzongkhag is the second lowest in the country. One of the factors for this is high dependency on agriculture and livestock. In Zhemgang 12th FYP, as the local economic strategy, it is also oriented towards the development of other sectors such as non-farm, eco-tourism, IT related business, etc. For instance, in the 12th FYP, it is suggested that diversification of products from cane and bamboo e.g., furniture and daily miscellaneous goods, will be encouraged and supported in order to diversify value addition apart from making traditional products such as bangchung.

The 12th FYP concludes that the Dzongkhag should put diversification of economic activities in the centre of development not depending on primary industry. To realise this, multi-stakeholder collaboration should be pursued to support CSIs, start-up and entrepreneurs who play an important role in contributing to local economic development and social service provision. Especially, the tourism sector such as eco-tourism would be the most promising not only for economic development but also for preserving traditional and cultural heritage.

Stakeholder collaboration

In the comprehensive manner, collaboration with many stakeholders is critical for local economic development and extensive collaboration among different sectors and institutions will be pursued. Also, it is suggested that Dzongkhag Business Council will be established as a forum to address the issues and facilitate ease of doing business. Furthermore, the council will also serve as a coordination mechanism between erstwhile Ministry of Economic Affairs (MoEA), Bhutan Chamber of Commerce & Industry (BCCI) and the business community in the Dzongkhag. In addition to supporting new cottage and small industries (CSIs), existing dormant and struggling firms which have the potential for growth will also be supported through policy input and investment push in collaboration with relevant institutions and agencies.

2) Tsirang 12th FYP

Livelihood and economy

It will plan and implement activities to bring the poor, vulnerable and women out of poverty on a permanent basis to ensure them a required level of abilities and resources to enable them to participate in local economic activities and opportunities for inclusive economic development and benefit out of it.

In tourism sector, apart from international visitors, efforts will be aimed at attracting regional and local tourists by improving existing infrastructures, developing new infrastructures and services including urban amenities such as parks, public spaces, standard hotels and restaurants, workshops, internet cafes and other service centres.

Considering potentials and long-term implications on the economy in terms of achieving our goal of food security and sufficiency, Dzongkhag has been focusing on conversion of agriculture land by providing assured irrigation water, addressing human-wildlife conflict through electric fencing, and minimising the loss of land due to monsoon rain, climate change etc.

From the perspective of the 12th FYP, Tsirang should focus on economic development with environment-friendly measures by fully utilising indigenous resources and generate sufficient job opportunities as an inclusive development supporting vulnerable people.

Stakeholder collaboration

The Dzongkhag will collaborate and consult with local stakeholders, agencies and experts to identify struggling and dying businesses and CSIs, as well as identify people and entrepreneurs who need specific help with existing operations of their businesses and CSIs, which will then be prioritized, for support and interventions.

3) Sarpang 12th FYP

Livelihood and economy

Considering the opportunities for economic growth, job creation and income generation in the Dzongkhag, the Dzongkhag administration will develop comprehensive local economic growth and job creation strategy. It will encompass the planning and implementation of the activities to lift the poor, vulnerable and women out of poverty at permanently and ensure them a necessary level of capacity and resources to participate in and benefit from the local economic activities and opportunities for inclusive economic development.

It will also facilitate and support new products development and marketing in tourism, in farm, non-farm sector, their quality, local brands, value chain and supply chain etc.

Stakeholder collaboration

The promotion of collaboration and consultations with relevant government agencies, and other public and private stakeholders, as well as local stakeholders, agencies and experts will be undertaken to identify struggling and dying businesses and CSIs. It is equally important to identify relevant people

and entrepreneurs. Preparatory work will be conducted to develop an action plan to assist entrepreneurs who aspire to be self-employed but lack both capital and space to start self-employment businesses and enterprises.

The Local Government business council will be established and will hold local business forum to discuss issues, finding solutions and recommending way forward.

3.1.3 Multi-stakeholder Meeting

A multi-stakeholder (MSH) meeting on each Dzongkhag were convened as the venue to explain the Project contents and to discuss on the initial output of this project such as the visions, the development concept and regional branding. The MSH meeting symbolises the participatory approach adopted in the Project for elaborating Regional Plan. Therefore, the participates of the meeting should be diverse a wide range of stakeholder. The number of participants at the first MSH meeting, held on September to October 2022 on each Dzongkhag, is shown in Table 3.1.2.

Table 3.1.2 Number of Participants on First MSH Meeting on Each Dzongkhag

Unit: Person

	Citizen including Gup ¹	Local group (CSO, NGO, etc.)	Company/business cooperative, etc.	Central government	Local government	Total
Zhemgang	5		2	5	21	33
Tsirang	8	1	2	7	17	35
Sarpang, Gelephu	10			12	40	62

Source: JICA Project Team

3.1.4 Vision for three Dzongkhags

A vision should be established for a comprehensive development for each Dzongkhag with a common vision for the future. The vision enables putting together efforts from various stakeholders for regional development. Establishment of a vision can contribute to branding the region which is an initiative to identify the uniqueness of a region and foster the growth of the unique strengths of the region.

Measures to increase attractiveness would be inseparable from economic/industrial activities in Bhutan. Especially, in the current situation where diversification of primary industries is lacking, it is essential to increase the attractiveness of the region through the establishment of industrial clusters. It could focus on specific products that give an edge over other Dzongkhags such as unique raw materials, skills and comparative advantage leading to local branding in the same principles applied for the One Gewog One Product (OGOP) programme.

Regional Branding is a key countermeasure against the common problems of “lack of regional attractiveness”, according to the problem analysis which was conducted by the participatory workshops held on May 2020. in the three Dzongkhags. It will be an initiative to distinguish the unique strength of a region and foster it by bringing it out through the region's core industries/cultures/traditions, etc. Also, the cooperation of local businesses/residents/organisation is essential for the formation of a strong regional brand in line with a vision established with ideal future.

(1) Vision for Zhemgang

1) Analysis of current situation and future perspective

According to the problem analysis described in Attachment of this report, the diversification of economic activities can contribute to the improvement of livelihood and provide solutions to other major problems such as abandoned households, lack of employment opportunity, etc. These problems cause

¹ Head of Gewog

population related problems such as rural-urban migration which might be difficult to tackle directly through any short-term interventions. Therefore, accepting the current situation, a unique vision different from conventional development value targeting to resolve the local issues, should be proposed. It would be not necessary to pursue a direction that looks at compensating for things which are currently non-existent in the Dzongkhag.

It would be effective to focus on increasing a connected population², which includes tourist and people who are interested in this region, in a pragmatic way. To do this, creation of attractive region would be necessary through the establishment of regional branding. While the connected population does not foresee the actual migration of people to the region as a permanent settler, at the outset it is important to deepen the relationship with the region as the connected population.

Zhemgang has rich forest cover. It is inherently due to this reason that the people's subsistence and culture are predominantly woven around its natural resources. The life beat of Zhemgang can be sustained by exploiting forests and associated activities for tourism coupled with their rich Khengpa culture which would be a big draw especially for eco-tourism, community tourism among others through wisely conserving and using the natural resource, tradition and culture.

2) Multi-Stakeholder meeting

The first Multi-Stakeholder (MSH) meeting was held on 29th September 2022. About 30 stakeholders participated in it. The stakeholders suggested the following points based on the draft vision prepared collaboratively by the JPT and the DHS:

- ✓ It should include 'To enhance livelihood of the people through sustainable socio-economic development in harmony with the nature';
- ✓ It is important 'To create local opportunity, growth and impact every community within Zhemgang Dzongkhag';
- ✓ 'Towards vibrant and high value of life/living in the new sustainable and profitable socioeconomic activities' is recommended, and
- ✓ 'Connecting community with a new innovation for better sustainability' should be included in the vision.

3) Vision

Considering the problems, the potentials and suggestions noted from the MSH meeting, the vision for development of Zhemgang is proposed as follows.

Vision for Regional Development of Zhemgang

New socio-economic development model with pioneering spirits, capitalizing on the rich cultural diversity, natural endowments, indigenous/local knowledge and entrepreneurship.

The vision aims to foster pioneering spirits in pursuit of a new socio-economic model in mountainous areas by making maximum use of the natural endowment in an environment of low population density, limited resources, and steep terrain, and not pursuing urban kind of lifestyle.

The model would pay more attention to possibilities of generating new types of employment opportunities. They would be different from the conventional model that pursues mainly economic growth not to mean that the model sacrifices economic growth in favour of employment generation. Methods to attain higher income levels are different from economic-oriented model. With the increase in connected population, the model enables to focus on capturing economic returns from the cultural and natural resources.

The vision aims to raise the standard of income level and reduce the poverty rate within a decade through

² Population based outside the region but continuously involved with the region and local people.

economic activities supported by local industrial entities such as CSIs, start-up and entrepreneur, and increased connected population. In terms of a foundation for livelihood, it is essential that basic infrastructure such as water supply will be improved.

The specific characteristics and priorities of a new development model can vary depending on regional needs, cultural contexts, and the specific challenges and opportunities facing a country or community. These models often evolve in response to changing circumstances and a growing awareness of the need for holistic, sustainable, and inclusive development.

BOX.1 Example of new development model to be pursuit in Zhemgang

The branding slogan of the Japanese small-town called Ama-cho³ is shown as an example: “We have nothing, we have everything”. It means not to imitate larger cities, but to make the most of their individuality.

In this way, Ama-cho has skilfully taken advantage of the disadvantages of a remote island and, with a reversal of thinking, has promoted community development using the "life on a remote island" as a resource. The town's bold, town-wide efforts are attracting people from outside the island, who are in turn making further contributions to the town, creating a positive cycle.



Source: Ama-Cho, HP

Figure 3.1.2 Example of New Socio-economic Model in Ama-Cho

Zhemgang have been facing the population decline and lack of social infrastructure for a long time, which is similar to many remote villages or small towns in Japan. To define the new socio-economic development model, which should be found by local people, in Zhemgang, following concepts would be referable.

- **Circular Economy Model:** This model emphasizes minimizing waste, optimizing resource use, and promoting recycling and sustainability. It aims to reduce the environmental impact of production and consumption while creating economic opportunities.
- **Social Entrepreneurship and Solidarity Economy:** These models focus on creating businesses and organizations that prioritize social and environmental objectives alongside financial goals. They often involve cooperatives, fair trade, and community-based enterprises.
- **Localism and Community-Based Models:** These models emphasize local production, consumption, and decision-making. They aim to strengthen communities, reduce dependence on global supply chains, and enhance resilience.

These models have in common the creation of a region that people in other regions keen to visit. Furthermore, local businesses, including start-ups, will contribute to the realization of these models, along with innovation. Since these models are not led by government, but by local residents of local

³ Ama-cho is one of the islands in the Oki Islands situated about 60 km off the Shimane Peninsula in the Sea of Japan

communities, it is important to draw a clear line between the role of the government and local communities.

4) Development concepts

The vision would be supported by the following development concepts that characterize the direction for the regional development of Zhemgang.

ZHEMGANG development concepts

- ✓ **Z**eal for collaboration with multi-stakeholders;
- ✓ **H**olistic service and basic infrastructure provision to improve living standards and livelihoods;
- ✓ **E**conomic activities with diversification, ensuring an increase in the income of individual households and a reduction in poverty;
- ✓ **M**anagement of natural resources and mechanism for resident-oriented environmental consideration;
- ✓ **G**overnance by means of a coordinated and participatory process, with a mix of top-down and bottom-up planning approaches;
- ✓ **A**ttractiveness of the region with sufficient promotion and a pragmatic strategy of regional branding;
- ✓ **N**etwork society with “connected populations” involved in regional development and
- ✓ **G**eneration of new CSIs, start-ups and entrepreneurs.

(2) Vision for Tsirang

1) Analysis of current situation and future perspective

According to the problem analysis, effective and optimum land use has not taken place which is evident in the expanded fallow land, low productivity, and scattered land ownership. From this viewpoint, both hard components such as irrigation development, soil improvement, etc. and soft components such as the introduction of centralised systems and commercialisation of agriculture produces, etc. has to be done with priority.

Despite the presence of a variety of tourism spots and products in Tsirang Dzongkhag such as traditional and cultural buildings, trekking activities, natural heritage, etc., the number of annual tourists visiting the Dzongkhag has been the lowest among the three Dzongkhags. Taking advantage of the accessibility and strategic location of the Dzongkhag, it would be vital for the tourism sector to develop, enhance and explore other types of tourism products. Agricultural-tourism and eco-tourism supported by the local people has a high potential to attract tourists. Utilising rich natural resources, stepwise and strategic approach would be effective. Training tour guides and promoting high potential agricultural activities could be a candidate of the direction for the first step of tourism development.

Similar to Zhemgang, it would be effective to focus on increasing a connected population that includes tourists and people who are interested in this region, in a pragmatic way. To do this, creation of attractive regions would be necessary through the establishment of regional branding. Tsirang already has a connected population to some extent. Furthermore, it is expected that the existing connected population would be more engaged in local economic activities and contribute to the local economy.

In terms of market, lack of public support and information sharing system encompassing the entire supply chain from producers, distributors, processors, and sellers have contributed to the inefficiency and ineffectiveness of the market management. This has resulted in producers not being able to sell their produces in the market with a reasonable price. The Dzongkhag distributes its agriculture produces to the capital city and others like Gelephu Thromde which has been found to impact the Dzongkhag negatively in terms of non-availability of agriculture products and high prices.

As per the statistical data, Tsirang had experienced comparatively the most significant rural-urban migration among the three Dzongkhags from 2005 to 2017. It is assumed that less job opportunities in

rural areas and lack of social service provisions caused this phenomenon.

2) Multi-Stakeholder meeting

The first MSH meeting was held on 12th October 2022. About 35 stakeholders participated in it. The stakeholders suggested the following points based on the draft vision prepared collaboratively by the JPT and the DHS:

- ✓ Tsirang can be an agriculture hub and it has a huge potential for agriculture. Therefore, vision should include agriculture and livestock;
- ✓ The vision should include words such as ‘security’. This is important for the private and corporate bodies to take part in the economic opportunities and activities without any fear of exclusion and disparity;
- ✓ ‘Green Tsirang’ has to be part of the vision as greening will bring the fallow land into life and irrigation would be necessary for this. Just by the mention of Green in the vision, it would cover many aspects of what Tsirang needs; and
- ✓ The plan should consider vulnerable groups such as women and disabled people and add words such as inclusive and accessibility in the vision.

3) Vision

Considering the problems, the potentials and suggestions noted from the MSH meeting, the vision for development of Tsirang is proposed as follows.

Vision for Regional Development of Tsirang

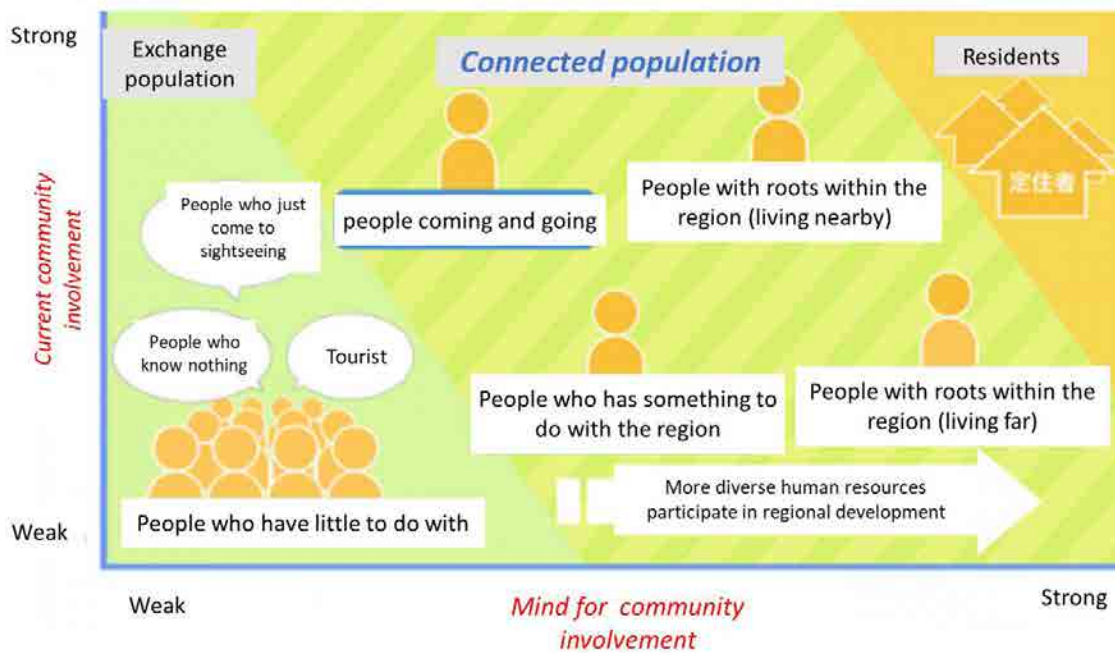
“Green Tsirang” is a highly developed agriculture/livestock base and network hub for economic growth and tourism development with improved security.

In the vision, “Green Tsirang” represents sustainability, cleanness and environmental conservation relating to socio-economy. “Green Tsirang” includes the concept branded as “Tsirang Natural” which is a label representing naturally grown vegetables and farm products. This type of socio-economy sees resources as capital on which development will be based. To ensure that developmental activities are supported continuously, capital needs to be conserved as much as possible. Economic efficiency is the prime criterion in pursuing the 20th century development model and the socio-economy will take social aspects into considerations more seriously.

In the vision, the security means it can provide various economic opportunities supporting all residents living in the region including vulnerable groups without any fear of exclusion and disparity. Inclusiveness would be enhanced in line with the improved security.

Indigenous resources related to local society, culture and heritage should be utilized to create niche markets for tourism and specialty products. These resources may be utilized for outward oriented development to vitalise the regional socio-economy supported by local governments and residents.

It is envisioned that Tsirang has high potential to be positioned as a network hub in many types of activities, taking advantage of the intermediate location connecting the capital region, the RCSP Area in Sarpang, India and other major cities. As a first step of economic development, it would be essential that the movement of people, goods, and money become more active in and around this Dzongkhag. Taking advantage of this position, it is expected to increase connected population accordingly. Connected population refers to people who are involved in a variety of ways with the region, not including people who have moved to the region, nor people who have come for tourism.



Source: JICA Project Team Translated HP of Ministry of Internal Affairs and Communications, Japan

Figure 3.1.3 Concept of Connected Population

To function as a network hub, economic activities should be diversified and logistic networks should be improved. It is promising not just as a transit area, but as a productive area for agriculture, livestock, service, etc. for exporting to other regions. Notably tourism related industries will be promoted. Establishment of the vision is expected to enhance these activities.

Also, becoming a network hub involves establishing a central location or system that facilitates the efficient movement of people, goods, and services within a region or across multiple regions. It should be considered several key factors to develop the hub as follows.

- Partnerships and Collaboration: Collaborate with transportation companies, carriers, logistics providers, and other stakeholders to establish routes and services and develop partnerships with government agencies, local authorities, and private sector entities to support the hub's growth;
- Accessibility: Ensure that the hub is accessible to all, including individuals with disabilities and provide appropriate infrastructure and services;
- Marketing and Promotion: Develop a strong marketing and promotional strategy to attract airlines, shipping companies, logistics providers, and travellers to the hub.

4) Development concepts

The vision would be supported by the following development concepts that characterizes the direction for the regional development of Tsirang.

TSIRANG development concepts

- ✓ Tourism promotion with the intensive engagement of local people;
- ✓ Strategic supply chain promotion for the main produce/products with an information sharing system to create sufficient job opportunities in rural areas;
- ✓ Integration of land based on a pragmatic land use plan and proper management;
- ✓ Redevelopment of large-scale and niche markets through the establishment of various connectivity and logistics functions;
- ✓ Attractiveness of region with sufficient promotion and a pragmatic strategy of regional branding;
- ✓ Network society for the integration of socio-economic activities and holistic social service provision and
- ✓ Governance enhanced by a coordinated and participatory process with a mix of top-down and bottom-up planning approaches.

(3) Vision for Sarpang

0) Analysis of current situation and future perspective

According to the problem analysis, most of the problems are divided into environmental/social problems faced in Gelephu and other types of problems in other areas. The problems faced by Gelephu might prevail in the entire RCSP Area in the future along with the urbanisation. In general, expansion of economy and population, and enhancing the initiatives for environmental conservation would be a trade-off in many cases. As for the environmental conservation, careful attention should be paid around large-scale infrastructure such as Jigmeling Industrial Park, dry port and airport. The natural environment also should be conserved as a regional heritage.

Human-elephant conflict occurs most frequently and it is one of the main human-wildlife conflict problem in Sarpang Dzongkhag including the RCSP Area. For many years, elephants have caused economic loss and social pressure on farmers of Southern Bhutan damaging crops and properties. To achieve high economic growth, it is necessary to mitigate these conflicts so that there is assurance of security for both residents and business entities.

The regional character for Sarpang inclines toward existing and potential for development of commercial activities, industrialisation and urbanisation. Its strategic location, nestled near the Indian border is crucial for accelerating transport, trade and commerce. Large areas which are flat and empty can be developed. Upcoming international airport and railway links from India would further position Sarpang Dzongkhag as an important socio-economic hub in Bhutan.

Cost effective infrastructure development is an important issue to support various socio-economic activities given the budget constraints. Considering the development stage of economy of Sarpang, sensible use of rich resources, and protection and enhancement of the social environment with unique socio-cultural heritage are critical in pursuing sustainable socio-economic development. It should achieve high economic growth in harmony with the environment through the development of quality infrastructure.

To strengthen an economic base and diversify economic activities, innovations created and applied in Thimphu, Japan or other countries should be actualised this region more effectively. Through innovative social reform, labour productivity shall be enhanced drastically to alleviate the disparity and to solve social and economic problems simultaneously. Especially, infrastructure sector can fully utilize the innovations by adapting ICT and other technologies suitable for this region.

Same as Zhemgang and Tsirang, it would be effective to focus on increasing a connected population in a strategic way including creation of attractive region through establishment of regional branding. Taking advantage of bordering India, Sarpang would accelerate the preparation of receiving the immigration from India. It is expected that the existing connected population including Indian people

would be more engaged in local economic activities.

1) Multi-Stakeholder meeting

The first MSH meeting was held on 10th October 2022. About 55 stakeholders participated in it. The stakeholders suggested the following points based on the draft vision prepared collaboratively by the JPT and the DHS:

- ✓ It is suggested to include environmental management in the vision;
- ✓ One of the participants requested experts for a comprehensive environmental management plan besides disaster management, and particularly for the river basin management of Maokhola, and
- ✓ On the social side, using the SCRP, implementing the Structural Plan to enhance community vitality and quality of life through planned development including connectivity, recreational areas and commercial hubs.

The participants also suggested the vision as “A prosperous Dzongkhag with well-developed infrastructure and enabling environment for industrial development, trade and commerce, tourism and agricultural productivity while also serving as the preferred gateway to Bhutan.”

2) Vision

Considering the problems, the potentials and suggestions noted from the MSH meeting, the vision for development of Sarpang is proposed as follows.

Vision for Regional Development of Sarpang

The largest industrial region in the country with well-developed infrastructure and comprehensive environmental management for industrial development, connecting the rest of Bhutan with the Sarpang-Gelephu corridor area.

The vision looks at Sarpang as having high potential to achieve high economic growth and lead the national economic activities. It looks at taking advantage of the economically suitable location connecting the capital region, India and eastern region. As a step-wise approach of economic development, it would be essential that the corridor area become a receptacle for local industry in the rest of Sarpang Dzongkhag and for whole industry in Bhutan.

In line with economic development, a comprehensive environmental management is important for sustainable socio-economic development. Especially, disaster risk and river basin management should be done by local initiative as they are familiar with local conditions, natural resources and environmental management.

The Dzongkhag development, in principle, enables pursuing outward oriented development such as globalisation. This is particularly relevant in view of the position of Sarpang encompassing the economic corridor linking two major cities, Sarpang and Gelephu. This does not contradict with the localisation model for “local consumption of local products.” The globalisation also means expanded opportunity to global market including the cross-border trade.

3) Development concepts

The vision would be supported by the following development concepts that characterizes the direction for the regional development of Sarpang.

SARPANG development concepts

- ✓ Security improvement, supporting diverse activities;
 - ✓ Affirmative actions towards foreign/domestic investors, ensuring intensive economic development with globalization;

- ✓ **Rapid economic growth, supported by international tourism and technology, representing ICT or other technologies;**
- ✓ **Proper infrastructure promotion and management to maximize regional potential along with environmental conservation;**
- ✓ **Attractiveness of region with sufficient promotion and a pragmatic strategy of regional branding;**
- ✓ **Network society aimed at the integration of socio-economic activities, as well as holistic social services provision and**
- ✓ **Governance enhanced by a coordinated and participatory process with a mix of top-down and bottom-up planning approaches.**

Source: JICA Project Team

(4) Validity of visions and development concepts for each Dzongkhag

In addition to a SEA implementation process described in Chapter 2, spatial development direction has been analysed and public participation through the MSH meeting and the RDP meeting, which are a basis of participatory approaches, has been ensured. Vision and development concept should be validated from different stakeholders including government, residents and the private sector.

1) Zhemgang

Residents and private sector in Zhemgang have almost identical perspectives for the regional development of Zhemgang. The key summarisation as follows:

- Preserving the richness of nature;
- Promoting tourism sector such as eco-tourism utilising rich natural resources;
- Taking advantage of the region's unique assets;
- Improving livelihood and social service;
- Financial support from government, and
- Collaborating with other regions to revitalize the region

On the other hand, government side has different perspectives as follow:

- Industrial development by making the most of the connectivity with the RCSP Area;
- Preserving traditional and cultural tourism, and
- Promoting agro-based Cooperatives.

The vision and development concept of Zhemgang is considered to be integrated, incorporating the perspectives of relevant stakeholders.

2) Tsirang

In Tsirang, residents and private sector have following perspectives of the regional development.

- Discovering sufficient market for selling local product with high-value;
- Branding promotion of "Tsirang Natural" with organic agricultural products;
- Promoting tourism sector such as eco-tourism utilising rich natural resources, and
- Regional brand promotion of local resources.

On the other hand, government side has different perspectives as follow:

- Industrial development by making the most of the connectivity with the RCSP Area;
- Creating a recreational park;
- International convention centre for conferences and seminar for national and international level;
- Preserving traditional and cultural tourism, and
- Promoting agro-based cooperatives.

It is posited that the vision and development concept for Tsirang are consistent with the perspectives of

relevant stakeholders by making slight modification to the slogan from ‘Tsirang Natural’ to ‘Green Tsirang’.

3) Sarpang

In Sarpang Dzongkhag and Gelephu Thromde, residents and private sector have following perspectives for regional development.

- Commercial agriculture and livestock farming;
- Taking advantage of tourism entry point for resorts and amenities;
- Promoting regional branding through social media, event, festival, etc., and
- Promoting local resources such as minerals, quarries, hot spring, etc.

On the other hand, government side has different perspectives as follow:

- Commercial hub with international airport;
- Industrial centres and Hubs for every product;
- Opening of Additional Trade Route, and
- Developing resorts and amenities

The perspectives of relevant stakeholders are considered to be integrated into the formulation of the vision and development concept for Sarpang.

3.2 Branding the Region

3.2.1 Importance of branding the region

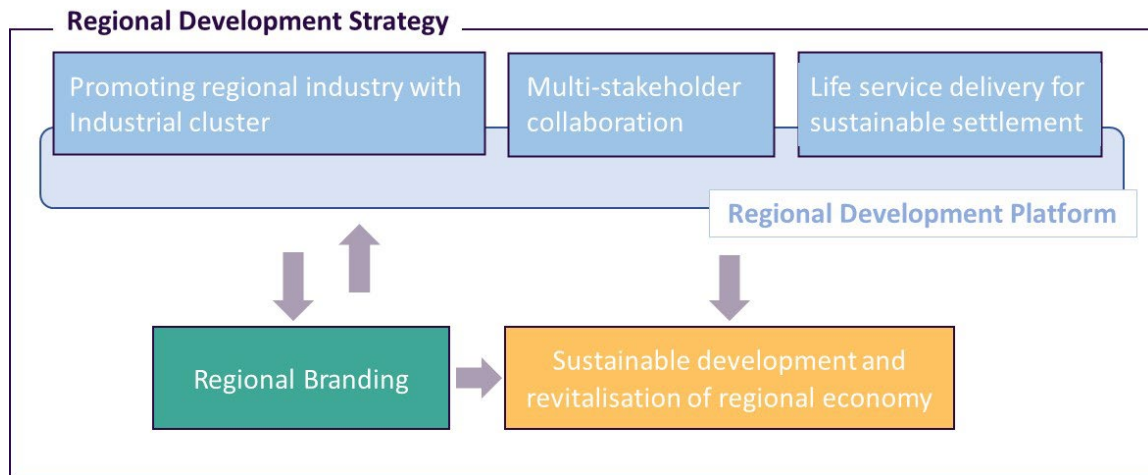
(1) What is regional branding?

Regional branding is a series of efforts to clarify the differences of a region and to foster the strengths unique to the region, along with promoting and communicating them externally as a regional brand by unifying the region and developing the region's core industries. In regional branding, it is said that it would be essential for local persons, businesses and merchants to work together as one, from the primary and secondary industries to the tertiary industries.

(2) Why is regional branding necessary?

The Regional Development Strategy will be developed based on the three pillars of promoting regional industry with industrial cluster to secure livelihood improvement, improving life service delivery system for sustainable settlement and multi-stake holders' collaboration. These strategies have a potential to formulate a core image of the regional branding through granting the uniqueness of the region: attractive industry, good social security and unity of various stakeholders.

Furthermore, in formulating the development strategies, it will be effective to focus on strengthening branding with a view to sustainable development of the region and revitalisation of the regional economy. In other words, several strategies for the sustainable development and revitalisation can be embodied through the establishment of the regional branding.



Source: JICA Project Team

Figure 3.2.1 Structure Related to Regional Branding

3.2.2 Procedure of regional branding

(1) How is Regional Branding achieved?

Sustainability is enhanced by stimulating local agriculture, industry, logistic, tourism, etc. to attract people, goods and money to the area. New business models with local added value can be created in the region through commercialisation of resources with regional branding. The cooperation of local businesses/residents/organisation, etc. is essential for the formation of a strong regional brand.

In the planning process for the SCRP, a series of discussions, the MSH meetings and participatory workshops have been conducted so far. These kinds of the sessions will be integrated into the RDP after the establishment to ensure periodical discussion opportunities and decision-makings among the regional stakeholders. Based on the work, formulation and implementation process of the regional branding is proposed as Figure 3.3.2. Implementation of the promotion activity would be commenced after the Project completion led by the RDP members.



Source: JICA Project Team

Figure 3.2.2 Formulation and Implementation Process of Regional Branding

(2) Regional Development Platform

The RDP is formed with the aim of improving the coherence of planning and achieving proactive local development through the continuous participation of diverse people in local development planning from planning to implementation. Members are expected to be actively involved and be able to evaluate and monitor the process.

As for the regional branding, it is essential for stakeholders to involve not only strategical setting, but also implementation stage. Therefore, it is expected that the RDP can lead this collaborative work from formulation of branding concept to implementation of the activities related to promotion.

(3) Progress of regional branding

As of October 2023, a work for identifying local resources and drafting the branding concept is mostly completed as described below. However, this output should be elaborated through further discussions and collaborations. Subsequently a promotion plan will be formulated to disseminate the regional branding concept to rest of the country.

3.2.3 Regional characters

(1) Zhemgang

Zhemgang has forest cover of 94.17% while almost 90% area of the district also falls within biological corridors. The Dzongkhag has been blessed with rich biodiversity with its lush forests: it is a home to 22 endangered animal species including the Golden Langur. Though much of the Dzongkhag has warm and humid climatic conditions, its northern regions have moderately cool temperature. The terrain in the Dzongkhag is also rugged and its steep slopes inhibit large scale agriculture although in the last three decades plantation of crops such as mandarin oranges and cardamom have been carried out in most areas of the district.

The Dzongkhag also has a number of potential tourist sites: Buddhist temples namely the Buli Lhakhang and Tharpa Choeling Lhakhang; and cultural sites namely Buli Tsho (lake) and the Duenmang Tsachu (hot springs). They are an attraction for domestic tourists in winter. There are also several heritage settlements namely the Trong and Dangkhar villages and the Ngala Trong.

The Khengpas (ethnic people of Zhemgang), who speak Kheng-kha are known for their rich culture, folk songs, and festivals among others. They are also skilled in weaving cane products such as Bangchungs (woven bamboo plates) and Aumbuli (containers) and have deep knowledge of the forests, animals, birds and plants.

The main income of each gewog in Zhemgang is currently from the sale of cardamom, citrus, and vegetable. In OGOP programme, processed value-added food products being different from current main income sources are suggested. Also, these products have a high potential for tourism.

Table 3.2.1 Main Income and One Gewog One Product List in Zhemgang

Gewog	Main income	OGOP Product	Other product	Other future potentials
Trong	Citrus, Cardamom	Turmeric powder, Banana chips, Bamboo Pickles (KNC), Local rice	Organic ginger powder, watermelon	Quinoa, avocado, banana
Nangkor	Vegetable & Cardamom	Turmeric powder & Quinoa	Rice, corn flakes (Tengma)	Passion fruit, Avocado
Bardo	Cardamom	Buck wheat flour	Rice & Cardamom	Quinoa, cardamom
Shingkhar	Chili	Dry chili	Cardamom, Citrus	Quinoa, passion fruit, Avocado
Phangkhar	Citrus	Cornflake / tengma production	Ginger, Turmeric	Watermelon, Pineapple
Goshing	Citrus	Pineapple production & its products	Ginger, Turmeric	Passion fruit, pineapple
Ngangla	Citrus	Pineapple production & its products	Vegetable, Ginger, Turmeric	Pineapples, watermelon
Bjoka	Citrus, Cardamom	Tsharzo product	Maize, Citrus	Avocado, vegetable, quinoa, passion fruit

Source: Zhemgang Dzongkhag

(2) Tsirang

Tsirang Dzongkhag is often called the ‘vegetable capital’ of Bhutan. This is primarily because of the climatic, soil fertility, and favourable altitude (500 to 1900 msl) and water availability to ensure year-round cultivation of a range of vegetables and fruits. Organic vegetables grown in the Dzongkhag are in high demand in the urban centres of western Bhutan, particularly Thimphu. Also, it exports mandarin (orange) and cardamom, the top three cash crops exported to Bangladesh. There is potential to exponentially promote horticultural cultivation with improved technology to produce organic fruits and vegetables for export. There is potential to enhance animal husbandry activities on a commercial scale such as poultry, dairy, piggery, goat and fish farming.

There is also a good potential for tourism which until now has largely remained untapped. The gently sloping agricultural lands present picturesque scenery coupled with traditional mule tracks that traverse the villages. There is demand for development of tourism products and Tsirang has natural terrain for trekking routes, and natural assets like 87.5% forest cover, hills, rivers, lakes for community and eco-tourism and cultural monuments (66 religious monuments). Given all these natural assets that Tsirang has, people could invest in homestays to provide an experience of village life and at the same time contribute to the local economy.

(3) Sarpang and Gelephu Thromde

Sarpang is developing as a hub for industry and commerce with substantial future prospects growth. An industrial park, worth Nu 300 million is being built at Jigmeling, 15 km away from Gelephu and it is expected to accelerate Sarpang Dzongkhag’s status as a growing industrial zone. Besides, construction of a mini-dry port has also commenced within the Gelephu Thromde boundary which will not only benefit the Dzongkhag but the entire area of the Southern Central Region. It will improve cargo handling services, facilitate import of raw materials and export of both finished goods and raw materials to India and Bangladesh.

In the context of agriculture, in which 52% of the employed people are engaged in, vegetables cannot be grown at larger economies of scale. However, a heavy rain is beneficial for paddy cultivation and fisheries. With augmentation of water through irrigation, a host of other winter crops can be grown commercially at a large scale for export and internal supply to other Dzongkhags. The potential for seasonal (winter) commercial horticulture crops is huge. Sarpang is a net contributor to GDP through exportable cash crops such as cardamom and oranges. The humid foothills and forests are ideal ecosystems for these crops to thrive.

In terms of potential for tourism, there are huge opportunities in exploring unique local traditions, culture, language and religion of diverse ethnic groups in the Sarpang Dzongkhag. The cultural attractions in Sarpang Dzongkhag include the Hindu Shiva Temple gifted by His Majesty the King, the Vaishnav temple and Patshala at Jigmecholing, the hot springs near Gelephu and the sacred site at the upper reaches of Dhol khola dedicated to God Shiva. The numerous rivers also have many picnic spots. Wildlife such as the peacock, hornbill, golden langur and elephants supplement the flat and lush southern landscapes.

3.2.4 Proposition for Regional Branding

(1) Draft of slogan for promotion of regional brand

A slogan should be developed to further promote a brand concept. The slogan should be shared among the stakeholders for the dissemination of regional resources. It is also necessary to verbalise every detail of the regional brand and prepare the brand to be correctly communicated.

The slogan will be developed through multi-stakeholder discussions in the RDP. As of now, the following slogans for each Dzongkhag are proposed.

Zhemgang

“Living with nature, having priceless value and experience”

Tsirang

“Designing life with seamless network”

Sarpang

“Taking challenge, making new things and changes”

3.2.5 Developing a brand concept and promotion plan

(1) Strategy for branding promotion

In order to brand the Project Areas, underlying strategies should be developed in branding the region. The promotional strategies have been proposed through the collaborative work such as multi-stakeholders’ meetings, numerous interviews and incorporating digital revolution and trends as following.

1) Develop and finalize logo and slogan of each Dzongkhag for strategic destination branding

A logo is a tool that can convey various information, messages, impressions, and images to people through symbols (shapes), logotypes (letters), and colours. It is preferable for logo accompanied by Slogan.

2) Create travel website or provision of travel page on the current Dzongkhag website

It will be created tourism website that will be an informative, attractive, and functional marketing tool to inspire targeted audiences.

The website should be linked with tour operators and travel planners to book and pay for their trip to the country (including hotels, guides, etc.).

3) Create official social media

As of October 2023, the three Dzongkhags has respective Facebook pages, however, to leverage more visibility of the destination, each district must incorporate digital marketing.

Hence, the first step towards digitization will be creating social media pages including Facebook, Instagram, Pinterest, YouTube, etc.

4) Product placement

Locally oriented groups such as farmers' groups and women's groups struggle to market their products. Some of them have channels to sell in Thimphu. It would be preferable for them to have a proprietary channel for the marketing, because the margins are higher than having a shop or counter in Thimphu.

In some cases, vegetables harvested in other regions are sold as produced in Tsirang for recognition of Tsirang as producing high quality and organic vegetables. Labelling the produce with a clear mention of the origin of the produce will be necessary.

5) Host festivals and MICE events to attract more visitors (both local and tourists)

Introducing vibrant festivals such as host rafting, orange festival, watermelon festival, etc. or any MICE event according to the logistical capacity of the Dzongkhag can bring in more visitors.

6) Collaborate with mainstream media and CSOs

Dzongkhags must consistently collaborate with mainstream media and prints such BBS, BBS Radio, Kuensel, Business Bhutan, Bhutan Times, Kuzoo FM, Radio Valley to promote destination and its product and services.

Dzongkhags could also prepare newsletters and content releases to the press and media for frequent

visibility of destinations and brand.

7) Collaborate with content creators, bloggers (Influencer marketing)

In order to promote the Project Area, Dzongkhags can collaborate with Department of Tourism to invite influencers from around the world to experience Bhutan and eventually marketing Bhutan through digital contents.

It would be effective to recruit brand ambassadors from the existing customer base who willingly participate in promotional activities.

8) Promotional contents and collaterals such as videos, flyer, newsletter, inflight magazines, podcast, blogs, live video marketing

Content marketing builds brand visibility, awareness, generates leads, and increases sale of the product or services. Person in charged must develop marketing content to elevate brand vision and philosophy and increase customer engagement with such messaging.

With the advancement of the digital age, content has become an essential part of any marketing strategy.

9) Online paid promotion (SEO content marketing) and affiliate marketing

In order to boost the digital contents produced from these three Dzongkhags, it is very important to invest on online paid promotion and SEO⁴ content marketing to boost engagements and visibility.

Affiliate marketing is a marketing model in which third-party publishers promote a merchant's goods or services and receive a percentage of the sales or web traffic made as a result. It is typically considered a key part of modern digital marketing.

10) Appoint social media manager/content writer

Although the position of social media manager or content writer is new in country, it is very important to recruit an expert who is exceptionally savvy and creative.

As of today, the existing social media pages are managed by officers working in Dzongkhag or no one at all. There seems to be lack of coordination in generation and posting contents online.

11) Develop complete travel guide book

In order to promote tourism, the Project Area must create travel guide comprising of all the information regarding the landmark, culture, people of each Dzongkhag.

Most of current general travel book information are outdated and mostly written about tourist destination and landmarks in western part of Bhutan.

12) Recognize signature landmark

It is recommended to develop unique landmark of the brand and place it at popular site or recognize a popular attractive site in each Dzongkhag or create unique signages.

(2) Action plan branding promotion

1) Output of 2nd RDP meeting

Action plans for each Dzongkhag and Gelephu were prepared by the participants at the 2nd RDP meeting held on 16th October 2023.

The preparation was carried out according to the following procedure;

⁴ Search engine optimization

- (a) Prioritize the branding strategies by groups (2 or 3 groups in each Dzongkhag)
- (b) Promotion of strategies (implementer, method, time frame, funding) by groups
- (c) Dzongkhag-wise discussion and preparation of action plans

The action plans for each Dzongkhag and Gelephu are proposed below table. The contents of the Table are a bit modified by the JPT.

Table 3.2.2 Action Plan Proposed by Each Dzongkhag Group

Sarpang Dzongkhag

	Short-term (2024)	Medium-term (2026)	Long-term (2028)
Action Plan 1 (Marketing and promotion)	Preparation work for marketing and promotion initiated by Gewog administration		Formation of users group
Action Plan 2 (Utilizing media)	-	Social media: Telegram/WhatsApp	Marketing website
Action Plan 3 (Product Placement)	-	Enhance communication system	Local produce
Action Plan 4 (Event)	-	Establishment of Processing Units	Sales Outlet

Gelephu Thromde

	Short-term (2024)	Medium-term (2026)	Long-term (2028)
Action Plan 1 (Marketing and promotion)	Logo and slogan, signature and Landmark	Enhance GPS Services (Update Road Network and other information on google maps)	<ul style="list-style-type: none"> • Expansion of Airport • Construction of railway and elephant corridor
Action Plan 2 (Utilizing media)	<ul style="list-style-type: none"> • Create official social media • Promotional contents and collaterals • Appoint social media managers 	<ul style="list-style-type: none"> • Create travel website • Collaborate with content creators/bloggers 	<ul style="list-style-type: none"> • Develop complete travel guidebook • Online paid promotion
Action Plan 3 (Event)	-	Collaborate with mainstream media and CSOs	Host festivals and MICE events

Tsirang Dzongkhag

	Short-term (2024)	Medium-term (2026)	Long-term (2028)
Action Plan 1 (Marketing and promotion)	Logo and Slogan (Tsirang Naturals) and create Website	Brochure and pamphlet	-
Action Plan 2 (Connectivity)	-	Improve road connectivity	-
Action Plan 3 (Product Placement)	Input supplies	<ul style="list-style-type: none"> • Adoption of new technologies and capacity building • Value addition 	Develop niche market, festivals and cold storage

Zhemgang Dzongkhag

	Short-term (2024)	Medium-term (2026)	Long-term (2028)
Action Plan 1 (Promotion and	Logo and slogan	<ul style="list-style-type: none"> • Infrastructure • Marketing 	Festivals and events

marketing)			
Action Plan 2 (Utilizing media)	Social media and travel website	<ul style="list-style-type: none"> • TV/Radio • Bloggers 	<ul style="list-style-type: none"> • GPS • Maps • Coordinates
Action Plan 3 (Product placement)	<ul style="list-style-type: none"> • Advertisement • Online shopping 	Guidebooks, pamphlets and brochures	<ul style="list-style-type: none"> • Exhibitions and Expos • Festivals
Action Plan 4 (Events)	<ul style="list-style-type: none"> • Consultations • Advocacy 	<ul style="list-style-type: none"> • Festivals • Feedback Systems 	<ul style="list-style-type: none"> • Exhibitions and Expos • Festivals improvements

Source: Result of participatory workshop in 2nd RDP meeting

2) Step-wise approach for branding promotion

Creating a successful regional branding strategy involves various elements that help showcase the unique identity, culture, and offerings of a specific area. Actually, it is not easy to implement the pragmatic actions to realise the strategies. Therefore, according to the output of 2nd RDP meeting, it is proposed a comprehensive guide to develop a regional branding strategy with step-wise approach as follow.

Short-term (to 2024)

Logo and slogan should be created immediately within the framework of the RDP. Under the slogan which can foster the common recognition among the local players, collaboration with media and CSOs will be strengthened.

A concept of product placement will be disseminated to all target areas, so that websites and social media can have a basis for active engagement. Collaboration with social media manager/content writer can lead to success of events in the target area, which will be updated on the website.

Mid-term (2024 to 2026)

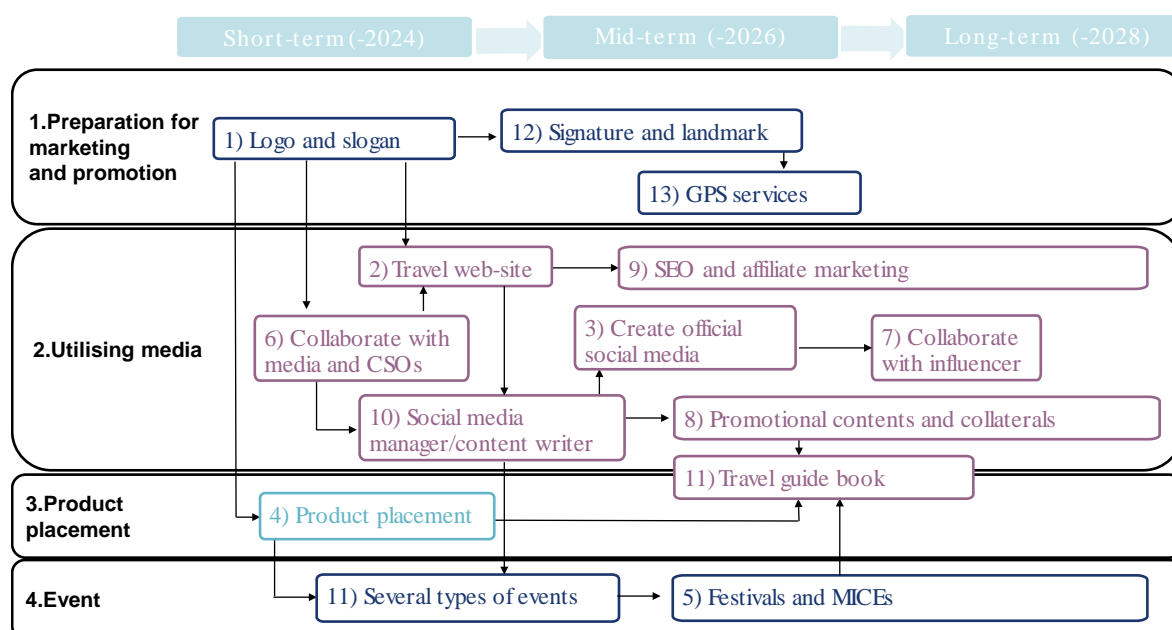
Travel website will be linked with tour operators and travel planners to book and pay for their trip to the country. It is preferable for the website to have a reciprocal link with Dzongkhag and Department of Tourism's website.

Digital marketing is an effective tool, the first step towards digitalisation should be the creation of social media pages for each Dzongkhag, such as Facebook, Instagram, Pinterest and YouTube.

Long-term (2026 to 2028)

Organizing several types of events will be continued from initial stage. Then, holding big festivals and promoting MICEs will be realised.

To upgrade the influence of website and to make it pragmatic tool, SEO and affiliate marketing will be developed and digital contents will be boosted.



Source: JICA Project Team

Figure 3.2.3 Regional Development Concept in the Project Area

3.2.6 Regional development concepts

(1) Constraint for regional development

Most tourists originating from Thimphu are less likely to visit Zhemgang. The main tourist route from Thimphu is mainly to Punakha and Wangdue Phodrang. Only a limited number of people venture to Zhemgang. Panbang also has potentials for promotion of tourism but due to remoteness and distance from the Zhemgang Town and Gelephu Thromde, measures to utilise this potential are needed. It has been facing difficulties in integrating tourism resources into core package of synergistic benefits.

Central area of Tsirang, especially Damphu, is located in the midway between capital city of Thimphu and border city of Gelephu, connected by a national highway. Notwithstanding the relative advantage due to location, only the annual number of tourists visiting it is fewer than other Dzongkhags. The flow of people and goods has been mainly from Tsirang to Thimphu due to which it would be difficult to create well-productive activities and add value to the products. Currently, major production activities such as agriculture, etc. have been limited to more inward development within the region.

In Sarpang, the development in the northern hinterland of the RCSP Area is behind compared to the flat area in the south. Some areas of the hinterland face higher level of poverty. Should the RCSP Area develops highly, environmental concerns could emerge. The RCSP Area has opportunities for development taking advantage of the wide flat area which is favourable for heavy industry, light industry, ICT, primary and secondary industry, and services.

(2) Regional development concepts

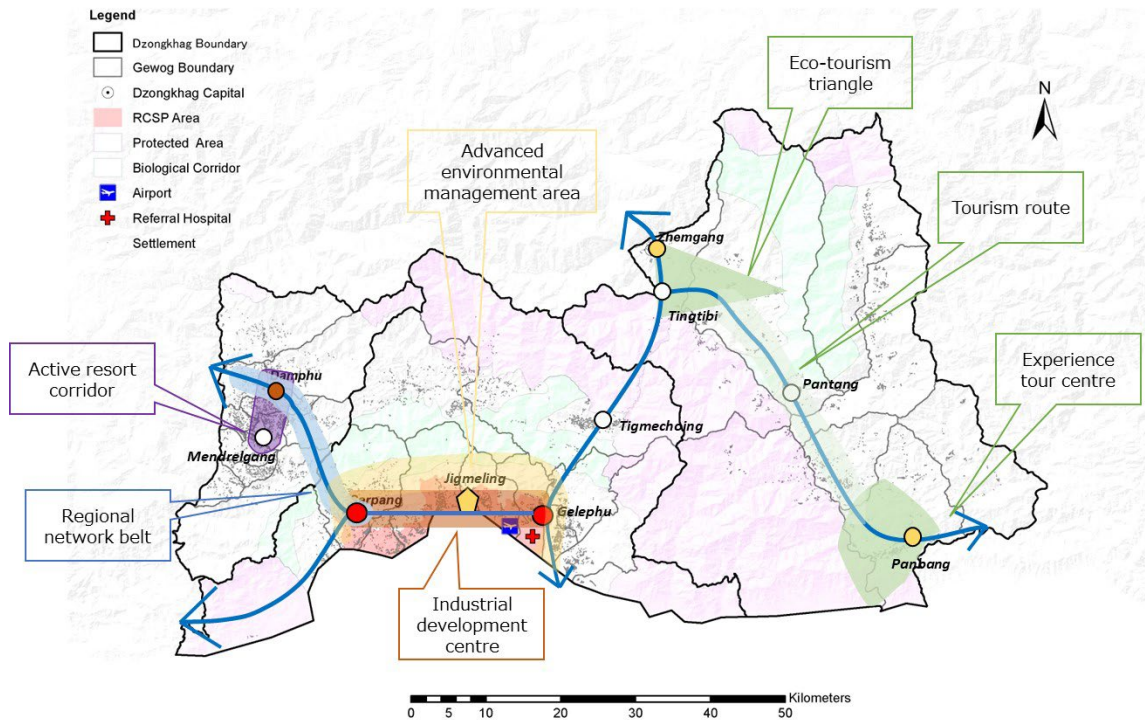
In order to realise the promotion of regional branding of each Dzongkhag, it would be effective for the visions and regional development concepts to be tied to the branding concept mentioned above. Some promotional measures also should be related to specific geographic locations and thus should be implemented as a set of related promotions in respective localities for effectiveness. The concepts are defined to establish consistent policies of the government for coherent implementation of related projects and facilitate coordination between various implementing organisations.

In Zhemgang, there is so much potential for eco-tourism surrounding Zhemgang Town. In Panbang, there is even more potential considering the Manas wildlife safari, Manas white river rafting, and

adventure including rock climbing, bicycling, mountain biking, and bungee jumping, etc. to be considered for experience tourism. Panbang has also hosted conferences and became a favourite destination for the locals to do vacations. People would be entering the tourism area through Trongsa or from Sarpang. However, using the "Tourism route", it could strengthen the socio-economy within Zhemgang. The tourism route could be a way to vitalise the other parts of Zhemgang. There could be all kinds of services for tourists such as small cafes, etc.

For Tsirang, its vision has two parts. The first being 'Green Tsirang' which aims at developing agriculture/livestock including value added and eco-friendly products to compete with products of other Dzongkhags. The second- 'network hub' aims for realising a seamless network for attracting connected population. Mendelgang has potential to be developed into a town to complement Damphu. It could be established as a resort spot and livelihood centre and function as a base for tourism and community activities.

In Sarpang, more advanced industrial development should be achieved. The impact centred on the RCSP Area should be disseminated to the neighbouring regions including hinterland towards north. In parallel, an advanced environmental management should be done properly to mitigate environmental deterioration in order to avoid the Dzongkhag from impacts of uncertainties arising out of development in India and neighbouring regions.



Source: JICA Project Team

Figure 3.2.4 Regional Development Concept in the Project Area

3.3 Reginal Development Framework

3.3.1 Population projections

(1) Population projection

Table 3.3.1 shows the summary of the population projections in the Project Area by NSB and the CNDP2030. As shown in the Table, the results between (a) National Statistics Bureau (NSB) projections,

which is assumed that the level of migration⁵ between 2005 and 2017 will continue until 2027 and (b) the case without policy intervention by the component method, which considers the influences of demographic factors by CNDP2030 are not different from each other. On the other hand, the projected population of Sarpang in 2030 for the case with policy intervention is different from those of the above-mentioned two cases. As policy intervention, Jigmeling industrial park development between 2017 and 2030 and the positive impacts of the proposed Linked Urban Centres (LUCs) Development is considered.

Table 3.3.1 Population Projection in the Project Area for SCRП by NSB and CNDP2030

Dzongkhag	PHCB 2017	NSB Projections			CNDP2030 Projections			
					Case without policy intervention		Case with policy intervention*	
	2017	2023	2025	2027	2023	2030	2023	2030
Sarpang	46,004	50,221	51,714	53,192	50,797	54,768	49,462	70,633
Tsirang	22,376	24,073	24,671	25,259	23,725	25,191	23,373	23,371
Zhemgang	17,763	16,753	16,384	15,979	16,649	15,048	16,403	13,961
Total	86,143	91,047	92,769	94,430	91,171	95,007	89,238	107,965

Source: JICA Project Team based on Population and Housing Census of Bhutan (PHCB) 2017, Dzongkhags Population Projection 2017-27 by NSB and CNDP2030

The population of Gelephu Thromde is also estimated by case without policy intervention assuming that the level of migration between 2005 and 2017 will continue until 2030 and by case with policy intervention.

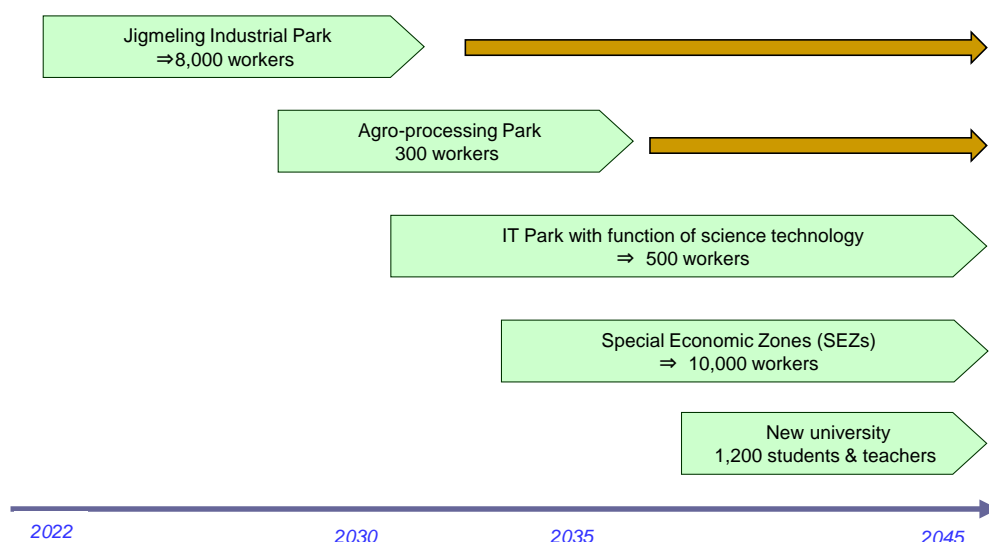
As a result, the population of Gelephu Thromde was 9,858 in 2017 and will reach 10,199 in 2023, and 10,463 in 2030 respectively for the case without policy intervention, and will reach 10,419 in 2023 and 20,850 in 2030 respectively for the case with policy intervention,

In the SCRП, on the other hand, the population in the Project Area is newly projected until 2045 in accordance with the Macro-development Alternatives A-2 and B of SEA through the latest data and information. The projected population are calculated in the following steps.

First, the future population until 2045 is estimated by the component method, which considers the influences of demographic factors, such as the first-year single-age population, the age-specific fertility rate, the total fertility rate, and life expectancy, based on NSB projection data. The total fertility rate is expected to decline from 2017 to 2032 and then remain constant at 1.70 from that point until 2045, according to the assumptions of NSB.

Secondary, the internal and international migration or social increase as the impact of the existing and proposed several industrial development projects in the RCSP Area, namely, Jigmeling Industrial Park, Agro-processing Park, SEZs and IT Park with function of science technology, together with the newly proposed college in Sarpang Town, is additionally and simultaneously considered between 2022 and 2045 according to the timeframe. This includes employees and their families, students, staff, faculty, and their families affiliated with these projects, as previously as shown in Figure 3.3.1 below.

⁵ Migration statistics is shown in 3.5.1 of the PrR



Source: JICA Project Team

Figure 3.3.1 Mapping of estimated employments and their distribution by proposed projects in the RCSP Area based on the timeframe

As for the proposed college, number of students, staff, faculty and their families will be estimated to be 1,200 by 2045. All of them will be located in Sarpang Dzongkhag.

As a result, the population projection of the Project Area by Alternative A-2 in 2030 and 2045 amounts to 110,400 in 2030 and 150,300 in 2045, respectively, as shown in Table 3.3.2.

Table 3.3.2 Population Projection of the Project Area between 2022-2045: Macro-Development Alternative A-2

Dzongkhag	2022	2030	2035	2045	Annual Average Growth Rate (%) 2022–2030	Annual Average Growth Rate (%) 2030–2035	Annual Average Growth Rate (%) 2035–2045
Sarpang	48,700	65,400	78,600	99,400	3.74	3.75	2.37
Gelephu Structure Plan Area	10,700	19,000	24,300	33,000	7.45	5.06	3.09
Tsirang	23,200	25,100	26,400	28,200	0.99	0.99	0.67
Zhemgang	18,300	19,900	20,900	22,700	1.02	1.02	0.81
Total of the Project Area	90,300	110,400	125,900	150,300	2.55	2.67	1.78

Source: JICA Project Team

On the other hand, the population projection of the Project Area by Alternative B in 2030 and 2045 amounts to 109,100 in 2030 and 120,000 in 2045, respectively, as shown in Table 3.3.3. Alternative B takes into account the population increase only resulting from the development of Jigmeling Industrial Park as a policy intervention, and it adopts a slightly higher growth rate than the past trend.

Table 3.3.3 Population Projection of the Project Area between 2022-2045: Macro-development Alternative B

Dzongkhag	2022	2030	2035	2045	Annual Average Growth Rate (%) 2022–2030	Annual Average Growth Rate (%) 2030–2035	Annual Average Growth Rate (%) 2035–2045
Sarpang	48,700	64,800	67,600	71,400	3.63	0.90	0.54
Gelephu Structure Plan Area	10,700	19,000	19,800	21,200	7.40	0.92	0.64
Tsirang	23,200	24,700	25,700	27,000	0.79	0.79	0.47

Zhemgang	18,300	19,500	20,400	21,600	0.82	0.82	0.61
Total of the Project Area	90,300	109,100	113,700	120,000	2.40	0.83	0.54

Source: JICA Project Team

3.3.2 Projection of the numbers of employments

The numbers of employed persons of the Project Area in 2017 according to PHCB2017 was 40,629. By Dzongkhag, Sarpang amounted to 20,661, Tsirang was 11,302, and Zhemgang was 8,666.

The future employed persons for Macro-development Alternative A-2 and B is estimated based on several indicators such as (i) the projected future population, which is discussed in the preceding section, (ii) the ratio of the working-age population (15 years of age or over) in the total population, and (iii) the labour force participation ratio or the ratio of economically active population, which is defined as the ratio of active population including both employed and unemployed people divided by the working-age population. According to the calculation, the ratio of the working-age population is almost between 78% and 84% between 2022 and 2045, and the labour force participation ratio is about 63%.

As a result, as shown in Table 3.3.4, the number of projected employed persons in the Project Area will increase from 44,000 in 2022 to 56,100 in 2030 and 79,200 in 2045 for the case of Alternative A-2. By Dzongkhag, the number of employed persons in 2045 amounts 53,000 in Sarpang, 14,600 in Tsirang, and 11,600 in Zhemgang.

Table 3.3.4 Projection of Number of Employments in the Project Area Between 2022-2045: Macro-development Alternative A-2

Dzongkhag	2022	2030	2035	2045
Sarpang	23,900	33,400	40,900	53,000
Tsirang	11,300	12,700	13,400	14,600
Zhemgang	8,800	10,000	10,500	11,600
Total of the Project Area	44,000	56,100	64,800	79,200

Source: JICA Project Team

On the other hand, as shown in Table 3.3.5, the number of projected employed persons in the Project Area will increase from 44,000 in 2022 to 55,700 in 2030 and 63,300 in 2045 for the case of Alternative B. By Dzongkhag, the number of employed persons in 2045 amounts 38,300 in Sarpang, 13,900 in Tsirang, and 11,100 in Zhemgang.

Table 3.3.5 Projection of Number of Employments in the Project Area Between 2022-2045: Macro-development Alternative B

Dzongkhag	2022	2030	2035	2045
Sarpang	23,900	33,100	35,000	38,300
Tsirang	11,300	12,500	13,000	13,900
Zhemgang	8,800	9,900	10,300	11,100
Total of the Project Area	44,000	55,500	58,300	63,300

Source: JICA Project Team

3.4 Development Strategy

3.4.1 Livelihood improvement by industrial cluster development

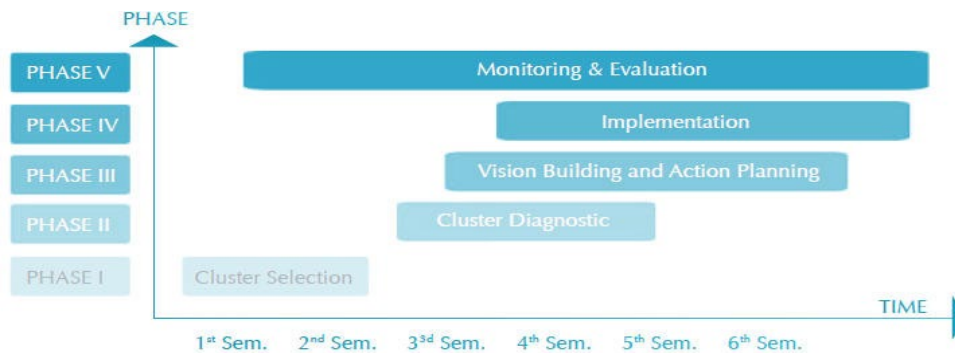
(1) Concept of industrial cluster development

Industrial cluster development is a key for private sector development and regional development in the Project Area. According to United Nations Industrial Development Organization (UNIDO)⁶, to help cluster stakeholders reduce barriers, measures are needed to (a) foster linkages between cluster stakeholders, (b) facilitate consensus building, (c) build relationships, (d) encourage trust building, (e)

⁶ UNIDO Approach to Cluster Development; Key Principles and Project Experiences for Inclusive Growth 2013

strengthen governance mechanism, and (f) support the cluster’s institutional network. Also, UNIDO states that their approach focuses on providing incentives for public and private sector bodies to more effectively promote cluster development and to build their capacity to do so, and that relevant local, regional and national institutions, including chambers of commerce, local governments, NGOs, producer associations, universities, training institutions and regional as well as local economic development agencies are assisted to gradually assume a strong supporting role in the development of clusters.

The phased cluster development is composed of five phases; Phase 1: Cluster Selection, Phase 2: Cluster Diagnostic, Phase 3: Vision Building and Action Planning, Phase 4: Implementation and Phase 5: Monitoring and Evaluation as shown in Figure 3.4.1.



Source: UNIDO Approach to Cluster Development; Key Principles and Project Experiences for Inclusive Growth 2013.

Figure 3.4.1 Example of Cluster Development Phasing

Industrial cluster development should be pursued under the following strategy to integrate value-added production by the economic strategy and effective infrastructure development by the spatial strategy.

Industrial cluster development allows introduction of technology for product development and market development by promoting foreign and neighbouring capital investment. The development facilitates linking people, industries and administrations through sharing knowledge of new technology and markets between them. For the purpose of facilitating sharing related information, the RDP will be effective in linking people, industries and administrations. In the Project Area, where primary industry is flourish and there exists the RCSP Area as industrial centre, especially vertical industrial cluster described below is more promising.

(2) Industrial cluster development strategy

Promotion of vertical industrial clusters is to be based on primary products to integrate value-added production and effective infrastructure development. A vertical industrial cluster is a concept that various stakeholders such as producer, marketer, retailer, wholesaler, processor, middleman, etc. are involved in the specific primary product so that many employments would emerge and minimizing waste would be realised in the process.

The cluster based on primary products links livelihood activities by the rural people such as traditional livestock farming to indigenous industries such as timber, cardamom, maize and dairy products industries, and further to export industries such as quality food products industries. By establishing export products that can sell in the neighbouring and global market, the entire industrial cluster becomes viably linked to them. This, therefore, could be an effective measure to alleviate poverty.

Application of the industrial cluster development strategy in the Project Area is illustrated by wood product, as an example, industrial cluster in Figure 3.4.2.



Source: JICA Project Team

Figure 3.4.2 Industrial Cluster for Wood Product

The candidate primary products for effective industrial cluster in the Project Area are proposed in Table 3.4.1. Further nomination and consideration would be necessary.

Table 3.4.1 Candidate Products for Industrial Cluster Development

Dzongkhags	Product
Sarpang	Walnuts, betelnut, cardamon, poultry, rice product, fruits, wood
Tsirang	Cardamon, ginger, citrus, beans, poultry, fruits, wood
Zhemgang	Bamboo, cardamon, maize, turmeric, dairy product, poultry, fruits, wood

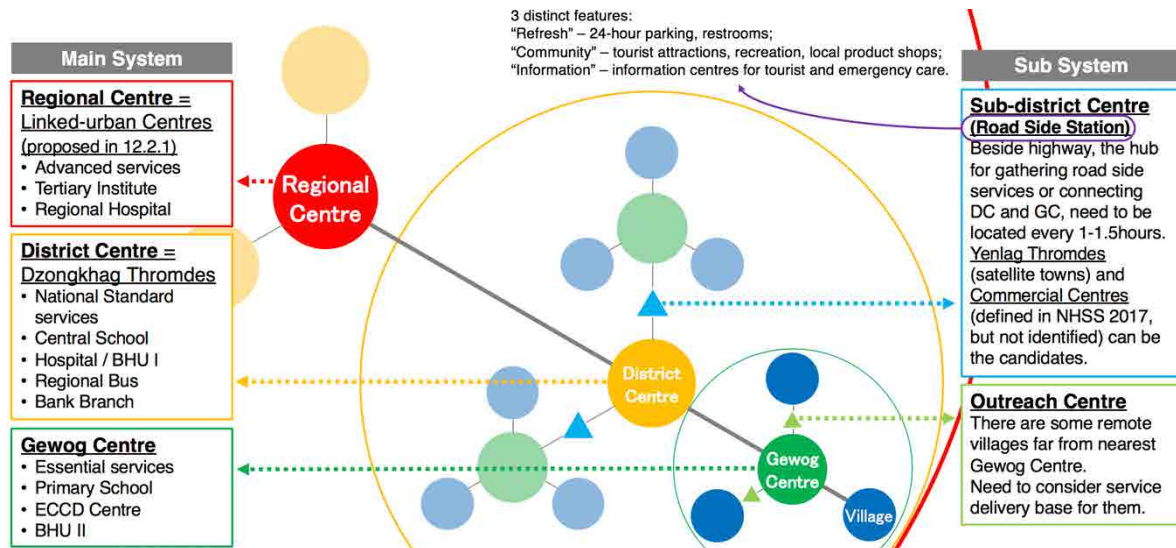
Source: JICA Project Team

3.4.2 Life service delivery for sustainable settlement

(1) Hierarchical service delivery system proposed in the CNDP2030

In line with the objective of the Holistic Service Delivery System proposed in the CNDP2030, social services such as education, health and transport services should be sustained. In addition, commercial and recreation services should be expanded, and all citizens should be encouraged to seek physical and spiritual well-being. Of course, civic services such as administrative and community services should be available for all the Bhutanese citizens. However, because of the small population and limited transport services, it is still challenging to deliver appropriate social services all over the country.

For building the Holistic Service Delivery System, the nationwide network of Bhutan should be based on effective hierarchy. It is the first priority to regard the Gewog as the fundamental unit of essential services for daily life. On the other hand, it is also important to locate the hubs for advanced service delivery within the neighbouring areas. The regional centre (RC), the district centre (DC), and the Gewog centre (GC) are considered to be the main system of holistic service delivery system. It means these centres should be the hub of service delivery in each region, district, and Gewog. The sub-district centres (SDC) and the outreach centres (OC) are considered to be a sub system for supporting main system.

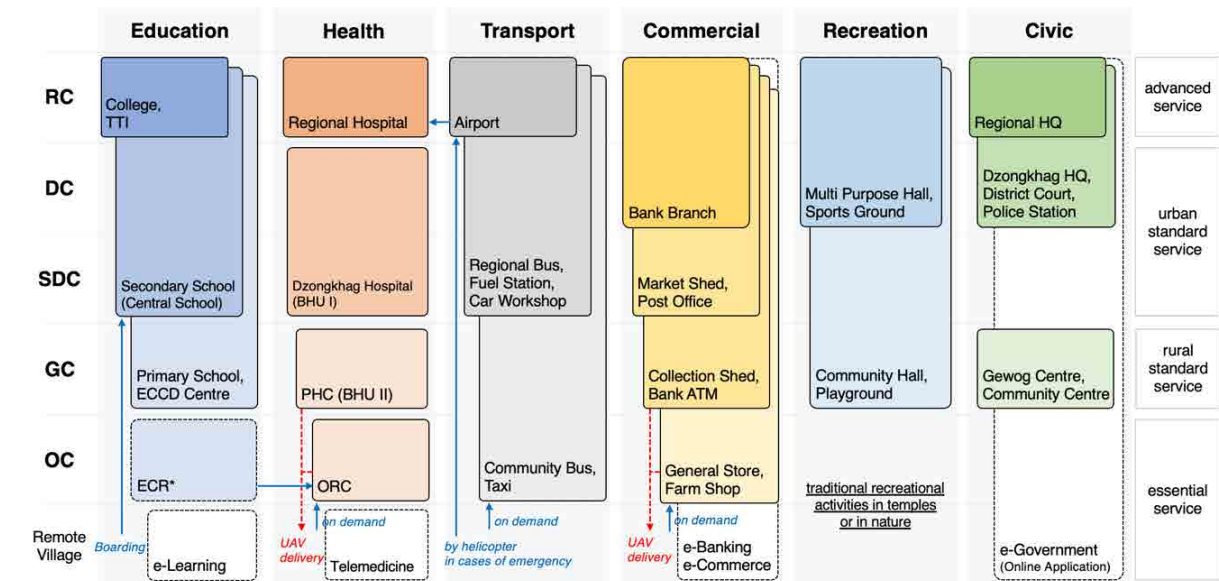


Source: CNDP2030

Figure 3.4.3 Proposed Hierarchy Model

The specifications and function of each hierarchy are shown as follows:

- RC: The core town(s) or proposed Linked Urban Centre should be the RC of the region. High level urban service facilities such as tertiary institutes or regional hospitals will be distributed.
- DC: Dzongkhag Thromde, the core town of the Dzongkhag or district should be the DC. Middle level service facilities such as central schools, Dzongkhag hospitals, bus terminals, and bank branches will be distributed.
- SDC: The special objective of the SDC is to deliver road-side service facilities, such as public toilets, a cafeteria, a farm shop, a fuel station and automobile workshop. Existing Yenlag Thromdes and other towns located by the national highway are taken into consideration as candidates.
- GC: The main hub of the rural service network. Existing gewog centres should be the distribution base for rural standard services or essential services.
- OC: The largest facility in remote village such as primary school, outreach clinic or community temple might be regarded as the OC. Essential services for the surrounding community can be delivered on demand or by using ICT.



Source: JICA Project Team

Figure 3.4.4 Proposed Service Delivery System by Function

The challenges in distributing social services by the Holistic Service Delivery System proposed in the CNDP2030 are as follows:

- (a) Regional level
 - i) Meeting the threshold population for the higher hierarchy of services like regional level hospitals and colleges;
 - ii) Having no alternate route or mode of transportation may delay the service delivery;
 - iii) Huge investment for regional infrastructure;
 - iv) Lack of dedicated agency for regional development, and
 - v) Institutionalization of the regional offices and coordination.
- (b) Dzongkhag level
 - i) Inadequate capacity of the Dzongkhag Administration;
 - ii) Lack of human capacity to fill the health, education, and other service institutions;
 - iii) Poor accessibility;
 - iv) Delivery of services should be fairly working at this level due to pre-existing infrastructure, but at the same time it could also pose challenges while integrating newer system to it, and
 - v) Lack of adequate budget for implementation.
- (c) Gewog level
 - i) Limited budget;
 - ii) Due to lack of technical capacity and human resources, coordination issues might arise, and
 - iii) Even with the provision of facilities, people might still choose to migrate.

It is noted that the Holistic Service Delivery System proposes only a hierarchical structure of service facility distribution. It does not refer to the structural reform of the government, including the location of regional offices of ministries and local government, for its implementation. The CNDP2030 focuses on spatial structure, while the structural reform of the government needs to be considered separately.

(2) Related policy and system

The concept proposed in the CNDP2030 on the Holistic Service Delivery System was not mentioned in the 12th FYP. This is because the hierarchical structure and service functions are very different from those of previous hierarchies of central and local government and the structure of the government

agencies responsible for social services. There was no such concept to consider the RC as the top of hierarchy before the CNDP2030.

In contrast, the concept of Common Minimum Infrastructure (CMI)⁷ has been introduced to support the provision of cross-sectoral services in each local government. This is a framework for providing funds to distribute public infrastructure and facilities at Dzongkhag, Gewog, and Thromde level. It is understood that the provision of each service function will be carried out in collaboration with the central ministries, national agencies and local governments that have the respective lead responsibility. However, since the highest level of the hierarchy are not specifically outlined in the CMI they could complement each other.

Regarding the education service, the minimum demand is to deliver the primary education all over the country. The Central School system led by erstwhile MoE has been one of the solutions for delivering it. Of course, the impact on urban-rural migration should be under consideration. On the other hand, the tertiary education should be established properly under the consultation between Ministry of Education and Skills Development and University of Bhutan (RUB) for achieving regionally balanced development. In addition, Technical and Vocational Education Training (TVET) system should be properly transformed by Ministry of Industry, Commerce and Employment (MoICE) to overcome the challenges for attracting adequate number of youths to pursue TVET as the main learning and career pathway.

To improve access to health facilities, Ministry of Health (MoH) provides technical clearance for the construction of health infrastructure. The criteria identified are Catchment Population, Distance to the nearest facility, Poverty rate in Gewog/Dzongkhag, Available land area for construction, Location of the proposed facility, Number of female populations in the age group of 15 to 49, and Presence of other sectoral facilities (RNR, School). In the Project Area, it is important to deliver the regional health care system centred on Gelephu RRH.

The Digital DrukYul Programme⁸ led by former Ministry of Information and Communication (MoIC) should be mentioned in terms of digitalization of social service delivery especially in Government to Citizen (G2C) services. Digital DrukYul Flagship Program is an initiative to harness the potential of ICT technologies and tools towards transforming Bhutan into an ICT enabled and knowledge-based society. It has 8 broad components which are National Digital Identity, Government Initiated Network, Integrated Citizen Services, Digital School, e-Business, Electronic Patient Information System, Bhutan Integrated Tax Systems and Enhancement of ICT sectors.

(3) Existing conditions

The RCSP Area should be the RC, the top hierarchy of the Holistic Service Delivery System, in the Southern Central Region⁹. Gelephu, the third-largest city in Bhutan, already has advanced urban functions and infrastructure, such as regional referral hospitals, direct road access to India and a domestic airport. In addition, Sarpang Town and Gelephu Thromde are connected by one of the straightest and flattest highways in Bhutan.

Regarding the regional level of education, the RCSP Area lacks a high-level education service such as a college. Therefore, the RCSP Area is considered an academic potential zone. According to the PHCB2017, the population of six years and above by school/institute attendance shows the gap in school enrolment between urban and rural areas. Especially in Zhemgang, the never attended rate, includes the

⁷ The concept of CMI is “to reduce disparities in distribution of common public infrastructure and facilities among Dzongkhags, Gewogs, and Thromde ‘A’s,” referred to the chapter 3.9.2 of GNHC (2019) Twelfth Five Year Plan 2018-2023, Volume 1: Main Document, <https://www.gnhc.gov.bt/en/wp-content/uploads/2019/05/TWELVE-FIVE-YEAR-WEB-VERSION.pdf>, Accessed on 10 March 2022.

⁸ This programme aims to “leverage ICT for delivering health care, education, business licensing and other critical public services efficiently.” referred to the NKRA 9 of GNHC (2019) Twelfth Five Year Plan 2018-2023, Volume 1: Main Document, <https://www.gnhc.gov.bt/en/wp-content/uploads/2019/05/TWELVE-FIVE-YEAR-WEB-VERSION.pdf>, Accessed on 10 March 2022.

⁹ In the CNDP2030, the whole of Bhutan is divided into four regions (Western, Central Western, Central Eastern, and Eastern region). However, it is more appropriate to consider each Linked Urban Centre covering its neighbouring Dzongkhags as one region. Thus, the Southern Central Region includes Sarpang, Tsirang, and Zhemgang Dzongkhag.

elderly those who couldn't have a chance to enrol on any kind of education, showing 48.2% in rural areas due to the poor road connectivity, in contrast to 21.9% in urban areas.

In terms of health service, the contribution of the Central Regional Referral Hospital (CRRH) in Gelephu to Sarpang Dzongkhag or the surrounding Dzongkhags is remarkable. A 150 bedded hospital was constructed in 2018 with the aim of developing a free, fair and equitable health system for the patients. The CRRH can now connect to provide technical support, human resource backup and consultation services to all the adjacent districts. The main concern about delivering primary health care in the Project Area stems from the geographical condition. Sarpang Dzongkhag is located in the subtropical zone and bordering Assam state in India. There are many risks such as infections like COVID-19 and vector-borne diseases such as malaria and dengue¹⁰. And this condition leads to the high mobility of people and the inability to keep track of people through the presently available digital system as another challenge to the health system. Its biggest problem is heading towards curative services rather than preventive services.

(4) Hierarchical strategy by function

1) Education

(a) Regional level

Creating a human resource development hub, such as a tertiary institute, in each region should be the constructive strategy for solving the issues related to rural-urban migration and youth unemployment, and achieving regionally balanced development.

(b) Dzongkhag level

Providing secondary education to cover the catchment radius and the catchment population properly.

(c) Gewog level

Improving internet connectivity should be one of the most important strategies for delivering primary education in rural areas, especially in remote villages by using emerging ICT-based learning.

2) Health

(a) Regional level

In preparing for regional health care, the introduction of a full-scale telemedicine system, the expansion of facilities to meet population growth, and the fulfilment of expertized doctors and medical staff, are required gradually.

(b) Dzongkhag level

Cooperating with the CRRH, each hospital needs to share medical records by using the nationwide networked system.

(c) Gewog level

- In providing preventive services, to improve not only health facilities but also drinking and irrigation water, waste management and drainage system, are required.
- Improving the accessibility to the primary health facility fundamentally, especially in Tsirang and Zhemgang, is also important.

3) Transport

(a) Regional level

¹⁰ MoH "Demarcation Of The High Risk Area (Southern Buffer)", <https://www.moh.gov.bt/update-demarcation-of-the-high-risk-areasouthern-buffer/>, Accessed on 10 March 2022.

- In Jigmeling, the intermediate area between Gelephu and Sarpang, should be developed as the road-side service hub including a fuel station, a car workshop.
- Inter-city transport such as Bus Rapid Transit (BRT) between Gelephu Thromde and Sarpang Town should be set up as mentioned by the DHS (2019)¹¹.
- In terms of air transport, the feasibility of the upgrading plan of Gelephu Airport into an international airport is still not clearly spelt out. However, the international airport is required when Gelephu becomes the international gateway city overcoming the situation like a pandemic.

(b) Dzongkhag level

The road-side service station as the SDC equipped with a fuel station and a car workshop should be distributed on the half-way of each Gelephu-Tingtibi and Tingtibi-Panbang. And it is also required to equip road-side services in the towns functioning as hubs.

(c) Gewog level

Community bus or taxi service would help daily transport in rural areas. For emergency, helipad should be installed in each Gewog Centre.

4) Commercial, recreation, and civic service

(a) Regional level

- Installation of emerging ICT-oriented commercial services should be developed step-by-step, in cooperation with the public and private sectors.
- Top-level recreation facilities such as a central park with attractive amenities and an indoor sports complex could promote Gelephu toward a healthy and recreational destination in the country.

(b) Dzongkhag level

- Commercial facilities such as bank branches, post offices and market sheds should be maintained in all Dzongkhag Thromdes.
- Modern urban recreation facilities such as cycling trails, bird-watching sites and water sporting sites could be distributed in all Dzongkhag Thromdes.

(c) Gewog level

The digitalization of G2C services by the Digital Drukyul Programme would be fulfilled by public education and sustainable use in rural areas.

3.4.3 Multi-stakeholders' collaboration

(1) Background

Due to Bhutan's geographical conditions, it is not easy for people to interact with each other. The formation of the RDP was proposed to expand the network of information sharing, ensure equality and encourage rural people's participation in the development of the region under the project.

Implementation of the governmental project is still a top-down method in Bhutan. Therefore, the RDP could face a challenge in gathering public comments from a wide range of local people and local actors on the regional planning and community development.

The JPT and DHS organised a series of briefing sessions for the launch of the RDP, both face-to-face in Tsirang and Sarpang and online with Zhemgang as the monsoon made it difficult to visit the site in August 2022. The members from each Dzongkhag official, NPOs, CSOs (farmers' groups and women's groups), Bhutan Chamber of Commerce & Industry (BCCI) and Royal Society for Senior Citizens (RSSC) members working in the area participated and were briefed about the platform, its principals, the membership concept, and its operation. At the briefing, the Dzongkhag officials who will be responsible for the operation in the future said that their specific duties need to be clearly stated and that

¹¹ DHS (2019) "Preliminary Report on Sarpang-Gelephu Corridor"

they need to propose a means of communication that will allow residents in the rural areas to participate. Some participants from the community expressed the hope that they would benefit through their participation in the RDP. The proposal to establish the RDP has been favourably accepted in each Dzongkhag and preparations were underway for actually setting it up.

(2) Expected contribution for regional development by the Regional Development Platform

1) Strengthening industrial cluster development

For industrial cluster development which can realise robust socio-economy, linking people, industries and administrations is essential. In addition, for inclusive development, multi-stakeholder collaboration through the RDP can contribute to linking primary industry with livelihood activities, indigenous industry and export industry.

2) Community empowerment supporting self-reliant regional development

Community empowerment should start with strengthening neighbourhood communities, supported by improved social services and support for primary industry in rural areas. As industrial clusters are developed in stages, community links will be further extended within the region facilitated by improvement of transport and communications infrastructure. Community empowerment may be further extended beyond regional boundaries into other regions or even neighbouring countries.

3) Spatial links strengthening

Spatial links strengthening starts with improving links between primary producers, processors and service providers to support industrial activities. This will facilitate the delivery of various social services for people in rural areas as well. Transport and communications infrastructure will also be upgraded in steps as the promotion of multi-stakeholder collaboration.

(3) Outline of the Regional Development Platform

1) Principal

To form a platform as a means of inter-organisational communication between local administrations, industry, private sector and citizens, and to establish a mechanism for the inclusive and continuous participation of diverse stakeholders in the regional planning process.

2) Objective

The platform will promote the continued involvement of a diverse range of people, improve the coherence of regional development planning and implement regional development proactively. It is expected that the people involved in the planning process will be able to take part actively in the regional development through to implementation, evaluation and monitoring.

Table 3.4.2 Objectives of RDP

Platform contents	Objectives
Participation of different stakeholders	The inclusion of viewpoints based on the day-to-day activities of the people in community development enables planning to take account of the actual situation. The aim of the platform is to create a forum for bringing together a wider range of viewpoints, from government agencies to grassroots level. In addition, to involve organisations working in diverse fields in rural areas, horizontal links between government agencies are also necessary. It is also the role of the RDP to build a more inclusive consultative platform through collaboration between the public and private sectors, and between government and government agencies.
Ensuring regional development coherence	The objective of the RDP is to ensure consistency in the planning of local development by absorbing the views of the organisations and residents who are operating in the region and reflecting them in the planning process. It is important to respect the views of long-term residents in the target region and to build a platform for sharing medium- and long-term perspectives and passing them on to the next generation.
Community development implementation	The aim is to create a system in the RDP to exchange information or collaborate on developments that can be implemented by local actors, with a focus on the private sector and local communities. It is expected to promote synergies between infrastructure, public works and the implementation of development actions bottom-up.
Evaluation and monitoring	It aims to enable regular monitoring and evaluation of regional development planning by the various members of the RDP to be carried out. It is expected that the involvement of several different sectors will result in a broad-based and fact-based evaluation and monitoring.

Source: JICA Project Team

3) Three key concepts of the RDP

Proper management system

The RDP should be run according to a Memorandum of Understanding (MoU). The representatives will be chosen, meetings will be organised, and agendas will be decided upon. The MoU includes items such as objectives, scope of cooperation, rules of procedures for the RDP meetings, monitoring and evaluation and amendment and cancellation. The RDP would be officially launched with a signature of the core team.

Keeping coherence

The main actors in the RDP are the organisations and people who are active in the relevant regions and who are continuously collaborating in the regional development. Their ongoing participation in regional planning and development will lead to them being coherent.

Participatory approach

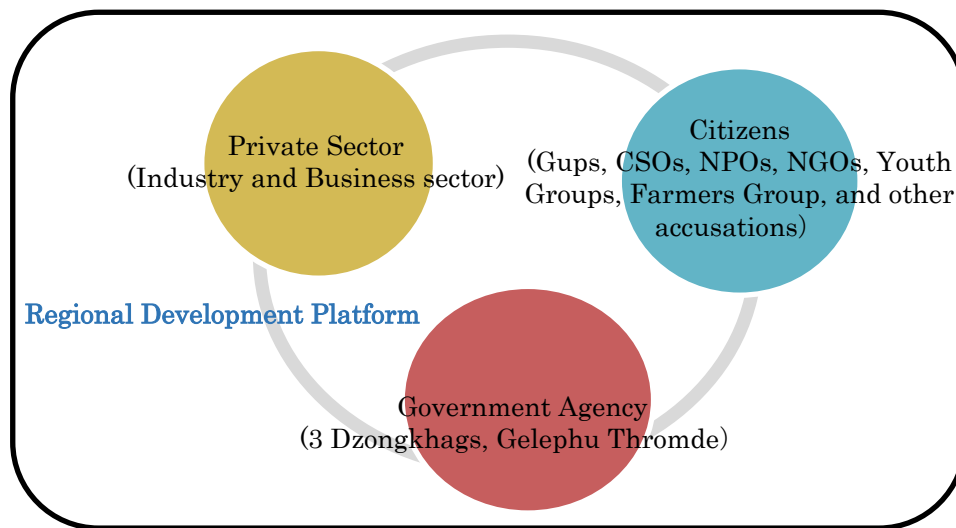
All participants have an equal right to speak and can freely discuss local issues. Traditionally the younger generation and women hesitate sharing their views at meetings in Bhutan. However, the RDP provides a forum where all participants can openly discuss issues to enable preparation of plans that are more in line with actual conditions in the future.

The MoU describes the background to the establishment, categories of stakeholders and membership structure within the platform, and the activities and responsibilities, etc of the RDP.

4) Structure of the RDP

The RDP is envisaged to be composed of three categories of stakeholders: government agencies, private sector and civil society. The government agencies will include the three dzongkhags and one Thromde office in the target regions, while the civil society organisations will include CSOs, NGOs,

farmers' groups, women's groups, youth groups and gups (elected leaders of gewogs).



Source: JICA Project Team

Figure 3.4.5 Structure of the RDP

5) Expected members

The members proposed for the RDP are divided into two broad categories: the core team, which is the main body responsible for the operation of the RDP, and the participants. The core team consists of the DHS, the administration offices of the three dzongkhags, the Municipality of Gelephu, the regional office of the Ministry of Industry, Commerce and Employment, the BCCI regional office and one representative of a local group of residents working in each dzongkhag. Other individuals, for instance farmers groups, women's groups, youth groups and gups are referred to as participants. The RDP is entirely volunteer-based, and participation is not mandatory.

In each Dzongkhag, there was an opportunity to observe the activities of farmer and women's groups, all of which were active in developing products from agricultural produce, processing them, and selling them in the capital. In all cases, the development of sales routes and distribution were reported to be a challenge. It was also observed that there were differences in information sharing from the Dzongkhag Administration and that opportunities to open stalls in certain exhibitions were not equally provided.

As mentioned above, the core team is the only organisation responsible for its operation. This provides each organisation an equal footing in the RDP, regardless of hierarchy, to enable sharing of views in a fair manner.

6) Gender and women's empowerment

The RDP strongly encourages and promotes the participation of all types of women members and women's groups in terms of women's empowerment and equality. According to the Global Gender Gap Report 2022¹², Bhutan ranks 126th out of 153 countries in the Gender index 2022, which ranks countries based on several indicators of gender parity, including political empowerment, health and survival, educational attainment, economic participation, and opportunities. Given that Bhutan was ranked 131st in 2020¹³ and 130th in 2021¹⁴, the situation of women's empowerment in Bhutan has been improving. However, it indicates that there are still gender gaps in the economic participation and opportunity especially in management levels.

The RDP is one of the core mechanisms for regional development in Bhutan and is also expected to be

¹² https://www3.weforum.org/docs/WEF_GGGR_2022.pdf

¹³ https://www3.weforum.org/docs/WEF_GGGR_2020.pdf

¹⁴ https://www3.weforum.org/docs/WEF_GGGR_2021.pdf

an important arena for promoting women's participation in economic activities and improving their empowerment. In the Project Area, there are women's groups and entrepreneurs who are involved in activities such as agro-food processing, household goods production, etc. Their involvement would help to foster a more comprehensive social development that considers gender perspectives, thereby contributing to inclusivity.

7) Activities

The RDP envisages four activities: the RDP meeting, exchange of information, promotion of regional branding and monitoring and evaluation of regional development.

The RDP is expected to operate around these activities and to be a conducive space where members could carry out other activities amongst themselves voluntarily and freely, depending on other relevant areas and issues. Details of each activity are as follows:

RDP meeting

This meeting will be held annually. The agenda must be decided before the meeting and should be shared in advance by the facilitator. In the meantime, all members of the RDP will be able to suggest their ideas and comments on the agenda. The RDP meeting will take place face-to-face or online or a combination of both. The use of online is seen as creating opportunities for rural communities to participate and promoting flexibility in meeting methods. As mentioned above, the participation will be based on the premise that all groups have an equal right to speak and all opinions in the meetings would be respected.

Exchange of information

The RDP is a place for members to interact and communicate with each other. Members are expected to interact and collaborate more freely.

It is envisaged that the RDP will use Telegram for day-to-day communication between members, and postings on Facebook for presentations and discussions of specific topics proposed by the facilitator or topic focal person, either monthly or as required. Facebook is expected to create sub-channels such as sectoral channels (e.g., agriculture and industry) and the exchange of information on activities at grassroots level, as well as a forum for promoting practical and constructive activities.

Regional branding promotion

This is a topic of great interest and importance to the people of the three dzongkhags. Interviews with locally oriented groups, such as farmers' groups and women's groups, indicate that they struggle to market their products. Some have channels to sell in Thimphu, but the margins are higher than having a shop or counter in Thimphu. In addition, vegetables harvested in other regions are sold as produced in Tsirang for recognition of Tsirang as producing high quality and organic vegetables. There was suggestion that this problem should be resolved with the requirement labelling the produce with a clear mention of the origin of the produce. It is expected that these issues will be shared amongst members and solutions found through active discussions amongst diverse stakeholders within the RDP.

It is also expected that differences and challenges between communities are reviewed through interaction with other communities and subsequently seize and new opportunities available.

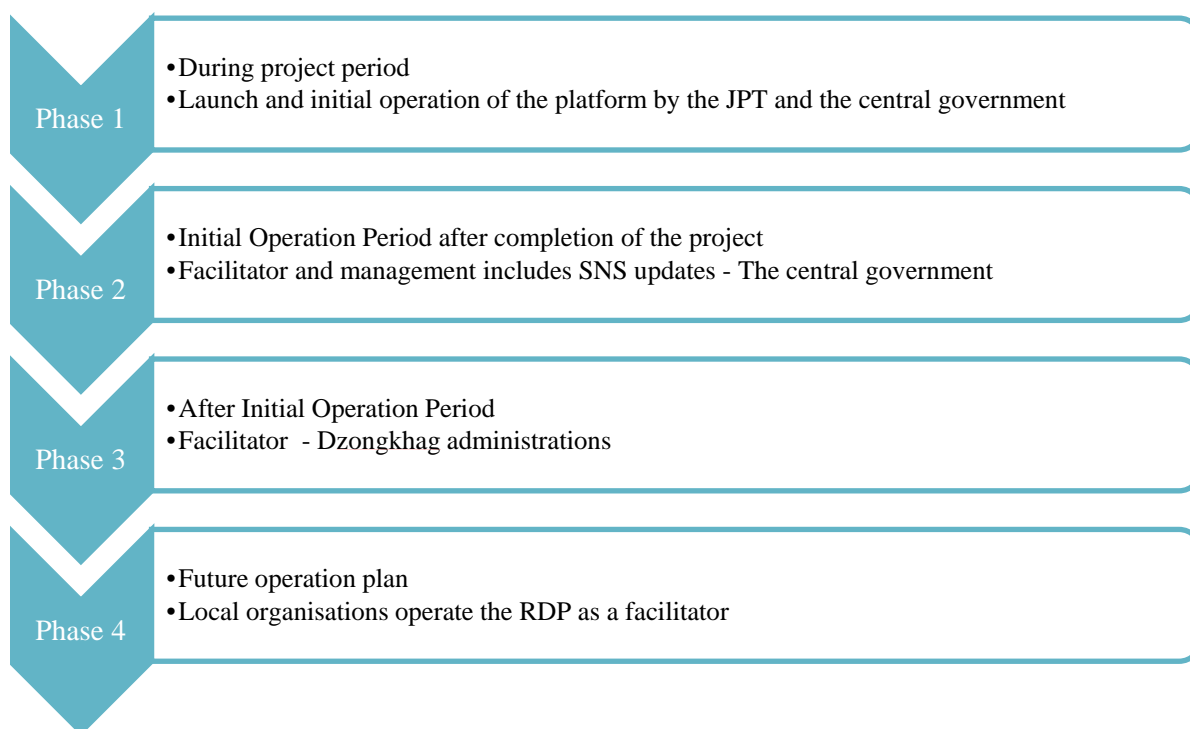
Monitoring and evaluation on progress of regional development

The progress of the regional development should be monitored and evaluated by people who are living in the region. This will contribute to more appropriate and localised methods and improve outputs. Administrative organisations should be able to incorporate the views of the local residents collected in the RDP in the regional development plans and make the plans more aligned with ground realities.

8) Outlook of the Operational Plan

The operation of the RDP is considered to be handed over from the government to local-based organisations through four steps. The facilitator of the RDP is the organisation/person in charge of the management, whose main tasks will be to prepare for the meeting (pre-sharing the agenda, confirming

attendance, preparing the venue), update and manage the Facebook page, and monitor and compile the development plan evaluation.



Source: JICA Project Team

Figure 3.4.6 Operational Plan of the RDP

Phase 1: During the project period

The JPT and central government take the lead in launching and operating the platform during the project period. After the creation and signing of the MoU, the RDP activities include the exchange of information via Telegram and Facebook accounts, and the preparation and implementation of the first RDP meeting.

The Central Government takes lead in managing as a facilitator. It updates the Telegram and Facebook pages and carries out publicity activities to expand membership. It also prepares and conducts the second RDP meeting. These preparations are done in conjunction with preparations for the transfer of responsibilities to the local administrations.

Phase 2: After Initial Operation Period

The Dzongkhag administrations commence to take over the facilitator. It is expected to operate from a location closer to the ground and local conditions, while referring to past methods of operation. It is also hoped that reviews and reforms will be carried out as necessary to ensure sustainable operation.

Phase 3: Future operation plan

Local organisations will operate the RDP as a facilitator and manage the RDP meeting and communication channels. It is intended to provide a forum for equitable, ventilated and lively discussions to achieve public-private partnerships for local development.

This flow is consisted for managing the RDP sustainable. The responsibility will be taken over by the local organisations from the JPT and central government gradually. It is important that appropriate operation method is created in collaboration with the local manners and make it simple for the equality and transparency with future expectation.

(4) Signing of MoU and first RDP meeting

1) Conclusion of MoU

The MoU was signed by core members in each dzongkhag in March 2023. The core members were the head of each Dzongkhag and the Mayor of Gelephu, a representative of the BCCI Gelephu Regional Office as the private sector, a CSO representative from each Dzongkhag and the project leader of the DHS signed the MoU.

In addition, it was agreed to use Telegram as a means of communication between platform members after a questionnaire was conducted during the briefing session. Moreover, it was also decided to use Facebook as a means of sharing information, and this was launched at the briefing session.

2) The first RDP meeting

The first RDP meeting was held on 5 April 2023 at the Gelephu Municipal Hall. The overall number of participants was about 80 from the Dzongkhags of Sarpang, Tsirang and Zhemgang and Gelephu. The agenda included opening remarks by the Mayor of Gelephu City and JICA Bhutan Office, followed by an explanation on the RDP and participatory group work on future expectations of the RDP by DHS, as well as an explanation of the regional development vision, development concept, regional branding, etc. and participatory workshop on regional branding by JPT. Finally, the Urban Planner of Gelephu gave a vote of thanks. Table 3.5.3 shows the number of participants in the first RDP meeting.

Table 3.4.3 Number of Participants on First RDP Meeting on Each Dzongkhag

Unit: Person

	Citizen including Gup ¹⁵	Local group (CSO, NGO, etc.)	Company /Business cooperative, etc.	Organisation /Institute	Local government	Total
Zhemgang	8	1	2	1	6	18
Tsirang	13	2	1		8	24
Sarpang, Gelephu	8	2			18	28

Source: JICA Project Team

As platform and regional branding are new concepts in Bhutan, there is a need to take steps to explain and prepare them and take time to implement in order to push them forward. The first meeting would have conveyed to the participants that the RDP is a place where participants can take the initiative to exchange ideas, expand their networks and discuss regional development. The results of the post-meeting participant feedback questionnaire are presented below. The questionnaire was administered using Google Forms, with an announcement made via telegram one week after the meeting. The request for responses was sent out again, but the number of responses obtained over the month was only 17.

Table 3.4.4 Feedback of First RDP meeting

Unit: The number of people

Questions	Responses (Total of respondents: 17)				
	1	2	3	4	5
How satisfied were you with the event in general?	0	0	1	8	8
How relevant and helpful do you think it was for your current job/activity?	0	0	0	5	12
Have you made more acquaintances beyond your organization or profession by getting together for RDP Meeting?	0	0	1	8	8
Do you feel that you have made progress in sharing the issues/challenges/opportunities of your region through this platform meeting?	0	0	0	7	10
How satisfied were you with the contents of the session?	0	0	1	6	10

Source: DHS. For each response, 1 as the lowest score and 5 as the highest score.

¹⁵ Head of Gewog

In terms of opinions on the participatory workshops on the RDP, the exchange of opinions and knowledge within the group was a new discovery and gave different ideas. Respondents also stated that it was an opportunity to get to know different sectors and to share opinions and methods for the development of the region. While some expressed a request for training and workshops on knowledge and skills (mainly budget management) as an expectation of the RDP, many also expressed a desire for its sustained function as a place for collaboration and interaction, and for the implementation of what was discussed at this meeting.

On the other agenda point, regional branding, the participants themselves commented that they were able to realise the potential of their own region, as well as the differences between their region and other regions. There was also a need to think beyond what was being discussed and a desire for inclusive branding. They expressed a desire to spend more time discussing the issue and linking it to their activities, indicating that they have high expectations for the future.

Commenting on the meeting as a whole, it was noted that more time for discussion was needed and that the languages used at the meeting should be Dzongkha and English. However, as this was the first meeting, the number of participants and the results of the questionnaire could be used to gauge the high expectations of the RDP. Future challenges include considering sustainable management of the RDP, expanding the number of stakeholders, and stimulating collaboration. After the project is completed, the DHS and the three regional counterparts will have to take the lead in implementing the operation. With limited personnel and budget, it is imperative to find an efficient and effective way to operate the project. It is also important to ensure the involvement of a wider range of stakeholders, including marginalised groups and vulnerable populations. One of the challenges is to widely publicise the RDP to all corners of the community in order to open the front door to all residents. It is then necessary to consider mechanisms to enable collaboration across regions, organisations and sectors to be implemented through the RDP. Further work will continue to examine ways in which the RDP can be fostered, with the cooperation of RDP members.

3) The second RDP meeting

The second RDP meeting was held on 16 October 2023 at the RAA Conference Hall of Technical Training Centre in Tsirang. It was attended by 61 participants from three Dzongkhags, Gelephu Thromde, private sector and NGOs. The composition of the participants is shown in the table below. The total number of participants does not include DHS officers and JPT team who were involved in the operations on the day of the meeting.

Table 3.4.5 Number of Participants on Second RDP Meeting on Each Dzongkhag

Unit: The number of people

	Citizen including Gup ¹⁶	Local group (CSO, NGO, etc.)	Company /Business cooperative, etc.	Organisation /Institute	Local government	Total
Zhemgang	8	1	2	1	9	21
Tsirang	9	2			5	16
Sarpang, Gelephu	6			1	25	32

The second meeting was held from 09:30-16:00, based on the reflections of the first meeting, which lasted half a day. The meeting agenda was structured in two parts: Regional Development Planning and Regional Branding. In the morning session, presentations on Regional Development Planning and Regional Branding were given by the DHS and the Dzongkhag officers, followed by a question and answer session; not only the DHS but also the Dzongkhags prepared presentation materials to facilitate the participants' understanding. For the Q&A session, participants were notified in advance through their Dzongkhag officers to ask their own community members and organisation members for their opinions and questions on the Regional Development Plan. This was done with the aim of gathering a more comprehensive set of views and to ensure that they were representative of the community and the organisation, rather than the personal views of those present. The questions asked were as follows.

¹⁶ Head of Gewog

- Q1. What expectations do you have on South Central Regional Plan?
- Q2. What do you think about the regional character of South Central Region?

Details of the Q&A session

The afternoon session consisted of a presentation from the JPT team on regional branding and a participatory workshop. The presentations included an overview of regional branding and its strategies, and a presentation on the Elephant Corridor. Questions on regional branding were also given to participants in advance.

- Q1. What are main products and services, culture and context, background or spiritual features, nature and tourism resources in the region in order to achieve the Regional Branding?
- Q2. What do you see as the means of connecting local residents with people outside the region?
- Q3. Who do you see as the persons or organizations who can be a main entities in order to promote the Regional Branding or unite the region?
- Q4. Do you want to build a partnership with whom or which organization for the Regional Branding?

More information about the workshops can be found in the section on Regional Branding. Feedback from participants was collected via a Google form, the results of which are shown below.

3.4.4 Regional Development centred on Regional Centre Structure Plan Area

(1) Regional Development Strategy and RCSP

In the southern central region, the Project Area, it is expected that regional development including economic and demographic growth would be driven by the integration of socio-economic activities which are now scattered within the region. The RCSP Area would have three important roles: 1) lead socio-economic growth as a regional hub in the region, 2) mitigate the excessive excellence of the Western Region including the capital city at country level, and 3) keep check on the growth of the Project Area by continuously innovating ways to keep the growth soundness. That is, the Regional Development Strategy, which will show the regional growth strategy and the contribution to the balanced development of the country, would be structured centred on the RCSP Area development.

(2) Visions of three Dzongkhags and Development of RCSP Area

The visions proposed for the three Dzongkhags are shown in section 3.1.4. They would be achieved along with the development of the RCSP Area. In other words, the visions would require establishment of the RCSP Area as a socio-economic centre. For instance, a part of the vision of Sarpang- “the largest industrial region in the country”, is linked with the improvement of transportation modes and promotion of wide-ranged industries which forms the descriptions of the vision of the RCSP Area.

It is also important that the RCSP Area serves as a pull factor for population and industrial activity. This is strongly linked with the vision of Zhemgang and Tsirang, which aims at increasing connected population through the development of neighbouring region and the RCSP Area connecting Sarpang and Gelephu. Zhemgang and Tsirang should call for the development of the RCSP Area like Sarpang.

(3) Industrial synergy between Dzongkhags and RCSP Area

The corridor area connected by two major cities is considered as one economic zone. The industrial potential of the RCSP Area along the corridor should be widely explored to develop a growth scenario that meets the economic rationale. It will be effective to distribute a wide range of industrial potential of the corridor area to the neighbouring Dzongkhags.

In addition, the ongoing development of Jigmeling Industrial Park, proposed agro-industrial park and SEZ, and other industrial facilities such as processing factory, market, retailer, etc. would serve as a receptacle for industrial activities of three Dzongkhags.

As for the tourism sector, Gelephu serves as a gateway from India. Sarpang and Gelephu will serve as a destination for capital area. The RCSP Area can be linked to the respective tourist areas of each

Dzongkhags to establish a tourism package. Especially, Gelephu has a huge potential serving as a tourism hub which would enable tourists to stay longer as a tourist base.

3.5 Stepwise Development Scenario

3.5.1 Development phasing

The development scenario represents the process for the Project Area to realise the vision of each Dzongkhag and whole Project Area. To present the development scenario, the planning period is divided broadly into three phases: Phase 1 up to 2030, Phase 2 for 2030-35 and Phase 3 for 2035-45, which will be groundwork phase, building up phase and fulfilment phase respectively.

3.5.2 Whole Project Area

In the whole Project Area (three Dzongkhags), as for the three pillars (industrial cluster, multi-stakeholder collaboration and life service delivery) for regional development strategy and regional branding promotion, each scenario is shown in Table 3.6.1.

Table 3.5.1 Development Scenario for Three Pillars and Regional Branding Promotion

Platform contents	Phase 1: up to 2030	Phase 2: 2030 to 2035	Phase 3: 2035 to 2045
Industrial cluster	<ul style="list-style-type: none"> Organise/strengthen farmers and related associations Plan the entire cluster development in stages and necessary infrastructure Establish management organisation for the initial cluster development 	<ul style="list-style-type: none"> Establish initial components of the complex facilities together with improvement of necessary infrastructure, Research for product development and market development. 	<ul style="list-style-type: none"> Enhance the management mechanism, technology, and development of SMEs, various associations, and the private sector
Multi-stakeholder collaboration	<ul style="list-style-type: none"> Expand the RDP initiative in the Project Area and involve neighbouring regions Establish stable operation of the RDP Promote regional branding through involvement of diverse stakeholders 	<ul style="list-style-type: none"> Strengthen spatial links among diverse stakeholders in supply-chain Strengthen industrial cluster by collaborating multi-stakeholders 	<ul style="list-style-type: none"> Supporting self-reliant regional development with community empowerment
Life service delivery	<ul style="list-style-type: none"> Upgrade or consolidate existing secondary and primary schools Upgrade PHC in Sarpang and Zhemgang 	<ul style="list-style-type: none"> Promote selection and concentration in rural education service facilities Provide regional level services with Gelephu and Sarpang CRRH 	<ul style="list-style-type: none"> Establish tertiary education institute in Sarpang Enhance preventive health service through PHCs and CRRH
Regional branding promotion	<ul style="list-style-type: none"> Initiate regional branding strategy Create web site or other platform to promote the branding 	<ul style="list-style-type: none"> Increase connected population through upgrading regional branding 	<ul style="list-style-type: none"> Integrate whole area (three Dzongkhags) in the name of regional branding for their promotion as one region

Source: JICA Project Team

Development scenario supporting three pillars and regional branding promotion is in line with development alternative scenario described in Chapter 2. The development conditions are as follows:

Phase 1 up to 2030

- Improvement of connectivity will commence to create a foundation for strong economic growth and provision of holistic social service. A capital accumulation should be realized in preparation for large investments in infrastructure development and new economic activities to support community cohesion;
- Development administration will be improved to support the resource management with stronger local administration and more active participation by the people, and
- Community development plan will be prepared by local government, Gewog or community.

Phase 2 for 2030 to 2035

- Strong economic growth in the region, based on the large public investment, will start; community development plan will be put into action;
- Provision of social management of natural and cultural resources should be improved recognizing these resources as capital to be conserved so that they can continue generating benefits for people for decades to come;
- Economic activities and exports will be diversified to generate higher value-added activities; industrial clusters will be established for more employment opportunities, and to ensure resilient and robust socio-economy, and
- Branding the region will be achieved in the whole Project Area and each Dzongkhag.

Phase 3 for 2035 to 2045

- Large investment towards the infrastructure would be persisted vigorously; establishment of all planned infrastructure will be completed;
- The community-based issue will be solved.; community empowerment will be strengthened with community cohesion, and
- Several industrial clusters will be established so that livelihood activities will be bottom up.



Source: JICA Project Team

Figure 3.5.1 Target on Each Development Phase in the Project Area

3.5.3 Each Dzongkhag

In each Dzongkhag, development scenarios are in line with the visions and development objectives of each. The development conditions are as follows.

(1) Zhemgang

In Zhemgang, a rapid transformation of socio-economic activities would be not preferable, considering the need to respect for the current lifestyle with rich indigenous resources. Therefore, the development activities in the Phase 1 should be perceived as a preparatory stage for comprehensive development and the pursuit of a new socio-economic model in Zhemgang. Phase 2 represents the building up stage aimed at actualizing the vision and objectives. This process may progress at slightly slower pace compared to Tsirang and Sarpang, primarily due to the greater challenges in shifting existing socio-economy framework in Zhemgang.

In addition to the population projection for 2045 shown in section 3.4.1, it is expected that connected people will continually increase from the Phase 2 to Phase 3 significantly. As the linkage with the RCSP would be enhanced, local livelihood and social service will be improved along with tourism development and industrial cluster development.

Phase 1 up to 2030

- Primary products that contribute to the formation of industrial clusters will be identified, and preparatory studies, including market research, will be conducted;
- Improvement of livelihood based on regional branding will be promoted; awareness for new socio-economic model will be shared among the residents;
- Enhancement of network with the RCSP Area will be pursued for life service delivery system and industrial cluster development;
- Locally based youth group, etc. will be strengthened collaborating with CSIs, start-up and entrepreneur;
- Preparation for tourism activity development such as eco-tourism and experience tour, will be conducted; establishment of tour route, guide training, management of tourism site. etc., and

Phase 2 for 2030 to 2035

- Infrastructure development linking the elements of industrial clusters will start;
- Attractive tourism packages will be established;
- More diverse human resources such as connected population will start to participate in regional development through tourism promotion, etc.;
- Community cohesions will be strengthened; awareness for new socio-economic model will be shared among the residents, and
- Industrial cluster on specific products will be developed for supporting local livelihood.

Phase 3 for 2035 to 2045

- Industrial cluster on several products will be developed for supporting regional economy;
- Increased connected population, back and forth in and out of Zhemgang, will contribute to regional vitalization;
- Zhemgang and the RCSP Area will be as one economic zone;
- A range of the market of industrial cluster development will be expanded to other regions and foreign countries, and
- Traditional neighbourhood communities will be strengthened.

(2) Tsirang

Tsirang has a relative advantage over other Dzongkhags in terms of its accessibility, commercial prospects, market and trade due to the geological location between the capital area and the RCSP Area. However, despite its high potential, the diversity of livelihood and the number of tourists have been stagnating. Therefore, development activities in the Phase 1 should be positioned as a preparatory stage for enhancing comparative advantage. Furthermore, through regional branding promotion, the slogan “Tsirang Natural” is transitioned into to the next stage with pragmatic promotional measures.

In the Phase 2, economic activities in Tsirang should be effectively connected to the RCSP Area to establish one economic zone. The Phase 2 represents a building up stage which is to realise the vision and objectives. By accelerating the flow of products and goods toward the RCSP Area, market failure will be mitigated and improved.

In the Phase 3, Damphu will become more preeminent as the centre of Tsirang with quality accommodation, high productivity, smooth transaction, etc.; Mendregang will complement the function of Damphu.

Phase 1 up to 2030

- Primary products that contribute to the formation of industrial clusters will be identified, and preparatory studies, including market research, will be conducted;

- Improvement of livelihood based on regional branding will be promoted; Tsirang brand “Green Tsirang” will be established and disseminate to other regions;
- Enhancement of network will be pursuit for life service delivery system and industrial cluster development;
- Improvement of road condition on main artery for strengthening network centred on Damphu will be pursuit, and

Phase 2 for 2030 to 2035

- Infrastructure development linking the elements of industrial clusters will start;
- More diverse human resources such as connected population will start to participate in regional development through improvement of connectivity, etc.;
- Network belt including Damphu and Sarpang Town will be established; additional network along the national highway will be enhanced;
- Industrial cluster on specific products will be developed for supporting local livelihood
- Tsirang and the RCSP Area will be as one economic zone, and
- Increased connected population, back and forth in and out of Tsirang, will contribute to regional vitalization.

Phase 3 for 2035 to 2045

- Industrial cluster on several products will be developed for supporting regional economy;
- Damphu will be developed with various activities such as tourism, processing, market, etc. as a core relay point between capital area and the RCSP Area; Mendrelgang will complement the functions of Damphu;
- A range of the market of industrial cluster development will be expanded to other regions and foreign countries, and
- Traditional neighbourhood communities will be strengthened.

(3) Sarpang

Sarpang has a wider urbanized area than other Dzongkhags. Potential development areas exist even in western and eastern side of the RCSP Area. Most of them are utilized as crop land or untouched as shrub. However, it is noticeable that biological corridor stretches across the central part of this Dzongkhag. Additionally, the southern region is known to be inhabited by numerous elephants, which have been a source of human-wildlife conflict. However, their presence also highlights the rich ecological diversity of Bhutan, particularly within the southern forests of Sarpang.

In this sense, achieving a balance between environmental conservation and industrial development with large-scale infrastructure becomes imperative. In the Phase 1, preparatory work should be undertaken to minimize irreversible environmental effects. Also, in order to make the most of the potential of the RCSP Area, enhancing accessibility to Tsirang and Zhemgang is essential to establish the RCSP Area as the centre of economic activities.

As the next step, public investment should be focussed on large scale infrastructure. Promotional activities for domestic/foreign investment will be required. In addition, similar to Tsirang and Zhemgang, community development will be strengthened for inclusive development.

Phase 1 up to 2030

- Preparation for new infrastructure project will commence in line with preparatory survey: feasibility study, consensus building among stakeholders, budget allocation plan, etc.;
- Primary products that contribute to the formation of industrial clusters will be identified, and preparatory studies, including market research, will be conducted;
- Enhancement of network will be pursuit for life service delivery system and industrial cluster development, and

Phase 2 for 2030 to 2035

- Promotion activities will commence to invite foreign and neighbouring investment;

- Large scale infrastructure plan in the RCSP Area will be developed; the construction work will commence, and
- Infrastructure development linking the elements of industrial clusters will start.

Phase 3 for 2035 to 2045

- Large investment towards the infrastructure would be persisted vigorously; establishment of all planned infrastructure will be completed;
- Promotion activities continue and expand the target area for the additional investment.
- Industrial cluster on several products will be developed for supporting regional economy;
- A range of the market of industrial cluster development will be expanded to other regions and foreign countries, and
- Traditional neighbourhood communities will be strengthened.

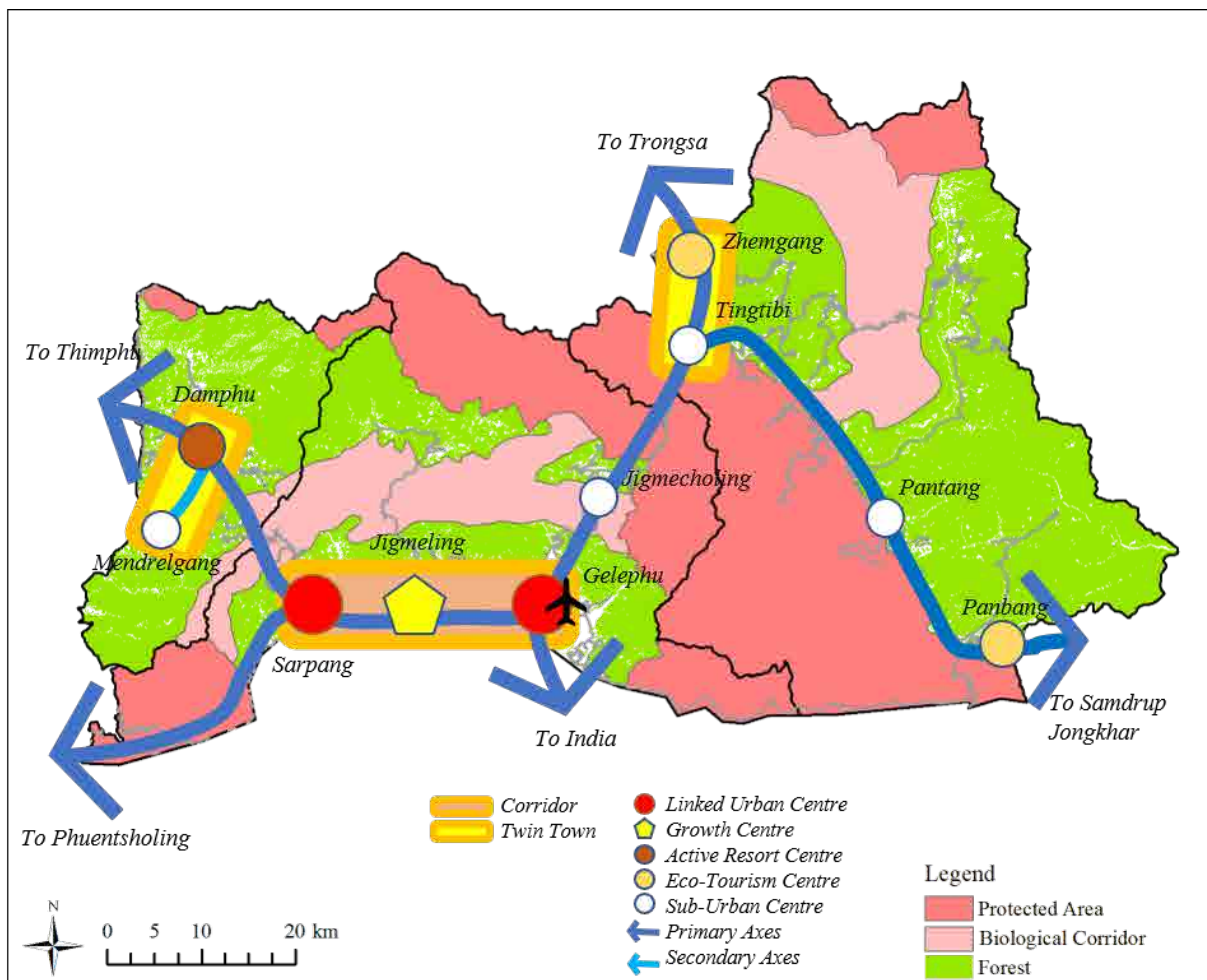
CHAPTER 4 REGIONAL SPATIAL PLAN

4.1 Regional Spatial Structure

The Linked Urban Centres will be created in the two towns of Gelephu and Sarpang in Sarpang Dzongkhag. The Growth Centre will be developed at Jigmeling between the two towns. Those Centres will be interlinked with Thimphu to the northwest, Trongsa to the northeast, Samdrup Jongkhar to the east, Phuentsholing to the west, and India to the south via the primary axes. On the primary axes, Damphu and Zhemgang will be the gateways to the west and east, respectively.

It has been officially decided that Zhemgang and Tingtibi are combined to form Dzongkhag Thromde. Based on this, both towns will form a Twin Town as urban centre in Zhemgang Dzongkhag. Damphu and Mendrelgang are in the relationship of Dzongkhag Thromde and Yenlang Thromde in Tsirang Dzongkhag. Both towns form another Twin Town of urban centre. In addition to these Twin Towns, Panbang forms the eastern urban centre. Each dzongkhag and direction have a hub of urban centre, but travel time between hubs is relatively long. Sub-urban centres will be designated in Jigmecholing and Pantang to ensure that social services cover all three provinces.

A regional structure based on these factors is shown in Figure 4.1.1.



Source: JICA Project Team

Figure 4.1.1 Regional Spatial Structure in the Project Area

4.2 Economic Development Plan

In Chapter 2, through elaboration of the development alternatives, inclusive economic development in the Project Area and intensive industrial development in the RCSP Area have been considered along with importance of industrial cluster, tourism, ICT industry and manufacturing. Especially, industrial cluster development is described as one of the pillars for Regional Development Strategy in Chapter 3. In this section, considering the characters and potentials of each Dzongkhag based on the spatial structure, suggestions of each sector development are described.

4.2.1 Agriculture and livestock

(1) Agriculture and livestock situation

There is a diversity of agricultural and livestock products in the Project Area. As shown in Table 4.2.1, Tsirang Dzongkhag has a variety of agricultural resources including fruits and vegetables. On the other hand, Sarpang Dzongkhag is known as one of the largest poultry and meat producers in the country. Bamboo production is famous in Zhemgang Dzongkhag. Aquaculture may have a potential in the Project Area. Currently, one establishment is located in Sarpang according to Investment Opportunity Report 2020 by erstwhile Ministry of Economic Affairs (MoEA).

As for agriculture, livestock, and forestry sector, it is recommended to keep a production area to offer more competitiveness through improvements in infrastructure, strengthening bargaining power, and widening marketing networks including foreign market, since this sector represents important parts of the economy in the Project Area.

Table 4.2.1 Diversity and Resources of Agricultural Products in the Project Area

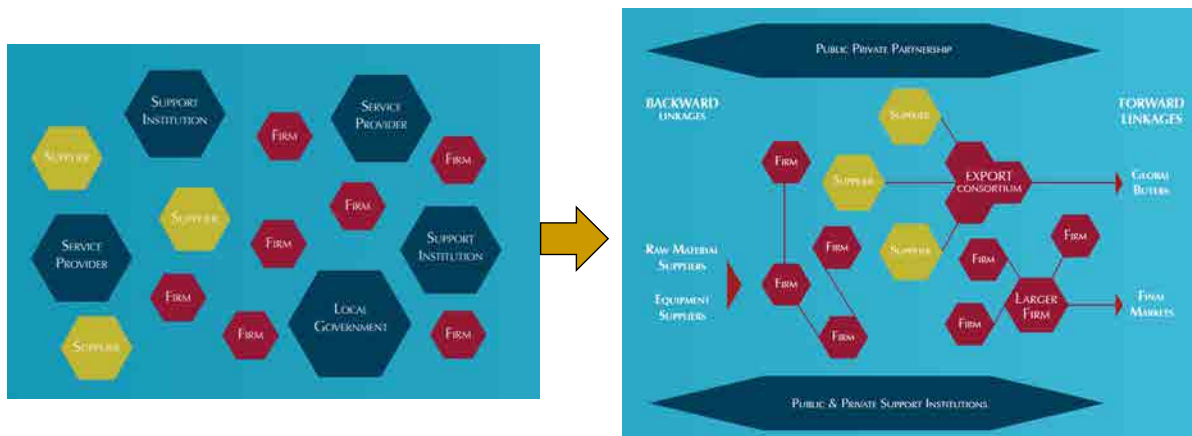
Dzongkhags	Agricultural, livestock and forestry products	Remarks
Sarpang	Paddy, Maize, Millet, Areca nuts, Cardamon, Ginger, Sunflower, Onion, Tomato, Mandarin, Mango, Pear, Cattle, Buffalo, Milk & butter, Poultry, Pig & pork, Poultry & chicken, Goat, Chevon, Mushroom, Fish, Honey, Flowers, etc.	-High development of processing industry -Well connected to export market such as India
Tsirang	Paddy, Maize, Millet, Cardamon, Ginger, Sunflower, Onion, Broccoli, Chilli, Mandarin, Mango, Pear, Peach, Plum, Guava, Cattle, Buffalo, Milk & butter, Beef, Pig & pork, Poultry & chicken, Goat, Chevon, Mushroom, Honey, Flowers, etc.	- Formulation of ICT based market information system is proposed by Tsirang Dzongkhag. - Tsirang has a brand as "Tsirang Natural."
Zhemgang	Paddy, Maize, Barley, Ginger, Walnut, Cattle, Poultry & chicken; Mushroom, Bamboo, etc.	- Smallholder Horticulture Empowerment Project (SHEP) is implemented with JICA. - Highest poverty rate in the country

Source: JICA Project Team based on Statistical Year Book 2021 and Investment Opportunity Report 2020 by erstwhile MoEA

(2) Development method

To utilize resources of agricultural products through advanced methods, technology, and innovations, and to increase productivity, an introduction of industrial cluster would be very effective. Industry clusters are groups of competing, collaborating and interdependent businesses within a value chain. As shown in Figure 4.2.1, an underperforming cluster consists of many players (private firms, also farmers, CSIs/Small and Medium sized Enterprises (SMEs), central/local governments and local support institutions), but it does not display clear linkages among the different entities. On the other hand, a performing cluster is well organised with strong linkages between various players and stakeholders. The industrial cluster is generally composed of the operation of upstream (raw material suppliers, production

inputs) and downstream (value added processing, packaging, marketing, and exporting) economic activities.



Source: UNIDO Approach to Business Investment Technology Services, Key Principles and Project Experiences for Inclusive Growth, Technical Paper, 2013

Figure 4.2.1 Underperforming and Performing Industrial Cluster

Support policy measures and recommendations to facilitate the establishment of the promising industrial clusters are listed and summarized in Table 4.2.2.

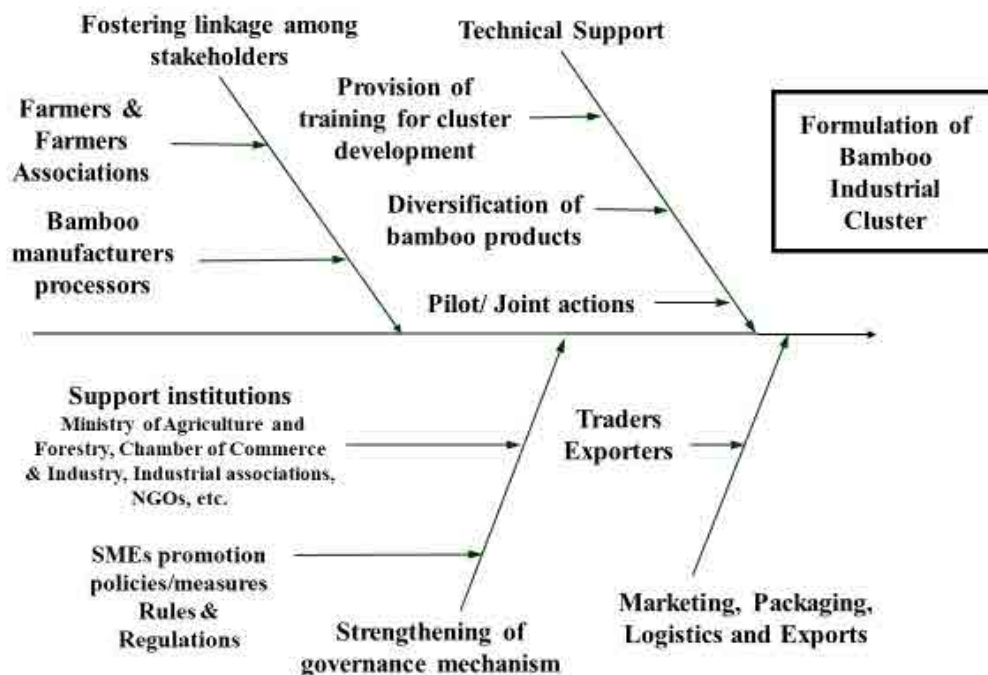
Table 4.2.2 Candidates of Agricultural Industrial Clusters

Product	Possible processing/ services	Possible approach	Support policy measures/ recommendations
Fruits (Mandarin, Mango, Pear, Peach, Plum, Guava, etc.) and vegetables	Juice, canned food, dry fruits, sweets frozen vegetables, health products, etc.	<ul style="list-style-type: none"> Integrated production and processing system being developed with food industries through industrial cluster ICT based market information system with real time data 	<ul style="list-style-type: none"> Production increase and quality improvement necessary for international competitiveness Technical training for increase of production and improvement of quality Support for markets diversification Support of value addition processes including post-harvest processes
Milk, butter, and Cheese	Dairy products, yoghurt, health products, etc,	<ul style="list-style-type: none"> Livelihood activities to be organized to increase production and promote export through industrial cluster 	<ul style="list-style-type: none"> Support for products and markets diversification
Bamboo	Construction materials, bamboo Furniture, bamboo lifestyle products, bamboo shoot, etc.	<ul style="list-style-type: none"> Integrated production and processing system being developed with processing industries through industrial cluster (* There is a proposal by Tarayana Foundation for development and diversification of bamboo products in Zhemgang.) 	<ul style="list-style-type: none"> Technical training for increase of production and improvement of quality Support for markets diversification

Source: JICA Project Team

The bamboo industrial cluster as an example are shown in Figure 4.2.2. It should be noted there are many players and stakeholders. At the initial stage for the formulation of the industrial cluster, the following actions should be taken.

- 1) Conducting a study to select the appropriate product,
- 2) Training for cluster development on (a) stable procurement of raw materials, products, and markets diversification, and (b) fostering linkage among stakeholders such as farmers, traders, and manufacturers,
- 3) Technical and skill training for diversification of the product or new product, and
- 4) Formulation of implementation plan including a pilot action or project.



Source: JICA Project Team

Figure 4.2.2 Formulation of bamboo industrial cluster

(3) Development policy measures

The development policy measures on agriculture and livestock are summarized in Table 4.2.3.

Table 4.2.3 Policy Measures on Agriculture and Livestock

	Policy measures
Overall	ICT-oriented industrial clusters based on primary products offer a viable approach to achieving self-reliant regional development with inclusive growth and effective natural resource management.
RCSP Area	In the RCSP area or Sarpang Dzongkhag, it is essential to enhance the linkages between agricultural and livestock activities, processing, trade/marketing, and the development of indigenous industries that export high value-added products.
Project Area	Zhemgang is mostly covered by forests, with sloping cultivable land explaining the relatively smaller acreage of paddy fields. To address this, policy measures should focus on the formulation of industrial clusters that process forest products. In Tsirang, the cultivation of mandarin oranges, orchards, areca, and cardamom plantations have been well-established since the 1960s, serving as significant sources of cash income. Additionally, vegetables have gained importance as a cash crop in recent

	years. Consequently, the formulation of an industrial cluster for fruits and vegetables appears promising.
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Source: JICA Project Team

The highest poverty rate in Zhemgang should be improved through agriculture, and food processing based industrial cluster. A vertical industrial cluster based on primary products links livelihood activities by the rural poor such as traditional livestock and bamboo farming to indigenous industries such as meat/dairy products and handicraft industries. By establishing export products that can sell not only within the Project Area, but also neighbouring market, the entire industrial cluster becomes viable linked to them. This, therefore, could be an effective measure to alleviate poverty.

In Tsirang and Sarpang, ICT-oriented industrial clusters based on primary products provide a viable means to realise self-reliant regional development with broad-based inclusive development and proper natural resources management. They would link livelihood activities by the poor through indigenous industries to export industries, generating large number of employment opportunities and attaining high value-added. ICT application to link all the players in each cluster would facilitate the cluster development and operation. Market information on agriculture and livestock products has yet to be integrated in the Project Area because local markets are scattered over a large area. The ICT-oriented network supported by corroborative work between private and government would provide the farmers and herders with price and logistics information on the respective products in the Dzongkhag; it will also feature a function to match them with brokers. In this way, the network would integrate scattered and isolated livestock markets online.

4.2.2 Processing, manufacturing, and cottage and small industries

According to the statistics and information from the local administration, most establishments in the Project Area are cottage and small-scale industries such as furniture, wooden or bamboo product manufacturers, brick manufacturers, repair and maintenance services for computers, electrical and electronics products and machines, building repair and maintenance services (plumbing, cleaning, carpentry, painting, water and waste water treatment), tailers, bakery and so on.

In Gelephu Thromde, the accumulation of CISs is seen in the Industry Service Centre. In Tsirang Dzongkhags, the CSIs estate is being developed at Changchey, Semjong Gewog.

Also, Jigmeling Industrial Park with 645 acreage (261 hectare) is being developed in the RCSP Area. According to the information by MoICE, about 80 enterprises submitted the proposals. Among them, some enterprises have already constructed factories and have started operations. Major types of industries to be located are agro-processing industries, forest-based products industries, and mineral-based products (ferrosilicon, etc.) industries. This industrial park is highly expected to be a hub for industrial development in the Project Area and to strengthen the linkages among various processing and manufacturing activities in the whole country and India.

Various policy measures for industrial development have been taken in Bhutan. General policy measures, current situations and issues, and strategies for industrial development are summarized and discussed in Table 4.2.4, although they are not only managed by Dzongkhags or Thromde administration, but also central government. They are classified into six categories: (1) Legal and policy framework, (2) Human resource development, (3) Strengthening & diversification of enterprises capability, (4) Foreign Direct Investment (FDI) and domestic investment attraction, (5) Value-chain development and strengthening of marketing and business linkage, and (6) Start up and Innovation.

Table 4.2.4 Overall Policy Measures and Plans for Industrial Development

Policy measures	Current situations and issues	Development plans
(1) Legal and policy framework		
Provision of necessary laws and regulations	<ul style="list-style-type: none"> Necessary laws and regulations including Foreign Direct Investment Rules and Regulations 2019 are already 	Provision of the detailed regulations for the SEZ development.

Policy measures	Current situations and issues	Development plans
	prepared. As for special economic zone (SEZ) development, detailed regulations are not completed.	
Designation or creation of lead ministry/agency for priority policy	<ul style="list-style-type: none"> MoICE is responsible for industrial development as a lead ministry. 	-
Introduction of effective public-private partnership (PPP)	<ul style="list-style-type: none"> Not yet be fully introduced. 	Introduction of effective PPP scheme
Policy structure consisting of visions, roadmaps, and action plans	<ul style="list-style-type: none"> Policies and strategies such as Economic Development Policy 2016 are prepared. 	The implementation of policies/strategies/projects is needed as soon as possible.
National standard for quality, intellectual property rights, etc.	<ul style="list-style-type: none"> Bhutan Standards Bureau (BSB) was established as an autonomous organization in the year 2010 after the enactment of the Bhutan Standards Act 2010. 	-
Strategic mobilization of international cooperation	<ul style="list-style-type: none"> Being developed including trade agreements 	-
(2) Human resources development		
Technical Vocational Education and Training (TVET) for new and/or current workers	Vocational training institute (VTI) or Technical Training Institutes (TTI) are already established.	Develop curriculum / training programs based on the demand of private sector
Training for workers in CSIs/SMEs	Some of the training programs by MoICE such as food processing, value addition, packaging, value addition, management, marketing, bookkeeping, and packaging	-
(3) Strengthening & diversification of enterprises capability, mainly for CSIs/SMEs		
Introduction of productivity tools (QC circles, suggestion box, just-in-time system, etc.)	Some tools are introduced.	Introduction of productivity tools for SMEs should be considered by MoICE, other agencies, private associations.
Enterprise diagnostic and technical advisory system (institutionalized technical extension services by visiting consultants or experts)	MoICE provides managerial or technical advisory and support services to CSIs.	Introduction of institutionalised technical extension for SMEs may be considered.
Quality standards and certification, testing services	Not well introduced.	Quality standards and certification, testing services should be introduced.
Subsidies & incentives for upgrading management, technology, marketing, and ICT	Not well introduced.	Subsidies & incentives for upgrading management, technology, marketing, and ICT may be introduced,
Development of financial institution and provision of special loan and grants for priority products and activities	MoICE does not have direct involvement for improving access to finance, however, the Department of CSI do support CSIs in availing various financial products/schemes.	More coordination among government and private commercial banks may be needed to provide a loan to CSIs/SMEs in response to their demand including development of financial institution and/or special scheme for CSIs/SMEs.
(4) Foreign Direct Investment (FDI) and domestic investment attraction		

Policy measures	Current situations and issues	Development plans
Clear announcement of preferred investors, sectors, regions, etc. with incentives	Prioritized industries are indicated in Economic Development Policy 2016. Also, Foreign Direct Invest Regulations 2019 designates priority list of activities with incentives. Bhutan does not give the incentives for the industrial parks/estates or SEZs.	Specific incentives should be given to enterprises with high and eco-friendly technologies in industrial parks/estates and SEZs. It may be recommended to revise the clause on the restriction of expatriate employment by FDI Regulation 2019.
Investment promotion seminars, missions, and office abroad	Not well developed.	Investment promotion seminars, missions and office abroad should be strengthened.
Provision of high-quality infrastructure services (power, transport, land, water, waste water and solid waste treatment)	Being developed	-
One-stop investor support service (both before and after investment)	A Single Window for investors to come and interface with the MoICE authorities is not well prepared.	Streamline approval process for foreign and creation of a Single Window are needed.
Development and management of industrial estates including Industrial parks Free Economic Zone (FTZ), SEZs for priority sectors, high-tech firms, etc.	Jigmeling IP are being developed by MoICE with the infrastructure development in/out of the zone.	Facilitate FDI inflows into the new SEZ to be located in the Corridor Area Strive to attract anchor investors in targeted or selected sectors Appropriate financing modalities to develop industrial zones/SEZs such as loan, grants, technical assistance, equity investment, and private sector loans should be taken into consideration.
(5) Value-chain development and strengthening of marketing and business linkage		
Enterprises database (CSIs/SMEs, supporting industries by region, etc.)	No region-specific resource inventory/sector development studies for CSI have been conducted till date.	Enterprises database for the linkage among industries should be developed.
Official promotion/intermediation of subcontracting	Physical CSI product promotion are carried out in Dzongkhags and match-making with wholesalers/retailers/ customers is done from time to time.	Official promotion/ intermediation of subcontracting should be promoted by MoICE in cooperation with Bhutan Chamber of Commerce and Industry (BCCI)
Establishment and strengthening of industry/business associations and local firm networks	Not well developed, although Bhutan Chamber of Commerce and Industry (BCCI) play an important role.	Establishment and strengthening of industry/business associations and local firm networks should be strengthened.
Development of Industrial Clusters	It is important to introduce advanced methods, technology, and innovations, and to increase productivity through organizing export-oriented processing industry.	Development of agro-processing industrial cluster is one of the proposed projects. They are groups of competing, collaborating and interdependent businesses.
(6) Start up and Innovation		
Business start-up support (including venture capital), development of incubation centres, etc.	MoICE is involved in development of several infrastructures such as incubation or startup centre, CSI Estate (Tsirang), and Common Facility centre (Tsirang)	Support of setting up incubation centres including the functions of R&D for entrepreneurs in collaboration with relevant business associations should be strengthened.

Policy measures	Current situations and issues	Development plans
Support for R&D, branding, patenting	Regional branding, mainly products basis such as one Gewog one product (OGOP) is being introduced or prepared by Dzongkhags level, but not well recognized.	Development of the strong branding image, not only product, but also culture, or life style, will be needed.

Source: JICA Project Team

From the viewpoint of the Regional Spatial Plan, among above mentioned general policies and recommendations, (4) Foreign Direct Investment (FDI) and domestic investment, (5) Value-chain development and strengthening of marketing and business linkage, and (6) Start up and Innovation would be directly applicable. Namely, they are development of industrial park or SEZ development under (4), industrial cluster development under (5), which is already discussed in the preceding section, and development of IT Park with science technology under (6).

To fully utilize the existing or planned infrastructure and facilities such as an airport, dry port, and trunk road and the strategic location bordering India, the creation of additional industrial park (Agro-processing Park), SEZ and IT park will be recommended. Also, time-sensitive businesses activities that require immediate attention or priority handling to ensure timely completion or delivery such as order processing, logistics, and commerce will be developed. The candidate sites are expected in the RCSP Area, which will be discussed in the later sections.

Table 4.2.5 shows the location factors or requirements by type of industry. The requirements such as “access to market,” “access to transportation/trunk road,” “access to airport,” and “electricity (stable power supply)” are highlighted since the Project Area may be held in high regard. According to this table, food and beverage, construction materials, electronics and electrical machinery, basic metal, pharmaceutical products and so on seem to be positive in the Project Area.

Table 4.2.5 Location Factors or Requirements by Type of Industry.

Type of Industry	Industrial sub-sector	Market & Transportation				Utilities & Local resources					Accumulation of Industries & ICT				
		Access to market	Access to Transportation/ logistics, Trunk Road	Sea Port	Air port	Railway	Land (a large area)	Water Supply	Electricity	Access to Raw Materials	Labor Force (intensive)	Labor Force (qualified engineers/experts)	Accumulation of support industries	University/College, Inspection Institute	Accumulation of ICT & Knowledge-based industries
Light Industry	Agro-Processing/Food	X	X						X						
	Beverage	XX	X						X						
	Textile	X	X							X					
	Wearing Apparel	X	X							X					
	Wood & Wood Product, Furniture		X	X		X	X		X						
	Precision machinery												X		X
Heavy Industry	Industrial sub-sectors which may not cause a large impact on environment	Construction materials	XX	XX	X		X	X	X	X					
		General Machinery & Equipment		X							X	X			X
		Electronics & Electrical machinery including information and communication equipment		X		X						X	X		X
		Transport equipment	X	X	X	X	X	X	X	X	X	X	X		X
		Pharmaceuticals	X	X		X			X	X		X		X	X
	Industrial sub-sectors which may cause a large impact on environment	Basic Metal (Iron/Steel, Non-ferrous metal)	X	X	X		X	X	X	XX					
		Fabricated Metal products		X						X					
		Oil & coal product	X	X	X	X	X	X	X	X		X			X
		Chemical product	X	X	X	X		X	X	X		X	X		X

Source: JICA Project Team

Considering the Economic Development Policy 2016, Investment Opportunity Report 2020 or the table above, electronics, electric vehicles and transport, electrical transformers & equipment, computer

hardware, pharmaceuticals, industries related to communication technologies are listed as the candidate type of industries to be introduced in SEZ. In Agro-processing Park, food industries from organic and natural farming will be highly expected.

4.2.3 Tourism

Most tourists visit only Thimphu or the surrounding area as shown in Table 4.2.6.

Table 4.2.6 Number of Tourists in the Project Area

Dzongkhag	2015	2016	2017	2018	2019
Sarpang	233	231	284	231	263
Tsirang	10	32	27	68	74
Zhemgang	298	231	259	332	346
Thimphu	46,875	53,454	59,164	60,100	58,593
Total	186,074	204,040	224,115	232,880	229,663

Unit: person

Note: Only the international leisure tourists

Source: Erstwhile Tourism Council of Bhutan, Thimphu.

However, the Project Area has numerous tourism resources including the Royal Manas National Park. Resources, characteristics, and potential of tourism development in the Project Area, which are mainly coming from the ideas and plans of the Dzongkhag administration, are summarised in Table 4.2.7.

A combination of nature, culture and wellness including winter resort tourism by exploiting the comfortable climate will promote the tourism development in the Project Area with the preparation of roads, hotels, restaurants, and other services facilities as well as fully utilization of airport at Gelephu.

Table 4.2.7 Resources, Characteristics, and Potential of Tourism Development in the Project Area

Dzongkhags	Resources, characteristics, and potential for tourism development	Remarks
Sarpang	Entry point for the region, Golf resorts, Water recreational facility, Wellness industry, Meeting, Incentive Travel, Convention, Exhibition/Event (MICE)	Royal Manas National Park covers eastern Sarpang Dzongkhag, the western half of Zhemgang Dzongkhag, and western Pemagatshel Dzongkhag. It is connected via "biological corridors" to Phibsoo Wildlife Sanctuary.
Tsirang	Agri-tourism, Meeting, Incentive Travel, Convention, Exhibition/Event (MICE) as it has favourable climatic conditions, Transit stop for tourists entering from Gelephu to other parts of the region, Earmarked land for sporting hub	Agri-tourism is for settlements and homestays of agricultural life style.
Zhemgang	Natural landscape, Rich biodiversity in terms of flora and fauna, Ecotourism, Buli village, Buli Tsho (lake), Trong heritage village, Duedmang Tshachu, Bird watching, River rafting, Elephant riding, Trails, High end fly fishing, Hot springs	Trong Heritage Village is a cluster of 27 traditional stone houses located on a small hilltop above Zhemgang town.

Source: JICA Project Team

As for the tourism sector, below strategies are suggested in each Dzongkhag;

- (a) Development of nature and wilderness tourism such as eco-tourism utilizing national parks and forest reserves as well as culture experience tourism, through the linkage of plural tourism sites in Zhemgang;

- (b) Promotion of border tourism based on Gelephu in combination with shopping opportunity on the border with a border transaction in Sarpang;
- (c) Active resort tourism and agriculture experience tourism taking advantage on the location for networking hub in Tsirang;
- (d) Organising highly efficient tour route and training tour guide for local people, and
- (e) Promotion of tourism resources by Social Network Service (SNS) and establishment of tourism information centre in Thimphu.

4.3 Holistic Service Delivery System

4.3.1 Hierarchical analysis

As mentioned in section 3.3.3, the regional development strategy of social service delivery follows the Holistic Service Delivery System proposed in the CNDP2030. The following hierarchical analysis and spatial plan also focus on realising the Holistic Service Delivery System. The RCSP Area is considered to be the RC, the top hierarchy of the Holistic Service Delivery System, in the Southern Central Region. The rest of the Project Area consists of Tsirang and Zhemgang Dzongkhag, Thromdes as the second hierarchy and all Gewog Centres as the third. The DC, the second hierarchy, is the hub of urban standard-level services, and the GC, the third hierarchy, is the hub of rural standard-level services.

The following tables show the hierarchical analysis of social services by function. This analysis depends on the field research, interviews, data collection, and the questionnaire in collaboration with JICA Project Team, the Project Core Team and the Technical Working Group.

Table 4.3.1 Hierarchical Analysis of Social Services by Function: Education

	Spatial/Physical Issues	Corresponding Issues
Overall	<ul style="list-style-type: none"> • Central School concept is facing challenges due to a limited budget. • As per existing strategic plan, the Royal University of Bhutan (RUB) does not have plans to establish a new college until 2030. And there is no policy as such to establish institutions considering regional balance. 	<ul style="list-style-type: none"> • A shortage of teachers is highly concerned. • Structural reform of school education including separation primary school from secondary school is under planning by MoESD.
The RCSP Area	<ul style="list-style-type: none"> • To establish a tertiary education facility is requested contributory to human resource development. However, it is less negotiable in short term due to the lack of the strategic plan until 2030. • Locating near the border is related to risks such as lockdown during pandemic. On the other hand, there are some advantages such as availability of machinery and materials. • Jigme Wangchuck Power Training Institute (JWPTI) is providing not only high quality training services required for both public and private sectors, but also access to advanced training and lifelong learning to 	<ul style="list-style-type: none"> • The Department of Adult and Higher Education (DAHE), MoESD is the custodian of higher education development policy. If there are private entities interested to establish higher education institutions the DAHE looks after the approval process.

	enable graduates to deliver customized training services.	
The Project Area	<ul style="list-style-type: none"> Considering the plain geographical conditions in Sarpang, there is high potential for development of schools, colleges and sporting facilities. The merger of schools in Zhemgang is underway. It should be careful not to accelerate urban-rural migration. 	<ul style="list-style-type: none"> Poor internet connectivity and shortage of committed teachers are concerned. Frequent power fluctuations¹ especially during monsoon which causes damage to already limited electrical appliances.

Source: JICA Project Team

Table 4.3.2 Hierarchical Analysis of Social Services by Function: Health

	Spatial/Physical Issues	Corresponding Issues
Overall	<ul style="list-style-type: none"> Bad road conditions and no road connectivity in the community, rugged terrain and unfavourable geographical situation of the country has impacted negatively on the part of providing timely health care services. 	<ul style="list-style-type: none"> The planning policy including health facility distribution by MoH should be respected. Cluster strategy, to gradually roll out selected specialist services to district hospitals in a phase wise manner, will be adopted for the next FYP. Skilled Human resource shortage and balancing investments in sustenance of services and expansion nationally should be highly considered.
The RCSP Area	<ul style="list-style-type: none"> With the construction of CRRH in Gelephu, the patients from Tsirang, Dagana, Zhemgang, Trongsa, Bumthang and even from Pemagatshel and Samdrup Jongkhar have immensely benefited. 	<ul style="list-style-type: none"> Rehabilitation facility is required especially for recovering from DV or alcoholic cases. Alcoholism is rampant and one of the top 3 killers in the country. CRRH can now connect to provide technical support, human resource backup and consultation services to all the adjacent districts.
The Project Area	<ul style="list-style-type: none"> High mobility of people and inability to keep track of people through the present available digital system is a challenge to the health system. Difficult geographic terrain, sporadically distributed human settlements and poor road accessibility of health facility is the 	<ul style="list-style-type: none"> Increased number of floating populations may be another concern to provide necessary primary health services. Increased number of elderly citizens can be one of the primary health care concerns. Old age homes may finally be required in

¹ Although the areas covered by this study are almost 100% electrified except for some remote areas, problems due to voltage fluctuations during the rainy season have been pointed out.

During rainy seasons, voltage fluctuations are caused by overloads and shorts in power transmission and distribution lines and transformers due to large surge currents and voltages caused by natural phenomena such as lightning and thunderstorms, leakage and poor contact due to decreased insulation performance of power transmission and distribution lines and equipment caused by increased electrical conductivity of moisture in the air during high humidity, circuit interruptions and shorts due to strong winds, etc.

In Bhutan, the effects of voltage fluctuations during the rainy season may be more serious due to the aging and breakdown of the power transmission and distribution network, inadequate maintenance, and lack of backup systems on the power receiving side, etc. Therefore, it is considered necessary to take measures such as installing backup systems with UPS, etc. on the power receiving side.

	<p>main concern.</p> <ul style="list-style-type: none"> During the COVID-19 pandemic, the whole Sarpang Dzongkhag and the southern half of Zhemgang Dzongkhag is considered to be the high-risk area. 	<p>the wake of breakdown of social safety nets.</p> <ul style="list-style-type: none"> Unstable sources of drinking and irrigation water, waste management, and no proper drainage system may be another concern. Shortage of health staffs and inadequate health facilities. Lack of receptibility on National Determined Contributions (NCDs), mental illnesses.
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Source: JICA Project Team

Table 4.3.3 Hierarchical Analysis of Social Services by Function: Transport

	Spatial/Physical Issues	Corresponding Issues
Overall	<ul style="list-style-type: none"> No detour route increases the risk of isolation due to landslide. 	<ul style="list-style-type: none"> EV promotion strategy needs to be under consideration.
The RCSP Area	<ul style="list-style-type: none"> No inter-city bus service between Gelephu Thromde and Sarpang town. Upgrading plan of Gelephu Airport into international airport. Road-side service facilities (Fuel Station, Car Workshop and Car Wash facility, Electric Charging Station, ATM, Restaurants/eateries, Market Sheds, Recreational areas, Footpath, and Taxi Parking) are needed in Jigmeling. 	<ul style="list-style-type: none"> Mass Rapid Transit such as Bus Rapid Transit (BRT), metros, commuter rail and light rail transit were indicated as transportation alternatives by the DHS (2019). However, the low user-base is hard to justify its uptake.
The Project Area	<ul style="list-style-type: none"> There are still many households that have to take more than 30 minutes for access to a vehicle road. Fuel Station for Damphu, Mendrelgang, Tsirangtoed and Car Wash facility for Damphu are needed. Car Workshop and Car Wash facility for Zhemgang Town and Tingtibi are needed. The road-side service facilities including Fuel Station and Car Workshop should be distributed on the half-way of Gelephu-Tingtibi and Tingtibi-Panbang. Feasibility of railway link between India and Bhutan through Gelephu. 	<ul style="list-style-type: none"> Shortcut route between Gelephu and Panbang through Royal Manas National Park is highly required, but it is hard to realize due to the strict regulation. Inadequate public transport especially bus services. Rampant human-wildlife conflict (elephants) along the highway posing huge threats to transport.

Source: JICA Project Team

Table 4.3.4 Hierarchical Analysis of Social Services by Function: Commercial, Recreation, and Civic Services

	Spatial/Physical Issues	Corresponding Issues
Overall	<ul style="list-style-type: none"> The weakness of postal service and home delivery service has had a negative effect on the spread of e- 	<ul style="list-style-type: none"> Cashless services including e-banking and QR code payment are increasing.

	<p>commerce.</p> <ul style="list-style-type: none"> Recreation facilities such as indoor sports hall and playgrounds are needed in urban area, generally. 	<ul style="list-style-type: none"> Unmanned delivery by drone can be under consideration. Need to Strengthen Bhutan Olympic Committee which can outsource management of recreation service facilities to one of the Youth Centres in the district. Need to follow the digitalization of G2C services by Digital Drukyul Programme. Public education and sustainable use in rural areas of G2C is critical.
The RCSP Area	<ul style="list-style-type: none"> With the establishment and operation of Jigmeling Industrial Park, the commercial activities in the corridor area is expected to prosper. 	<ul style="list-style-type: none"> Increase in social issues like crimes, youth abusing drugs, alcoholism, hooliganism with increase in commercial activities.
The Project Area	<ul style="list-style-type: none"> In Sarpang, there are high potential to develop recreational places like parks, cycling trails, bird watching, water sporting, etc. 	<ul style="list-style-type: none"> Less priority is given to develop recreational facilities as the Local Government is burdened by other important activities. If the recreational facilities are developed by the government, there are issues pertaining to ownership and sustainability. There will be issues for availing services online for illiterate people. Shortage of HR delivering services and lack of opportunities to develop capacities at grassroot level.

Source: JICA Project Team

4.3.2 Spatial plan

(1) Planning standards

To realize the Holistic Service Delivery System, it is necessary to draw maps reflecting the present geographical distribution of social service facilities. Then, it would be possible to launch a plan based on spatial or physical analysis.

Reference was made to the criteria of the Spatial Planning Standards (SPS)² in terms of which facilities should be included on the map or not. The term public amenity is used in the SPS almost synonymously with the social service facility. The listed GIS data in Table 4.3.5 is collected for mapping. 14 types of facilities not included in the SPS are added because some top-hierarchical facilities or fundamentals are missing.

Table 4.3.5 GIS Data Collection List

Education	Health	Transport	Commercial	Recreation	Civic
College *	Regional Referral Hospital (RRH)	Airport *	Post Office	Multi-Purpose Hall	Dzongkhag Court *
VTI/TTI *	Hospital	Bus Terminal	Bank Branch *	Community	Dungkhag Court

² DHS (2017a) "Spatial Planning Standards"

	(BHU I)			Hall/Centre	*
Central School (CS) *	Primary Health Centre (PHC) (BHU II)	Taxi Stand	Bank ATM *	Football Ground	Royal Bhutan Police (RBP) Division HQ *
Higher Secondary School (HSS)	Sub-post *	Fuel Station	Renewable Natural Resource (RNR) Market Shed	Playground	RBP Police Station
Middle Secondary School (MSS)	Outreach Clinic (ORC) with shed	Car Workshop *	RNR Collection Shed *	Public Park/Garden	LG Office (Municipal / Thromde)
Lower Secondary School (LSS)	ORC without shed		RNR Farm Shop *		Gewog Centre
Primary School (PS)					Waste Disposal Site
Extended Classroom (ECR) *					Fire-fighting Station

* Not included in the Spatial Planning Standard (DHS, 2017a)

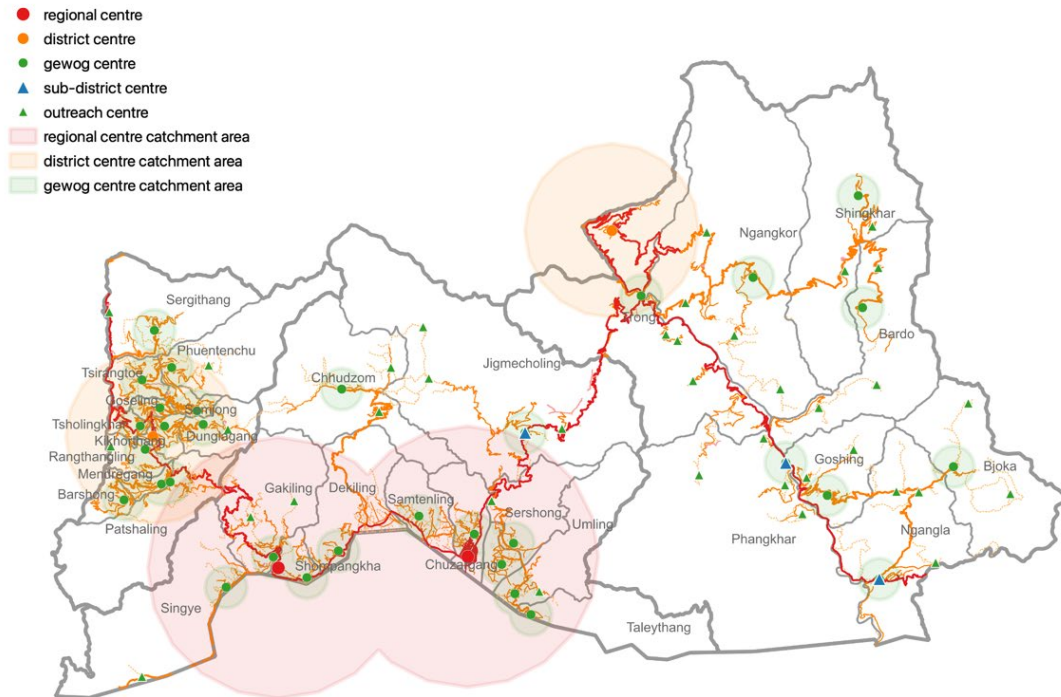
Source: JICA Project Team

The following Table 4.3.6 shows the planning requirements for the Holistic Service Delivery System. The criteria of RC are based on the planning requirements for the regional-level service facility, such as Regional Hospital, in the SPS. In the same way, the criteria of DC are based on the planning requirements for Dzongkhag/District Hospital, and the criteria of GC are based on the planning requirements for the LG office. And Figure 4.3.1 shows the whole image of the regional hierarchy depending on the planning requirements as mentioned above.

Table 4.3.6 Planning Requirements for the Holistic Service Delivery System

	Location	Max Catchment Radius	Max Catchment Population	Indirect Catchment Area	Remarks
RC	The RCSP Area	45 minutes driving (15km)	20,000-30,000	Whole Region	Based on the planning requirements for Regional Hospital in the SPS.
DC	Dzongkhag Thromde	30 minutes driving (10km)	15,000-20,000	Whole Dzongkhag	Based on the planning requirements for Dzongkhag/District Hospital in the SPS.
GC	Gewog Centre	30 minutes walking (2.4km)	No Limit	Whole Gewog	Based on the planning requirements for the LG office in the SPS.
SDC	Located on the intermediate of the RC or DCs, on the National Highway.				
OC	Located with the rural hub facility such as PS, ECR, PHC (BHU), or ORC.				

Source: JICA Project Team



* RC catchment radius = 15km, DC catchment radius = 10km, GC catchment radius = 2.4km
Source: JICA Project Team

Figure 4.3.1 Regional Hierarchy for the Holistic Service Delivery System

(2) Spatial plan by function

The plan for the spatially balanced development of social services is shown as follows based on the maps of regional hierarchy by function and catchment radius by the facility. The hierarchical analysis mentioned in 4.3.1 is also referred to properly. Note that the spatial map drawing in the Paro Valley Development Plan (PVDP)³ was referred to for the actual mapping. As it is not practical to show all facilities, only representative facilities have been mentioned. Moreover, the detailed planning requirements for each facility are mentioned in the following chapter 5.4.3.

1) Education

The following table, showing the existing conditions of education facilities based on planning requirements, suggests that all 3 Dzongkhags have plenty of HSS and MSS. Regarding LSS, there would be apparently a shortage, but actually, some HSS and MSS include classes of LSS. Thus, there is no urgent demand to distribute new schools as of now. The population coverage of PS, especially in Zhemgang, hits a high ratio, however, schools are required to be distributed to cover the scattered settlements.

Moreover, the area coverage of LSS and PS seems to be a low ratio, because the catchment radius regulated in the Spatial Planning Standards (SPS) is based on the walking distance of student commuting, is not conforming to the difficulty with daily commuting in Bhutan. One existing solution to solve this issue is establishing a boarding school called a central school (CS), and another is installing an e-learning system. Each solution has both merits and demerits, so, it should be important to combine various solutions on the basis of actual conditions.

³ DHS (2017b) "Paro Valley Development Plan"

Table 4.3.7 Existing Conditions of Education Facilities based on Planning Requirements

	Numbers	Total Catchment Area (km ²) ⁴	Total Catchment Population ⁵	Area Coverage (%) ⁶	Population Coverage (%) ⁷
Sarpang Dzongkhag (Area: 1,681.5km², Population: 46,004)					
HSS/CS	6	4,239.0	120,000	252.1	260.8
MSS	7	4,945.5	140,000	294.1	304.3
LSS	1	4.5	5,000	0.3	10.9
PS	11	22.0	55,000	1.3	119.6
Tsirang Dzongkhag (Area: 639.0km², Population: 22,376)					
HSS/CS	3	2,119.5	60,000	331.7	268.1
MSS	1	706.5	20,000	110.6	89.4
LSS	0	-	-	-	-
PS	12	24.0	60,000	3.8	268.1
Zhemgang Dzongkhag (Area: 2,421.5km², Population: 17,763)					
HSS/CS	4	2,826.0	80,000	116.7	450.4
MSS	0	-	-	-	-
LSS	3	13.5	15,000	0.6	84.4
PS	23	46.0	115,000	1.9	647.4

Source: JICA Project Team

Short-term

Understanding the following figures about the Catchment Radius of education facilities and the actual conditions, the grade-up or consolidation of existing secondary schools or primary schools should be taken into consideration. In Sarpang, Sarpang CS and Sarpang MSS, Dekiling MSS and Chokholing MSS, Perlithang MSS and Gelephu MSS, should be consolidated. And, Samkhara ECR should be annexed to Jigmecholing MSS. In Tsirang, Tsirangtoe MSS should be upgraded to HSS, and Dungleang PS should be upgraded to MSS with boarding facility. In Zhemgang, higher secondary school including middle secondary and lower secondary classes should be located both northern and southern part of Dzongkhag area. Then, each Gewog should have at least one primary school.

Mid-term

The sustainability of the central school, maintenance of schools in remote villages, the shortage of teachers, etc., are highly concerned. From the spatial point of view, promoting selection and concentration in rural education service facilities is a high priority. School consolidation for advantages of scale would solve the problems related to the limited budget and human resources.

⁴ The total catchment area is roughly calculated from multiplication of the number of facilities by the catchment area of each facility. Then, the catchment area is also calculated from the catchment radius, mentioned in the Table 5.4.8 Planning Requirements for Education Facilities. The overlap between the catchment area of schools is supposed to be disregarded.

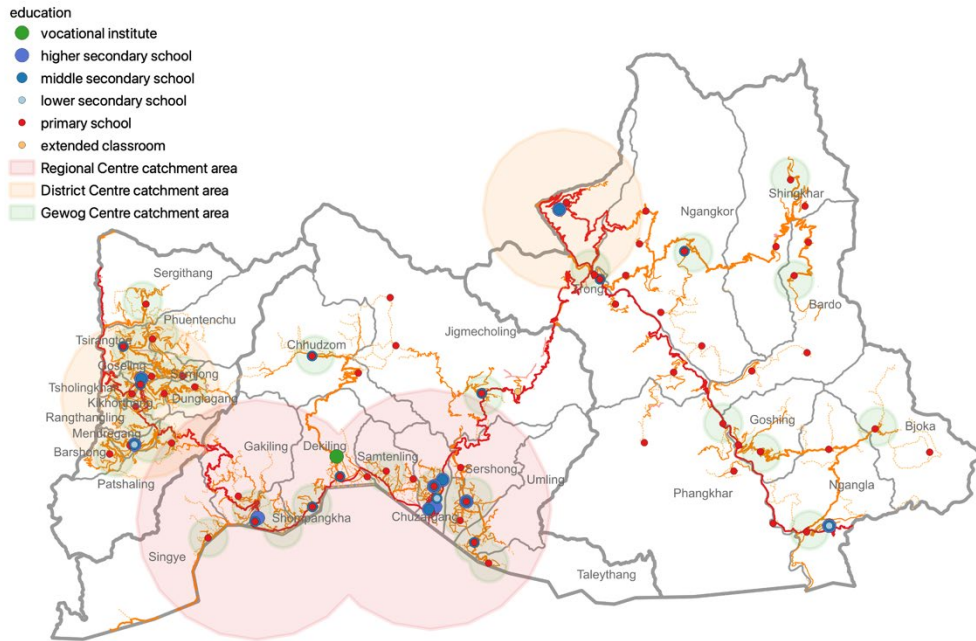
⁵ The total catchment population is roughly calculated by multiplication of the number of facilities and the max catchment population of each facility, mentioned in the Table 5.4.8 Planning Requirements for Education Facilities. The overlap between the catchment area of schools is supposed to be disregarded.

⁶ The area coverage is calculated from division of the total catchment area by the area of each Dzongkhag. If it reaches 100%, it means schools in the Dzongkhag are sufficient.

⁷ The population coverage is calculated from division of the total catchment population by the population of each Dzongkhag. If it reaches 100%, it means schools in the Dzongkhag are sufficient.

Long-term

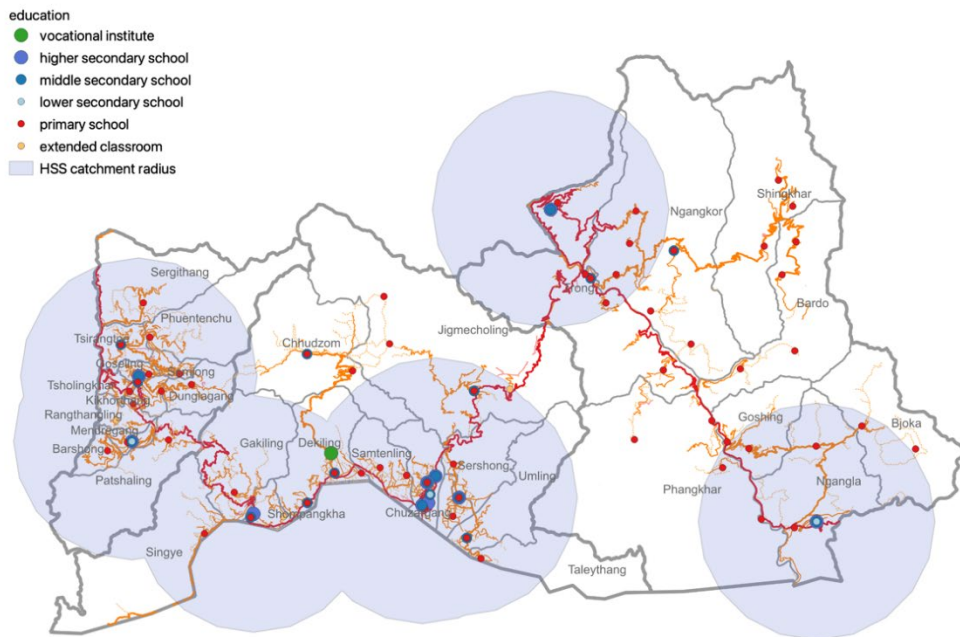
From a long-term perspective, the establishment of a tertiary education institute in this region is required for regional balanced development. Cooperation among the local government, the Royal University of Bhutan, and the Department of Adult and Higher Education, MoESD, is indispensable for realising that.



* RC catchment radius = 15km, DC catchment radius = 10km, GC catchment radius = 2.4km

Source: JICA Project Team

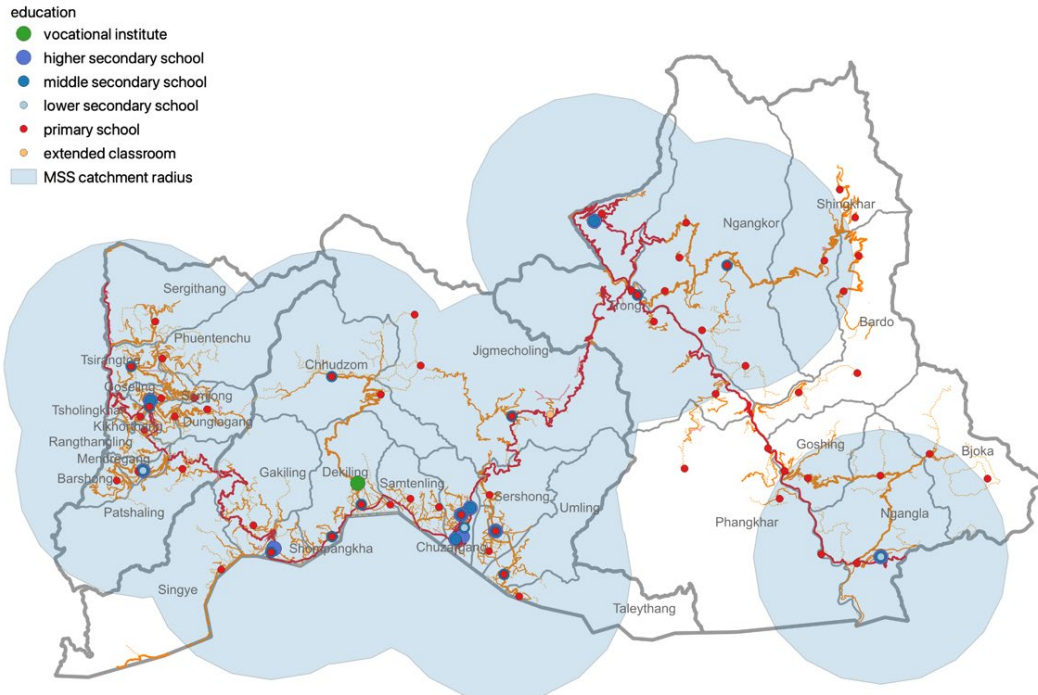
Figure 4.3.2 Regional Hierarchy of Education



* HSS catchment radius = 15km

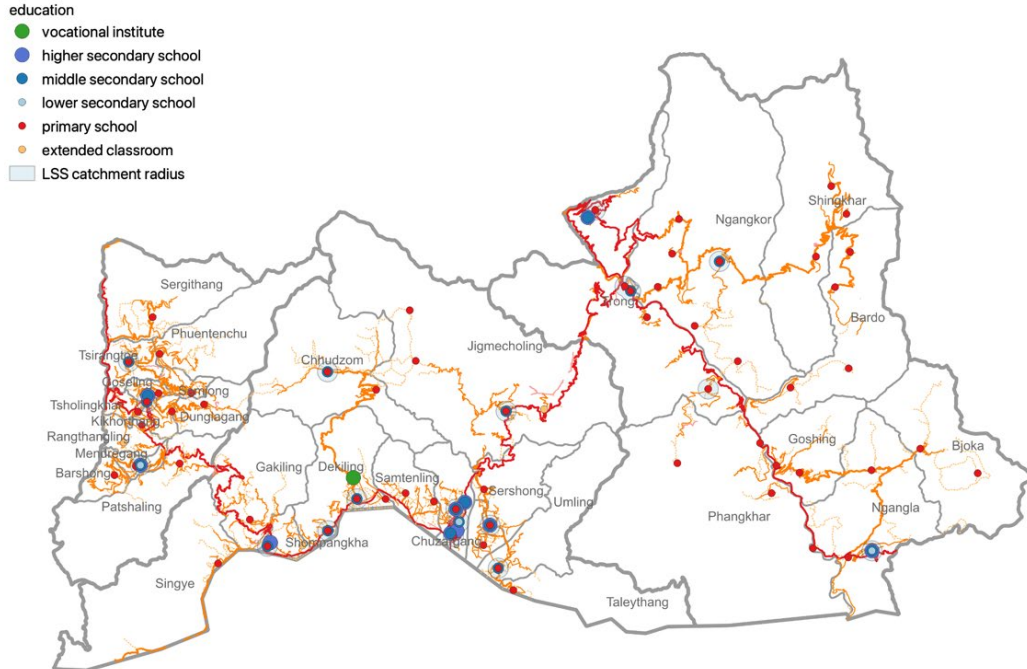
Source: JICA Project Team

Figure 4.3.3 Catchment Radius of HSS



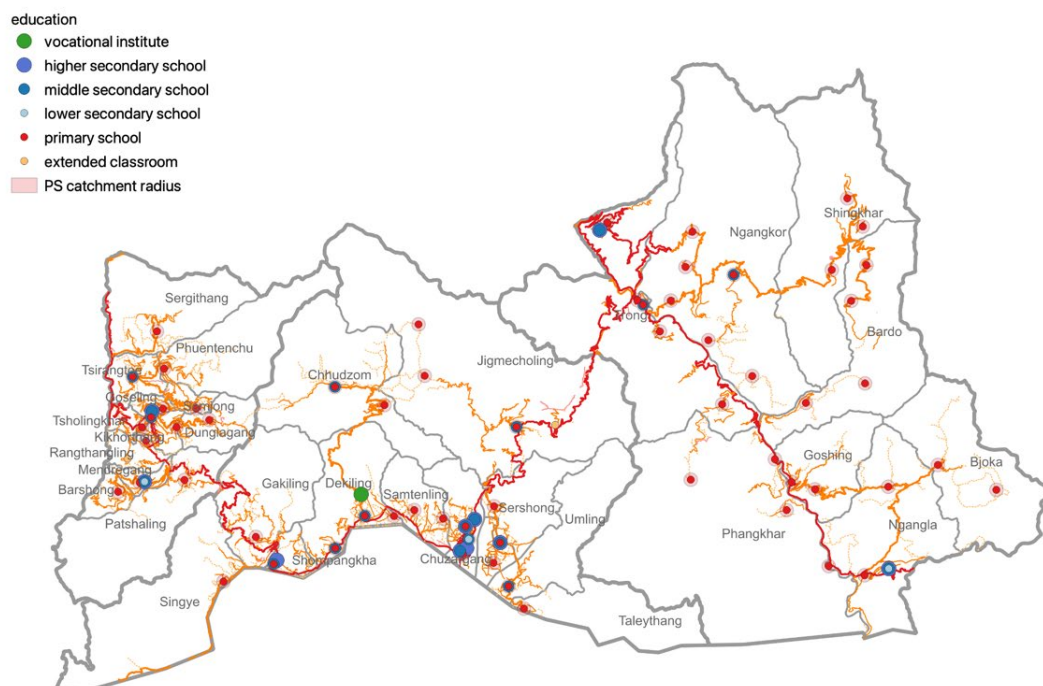
* MSS catchment radius = 15km
Source: JICA Project Team

Figure 4.3.4 Catchment Radius of MSS



* LSS catchment radius = 1.2km
Source: JICA Project Team

Figure 4.3.5 Catchment Radius of LSS



* PS catchment radius = 0.8km
Source: JICA Project Team

Figure 4.3.6 Catchment Radius of PS

2) Health

The following table, showing the existing conditions of health facilities based on planning requirements, suggests that the CRRH in Gelephu seems to be not only insufficient to cover Sarpang Dzongkhag but also the whole Southern Central Region. However, there is no possibility to locate another RRH in this region, then, regional health service should be covered by the cooperation of surrounding hospitals, PHC (BHU) and ORC. Telemedicine by using up-to-date ICT should be supportive of this issue.

Regarding hospitals and PHC, the area coverage shows a low ratio compared to the population coverage. For contributing to Dzongkhag-wise health service, hospitals should cover the whole area in each Dzongkhag at least. Both the area coverage and the population coverage of ORC are also low in all 3 Dzongkhags, however, it would be sufficient to be distributed to cover each remote village properly considering the role of ORC.

Table 4.3.8 Existing Conditions of Health Facilities based on Planning Requirements

	Numbers	Total Catchment Area (sqm) ⁸	Total Catchment Population ⁹	Area Coverage (%) ¹⁰	Population Coverage (%) ¹¹
Sarpang Dzongkhag (Area: 1,681.5km², Population: 46,004)					

⁸ The total catchment area is roughly calculated from multiplication of the number of facilities by the catchment area of each facility. Then, the catchment area is also calculated from the catchment radius, mentioned in the Table 5.4.9 Planning Requirements for Health Facilities. The overlap between the catchment area of health facilities is supposed to be disregarded.

⁹ The total catchment population is roughly calculated by multiplication of the number of facilities and the max catchment population of each facility, mentioned in the Table 5.4.9 Planning Requirements for Health Facilities. The overlap between the catchment area of health facilities is supposed to be disregarded.

¹⁰ The area coverage is calculated from division of the total catchment area by the area of each Dzongkhag. If it reaches 100%, it means health facilities in the Dzongkhag are sufficient.

¹¹ The population coverage is calculated from division of the total catchment population by the population of each Dzongkhag. If it reaches 100%, it means health facilities in the Dzongkhag are sufficient.

RRH	1	706.5	30,000	42.0 (14.9 ¹²)	65.2 (34.8 ¹³)
Hospital	2	628.0	40,000	37.3	86.9
BHU/ PHC	11	198.0	55,000	11.8	119.6
ORC	13	234.0	2,600	13.9	5.7
Tsirang Dzongkhag (Area: 639.0km², Population: 22,376)					
RRH	0	-	-	-	-
Hospital	2	628.0	40,000	98.3	178.8
BHU/ PHC	6	108.0	30,000	16.9	134.1
ORC	20	360.0	4,000	56.3	17.9
Zhemgang Dzongkhag (Area: 2,421.5km², Population: 17,763)					
RRH	0	-	-	-	-
Hospital	4	1,256.0	80,000	51.9	450.4
BHU/ PHC	10	180.0	50,000	7.4	281.5
ORC	34	612.0	6,800	25.3	38.3

Source: JICA Project Team

Short-term

The grade-up of existing PHC (BHU) should be taken into consideration. The following figure about the Catchment Radius of Hospital shows that there are blank areas in Chhudzom and Jigmecholing Gewog in Sarpang, and Shingkhar, Bardo, Bjoka, Goshing and Phangkhar Gewog in Zhemgang. Then, considering the population growth in Jigmeling with the development of Jigmeling industrial park, Chokhorling PHC should be upgraded to 10-bedded hospital.

Mid-term

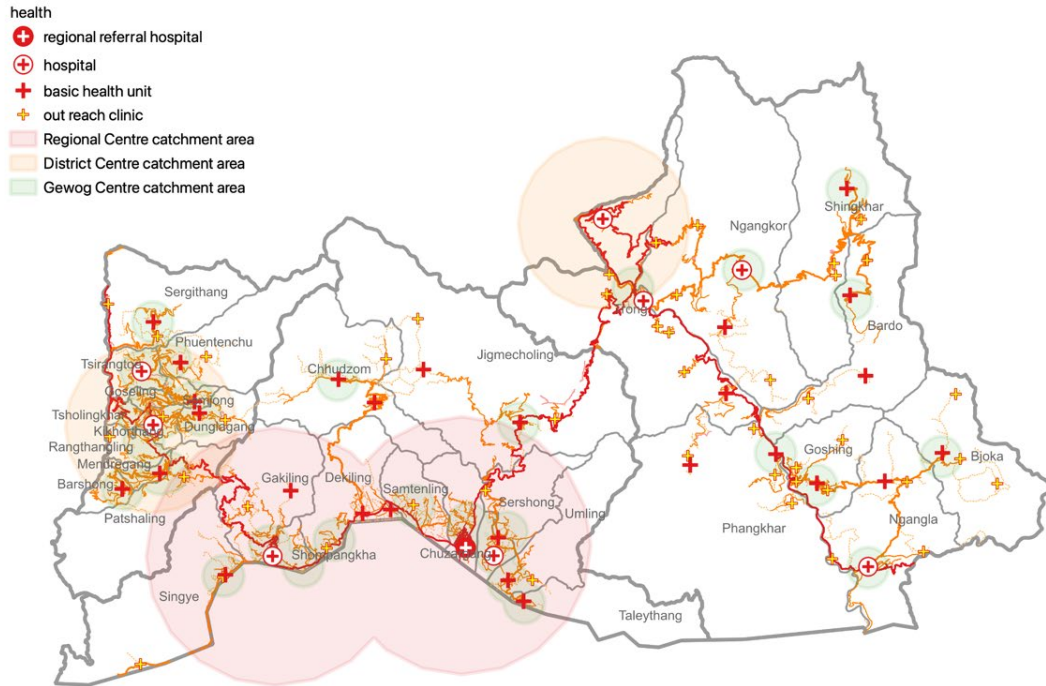
The CRRH in Gelephu provides regional-level health services properly up to the present. Considering the population growth, the expansion of floor space, medical equipment, and human resources, should be planned gradually. Regarding the regional health, alcoholic addiction is highly concerned, and the rehabilitation facility should be constructed near CRRH. In addition, Sarpang Hospital has a plan to upgrade to the 20-bedded hospital to lighten the burden on CRRH.

Long-term

Difficult geographic terrain and sporadically distributed human settlements would be permanent barriers to providing daily healthcare services, especially in Zhemgang. Preventive services such as periodic medical checkups provided by surrounding PHCs, supported by the CRRH, would help to decrease the number of emergent transport of patients.

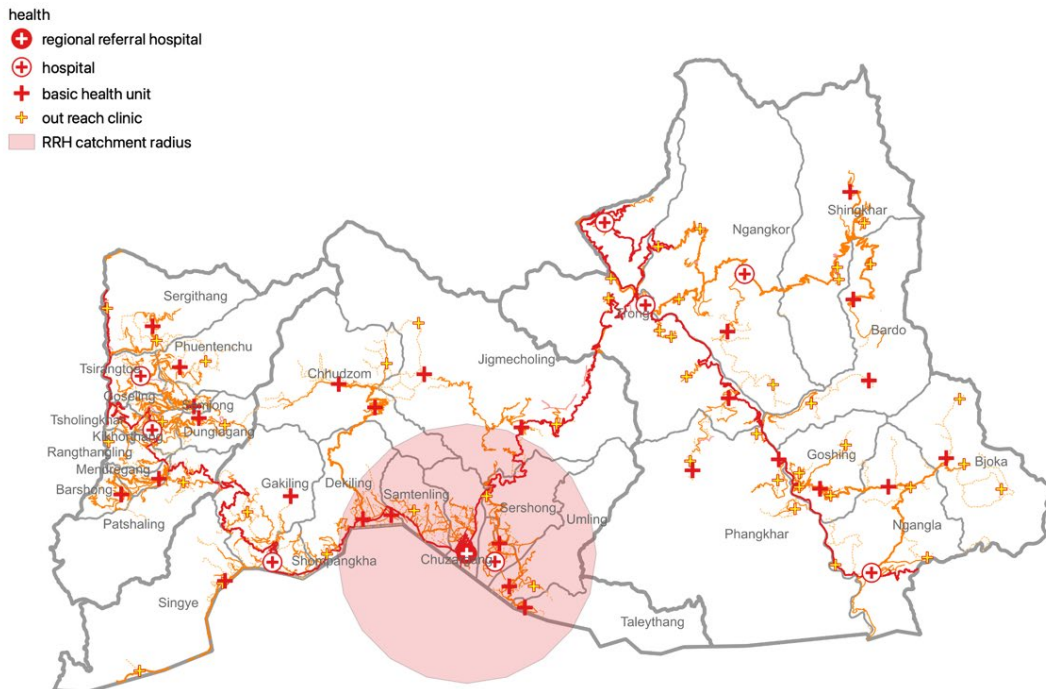
¹² The area coverage of RRH is also calculated from division of the total catchment population by the population of the whole Southern Central Region (including all 3 Dzongkhags).

¹³ The population coverage of RRH is also calculated from division of the total catchment population by the population of the whole Southern Central Region (including all 3 Dzongkhags).



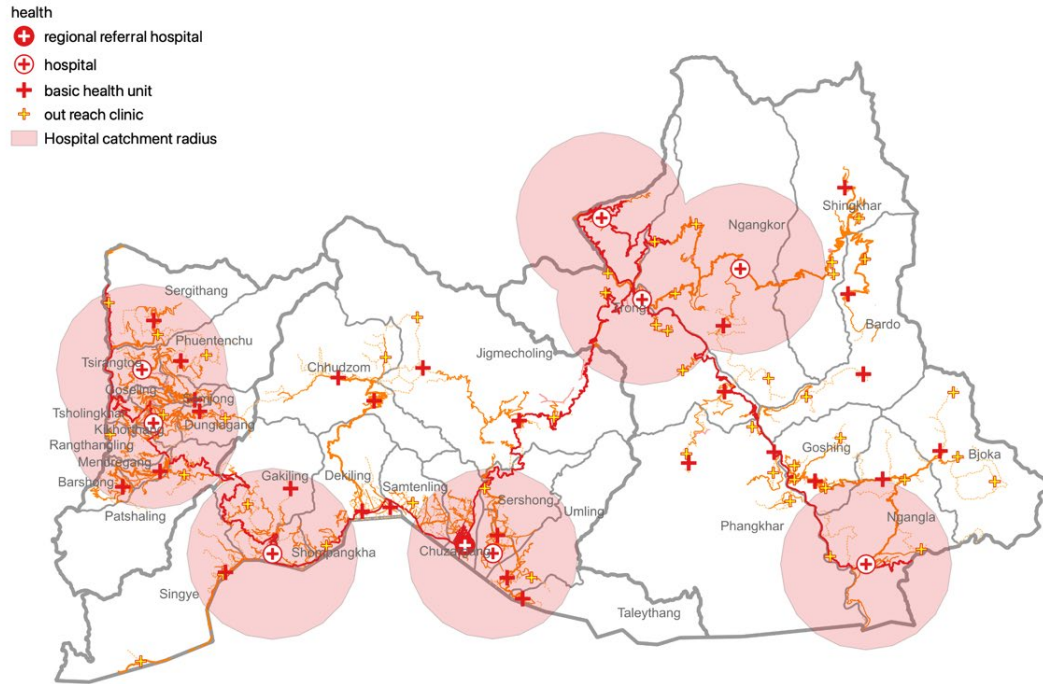
* RC catchment radius = 15km, DC catchment radius = 10km, GC catchment radius = 2.4km
Source: JICA Project Team

Figure 4.3.7 Regional Hierarchy of Health



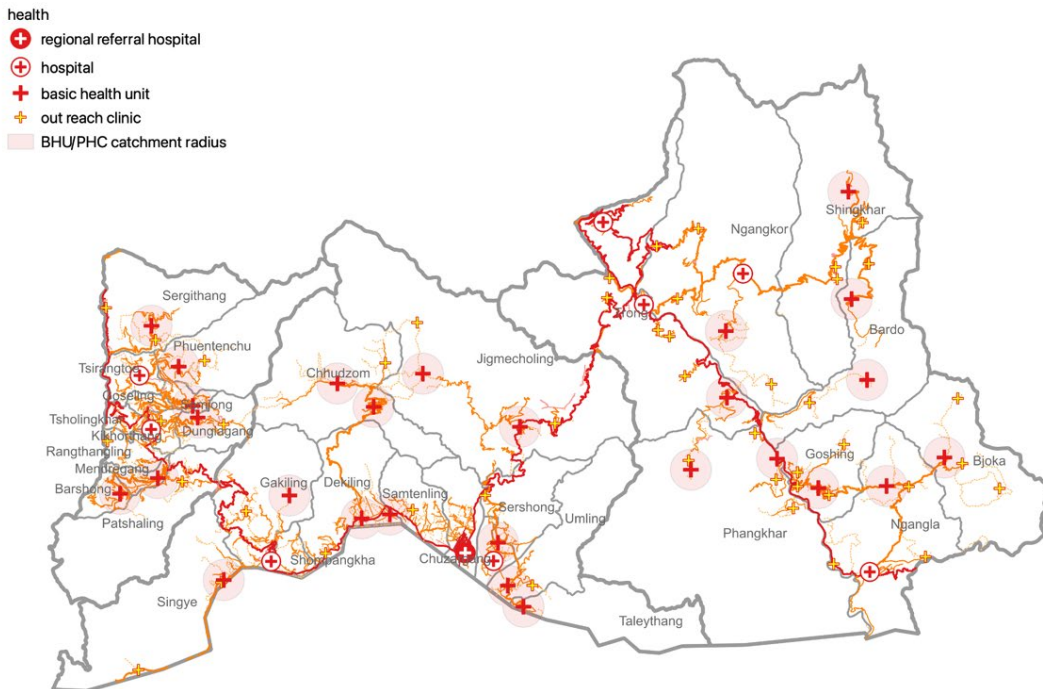
* RRH catchment radius = 15km
Source: JICA Project Team

Figure 4.3.8 Catchment Radius of RRH



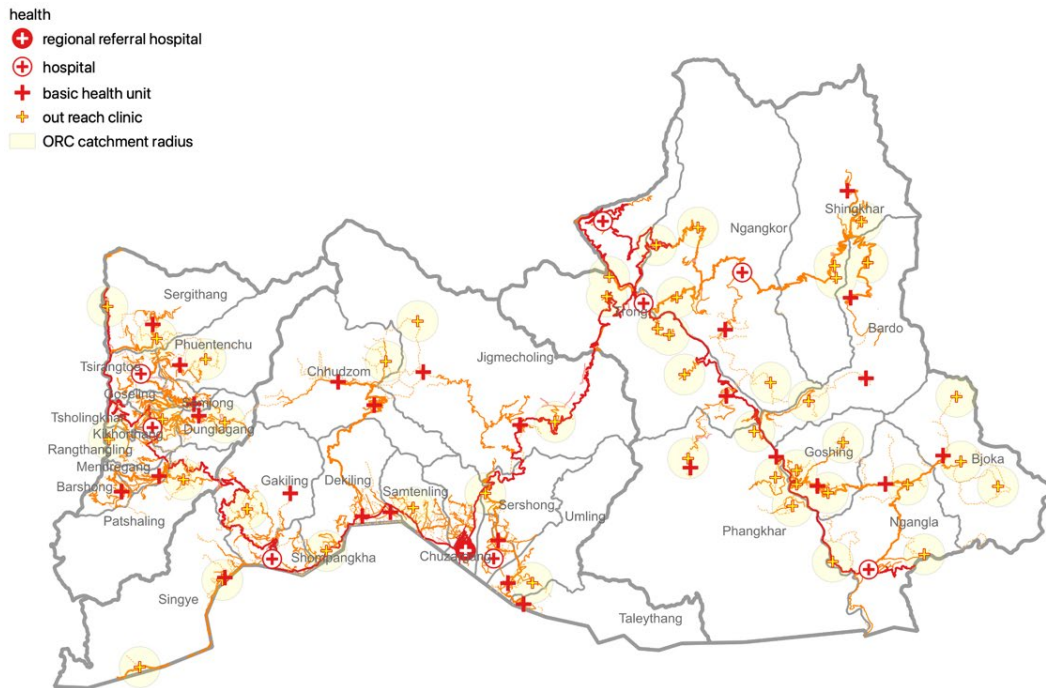
* Hospital catchment radius = 10km
Source: JICA Project Team

Figure 4.3.9 Catchment Radius of Hospital



* BHU/PHC catchment radius = 2.4km
Source: JICA Project Team

Figure 4.3.10 Catchment Radius of BHU / PHC



* ORC catchment radius = 2.4km
 Source: JICA Project Team

Figure 4.3.11 Catchment Radius of ORC

3) Transport

The quantitative analysis would be omitted due to the scarcity of data and the small number of target facilities.

Short-term

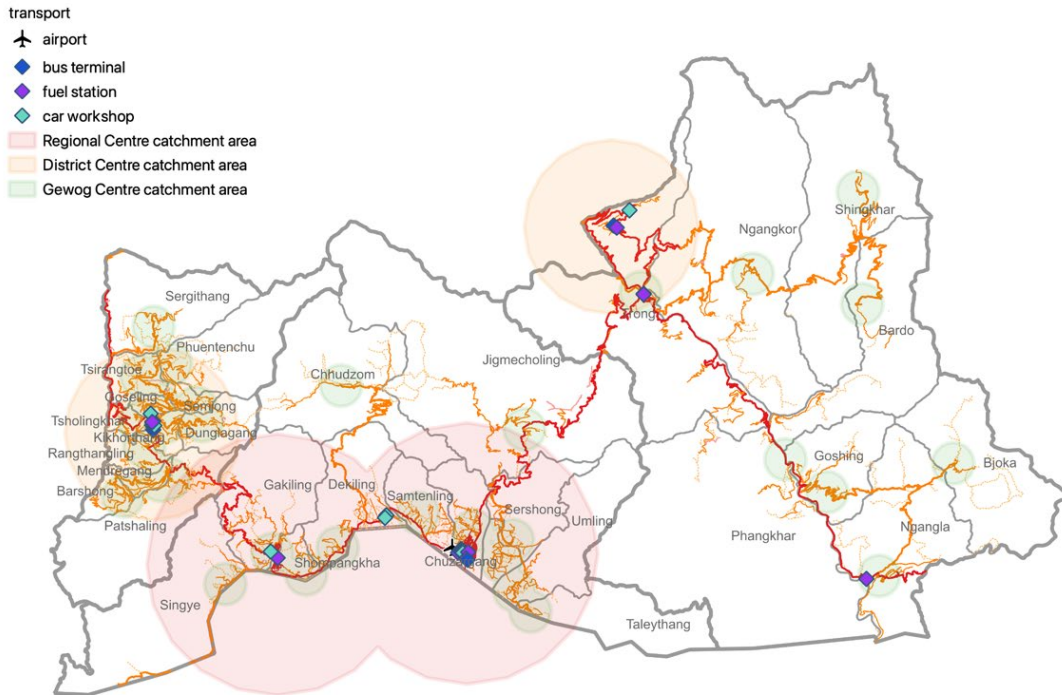
As the inter-mediate town of the corridor, road-side service facilities (fuel station, car workshop and car wash facility, electric charging station, ATM, restaurants/eateries, market sheds, recreational areas, footpath, and taxi parking) should be installed in Jigmeling.

Mid-term

For convenient inter-city travel, road-side amenities such as fuel stations, car workshops and car wash facilities should be installed in all Dzongkhag Thromde and Yenlag Thromde properly. Samkhar in Jigmecholing Gewog, at the halfway of Gelephu and Tingtibi, Pantang in Phangkhar Gewog, at the halfway of Tingtibi and Panbang, and Panbang as Yenlag Thromde in Zhemgang are the candidates for Sub-district centres (SDC) equipped with fundamental road-side amenities.

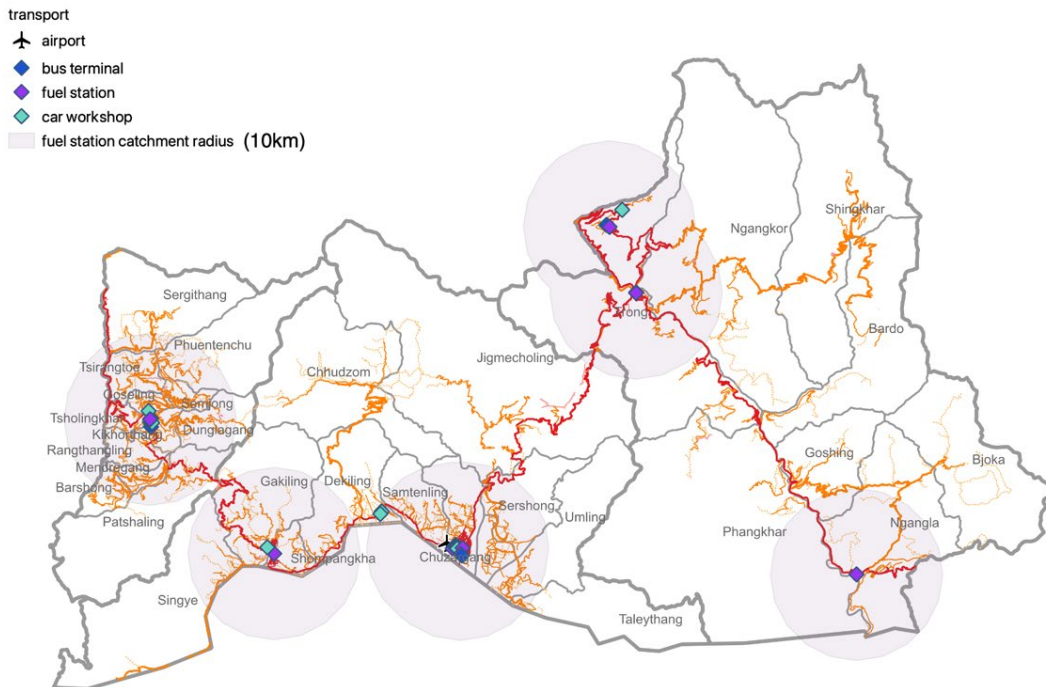
Long-term

As the transport network hub of the region, Gelephu Airport should be the 2nd international gate of the air route. Then, Gelephu Thromde and Sarpang town should be connected by the inter-city transportation system such as Mass Rapid Transit (MRT).



* RC catchment radius = 15km, DC catchment radius = 10km, GC catchment radius = 2.4km
Source: JICA Project Team

Figure 4.3.12 Regional Hierarchy of Transport



* Fuel Station catchment radius = 10km
Source: JICA Project Team

Figure 4.3.13 Catchment Radius of Fuel Station

4) Commercial, Recreation, and Civic Service

The quantitative analysis would be omitted due to the scarcity of data and the small number of target facilities.

Short-term

Modern urban recreation facilities such as cycling trails, bird-watching sites and water sporting sites could be distributed in all Dzongkhag Thromdes.

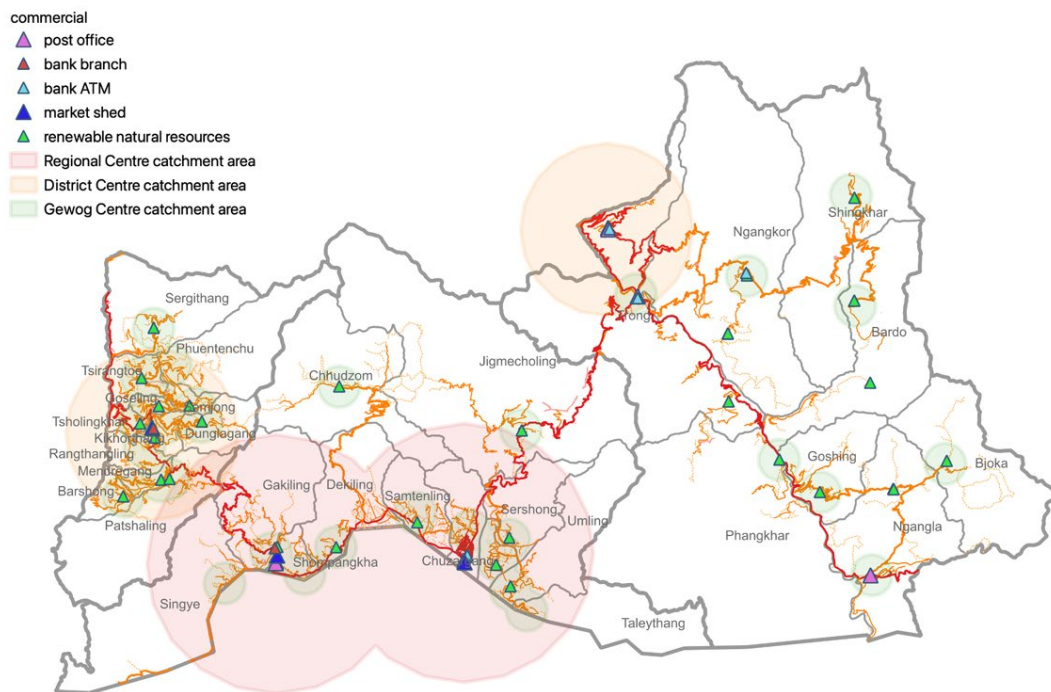
Mid-term

Top-level recreation facilities such as a central park with attractive amenities and an indoor sports complex could promote Gelephu toward a healthy and recreational destination in the country.

Long-term

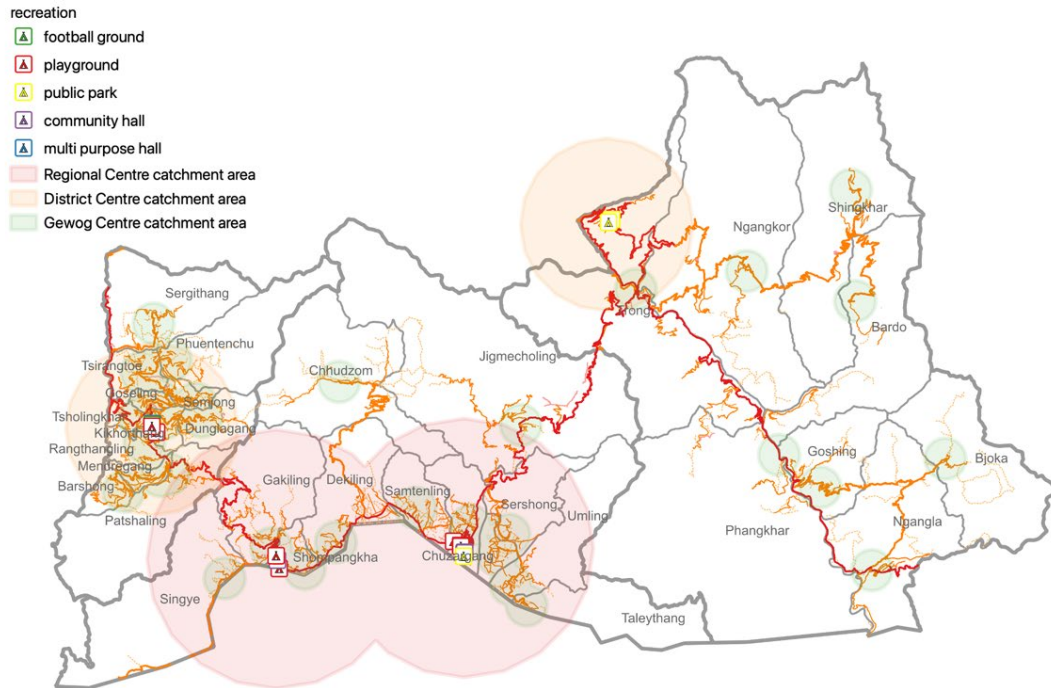
Installing emerging ICT-oriented commercial services such as cashless payment, e-banking, e-commerce, and unmanned delivery should be developed step-by-step, in cooperation with the public and private sectors.

The digitalization of G2C services would be fulfilled by public education and sustainable use in rural areas.



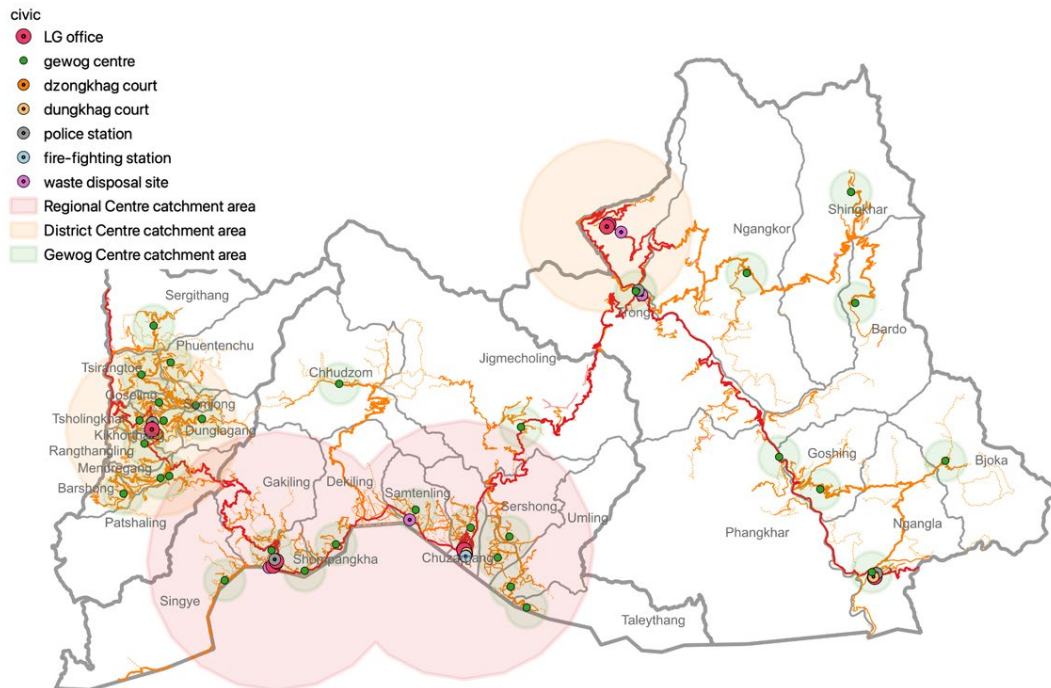
* RC catchment radius = 15km, DC catchment radius = 10km, GC catchment radius = 2.4km
 Source: JICA Project Team

Figure 4.3.14 Regional Hierarchy of Commercial Service



* RC catchment radius = 15km, DC catchment radius = 10km, GC catchment radius = 2.4km
Source: JICA Project Team

Figure 4.3.15 Regional Hierarchy of Recreation Service



* RC catchment radius = 15km, DC catchment radius = 10km, GC catchment radius = 2.4km
Source: JICA Project Team

Figure 4.3.16 Regional Hierarchy of Civic Service

4.4 Land Use Plan

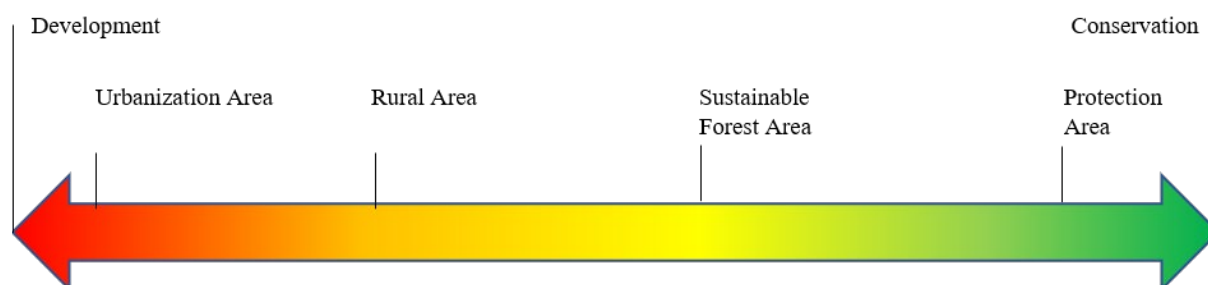
4.4.1 Land use planning policy

Bhutan is a country with a strong commitment to environmental conservation, as the Constitution sets the minimum target percentage of forest cover at 60%. Furthermore, the Constitution lays out the principles of the state policy to ensure the well-being of the people by pursuing Gross National Happiness (GNH). Environment is defined as one of nine domains of GNH. On the other hand, urbanization is progressing in Bhutan, and the urban population is expected to continue to increase in the three Dzongkhags in the Project Area. Urbanization is not only a concentration of economic activities, but also of cultural and social services, and is essential for the vitalization of the economy and cultural and social activities. Therefore, in order to achieve sustainable development in the Project Area, a land use plan will be pursued to harmonize urbanization (human activities) and environmental conservation.

4.4.2 Contents of the land use plan

In the Project, the land use plan proposes four land use categories: Urbanization Area, Rural Area, Sustainable Forest Area, and Protection Area. The Urbanization Area is an area with a high concentration of population and is the political, economic, and cultural centre of the city. Rural Area, on the other hand, is an area where human activities and the environment coexist in a mixture of villages and farmland, including scattered settlements. The Sustainable Forest Area is a forest area that should be preserved in the long-term, and the Protection Area is an environmental protection area that includes Protected Areas and Biological Corridors.

Each land use category is to be realized by linking it to existing laws and regulations, including current land use restrictions, and statutory plans. A conceptual diagram showing the concept of land use category and the relationship between urbanization and environmental conservation is shown in Figure 4.4.1. The relationship between regulations and statutory plans for each land use category is shown in Table 4.4.1.



Source: JICA Project Team

Figure 4.4.1 Conceptual Diagram of Land Use Category

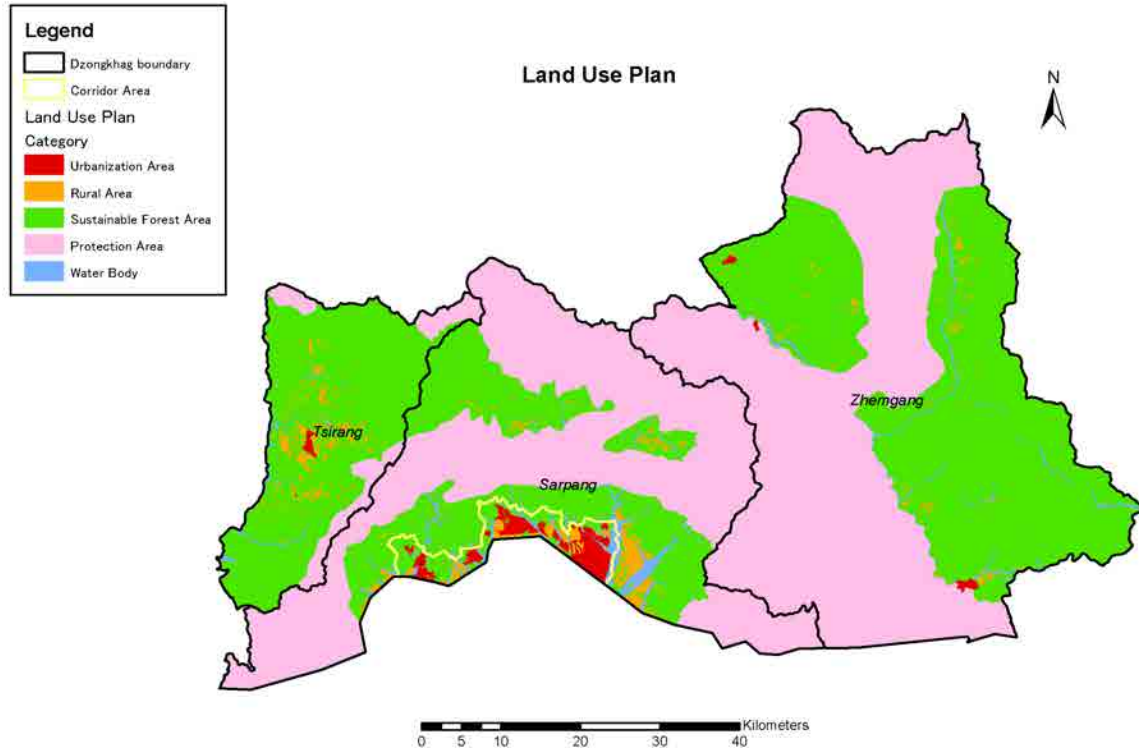
Table 4.4.1 Relationship between Regulations and Statutory Plans for Each Land Use Category

Land Use Category	Regulation	Statutory Plan
Urbanization Area	<ul style="list-style-type: none"> ● Development Control Regulation (DCR) ● Land Act 2007 ● Building Regulations 2018 	<ul style="list-style-type: none"> ● Valley Development Plan ● Structure Plan ● Local Area Plan ● Action Area Plan
Rural Area	<ul style="list-style-type: none"> ● Ditto 	<ul style="list-style-type: none"> ● Ditto
Sustainable Forest Area	<ul style="list-style-type: none"> ● Regulation by Forest and Nature Conservation Act 1995 (FNCA) ● Forest and Nature Conservation (Amendment) Rules and Regulations 2020 (FNCRR) 	<ul style="list-style-type: none"> ● Forest Management Plan
Protection Area	<ul style="list-style-type: none"> ● Ditto ● Cultural Heritage Bill 	<ul style="list-style-type: none"> ● Conservation Management Plan

Source: JICA Project Team

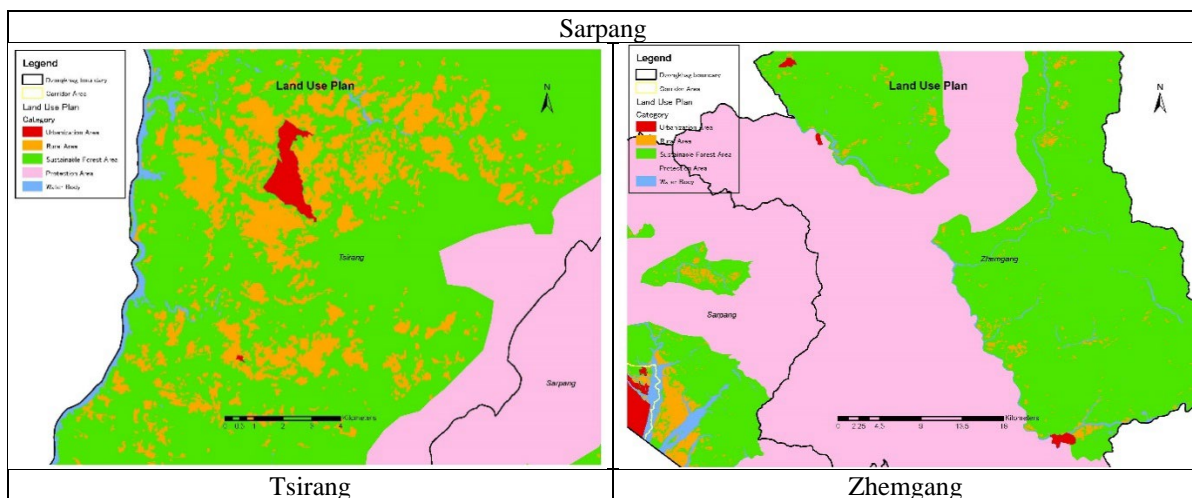
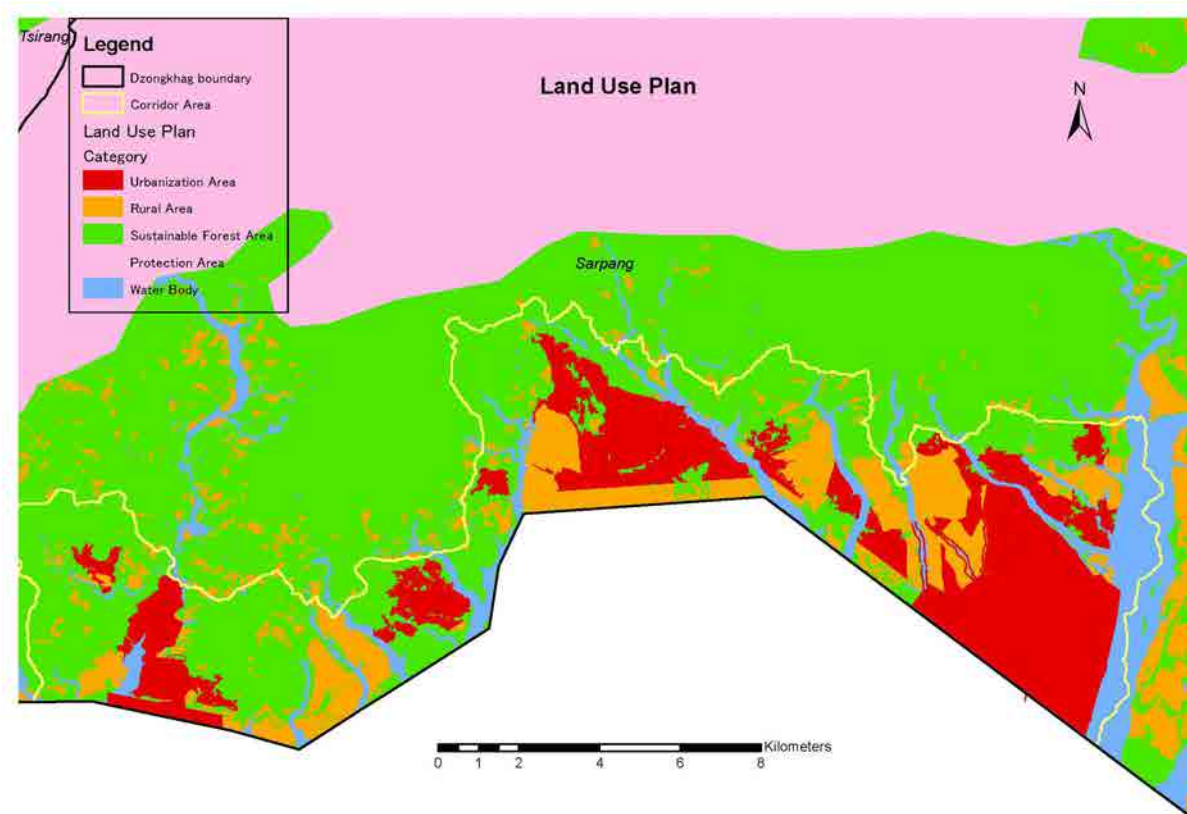
4.4.3 Map of land use plan

The map of land use plan based on the above land use planning policy is shown in Figure 4.4.2. The land area by land use category of each Dzongkhag is shown in Table 4.4.2.



Source: JICA Project Team

Figure 4.4.2 Map of Land Use Plan



Source: JICA Project Team

Figure 4.4.3 Enlarged Map of Land Use Plan to Show Urbanization Area by Dzongkhag

Table 4.4.2 Land Area by Land Use Category of Each Dzongkhag

Category	Sarpang		Tsirang		Zhemgang		Total	
	Area (sq. km)	Ratio (%)	Area (sq. km)	Ratio (%)	Area (sq. km)	Ratio (%)	Area (sq. km)	Ratio (%)
Urbanization Area	37.83	2.29	2.47	0.39	4.28	0.18	44.58	0.95
Rural Area	89.68	5.42	79.35	12.44	52.61	2.18	221.64	4.71
Sustainable Forest Area	501.90	30.32	472.62	74.10	1,054.96	43.66	2,029.48	43.09
Protection Area	990.44	59.83	75.82	11.89	1,288.67	53.33	2,354.93	50.00
Water Body	35.53	2.15	7.57	1.19	16.05	0.66	59.15	1.26
Total	1,655.38	100.00	637.83	100.00	2,416.57	100.00	4,709.78	100.00

Source: JICA Project Team

4.5 Road Transportation System

4.5.1 Objective of the regional development and direction of road transportation system development

In order to realize the future vision of the Southern Central Region, based on the socioeconomic infrastructure plans proposed in the previous sections, the following four "directions of road transportation system development" were identified such as (1) building a disaster-resistant inter-dzongkhag road network, (2) creating safe and secure road network, (3) improving logistics efficiency and industrial productivity, and (4) promoting tourism and intra-regional exchange.

In addition, seven "initiatives to be taken by the road transportation system" were selected in conjunction with the "directions of road transportation system development" and identified issues for the implementation of each measure.

Table 4.5.1 Direction and Proposed Initiatives of Road Transportation System Development to realize Vision of the Regional Development

Objective of the Regional Development	Direction of Road Transportation System Development	Proposed Initiatives to be taken by the Road Transportation System
<ul style="list-style-type: none"> -Sustainable region with sufficient job opportunity for youth and adult -Outward-oriented development -Unified development process -Transforming governance toward decentralization -Holistic service system for “No one left behind” -Expansion of ICT network -Regional branding promotion -Network society with urban and rural areas -Community-oriented development -Economic structure with diversity -Non environmental deterioration -Transparent platform with various stakeholders -Road network linking socio-economy -Advanced socio-economic development -Linking strongly with capital city and India 	<ul style="list-style-type: none"> Building a disaster-resistant inter-dzongkhag road network Creating safe and secure road network Improving logistics efficiency and industrial productivity Promoting tourism and intra-regional exchange. 	<ul style="list-style-type: none"> -Development of a hierarchical road network based on a ladder artery network for the three Dzongkhags (based on the regional road network connectivity, connecting facilities, traffic nodal points, disaster bottlenecks, etc.) -Development of road network to ensure access to the social services -Measures to ensure year-round traffic on the low paved Dzongkhag Roads and unpaved Farm Roads and Access Roads (implementation and O&M methods) -Strengthen network with logistics hubs such as dry ports, multi modal transport hubs, industrial parks, etc. -Reinforcement of network for access to airports, Indian transportation network, etc. -Examination of measures to improve comfort and convenience of inter-district and intercity long-distance buses (bus location system, online ticketing) -Examination of measures to support promotion of EV buses, etc. (EV stations)

Source: JICA Project Team

4.5.2 Issues for transportation

(1) The implementation of the proposed initiative of building a disaster-resistant inter-dzongkhag road network

Development of a hierarchical road network

The CNDP 2030 proposes a ladder artery network plan as shown in Figure 4.1.1 in section 4.1.1.

Southern east-west arterial road from Tsirang through Sarpang to Zhemgang has no detour routes, and road development in the national park area is difficult, so the risk of isolation due to landslides, especially during the rainy season, is unavoidable.

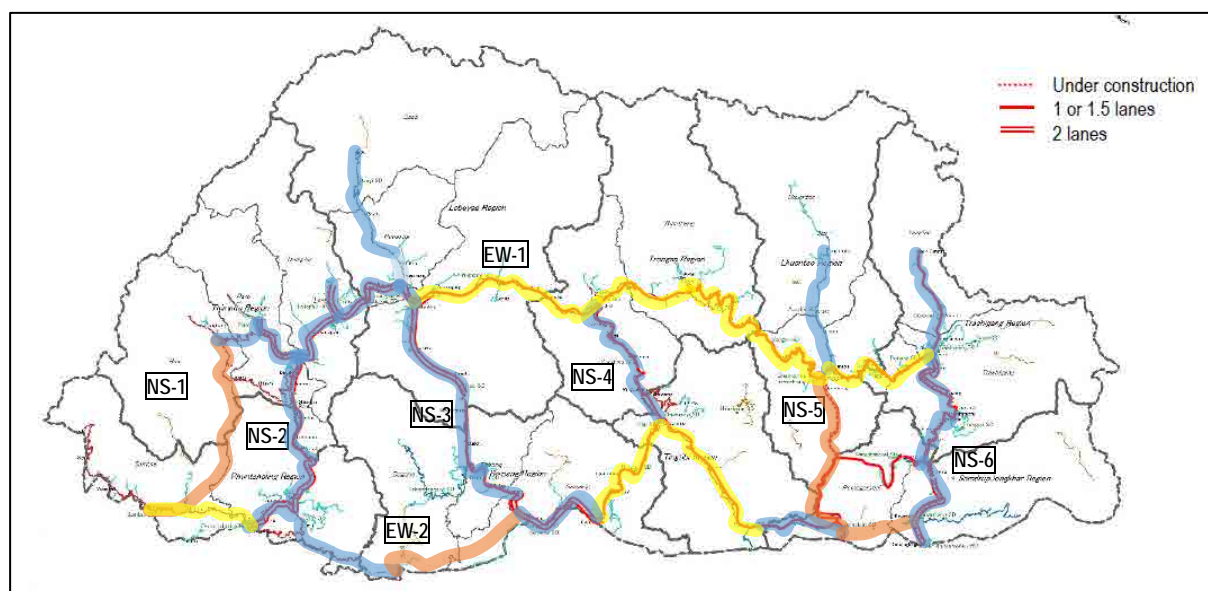
The CNDP prioritized the network in terms of natural disasters, travel time, and number of road lanes, as shown in Table 4.5.2 and Figure 4.5.1. A section of Lamoizingkha-Sarpang passes through the Phipsoo wildlife sanctuary, which is being developed as a wildlife tourism road.

Table 4.5.2 Prioritization of Route Improvement based on Bottleneck Analysis

Type	Routes		Route Length (km)	Average Travel Time (h)	Average Travel Speed (km/h)	Remarks
	ID	Name				
North-south route	NS-4	Bumthang -Gelephu				
		b. Trongsa-Zhemgang	111	5	22.2	
		c. Zhemgang-Gelephu	133	5	26.6	
East-west route	EW-2	Samtse-Samdrup Jongkhar				
		e. Lamoizingkha-Sarpang	(87.5)	-	-	Missing section
		f. Sarpang-Gelephu	39	-	-	
		g. Gelephu-Panbang	(70)	-	-	Missing Section
		h. Pangbang-Nganglam	55.6	-	-	

Note: ■ Significant Bottleneck (total score > 6.5), ■ Moderate Bottleneck (6.5 > total score > 5.5), ■ Minor Bottleneck (5.5 > total score)

Source: CNDP



Note: ■ High Priority, ■ Middle Priority, ■ Low Priority

Source: CNDP

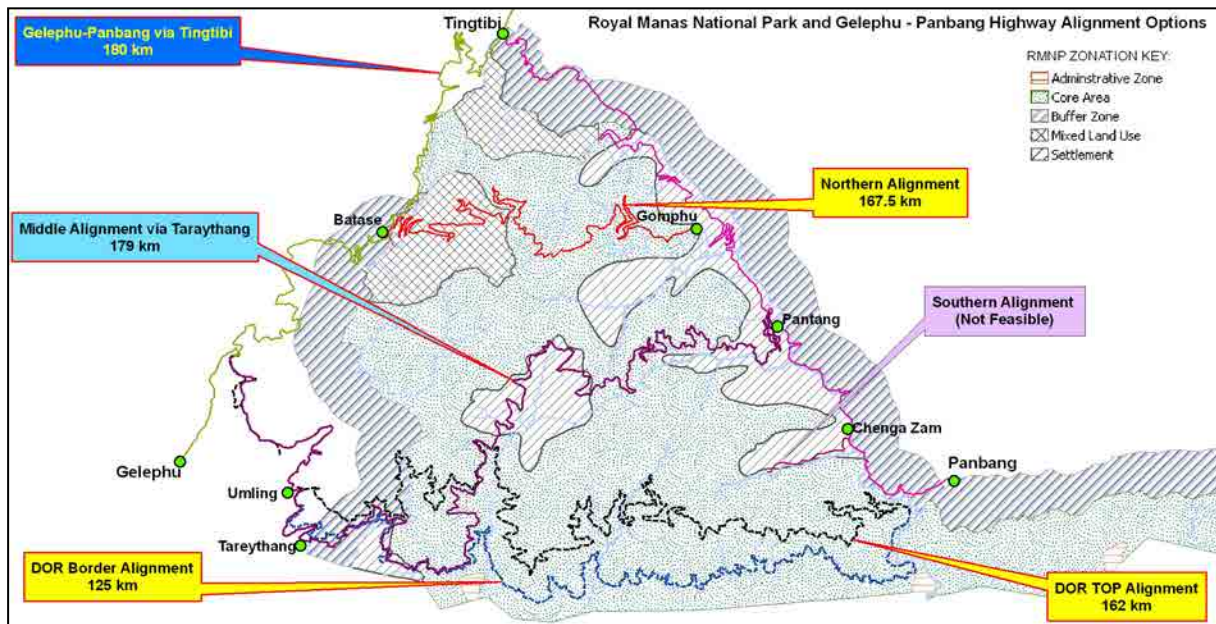
Figure 4.5.1 Prioritization of Route Improvement based on Bottleneck Analysis

For the Gelephu-Panbang section, a shortcut road shown in Figure 4.5.2 was considered by the Asian Development Bank (ADB) study. However, it was concluded that implementation would be difficult

due to low sustainability in terms of impact on the natural environment and cost-effectiveness. However, MoAL is currently reviewing the Zonation of Royal Manas National Park, and confirmation of new road possibility based on this is needed.

The jurisdiction of this matter was transferred from MoAL to Nature Conservation Division, Ministry of Energy and Natural Resources (MoENR) following a reorganisation of the government structure.

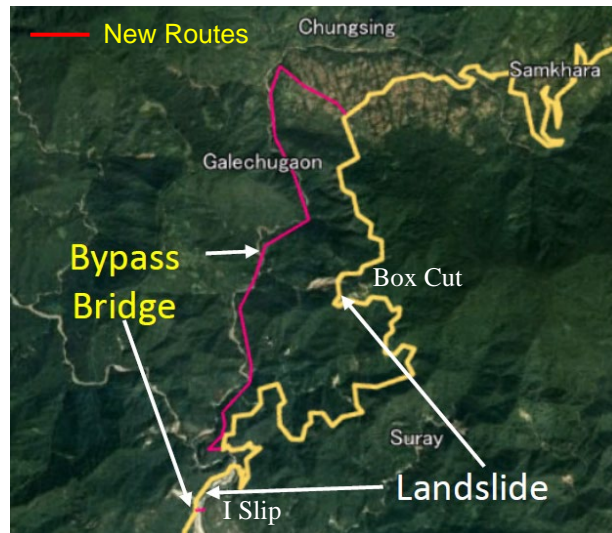
MoENR considered the feasibility of the five route options proposed in Figure 4.5.2 based on the updated Zonation, but assessed them as not feasible due to the long transit sections of the Core Area. MoENR suggested the possibility of converting the existing trail, where the terrain is relatively gentle and parallel to the border, into a motorway. However, the trail is located in the core zone, and with approximately 15 intersecting rivers and a high potential for flooding, it is not desirable to develop it as an arterial road.



Source: ADB TA 7803-BHU Road Network Project II (Additional Financing) Draft Final Report, April 2012

Figure 4.5.2 Alternative Study of South East – West Highway (Gelephu-Panbang section) by ADB Study

There are two major landslides between Gelephu and Zhemgang namely I slip and Box cutting, which frequently cause road closures, especially during the rainy season. Road closures due to disasters without detour routes have a significant impact on rescue and recovery efforts as well as on economic activities and logistics, and it is necessary to ensure the substitutability of the road network. Figure 4.5.3 shows the landslide locations and potential landslide countermeasures such as bypass route and new bridge to detour Box Cutting and I Slip, respectively.



Source: JICA Project Team

Figure 4.5.3 Candidate Measures for Landslides

Sarpang to Gelephu section of the existing Primary National Highway will be the main axis in the RCSP area, where development is being intensively implemented, and therefore safety and drivability should be improved.

For the above-mentioned purposes, widening of the current road in the narrowed areas (without land acquisition), installation of footpaths near densely populated areas and improvement of the road space (shoulders, street lights, traffic signs, etc.) will be implemented as short-term projects to improve the quality of the ladder road network for regional development, safety during disasters and road space functions.

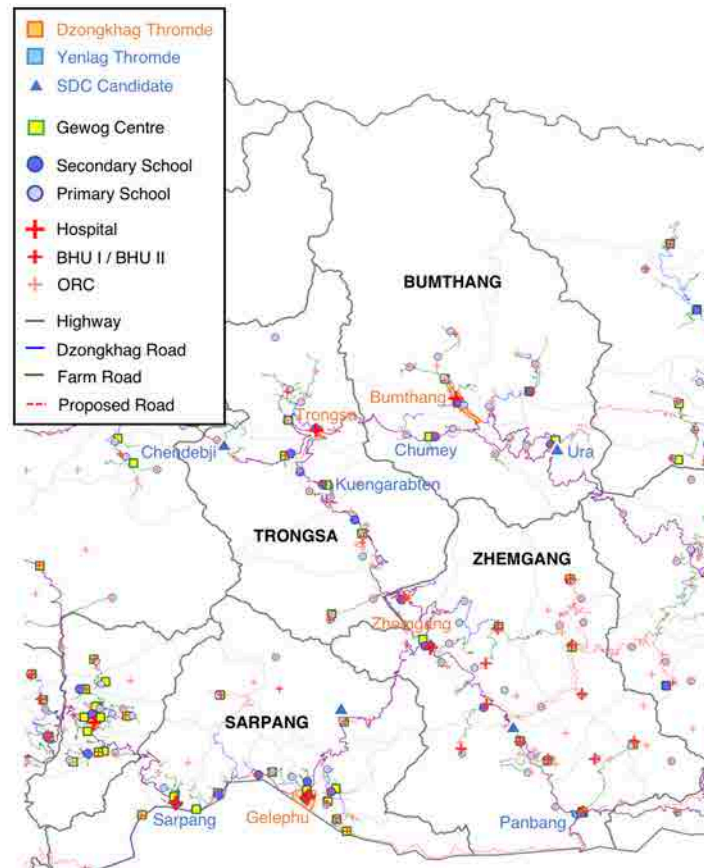
(2) The implementation of the proposed initiative of creating safe and secure road network

Development of road network to ensure access to the social services

Formulation of proposed service delivery network among Gewog centres and service facilities by road network is essential. However, budget for road improvement is limited for existing plenty number of feeder roads such as Gewog centre roads and farm roads. Therefore, prioritization of roads subjected to improvement is important with consideration of the following issues:

- Prioritization of road sections to be improved on Gewog centre roads and farm roads, and
- Review and update of standards and methods on design and construction to ensure sustainability of improved structures.

Service delivery network for each region as shown in Figure 4.5.4 shall be referred to prioritization of the network for Gewog centre roads and farm roads.



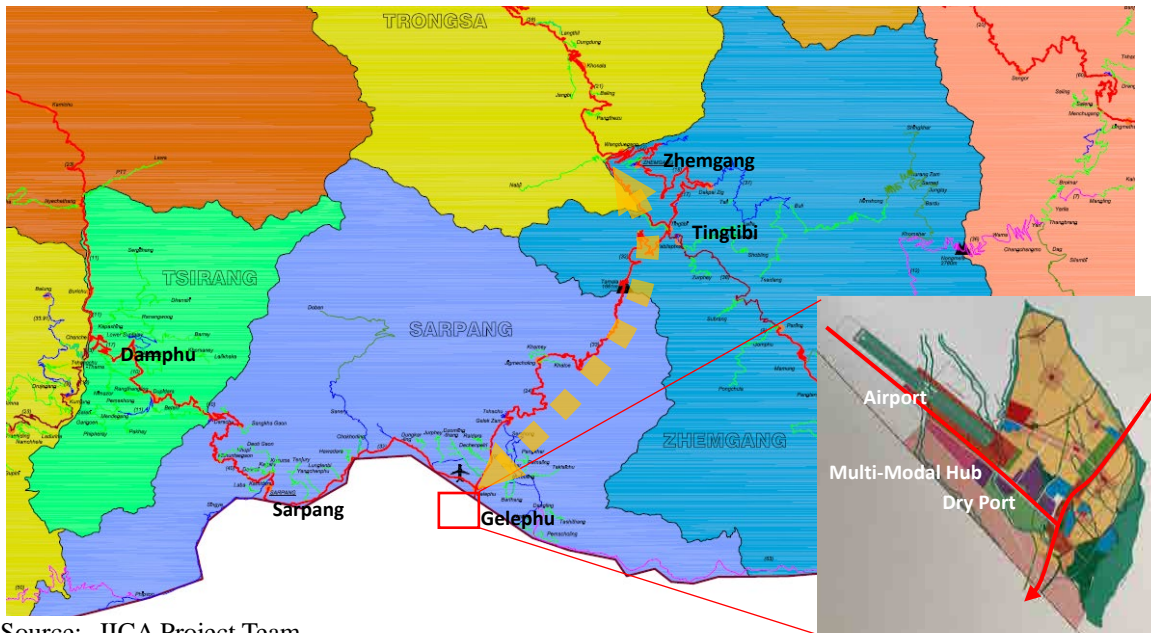
Source: CNDP2030

Figure 4.5.4 Service Delivery Network in the Central Eastern Region

(3) The implementation of the proposed initiative of improving logistics efficiency and industrial productivity

Strengthen network with logistics hubs such as dry ports, multi modal transport hubs, industrial parks

Gelephu faces the Indian border and has a strong geographical advantage as a hub for international trade. In addition, the airport is being internationalized and the Dry Port and Multi-modal transport hub are being developed.



Source: JICA Project Team

Figure 4.5.5 Logistic Hub in Gelephu

International trade with India, Bangladesh, and other countries using the port of Kolkata is conducted via Indian roads. Currently, the Jogighopa multi-modal logistic park, which has access functions to road, rail, shipping, and air routes, is under construction at a point about 95 km away from Gelephu in Assam. This project further increases geographical advantage of Gelephu as an international trade hub.

In order to improve accessibility to Gelephu as a logistics hub from various parts of Bhutan, the challenge is to ensure year-round traffic on the road between Gelephu and Zhemgang.

(4) The implementation of the proposed initiative of promoting tourism and intra-regional exchange

Examination of measures to improve comfort and convenience of inter-district and intercity long-distance buses (bus location system, online ticketing)

Hierarchic inter and intra-regional public transport service network is key infrastructure to provide access to service delivery system. A bus service is dominant in public transport system and taxi service provides supplemental transport service for bus service in the region. Following bus network is under operation.

1) Sarpang Dzongkhag

Long-distance bus routes from Gelephu Thromde to Tingtibi Town (Zhemgang Town) pass through bus stops in Serzhong (Serzhongt), Surey (Jigme Chhoeling), and Samkhara (Jigme Chhoeling) Gewogs. Long-distance bus routes from Gelephu Thromde to Damphu Town via Sarpang Town stop at Toribari (Gakiling).

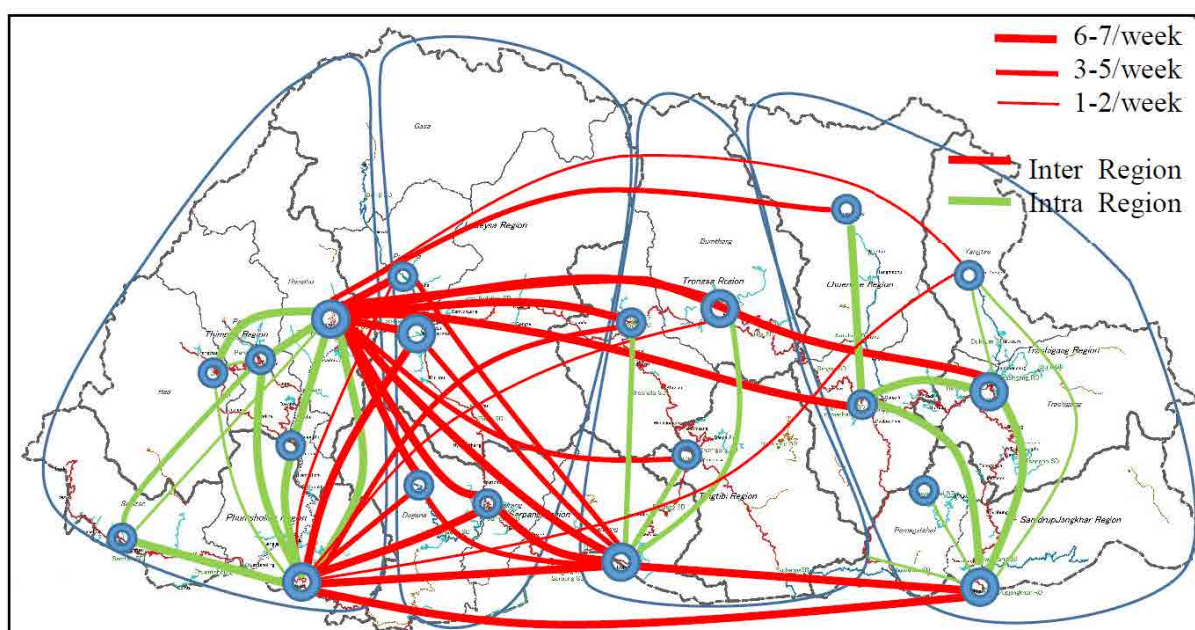
2) Tsirang Dzongkhag

From Tsirang, there is a long-distance bus route starting from Damphu Town and Mendrelgang Town to Thimphu via Wangdue Phodrang.

3) Zhemgang Dzongkhag

From Zhemgang, there are long-distance bus routes departing from Gomphu (Trong) to Bumthang Town via Zhemgang Town and Trongsa Town, and from Zhemgang Town to Thimphu via Trongsa Town and

Wangdue Phodrang.



Source: JICA Project Team

Figure 4.5.6 Existing Inter and Intra Regional Bus Network

In Bhutan, the following issues are generally confirmed in public transport service:

- Size of bus fleet is limited by mountainous road geometric structure;
- Facilities in terminal such as waiting lounge, transfer area, parking area, etc. are poor;
- Information service regarding general information, transfer, operation status, and operation schedule is poor, and
- Bus service is undertaken by private operator with government tariff in entire country.

The above issues are identified in RSP Area. There is no bus terminal in Zhemgang Town, and the existing bus terminal in Damphu Town is inadequate in information provision and comfortability of facilities. Therefore, following measures are proposed to achieve issues on development policy:

- Development of bus terminal in Zhemgang Town
- Improvement of facilities in Damphu Town bus terminal
- Introduction of bus information system (bus location system, bus schedule) and smart card to enhance convenience for users

4.5.3 Road Transport System Development Plan

(1) Road Network Development Plan

The supply of future road traffic demand in the region could be met by a two-lane road, except between Gelephu and Sarpang. Therefore, in the road network development plan, new roads are proposed to solve the issues discussed above, as well as roads necessary from the viewpoint of disaster prevention, etc.

Table 4.5.3 Stage-wise Development Strategy: Road Network Development Plan

Target Area	Short-Term (groundwork phase) Strategy for 2030	Mid-Term (building up phase) Strategy for 2035	Long-Term (fulfilment phase) Strategy for 2045
Development of a	● Development of	● F/S of Gelephu-	● Development of

hierarchical road network	Lamoizingkha-Sarpang as tourism road. • F/S of bypass routes for Box Cutting and I Slip.	Panbang as tourism road. • Development of bypass routes for I Slip.	Gelephu-Panbang as tourism road. • Development of bypass routes for Box Cutting.
Development of road network to ensure access to the social services	• Prioritization of road sections to be improved on gewog centre roads and farm roads. • Development of new standards and methods on design and construction in corporation with Department of Road to ensure sustainability of improved structures.	• Development of road sections to be improved on gewog centre roads and farm roads with applying new standards and methods on design and construction.	• Development of road sections to be improved on gewog centre roads and farm roads with applying new standards and methods on design and construction.
Strengthen network with logistics hubs such as dry ports, multi modal transport hubs, industrial parks, etc.	• Debottlenecking at land slide section to ensure year-round traffic on the road between Gelephu and Zhemgang (F/S of bypass routes for Box Cutting and I Slip).	• Debottlenecking at land slide section to ensure year-round traffic on the road between Gelephu and Zhemgang (Development of bypass routes for I Slip).	• Debottlenecking at land slide section to ensure year-round traffic on the road between Gelephu and Zhemgang (Development of bypass routes for Box Cutting).

Source: JICA Project Team

(2) Public Transportation Development Plan

Public transportation in the region, except between Gelephu and Sarpang, is mainly provided by intercity buses, and the public transportation plan will focus on improving the convenience and comfort of the bus terminals and bus fleet.

Table 4.5.4 Stage-wise Development Strategy: Public Transportation Development Plan

Target Area	Short-Term (groundwork phase) Strategy for 2030	Mid-Term (building up phase) Strategy for 2035	Long-Term (fulfilment phase) Strategy for 2045
Examination of measures to improve comfort and convenience of inter-district and intercity long-distance buses	• F/S and implementation of Bus IT System (Time table, Bus location, Ticket, etc.)	• Introduction of Smart Card System for bus services	

Source: JICA Project Team

4.6 Disaster Risk Management

4.6.1 Transportation security

(1) Risk assessment of transportation network in the Project Area

Landslide and flood risk are the main threats to the transportation network in the Project area. Based on the results of field survey and previous study, in total 42 landslide disaster sites and one complex disaster (flood and sediment) site have been identified along the national road. Considering the importance and management efficiency, the national road will be first considered in disaster risk management for the transportation section.

To understand the risk level and decide the priority of mitigation measures in future, the 42 landslide sites have been classified into four types including slope failure, debris flow, rock fall and slide, and then the risk assessment of them has been conducted by evaluating the indicators of hazard degree and effect degree as shown in Table 4.6.1.

Table 4.6.1 Risk Assessment Indicator and Factors for Landslide Sites

Indicator/Factor	slope failure and rock fall	Debris flow	Slide
Hazard degree	<ul style="list-style-type: none"> • Slope heigh • Slope degree • Overhang • Spring • Frequency 	<ul style="list-style-type: none"> • Catchment area • Slope degree • Outlet width • Frequency 	<ul style="list-style-type: none"> • Slope width • Structure deformation • Spring • Sliding speed
Effect degree	<ul style="list-style-type: none"> • Road type • Important infrastructure or residential area effected • Type of disaster • Effective countermeasure 		

Source: JICA Project Team

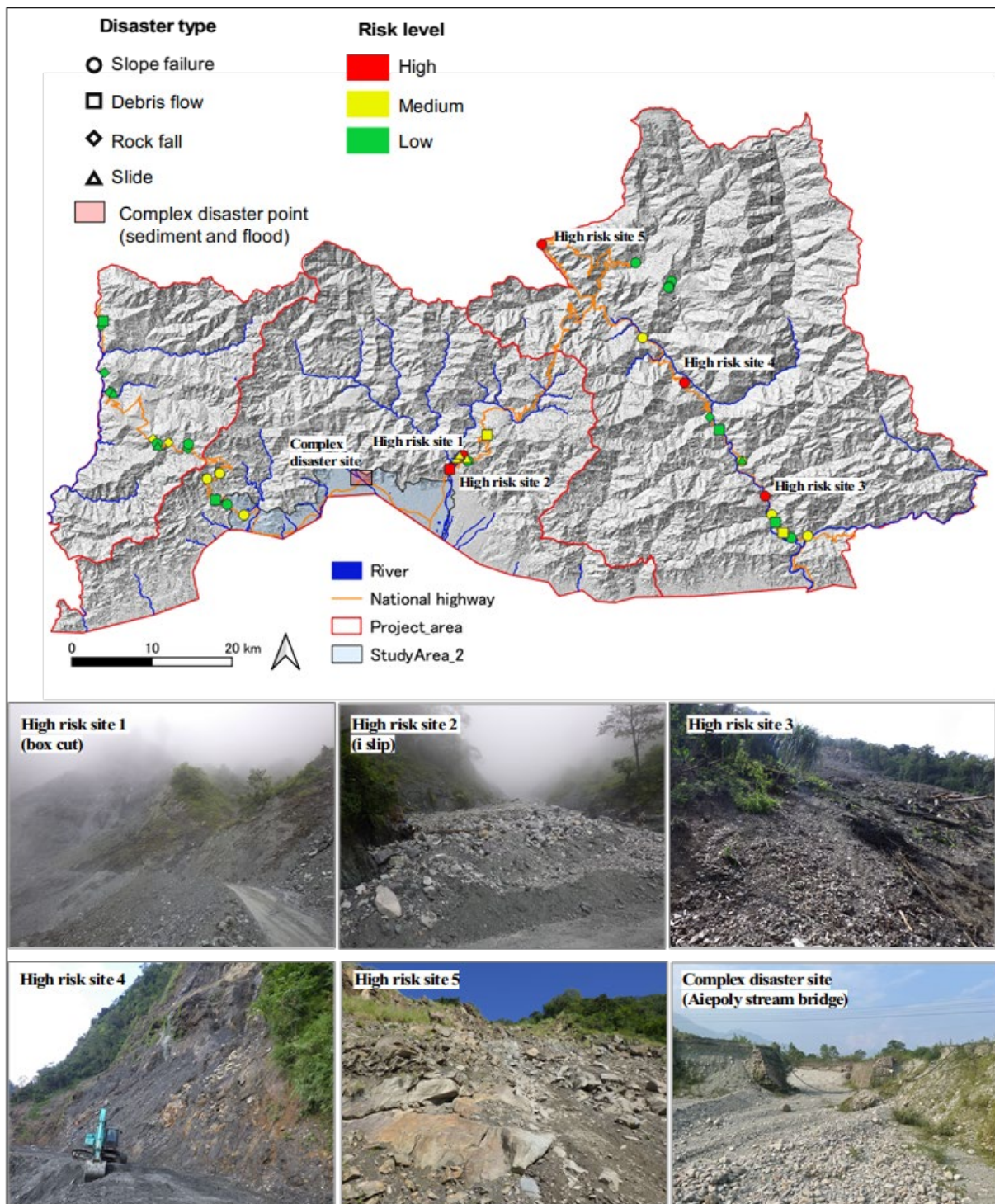
The risk assessment result is shown in Table 4.6.2. The assessment result shows that in total 5 high risk landslide sites existing in the project area, in which 4 (Sarpang 1, Zhemgang3) sites are slope failure type and 1 (Sarpang) is debris flow type. The high-risk landslide sites include the “box cut” and “i slip” sites which has gathered lots of attention by many previous studies by now. The other three high-risk sites are along the nation way between Tingtibi to Panbang and the boundary of Zhemgang and Trongsa. Distribution and the photo of the sites is shown in Figure 4.6.1. As mentioned above, one ne complex disaster (flood and sediment) site is located in the Corridor Area on the national highway connected Sarpang town and Gelephu Thromde. Considering the damage scale and occurring frequency of the site according to the existing disaster records, the complex disaster site is classified as the high-risk site.

Table 4.6.2 Landslide sites risk assessment

	Slope failure			Debris flow			Slide			Rock fall		
	H	M	L	H	M	L	H	M	L	H	M	L
Tsirang	0	0	2	0	0	1	0	0	2	0	2	5
Sarpang	1	4	2	1	1	1	0	3	0	0	0	0
Zhemgang	3	4	5	0	1	2	0	0	1	0	0	1
Total	4	8	9	1	2	4	0	3	3	0	2	6

H: High risk level M: Medium risk level L: Low risk Level

Source: JICA Project Team



Source: JICA Project Team

Figure 4.6.1 Risk Assessment Results Distribution and Sites Photos

(2) Proposed mitigation measures for transportation security

Mitigation measures including structural and non-structural countermeasure is proposed diversely according to the risk level as shown in the Table 4.6.3 below for transportation security. Structural countermeasures are the disaster prevention measures that build facilities and structures to deter, control and mitigate the damage and impacts during the disaster events, and is also known as hard countermeasure in contrast to soft countermeasure. Non-structure countermeasures are the measures not involving physical facilities and structures but using knowledge, practice or agreement to reduce disaster

risks and impacts, and also known as soft countermeasures. The well-known non-structural countermeasures include disaster mapping and zoning, early warning system, public awareness raising, training and education.

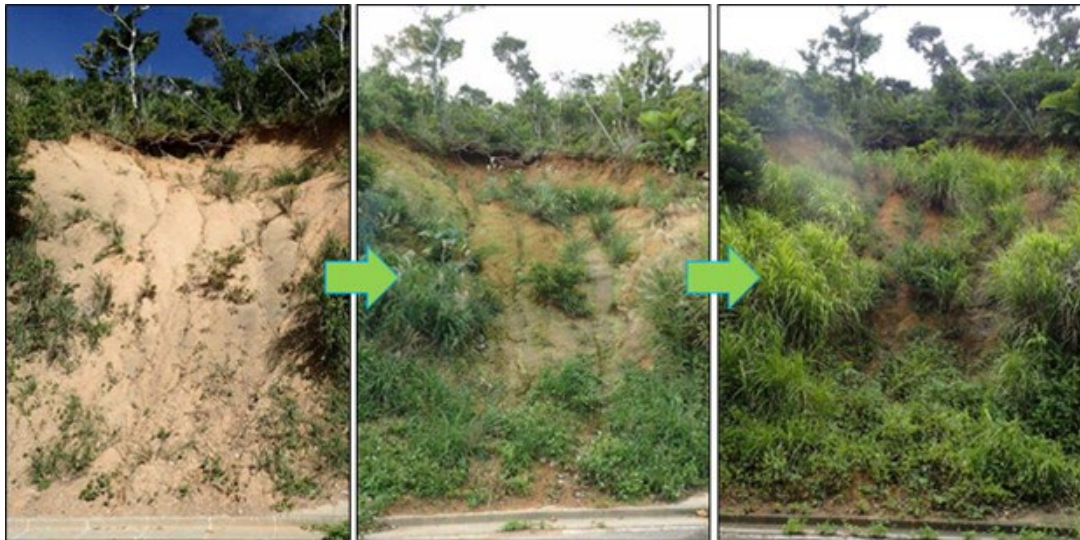
Table 4.6.3 Proposed Mitigation Measures for Transportation Security

	Description	Structural countermeasure	Non-structural countermeasure
High risk site	The disaster site that has high risk due to its large scale and high occurring frequency (e.g., road is blocked over 5 times per year), which may cause large social impact during the disaster events.	<ul style="list-style-type: none"> • Detailed survey and F/S study for permanent countermeasure works design and determination are proposed to be carried out as soon as possible • In case permanent countermeasure is not suitable technically and financially, road realignment will be the option. 	<ul style="list-style-type: none"> • Early warning System (EWS) are proposed to be installed for high-risk site, e.g., precipitation gauge, CCTV camera. • Regular and emergency road inspection • Sediment-related disaster risk area are proposed to be set
Medium risk site	The disaster site with medium risk usually has large scale but low occurring frequency, or high occurring frequency but relatively smaller site scale, which may cause less social impact than high risk sites.	<ul style="list-style-type: none"> • Emergency countermeasure in selected sites • Biological Soil Crust (BSC) Method could be considered to be applied in some selected landslide sites 	<ul style="list-style-type: none"> • Monitoring equipment, for example ground extension meter and a pipe type strain meter for slide sites, is expected to be installed • Monitoring by use of InSAR is proposed for the landslides site if it is difficult to install the monitoring equipment • Regular and emergency road inspection
Low risk site	The disaster site with low risk usually has relatively smaller site scale and low occurring frequency.	Emergency countermeasure work in selected sites	Regular road inspection

Source: JICA Project Team

Among the proposed mitigation measures, what should be noticed are two advanced, but low-cost and efficient mitigation measures have been proposed for the site with medium risk, because those technologies are relatively easier to applied in the project are considering the natural and social situation.

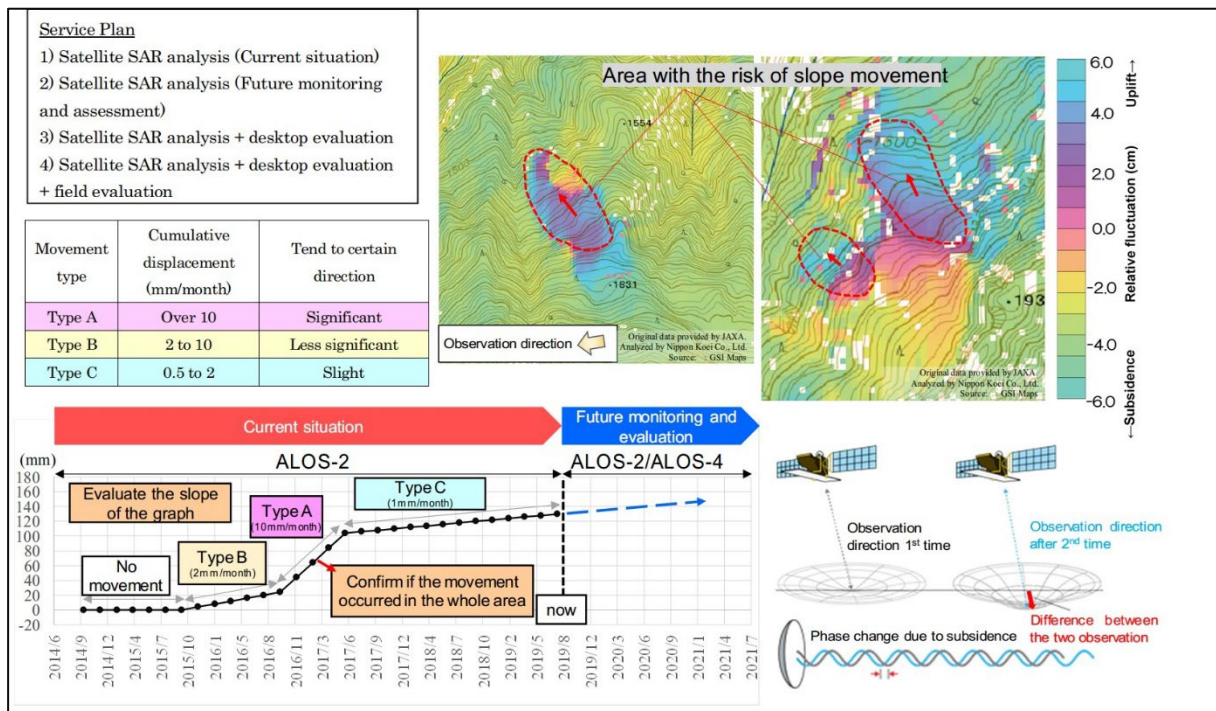
One of them is BSC method, one of the vegetation recovery methods in Japan to prevent slope erosion and facilitate the vegetation intrusion by seeds flying from the surrounding areas (Figure 4.6.2). BSC is a sheet-like colony of soil microbes formulated by soil particles and fractures on the soil surface bound by the filamentous bacterium, soil algae, lichens, and moss. For the sites by traditional vegetation implementation methods, the implemented areas are prone to be eroded and damaged by flowing water. Comparing with the traditional methods, as the soil algae used in the BSC method well develop and grow especially along the water-flowing parts (i.e. rills, gullies), such algae in the BSC method can prevent from the expansion of erosion. Besides, the invasion of plants and other vegetation that originally existed in the surrounding area will create natural vegetation and landscapes suitable to the site. (Figure 4.6.2).



Source: <https://www.bosai-jp.org/en/solution/detail/89>

Figure 4.6.2 Vegetation Change After Use of BSC Method

Monitoring by use of InSAR is also proposed for medium risk sites in case it is difficult to install the monitoring equipment. By using the SAR satellite, it is possible to grasp changes in the ground surface at the level of several centimetres over a wide area without installing measuring equipment on site. The monitoring method using the SAR satellite is now getting more and more attention as a land conservation technology because of its good balance between the economy and accuracy (Figure 4.6.3).



Source: <https://www.bosai-jp.org/en/solution/detail/89>

Figure 4.6.3 Application of InSAR for Ground Movement Monitoring

Detailed assumable permanent countermeasure will be proposed as below for high-risk site 1 and 2, which are closed to the RCSP Area and greatly affect the accessibility between Zhemgang and Sarpang. The assumable permanent countermeasure proposed for high-risk site 1 and 2 could also be worth referring to for high-risk site 3 to 5. As for complex disaster site, detail permanent countermeasure, in which both flood and sediment disaster prevention are considered, is proposed in section 5.6.6 (2), the

part about Aiepoly Stream (Big and small).

Proposed mitigation and management plan for high-risk site 1: Box Cut site

A detailed geotechnical survey has been carried out by Department of Geology and Mines with the support of UNDP and then an integrated risk assessment has been reported in 2017. Based on the previous studies, the mitigation measures for Box Cut are considered as following.

Table 4.6.4 Proposed Mitigation Measures for Box Cut

Structural countermeasure	<ul style="list-style-type: none"> Emergency countermeasures. Considering the frequency of disaster occurrence and the times of road to be blocked, emergency countermeasure should be well prepared for the sites before permanent countermeasure works. It is suggested to build the space near the site to place the heavy machine used for sediment remove during the rainy season. Permanent countermeasures. Considering the scale and the geological condition of the site, a combination of different structural countermeasures should be necessary. The complex countermeasure works is proposed to include drainage works, re-shaping slope with benching, shotcrete, concrete crib with anchor, retaining wall with anchors.
Non-structural countermeasure	<ul style="list-style-type: none"> Alarm system and traffic information transmission system (SMS, SNS, etc.) is proposed for providing information of blocked road to the driver or road users. CCTV camera is proposed to be installed at relatively stable location for monitoring the site situation.
Other alternative measure	<ul style="list-style-type: none"> Considering the scale of the site and the slope unsalability determined by the geological condition, in case that it is difficult to construct the permanent countermeasure works technically and financially, as an alternative measure, road realignment to avoid the site is proposed.

Example image of permanent countermeasure:



Source: <https://www.toko-geo.co.jp/construction/show/264>

Spraying concrete crib with ground anchor

Source: JICA Project Team

Proposed mitigation and management plan for high-risk site 2: I Slip site

The mitigation measures for Box Cut are considered as following.

Table 4.6.5 Proposed Mitigation Measures for I Slip

<p>Structural countermeasure</p>	<ul style="list-style-type: none"> Emergency countermeasures. Same to Bot Cut site, considering the frequency of disaster occurrence and the times of road to be blocked, it is also suggested to build the space near the site to place the heavy machine used for sediment remove during the rainy season as the emergency countermeasures until permanent countermeasures works is completed. Permanent countermeasures. Combination of multiple sabo dam is proposed as the permanent countermeasures. Considering the volume of sediment occurred during disaster event, sediment removal works is expected to be carried often, necessary equipment with enough capacity for sediment removal works is proposed to be well prepared near the site.
<p>Non-structural countermeasure</p>	<ul style="list-style-type: none"> Sensor like wire, LVP (Load, Vibration and Pressure sensor), load cell is proposed to be installed in the flow path to detect the debris flow and data monitoring. It is not only for the early warning system but also to understand the characteristics of the debris flow then can supply necessary information for proper disaster management. CCTV camera is proposed to be installed in the dam crest and the location where can well observe the source of the sediment.
<p>Other alternative measure</p>	<ul style="list-style-type: none"> Same to the Box Cut site, considering the scale of the site and the sediment volume situation, in case that it is difficult to construct the permanent countermeasure works technically and financially, as an alternative measure, road realignment to avoid the site is proposed.

Example image of permanent countermeasure:



Source: <https://magazine.cainz.com/article/79913>

Sabo dam

Source: JICA Project Team

Especially, it is proposed to adopt the Soil-cement method rather than the traditional concrete method for the sabo dam construction. The Soil-cement method is a method of constructing sabo dam by mixing locally generated soil, cement, water, and other materials onsite, the merit of which includes reduction of construction by-product (surplus soil) generation, reduction of construction cost, and construction period shortening. Figure 4.6.4 shows an example of use of Soil-cement method in “Sabo” dam construction site of Japan, where seems have similar sediment and geological situation.



Source: <https://shinken-eventandseminar.jp/information/2797>

Figure 4.6.4 Example of Use of Soil-Cement Method in “Sabo” Dam Construction Site of Japan

4.6.2 Risk management for settlement

(1) Existing risk condition

Disaster record can help understand well the existing risk condition in the RCSP area. However, the disaster history has not been systematically and constantly recorded in three Dzongkhags, and quality of existing record is also different in different Dzongkhags. Disaster record information could be collected in the project is described as below.

Sarpang Dzongkhag

Sarpang Dzongkhag has experienced several disasters over the last 20 years, the most devastating being the September 18, 2011, Sikkim earthquake of M 6.9, which caused widespread damages to rural homes and government infrastructure. According to Draft Dzongkhag Disaster Management and Contingency Plan by Sarpang Dzongkha Administration (2017), the disaster occurred in past has been recorded by Gewog. Table 4.6.6 shows the events number for each main disaster types occurred in each Gewog of Sarpang since 2000. Most hazards are seasonal and occurs at some particular time of year. For example, flash flood and landslide occur mainly during the rainy season in the months of June to August.

Table 4.6.6 Disaster Events by Gewog in Sarpang Dzongkha (2000-2017)

Gewog	Area (km ²)	Number of Households	Earthquake	Windstorm	Flash Flood	Landslide	Wildlife conflicts	Fire
Chhuzagang	57.6	587	1~3		2		2	5
Chhudzom	222.0	623		3		4		1
Dekiling	113.0	1,004		1				1
Gakiling	785.0	541		2		3		1
Gelephu	54.0	423		2		Every year	Every year	
Jigmechoeling	492.0	686		5	3	2		
Seng-gey	232.0	286		1	2	2	Every year	
Shompangkha	21.0	404		1	2	2	Every year	1
Samtenling	55.4	568			1	1		1
Serzhong	78.0	483		Every year	2	Every year		
Tareythang	399.0	84		1	3		Every year	2

Umling	122.0	408		3	Every year	2
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Source: Created by JICA Project Team based on Draft Dzongkhag Disaster Management and Contingency Plan by Sarpang Dzongkha Administration (2017)

The Sarpang Dzongkhag Administration also assessed the disaster risk by disaster type based on the past disaster recordings, and the results show that the disaster with relatively high risk in Sarpang Dzongkhag is flash flood > landslide, wildlife conflicts > Earthquake.

Risk of Pest and Disease disaster has been ranked in the 8th of 10 evaluated disaster types which implies a relatively low risk of it in Sarpang Dzongkhag. However, Malaria has been reported almost every year in the Gewog such as Chhuzagang, Gelephu, Shompangkha.

Tsirang Dzongkhag

Tsirang Dzongkhag is also exposed to various natural disasters. During Sikkim earthquake on September 18, 2011, widespread damages has been caused on rural houses and government infrastructure. The other major and recurrent hazard in Tsirang is landslide and windstorm, which causes extensive damages to public infrastructure and roofs of houses. However, only a few of disaster events have been recorded which are being reported in Tsirang Dzongkhag Disaster Management and Contingency Plan (2019) as shown in Table 4.6.7. In this plan, earthquake and landslide have been assessed as high probability of occurrence in Dzongkhag.

Table 4.6.7 Disaster Event and Assessment in Tsirang Dzongkhag

Disaster type	Occur season	Probability of Occurrence	History of Past Disaster	Impact/Damage
Windstorm	March, April, May	Medium	April 2015	88 householders affected
Landslide	June-September	High	2016, 2017	Public and Private Infrastructures, Firm roads, Private Lands
Structural fire	Winter season	Medium	2018	2 houses affected.
Bush fire	Winter season	Medium	2018	14 acres affected
Lightning and Thunder	Summer season	Medium	2016	Electric lines short circuited and a women electrocuted
Earthquake	<i>Unpredictable</i>	High	2009, 2011	More than 100 householders affected.
Flood	June to August	Medium	1995	Damaged crops and cultivatable land

Source: JICA Project Team based on Tsirang Dzongkhag Disaster Management and Contingency Plan (2019)

Zhemgang Dzongkhag

Zhemgang Dzongkhag is susceptible to both natural and human-made disasters. This includes earthquake, windstorm, fire, landslides, thunderstorm and vehicle accidents. The most notable disaster was the September 21st earthquake in 2009 which affected the most Dzongkhags in Bhutan including Zhemgang. It damaged most of the rural households, schools, and other government infrastructures. Furthermore, the Dzongkhag is affected by windstorms every year which has destroyed houses and crops with serious implication on the livelihood of the people. However, only a few of disaster events have been recorded which are being reported in Zhemgang Dzongkhag Disaster Management and Contingency Plan (2020) shown in Table 4.6.8. In this plan, windstorm, earthquake and structural fire have been assessed as high probability of occurrence in Dzongkhag.

Table 4.6.8 Disaster Event and Assessment in Zhemgang Dzongkhag

Disaster type	Occur season	Probability of Occurrence	History of Past Disaster	Impact/Damage
Windstorm	Spring and autumn	High	2014-2019	More than 200 public

Disaster type	Occur season	Probability of Occurrence	History of Past Disaster	Impact/Damage
				and Private Houses, Crops, Govt. Infrastructure were damaged from 2014 to 2019.
Earthquake	<i>Unpredictable</i>	High	2009, 2011, 2018	Damaged to 1-2 private houses especially in the villages by minor shocks every year. Moreover, falling boulders has damaged 3 houses in Shingkar Gewog in 2018
Structural fire	Dry and windy season	High	2014, 2017	Damage private/public properties are possible but reports not available.
Landslide	Summer/rainy season	Medium	2003, 2017, 2018	Traffic disturbance, lost lives, damages to infrastructures and properties especially in lower Kheng

Source: JICA Project Team based on Zhemgang Dzongkhag Disaster Management and Contingency Plan (2020)

(2) Disaster risk assessment

Based on the existing previous disaster records and the results of field and hearing survey, the disaster risk assessment for the settlement area and its incentives analysis are summarized as shown in Table 4.6.8. Three main disaster types including flood, landslide and wildlife conflicts have been evaluated, and the disaster type with medium and high risk and corresponding mitigation measures will be discussed in the viewpoint of disaster management.

High flood disaster risk is only identified in Sarpang Dzongkhag, specifically in the RCSP Area due to terrain and climate features there. Regarding to Tsirang Dzongkhag and Zhemgang Dzongkhag, according to the filed survey, high flood disaster risk could not be identified in on the river or catchment existed in those two Dzongkhags, which could be reasonable if considering the settlement distribution as well as land use situation.

Landslide disaster seems a common threat in the whole project area, which is because the mountainous landscape widely distributes in Bhutan. Wildlife conflicts disaster with high risk exists in Sarpang and Zhemgang, specifically the main wildlife conflicts in Sarpang originates from the elephant while it is more diverse Zhemgang. One more problem is valid structural or non-structural countermeasures are still far short of even in the area with high disaster risk.

Table 4.6.9 Disaster Risk Assessment and Incentives Analysis for the Settlement Area

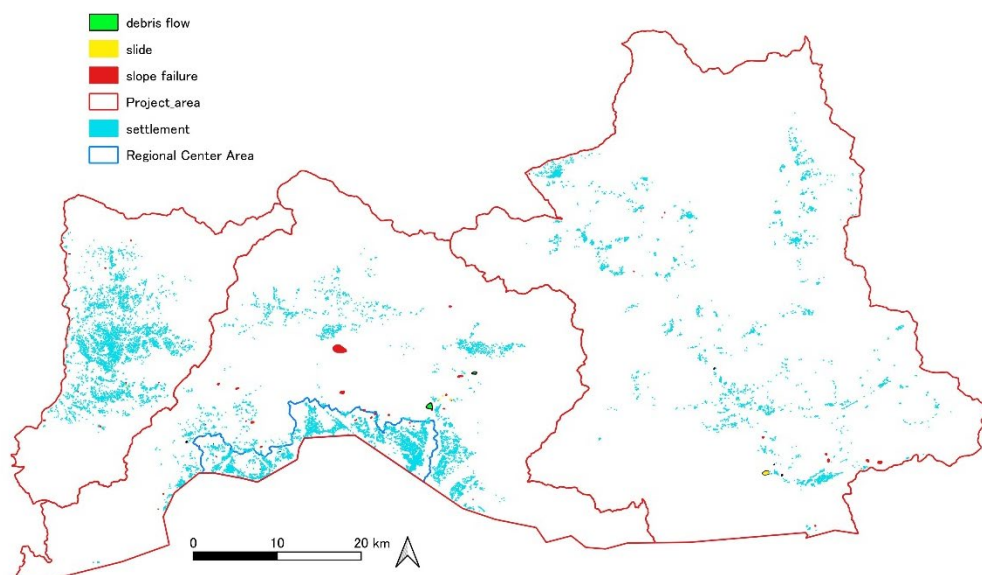
Dzongkhag/Analysis		Flood	Landslide	Wildlife conflicts
Sarpang		High	High	High
Tsirang		Low	Medium	Medium
Zhemgang		Low	High	High
Incentives analysis	Physical/materials	<ul style="list-style-type: none"> • Heavy rainfall • Wrong location selection of settlement and cultivable land • Rugged terrain • Poor drainage 	<ul style="list-style-type: none"> • Unstable and step terrace terrain, poor land management • Heavy rainfall or earthquake effects • Use of poor-quality material for 	<ul style="list-style-type: none"> • Dense forest around • Areas being located near to wildlife corridor • Improper

Dzongkhag/Analysis		Flood	Landslide	Wildlife conflicts
			construction	fencing and lack management of solar fencing
	Social/Organizational	<ul style="list-style-type: none"> Lack of proper planning Lack of communication and preparedness 	<ul style="list-style-type: none"> Lack of land management knowledge among public Poor cooperation within the society Lack of technical expert in planning and countermeasure works 	<ul style="list-style-type: none"> Poor method of protection Poor cooperation among communities Lack of experts in mitigation

Source: JICA Project Team

Specific risk area is expected to be identified for each disaster type in the viewpoint of proper disaster management. Due to lack of previous disaster records, it is difficult to identify the wildlife conflict risk area for Zhemgang Dzongkhag, while high risk area of wildlife conflict in Gewog unit can be provided for Sarpang Dzongkhag thanks to relatively detailed disaster records, which is described in section 5.6.6 (3). High flood risk area has been assessed for the RCSP Area in Sarpang Dzongkhag by previous studies and will be described in section 5.6.6 (2). For mitigating flood risk in Sarpang Dzongkhag, considering the terrain and geographic condition in Bhutan, structural measures in upstream such as Tsirang and Zhemgang are not effective.

As for the landslide disaster, by use of satellite data aerial photograph and terrain interpretation have been conducted, and many landslide sites close to settlement area, important facilities or heritage sites have been identified. Those landslide sites are preliminarily and simply estimated to be risk area considering its scale read from the satellite data and the distance to settlement area, important facilities or heritage sites. The distribution of those landslides is shown in Figure 4.6.5.



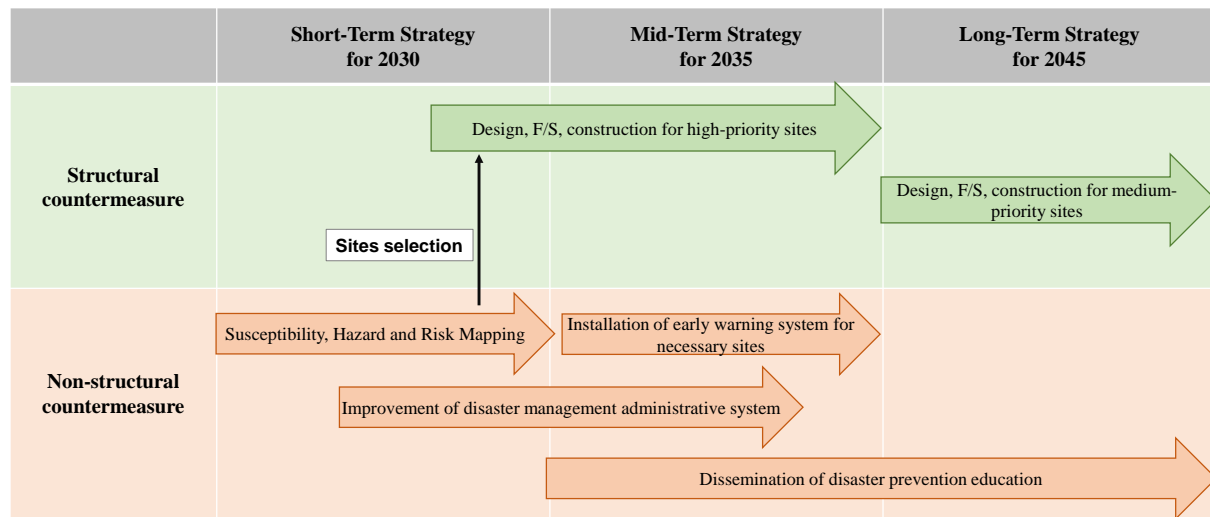
Source: JICA Project Team

Figure 4.6.5 Wide-area Interpretation Results of Landslide Terrain

(3) Proposed risk management plan for settlement area

1) Proposed risk management plan against natural disaster for settlement area

Detailed disaster mitigation plan including structural and non-structural countermeasures for selected specific high-risk sites are described in section 5.6.6. For the other disaster sites, the mitigation plan including both structural countermeasure and non-structural countermeasure is considered generally and temporally as shown in Figure 4.6.6.



Source: JICA Project Team

Figure 4.6.6 Proposed Risk Management Plan against Natural Disaster for Settlement Area

Structural countermeasures for settlement

The sites that need structural countermeasures will be selected and the priority for structure construction will be determined based on the results of risk assessment conducted. The structure design, F/S and construction of it for high-priority sites are suggested to be conducted and completed by 2035. The structure design, F/S and construction for medium-priority sites are proposed to be conducted and completed by 2045 mainly depending on the financial situation of central and local government. Structural countermeasure is not proposed for low-priority sites.

Non-structural countermeasures for settlement

Non-structural countermeasures for settlement are considered as following.

- Susceptibility, Hazard and Risk Mapping

As basic but essential information for proper disaster management, it is proposed to complete wide-area mapping for the whole Project Area. Proposed mapping work includes three types of maps, which are a wide-area susceptibility map and, the hazard map and the risk map for selected areas based on susceptibility map.

The susceptibility map is usually used to predict the spatial occurrence of disaster events, but the hazard is usually used to predict the spatiotemporal occurrence of the disaster events during a given terrain. The term of risk refers to the expected losses or damage by events during a given region, which are the products of susceptibility, hazard, and elements in peril (Azemeraw Wubalem, 2021). Completion of the maps will greatly contribute to the land use plan and development related to the settlement as well as a proper and efficient disaster management.

- Installation of the early warning system

Early warning system is proposed to install for the site or area which is necessary. What should be noted is that for the site where structural countermeasure is planned to be conducted, the early warning system is usually not necessary unless it is estimated that only the structural countermeasure could not prevent the disaster sufficiently. Early warning system is also proposed to be installed for the sites or areas where there is no structural countermeasure as an alternative option especially for the sites with low priority for structure construction. The selection of the sites or areas where to install early warning system will be discussed and determined based on the results of risk mapping.

- Improvement of disaster management administrative system

Different disaster type is being managed by different administrations in Bhutan, and disaster event and data are accordingly being recorded and collected by different administrative department. Besides, the quality of the record and collected data varies greatly in different department and regions.

As disaster data collection and accumulation is so important to provide basic information for proper disaster management, it is proposed to build a unified disaster database to manage the disaster data and allow the access from different department or the public if necessary. For realizing it, it is necessary to make clear the role and function of different department in the field of disaster management.

It is also proposed to provide a platform for different department involved with disaster management to exchange opinions or study the knowledge of other disaster type. Due to the terrain features and natural conditions in Bhutan, the disaster event sometimes is not a single type but the complex one. Therefore, it is important to provide a chance for the technicians or policy maker in different department to know necessary knowledge of different disaster type.

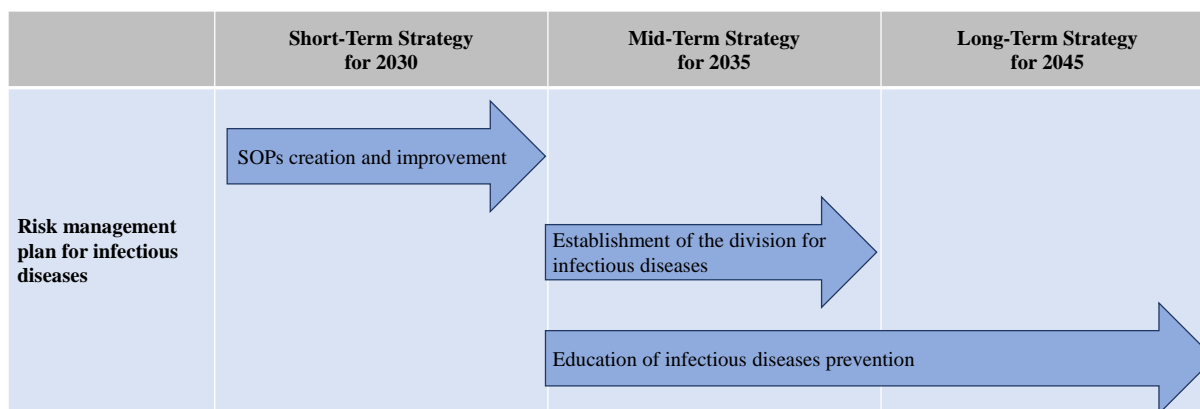
- Dissemination of disaster prevention education

Plan for the dissemination of disaster prevention education to the public, like holding the lecture about necessary disaster knowledge, disaster evacuation drills, is proposed to make.

Well understanding and education about the disaster will greatly contribute to the efficiency of disaster management, for example, it is easy get correct information from local people when disaster events occurred; it is easy to get understanding from local people when explaining or implementing the land use development plan related to disaster prevention due to well understanding of the disaster features.

2) Proposed risk management plan against infectious diseases for settlement area

The GNHC and JICA Bhutan Office signed a grant agreement on September 2022 to construct the Royal Centre for Infectious Diseases (RCID) at Gidakom Hospital. Therefore, the risk management plan against infectious diseases for settlement area will be considered taking this fact into account accordingly. Specific plans are proposed as follows (Figure 4.6.7).



Source: JICA Project Team

Figure 4.6.7 Proposed Risk Management Plan against Infectious Diseases for Settlement Area

SOPs creation and improvement for determined settlement area

SOPs has been actually created in some areas or by some institutions during COVID-19 pandemic period. It is proposed to improve the existing SOPs considering the experiences and lessons learned this time. It is also proposed that SOPs need to be created and specified for determined settlement area. Population and medical facilities are diverse from different areas, so the settlement area should be divided into different units and classified into different categories for applying the corresponding SOPs.

Establishment of the division for infectious diseases

Division for infectious diseases is proposed to be established in the local centre hospital for each Dzongkhag. At least one hospital in each Dzongkhag will be selected to establish the division. The timing of the establishment could coordinate with the construction progress of RCID, and the division basically get technical support and training from RCID or other central institution with sufficient related knowledge and experiences.

Education of infectious diseases prevention

Similar to natural disaster, public education is so important to infectious diseases prevention as part of risk management. It is proposed to disseminate the basic knowledge of infectious diseases and contents of SOPs periodically. Combination of face-to-face lecture and use of online platform like SNS is suggested to be used to conduct the education activities.

4.7 Environmental Management

4.7.1 Environmental and social consideration

Bhutan has many legislations, strategies and standards governing environmental conservation. A summary of some of the legislations is described in the PrR. As for natural condition such as climate, topography and geology are also overviewed in the PrR as well as land use and land cover.

4.7.2 Region-wise environmental strategy

Natural condition in the Project Area were analysed in section 3.3.1 of the PrR. The major environmental problems have been identified with the SEA scoping methodology in section 2.3 of the Interim Report and. Environmental management strategy can be further divided into 5 distinct clusters.

(1) Cluster 1: Tsirang area and connectivity to Sarpang

1) Environmental problems:

- Human wildlife conflict;
- Water source degradation, and
- Disaster risk along the national highway connecting to Sarpang.

2) Strategy:

- Proper and effective countermeasures for reducing human wildlife conflict;
- Protection of watersheds and continuation Payment of Environmental Services (PES) mechanism, and
- Countermeasures along the national highway.

Tsirang is one of the Dzongkhag's with identified degraded watersheds¹⁴ shown in Figure 2.3.1 in section 2.3.2. There is already a PES system established. It is critical to continue and expand this initiative.

The upper part of Tsirang is the area with the greatest number of human wildlife conflict incidences. Proper countermeasures that are effective in terms of cost and reducing the incidences must be further put into place, as agriculture in Tsirang is one of the key economic activities.

Within the framework of the SCRP, the connectivity issue is one of the most critical in terms of regional cooperation and integration of different kinds of activities for regional vitalization. Proper countermeasures along the highway must be ensured.

(2) Cluster 2: Southern foothills of Sarpang

1) Environmental problems:

- Human wildlife conflict;
- Biodiversity, and
- Disaster risk along the national highway and major river sources.

2) Strategy:

- Proper and effective countermeasures for reducing human wildlife conflict;
- Elephant movement corridors secured, and
- Countermeasures along the national highway and around the major water bodies.

The Southern parts of Sarpang, form important migratory routes for elephants. The elephants are considered endangered internationally and is under protection by the RGoB. The situation will further exacerbate as the urban settlements expand and the population increases. Conservation activities must be coupled with strategies that take into consideration the livelihoods of the farmers. Additionally, proper, and effective countermeasures must be put into place that protects property, farmlands, crops and human lives. Disaster risk countermeasures must be put in place for ensuring connectivity and protection of lives and properties.

(3) Cluster 3: The bordering areas of upper Sarpang and Zhemgang

1) Environmental and socio-economic problems:

- Poverty rate, and

¹⁴ Karma Yangzom and Phuntsho Choden, 2021. Climate change and water resources in Bhutan. Journal of the Bhutan Ecological Society

- Water source degradation.

2) Strategy:

- Creating employment opportunities, and
- Protection of watersheds.

It is important and critical to have policies and incentives to creating employment opportunities in places with high poverty rates. Such areas are also geographically distinct and isolated, which needs to be taken into consideration. Water scarcity will affect all walks of life including ecosystem degradation, human activities, and their livelihoods. It will serve as a factor that could further affect the livelihoods of the most vulnerable members of the community. It is essential to protect the watersheds and seek possibilities to introduce PES systems.

(4) Cluster 4: Upper-Eastern side of Zhemgang

1) Environmental and socio-economic problems:

- Human wildlife conflict, and
- Poverty rate.

2) Strategy:

- Proper and effective countermeasures for reducing human wildlife conflict, and
- Creating employment opportunities.

Human wildlife conflict presents as a threat to all the communities, although the types of animals and the intensity differs. It is important to have countermeasures for each specific need.

Employment opportunities must be explored and created in accordance with the strengths and opportunities that are present at each give location.

(5) Cluster 5: Southern half of Zhemgang

1) Environmental and socio-economic problems:

- Poverty rate, and
- Disaster risk along the national highway connecting to Panbang.

2) Strategy:

- Creating employment opportunities, and
- Countermeasures along the national highway.

Poverty rate is quite high in the Sothern part of Zhemgang, with slight difference in Panbang area. Employment opportunities must be created by exploring the uniqueness of the area. Connectivity issues play a significant role not only in the socio-economic role, but also prevents from forming an integrated and well linked local system in place. Connectivity must be also ensured in digital connectivity and telecommunications front.

4.7.3 Environmental management strategy

(1) Solid waste management system

Bhutan lacks proper solid waste management system and practices which can effectively handle waste from generation to disposal in an environmentally sound manner. Improper solid waste management creates nuisance, cause environmental pollution and have negative impacts on public health through practices such as open dumping and unsanitary landfills. Furthermore, there is a tendency among people

to casually litter garbage in the street and open spaces.

Therefore, creating a circular system that minimizes all the negative impacts of waste while maximizing material recovery is essential. Both physical and governance issues related to all waste related activities from generation to disposal will be considered to capture the existing conditions. Unhealthy and improper practices, such as burying mixed waste in the soil near residential areas, have been observed especially in the rural villages where tourism is promoted. Such practice is counterintuitive to eco-tourism and will give a negative perception to tourists as well as contribute to environmental deterioration and adversely affect public health. Hence, villages and localities that promote eco-tourism and homestays have the potential to transition towards zero waste initiatives.



Figure 4.7.1 Linear versus Circular Economy

Furthermore, the establishment of a paper recycling factory at Jigmeling Industrial Park and the Integrated Waste Management Centre in Sarpang can be further utilized to develop a circular municipal solid waste management in the whole region.

(2) Elephant corridor

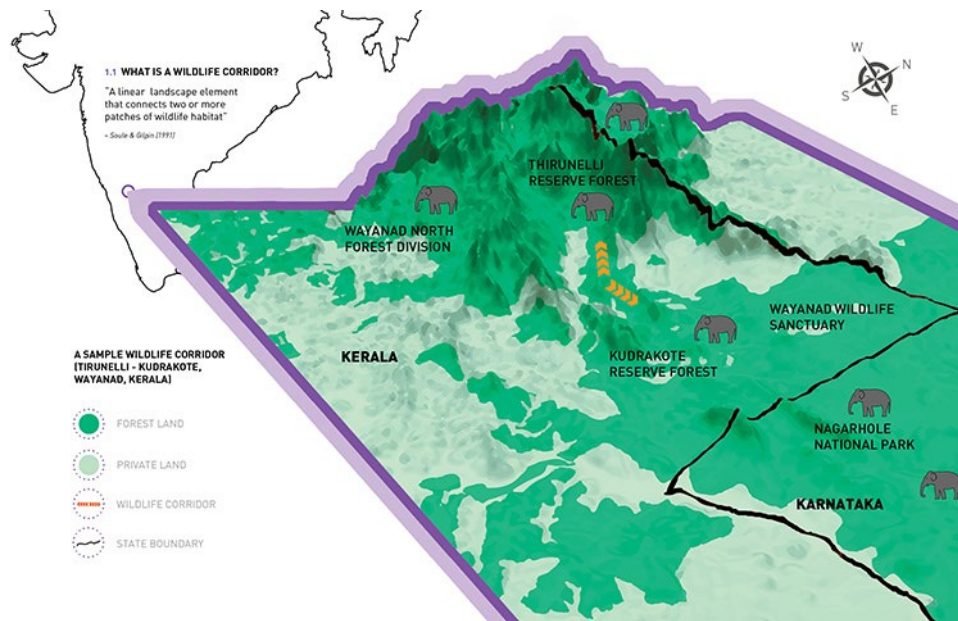
Elephants are classified as endangered by the International Union for Conservation of Nature (IUCN) Red List of Threatened Species and listed on Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). In Bhutan, elephants are protected under Schedule I of the Forest and Nature Conservation Act, 1995.

The narrow band of habitat along Bhutan’s southern border constitutes the core of its elephant population, estimated to number between 605-761 animals, highest numbers occur in Phipsoo Wildlife Sanctuary (WS) and Royal Manas National Park. Bhutan’s population is tied to India where suitable forested habitats are rapidly disappearing.

The situation will further aggravate if development planning does not account for the need of elephant habitat use. Therefore, strategies need to be put into place to secure the habitats, prevent loss of habitat, and ensure habitat connectivity. This would also require a deeper understanding of the conflict pattern in the area.

Integrated human-wildlife conflict management and holistic coexistence strategies can benefit communities, society, governance, sustainable development, and businesses, all while securing the survival of threatened species and the ecosystems they depend on.

The South of Bhutan can become a model case for promoting human-elephant coexistence through engaging all the relevant stakeholders and solving the existing conflicts with creative and agile solutions that consider the wellbeing of both humans and elephants.



Source: <https://www.wti.org.in/projects/right-of-passage-national-elephant-corridors-project/>

Figure 4.7.2 Tirunelli – Kudrakote elephant corridor in Kerala, India

(3) Development of animal viewpoints

Bhutan is known for its rich and abundant wildlife, bird species, and natural environment, which are one of the main attractions. As development activities flourish, it is equally important to keep the natural equilibrium.

Through wildlife watching and nature-based tourism, all stakeholders can be engaged in education and awareness raising, as well as appreciating the beauty of the natural world with all its richness and biodiversity. Through the enrichment of the habitat and greenery in these corridors, the natural environment and habitat will be protected, as well as creating socio-economic gains.

The existing migratory routes will be identified and the critical habitats and connectivity to them will be protected that may include additional areas for protection, including the national highways.

Development of wildlife viewpoints will attract both locals and tourists; therefore, it will have implications for tourism development through the development approach that considers the balance between development and conservation activities.

The animal viewpoints can be connected by eco-trails, and viewpoint decks/canopies shall be constructed that will minimize the disturbance to wildlife. Establishing eco-trails that lead to Phibsoo Wildlife Sanctuary and Royal Manas National Park would further develop eco-tourism and enhance the existing network of tour routes and tourist facilities along the route. The engagement of local tour guides and tourist services shall also be prioritized.



Overview and pathway to the bird viewpoint



Bird viewpoints' canopy / Bird stands through the viewing decks

Source: JICA Project Team

Figure 4.7.3 Bird viewpoints at Kasai Rinkai Park in Tokyo, Japan

(4) Development roadmap

It is essential to foster coexistence of humans and wildlife through wildlife watching and nature-based tourism for environmental conservation. Therefore, development of animal viewpoint should be achieved as a short-term strategy with minimal investment. The Solid waste management system will be developed in mid- and long-term because education and awareness-raising programs are necessary beforehand. Elephant corridor requires careful study and analysis and should be positioned as a long-term strategy.

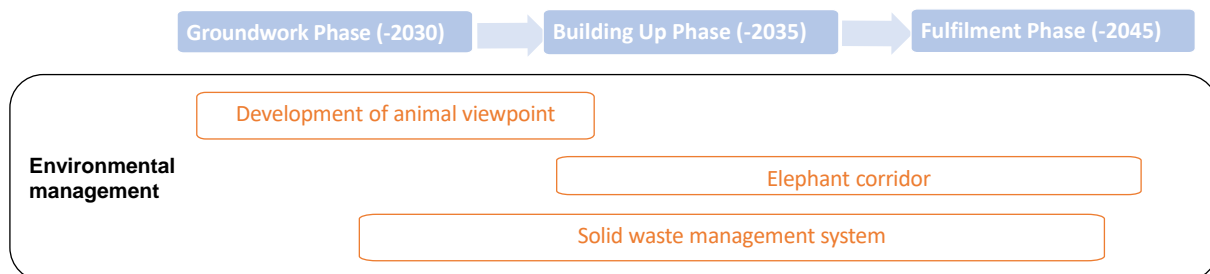


Figure 4.7.4 Development Roadmap for Environmental Management

4.8 Delineation of Boundaries of Structure Plan

The erstwhile Ministry of Works and Human Settlement has made efforts to formulate the structure plans and urban development plans of municipalities in 3 Dzongkhags of Sarpang, Tsirang and Zhemgang. Table 4.8.1 shows a list of existing structure plans of each municipality which covers towns designated as Urban Centre in the regional spatial structure.

Table 4.8.1 Existing Statutory Plan of Municipalities in 3 Dzongkhags

Dzongkhag	Municipality	Existing Plan
Sarpang	Sarpang	Structure Plan
	Gelephu	Structure Plan
Tsirang	Dampchu	Urban development plan
		Structure plan
Zhemgang	Zhemgang	Structure Plan
	Tingtibi	Structure Plan
	Panbang	Structure Plan
	Buli	Commercial service centre - Development plan
	Sonamthang	Action Area Plan

Source: Erstwhile Ministry of Works and Human Settlement

However, the Structure Plans have not been developed in some of the towns shown in the regional spatial structure. Towns where new Structure Plans should be created are listed below.

- Sarpang Dzongkhag: Jigmecholing and Jigmeling Industrial Park and its surrounding area
- Tsirang Dzongkhag: Mendrelgang
- Zhemgang Dzongkhag: Panbang

4.9 Community Development

4.9.1 Stakeholder structure

In Bhutan, people's participation in development planning starts at the Chiwog level, where member of every Gung or household is consulted through a Chiwog Zomdu, a primary platform for people in the community to participate in the development process. During these Zomdus, people raise their issues to the Tshogpas,

Chiwog is the lowest territorial constituency consisting of a group of villages. There are 1044 Chiwogs. Generally, there are 5 or 6 Chiwogs that form a Gewog. Most of the Chiwogs are small rural communities.

Community-based organisations such as cooperatives or CSOs, who are engaged in socio-economic activities, are common at the community level in the Project Area. Collaboration with local cooperative/CSOs and Gewog/Chiwog is quite effective. Such organizations have rich experiences on community development activities, and also know the local context very well. Their experience and expertise can bring different points of view that the outsiders do not have.

According to the Local Government Act and the Local Government Rules and Regulations, through the planning cycle at local governments, the committees responsible for planning, implementation, and M&E are involved. Committees can be established by local Governments for purpose of specific functions. Each committee may have co-opted members from amongst officials from any national agency, ministry, department and regional office or the voters of the Thromde/Gewog on the basis of relevancy and need to the committee.

For example, as of 30th August, 2022, Sarpang Dzongkhag has the following committees¹⁵.

¹⁵ <https://sites.google.com/sarpang.gov.bt/sarpang/home>

- I. Standing Committee: 1. Human Resource Committee, 2. Dzongkhag Tender Committee, 3. Dzongkhag Finance Committee, 4. Dzongkhag Environment Committee, 5. Dzongkhag Land Lease Committee
- II. Ad-hoc Committee: 1. Handing Taking Committee, 2. Dzongkhag Land Dispute Settlement Committee, 3. Construction Monitoring Committee
- III. General Coordination meetings committee: 1. Quarterly Coordination Meeting with Contractors, 2. Goods and Services Receiving Committee, 3. Annual Cash Crop Auction Committee, 4. Entertainment Licensing Committee, 5. Internal Review Committee (APA)
- Other Coordination Meetings: 1. Monthly Coordination Meeting, 2. General Staff Meeting

4.9.2 Gender and women's empowerment

As described at section 3.5.3 6), although Bhutan ranks 126th out of 153 countries in the Gender index 2022, there are many types of women's groups and entrepreneurs who are involved in socio-economic activities. However, some women's groups struggle to upgrade their local activities into more profitable or significant ones. To make these activities related to women's empowerment more enliven, it is suggested that the government give the preference to women's group in the screening process for grants related to entrepreneurship when it comes to considering the grant system for entrepreneur.

It is said that the percentage of women in the agricultural workforce is much higher than men. Related to this, many women in rural areas have inadequate incomes due to low levels of education. Also, as for the gender consideration, it is necessary to improve the livelihood of women in rural communities through the creation of occupational opportunities suitable for women to work and the development of day-care centres, etc.

4.9.3 Strategy for community development

(1) NGOs

At present, there is few local NGOs which actively helps the activities of local residents well, although local NGO would be a good tool to collaborate with local people. NGO could also be a good intermediary to negotiate with government or international donors, and motivate and organize the communities. In order to provide a social or other service, it is necessary for a lot of local people to understand the objectives and mechanism. Moreover, the local government which wants to do such kind of social support should go through the various procedure within their organization, and receive the approval from local people on the contents of provided service. In that case, NGO can play an important role standing between local people and local government.

NGOs are organizations that voluntarily engage in the activities that respond to the difficult needs which there are much difficulties that the governments, municipalities and private companies can provide. Thus, NGOs which can stand between the government side and local people are able to play an important role for directly connected to local needs.

Since NGOs are not for-profit organizations, they can receive donations to fund their activities. NGOs benefit a variety of people, including members of organizations that want to contribute to society, people who are seeking assistance, and individuals and companies that want to make use of their money. It would be suitable for NGOs newly established to accept the needs of the Project Area.

(2) Cooperative

Cooperative can have a wider scope of activities than NGOs. The groups consist of indigenous active people. Cooperative is defined as a group sharing some economic or social objectives. In the Project Area, already there exist many cooperatives such as woman group, youth group, and elderly group. However, it is not enough to improve comprehensive development for communities.

They should be connected to other village's cooperative to corroborate with each other and get the

informative information. Moreover, they can provide that there are likely to have possibility to connect three or four villages which have similar culture, indigenous character and economic activities, more narrow area than rural district.

For example, Panbang YOUTH Cooperative is one of the prominent cooperatives which contribute to local economy, regional branding, youth employment, etc. They are also engaged in a series of supply-chain supportive activities such as marketing, transportation, product branding, promotion, etc. This type of cooperative, which can contribute to local livelihood, social life, regional vitalisation, should be expanded to wider area in not only one Dzongkhag, but also neighbouring Dzongkhags.

(3) Establishment of new department in local government

As above mentioned, NGOs and cooperatives are the key to community development. However, there is no department or organization to promote them. It is suggested that new department which can support to establish new NGOs or cooperatives would be established within Dzongkhag administration, because Dzongkhag is a basic public administration which should be the close to local community activities. Also, the department can coordinate various organizations in each village and support mutual development. Figure 4.9.1 shows the suggested relationship between each actor.



Source: JICA Project Team

Figure 4.9.1 The relationship between each actor

(4) Public participation

Public participation is a key for community development as well. However, not only simple cooperation within local people but also democratic decision-making system is required in the contemporary community development. The participatory approach is a method to ensure democratic decision making. Since various methods have been developed around the world, villagers and government officials have to learn participatory approach suitable for the Project Area.

Taking Kumamoto City in Japan for example, there is a volunteer program for local non-profit organisation to conduct environmental beautification activities such as cleaning, weeding, and grooming of plants and trees on roads managed by Kumamoto City. This program significantly contributes to not only pragmatic action such as keeping road condition, but also strengthening the connection between municipalities and residents.



Before action



After action

Source: Kumamoto City HP
(https://www.city.kumamoto.jp/common/UploadFileDsp.aspx?c_id=5&id=1526&sub_id=6&flid=245334)

Figure 4.9.2 Picture of Road Side Condition in Kumamoto City

(5) Involvement of multi-stakeholders

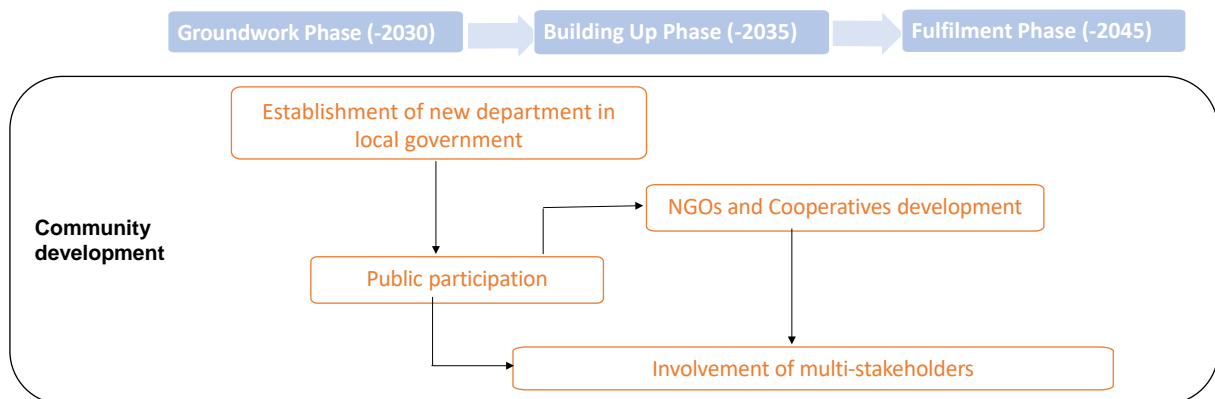
In Zhemgang, Sarpang, and Tsirang Dzongkhags, there are a number of Farmers’ Groups/Associations/ Cooperatives that produce vegetables, fruits and flowers, as well as processed agricultural products such as bamboo products and dairy products. Many of these existing community-based groups are already producing quality products and have gained a good reputation in Bhutan. However, they have yet to develop sophisticated, high-quality products that meet design, packaging, hygiene and other standards for foreign tourists and consumers.

It is effective for the multi-stakeholders to focus on quality over quantity, quality control, branding, marketing, and promotion, with the aim of selling the products at Gelephu/Paro International Airport, hotels where foreigners stay and online shops. Modern design, packaging and online shops can make use of the English language skills and IT skills of local youth as well.

(6) Development roadmap

As for the community development, it is proposed several strategies from both of the organizations and human resources aspect. The local government does not have a good policy for operation and maintenance of infrastructure, especially under community management. Discussion on operation and maintenance tend to be ignored both by the government and community members.

To achieve the community management, it will be effective for some strategies mentioned above to be implemented as below figure.



Source: JICA Project Team

Figure 4.9.3 Roadmap for Community Development

4.10 ICT Development

4.10.1 Current Situation on ICT

(1) Background

It is commonly observed in industrial development that labour productivity tends to be relatively low in regions with low population density area. In the Project Area, Zhemgang is the lowest population density region in the country. Furthermore, an inflow of population to the western area such as Thimphu, Palo, etc. can expand further the disparity between urban and rural areas, and therefore, there is a concern that low productivity tends to be aggravated in rural areas. In order to keep pace with the latest development trend, it is necessary for the development of the Project Area to promote digital transformation (DX) and implement the ICT innovation as promoted in the whole world.

It is evident that achieving sustainable socio-economic development, based on the significant enhancement of productivity through innovation is essential. This approach can address various economic and social issues. Particularly, due to the influence of COVID-19, there is an urgent need to accelerate the adoption of DX and ICT promotion to mitigate economic and social impacts and realize a robust and resilient socio-economy.

Internet coverage and usage in Bhutan have increased significantly with total coverage of 97.4 per 100 inhabitants¹⁶. As of date, the total number of internet subscribers has reached 729,733¹⁷. Therefore, ICT industry has a high potential to be highly developed even in the Project Area.

The Economic Development Policy 2016 envisions the country to realize the national development objective of “green knowledge economy.” The policy underlines the need for Bhutanese ICT industry to move way from a pre-dominantly vendor-based industry to higher value industries of software development, business process outsourcing, designs, animations, data processing and data centres through development skills.

(2) Key policy and programme

1) E-Government Master Plan 2014

The e-Government Master Plan of 2014 was developed by the RGoB with the recognition of ICT as the principal enabler of a knowledge-based society. It was to be used to complement the socio-economic development plans through ICT in the 11th Five Year Plan. The master plan identified three desired outcomes such as 1) ICT for Good Governance, 2) ICT for a Bhutanese Information Society, and 3) ICT as a key enabler for sustainable economic development.

Goals for each outcome and strategies are also identified in the plan. The master plan was expected to be supplemented by master plans from individual agencies including the Education ICT Master Plan, Health ICT Master Plan, Finance ICT Master Plan, Tourism ICT Master Plan and others.

2) 12th FYP

There are three main priorities in terms of ICT in 12FYP as follows.

- The Government has undertaken numerous ICT infrastructure projects to enable the transformation of government from traditional to e-governance. Due to inadequate coordination between agencies, the benefits of ICT services were not optimised. Therefore, Digital Drukyl programme and its regular programme will strive to capitalise opportunities provided by ICT through collaboration, and by the reuse and sharing of common data;
- Media literacy will be increased from 50 to 75 percent and similarly, digital literacy to 40 percent by the end of the plan period, and

¹⁶ International Journal of Engineering Applied Sciences and Technology, 2021

¹⁷ Gross National Happiness Commission

- The digital divide is another concern and to mitigate this gap, Wi-Fi routers will be installed in strategic locations to provide access to ICT related services, and to allow people to communicate and stay connected. This will also promote online public services and business opportunities through ecommerce and trade.

3) Draft concept note for 13th FYP

In the draft concept note, two main objectives such as “Governance and Ecosystem Reforms” and “Leveraging Digital Technology” are presented.

Former one includes the importance of providing more equal opportunities and access to services such as education, technology, credits, etc. Latter one shows diffusing and adopting digital/4IR technology to tap vast economic opportunities that lie ahead such as through policy measures, conducive regulation, and creation of institutions, infrastructure, logistics and capabilities. Also, it would ensure their availability, affordability and accessibility, and promoting digitalization, digital services and digital industries.

4) Digital Drukyul Flagship Programme

The Digital Drukyul Flagship Programme can be considered a successor to the government to citizen (GtoC) initiative of 2010 to transform all public services into e-services (Digital Drukyul - an ICT Masterplan for Bhutan, The Druk Journal, Spring Edition, 2020). GtoC had a mixed reception and did not achieve the success that was initially hoped. The programme is a major overhaul of GtoC with the addition of many new features. The major projects are listed in the Table 4.10.1.

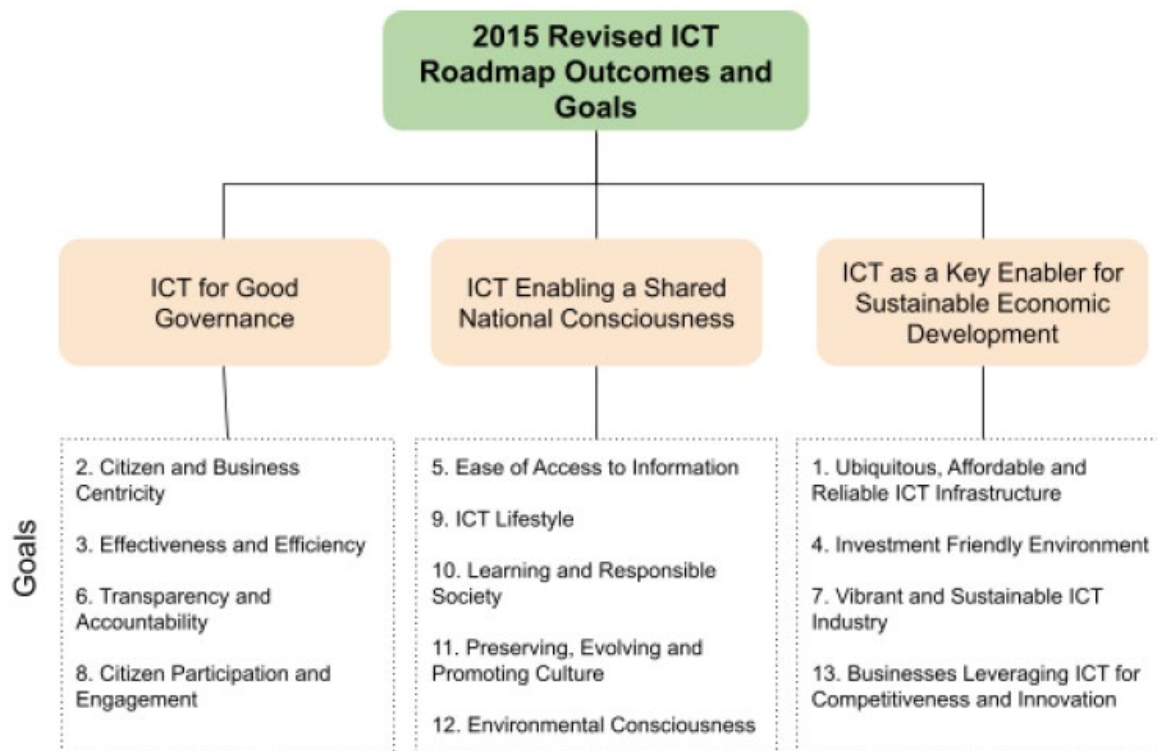
Table 4.10.1 Major Projects of the Digital Drukyul Flagship Programme

No.	Project	Description
1	Digital Identity	A unique digital identity for all legal, long-term residents in the country to authenticate themselves online using digital signatures and biometric technologies.
2	e-Patient Information System (e-PIS)	A digital health record for all citizens in Bhutan. The e-PIS will not only automate the operations of hospitals in the country but will also develop an information system that will securely maintain the historical medical records of all patients.
3	Bhutan Integrated Tax System	Develop an enhanced integrated tax system, integrating all aspects of personal, business, and value-added taxes in the country to improve the quality of data collected on taxes, enabling better risk management and more effective and efficient tax monitoring.
4	Integrated Public Service	Transforming 150 or so online services by integrating them across agencies and providing robust online payment options, so that citizens can get services delivered end-to-end online
5	e-Business	Improving ease of doing business in Bhutan by using ICT to improve starting a business and simplifying the regulatory requirements for the import and export of goods.
6	al Schools	Develop systems so that schools can leverage numerous online educational contents that students can access to be better prepared to productively contribute in the 21st century. The project will also develop an Education Information Management system as a single source for all data relating to students, teachers, and other data covering different aspects of education
7	Enhanced Connectivity	Provide ubiquitous and reliable connectivity throughout the country.

Source: Digital Drukyul - an ICT Masterplan for Bhutan, The Druk Journal, Spring Edition, 2020)

5) Revised Bhutan ICT Roadmap 2015

The 2015 Revised Bhutan ICT Roadmap is a review of the ICT roadmap. It was developed in 2011 by the former MOIC with assistance from the World Bank. It took into account the previous roadmap and identified gaps to make recommendations to drive ICT development in Bhutan. The expected outcomes of the revised roadmap which were carried forward from the previous roadmap are shown in Figure 4.10.1 along with the goals for each outcome. The outcomes are the same as the ones from the e-Government Master Plan 2014 except for ICT for a Bhutanese Information Society which has been changed to ICT Enabling a National Shared Consciousness.



Source: Revised Bhutan ICT Roadmap 2015

Figure 4.10.1 Revised ICT Roadmap Outcomes and Goals

6) E-Gov Policy 2019

The challenges faced during implementation of the 2014 e-Government Master Plan especially, particularly the lack of coordination among agencies, along with other issues highlighted in the Revised ICT Roadmap of 2015, led to the development of the e-Gov Policy in 2019. Its main purpose is to provide clear guidelines for the implementation of e-governance initiatives. The e-Gov policy adopts two guiding principles.

- WoG: Bring together all government agencies to implement e-Governance initiatives in a coordinated, cost-effective and sustainable manner, and
- Citizen Centric: Ensure seamless delivery of online services by placing citizens at the centre of all e-Governance initiatives.

7) GovTech initiatives

GovTech was previously known as the Department of Information Technology and Telecommunications and was under the erstwhile Ministry of Information and Communications (MoIC). Under the recent Civil Service Reform Act of Bhutan 2022, the erstwhile Ministry of Information and Communications was dissolved and GovTech was reconstituted as an autonomous agency to carry out functions related to ICT in Bhutan. GovTech is the main driver of technology adoption, change and capacity building in Bhutan. GovTech have embarked on several projects and have others in the pipeline that are in line with the outcomes stated in the e-Government Master Plan 2014 and that also complement the projects of the Digital Drukgyul Flagship Programme. These projects broadly fall under three overarching themes:

Digital Workforce Creation

A core focus of GovTech is to build a highly skilled digital workforce that emphasises deep tech skills that include artificial intelligence (AI), blockchain, web3, biotechnology, robotics, quantum computing, photonics, and advanced manufacturing. They have started an AI Lab in partnership with Omdena, a global platform that provides access to AI practitioners that can help organisations build AI solutions to real-world problems. There is an Omdena Bhutan Chapter that invites the private sector, new IT graduates and even unemployed youth to learn about AI and run open-source projects to solve challenges faced by the local community.

Technology Ecosystem

GovTech realises that for a digital workforce to thrive, they must be immersed in a supportive technology ecosystem. There is an acknowledge that setting this up is a huge challenge especially due to constraints such as funding and market size which are critical for the success of tech companies. Despite these challenges, they have provided support for local startups especially in Thimphu through funding, mentorship and networking opportunities. However, recently the number of new local startups that have emerged are in decline. There are several reasons why this could be happening including the difficulty to get products adopted by a small market, the migration of skilled tech workers overseas especially to Australia, etc. GovTech is now looking at other ways of stimulating the ecosystem and is studying the feasibility of attracting global startups and digital nomads. Digital nomads would be invited to work from Bhutan but with the condition that they share their expertise with the local tech industry. There is a small community of Bhutanese freelancers in the country but they have their own challenges especially when it comes to receiving funds from abroad and unclear tax implications. GovTech is working on resolving these issues so that the freelance community in Bhutan can grow.

Digital Skilling of Citizens

GovTech has also run several digital literacy programmes so that citizens know how to avail e-government services. Most of these programmes focussed on government services but some were provided in partnership with the Department of Cottage and Small Industry so that participants were equipped with essential skills to take their businesses online. These programmes are mainly conducted outside Thimphu and although more of these programmes would be useful it is cited that resource mobilisation proves a big challenge especially when training providers have to be brought in from outside Bhutan.

(3) The State of the Private ICT Sector

1) Bhutan as whole

In terms of the private ICT sector, although there are two strategies (Promote ICT Adoption in Private Sector, Develop ICT Industry) identified in the Revised Bhutan ICT Roadmap 2015 to achieve desired ICT goals, it is not clear what exactly has been done beyond identifying those strategies. The e-Business project of the Digital Drukgyul program is focussed on easing doing business in Bhutan. Unlike other countries like the United States for example, the government in Bhutan seems to be the main driver of technological change.

According to the Economic Census of Bhutan 2018, the number of establishments involved in ICT is

quite limited and many of them are concentrated in western region, especially Thimphu. These establishments may include hardware supply and repair vendors, so the number of businesses actually dealing with software development and other IT enabled services could be much smaller. It is not surprising that the contribution to the GDP from the sector makes up only a tiny fraction of the total GDP.

As the flagship project of the Bhutan tech industry, its current status closely mirrors the state of the tech industry in general in Bhutan. Although the initial enthusiasm to attract big name tech companies never materialised, a few foreign firms established offices in the Thimphu TechPark (TTP) and have been successfully operating for over a decade. These companies have an almost entirely Bhutanese workforce, totalling several hundred employees, which is quite significant for a small country like Bhutan. In 2014, the TTP became a part of the Druk Holdings and Investment group (DHI), the commercial and investment arm of the Bhutanese government and since 2019, in addition to its previous role, the TTP has evolved into an ICT company.

The TTP has grown to become one of the largest employers in the IT park and also the largest software firm in the country. Conversely, FDI in the tech industry has declined. While the TTP park once had 21 FDI companies in its premises but currently has only five.

Many private firms rely on the government as their primary client. With the government now able to outsource ICT projects to a company within its own holding, there are concern that the available work for these private firms could become scarcer.

2) Project Area

The situation of the private ICT sector in the Project Area is facing much worse situation and businesses in the sector are almost non-existent in the target areas. The case is the same in almost every other Dzongkhag since almost all private ICT firms are based in Thimphu. the reason for this seems to be the business and networking advantage offered by being in close proximity to government offices, corporations and international organisations in Thimphu who are usually the major clients of ICT firms. In the southern areas, which include the Project Area, there are only nine IT establishments. Tsirang, Sarpang, Zhemgang and Gelephu Thromde have just a few vendors selling and repairing hardware. There are no firms providing IT services except for one in Gelephu that provides basic digital literacy training to students and sometimes to government agencies.

4.10.2 General perception toward DX and ICT application in Bhutan

(1) Government intervention

Considering current situation of ICT sector, to implement DX and ICT application successfully, the government need to develop following two core competencies.

- **Awareness:** This competency reflects the government’s ability to detect and monitor changes in its environment including its internal and external factors. The main barrier to the implementation of DX strategy is a lack of awareness of the of digital government and DX in the public sector and society.
- **Informed decision-making:** This competency signifies the government’s ability to make the best decision possible in various situation. As citizens become more connected and informed, their demand for public engagement and consultation grows. This presents a valuable opportunity to strengthen democratic governance, create more inclusive decision-making processes and government operations, and leverage data, information and knowledge from the broader society to provide public value.

It is important to note that these competencies are not technologies themselves but rather technology-enabled capabilities. The developing a digital government strategy with strong ownership and support across society should integrate the views and interests of all relevant stakeholders to create a common vision of how digital technologies can be used to improve societal well-beings, thus enhancing the

government’s ability to make the transition.

In the Project Area, where many communities are physically located in a distant place, Life service delivery system, one of the major strategies of the Project, would be enhanced to reach the communities; Essential services for the surrounding community can be delivered on demand by using ICT, even for the people living in the most distant places as the veins of the hierarchical service delivery system.

(2) Supply chain development

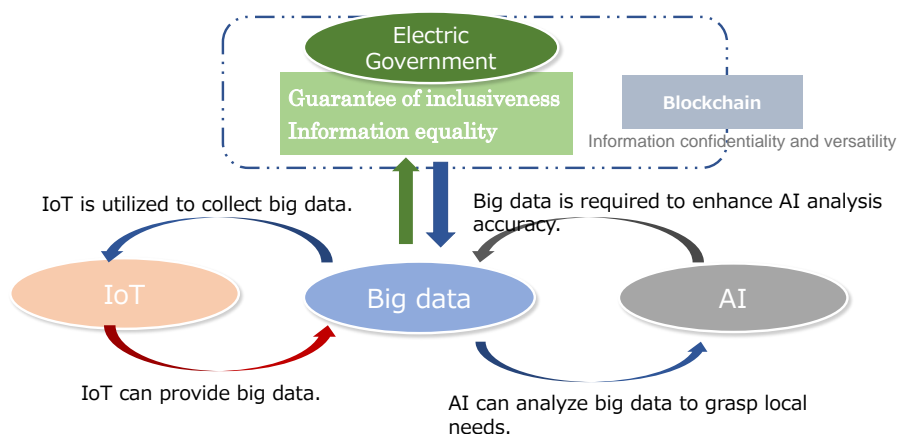
While many interventions may be required to address the prevalent issues such as high poverty rate and low productivity in three Dzongkhags, technology can play the important roleplay. All the Dzongkhags have good internet connectivity including access to the high speed Druk Ren internal network that connects more than 250 agencies around the country. With these existing infrastructural provisions, technology can be effectively utilised for the following purposes:

- Developing a robust supply chain: Technology can be used to establish a resilient supply chain infrastructure that connects farmers with consumers, facilitating the timely deliveries of produce.
- Planning and Management: Applications can be employed for efficient planning, scheduling and planting of crops based on projected market demands and weather forecasts.

The utilisation of technology carries the added value as it increases that attractiveness of occupation related to technology, thereby likely attracting more youth to pursue career involving technology. This development could potentially aid in mitigating the migration problems that the Project Area faces. Thoughtful careful planning and the application of technology in the production process not only save time but also reduce the duration of manual labour tasks in fields like farming. Furthermore, it can contribute to increased youth engagement in agriculture.

4.10.3 Scope of application of digital technology

Figure 4.10.2 shows the interrelationships among the major ICT components. which correctly address a series of issues. To advance the mainstreaming of DX, it is imperative to integrate individual ICT technologies as a kind of aggregation and incorporate them into a realistic framework such as E-government. The achievement in this regard shall be represented not only by e-government, but also data catalogues, digital currencies, quality improvement of social services, utilization of geospatial data, etc. Among the digital technologies promoted by the fourth industrial revolution, including IoT, big data, AI, robots, and sensors, these technologies are expected to play pivotal roles in addressing major issues in the Project Area. Notably, blockchain technology has gained widespread acceptance globally in recent years, leading to various innovations driven by improvements in information confidentiality and versatility.



Source: JICA Project Team

Figure 4.10.2 Relationship Between Major Technologies and Major Issues

Table 4.10.2 summarizes the range of typical digital technologies that are considered to be applicable to the Project Area in socio-economy, urban development, infrastructure and governance. It is highly effective to consider the possibility of application of these technologies to core projects, development policies, and sector-specific development strategies in the SCRP. It would be expected that IT or ICT development enable to enhance the job opportunity for potential IT or ICT experts who are working in another field.

Table 4.10.2 Scope of Representative on DX and ICT Application

Application	IoT	Big data	AI
Socio-economy and industry	<ul style="list-style-type: none"> • Social services unified in the region (Dzongkhags) • Data acquisition in social infrastructure • Visualization of supply chain and ensuring traceability (especially livestock) 	<ul style="list-style-type: none"> • Centralized management of statistical data • Future forecast by data mining and grasping abnormal values • Search for business opportunities in the supply chain • Product tracking (especially livestock) 	<ul style="list-style-type: none"> • Analysis of statistical data for each Dzongkhag • Rationalize socio-economic framework • Macro and micro economic analysis
Urban development and environment	<ul style="list-style-type: none"> • Resilient city • Smart and compact city • Acquisition of environmental data in the field 	<ul style="list-style-type: none"> • Data-driven urban design and environmental conservation • Smart planning (simulation of migratory behaviour in cities and so forth) • Renewable energy prediction, analysis and stable operation 	<ul style="list-style-type: none"> • Analyse urban problems by machine learning • Analyse big data related to climate change and so forth • Interactive city planning decision making
Infrastructure	<ul style="list-style-type: none"> • Infrastructure management and maintenance by digital facility ledger • Immediate response to an emergent disaster • Disaster prevention management in facilities 	<ul style="list-style-type: none"> • Master data management • Infrastructure management and maintenance by digital facility ledger • Monitor the permafrost situation 	<ul style="list-style-type: none"> • Extend the facility life and maximize stock effect based on digital ledger • Rationalize facility management for a longer lifespan
Organization • institution • governance	<ul style="list-style-type: none"> • Cross-sectional data collection • Multiple database • SDGs monitoring 	<ul style="list-style-type: none"> • Strategic risk management • Secondary use of public data • SDGs monitoring 	<ul style="list-style-type: none"> • Data-driven policy making utilizing big data • Rationalize the SDGs indicators for enhancement of governance

Source: JICA Project Team

4.10.4 Strategies on ICT development in the Project Area

(1) E-Government promotion

In terms of e-Government promotion, following strategies are suggested in the Project Area.

3) Improvement of network and repair of equipment

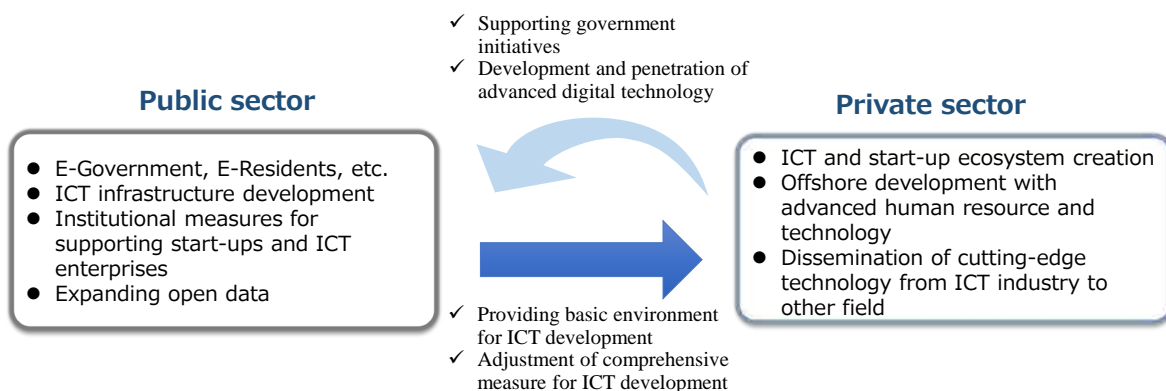
The most common problem raised in the Project Area is network disruption and equipment damage due to inclement weather especially in the summer monsoon season. These issues can result in some areas being disconnected for extended periods, sometime lasting for days or even weeks before a maintenance team can reach them. Additionally, the technical staff in the Project Area possess limited skills in repairing electronic equipment, which further delays the restoration process. For the further development of e-Government in the Project Area, it is imperative to establish a resilient network and ensure the timely procurement of new equipment.

4) Regular training

Services provided by Dzongkhag and Thromde ICT staff cover large areas, and they are often stretched beyond their abilities. Regular training is necessary as the digital world is always evolving rapidly and will help them stay on top of new developments in technology. The local government should encourage self-learning and has given them access to online learning platform.

(2) Mutual cooperation between public sector and private sector

For the purpose of promoting ICT industry, the public sector and the private sector should cooperate in an organized systematic manner on the basis of mutual supporting concept. This concept is based on the understanding that start-ups or enterprises can play an important role for ICT industry prosperity in the Project Area. The Government or public organizations should create the basic environment such as ICT infrastructure or policy framework with institutional measures.



Source: JICA Project Team

Figure 4.10.3 Mutual Cooperation Framework between Public and Private Sectors

Gelephu Thromde, in the vicinity of India which has a large market for information services, has a high potential to become the centre of the ICT ecosystem in the Project Area. It would be important for Gelephu to provide ecosystem operation function and receive the inflow of ICT engineers and ICT technologies catalysed and developed initiatively by the various necessities in the rural area.

(3) IT park development

With increased emphasis on development of IT sector and the priority accorded to the sector for economic development of the country, there is opportunity to develop and operate IT park. Currently, there is only one IT park located in Thimphu. As the fiscal incentives, IT park developers are given a 10 years tax holidays.

In addition to IT park in Thimphu, it is recommended to establish IT park in Gelephu with functions of (1) the business incubator, (2) the shared technology centre and (3) the data centre to utilize the potential of economic development in the Project Area.

(4) Development of IT industry

5) Key concept for promotion of IT industry

The Project Area has significant opportunities for the establishment of a robust IT industry, driven by a larger market size facilitated by the RCSP Area and India. Technology can play a crucial role in the poverty alleviation and finding important use cases in agriculture in places like Zhemgang. With proper support from the government and the introduction of other enabling factors, the growth of the IT industry in the Project Area can only be propelled forward, contributing to the overall development goals.

For the development of IT industry, careful consideration should be given to the selection of appropriate digital technologies as following perspective.

- Development of specific technologies strongly linked to social issues;
- Market-oriented strategies including niche market for promotion of offshore development, and
- Supportive measures for entrepreneur, which has a potential for building groundbreaking technologies such as medical/health data construction or drone logistics, with high competitiveness.

6) Job opportunity

Digital Jobs in Bhutan: Future Skilling in Bhutan 2021 produced by the UNDP in Bhutan identifies potential areas that can help with the creation of digital jobs and therefore the growth of the ICT industry. Figure 4.10.4 is adapted from that report.

		Short-Term Readiness and Capacity	
		Low	High
Long-term Fit and Potential	High	Home-grown Software Development	Small & Medium-sized Global Outsourcing
	Low	Global and Regional Big Tech	Remote Work Low-skill BPO opportunities

Source: Digital Jobs in Bhutan: Future Skilling in Bhutan 2021

Figure 4.10.4 Potential Areas for Creating Digital Jobs

The four ideas are prioritised according to how quickly Bhutan would be able to take advantage of the opportunity (Short-Term Readiness and Capacity) and whether it has the potential to create a sustainable ICT industry (Long-term Fit and Potential). A brief description of each potential area is provided as follows:

- (a) Home-grown Software Development: As the name implies, this is the creation of indigenous companies that can cater both to local, regional and global markets. It has very good long-term implications for setting up a sustainable ICT industry.
- (b) Small & Medium-sized Global Outsourcing Companies: Vendors support complex processes, applications, or full business functional areas that require more specialised expertise.
- (c) Global and Regional Big Tech: This refers to jobs in big tech companies that Bhutanese would be able to employed directly by. However, this is very competitive and also Bhutan does not offer the economies of scale nor the talent pool for them to set up an office in the country.
- (d) Remote Work & Low-Skill BPO: Remote work offers flexibility but can be less stable.

For the Project Area, (a), (b) and (d) are probably present the most realistic opportunities. For the quickest economic benefit, setting up low-skill BPO businesses is the way to go forward.

Home-grown Software Development

This would represent the pinnacle of an established ICT industry. Companies have more freedom to be creative and launch products and services that address previously neglected problems. This would be the most practical way that the ICT industry in the Project Area can be developed and grown into a flourishing industry. The growth of the industry can be divided into three steps as follows.

- 1) Local: Develop software to solve immediate needs in the Project Area;
- 2) Regional: Use the skills and experience acquired in 1) to solve needs in the region, and
- 3) Global: Using the experience gained from 2), turn to the global market.

Small and Medium-sized Global Outsourcing

Small and Medium-sized Global outsourcing is a step up for low-skill BPO. They could also be thought of as Managed Services which is defined as a move beyond traditional outsourcing, combining cost reduction and discrete value-add, where vendors support complex processes, applications, or full business functional areas requiring specialised expertise (Deloitte Global Outsourcing Survey 2022).

The Project Area, especially Gelephu, could be the hub for such centres. FDI companies could easily relocate to Gelephu since their clients are all overseas and there is no specific reason to be based in Thimphu. All that is really needed is good connectivity.

The prospect of setting up Small and Medium-sized outsourcing businesses is more challenging than the low-skill BPO model. However, it can be done and a long-term vision needs to be adopted. A basic roadmap would be as follows.

- 1) Indicate which business/IT functional areas to target;
- 2) Identify the skills needed for those areas;
- 3) Acquire or create the talent pool with those skills;
- 4) Set up business with proper management and leadership, and
- 5) Identify which businesses to approach and why.

Low-skill BPO opportunity

Low-skill BPO are simple, discrete and narrowly defined business processes. It includes jobs like data entry, customer service, network management, etc. Setting up these sorts of businesses is quick as anyone with good communications skills and basic computer literacy can handle these tasks, therefore, finding people is not an issue. Scan Cafe, a FDI company whose business is photo editing, is one such example of this. Although India has the biggest outsourcing business in the world, it houses many international tech firms and has become a major global IT player itself with companies.

Compared to Western Bhutan and especially Thimphu where most IT firms are, Sarpang and Gelephu can offer a big advantage for setting up nearshore development outsourcing centres. Given its close proximity to India, setting up nearshore centres by Indian or India-based foreign firms in Gelephu would have several benefits:

- 1) Cost saving in terms of travel: Gelephu can be accessed by road from India and already has a domestic airport which in the near future is to be converted to an international airport;
- 2) Cultural compatibility: Most Bhutanese who live along the border speak Hindi and are aware of Indian customs and traditions, and
- 3) Language: Most Bhutanese converse well in English and also in Hindi.

(5) Setting up a startup ecosystem in the Project Area

1) Background

Establishing an ICT industry comes down to the creation of sustainable ICT businesses. Businesses must be supported by a robust ecosystem that can help them find long term success. The ICT industry in the

Project Area is practically non-existent but this offers a great opportunity for the creation of a startup ecosystem that builds on lessons learnt from around the world. A startup ecosystem is an environment consisting of people, investors and various organisations that collaborate to create an environment for startups to thrive.

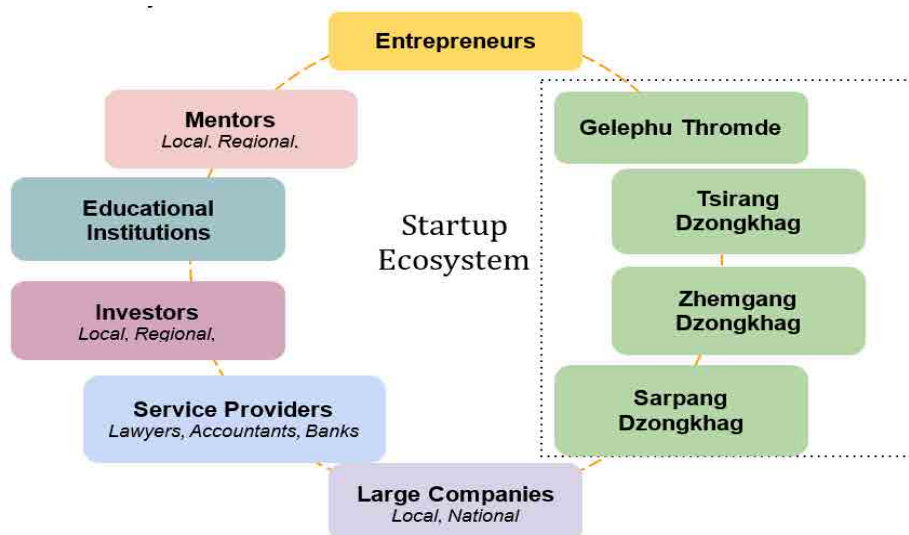
2) Gelephu startup ecosystem

Gelephu offers several advantages over others for setting up a startup ecosystem. It is the biggest urban centre in the Project Area with some already established medium-sized businesses. It has good connectivity both by air and road to other regions and India. By working collectively, it can be centralised their resources to Gelephu so that everyone benefits from the ecosystem.

Startup ecosystems can be physical or virtual but given that the Project Area has some limitations, it is the best to adopt a hybrid-model, therefore, some missing resources can have a virtual presence. Since virtual resources are not distance bounds, they can be advantageous when it comes to choosing the best resources as partners. As long as virtual resources are managed effectively, their mode should not inhibit the ecosystem.

3) Structure of ecosystem

There are several key actors that are needed for a functional startup ecosystem as shown in Figure 4.10.5. Their roles are briefly described below.



Source: JICA Project Team

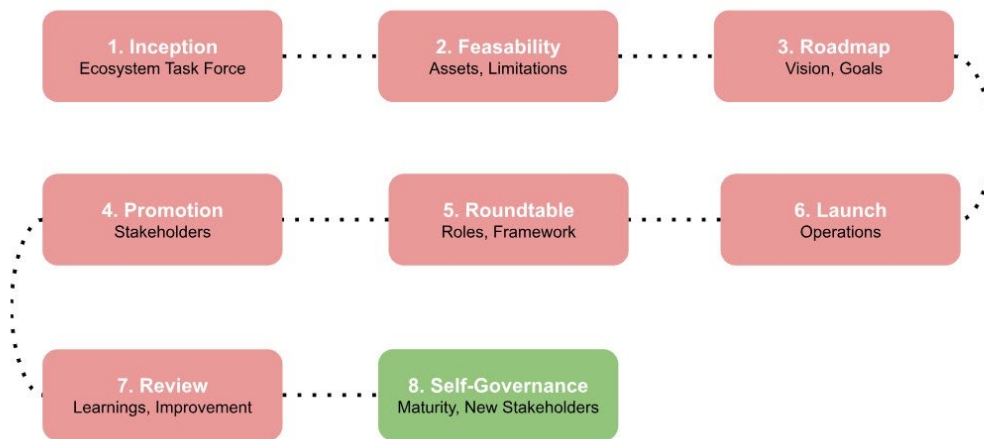
Figure 4.10.5 Structure of Ecosystem

- **Entrepreneurs:** They are the ones that discover business opportunities and find ways to turn them into reality;
- **Mentors:** They are experienced business leaders, experts that can guide entrepreneurs to setting up successful businesses;
- **Educational Institutions:** Universities and other educational institutions can provide talent, research and innovations that startups need;
- **Investors:** Angel investors, businessmen and financial institutions /looking for opportunities can provide the capital needed by startups;
- **Service Providers:** Organisations that can provide services like legal, accounting, etc. necessary for setting up and taking startups forward;

- Large Companies: Companies can form partnerships with startups, give resources or even be investors, and
- Governments: Governments at all levels can help create conducive environments through incentives, regulation and policies.

Entrepreneurs must lead the creation of the startup ecosystem. As this concept is fairly new in the Project Area, initially the government both at the local and national level must educate people and promote the idea and run programs to identify and gather a pool of entrepreneurs that can form the first cohort of entrepreneurs in the RCSP Area whose primary responsibility will be the creation and growing of the Gelephu startup ecosystem.

In its ultimate state a startup ecosystem should be self-governing, which is that once an ecosystem is fully up and running, there is no need for anyone to oversee it. The systems and processes of the ecosystem are in place such that new entrepreneurs, businesses and other parties may freely join and be part of the ecosystem. However, in its nascent stage the ecosystem will need to be carefully supported and hot-housed until it reaches a point where it can function on its own. Figure 4.10.6 is a basic eight step strategy that could be followed to create up the Gelephu Startup Ecosystem.



Source: JICA Project Team

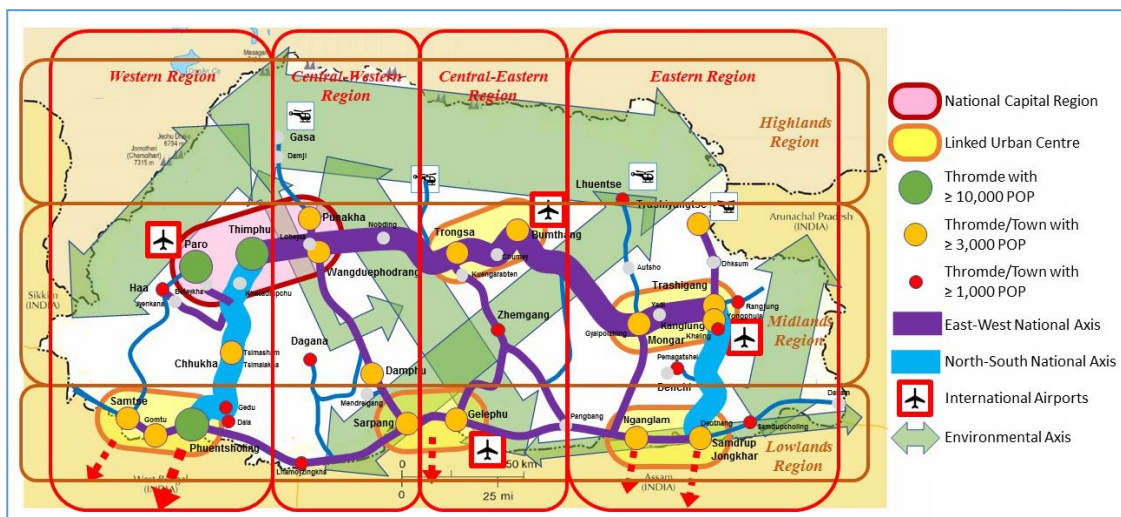
Figure 4.10.6 Eight Step Strategy for Setting up the Gelephu Ecosystem

CHAPTER 5 REGIONAL CENTRE STRUCTURE PLAN

5.1 Introduction

5.1.1 Background

The CNDP2030 was formulated in 2019 with the aim of promoting regionally balanced development. Its strategies were incorporated in the 12th FYP (2018-2023) for implementation. As shown in Figure 5.1.1, the CNDP2030 proposed to bring about regionally balanced development through the national spatial structure that viewed Bhutan through four vertical regions and three lateral divisions taking into account the climatic condition and East-West and North-South national axes. In it, there is one National Capital Region namely Paro-Thimphu-Punakha/Wangdue and five Linked Urban Centres viz Sarpang-Gelephu, Samtse-Phuentsholing, Nganglam-S/Jongkhar, Trashigang-Mongar, and Trongsa-Bumthang.



Source: CNDP 2030

Figure 5.1.1 National Spatial Structure for Balanced Development

One of the ways forward recommended in the CNDP 2030 was the Formulation of Regional Plan for Sarpang-Gelephu Linked Urban Centre. Taking the recommendation forward, the Project for the Formulation of Southern Central Regional Plan was initiated on October 24, 2021 with the objective of coming up with the following outputs:

- Output 1: Regional Plan
- Output 2: Sarpang-Gelephu Regional Centre Structure Plan
- Output 3: General Standards and Guidelines

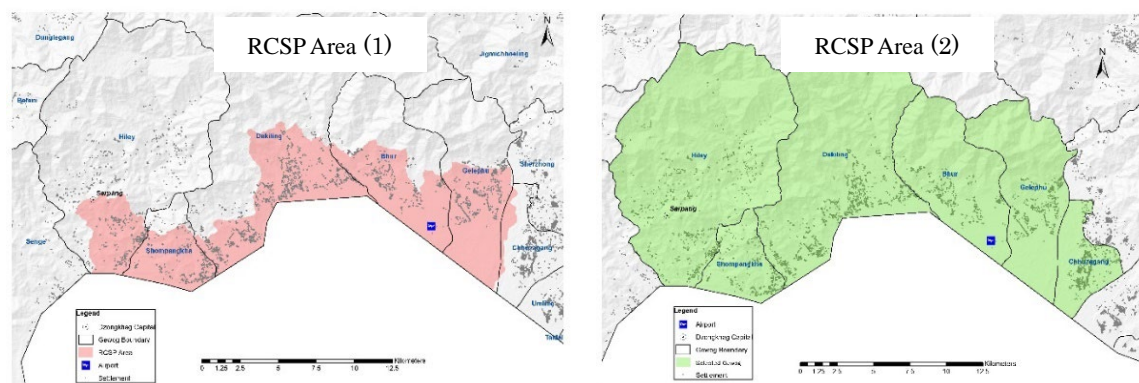
5.1.2 Overview

The RCSP encompasses Sarpang Town, Gelephu Thromde and the areas in between. There were two options suggested for its planning boundary:

- The RCSP Area (1) measures 120 Sq. Km with its limits bounded by: base of the ridges on the north; Mao river on the east; edges of Sarpang town on the west; and the international boundary on the south;
- The RCSP Area (2) measured 400 Sq. Km with its boundary aligned with the gewog boundary.

As per the instruction of the 1st JCC held on May 6, 2022, further consultations and field visits were carried out, and the boundary rationalisation was carried out to ensure that the planning area is not too large posing regulatory difficulties during implementation and the boundary not necessarily following the administrative boundary of chiwogs, but rather based on the spatial homogeneity and functional linkages.

The decision on the RCSP Area (1) was presented to the 2nd JCC held on December 13, 2022 and it was endorsed as recommended. Figure 5.1.2 shows the options of the RCSP Area (1) and (2).



Source: JICA Project Team

Figure 5.1.2 RCSP Area (1) and RCSP Area (2)

5.1.3 Chronology

The formulation of the SCRCP was planned to be carried out through series of site visits and consultations with the stakeholders. The following are the details of activities carried out until 2nd JCC held on December 13, 2022. The RCSP has been part of all the activities:

- October 25, 2021: Kick off meeting for the Formulation of SCRCP was held. The formulation of the RCSP was highlighted as Output 2.
- December 28, 2021: Discussion among the TWG members
- December 31, 2021: Bilateral meeting between Gelephu Thromde and Sarpang Dzongkhag.
- January 20, 2022: 1st PCT meeting was held virtually.
- January 31, 2022: Brainstorming session was held to discuss and recommend the boundary delineation for the RCSP.
- May 06, 2022: 1st JCC Meeting was held. The JCC instructed that detailed study to be done through consultation and site visit to decide between the RCSP Area (1) and the RCSP Area (2)
- May 08-19, 2022: Site visit by 1st Group JPT
- May 22- June 02, 2022: Site visit by 2nd Group JPT
- June 19- 26, 2022: Site visit by 3rd Group JPT
- August 12-19, 2022: Site visit by 4th Group JPT
- September 28-October 15, 2022: Site visit by 5th Group JPT
- October 18-22, 2022: Site visit by 6th Group JPT
- December 8-13, 2022: Site visit by 7th Group JPT
- In all the site visits by the JPT, the Sarpang-Gelephu RCSP Area was part their agenda for discussion with stakeholders and site verification.
- December 13, 2022: The 2nd JCC Meeting was held and the recommendation for the RCSP Area 1 was endorsed.

5.1.4 Site context

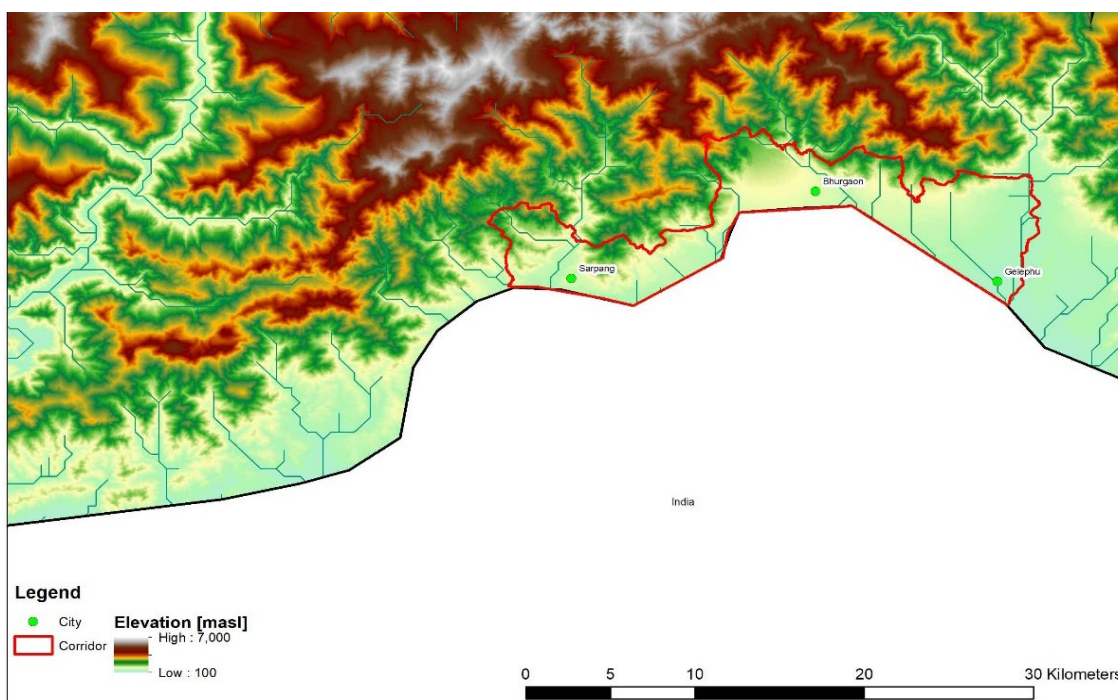
The RCSP Area is bound on the east by Gelephu Thromde, west by Sarpang Town, and north and south by the gewogs of Sarpang Dzongkhag namely Gakiling, Shompangkha, Dekiling, Samtenling, Gelephu and Chhuzagang, referring to Figure 5.1.3 for the gewogs. Beyond the gewogs towards the south is India. Midway between Sarpang Town and Gelephu Thromde is Jigmeling Industrial Park. Sarpang and Gelephu is connected by NH5, 33 km long and it is the main axis of the RCSP Area.



Source: Sarpang Dzongkhag

Figure 5.1.3 Gewogs in Sarpang Dzongkhag

The landform of the RCSP Area is comprised of mountains, valleys, rivers and flood plains. The elevation of the land ranges from 100 to 1500 masl. Over a stretch of 60 km there are at least 12 rivers: 1 river every 5 km. In terms of land suitability for human activities, the area between Samtenling and Gelephu is most suitable: flood plains with flat topography and fertile soil.



Source: JICA Project Team

Figure 5.1.4 Elevation of the RCSP Area

Given the landform and high level of precipitation in the region, the RCSP Area suffers high risk natural disasters such as flash flood, landslide and human-wildlife conflict. It also suffers from the risk of endemic diseases.

Table 5.1.1 Hazard Ranking by Gewogs in the RCSP Area

Gewog	Earthquake	Windstorm	Forest fire	Pest & Diseases	Flash flood	Landslide	Thunder/ Lightening	Human wildlife conflict
Gakiling	7	6	4	4	9	10	5	8
Shompangkha	6	4	7	2	10	9	5	8
Dekiling	6	5	3	2	9	9	7	7
Samtenling	7	7	4	5	10	8	5	7
Gelephu	7	6	6	6	10	9	8	9
Chhuzagang	8	6	4	7	10	1	2	9

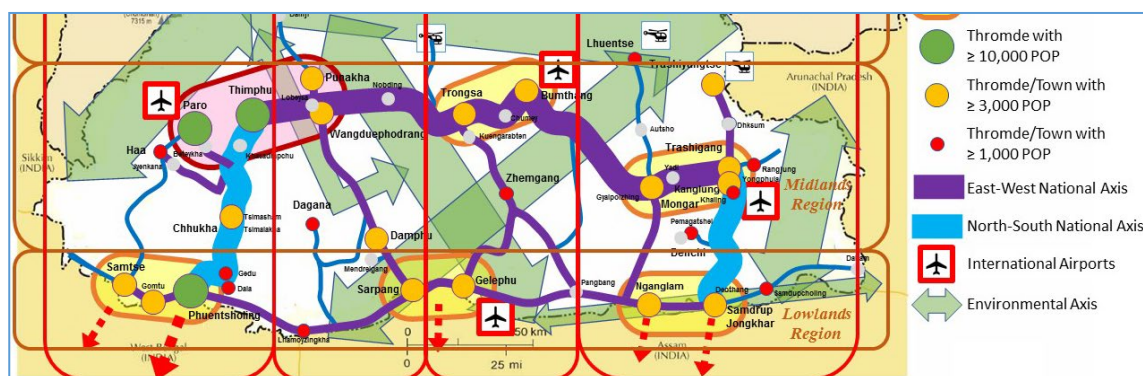
Score above 8 (Score varies from 1 (lowest) to 10 (Highest))

Source: Draft Dzongkhag Disaster Management and Contingency Plan by Sarpang Dzongkha Administration (2017)

5.1.5 Regional connectivity

The RCSP Area falls within the Central Region of the National Spatial Structure. As shown in Figure 5.1.5, Sarpang and Gelephu together form the Sarpang-Gelephu Linked Urban Centre and it is one of the five Linked Urban Centres identified in the CNDP2030. It connects directly to the three Linked Urban Centres in other regions namely Phuentsholing-Samtse, Nganglam-Samdrup Jongkhar and Trongsa-Bumthang. It also connects to the National Capital Region.

Besides it has Air connectivity to the Western Region, the Eastern Region, and the Trongsa-Bumthang Linked Urban Centre. With the direct road and air connectivity with many other regions, the Sarpang-Gelephu RCSP becomes the most connected LUC regionally. With the upgradation of the Gelephu Airport to international Airport, it will have international connectivity as well.



Source: CNDP2030

Figure 5.1.5 RCSP and Regional Connectivity

5.1.6 Methodology

In the process of drafting the contents of the RCSP, the following methods of reviews and analysis have been followed:

(1) Reviews

- (a) Review of the expected development direction of Sarpang-Gelephu Regional Centre by higher-level and related plans proposed by the CNDP2030.

- (b) Review of development concept for Sarpang-Gelephu Regional Centre proposed by the CNDP2030
- (c) Note expectations of Southern Central Regional Spatial Plan for Sarpang-Gelephu Regional Centre Structure Plan
- (d) Review of future envisioned for Gelephu Thromde and Sarpang Town in their respective structure plans

(2) Analysis

The SWOT (strengths, weaknesses, opportunities, and threats) analysis was conducted for the RCSP Area to provide a basis for developing vision, objectives, strategies etc for the planning area. The analysis identified the SWOT factors of the whole the RCSP Area, Gelephu Thromde, Sarpang Town, and the intermediate belt area between the two urban centre (see Table 5.2.1 in Section 5.2.1).

Discussion was carried out among the JPT members and Bhutanese counterparts (PCT, TWG2, and the members of thematic sub-groups) in-person and through online meetings for a number of times to discuss planning issues including the definition of geographical planning area, identification of specific planning issues, setting of future vision and development strategies, and examination of the content of thematic proposals.

5.1.7 Legal background

In the absence of a specific law for spatial planning, the Local Government Act (Amendment) of Bhutan 2014 will continue to be the legal basis for preparation of structure and local area plans. However, the Act covers only areas within the Thromdes. The Spatial Planning Bill (SPB) provides a nationwide hierarchical spatial planning system as follows: 1) National Spatial Plan, 2) Regional Spatial Plans; and 3) Local Spatial Plans which comprise of Valley Development Plans, Structure Plans, Local Area Plans (LAPs) and Action Area Plans. But the SPB is yet to be enacted although the concept note was approved by the Cabinet in 2017. In the meantime, the SPS and the National Human Settlement Policy (NHSP) 2019 approved by the erstwhile MoWHS and the Cabinet respectively which provides the hierarchy of planning system will be referred for considering the content of the RCSP for the Project.

NHSP 2019

Policy Statement 6.2.1.1: A 3-tier planning system comprising of the following, where a lower level plan gives due consideration to higher level plans, shall be constituted: a. National level plan. b. Regional level plan, covering two or more Dzongkhags. c. Local level plans, which could be either one or a combination of valley development plan, a structure plan, LAPs, etc

Source: NHSP 2019

Figure 5.1.6 Policy Statement of the NHSP 2019

Development of the RCSP in Bhutan is first of its kind. It is therefore imperative that the Spatial Planning Framework is referred for the process of formulation.

Preparation of the RCSP will require bringing together different aspect of environment and socio-economic concerns. Therefore, in addition to the SPF, the following legislations, strategies and standards should be referred for legal or policy support:

- 1) Environment Assessment Act (EAA) 2000, Regulation for Environmental Clearance of Projects 2016, and the Regulation on Strategic Environmental Assessment (SEA) 2002.

This legislation requires the government to ensure that potential impacts are assessed, and environmental concerns are fully considered when formulating, renewing, modifying, and implementing any policy, plan, or programme. In addition, the Regulation establishes procedures and defines responsibilities for the implementation of the EAA 2000 concerning the environmental assessment process.

2) Forest and Nature Conservation Act (FNCA) 1995 and Regulation 2017

It requires providing for protection and sustainable use of forests, wildlife and related natural resources of Bhutan for the benefit of present and future generation.

3) National Environment Protection Act (NEPA) 2007

It as an umbrella Act on environmental conservation and it provides environmental principles and legal framework for an effective system to conserve and protect the environment.

4) Waste Prevention and Management Act 2009 and its Regulation 2012 (and Amendment 2016)

It provides for promoting environmentally sound waste management practices.

5) Water Act 2011 and its Regulation 2014

This legislation applies to all issues related to water resources management and water use with the objective to ensure water is protected, conserved and/or sustainably managed through protection of water catchments and watersheds, development of National Integrated Water Resources Management Plans (for the conservation, development and management of water resources and river basins), ensure Minimum Environmental Flow requirement of rivers, prohibition to abstract or use water without Environmental Clearance (except for exemptions) and ensuring prevention and control of water pollution.

6) The Middle Path: National Environment Strategy 2020:

It emphasizes the need to conduct the SEA and Cumulative Impact Assessment for development activities. Amongst others, it essentially reinforces the SPS, 2017 and recognises the importance of ensuring that spatial human settlement plans are within the carrying capacity of the planning area.

7) National Integrated Solid Waste Management Strategy 2014 and National Waste Management Strategy 2019

While the former sets short-, medium- and long-term targets for “3 Rs” and improvement of disposal sites for municipal solid waste management, the latter provides strategic direction and tool to deal with all waste streams with targets at different timescales based on the principles of circular economy, and measures to address barriers to coordination and implementation.

8) Environmental Standards 2020

All developmental activities are required to comply with the Environmental Standards 2020 that sets out standards/criteria/parameters/limits for ambient environmental (air, water, and noise) quality standards and point source emissions.

9) Climate Change commitment (mitigation: low emission development strategies and adaptation)

Bhutan has declared to remain carbon neutral at the 15th Conference of Parties to the United Nations Framework Convention on Climate Change (UNFCCC) in 2009 in Copenhagen, Denmark and has further reiterated its commitment in the Climate Change Policy 2020 through National Determined Contribution (NDC) 2015 and 2021. The NDC elaborates priority mitigation actions in the form of low emission development strategies – human settlement, industries, food security, Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (REDD) plus and surface transport, and adaptation components.

5.1.8 Requirement of RCSP through policies of the higher-level spatial/development strategy

(1) Hierarchy of 3 Tier System

The Policy Statement 6.2.1.1 of the NHSP 2019 as shown in Figure 5.1.6 states that there shall be a 3-tier planning system where a lower-level plan gives due consideration to higher level plans. Considering that the CNDP2030 is the National Spatial Plan, the SCRCP corresponds to a Regional

Spatial Plan. It is being formulated drawing strategies and proposals from the CNDP2030. The RCSP is a Local Spatial Plan and it should give due consideration to the SCRCP to ensure its connectivity with plans at higher tiers. Table 5.1.2 shows the relationship between the existing plans and 3 tier system.

Table 5.1.2 3 Tiers of Plans against Existing Plan and Plans Under Formulation

Tier of Plans	Type of Plan	Planning Area	Existing or Under formulation
National Spatial Plan	Strategic	The whole country	CNDP 2030
Regional Spatial Plan	Strategic	An Area comprising one or more Dzongkhag	SCRCP
Local Spatial Plan • Valley Development Plan • Structure Plan • Local Area Plan	Regulatory	A valley Urban or Rural Area A part or whole of Valley Development Plan or Structure Plan	Sarpang-Gelephu RCSP

Note: SPS states that, unlike NHSP, the planning area for a Regional Spatial Plan (RSP) can be one Dzongkhag'.

Source: SPS & JICA Project Team

(2) Time Horizon

Table 5.1.3 shows the time horizon for the spatial plans of different levels. According to the Table 5.1.3, the RCSP falls under the Local Spatial Plan and it has a planning period of 20 years with mid-term review period of 10 years.

Table 5.1.3 Recommended Time Horizon and Review Period for Spatial Plans

Types of Plans	Time Horizon	Review Period
National Spatial Plan	20 years	10 years
Regional Spatial Plan	20 years	10 years
Local Spatial Plans		
Valley Development Plan	20 years	10 years
Structure Plan	20 years	10 years
Local Area Plan	10 years	5 years

Source: SPS

(3) Documentation requirement of Sarpang-Gelephu RCSP

The RCSP falls under the tier of Local Spatial Plan. The SPS details out the documentation required as shown in the Table 5.1.4.

Table 5.1.4 Documentation Requirements for Spatial Plans

Types of Plans	Minimum Requirements for Documents	Target Scale
Valley Development Plan Structure Plan	(a) a report; (b) a map of land use and zones; (c) a map of infrastructure networks; (d) a map of public amenities and public spaces; (e) a map of reserved areas and rights-of-way; (f) Development control regulations; (g) Priority Investment Programme;	1:5,000

	(h) Strategic Environmental Assessment report if deemed necessary.	
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Source: SPS

Based on the discussion between the DHS and JPT members held in Thimphu on June 30, 2022, the following conclusion were agreed:

- (a) Planning accuracy/granularity of the RCSP can be similar to that of a Valley Development Plan; and
- (b) The content of the RCSP will be compared with the existing plan documents and the ongoing review and revision of Thimphu Structure Plan and Paro Valley Development Plan.

5.2 Future Vision for the Planning Area

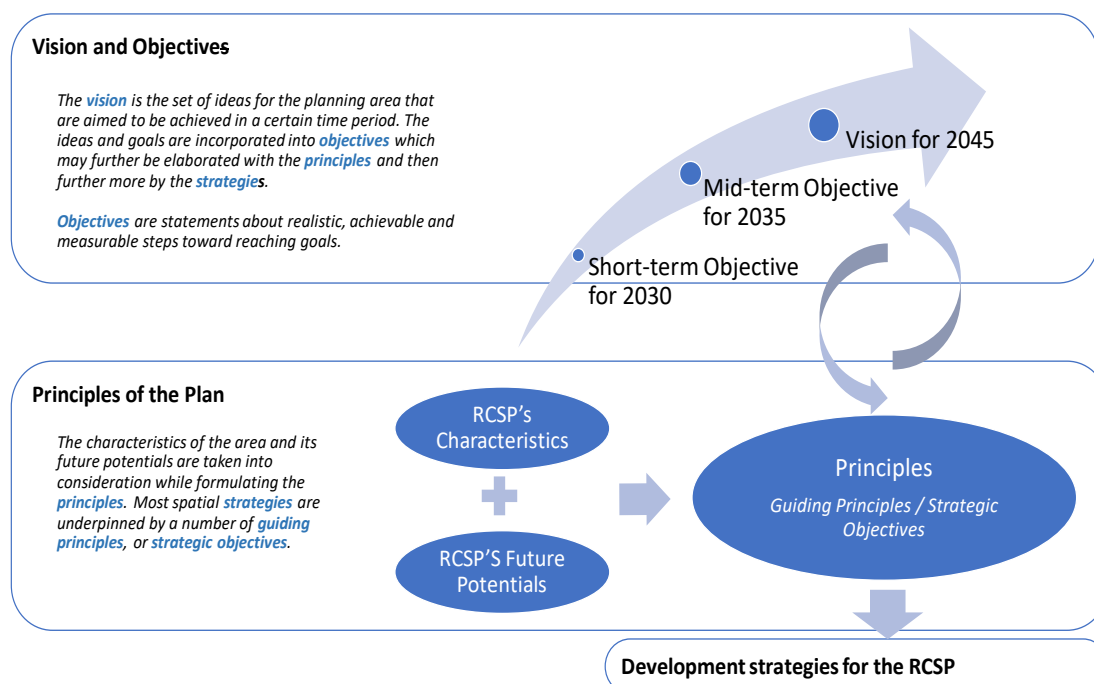
5.2.1 Vision and objectives

(1) Definition of terms: vision, objectives, principles and strategies

Figure 5.2.1 shows the definitions of ‘vision’, ‘objectives’, and associated ‘principles’ and ‘strategies’ as stated in the Spatial Planning Framework (2021, DHS).

According to the definitions, vision is “the set of ideas for the planning area that are aimed to be achieved in a certain time period”, while objectives are “statements about realistic, achievable and measurable steps toward reaching goals” which are set out in the vision. And principles are the set of elaboration of objectives, which are formulated taking into consideration the "characteristics of the area and its future potentials", followed by the strategies which are the set of further elaborations.

Figure 5.2.1 also shows a diagrammatic representation of the relationship between vision, objects, principles and strategies described above. As shown in this representation, the vision represents what the RCSP Area should look like in its final target year 2045, while the objectives represent the intermediate achievements up to 2030 and 2035, the respective short-term and mid-term target years of the RCSP.



Source: JICA Project Team

Figure 5.2.1 Relationship between Vision, Objectives, Principles and Strategies

(2) Characteristics of the planning area and its future potentials

In the PrR of the Project (May 2022), tentative result of SWOT analysis, as a preparatory work for considering development directions of the RCSP Area, was presented in Section 6.6.2, Chapter 6. After the submission of the PrR, the tentative result was reviewed in accordance with the further progress of situational analysis of the planning area. The table below shows the final SWOT analysis result after the review, and, as indicated earlier, the "characteristics of the area and its future potentials" found therein can be used to develop vision, objectives and principles.

Table 5.2.1 SWOT of the RCSP Area (Final)

Area	Strengths	Weaknesses
Whole RCSP Area	<ul style="list-style-type: none"> • Good road connectivity to agriculture areas and fish farms (CNDP*) • Mostly straight and flat highway (CNDP) • Flat terrain and topographical advantage (PSSGC**) 	<ul style="list-style-type: none"> • Shortage of drinking water supply during winter (PSSGC) • Solid waste management issues (PSSGC) • Lack of storage and marketing facilities (PSSGC) • Multiple flooding areas during monsoon (PSSGC) • Small accumulation of medium and large-scale industries (CNDP: JPT***) • Lack of tertiary education institute (CNDP: JPT) • Human wildlife conflict (PSSGC)
Gelephu Thromde	<ul style="list-style-type: none"> • Domestic Airport (CNDP: PSSGC) • Processing/manufacturing and service industries (CNDP) • Function as a wholesale trade centre (CNDP) • Regional referral hospital (CNDP) • Direct road access to India (CNDP) • The presence of Structure Plan (PSSGC) • Geographical location with international boundary and proximity/connectivity to Indian market (PSSGC: JPT) 	<ul style="list-style-type: none"> • Hot summer
Sarpang Town	<ul style="list-style-type: none"> • The presence of Structure Plan (PSSGC) • Dzongkhag Headquarter (JPT) 	
Intermediate belt area	<ul style="list-style-type: none"> • Technical Training Institute, Dekiling (CNDP) • Availability of vast land (PSSGC) • The proposed industrial estate at Jigmeling (PSSGC) • Rich in agricultural production of rice, mandarin, areca nuts, cardamom, tropical fruits and vegetable (PSSGC) • Rich forested area (PSSGC) 	<ul style="list-style-type: none"> • Low cost-effectiveness of investments to road in low populated areas (JPT)
Area	Opportunities	Threats
Whole RCSP Area	<ul style="list-style-type: none"> • Proposal of southern east-west national highway (PSSGC) • Tourism oriented development (PSSGC) • A rapid mass transit system between Sarpang and Gelephu (PSSGC) • Development of water parks and sports (PSSGC) • Development of a pilgrimage circuit (PSSGC) • Integration of the corridor with Sarpang, Jigmeling and Gelephu (PSSGC) 	<ul style="list-style-type: none"> • Land competition between agriculture and non-agricultural sectors (CNDP) • Flood hazards (Inherent quality of soil) (PSSGC) • Landslide (JPT) • Increased sediment load resulted from land use change in the foothills, hence modifying the river equilibrium (JPT) • Cheap products and services from across the border and border related security issues. (PSSGC)

	<ul style="list-style-type: none"> • Integrate management of water and disaster related to flood (PSSGC) • Enhance connectivity through provision of alternative routes for vehicular and nonmotorized transportation (PSSGC) • Availability of cheap labour from India • Availability of raw materials 	<ul style="list-style-type: none"> • Dependence on the Indian work force (JPT) • Unexpected regional lockdowns due to unforeseen circumstances such as the COVID-19 pandemic (JPT) • Population outflows triggered by the absence of higher education (College) (JPT) • Spread of various diseases such as vector borne diseases (to humans) and other infectious diseases to animals during the rainy season coinciding with the summer season (prolonged and more frequent exposure) (JPT) • Potential cascading effects related to climate change induced temperature changes (from temperate hot summer to Tropical monsoon) (JPT) • Security issues (PSSGC)
Gelephu Thromde	<ul style="list-style-type: none"> • Grade-up of Gelephu Airport as an international airport (CNDP) • Development of airport-related infrastructure (e.g., dry port; the accumulation of airport-related industries) (CNDP) • Further development of processing/manufacturing and service industries that generates sustainable employment (CNDP: JPT) • Promotion of tourism and wellness industry (as the gateway to Manas national park and hot springs) (CNDP) • Further development of the regional referral hospital for neighbouring Dzongkhags (JPT) • International touristic/commercial/industrial gateway • 3rd internet gateway/hub • Sports centre / golf course 	<ul style="list-style-type: none"> • Unstable water supply (CNDP) • Flash flood risk (CNDP)
Sarpang Town	<ul style="list-style-type: none"> • Development of agriculture-related wholesale trade function (CNDP) • Establishment of a new college including agricultural studies (CNDP) • Establishment of a vocational institution (CNDP) • Development of tourism gateway function to a wildlife sanctuary (CNDP) 	<ul style="list-style-type: none"> • Flood risk (JPT)
Intermediary belt area	<ul style="list-style-type: none"> • Roadside Station with sub-regional/district-level service delivery functions, including educational and medical services (CNDP) 	<ul style="list-style-type: none"> • Unplanned development along the periphery (PSSGC) • Environmental degradation (PSSGC) • Risk of pollution due to industries (PSSGC) • Deterioration of cultural landscape (JPT)

Note: *CNDP: factors identified by the CNDP2030 Project

**PSSGC: factors identified by Preliminary Study on Sarpang-Gelephu Corridor, conducted by DHS

***JPT: JICA Project Team for The Project for Formulation of Southern Central Regional Plan

Source: JICA Project Team

(3) Vision for the year 2045

The results of the final SWOT analysis confirm that the future vision of the RCSP Area proposed in the PrR remains valid. Based on the proposal, the future vision of the RCSP Area as a whole and its constituent areas (Gelephu Thromde, Sarpang Town and the Intermediate belt area) can be expressed as below. These visions for both the whole RCSP Area and its constituent areas can be seen in consonant with the CNDP-proposed direction for Sarpang Dzongkhag to enhance the Dzongkhag's local GNH characteristics – i.e., to pursue “Ecological management” to develop an economic centre with green environment in Central Region’.

1) Whole RCSP Area:

Regional Spatial Plan for the Southern Central Region (SCR) expects the RCSP Area to function as the socio-economic centre of the SCR by contributing to creating jobs, improving livelihoods, developing local industries and branding for local products and services, while pursuing to attain, in parallel, inclusive development.

To meet the expectation, the whole RCSP Area, already being well served by land- and air-transport and having vast plains with full development potential, aims to become a **‘Multi-Core Growth Corridor harmonising richness & comfort and guiding Bhutan towards a middle-income country’** that will strongly drive the development of the SCR through further improvement of transportation modes (Southern East-West National Highway, rapid public transport system between Sarpang and Gelephu, internationalisation of Gelephu Airport, etc.) and promotion of wide-ranged industries (agricultural processing, manufacturing, logistics, leisure, etc.)

2) Gelephu Thromde (including its expansion area proposed by Gelephu Structure Plan 2005):

Gelephu Structure Plan 2005 expects that the Thromde, including the proposed expansion area, will become the focal point of Bhutan's future manufacturing sector which will attract global investment, with highly skilled blue-collar labours, transport, energy, water and industrial plots.

While meeting the above-mentioned expectation, Gelephu, the primary urban centre to drive the socio-economic development of the region, will be developed as the **‘Bhutan’s Central Gateway City with Vibrant business & wellness activities and open to the world & the whole country’** through the internationalisation of Gelephu Airport, development of airport-related business infrastructures, promotion of tourism and wellness businesses as new industries, functional and scale upgrading of the RRH, etc.

3) Sarpang Town

Sarpang Structure Plan 2010 expects that the town will become an institutional and recreational hub for the entire southern region combined with its role as the Dzongkhag headquarter.

Sarpang, which forms a twin Linked Urban Centre with Gelephu, will be developed as a **‘Hillside Garden City with administrative, academic, cultural & recreational functions coexisting in a tranquil setting and synergic relationship’** (a more concrete image of ‘Multifunctional urban centre with vitality and attractiveness’ proposed in the PrR), while at the same time diversifying and geographically widening its role as an institutional hub beyond its existing function as the Dzongkhag administrative centre, as well as introducing functions that link with Tsirang Dzongkhag and a Wildlife Sanctuary.

4) Intermediate belt area

The area, having vast flat land which is rare in Bhutan, functions as one of the country's leading agricultural production areas protected by rich forest reserves, will be developed as **‘Green-Fringed Active Service Link connecting twin urban centres of Sarpang and Gelephu’**, having urban industrial clusters, represented by Jigmeling Industrial Park, which contributes to create job opportunities in the SCR, with planned residential areas and life service facilities for workers of the

clusters, on the premise that due consideration will be given to the quantitative and functional conservation of agricultural and forest land.

(4) Objectives for the year 2030 and the year 2035

The roadmap for the realisation of the future vision of the region, both for the RCSP Area as a whole and its constituent areas (Gelephu Thromde, Sarpang Town and the Intermediate belt area), will be a common path as follows.

- 1) 2024-2030: short-term (Phase 1)
- 2) 2031-2035: medium-term (Phase 2)
- 3) 2036 to 2045: the long term (Phase 3)

Each of the three phases is then characterised by;

- 1) **Short-term (phase 1):** the ‘**groundwork**’ phase, which prepares the conditions for the implementation of new dedicated actions (projects and policy measures) for the realisation of the vision.
- 2) **Medium-term (phase 2):** the ‘**building up**’ phase, in which the new actions are taken fully on the foundation laid in the previous phase.
- 3) **Long-term (phase 3):** the ‘**fulfilment**’ phase, in which activities are further expanded and developed to culminate in the realisation of the vision.

5.2.2 Principles of the plan

According to the SPF:

The principles are the set of elaboration of objectives which are considered to be milestones to reach the vision.

Also, the principles set the parameters to:

- ✓ Promote a sense of place;
- ✓ Promote community spirit;
- ✓ Harmonize non-residential uses;
- ✓ Improve and enhance physical & visual connectivity;
- ✓ Respect tradition, culture, and belief system;
- ✓ Preserve open spaces, farmland, natural beauty, and environmental areas;
- ✓ Innovate integration of modern infrastructures, and
- ✓ Land Mobilization Modality.

In particular, in Bhutan, the principles pertaining to such spatial strategies must take into account the following views:

- ✓ Traditional settlement areas need to be preserved/promoted while incorporating/blending in with the modern services/amenities;
- ✓ Recognizing the forces of modernization, interventions need be planned sensitively to enable harmonious coexistence of the old and new, and
- ✓ To ensure that settlements continue to have people living in them with their time-tested culture, tradition and ancestral wisdom. Interventions will have to be comprehensive taking into consideration all parameters/features that are integral to their formation/sustenance.

While the place will not have the traditional settlement forms similar to those of other parts of the country, there exists a certain settlement form and pattern that is representative of the place and developed in long settlement history of the place. Such a unique and vernacular settlement pattern, reflecting the life- and work-style of the local people, should be respected and utilised for identical and

attractive spatial development. Further the region is expected to develop with the provision of modern services and amenities but at the same time showcase the unique identity of the country as the gateway to Bhutan.

Thus, the key principle to pursue for spatial formations in the area should be **“a creative and tactical 21st century New Urbanism that harmonises initiatives to introduce forward-looking urban functions and to create an imageable Bhutanese landscape & culture”**, a further evolution of New Urbanism, which emerged in late 20th century and advocated by the Sarpang Structure Plan 2010.

5.2.3 Thematic areas of the Plan

The SPS states that “Regardless of their scale, all plans shall make provisions for:

- (a) the protection of the environment and of the cultural identity of the country;
- (b) the sustainable utilisation of space;
- (c) the form and intensity of human settlement;
- (d) the provision of public amenities and equipment;
- (e) the infrastructural networks and the related nodes of equipment and services;
- (f) the economic activities, and
- (g) the hazards and the measures to mitigate these risks.

With reference to the items listed above, and adding special attention to the wide geographical coverage of the planning area, this RCSP sets out the following planning themes:

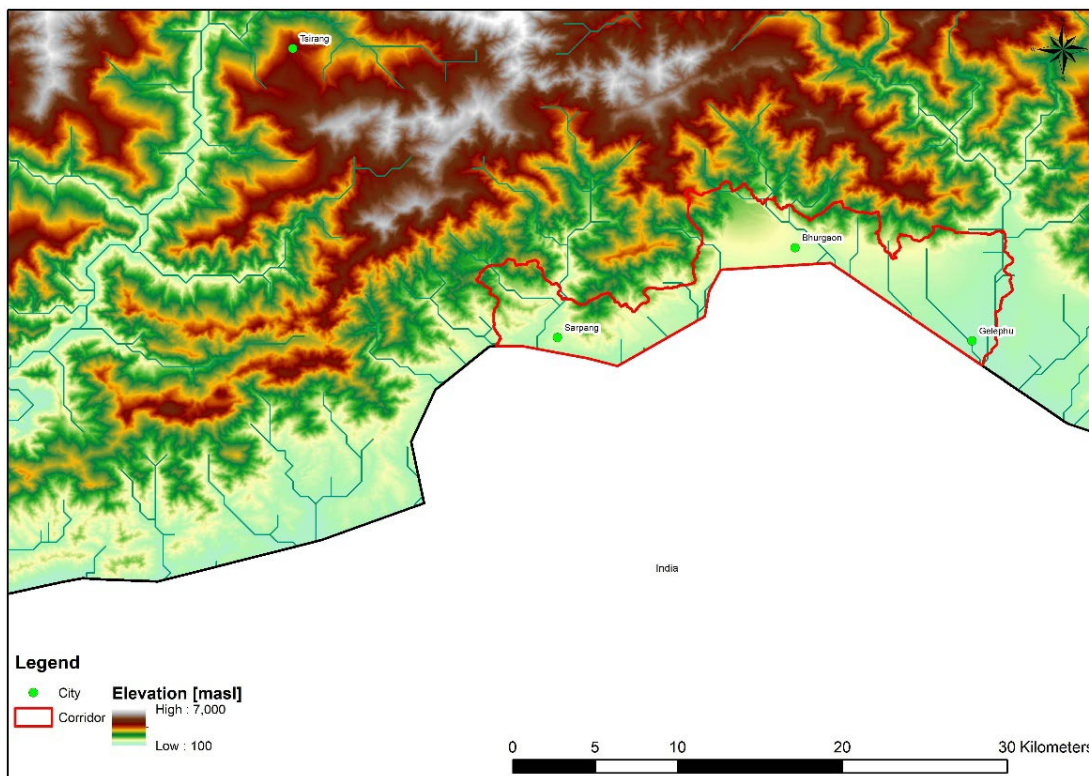
- 1) Protection and creation of attractive environment and cultural identity;
- 2) Realisation of sustainable land use and human settlement;
- 3) Provision of quality public infrastructure, amenities and services;
- 4) Development of integrated infrastructural network;
- 5) Promotion of vigorous economic development, and
- 6) Establishment of secure disaster risks management system.

5.3 Existing Scenario

5.3.1 Geography

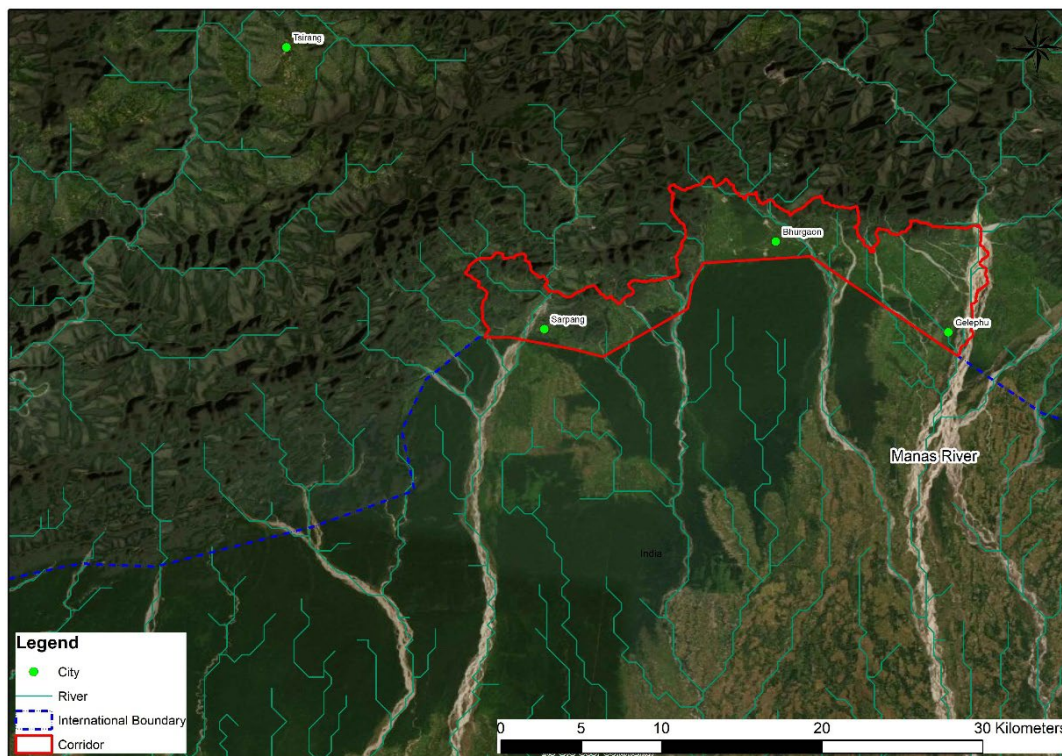
(1) Natural Geography

The RCSP Area is located at the foothills of the Alechhu basin. There are some mountains with elevations about 1,500 masl, but overall, the Area is composed of floodplains and valleys between 100 to 400 masl. The three main towns within the RCSP Area (Sarpang, Samtenling and Gelephu) are located at 290 masl, 370 masl and 200 masl, respectively. It is important to note the number of rivers within the RCSP Area. A first view analysis shows at least 12 rivers in 60 km. That is an average density of 1 river every 5 km. The minor rivers in the foothills are single thread rivers while the main rivers in the floodplains are braided rivers indicating a high sediment load (especially intense bedload) including coarse grains. The main river within the RCSP Area is the Mow/Manas River next to Gelephu. The Area between Samtenling and Gelephu appears to be the most suitable areas for human activities: floodplains with flat topography and fertile soils (Figures 5.3.1 and Figure 5.3.2).



Source: JICA Project Team

Figure 5.3.1 Topography of the RCSP Area

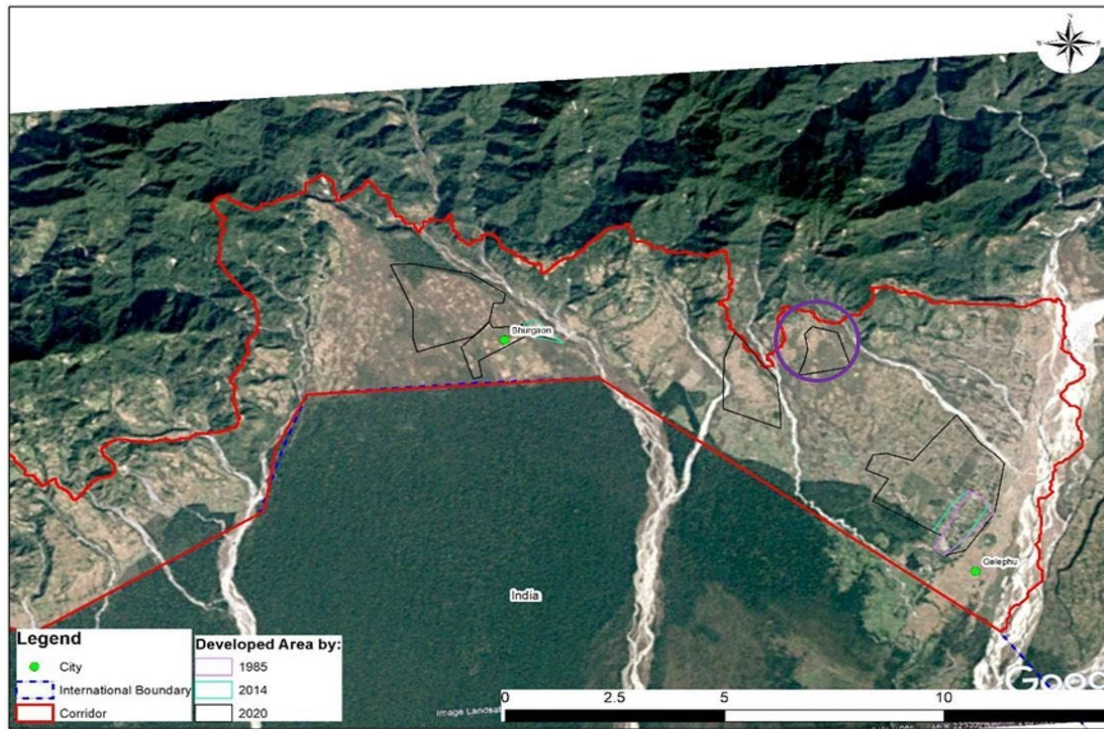


Source: JICA Project Team

Figure 5.3.2 Hydrography of the RCSP Area

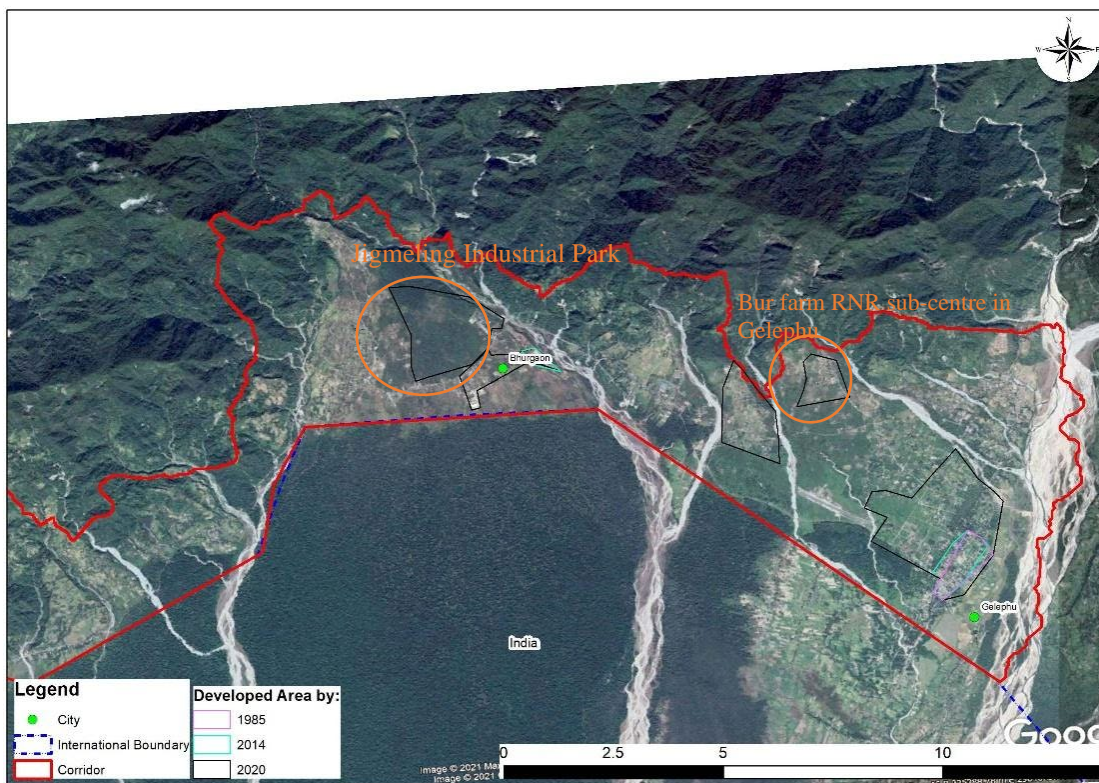
A more detailed analysis of the Samtenling– Gelephu area based on satellite images showed that this area has undergone important land use changes over the past 35 years (Figure 5.3.3 to Figure 5.3.5). This land use change was more accelerated during the past decade. By 1985 the area consisted of

floodplains and some agricultural land/from the Bur farm RNR sub-centre in Gelephu. The vegetation contrast indicates that the areas may have been deforested but human presence (settlement areas) was negligible. Due to the progress of the Jigmeling Industrial Park, development in the surrounding area is significant. By 2014 there were some clearly delineated crop plantations and modern urban features (streets and houses). Besides, there is more deforestation in the Gelephu side. By 2020 most of the plains are crop plantation (agricultural) areas and the Gelephu urban area extends more than 2 km into the floodplain. It is important to note that the deforestation shows an east-west trend originating in Gelephu. The deforestation is not limited to Bhutan territory alone: it extends into Indian territory as well.



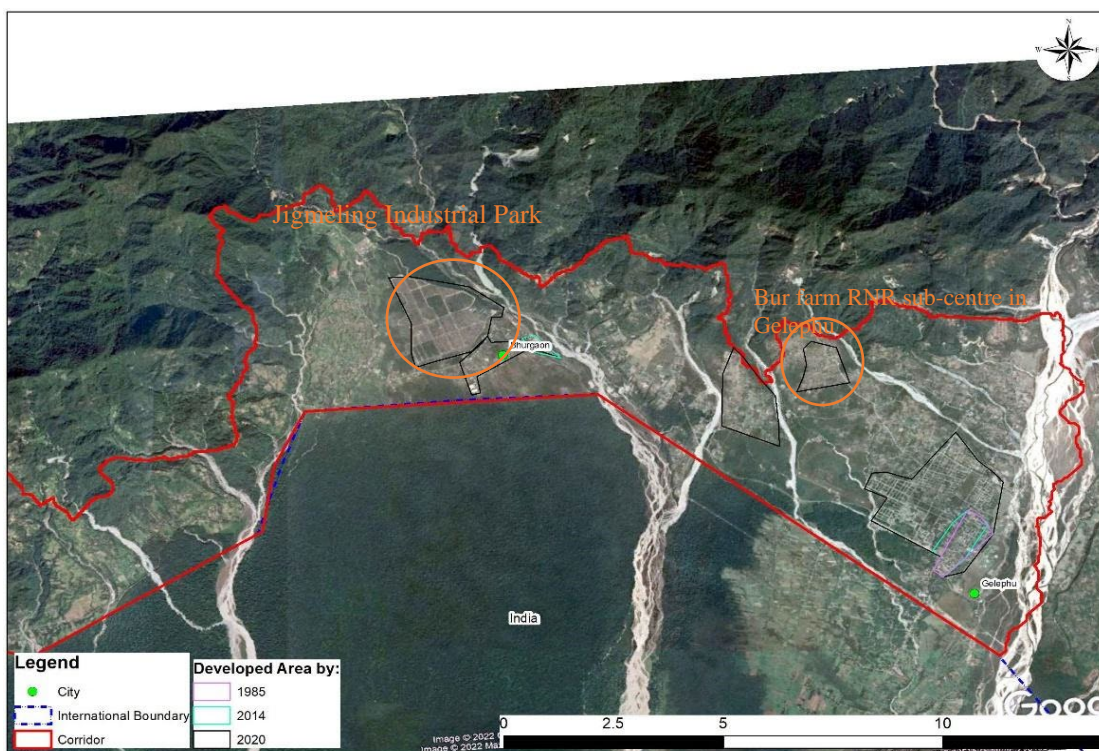
Source: JICA Project Team; Google Earth Landsat

Figure 5.3.3 Satellite Image of the RCSP Area (1985)



Source: JICA Project Team; Google Earth Landsat

Figure 5.3.4 Satellite Image of the RCSP Area (2014)

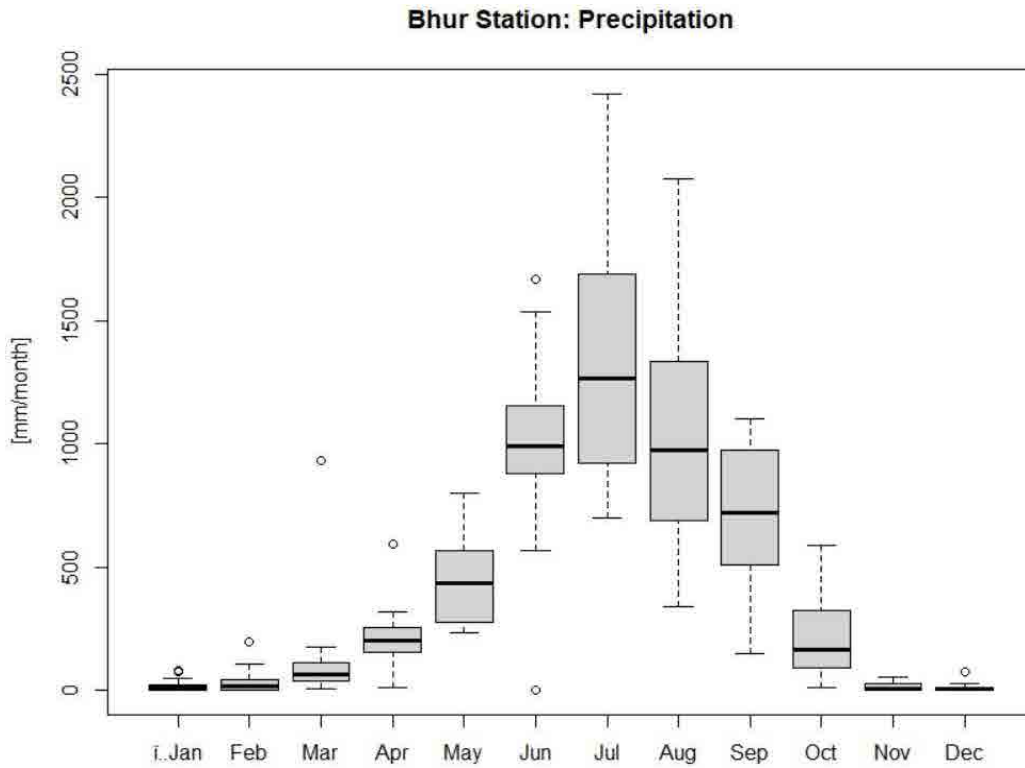


Source: JICA Project Team; Google Earth CNES Airbus

Figure 5.3.5 Satellite Image of the RCSP Area (2020)

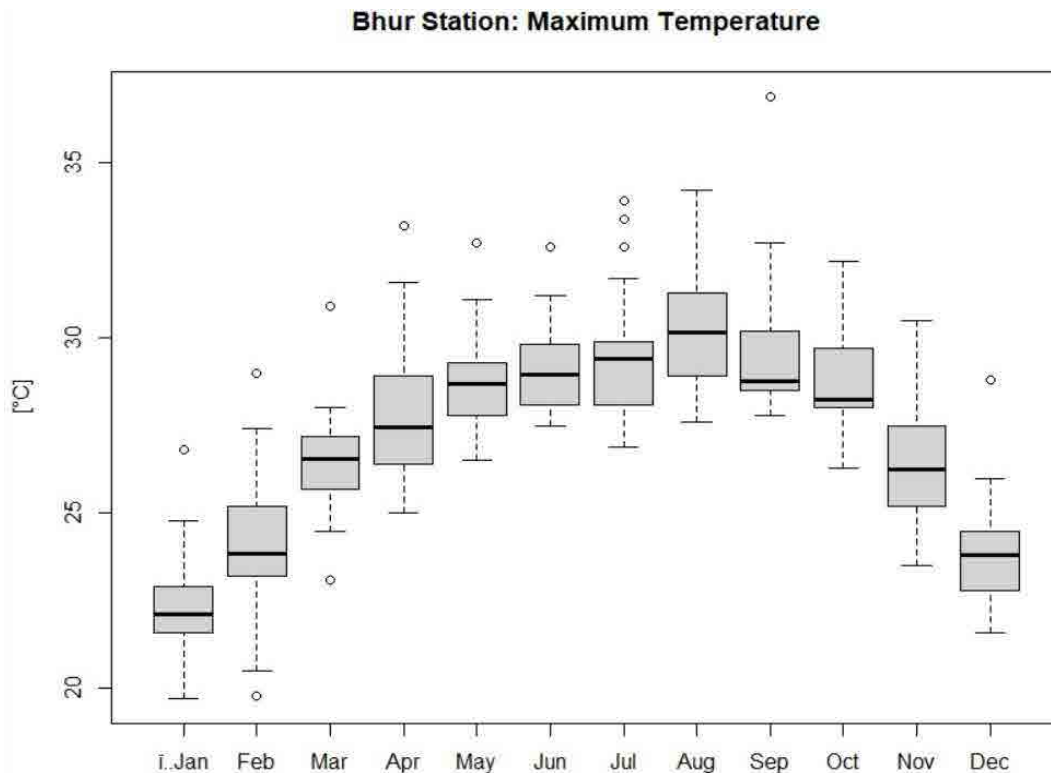
Considering the geographic conditions (elevation) and the proximity, data from the Samtenling station can be considered as representative of the RCSP Area. Figures 5.3.6 to 5.3.9 show statistical boxplots of monthly precipitation, maximum monthly temperature, minimum monthly temperature, and average

monthly wind speed of the past 26 years. Between May and June precipitation increases strongly from < 500 mm/month to > 1,000 mm/month. Following it, there is the three-month summer characterized by heavy precipitation > 1,000 mm/month. Although September still has a high precipitation, it is clear that it marks the end of the monsoon and precipitation decreases thereafter. November to February is a dry period with zero or near zero precipitation.



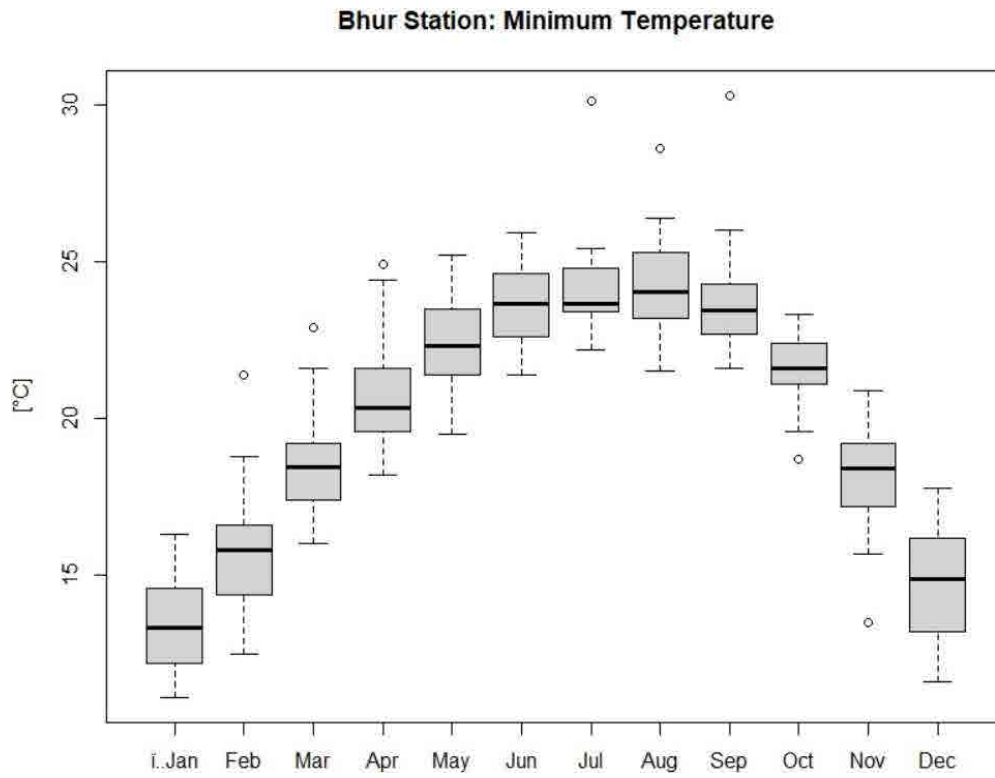
Source: JICA Project Team; NCHM

Figure 5.3.6 Monthly Precipitation Boxplots: Bhur Station



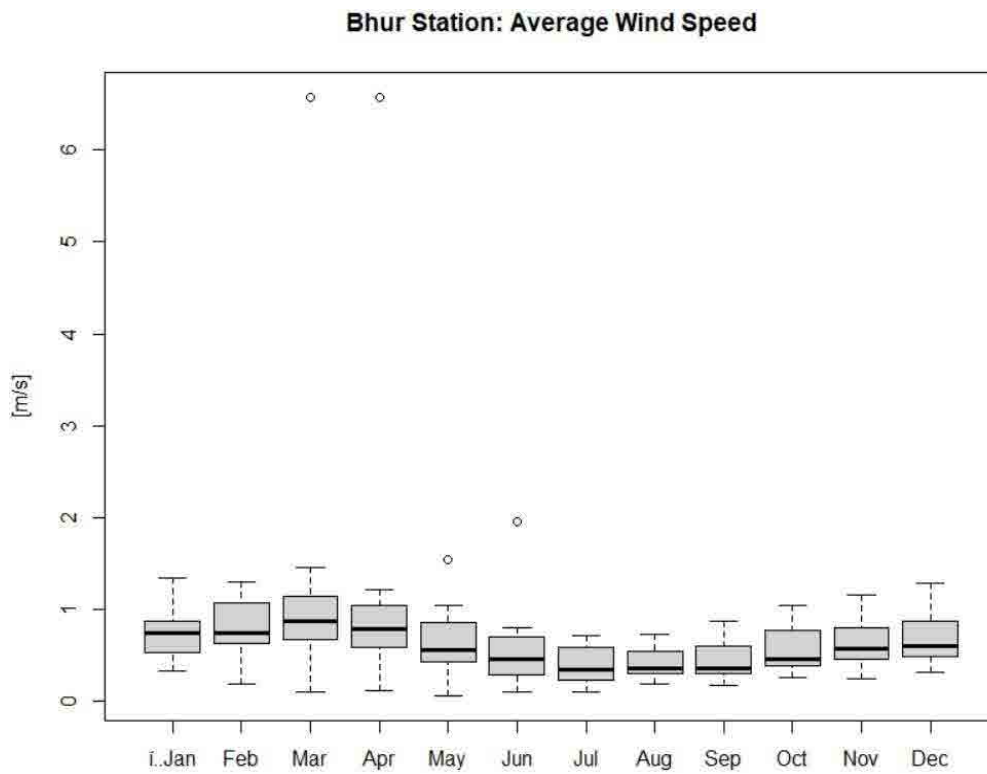
Source: JICA Project Team; NCHM

Figure 5.3.7 Average Maximum Temperature: Bhur station



Source: JICA Project Team; NCHM

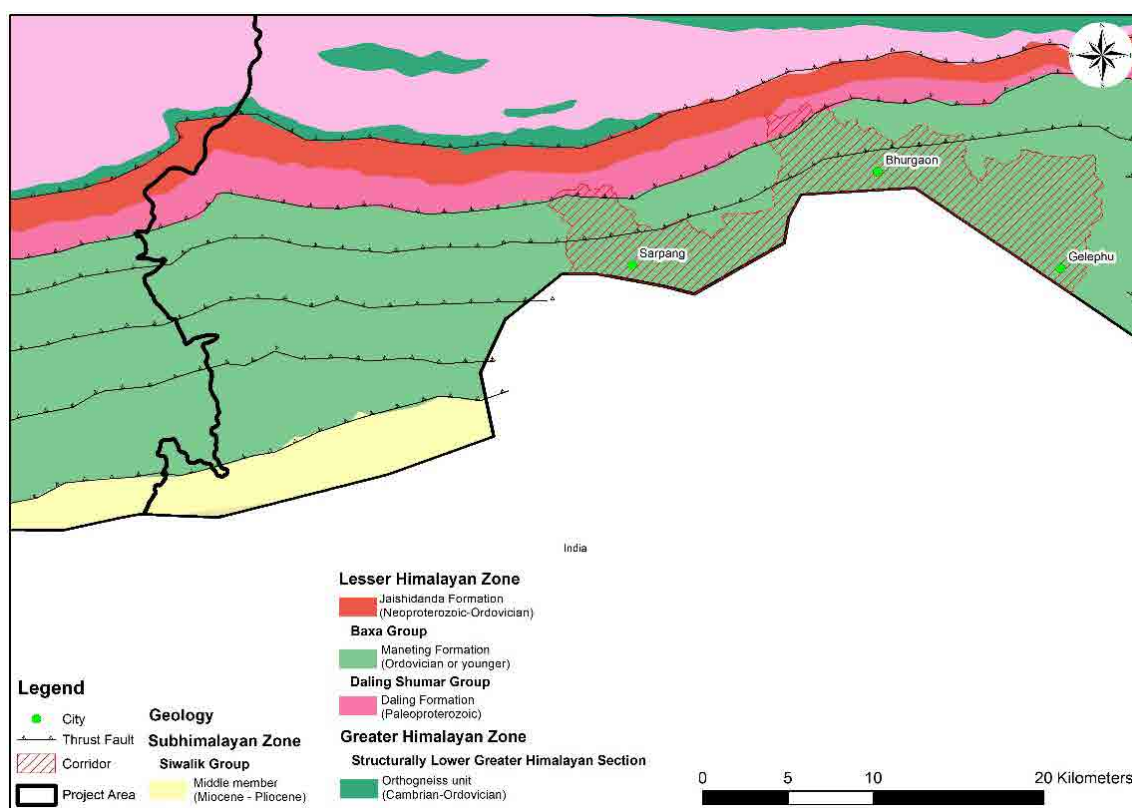
Figure 5.3.8 Average Minimum Temperature: Bhur Station



Source: JICA Project Team; NCHM

Figure 5.3.9 Average wind speed: Bhur station

Most of the RCSP Area consists of Manas formation from Baxa group. This formation comprises medium to thick bedded quartzite and exhibits young DZ¹ peaks that range in age from 1.8 Ga to 500 Ma. Formation². The lowest areas in the southwest are Siwalik Group Middle member from the Sub Himalayan Zone (Figure 5.3.10).



Source: JICA Project Team

Figure 5.3.10 Geology of the RCSP Area

It is difficult to analyse the soil characteristics because there are no comprehensive soil maps. For such reason studies tend to rely on low resolution soil maps³. The most detailed soil study is the “Technical Report on The Detailed Soil Survey of Bhur Farm, Gelephu; Sarpang”⁴. This study focused on a 52.9 ha area about 8 km northwest of Gelephu. The study reported that the soils are gravelly to extremely gravelly, slightly acid to acid with most of the pH value less than 6, and with a low to moderate content of organic carbon and total nitrogen. Although there are some soils with enough water holding capacity, most of the soils were classified as either not suitable for agriculture or marginally suitable requiring high levels of land shaping, anti-erosion measures, husbandry, nutrients, ameliorants or water required. Nevertheless, it is important to note that such study focused on a small area and is not necessarily representative of the entire RCSP Area.

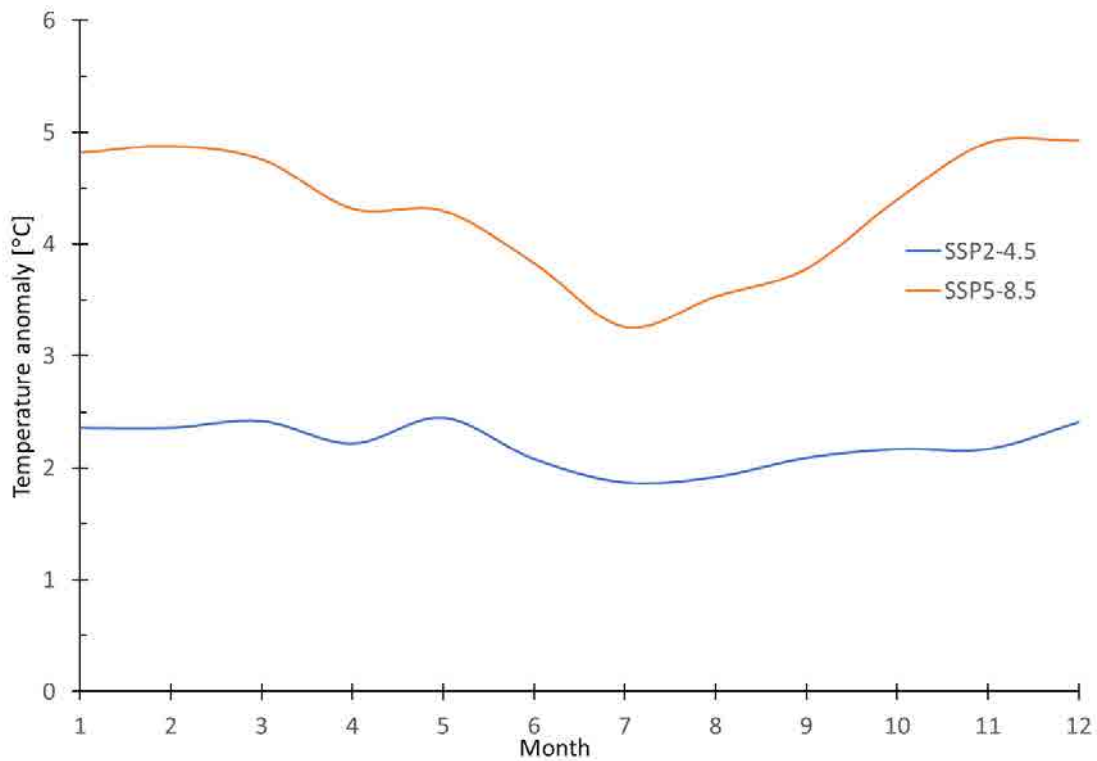
¹ Detrital zircons (DZ) are eroded zircon crystals transported by geological processes. Found in sedimentary deposits, they help age-date rocks and provide insights into geological history, as zircon is known for its durability and resistance to chemical weathering.

² Mc Quarrie, N., Long, S., Togbay, T., Nesbit, J., Ducea, M. 2013. Documenting basin scale, geometry and provenance through detrital geochemical data: Lessons from the Neoproterozoic to Ordovician Lesser, Greater, and Tethyan Himalayan strata of Bhutan, *Gondwana Research*, 23(4), 1491-1510.

³ Parker, L., Guerten, N., Thi Nguyen, T., Rinzin, C., Tashi, D., Wangchuk, D., Bajgai, Y., Subedi, K., Phuntsho, L., Thinley, N., Chhogyel, N., Gyalmo, T., Katwal, T., Zangpo, T., Acharya, S., Pradhan, S., Penjor, S. 2017. Climate change impacts in Bhutan: challenges and opportunities for the agricultural sector. Working Paper No. 191. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Wageningen, The Netherlands. Available online at: www.ccafs.cgiar.org

⁴ SSU 2001. Technical report on the detailed soil survey of Bhur Farm, Gelephu; Sarpang, National Soil Service Centre, Semtokha, Council for RNR Research of Bhutan, erstwhile Ministry of Agriculture, 62 pp.

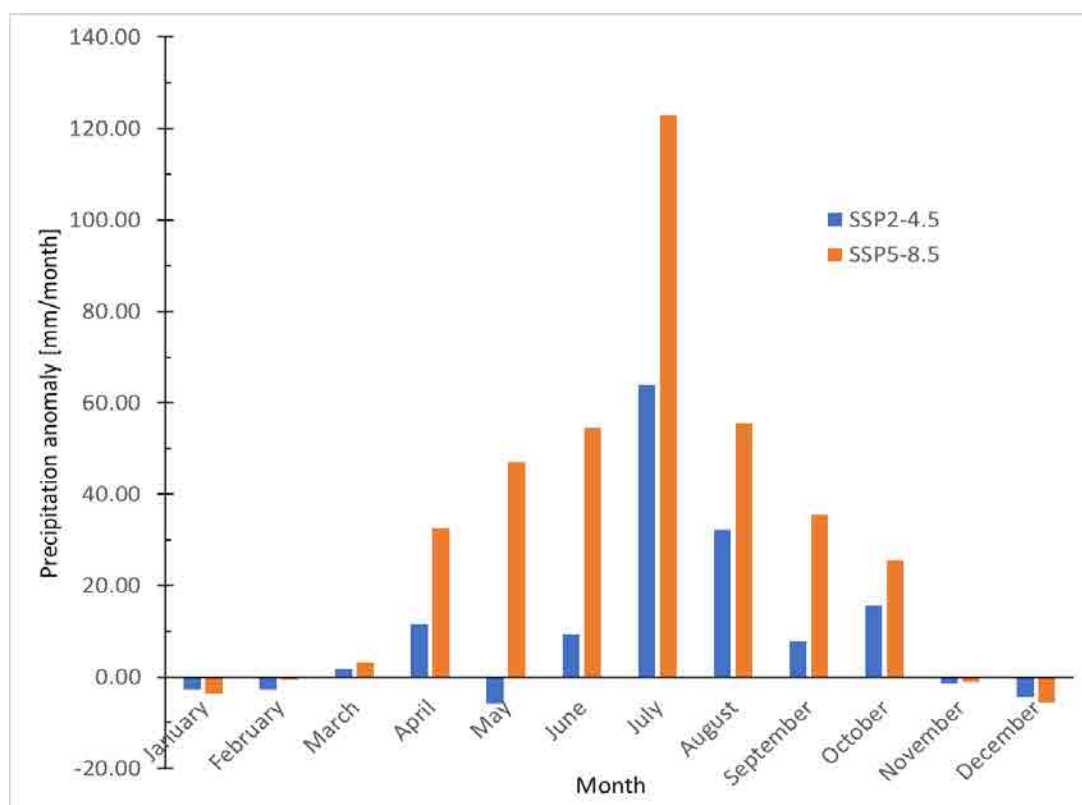
Figure 5.3.11 and Figure 5.3.12 show the projected ensemble temperature anomaly and the projected ensemble precipitation anomaly for Sarpang considering scenarios SSP2-4.5 and SSP5-8.5. The present study focused on those two scenarios because they are scenarios representing low greenhouse gas (GHG) accumulation and high GHG accumulation respectively⁵. In both variables, temperature and precipitation, the magnitude of the changes will depend on the season. The temperature anomaly will be higher during the winter months. In the case of precipitation, the precipitation anomaly will be higher during summer (monsoon season). On the other hand, precipitation may decrease during the winter (dry season). Such precipitation changes indicate that extreme events are likely to become more severe.



Source: JICA Project Team; WB (2022)

Figure 5.3.11 Sarpang Temperature Anomaly Projected by the End of Century Considering Scenarios SSP2-4.5 and SSP5-8.5

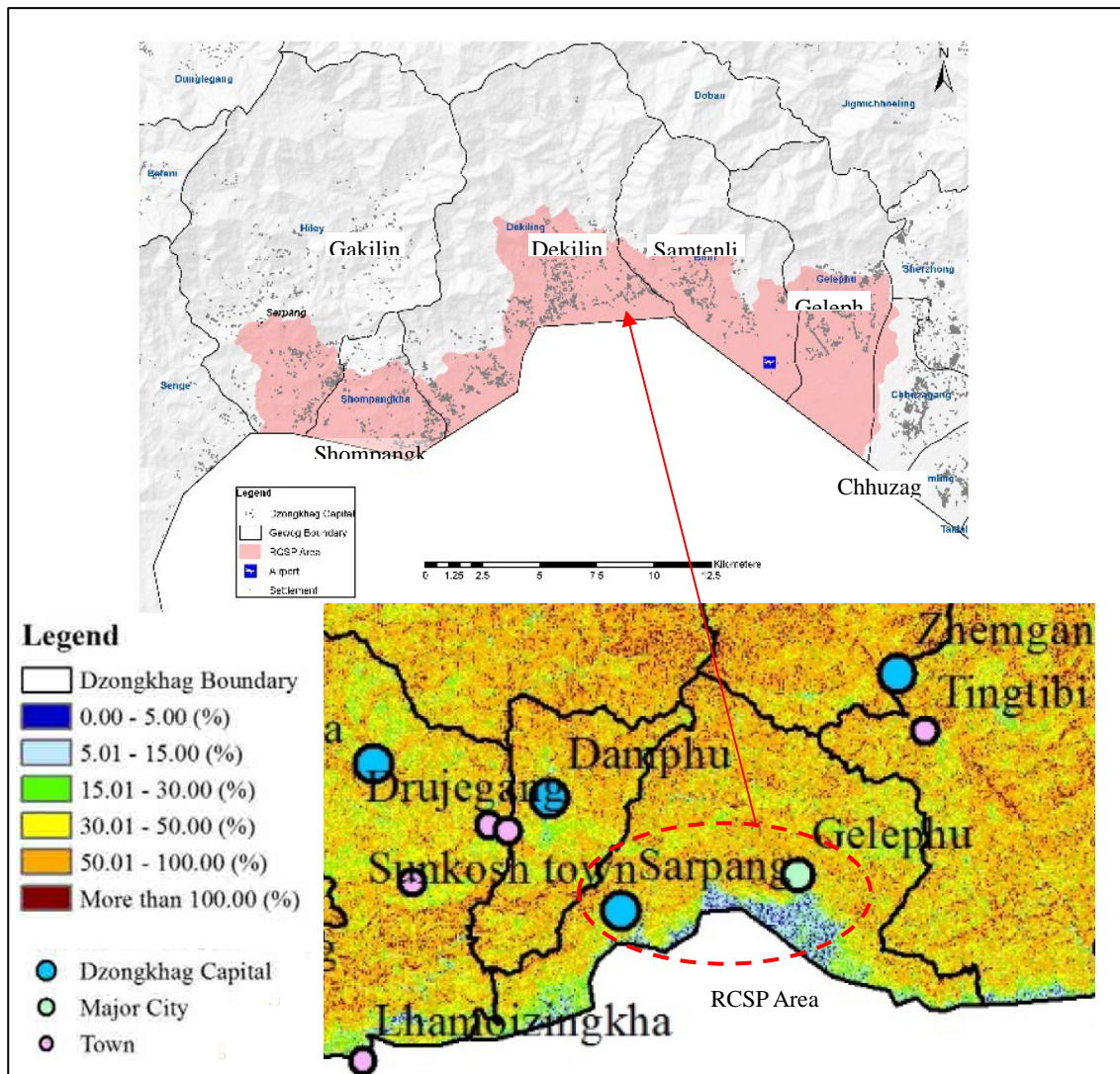
⁵ Pinson, A., White, E., Ritchie, H., Conners, H., Arnold, J. (2021). DoD installation exposure to climate change at home and abroad, US Army Corps of Engineers, Washington DC.



Source: JICA Project Team; WB (2022)

Figure 5.3.12 Sarpang Precipitation Anomaly Projected by the End of Century Considering Scenarios SSP2-4.5 and SSP5-8.5

The altitude of Sarpang Dzongkhag ranges from 200 to 3,600 meters. Its relatively flat area accounts for only 20% of entire Dzongkhag and it is mainly located in the southern part, the location where the RCSP Area is as shown in Figure 5.4.13. The terrain condition of the RCSP Area makes it a catchment of water from hills in the north and suffer flash floods especially during rainy seasons. However, due to a relatively flat terrain, instead of the road connecting Sarpang town and Gelephu Thromde, landslide occurs more often in north of the RCSP Area: the road between Sarpang and Damphu in Tsirang Dzongkhag, and the road between Gelephu and Zhemgang in Zhemgang Dzongkhag.



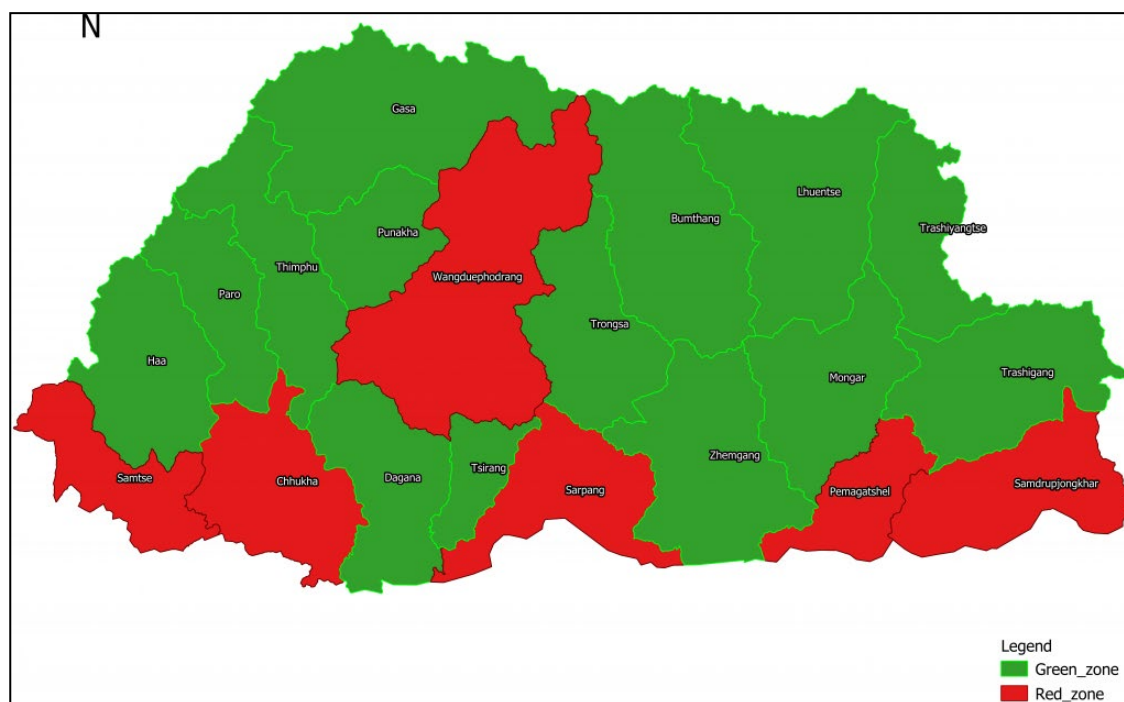
Source: JICA Project Team based on map using of ASTER GDEM in CNDP2030

Figure 5.3.13 Slope Classification in the RCSP Area

(2) Diseases and Infection

Although “Pest & Diseases” was assessed as a relatively low risk disaster in the RCSP Area, Malaria has been reported almost every year in the Chhuzagang, Gelephu, Shompangkha⁶. Under the situation of COVID-19 pandemic, as shown in Figure 5.3.14, the RCSP Area was classified as Red-Zone indicating a high infection risk as of 19 February 2022. Excluding the pest disaster, the RCSP Area should consider paying necessary attention to the epidemic diseases. In order to improve the situation of epidemic diseases in the Area, the Royal Government of Bhutan approved establishment of a Centre for Tropical and Zoonotic Diseases (CTZD) in Gelephu in the 11th Five Year Plan.

⁶ Draft Dzongkhag Disaster Management and Contingency Plan (2017).



Source: <https://www.gov.bt/covid19/national-covid-19-outbreak-phasing-map/>

Figure 5.3.14 National Outbreak Phasing Map of COVID 19 (as of 19 Feb 2022)

(3) Disaster Condition

The RCSP Area is located in Sarpang Dzongkhag and covered by six Gewogs. Few of disaster events have been well recorded correctly for the Area. However, based on previous experiences of natural disasters, Sarpang Dzongkhag Administration assessed the risk ranking for each Gewog. Table 5.3.1 shows the risk level of typical disaster type in the RCSP Area, and it indicates that flash flood, landslide and human-wildlife conflict are the natural disasters with high risk in the Area which is consistent with the overall situation of Sarpang Dzongkhag area.

Table 5.3.1 Hazard Ranking by Gewogs in RCSP Area

Gewog	Earthquake	Wind-storm	Forest fire	Pest & Diseases	Flash flood	Landslide	Thunder/ Lightning	Human wildlife conflict
Gakiling	7	6	4	4	9	10	5	8
Shompangkha	6	4	7	2	10	9	5	8
Dekiling	6	5	3	2	9	9	7	7
Samtenling	7	7	4	5	10	8	5	7
Gelephu	7	6	6	6	10	9	8	9
Chhuzagang	8	6	4	7	10	1	2	9

Score above 8 (Score varies from 1 (lowest) to 10 (Highest))

Source: Draft Dzongkhag Disaster Management and Contingency Plan by Sarpang Dzongkha Administration (2017)

As it is the situation of the whole Sarpang Dzongkhag, the RCSP Area has a high level of risk from the natural disasters viz flash flood, landslide and human-wildlife conflict. They have been noted to cause destruction of roads and properties, disruption of traffic, and even loss of life every year.

Due to the terrain characteristics of the RSCP Area, perennial river as well as intermittent and ephemeral river widely distribute here, and most of them have the flooding potential. Considering the location of main residence area and its influence on human activity, the flooding disaster risk in RSCP Area is mainly induced by Mow River and its tributaries, especially the Shetikhari Stream and the Aiepoly (Big and Small) Streams. The photos in Figure 5.3.15 show the current situation of small

Aiepoly streams. The photo in left is the broken bridge and road broken by previous flooding event, which make the vehicle have to pass through the riverbed for crossing. Thus, after heavy rain, the transport has been blocked due to flooding water as shown in the right photo.



Source: JICA Project Team (left, May 2022) and Gelephu Thromde (right, June 2022)

Figure 5.3.15 Current Situation of Small Aiepoly Streams

Due to relative flat terrain, few of high-risk landslide site can be identified in the RCSP Area. However, two high-frequently occurred landslide sites with large-scale area located on the national way and closed to Gelephu Thromde. One is a big-scale slope failure site nicknamed by “Box Cut” (High risk site 1), and the other one is a big-scale debris flow site nicknamed by “I Slip” (High risk site 2). The national road is blocked lots of times during the rainy season every year and significantly affect the connectivity of the RCSP Area with outside. Figure 5.3.16 shows the blocked road in the sites which happened after heavy rain, and the heavy machine in the photo is working for cleaning the rocks and sediment on the road.



Source: JICA Project Team (photoed in October 2022)

Figure 5.3.16 High-risk landslide site closed to the RCSP Area (left: “Box Cut”, Right: “I Slip”)

Human-wildlife conflict is another main threat in the RCSP Area. Specifically, the human-elephant conflict is the most common human-wildlife conflict that occurs in Sarpang Dzongkhag including the RCSP Area. For many years, elephants have caused economic loss and social pressure on farmers of Southern Bhutan where damage to crops and property has occurred (Figure 5.3.17)⁷. Though electric fences have been installed in the area as a countermeasure, management and maintenance of those fences have become a new issue and in many place the electric fences have been reported to have

⁷ Ugyen Tshering, etc. Human-Elephant Conflict Management Report: Divisional Forest Office, Sarpang, Bhutan. 2017

become defunct. There are improved methods of construction of electric fence being piloted in the RCSP Area.



Source: Gelephu Thromde (photoed in August 2018)

Figure 5.3.17 Human-Elephant Conflict in Sarpang

(4) Land Suitability

According to the Land Use and Land Cover Assessment that were conducted in 2010 and 2016, the land use classification of Sarpang Dzongkhag is shown in Table 5.3.2. The details of the RCSP Area will be calculated accordingly.

Table 5.3.2 Relative Distribution of Main Land Cover Classes by Sarpang Dzongkhag

Land Cover Class	Sub Class	Area (ha) 2016	Area (%) 2016 ⁸	Area (%) 2010 ⁹	Trend
Alpine Scrubs		72.72	0.04%		
Built up		450.80	0.27%	0.19%	Increased
Cultivated Agriculture		8029.80	4.90%	3.99%	Increased
	Chhuzhing	3062.25	1.87%		
	Kamzhing	3906.43	2.38%		
	Orchards	1061.12	0.65%		
Forests		146852.30	89.58%	87.99%	Increased
	Broadleaf	145299.97	88.64%		
	Fir	334.70	0.20%		
	Mixed conifer	1217.63	0.74%		
Landslides		446.49	0.27%		
Meadows		15.32	0.01%	0.03%	Decreased
Non-Built up		9.99	0.01%	0.00%	
Rocky Outcrops		61.93	0.04%		
Shrubs		5021.09	3.06%	5.02%	Decreased
Water Bodies		2967.67	1.81%	2.31%	Decreased
		2.25			
		2965.42	1.81%		

Source: Erstwhile MoAF, 2016, 2010

⁸ MoAF, 2016. Land Use and Land Cover of Bhutan 2016. Maps and Statistics

⁹ MoAF, 2010. Bhutan Land Cover Assessment 2010 (LCMP 2010). Technical Report

5.3.2 Demography and socio-economy

(1) Population and population distribution in Sarpang Dzongkhag

Table 5.3.3 summarises population, population growth rates and population densities by Gewog in Sarpang Dzongkhag. The population of Sarpang Dzongkhag amounted to 46,004 in 2017. As for the annual population growth rate by Gewog between 2005 and 2017, the increase in the three Gewogs, namely, Samtenling at 5.2%, Gelephu at 4.1%, and Dekiling Gewogs at 3.8%, respectively, in the eastern to the central region, is larger than in the urban areas (Gelephu Thromde and Sarpang Town). In terms of population density, Gelephu Thromde and Sarpang Town are densely populated settlements in the region.

Table 5.3.3 Population and Population Densities in Sarpang Dzongkhag

Gewog/Thromde/Town	Area Size (km ²)	Population by Census			Population density (2017) (person / km ²)
		PHSB 2005	PHSB 2017	Annual growth rates (%) between 2005 and 2017	
Gelephu Thromde*1	11.5	9,199	9,858	0.58	857.2
Gelephu Gewog*2	54.0	3,975	6,457	4.13	119.6
Samtenling Gewog*2	55.0	1,517	2,801	5.24	50.9
Dekiling Gewog*2	113.0	3,835	5,980	3.77	52.9
Shompangkha Gewog*2	21.0	1,130	1,486	2.31	70.8
Gakiling Gewog*2	78.5	2,517	2,125	-1.40	27.1
Sarpang Town*1	2.5	2,619	3,152	1.56	1,245.9
Other areas in Sarpang Dzongkhag	1346.0	12,310	14,145	1.16	11.4
Total	1681.5	37,102	46,004	1.81	27.4

Notes:

*1 All the area is included in the RCSP Area.

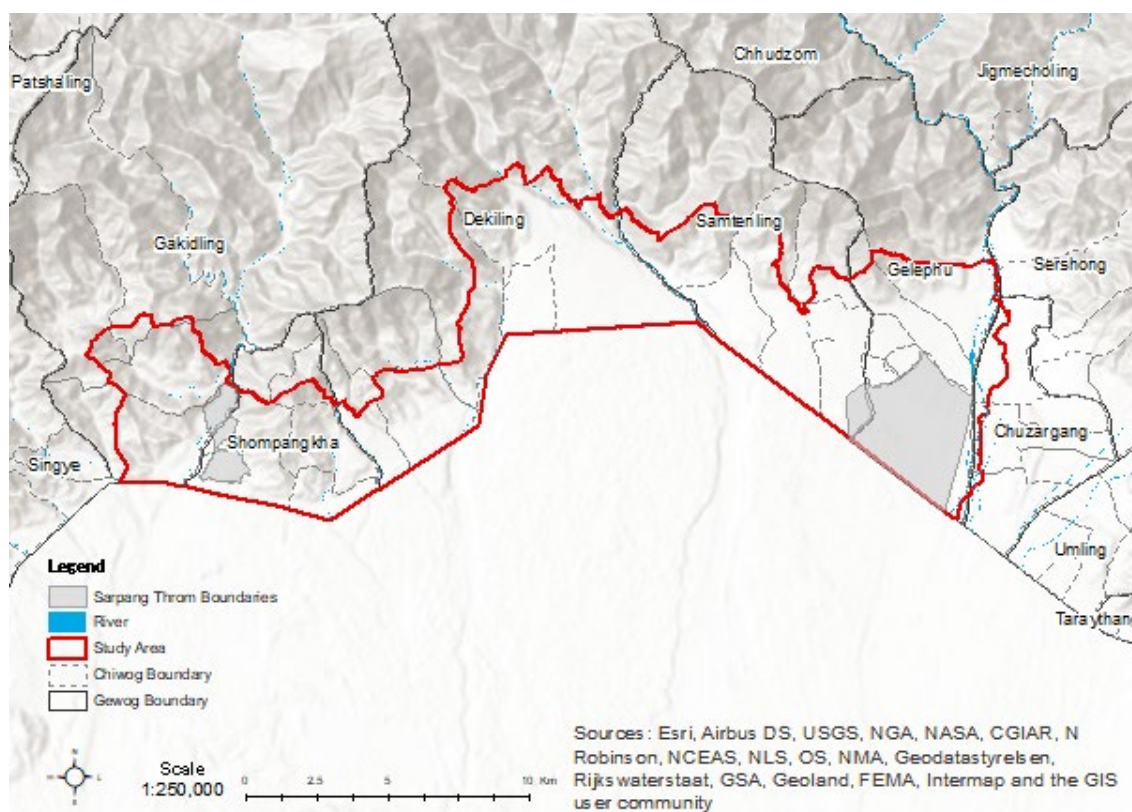
*2 The part of the area is included in the RCSP Area.

Source: JICA Project Team based on PHCB2005, PHCB2017, Dzongkhags at a Glance 2021 and Dzongkhag Administration, Sarpang; <http://www.sarpang.gov.bt/about-district>

The proportion of the urban population in Sarpang Dzongkhag, which is composed of Gelephu Thromde and Sarpang Town, is 28.3% in 2017 with a decrease of 3.5 percentage points from PHCB 2005. This may be due to an increase in the population of other gewogs defined as rural.

(2) Basis of the population projection

The RCSP Area runs along the southern border with India on the south side while towards the north it covers some of the gewogs and urban settlements in Gelephu and Sarpang. The Area encompasses several gewogs under Sarpang Dzongkhag namely Gelephu, Samtenling, Dekiling and Shompangkha. The boundary of the RCSP Area is shown in Figure 5.3.18.



Source: JICA Project Team

Figure 5.3.18 The boundary of the RCSP Area

The population of the RCSP Area in 2017 should be estimated to be a basis of the population projection since the boundary of the Area is not accorded with the administrative boundary. Thus, the population of Chiwoqs, Gewogs, Sarpang Town and Gelephu Thromde in 2017 based on PHCB2017 is adjusted according to the number of the settlements on GIS.

As a result, the population in the RCSP Area 2017 is estimated at 29,208, as shown in Table 5.3.4.

Table 5.3.4 Population of the RCSP Area in 2017

	Gewog/ Town/ Thromde in the RCSP Area	Chiwoq	Population 2017 (PHCB2017)	Estimated population in the RCSP Area 2017 based on GIS
1	Samtenling	Khenpagang	341	220
2	Samtenling	Samtenthang	551	516
3	Samtenling	Samtenling	1,164	1,164
4	Samtenling	Chhoekhorling dechhen pelri	370	370
5	Samtenling	Dechhen pelri	375	322
6	Gelephu	Pelrithang khatoed	3,480	2,843
7	Gelephu	Pelrithang khamaed	1,375	1,375
8	Gelephu	Pemathang	428	428
9	Gelephu Thromde		9,858	9,858
10	Gelephu	Lekidthang	666	666
11	Gelephu	Dzamlingthang	508	508
12	Gakiling	Gakiling	543	503
13	Gakiling	Getemkha	443	424
14	Gakiling	Sangkha	452	7
15	Dekiling	Dekiling	811	726
16	Dekiling	Nubgang	314	240

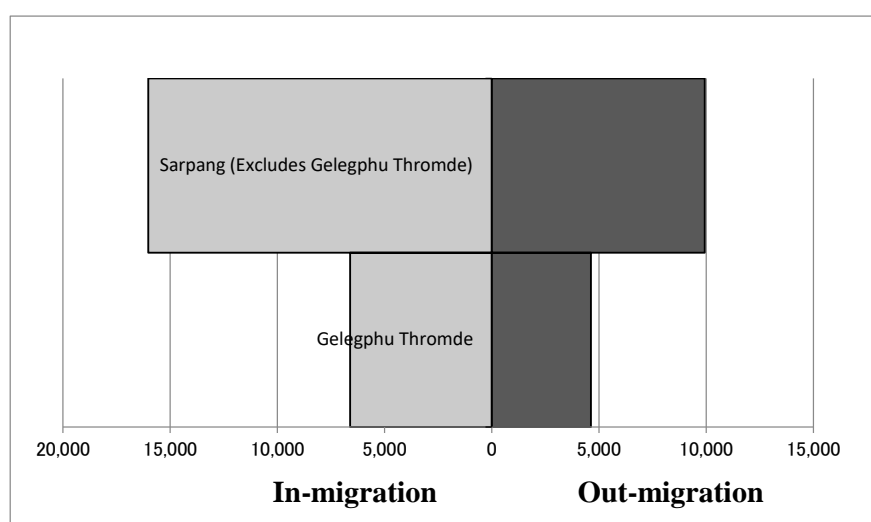
17	Dekiling	Chhoe-khorling	1,477	1,477
18	Dekiling	Jigmed-ling	3,021	2,880
19	Dekiling	Gawaihang	357	272
20	Shompangkha	Koenchhogling	404	404
21	Shompangkha	Gomchola	225	122
22	Shompangkha	Risoomgang	160	35
23	Shompangkha	Shompangkha	254	254
24	Shompangkha	Dargyethang	443	443
25	Sarpang Town		3,152	3,152
	Total		31,172	29,208

Note: Population of Gelephu Thromde and Sarpang Town in 2020 amounts to 10,373 and 3,020, respectively, according to the DHS survey.

Source: JICA Project Team based on Population and Housing Census of Bhutan (PHCB) 2017 and GIS data of DHS

(3) Migration

The PHCB 2017 report shows on interregional (and inter-Dzongkhag/Thromde) migration. This term is defined as life-time migrants by the NSB as a person whose area of residence at time of the census differs from their area of birth. As shown in Figure 5.3.19, Sarpang Dzongkhag has received a relatively large number (16,017) of in-migrants. Gelephu Thromde also received 6,609 in-migrants. On the other hand, out-migrants in Sarpang Dzongkhag and Gelephu Thromde amount to 9,939 people and 4,627 people, respectively.



Source: JICA Project team based on PHCB 2017

Figure 5.3.19 Migration pattern in Sarpang Dzongkhag and Gelephu Thromde

It is difficult to estimate the recent migratory patterns of people in the RCSP Area. This is mainly because updated migration data disaggregated by gewogs or chiwogs are not available. However, considering that most of the larger urban settlements are located in the RCSP Area such as Gelephu Thromde, Sarpang Town and smaller but important semi-urban centres along the Gelephu-Sarpang highway such as Samtenling (Bhur), it may be safe to say that most of the in-migration to Sarpang Dzongkhag have occurred to the RCSP Area. These urban centres which provide better economic opportunities due to their location along the national primary highway and proximity to major urban centres and access to services.

(4) Employment and Occupation

Table 5.3.5 shows the rates of employment and unemployment in 2020 in Sarpang Dzongkhag. The share of unemployed persons in total at 4.4% is slightly lower than that of the whole country at 5.0%.

As for occupation, services sector is more developed in Sarpang Dzongkhag mainly because of a higher proportion of government staff working at the administrative centres.

Table 5.3.5 Employment and Occupation in Sarpang Dzongkhag

Employment (%)						Occupation by sector (%)		
Employed			Unemployed			Agriculture	Industry	Services (government & private sector)
Male	Female	Total	Male	Female	Total			
95.2	96.0	95.6	4.8	4.0	4.4	52.3	12.5	35.5

Sources: Labour Force Survey 2020 and Statistical Yearbook 2021

(5) Poverty

In Sarpang Dzongkhag, poverty rates are up and down between 2012 and 2022 according to the Poverty Analyses Report by NSB as shown in Table 5.3.6. For Gelephu Thromde, poverty rates increased from 1.1% in 2017 to 7.8% in 2022. The reasons on decrease in poverty rates between 2017 and 2022 in the case of Sarpang and increase in the case of Gelephu Thromde cannot be explained well. This may be partially derived from sampling numbers and change of methodology.

Table 5.3.6 Changes of Poverty Rates* in 2012, 2017 and 2022 in Sarpang Dzongkhag and Gelephu Thromde

Dzongkhag/Thromde	2012	2017	2022
Sarpang	4.2%	12.1%	5.0%
Gelephu Thromde	-	1.1%	7.8%

Note: Population Poverty Rates

Source: NSB, Poverty Analyses Report 2012, 2017 and 2022

(6) Private sector activities

1) Jigmeling Industrial Park

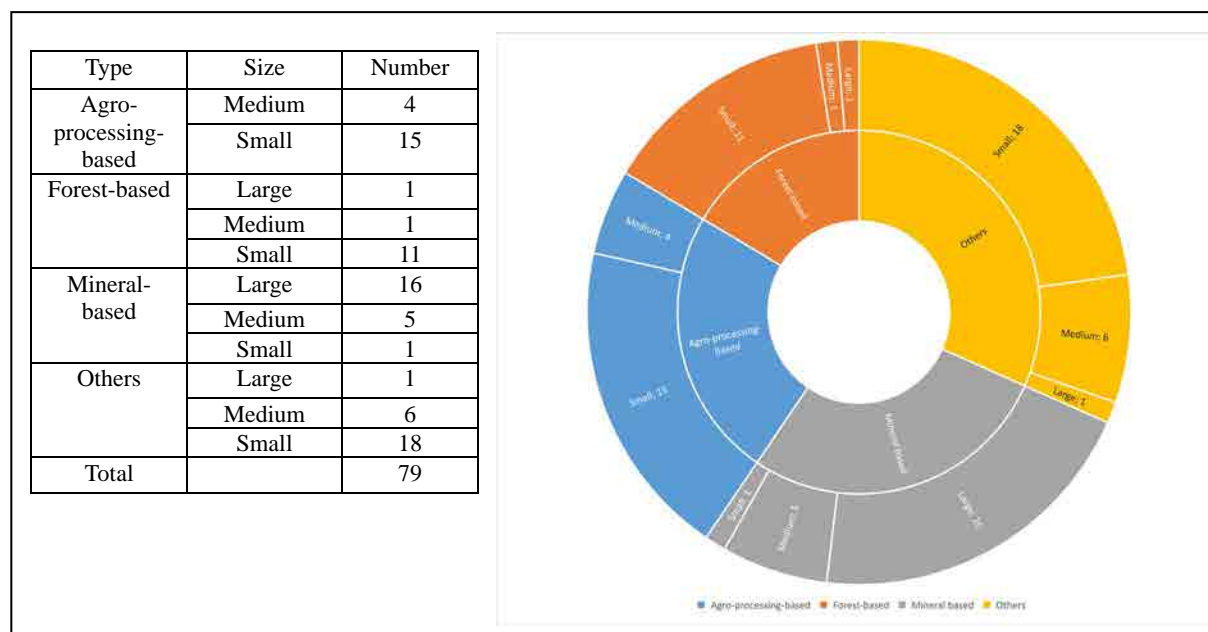
From the viewpoint of the private sector enhancement in the RCSP Area, the development of the Jigmeling Industrial Park is important. As of October in 2022, 79 proposals by companies/organizations are accepted in erstwhile MoEA. Among them, some companies have already started operations¹⁰.

By economic sector, as shown in Figure 5.3.20, broadly three types of industries, namely (i) agro-processing and food-based industry such as food, vegetables, nuts, and animal feed, (ii) forest-based industry such as sawmill and furniture, and (iii) mineral-based industry such as manufacturing of ferro silicon alloys, are majorities according to the concept of the Master Plan. In addition, manufacturers of fertilizer, glass products, and weaving are seen in the list of proposals.

Total estimated number of workers shown in the proposals amounts to 6,392 in total, which is composed of 5,258 Bhutanese workers and 1,134 expatriate workers.

¹⁰ As of September 2023, all factory operations have ceased, and development activities for the industrial estate, including the acceptance of applications, have been halted.

As for the size of enterprise, 45 companies out of 79 in the total (at 57%) are small industries. But, in mineral-based industries, most of them (16 out of 22) are large companies, and they are manufacturers of ferro silicon alloys.



Source: JICA Project Team based on the data from the erstwhile MoEA

Figure 5.3.20 Breakdown of Companies by Economic Type/Sector and Size of companies Based on the Proposals in Jigmeling Industrial Park

2) Small-scale enterprises in the RCSP Area

The accumulation of medium or large-scale industries is not seen in the RCSP Area except Jigmeling Industrial Park.

On the other hand, the data indicates that the RCSP Area, of the 751 different business enterprises, holds 90% of the business activities in Sarpang Dzongkhag whereas the non-RCSP Areas have just 10% as shown in Table 5.3.7. 95% of the contract/construction businesses are located in the RCSP Area. Also, 92% of the services (such as retail trade, hotels, transport services, etc.), and 84% of the manufacturing, processing, and production companies (such as tailoring, bakery/confectionary, furniture, sawmill, manufacturing of bricks and blocks, etc.) are concentrated in the Area. This indicates that the RCSP Area is the main economic hub in Sarpang Dzongkhag.

Table 5.3.7 Distribution of the Small Businesses in Sarpang Dzongkhag

Business Type/ Category	Sarpang Dzongkhag				Total
	RCSP Area	Share	Out of RCSP Area	Share	
Contracts, Construction	119	95%	6	5%	125
Manufacturing, Processing, and Production	197	84%	38	16%	235
Consultancy service	2	100%	0	0%	2
Other services	357	92%	32	8%	389
Total	675	90%	76	10%	751

Source: JICA Project Team based on the data compiled by the erstwhile Department of Cottage and Small Industries (DCSI), erstwhile MoEA

Within the RCSP Area, as shown in Table 5.3.8, Gelephu Thromde has the largest share at 56% of the small business establishments. Nearly three quarters of the services, two thirds of the contract/construction firms are located in Gelephu Thromde. Following Gelephu Thromde, Dekiling holds 15% of business entities with 37% of the manufacturing firms including ones located in

Jigmeling Industrial Park and Gelephu Gewog has 11% of the business entities, while the other Gewogs in the RCSP Area namely Samtenling, Gakiling and Shompangkha have less than 10% of the business entities.

Table 5.3.8 Distribution of the Small Businesses by Gewog in Sarpang Dzongkhag

Numbers

Business Type/ Category	Gewog/Thromde						Total
	Samtenling	Dekiling	Gelephu	Gelephu Thromde	Gakiling	Shompang-kha	
Contracts, Construction	2	7	14	79	0	17	119
Manufacturing, Processing and Production	40	72	19	40	12	14	197
Consultancy service	0	0	0	2	0	0	2
Other services	1	23	41	259	20	13	357
Total	43	102	74	380	32	44	675

Percentage

Business Type/ Category	Gewog/Thromde						Total
	Samtenling	Dekiling	Gelephu	Gelephu Thromde	Gakiling	Shompang-kha	
Contracts, Construction	2%	6%	12%	66%	0%	14%	100%
Manufacturing, Processing and Production	20%	37%	10%	20%	6%	7%	100%
Consultancy service	0%	0%	0%	100%	0%	0%	100%
Other services	0%	6%	11%	73%	6%	4%	100%
Total	6%	15%	11%	56%	5%	7%	100%

Note: Businesses in Sarpang Town are included in Shompangkha Gewog and Gakiling Gewog.

Source: JICA Project Team based on the data compiled by the erstwhile Department of Cottage and Small Industries (DCSI), MoEA

(7) Education and Health

1) Education

Education in Bhutan is provided free to citizens up to the 12th standard (secondary school). The government, to fulfil its mandate, has developed a system of schools at different levels throughout the country. Residents living in remote villages can also access education through extended classrooms and primary schools. However, there are no institutions of higher learning at the tertiary level in the RCSP Area. Given the relative better accessibility and land availability in Sarpang Town, or the location and conducive climatic conditions in Tsirang, establishment of tertiary level institutions seem a possibility.

Regarding the accessibility of education services, Table 5.3.9 shows the school attendance by sex and Town/Gewog in Sarpang Dzongkhag. When it comes to the never attended rate in urban areas, the male population reaches 1,162 and the never attended ratio is 18.4%, the female population reaches 1,423 and the never attended ratio is 25.0%, then, the total population reaches 2,585 and the never attended ratio is 21.5%. Compared to the above, in rural areas, the never attended ratio of male is 33.4%, female is 43.3%, and both sex is 38.1%. The school attendance of females especially beyond urban areas should be improved even in the RCSP Area.

Table 5.3.9 Population 6 Years and Above by School/Institute Attendance, Sex and Town/Gewog, Sarpang 2017

	Male				Female				Both Sex			
	Currently Attending	Previously Attended	Never Attended	% Currently Attending	Currently Attending	Previously Attended	Never Attended	% Currently Attending	Currently Attending	Previously Attended	Never Attended	% Currently Attending
Urban	1803	3349	1162	28.6	2032	2233	1423	35.7	3835	5582	2585	32.0
Gelephu Thromde	1176	2664	939	24.6	1430	1759	1120	33.2	2606	4423	2059	28.7
Sarpang town	627	685	223	40.8	602	474	303	43.7	1229	1159	526	42.2
Rural	4290	6126	5226	27.4	4316	3745	6155	30.4	8606	9871	11381	28.8
Dekiling *	652	1451	890	21.8	682	744	1009	28.0	1334	2195	1899	24.6
Gakiling *	229	409	384	22.4	210	225	490	22.7	439	634	874	22.5
Gelephu *	1082	1223	730	35.7	1119	825	896	39.4	2201	2048	1626	37.5
Samtenling *	364	505	427	28.1	319	372	506	26.6	683	877	933	27.4
Shompangkha *	177	276	236	25.7	178	151	333	26.9	355	427	569	26.3
Chhudzom	268	448	599	20.4	222	181	647	21.1	490	629	1246	20.7
Chhuzangang	383	422	342	33.4	338	352	426	30.3	721	774	768	31.9
Jigme Chhoeling	310	619	656	19.6	300	297	778	21.8	610	916	1434	20.6
Senggey	118	172	217	23.3	112	103	231	25.1	230	275	448	24.1
Serzhong	476	320	405	39.6	609	259	449	46.2	1085	579	854	43.1
Tareythang	38	48	87	22.0	20	38	55	17.7	58	86	142	20.3
Umling	193	233	253	28.4	207	198	335	28.0	400	431	588	28.2

* The RCSP Area includes southern parts of Dekiling, Gakiling, Gelephu, Samtenling, and Shompangkha Gewogs in addition to Gelephu Thromde and Sarpang town.

Source: Population & Housing Census of Bhutan, Sarpang Dzongkhag, 2017 (NSB)

2) Health

The population of Bhutan is provided free health care services. There are primary health care centres even in remote rural areas. The central regional referral hospital (CRRH) is located in Gelephu Thromde under Sarpang Dzongkhag which explains the high morbidity and mortality rates for Sarpang. This is because patients from the entire central region (Sarpang, Tsirang, Zhemgang, Trongsa, Bumthang and Dagana) may be referred here by their respective hospitals.

Regarding the accessibility of health services, the majority of households (93.4%) in Sarpang Dzongkhag availed of health services during the 12 months prior to the census reference day in 2017. Among those that did not, 86.0% stated that they did not require health services, and 3.7% stated that the health facilities were too far. On the other hand, in the RCSP Area¹¹, only 1.4% stated they were too far. The CRRH and Sarpang hospital contributed to RCSP Area-wide healthcare services not only in quality but also in accessibility.

Table 5.3.10 Reasons for Not Visiting a Health Facility During the Past One Year by Gewog/Town, Sarpang Dzongkhag 2017

	Too Far	No Need	No Faith	No Time	No Money	Prefer Home Treatment	Transport Problem	Other	Total
Urban	2	199	2	2	1	7	1	1	215

¹¹ In this sentence, because it is impossible to divide Gewog-wide statistics into inside and outside of the RCSP Area, the RCSP area includes the following 5 Gewogs (Dekiling, Gakiling, Gelephu, Samtenling, and Shompangkha) in addition to Gelephu Thromde and Sarpang town.

	Gelephu Thromde	2	159	2	2	1	5	1	0	172
	Sarpang town	0	40	0	0	0	2	0	1	43
Rural		23	386	4	29	1	15	4	3	465
	Dekiling *	3	87	1	9	0	0	0	1	101
	Gakiling *	0	16	0	0	1	1	0	0	18
	Gelephu *	1	72	0	2	0	7	0	2	84
	Samtenling *	1	41	1	8	0	0	1	0	52
	Shompangkha *	0	28	0	0	0	0	0	0	28
	Chhudzom	10	50	0	3	0	1	1	0	65
	Chhuzangang	0	16	1	0	0	0	0	0	17
	Jigme Chhoeling	6	21	0	4	0	5	2	0	38
	Senggey	0	4	1	0	0	0	0	0	5
	Serzhong	1	16	0	1	0	0	0	0	18
	Tareythang	0	0	0	0	0	1	0	0	1
	Umling	1	35	0	2	0	0	0	0	38

* The RCSP Area includes southern parts of Dekiling, Gakiling, Gelephu, Samtenling, and Shompangkha Gewogs in addition to Gelephu Thromde and Sarpang town.

Source: Population & Housing Census of Bhutan, Sarpang Dzongkhag, 2017 (NSB)

(8) Other public amenities and services

Considering the accessibility of other public amenities and services, the local community is faced with lack of commercial facilities such as farm shops, and lack of recreation facilities such as indoor sport complexes. Even in the RCSP Area, public investment always focuses on urban facilities in Gelephu Thromde and Sarpang Town and, consequently, rural-urban migration is caused seriously. To solve this problem, it is required to develop the third town in the intermediate belt area, to create job opportunity in rural area, and to empower the local communities.

Furthermore, regarding other public amenities and services, there is no sufficient statistical reference to the accessibility. Moreover, the classification table of these amenities and services is different in each statistic. It is necessary to specify the jurisdiction of each amenity or service, then, the local government can assess the accessibility of each amenity or service.

(9) Religious communities

Table 5.3.11 shows the religious organizations (RO) in Sarpang Dzongkhag, registered at the Commission for Religious Organization (Chhoedey Lhentshog) which was established in 2009 under the Religious Organization Act 2007. According to the Religious Organization Act, ROs are non-profit entities such as associations, foundations, etc., whose purpose and objectives are solely for the benefit of religious institutions and the spiritual heritage of Bhutan.

Table 5.3.11 Religious Organisations in Sarpang Dzongkhag

	Name of the Organisation	Gewog
1	Donga Kunzang Choeling Religious Association	Sershong
2	Shaydrup Chhoeling Religious Association	Sershong
3	Drodul Phendeyling Foundation	Samtenling
4	Pemai Rangdang Foundation	Senggye

Source: Department of Culture, Ministry of Home affairs

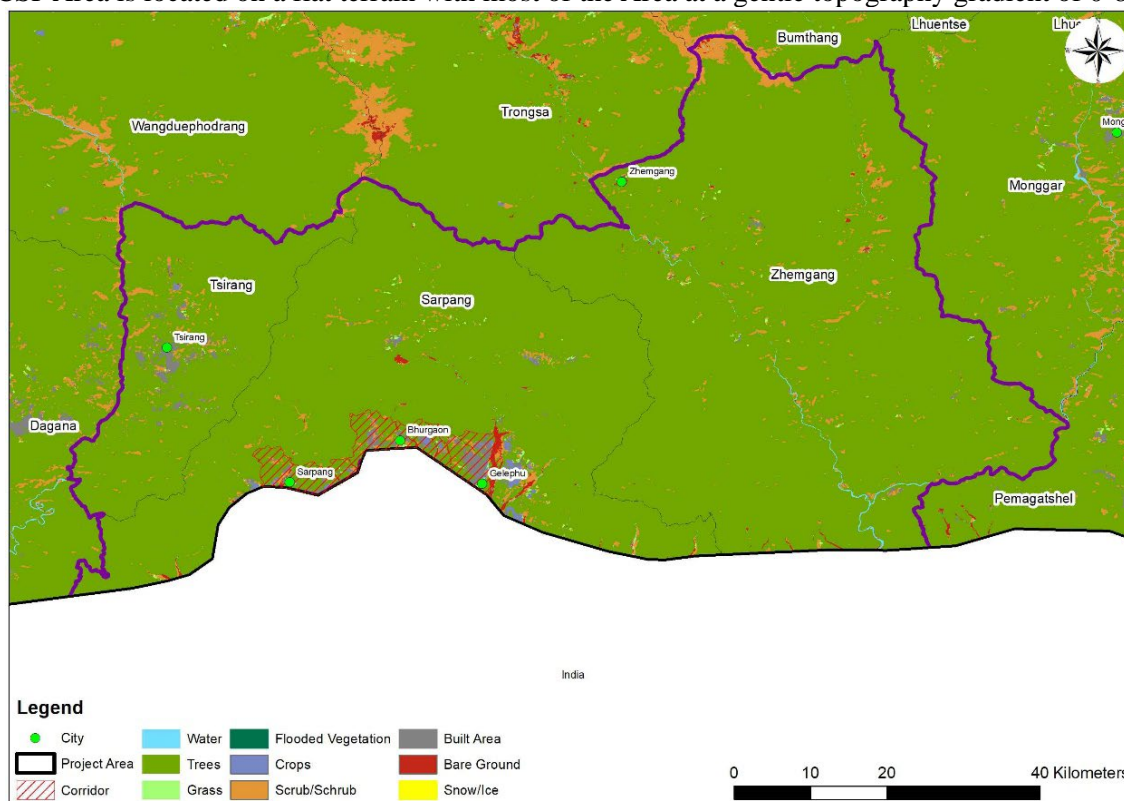
RO usually facilitates the constructive partnership between the Government and religious institutions as well as supports the residents to preside over the religious event/ceremony. In case of Drodul Phendeyling Foundation, which is composed of seven Buddhist women, its activities are building stupas, organizing religious event including a great ceremony (Ganachakra or Tsok offering) that allows everyone to accumulate merit every year. Activities of ROs are monitored by the Commission for Religious Organization (Chhoedey Lhentshog), to ensure their compliance with the above-mentioned Act and with their own articles of associations or charters. The Commission also regulate and ensure that construction of religious structures by the ROs adhere to the traditional and cultural

designs and heritage of Bhutan. It can be said that ROs and the Commission play the significant role to create/preserve religious heritage sites and cultural landscape.

5.3.3 Land use and urbanisation

(1) Land use

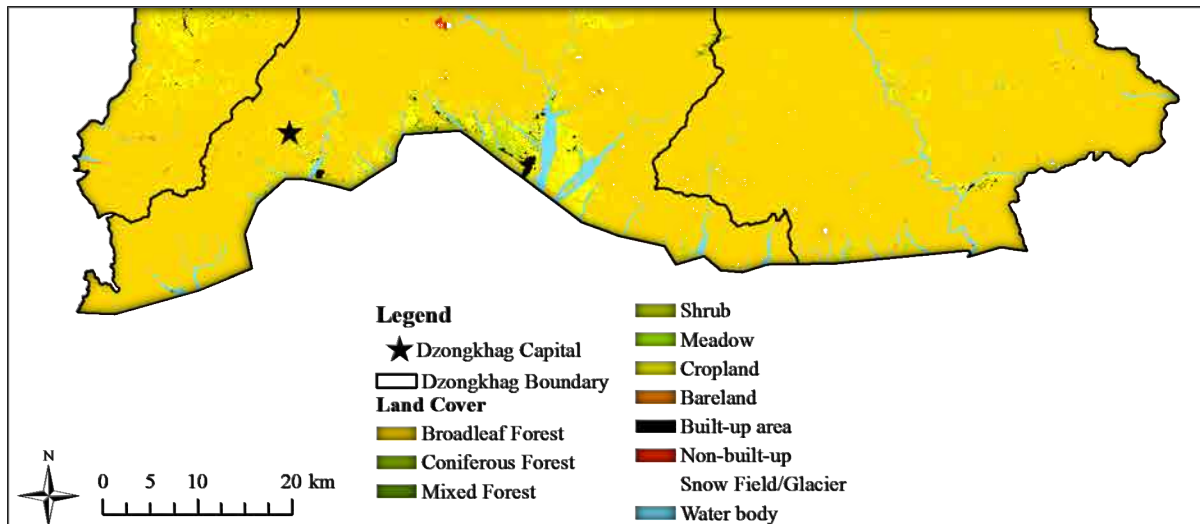
As per Figure 5.3.21, the land use in the Project Area is about 92% forested area. And within it, the RCSP Area is located on a flat terrain with most of the Area at a gentle topography gradient of 0-8%.



Source: JICA Project Team; Kontgis et al., (2021)

Figure 5.3.21 Land Cover Map Prepared by JPT based on Kontgis et al. (2021)

The RCSP Area has the diverse non-tree land use: built area, crops, shrubs, bare ground. It could be seen in the land cover map shown in Figure 5.3.22. This distinctive land cover is due to the RCSP Area being a floodplain with the Manas River and its tributaries surrounding it. According to the existing land use of the RCSP Area, the forest and agricultural lands are widely distributed. Most of the agricultural land is for paddy fields.



Source: CNDP2030

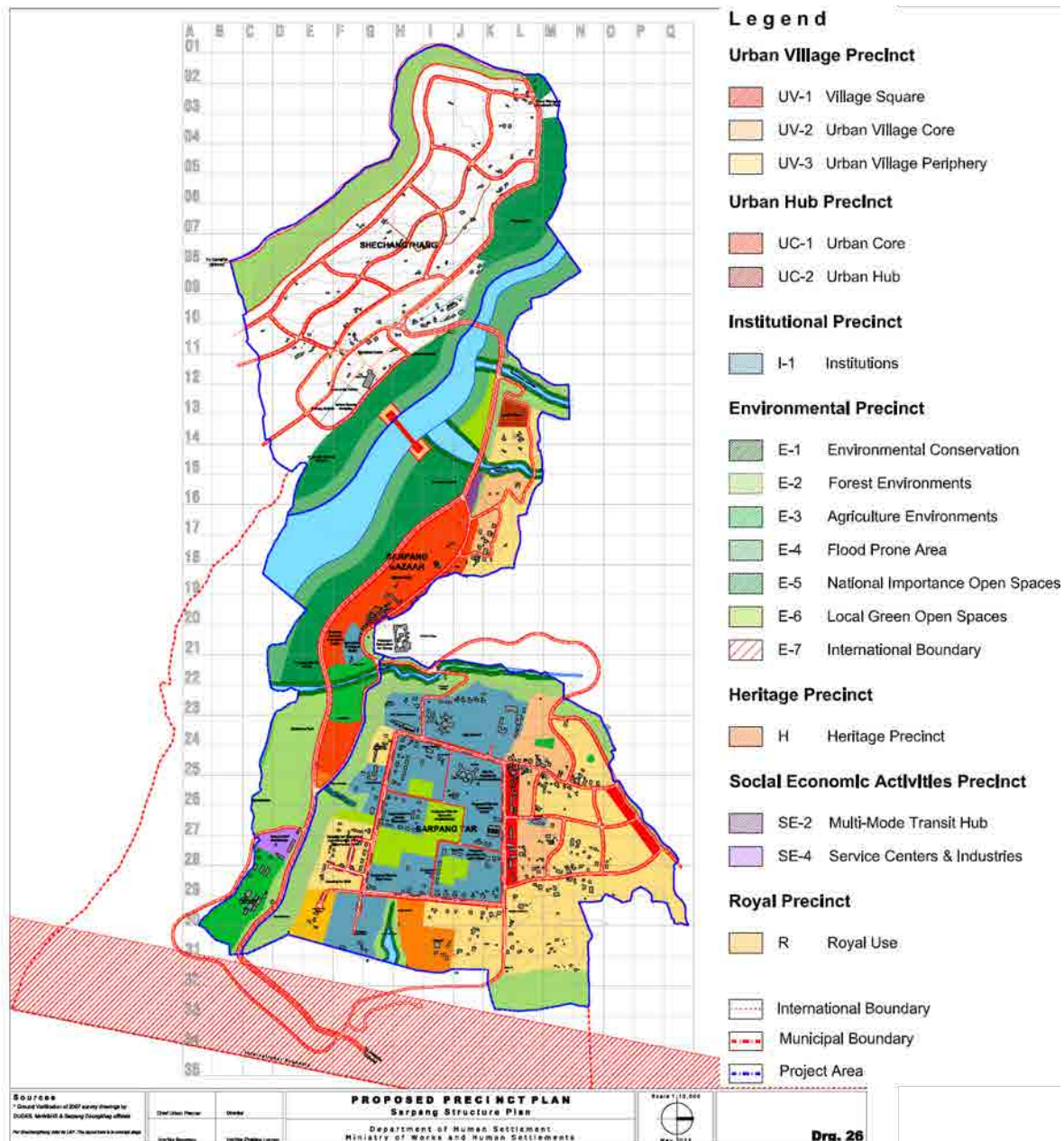
Figure 5.3.22 Land Cover in RCSP Area

The RCSP Area is bound on the east by Gelephu Thromde and west by Sarpang Town. In between are the six gewogs of Sarpang Dzongkhag. The land use in these areas is based on the Land Act 2007 and the respective structure plans. Sarpang Town and Gelephu Thromde are urban areas. They have the following land uses:

Sarpang Town envisions to be an Institutional and Recreational Hub for the entire Southern region of Bhutan combined with its role as the Dzongkhag Headquarter. It will be realised over 25 years through Sarpang Structure Plan approved in 2010. The structure plan has broad land uses such as Commercial, Residential, Institutional, Environment, Heritage and Economy. For their harmonious co-existence and also to allow more flexibility in development, precinct system has been used instead of conventional 'land use'. However, every precinct ensures that the dominant activity of each land use is given priority by allowing it in higher proportion and the other functions are allowed in limited proportion as supportive activities for a seamless transition between the land uses. The precincts are as follows:

- 1) Urban Village Precinct: In term of land use, it is residential but it allows mix uses such as convenience shopping, basic services and amenities;
- 2) Urban Hub Precinct: It is commercial land use with other uses such as residential, recreation and entertainment related uses in lower proportion;
- 3) Institutional Precinct: Other uses incidental to the institutional use not exceeding 20% is permissible;
- 4) Environmental Precinct: Generally open spaces, recreational areas, and areas that require protection and preservation such as steep slope, flood prone areas, etc.;
- 5) Heritage Precinct;
- 6) Special Economic Precinct, and
- 7) Royal Precinct.

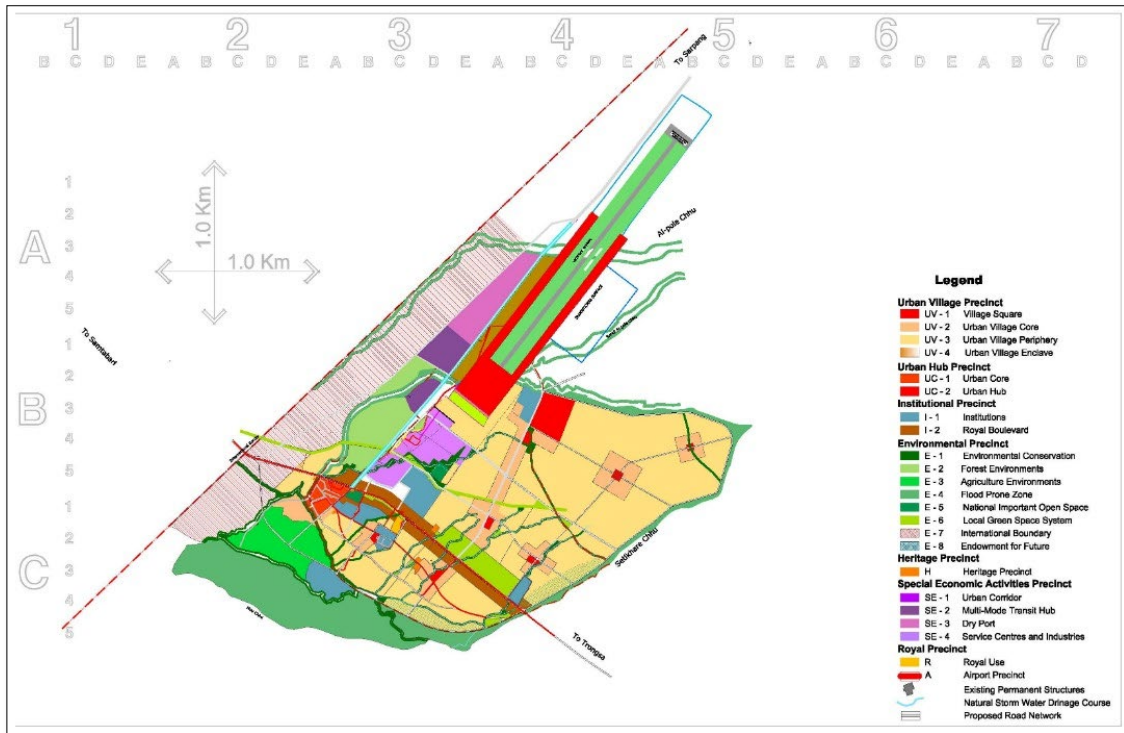
There are in total seven different types of precincts.



Source: Precinct Plan, Structure Plan for Sarpang

Figure 5.3.23 Land Use Plan for Sarpang

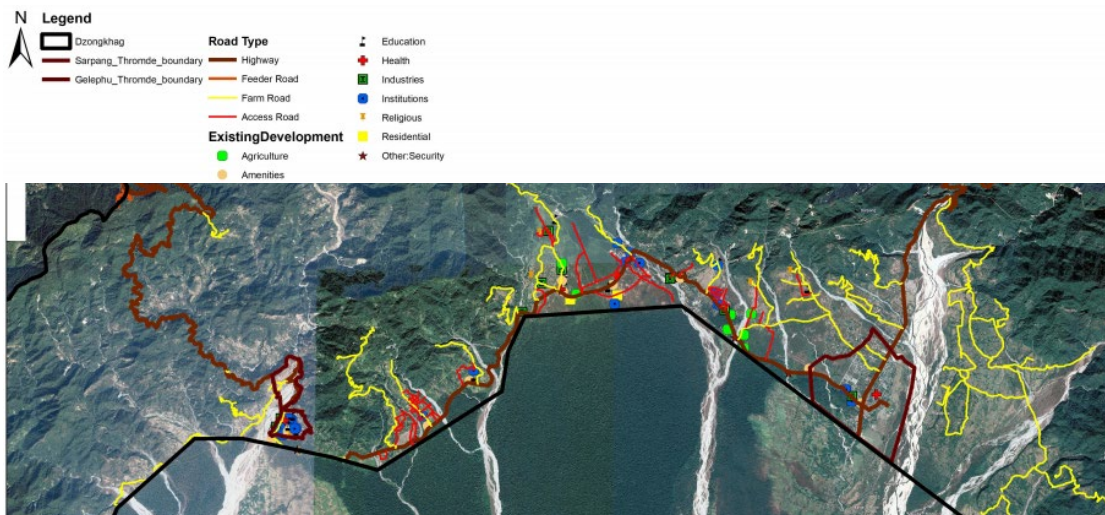
Gelephu Thromde envisions to be the focal point of Bhutan's future manufacturing sector which will attract global investment, with highly skilled blue-collar labours, transport, energy, water and develop industrial plots. It expects to realize its vision over a period of 20 years through its structure plan approved in 2005. As aforementioned, the precinct system of land use has been used for flexibility and harmonizing various land uses seamlessly. It also has seven different types of precincts as that Sarpang Structure Plan.



Source: Revised Proposed Precinct Plan, Gelephu Structure Plan

Figure 5.3.24 Land Use Plan for Gelephu

The Intermediate Belt between Sarpang Town and Gelephu Thromde has all categories of land listed in the Land Act 2007 namely Chhuzhing, Kamzhing, Cash crop land (apples, oranges, cardamom, any other cash crops), Residential Land, Industrial Land, Commercial Land, and Recreational Land. It also has institutional and religious establishments. One of the major differences between the Sarpang Town and Gelephu Thromde and the Intermediate belt area is that the latter is not a declared municipality and therefore it is a rural area. It doesn't have precinct system of land uses.



Source: Preliminary Report on Sarpang-Gelephu Corridor, DHS

Figure 5.3.25 Existing Development along the corridor

(2) Urbanisation

According to the PHCB 2017, 21.7% of people have migrated to urban areas leaving agricultural land fallow and their village house empty resulting in 4,800 gungtongs (empty households).

As per the Report ‘Rural-Urban Migration and Urbanisation in Bhutan’ published by NSB in 2018, the annual volume of rural-urban migrants and the rate of Urbanisation is already declining. The annual urban growth rate in the five years before the 2005 census was 7.3%. The annual growth rate between 2005 and 2017, had decreased to 2.9 percent per year. Specific to Sarpang, the net in-migration in 2005 was 1389 and in 2017 it was 6,078. There has been increase in population by 77% between 2005 and 2017. The population status gewog-wise in Table 5.3.12 shows that except for Gakiling, all the gewogs within the RCSP Area have increase of population. There is also increase of population in the Sarpang Town and Gelephu Thromde.

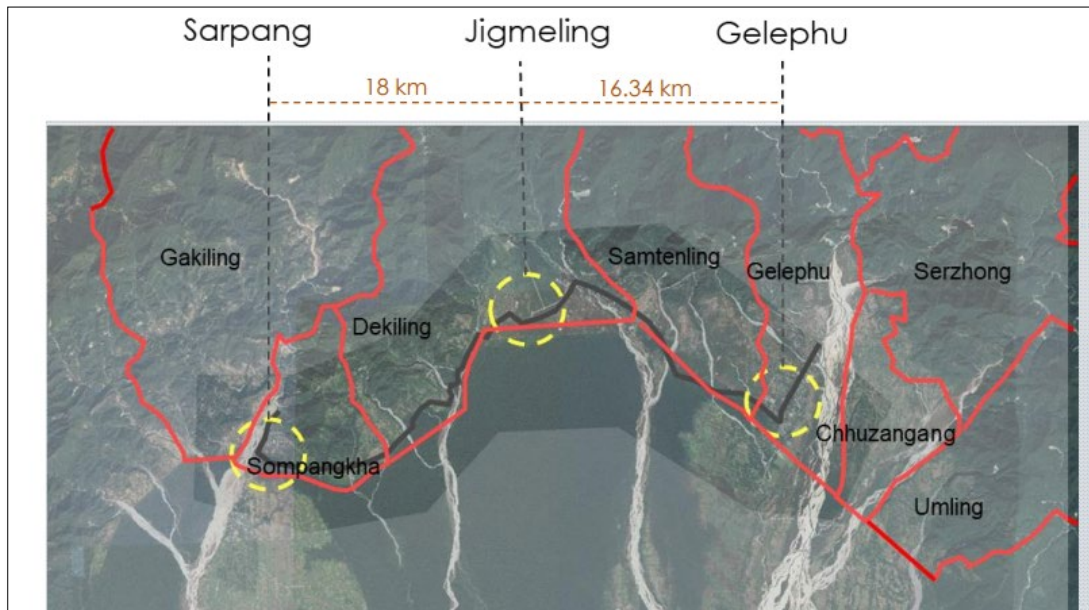
Table 5.3.12 Distribution of the Population by Gewog/Town and Sex, Sarpang (2005 & 2017)

Gewog/Town	(in Persons)							
	2005				2017			
	Male	Female	Total	Sex Ratio	Male	Female	Total	Sex Ratio
Urban	6,247	5,571	11,818	112.1	6,798	6,212	13,010	109.4
Sarpang Town	1,343	1,276	2,619	105.3	1,652	1,500	3,152	109.2
Gelephu Thromde	4,904	4,295	9,199	114.2	5,146	4,712	9,858	110.2
Rural	13,085	12,198	25,283	107.3	17,220	15,774	32,994	109.2
Chhuzagang	1,227	1,199	2,426	102.3	1,262	1,237	2,499	102.0
Chhudzom	1,009	1,055	2,064	95.6	1,460	1,204	2,664	121.3
DeKilng	2,051	1,784	3,835	115.0	3,290	2,690	5,980	122.3
Gelegphu	2,127	1,848	3,975	115.1	3,314	3,143	6,457	105.4
Gakiling	1,291	1,226	2,517	105.3	1,105	1,020	2,125	108.3
Jigmehchoeling	1,728	1,686	3,414	102.5	1,743	1,515	3,258	115.0
Samtenling	761	756	1,517	100.7	1,456	1,345	2,801	108.3
Serzhong	1,029	1,016	2,045	101.3	1,285	1,422	2,707	90.4
Shompangkha	573	557	1,130	102.9	757	729	1,486	103.8
Senggey	444	298	742	149.0	569	511	1,080	111.4
Umling	792	754	1,546	105.0	754	832	1,586	90.6
Tareythang	53	19	72	278.9	225	126	351	178.6

Source: Population and Housing Census of Bhutan, 2005 & 2017

Source: PHCB, 2005 & 2017

Relating the above statistics to urbanisation, while there is no specific survey done to verify the situation in the RCSP Area, it is important to understand it through the administrative categorization of urban and rural areas. In terms of area categorization, Sarpang Town and Gelephu Thromde are urban and the Intermediate belt area is rural. The boundaries of these two municipalities were declared through a process of deliberation at the Parliament. The expansion of their boundaries and declaration of areas within the Intermediate belt area as urban will be subject to Parliamentary process. However as shown in Figure 5.3.26, due to the location of Sarpang Town and Gelephu Thromde, there is apparently urban sprawl taking place in their urban peripheries and along the corridor. The Intermediate belt area already has development similar to those of Sarpang Town and Gelephu Thromde. Jigmeling Industrial Park and settlements around is a town already and the presence of institutions, commercial establishments, and religion’s structure will continue to fuel development by individuals owning land along the corridor. Disregard of whether the corridor area would be recognized as urban area, urbanisation is taking place and given the trend it will increase.

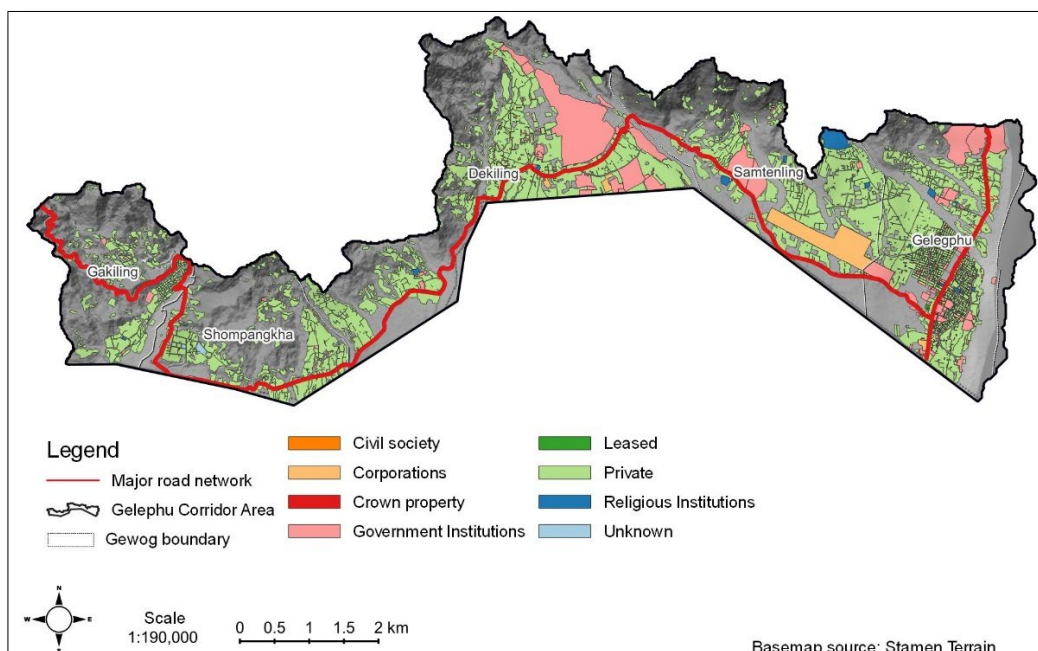


Source: Preliminary Report on Sarpang-Gelephu Corridor, DHS

Figure 5.3.26 Sarpang Town, Gelephu Thromde and Gewogs along the Corridor Including Jigmeling

While urbanisation would bring about population concentration and socio-economic development, if urban sprawl and haphazard development is not taken care it will destroy agriculture field and forest, worsen the disaster situation, and deteriorate scenic beauty.

The plot analysis based on the land ownership in the Figure 5.3.27 shows that the private ownership of land along the highway is proportionately high. It is highly probable that the fragmentation of even in the agriculture land with take place at higher frequency. Despite the stringent procedure to convert the agriculture land to other uses, the law allows subdivision of land if a due process specified in the Land Act of Bhutan 2007 is followed.



Source: JICA Project Team

Figure 5.3.27 Plot Analysis based on land ownership

5.3.4 Environment

(1) Policy and Legal Environment

Bhutan has many legislations, strategies and standards governing environmental conservation. A summary of some of the legislations pertinent to this Project are:

- 1) Environment Assessment Act (EAA) 2000, Regulation for Environmental Clearance of Projects 2016, and the Regulation on Strategic Environmental Assessment (SEA) 2002

Bhutan introduced Environmental Impact Assessment (EIA) into the decision-making process for land use change and new development in the 2000s, through the EAA 2000, and the Regulation for Environmental Clearance of Projects, 2016 (amendment of the 2002 regulation. This legislation requires the government to ensure that potential impacts are assessed, and environmental concerns are fully considered when formulating, renewing, modifying, and implementing any policy, plan, or programme. In addition, the Regulation establishes procedures and defines responsibilities for the implementation of the EAA 2000 concerning the environmental assessment process. The Regulation on Strategic Environment Assessment 2002 requires that the cumulative and large-scale environmental effects are taken into consideration while formulating, renewing, modifying, or implementing any policy, plan, or program.

- 2) Forest and Nature Conservation Act (FNCA)1995 and Regulation 2017

The Act provides for the regulation of use of public and private forests and the protection of forests, wild animals and plants, and the conservation of soil and water resources. The objective of the FNCA and its Regulation is to “provide for the protection and sustainable use of forests, wildlife and related natural resources of Bhutan for the benefit of present and future generations”. It also provides legal environment for community-based resource management and utilization, community forestry, transport & trade of forest produce, soil & water conservation and royalty free domestic consumption of non-wood forest products (NWFP) that are not in the list of Schedule 1 of the Act.

- 3) National Environment Protection Act (NEPA) 2007

The NEPA 2007 as an umbrella Act on environmental conservation provides the principles and legal and institutional framework for an effective system to conserve and protect the environment. The NEPA 2007 also outlines financing mechanisms for environmental conservation and provides the right to environmental information as well as rights of citizens to participate in environmental decision making.

- 4) Waste Prevention and Management Act 2009 and its Regulation 2012 (and Amendment 2016)

To promote environmentally sound waste management practices, the Waste Prevention and Management Act and Regulation of Bhutan have come into effect with the view to promote 3Rs and ensure all developmental activities that generate waste are planned and executed in harmony with the carrying capacity of the country’s fragile ecological settings and geographical terrains.

- 5) Water Act 2011 and its Regulation 2014

This legislation applies to all issues related to water resources management and water use with the objective to ensure water is protected, conserved and/or sustainably managed through prioritization of water use, protection of water catchments and watersheds, development of National Integrated Water Resources Management Plans (for the conservation, development and management of water resources and river basins), ensure Minimum Environmental Flow requirement of rivers, prohibition to abstract or use water without Environmental Clearance (except for exemptions) and ensuring prevention and control of water pollution.

6) The Middle Path: National Environment Strategy 2020

The strategy emphasizes the need to conduct the Strategic Environment Assessment and Cumulative Impact Assessment for development activities. Amongst others, it essentially reinforces the Spatial Planning Standards, 2017 and recognises the importance of ensuring that spatial human settlement plans are within the carrying capacity of the planning area.

7) National Integrated Solid Waste Management Strategy 2014 and National Waste Management Strategy 2019

While the former sets short-, medium- and long-term targets for three Rs and improvement of disposal sites for municipal solid waste management, the latter provides strategic direction and tool to deal with all waste streams with targets at different timescales based on the principles of circular economy, and measures to address barriers to coordination and implementation.

8) Environmental Standards 2020

All developmental activities are required to comply with the Environmental Standards 2020 that sets out standards/criteria/parameters/limits for ambient environmental (air, water, and noise) quality standards and point source emissions.

9) Climate Change Commitment (mitigation: low emission development strategies and adaptation)

Bhutan has declared to remain carbon neutral at the 15th Conference of Parties to the UNFCCC in 2009 in Copenhagen, Denmark and has further reiterated its commitment in the Climate Change Policy 2020, first Nationally Determined Contribution (NDC) 2015 and second NDC 2021. The NDC elaborates priority mitigation actions in the form of low emission development strategies – human settlement, industries, food security, REDD plus and surface transport, and adaptation components. In complying with the UNFCCC and the Paris Agreement, Bhutan has developed and submitted three National Communications and the First Biennial Update Report to the UNFCCC.

To develop a roadmap to remain carbon neutral for all times to come, Bhutan has developed the Long Term Strategy as well as sectoral Low Emission Development Strategies covering the Manufacturing, Transport, Food Security (Agriculture and Livestock) and the Human Settlement Sectors.

In responding to the rapidly changing climate, Bhutan is in the process of formulating its first National Adaptation Plan which will be submitted to the UNFCCC within the next few months. The adaptation assessment includes biodiversity as well as key economic sectors and infrastructure.

10) Climate Change Policy of the Kingdom of Bhutan 2020

The Climate Change Policy of the Kingdom of Bhutan is guided by the fundamental state policies and fundamental rights and duties enshrined in the constitution of the Kingdom of Bhutan, including the state policy “to ensure a good quality of life for the people of Bhutan in a progressive and prosperous country that is committed to peace and amity in the world,” the fundamental rights and duties of each citizen to act as a trustee of the Kingdom’s natural resources and environment for the benefit of present and future generations, and the recognition of intergenerational equity and provision of a safe and healthy environment and for present and future generations of the people of Bhutan's intergenerational equity, among others. The policy adheres to several policy objectives, including pursuing carbon neutral development, building resilience to climate change, ensuring means of implementation, and effective and coordinated actions. It discusses conformity and compliance of the policy with relevant legislation, and the implementation procedure.

11) Economic Development Policy 2016 and Fiscal Incentives (Amendment) Act of Bhutan 2022

The Economic Development Policy 2016 sets the agenda and the general direction for the development of sectors with the highest potential. This Policy departs from the usual sector-based approach and has been prepared in consultation with a wide range of stakeholders from private to government.

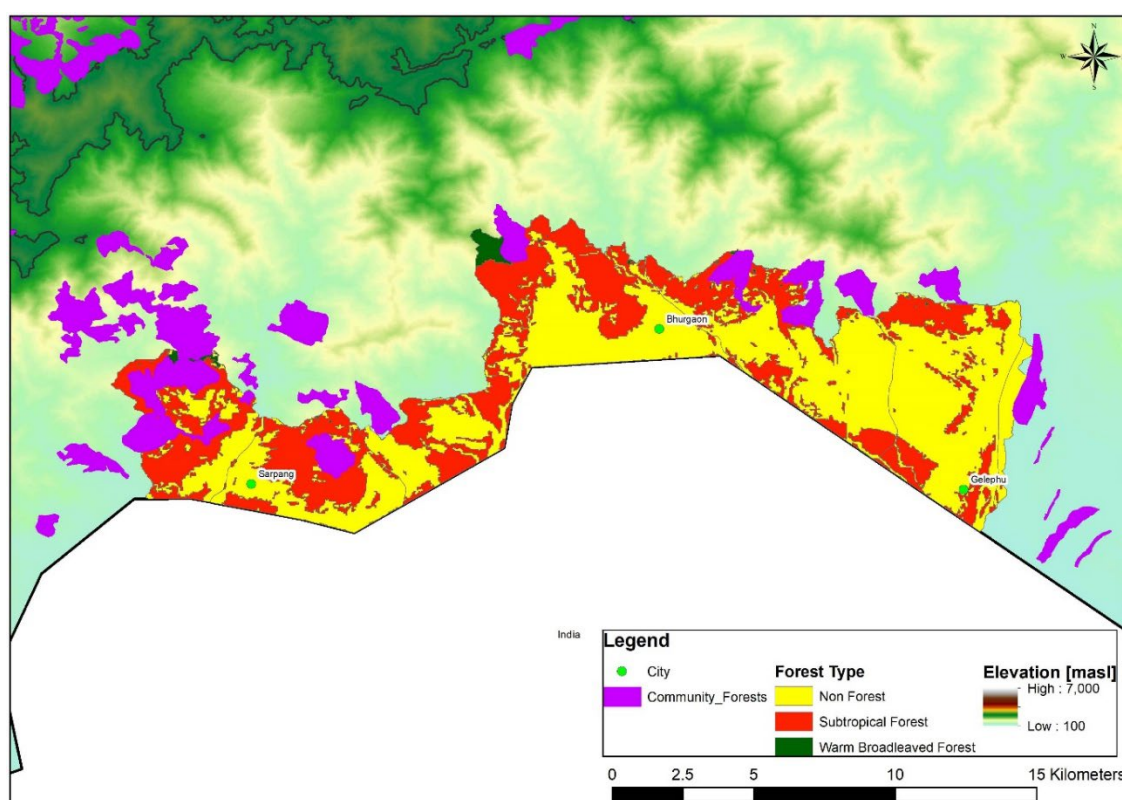
Bhutan’s commitment to remain carbon neutral contributes to developing the “Brand Bhutan” and more recently “Bhutan Believe” theme and will be pursued to capitalize on the opportunities arising from the global trends towards low emission development and global best practices. The Fiscal Incentives Act 2017 and Amendment 2022 provides the fiscal incentives (tax exemptions and concessions) to stimulate economic growth, foster private sector development and generate employment. Under this Act, types of incentives or exemptions included are income tax holiday, reinvestment allowance, tax rebate, income exemption, additional expenditure deduction, Tax Deducted at Source (TDS) exemption, sales tax exemption, customs duty exemption, and concessional customs duty.

(2) Existing Environmental Conditions

While most of the RCSP Area falls in pristine agriculture and forest ecosystems, the urban centres of Zhemgang, Tingtibi, Gelephu, Sarpang and Tsirang do not retain many of the salient features of an undisturbed natural environment and are poised to become the hub of economic activities in the years to come. This section describes the baseline environmental conditions from information collected through literature review, field visits and actual measurements.

1) Forest cover

Forest cover in the RCSP Area is shown in Figure 5.3.28. The total forest cover is 68% out of which community forests comprise 2%. The area is mainly covered with subtropical forest accounting for 48%, and the warm broadleaved forest makes up 19.7% of the land area. In total Sarpang Dzongkhag has 90% forest cover (146852.30 ha)¹².



Source: JICA Project Team based on erstwhile MoAF, Department of Forests and Park Services data

Figure 5.3.28 Map of Forest Cover in the RCSP Area

2) Protected areas and biodiversity

Bhutan is home to several protected areas, including national parks, nature reserves, wildlife sanctuaries and biological corridors. These protected areas are designed to conserve the country’s rich

¹² MoAF, 2016. Land Use and Land Cover of Bhutan 2016. Maps and Statistics

biodiversity and natural heritage while also contributing to climate mitigation by acting as global carbon sinks. Two RCSP hosts two notable protected areas and biological corridors which are described below in addition to bordering other protected areas such as the Phrumsengla National Park and the Jigme Singye Wangchuk National Park.

3) Phibsoo Wildlife Sanctuary

Phibsoo Wildlife Sanctuary (PWS) is the smallest protected area amongst the other Protected Areas in Bhutan with an area of 269 km².

The elevation in the park ranges from 200 meters to 1,600 meters above mean sea level. PWS stretches its border from right flank of Punatsangchhu (Sunkosh) River in the west till Singye village in the east and with Dhanishri ridge bordering the north edge. The entire southern boundary shares Indo-Bhutan International border with Ripu-Chirang Reserved Forest. PWS covers Nichula and Singye gewog under Dagana and Sarpang dzongkhag.

PWS falls in the Indo-Malayan bio-geographic realm. The entire area has sub-tropical forest ecosystem which can be categorized into Sub-tropical Semi Evergreen Forest, Sub-tropical Moist Deciduous Forest and Subtropical Moist Evergreen. There are approximately 1259 acres of plantations created between 1960 and 1975. PWS has one of the richest biodiversity, despite being the smallest park in the country. It is home to all the eight (8) cat species, Asiatic elephant, guar and endangered golden langur. It is the only natural habitat of spotted deer (Chital) and wild sal and agar wood forest in the country. In the recent past PWS have proven to be the potential habitat of globally endangered, White-bellied heron along Phibsoo river and Longa river. It has over 300 acres of pristine subtropical rangeland, which is potential prime habitat of pygmy hog and hispid hare. There are about 637 species of flowering plants, 28 species of mammals and 132 species of birds recorded still there are chances of increasing the numbers of flora and fauna over time.

4) Royal Manas National Park

Royal Manas National Park is the oldest National Park situated in the south-central foothills of Bhutan. Spanning an area of 1057 km², the national park falls within the political jurisdiction of three Dzongkhags i.e., Zhemgang, Sarpang and Pemagatshel.

Connected by the biological corridors to Jigme Singye Wangchuk National Park in the northwest, Phibsoo Wildlife Sanctuary in the southwest, Phrumsengla National Park in the northern centre, Jomotshangkha Wildlife Sanctuary in the southeast, the location of Royal Manas National Park is notably outstanding and forms the cornerstone of protected area network in Bhutan. Further the national park abuts with Indian Manas National Park in the south, forming a significant part of Transboundary Manas Conservation Area (TraMCA) for promoting landscape level ecosystem management.

RMNP is famed for harbouring one of the greatest populaces of wildlife diversity. The park has 558 species of flora, 65 species of mammals, 489 species of birds, 60 species of fishes and more than 180 species of butterfly species recorded till date. Out of the 65 mammal species recorded, 2 species are critically endangered, 8 species are endangered, 9 species are near threatened and 11 species belong to vulnerable list. Species from 8 orders belong to The International Union for Conservation of Nature Red List.

5) Ambient air quality

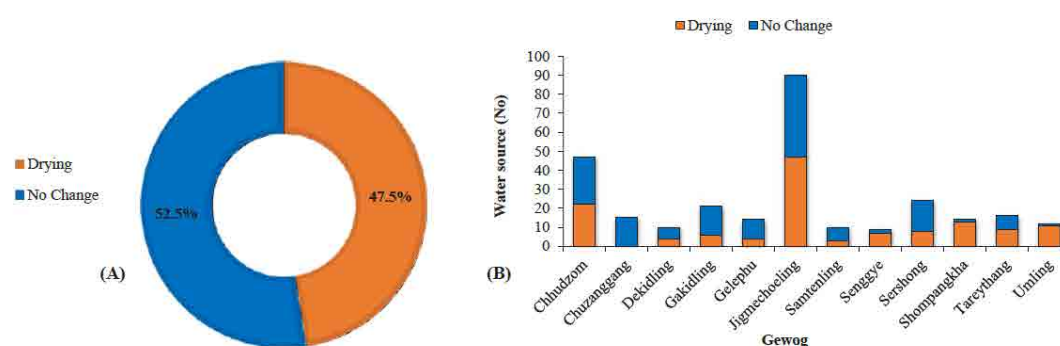
Air quality in the project area is observed to be clean in the RCSP Area with slight seasonal variations due to incidences of forest fires, local development works and transboundary pollutant transfers. Although there is no air quality monitoring established and data on the ambient air quality is not available, the ambient air quality is expected to be clean and in line with the Environmental Standards 2020. However, air quality may be moderate to poor along the southern foothills due to transboundary movement of air pollution especially in Gelephu owing to rapid developmental activities like operation

of Centennial distillery project and development of Jigmeling Industrial Park (which will house number of polluting industries) and its close proximity to Indo-Bhutan border.

Nonetheless, data on the ambient air monitored at Jigmeling in 2016 as part of the EIA studies for Jigmeling Industrial Park shows that the air quality is clean. The readings of ambient air quality conducted for post monsoon are average values of Suspended Particulate Matter (32-51 $\mu\text{g}/\text{m}^3$), PM 10 (14-23.8 $\mu\text{g}/\text{m}^3$), Sulfur-Dioxide (4.5-4.9 $\mu\text{g}/\text{m}^3$), Nitrogen Dioxide (12.5-19.5 $\mu\text{g}/\text{m}^3$) and Carbon Monoxide (0.2-0.3 mg/m^3).

6) Water Resources

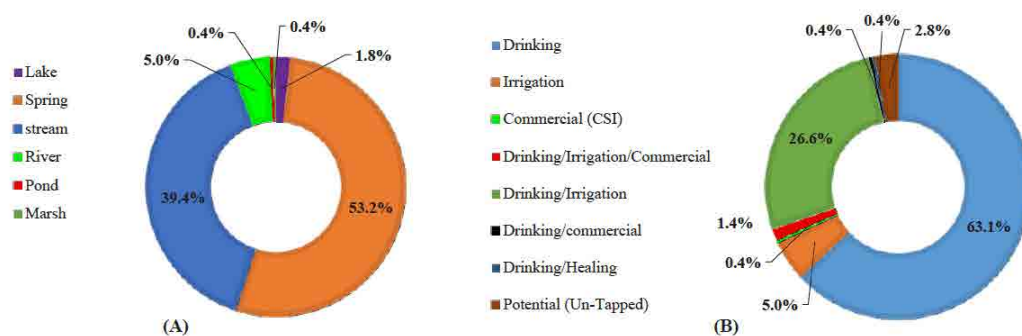
Sarpang dzongkhag currently taps 282 water sources across 12 gewogs with highest number in Jigmecholing gewog (90) followed by Chhudzom gewog (47). Out of 282 water sources, 134 are in drying up state and the remaining 148 are in no change status with no dried-up issues (Figure 5.4.29)¹³.



Source: Erstwhile MoAF, Department of Forests and Park Services, 2021

Figure 5.3.29 Status of Water Source: (A) Dzongkhag and (B) Gewogs

The major water source in Sarpang dzongkhag are springs which constitutes about 53.2 % followed by streams with 39.4 %. Remaining water sources are from rivers, few from small lakes, ponds and marshes (Figure 5.4.29).



Source: Erstwhile MoAF, Department of Forests and Park Services, 2021

Figure 5.3.30 Sarpang Dzongkhag: (A) Types of Water Source and (B) Uses of Water Source

About 178 water sources (63.1%) are solely used for drinking, 75 water sources (26.6 %) caters to both drinking and irrigation and 14 water sources (5%) are used only for irrigation purpose. There are four

13 MoAF, Department of Forests and Park Services, 2021. Assessment and Mapping of Water Sources in Bhutan

water sources that are used for drinking, irrigation and other commercial purposes (industries) in Sarpang dzongkhag (Figure 5.3.30).

7) Environmental Precinct

According to Sarpang Structure Plan, up to 300 m from the international border is considered as an international buffer. As for the Gelephu Thromde, the international buffer is up to 500 m. The environmental precincts of the Sarpang and Gelephu are as follows in Table 5.3.13. The Environmental Precinct takes into cognizance the Environmental aspects related to a town at various levels and related concerns.

Table 5.3.13 Environmental Precinct Definitions

	Environmental Precinct	Sarpang Town ¹⁴	Gelephu Thromde ¹⁵
E-1	Environmental Conservation Precinct	Enhancement and protection of Sarpang's fragile ecological legacy.	Enhancement and protection of Gelephu's fragile ecological legacy.
E-2	Forest Environments	Precincts devoted to the natural forest preserves.	
E-3	Agricultural Environments	Precincts characterized by paddy lands, agricultural areas, flood plains and other farming activities.	
E-4	Flood Prone Zone	Zones with risk of flooding where development must be allowed only after necessary flood protection measures are adopted.	
E-5	National Importance Open Spaces	Precincts of national importance such as a regional sports complex, archery ranges.	
E-6	Local Green Space System	Precincts of public assets like parks, gardens, sports and recreation areas.	
E-7	International Buffer Zone	300M wide no development zone along the Indo-Bhutan Border.	500M wide no development zone along the Indo-Bhutan Border.
E-8	Endowment for the Future	Precincts of land whose use determination is differed to future generations.	

Source: Gelephu Thromde 2021; Erstwhile MoWHS

8) Key Environmental Issues in the SCRP Area

Deforestation

Forest area increased from 2.63 million ha in 2000, to 2.65 million ha in 2010, 2.70 million ha in 2015 and 2.72 million ha in 2021. This results in a total forest cover of 71% in 2021. Therefore, deforestation is not a discernible land use trend in Bhutan from a land use/land cover change perspective. Given the high forest cover in the SCRP area and the limited land available to accommodate development, it is expected that deforestation would be the likely outcome. Development works create the demand for natural resources such as timber, stones, sand and other construction material and the extraction of these materials would also result in deforestation and disturbance in the ecosystem services of the forest and natural landscapes.

Forest cover in Bhutan in general has been increasing since the 1990s owing to strict legislations and conservation centred policies. However, considering the impact of the COVID-19 pandemic on the Bhutanese economy and the imperative to quickly recover, forests and forest-based products may be the low-lying fruits to spur economic growth which may lead to decreased forest cover in the long run. In the protected area itself, the Department of Forest and Park Services had identified 17,170 ha in Phibsoo Wildlife Sanctuary, 57,516 ha in Royal Manas National Park and 69,215 ha in biological

14 MoWHS, Department of Human Settlement. Sarpang Structure Plan 2010-2035

15 Gelephu Thromde, Development Control Regulations 2021

corridors and potential forest production areas¹⁶. Further, the same report identified a total of 22,984 ha in Zhemgang, 11,521 ha in Sarpang and 13,700 ha in Tsirang as potential forest production areas outside of the protected areas.

Understanding the current priorities of economic development, pressure on forest resources is expected to increase in the coming years which may lead to deforestation and reduced forest cover unless adequate safeguards are developed and implemented (Figure 5.3.31).



Source: JICA Project Team

Figure 5.3.31 Pressure on Forest from Development (Building a House (L) and Constructing a Road (R))

Overall, the area's unique flora and fauna will be protected, which would also be significant for tourism purposes. The potential of the RCSP Area is enormous taking into consideration the different kinds of development activities being undertaken and becoming the Southern gateway to Bhutan. It has potentials to attract international, regional, and domestic tourists.

Drying of Water Sources

Across Bhutan, spring and other local water sources are drying up, seasonally or completely, often attributable to rising temperature, reduced spring and winter precipitation and declining snow cover areas. In Bhutan, climate change will likely impact water availability to rural and urban communities, whose residence are typically high above the major rivers and streams. From the 6555 water sources identified in the country, 2,317 (35 percent) are drying up while 147 sources have dried up (Kuensel, 2021).

Human Wildlife Conflict

Human-wildlife conflict (HWC) is a critical issue for Bhutan where almost 60% of the population directly rely on livestock and crop production for livelihoods while coexisting with rich and highly biodiverse habitats. It is difficult to accurately quantify the full extent of human and economic loss of HWC in Bhutan due to crop loss, livestock depredation and attacks on people. This is largely due to the lack of a single national reporting system and database. Available data are either not on an annual basis or not accurately collected. In the SCRP area, HWC featured as one of the key concerns during the stakeholder consultations. HWCs in the project area include crop damage from elephants, wild boar, deer, monkeys and other herbivores, livestock predation by tigers, leopards, bears and other predators. Responding to the increasing incidents of HWC, the government reviewed the HWC Strategy 2008 and adopted the National Human-Wildlife Conflict management Strategy 2018-2028.

The natural environment in the RCSP Area is quite unique within Bhutan with vast expanses of open area, plains and rich forestry and greenery with interweaving water bodies. These natural settings form important wildlife habitat and serve as migratory routes, which are linked with the human-wildlife conflicts. In order to reduce the incidences of human-wildlife conflicts, habitat connectivity must be

¹⁶ MoAF, Department of Forests and Park Services. Forest Resources Potential Assessment 2010

ensured for the wildlife. This entails identifying the current migratory routes and protecting the critical habitats and connectivity to them that may include additional areas to be protected, including the national highways.

The RCSP Area is heavily used by elephants that are considered endangered species. Due to the effects of climate change and anthropogenic activities, the habitats are degraded. Thus, the current area is a very critical area for the elephants for water resources and migrating to and between the wildlife sanctuary and the national parks. For the protection of the habitat migratory routes, it is important to consider the enrichment of the natural habitat and clearing of invasive species.

Air Pollution

Air quality indicators and systematic observation of air quality data is not available in Bhutan and very little information is available for air quality data. Information accessed through the EIA reports of different projects at the NEC indicate that air quality in Bhutan is good with lower concentration of PM_{2.5} and PM₁₀. While the concentration of particulate matter in the air varies based on local meteorological conditions, a priority pollutant to be considered for planning are fine particulate matter (PM₁₀ and below) as they can penetrate deep into the lungs, enter the bloodstream, and travel to organs causing systemic damages to tissues and cells. As part of the JPT field visits, the following PM₁₀ and PM_{2.5} data was collected using a portable air quality measuring instrument which uses infrared particle counters (Table 5.3.14).

Table 5.3.14 Ambient Air Quality Sampling

Date	Sampling time	Station	PM 2.5 (ug)	PM 10 (ug)	Total RSPM (ug)
16.5.22	10.30 hrs to 18.00 hrs	Thromde Office Parking, Gelephu	9.34	19.76	29.1
18.5.22	9.30 hrs-21.30 hrs	Town area, Tsirang	5.76	19.81	25.57
20.6.22	08.00 hrs - 20.00 hrs	Town Area, Zhemgang	4.28	9.33	13.61
22.6.22	06.00 hrs - 18.00 hrs	Town Area, Gelephu	11.98	21.22	33.2
25.6.22	07.00 hrs - 19.00 hrs	Town Area, Tsirang	7.21	17.66	24.87
9.10.22	09.00 hrs - 21.00 hrs	Town Area, Gelephu	11.23	17.61	28.84
13.10.22	07.00hrs - 19.00 hrs	Jungle Lodge, Panbang	3.45	8.22	11.67
26.11.22	08.00 - 20.00 hrs	Jigmeling Industrial Park, Gelephu	6.92	10.11	17.03

Source: JICA Project Team

From the random sampling collected so far, it can be surmised that air quality in the project area is not yet a public health concern and while Number Resource Policy Manuals (particle size greater than 10 microns) can vary due to various meteorological conditions, the priority pollutant concentration is well below World Health Organisation (WHO) standards.

Since the RCSP Area will be further developed with industrial parks and other development activities, with a significant population increase; it is quintessential to take extra care and effort into raising people's awareness as it plays a key role in consensus building among the communities and ensuring environmental protection and compliance. Based on the examples of developed and other developing countries, proper planning, transparency, and involvement of stakeholders can all lead to minimizing unwanted outcomes and disasters in terms of environmental pollution.

Waste Management

Waste management is fast becoming an emerging environmental issue as the Bhutanese society transforms from a subsistence farming lifestyle to consumption of more packaged goods. The current focus of waste management is on reducing, reusing, and recycling waste through the use of traditional practices and modern technology. The country has implemented a "zero waste" policy, which aims to

minimize the amount of waste sent to landfills and encourages the use of composting and recycling. The government works closely with local communities to raise awareness about waste management and to promote sustainable practices.

The National Waste Inventory Survey 2019 revealed that the country’s total solid waste generation in a day was 172.16 metric tons and per capita waste generation 0.23 kilogram a day. Of the total waste generation, almost 50 percent of it comes from households, followed by commercial units at 40 percent. In waste composition, nearly half the total waste, or 46 percent, comprises food waste, indicating the potential for composting. Plastic and paper wastes make up 33 percent of the total wastes, indicating potential for recycling or reuse.

Waste collection, transport and disposal in the urban areas are fairly well developed but the same facilities are not available in the rural areas and rural wastes are generally disposed in pits or through open burning which have both human health and environmental impacts.

5.3.5 Heritage sites and cultural landscape

Heritage sites and cultural landscape are our link to the past and hope for the future. They form important components of the pillars of Gross National Happiness. Their presence in a settlement or a region would not only enrich community living, but it would also become the object of community and national bonding and identity. It is important that the heritage sites and cultural landscape in the RCSP Area would be identified and existing situation noted for strategic intervention and integration with the overall planning.

As per Table 5.3.15, Sarpang Dzongkhag is rich in historical and cultural structures. It is also observed that religious structures are increasing yearly. However, the data needs to be further verified to establish how many of them fall within the RCSP Area.

Table 5.3.15 Number of Historical Sites and Recreation 2014-2022 in Sarpang

(Numbers)

Historical sites	2014	2015	2016	2017	2018	2019	2020	2021	2022
Dzongs (monuments)	1	1	0	0	0	0	0	0	0
Government owned Lhakhang	9	9	9	8	8	8	8	8	8
Community owned Lhakhang	9	10	10	10	10	14	14	14	14
Private owned Lhakhang	8	8	8	8	8	6	6	6	6
Chortens	31	31	32	32	42	48	48	48	48
Museum	0	0	0	0	0	0	0	0	0
Children park	2	2	2	2	2	2	2	2	2
Drayangs	1	1	1	1	1	1	1	1	1
Discotheques	0	0	0	0	0	0	0	0	0
Archery ground	3	3	4	4	5	5	5	5	5
Basketball court	6	8	9	12	14	14	14	14	14

Source: Dzongkhag Administration, Sarpang

Table 5.3.16 shows the list of culturally and religiously important structures compiled by the National Land Commission Secretariat. The data has been organized gewog-wise. Since the RCSP Area covers part of gewogs falling within the Area, the data needs to be reorganized to see how many of them are within the boundary and Figure 5.3.32 illustrates it. However, there are two aspects to be noted as follows:

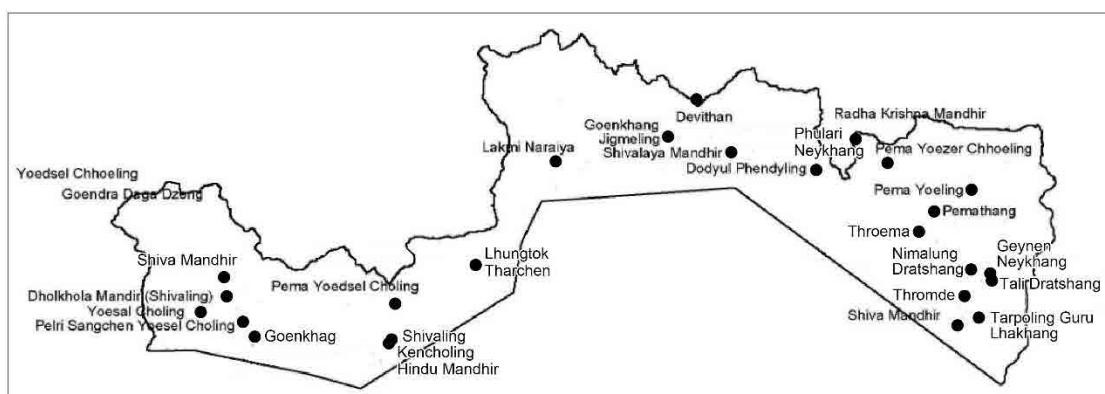
- 1) The data needs to be physically verified at site.

- 2) None of the structures listed in Table 5.3.16 and Figure 5.3.25 are among the heritage structures registered by the Department of Culture and Dzongkha development (DoC). However, since these structures are related to community leaving in the vicinity, it is important to consider them in the cultural landscape. Further, over the passage of time, each of these culturally significant structures will play important role in promoting culture and tradition and therefore even those which are outside the RCSP Area should be given importance.

Table 5.3.16 Culturally and Religiously Important Structures in the RCSP Area

S.No	name	class	geog	type
1	Phulari Neykhang	Buddhist	Samtenling	Lhakhang
2	Radha Krishna Mandhir	Hindu	Gelephu	Lhakhang
3	Pema Yoeling	Buddhist	Gelephu	Lhakhang
4	Pemathang	Buddhist	Gelephu	Lhakhang
5	Throema	Buddhist	Gelephu	Lhakhang
6	Nimalung Dratshang	Buddhist	Gelephu	Lhakhang
7	Geynen Neykhang	Buddhist	Gelephu	Lhakhang
8	Tali Dratshang	Buddhist	Gelephu	Lhakhang
9	Tharpaling Dratshang	Buddhist	Gelephu	Lhakhang
10	Shiva Mandhir	Buddhist	Gelephu	Lhakhang
11	Kencholing Hindu Mandhir	Hindu	Sompangkha	Lhakhang
12	Shivaling	Hindu	Sompangkha	Lhakhang
13	Goenkhang	Buddhist	Dekiling	Lhakhang
14	Pelri Sangchen Yoesel Choling	Buddhist	Sompangkha	Lhakhang
15	Pema Yoedtsel Choling	Buddhist	Sompangkha	Lhakhang
16	Jigmeling	Buddhist	Dekiling	Lhakhang
17	Goenkhang	Buddhist	Sompangkha	Lhakhang
18	Shiva Mandhir	Hindu	Sompangkha	Lhakhang
19	Dholkhola Mandir (Shivaling)	Hindu	Sompangkha	Lhakhang
36	Shivalaya Mandhir	Hindu	Samtenling	Lhakhang
37	Pema Yoezer Chhoeling	Buddhist	Samtenling	Lhakhang
38	Throm	Buddhist	Gelephu	Lhakhang
39	Yoedtsel Chhoeling	Buddhist	Gakidling	Lhakhang
40	Yoesal Choling	Buddhist	Gakling	Lhakhang
41	Lhungtok Tharchen	Buddhist	Dekiling	Lhakhang
43	Lakmi Naraiya	Hindu	Dekiling	Lhakhang
44	Goendra Daga Dzong	Cliff	Gakidling	Nye
45	Devithan	Boulder	Samtenling	Nye
48	Dodyul Phendyling	2	Samtenling	Choeten

Source: NLCS (The rows irrelevant to the RCSP Area have been deleted)



Source: NLCS, DHS and JICA Project Team.

Figure 5.3.32 Culturally and Religiously Important Structures in the RCSP Area

Figure 5.3.32 shows that cultural/religious structures are scattered and some of them are located away from the existing road network. Giving the importance of those structures in the community, it would be necessary to develop the access and properly maintain them.

(1) Sarpang Town and its Structure Plan

Currently, there is no area for landscape conservation/preservation designated in the Structure Plan or by the Ministry of Home Affairs. The Sarpang Structure Plan 2010-2035 proposes landscape-related project, “Local Area Plan Implementation and Landscaping” in the urban village of Shechangthang. Flood protection zone (E-4), national importance open space (E-5), and local green open spaces (E-6) are planned to be established along the river bank.

According to the stipulation of Cultural Heritage Bill of Bhutan 2016, it is likely that Sarpang Dzong under construction would be listed in Heritage Building Register, because of its representation of exceptional cultural heritage value. Also, Drodul Phendeyling, a privately owned Lhakhang which is under construction, has submitted its master plan to be developed as a cultural heritage.

Table 5.3.17 Proposed Landscape Related Project in Sarpang

Category	Project	Description	Estimated cost		Expected completion (year)
			Nu. in million	USD in million	
Landscape	Local area implementation and landscaping	– Landscape design along riverbanks (municipal area, outside municipal area)	18.197	0.404	2021-2025
		– Landscape design of golf course (outside municipal area)	49.162	1.092	2031-2035

Source: Sarpang Structure Plan 2010-2035

(2) Gelephu Thromde and its Structure Plan

As per the structure plan, the land use categories E-2 (Heritage Forest with indigenous species, designated after 2013 or 2014) and E-7 are restricted from development. The E-1 precinct is subject to conservation. In order to conserve E-1 area, local government utilizes the land pooling method of planning and secures the ecological corridors. The E-4 precinct is flood prone area. There is procedure to propose development in it. The E-5 precinct is designated for outdoor sports facilities. And the E-6 includes the buffer area. The areas adjacent to the border are restricted from development for security reasons.

The Table 5.3.18 shows the proposed list of the historic and cultural sites for protection in the structure plans of Sarpang Town and Gelephu Thromde.

Table 5.3.18 Existing Historic/Cultural Site in the RCSP Area

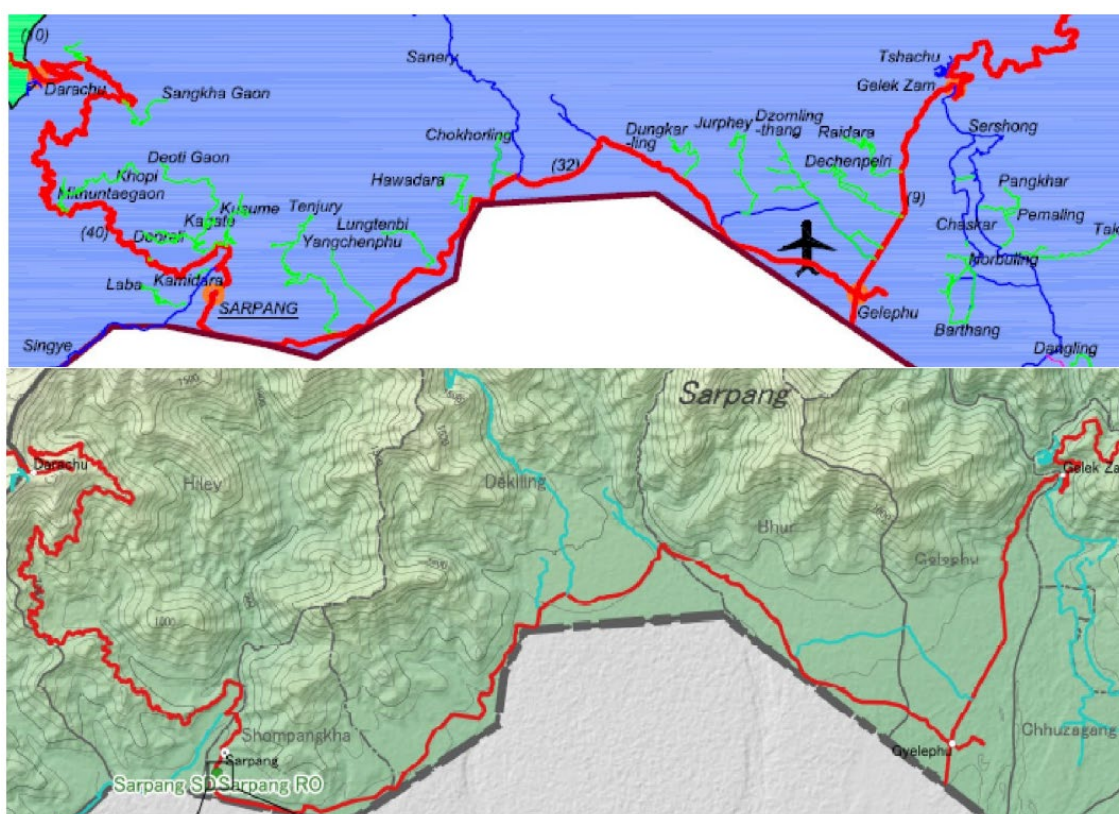
Location	Category	Historic/Cultural Site
Sarpang	Administration Office	Sarpang Dzongkhag Office
	Temple/Monastery	Zangdo Pelri
Gelephu	Administration Office	Gelephu Dungkhag Office
	Temple/Monastery	Nimalung Dratshang, Tali Dratshang, Tarpoling Guru Lhakhang, Tsewang Goempa

Source: Sarpang Structure Plan 2010-2035, Gelephu Structure Plan 2005

In general, preserving a landscape is synonymous to preserving the natural environment. However, the cultural landscape characteristic of Bhutan is one in which archaeological sites coexist in harmony with nature. The RCSP Area has a rare landscape in Bhutan, with flatlands that connect from the mountains behind it through forests, and therefore it is expected that the historic/cultural sites would continue to be maintained in its natural integrity and that open space would be utilized in the natural topography.

5.3.6 Public infrastructure, amenities and services

The RCSP Area is vibrant with the development of residential, commercial, industrial and institutional buildings. The NH5 connects the RCSP Area. The Highway is the main axis of the RCSP Area and it is approximately 33 km long. As shown in Figure 5.3.33, it runs along the foothills of the mountains and has about 11 river crossing points, which often get cut off due to floods during the rainy season.



Source: DoR, Erstwhile MoWHS

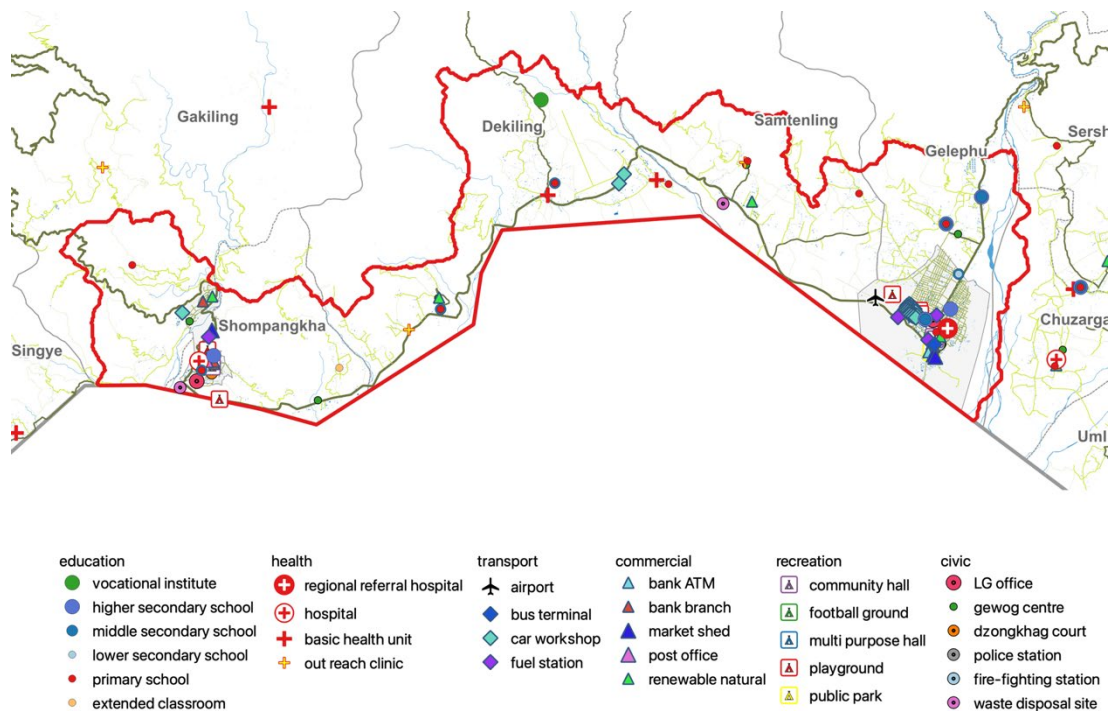
Figure 5.3.33 Road Network and Terrain in the RCSP Area

The public infrastructure, amenities and services are spread across the entire RCSP Area depending on whether it is at Sarpang Town or Gelephu Thromde or the areas in between. The following Table 5.3.19 shows the summary of existing facilities in the RCSP Area, and Figure 5.3.34 shows the spatial structure of existing facilities.

Table 5.3.19 Existing Public Amenities and Facilities in the RCSP Area

Category	Amenities	Number	Name of Facilities or Location
Education	Primary school	4	Dechenpelri, Gakiling, Jigmeling, Samtenling
	Lower secondary school	0	
	Middle secondary school	3	Chokhorling, Dekiling, Sarpang
	High secondary school	3	Sarpang central school, Losel Gyatsho Academy, Pelrithang
	Vocational training institute	1	Jigme Wangchuck Power Training Institute
	Others	4	Himalayan Institute of Technology & Management, Kunjung Institute of Technology & Innovation, USD Driving Training Institute, Royal Bhutan Police Training Institute Jigmeling
Health	Primary Health Centre (PHC)	2	Chokhorling, Jigmeling
	Out Reach Clinics (ORCs)	3	-
	Regional Referral Hospital (RRH)	1	Gelephu CRRH
	Hospital	1	Sarpang
	Small pet clinic	1	Sarpang Veterinary Hospital
Transport	Airport	1	Gelephu
	Fuel station	2	Sarpang, Gelephu
Commercial	Post office	2	Sarpang, Gelephu
	Farmers' Market	-	To be continued
Recreation	Indoor sport complex	2	Sarpang badminton club hall, YDF Basketball Court
	Outdoor ground (for football, archery, etc.)	19	
	Cinema hall	1	Gelephu
	Community hall and library, Exhibition	-	To be continued
Civic	LG offices, Regional government offices	4	Sarpang: Dzongkhag Office Dekiling: Gewog Office Gelephu: Thromde Office, Dungkhang Office
	Water treatment plant	-	
	Waste treatment plant	-	
	Waste disposal site	-	
	Fire-fighting facilities	-	
	Police service	-	
Other Community Facilities	Community temple (Lhakhang, Chorten, etc.)	9	Representative Temples: Jigmeling Lhakhang and Chorten, Dekiling Lhakhang, Drodul Phendeyling Chorten, Padseling Gonpa, Dordenma Chorten
	Others	3	Plant and Animal Quarantine Station, Agriculture Research and Development Centre, Regional Seeds Centre

Source: Annual Health Bulletin 2022 (MoH), Annual Education Statistics 2022 (Former MoE), Twelfth Five Year Plan 2018-2023 GNHC (2019c)



Source: JICA Project Team

Figure 5.3.34 Regional Centre Spatial Structure of Existing Facilities

These public facilities have contributed to the socio-economic advancement greatly. They also have benefitted areas beyond their jurisdiction. However, there are existing conditions which have been impeding the efficiency of service delivery. The following elaboration gives details pertaining to these facilities:

(1) Education

While the RCSP Area is vibrant with institutional establishments, it does not have tertiary education facility. For regionally balanced development and addressing rural-urban migration and youth unemployment, it is imperative that there is a regional level of educational institution and a human resource development hub in the RCSP Area. The presence of Jigme Wangchuck Power Training Institute (JWPTI) in Jigmeling, one of the national technical training institutes (TTI), is contributing majorly to Sarpang and the surrounding Dzongkhags in terms of:

- providing high quality training services, skills training on modern construction which are required for both public and private sectors, career counselling, leadership skill and employment support services which provide opportunities for every trainee to acquire skills;
- and giving access to an advanced training and lifelong learning to enable graduates to deliver customized training services to government, community and enterprise in the Dzongkhag and surrounding regions.

There are other institutes in Gelephu Thromde namely Public and Private Training Provider (OPPTP), Himalayan Institute of Technology & Management, Kunjung Institute of Technology & Innovation, and USD Driving Training Institute. (Erstwhile Ministry of Labour and Human Resources (MoLHR) 2020¹⁷)

¹⁷ Erstwhile MoLHR (2020) TVET Statistics of Bhutan, https://www.molhr.gov.bt/molhr/wp-content/uploads/2020/07/TVET_Statistics_Web_Version_30_7_2020_compressed.pdf, 2 Accessed on 10 March 2022.

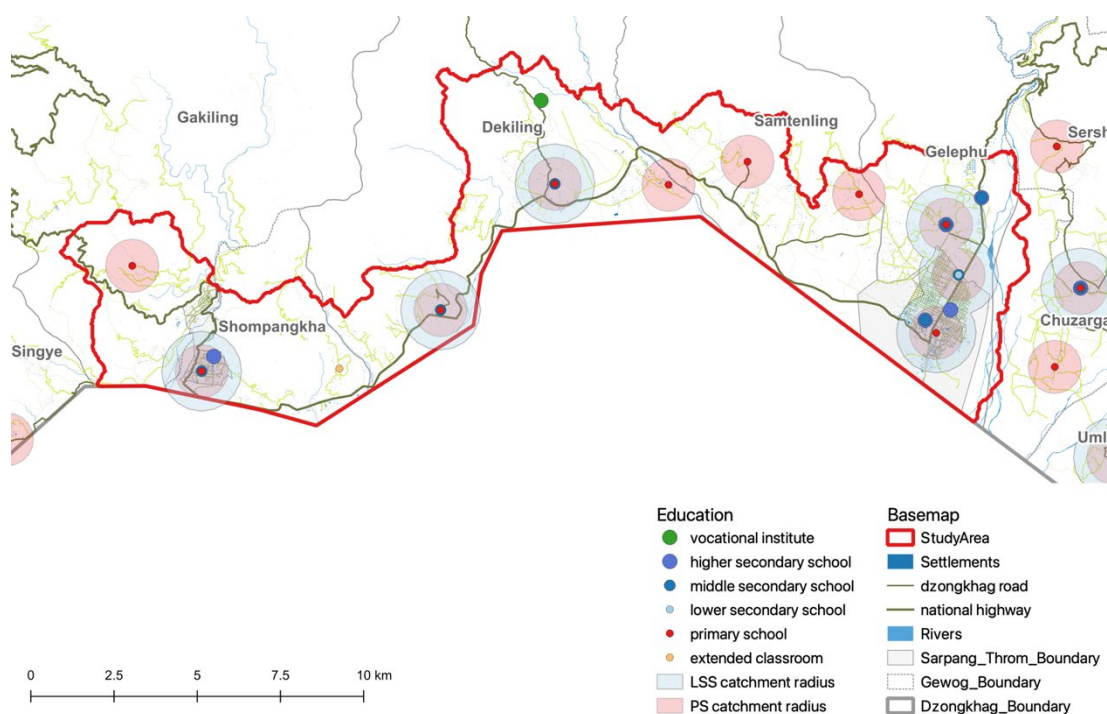
(2) Health

The 150 bedded Gelephu Central Regional Referral Hospital has benefited Sarpang and the surrounding Dzongkhags. It was constructed with the aim of developing a free, fair and equitable health system for the people of Sarpang Dzongkhag in particular and regional Dzongkhags in general. Besides benefitting the patients from Tsirang, Dagana, Zhemgang, Trongsa, Bumthang, it is also reachable from Pemagatshel and Samdrup Jongkhar can reach Gelephu on time for diagnosis and treatment. With the Medical, Surgical, Gynaecological, Paediatric and other specialist consultations facilities, even the health facilities in the neighbouring districts have technically benefitted and it also provides human resource backup consultation services.

Table 5.3.20 Education and Health Facilities in the RCSP Area

RCSP Area	Education								Health					
	College	VTI	CS	HSS	MSS	LSS	PS	ECR	RRH	Hospital	PHC	Sub-post	ORC	
													with shed	without shed
Gelephu Thromde	0	0	0	2	0	0	0	0	1	0	0	0	0	0
Gelephu Gewog	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Samtenling Gewog	0	0	0	0	0	0	2	0	0	0	0	0	1	0
Dekiling Gewog	0	1	0	0	2	0	1	0	0	0	2	0	1	0
Shompangkha Gewog	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Gakiling Gewog	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Sarpang Town	0	0	1	0	1	0	0	0	0	1	0	0	1	0
Total	0	1	1	2	3	0	4	1	1	1	2	0	3	0

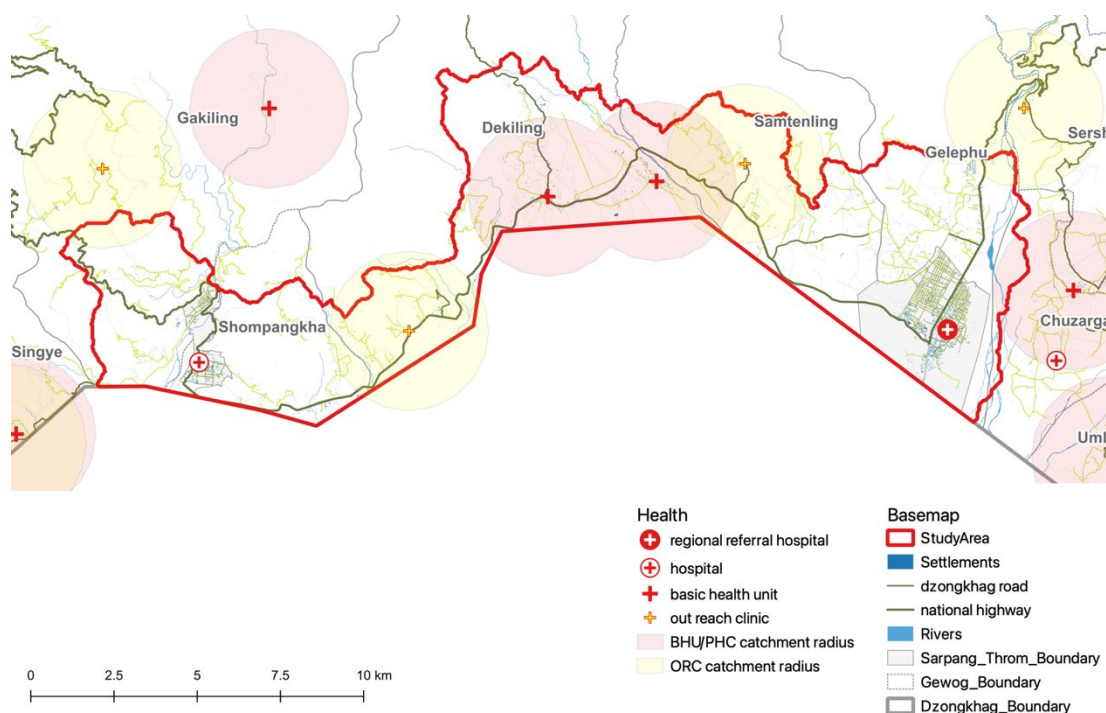
Source: Annual Health Bulletin 2022 (MoH), Annual Education Statistics 2022 (Erstwhile MoE)



* LSS catchment radius = 1.2km, PS catchment radius = 0.8km

Source: JICA Project Team

Figure 5.3.35 Regional Centre Spatial Structure: Education



* BHU/PHC catchment radius = 2.4km, ORC catchment radius = 2.4km

Source: JICA Project Team

Figure 5.3.36 Regional Centre Spatial Structure: Health

(3) Transport

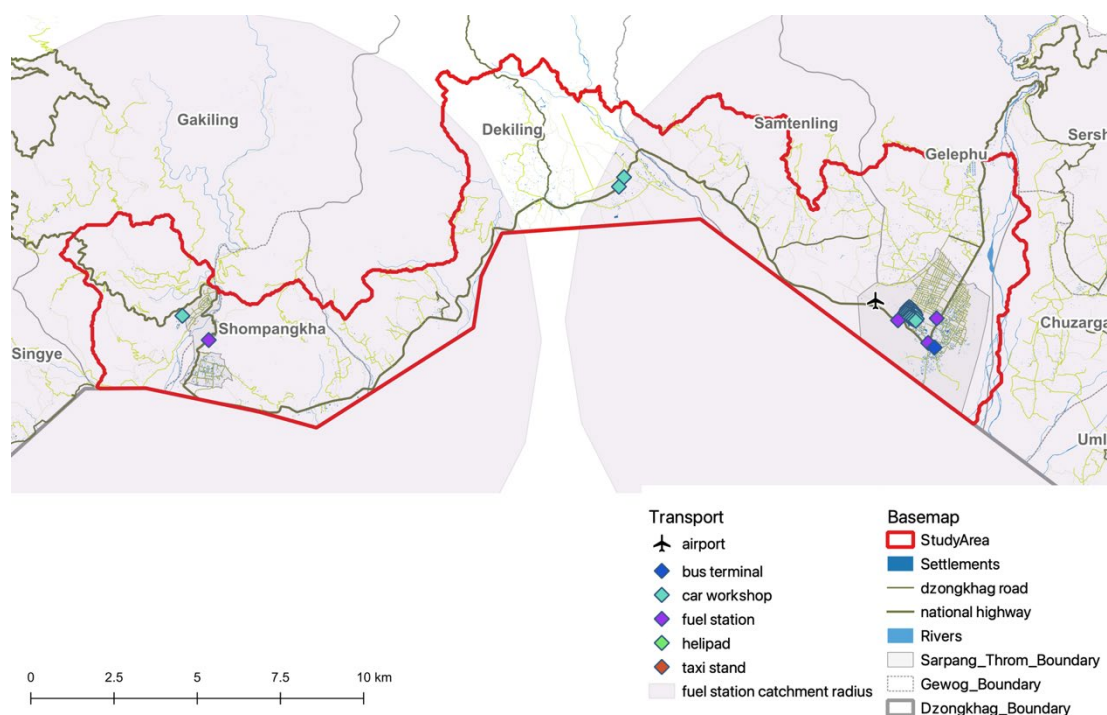
The inter-city bus service between Gelephu Thromde and Sarpang Town was planned in 2018. However, the plan could not be materialized. As of February 2021¹⁸, there is no inter-city bus service. The Preliminary Report on Sarpang-Gelephu Corridor by the DHS (2019)¹⁹ mentions about transportation alternatives such as Mass Rapid Transit (MRT) such as Bus Rapid Transit (BRT), metros, commuter rail and light rail transit which is still an idea.

Given the state of development in Jigmeling, there is need for road-side service facilities such as Fuel Station, Car Workshop and Car Wash facility, Electric Charging Station, Restaurants/eateries, Market Sheds, ATM, Recreational areas, Footpath, and Taxi Parking.

The domestic flights between Gelephu and Paro had been suspended during the COVID-19 pandemic. And the feasibility of the upgrading plan of Gelephu Airport into international airport is unclear.

¹⁸ Gelephu Thromde (2018) "Nit operating city bus service Gelephu thromde", <http://www.gcc.bt/tender/nit-operating-city-bus-service-gelephu-thromde>, Accessed on 1 February 2021.

¹⁹ DHS (2019) "Preliminary Report on Sarpang-Gelephu Corridor"



* Fuel Station catchment radius = 10km
Source: JICA Project Team

Figure 5.3.37 Regional Centre Spatial Structure: Transport

(4) Commercial, recreation, and civic service

Gelephu Thromde has General post office, bank branches of all 4 major bank branches (BoB, BNB, BDB, and DPB), Dungkhag Court, Division HQ of Royal Bhutan Police, Police station, and Check post at Gelephu border gate.

Sarpang town has Post office, bank branches of BoB and BDB, Dzongkhag Court, and Police station. Regarding civic services, Sarpang town has a local government office function and Gelephu Thromde has an independent city function.

Sarpang Town and Gelephu Thromde have structure plans based on which the developmental activities are being planned and implemented. Besides the above infrastructures and facilities, the respective structure plans have proposals to be developed within the plan time horizon.

The Sarpang Structure Plan 2010-2035 has urban/public facilities organized into three levels, namely, Town (whole Sarpang Town) - Urban village (Sarpang Tar and Shechangthang) - Urban core/urban hub (Sarpang Bazaar). It considers Shechangthang as an extension of urban functions which cannot be covered by the core city of Sarpang tar.

Likewise, the Gelephu Structure Plan 2005 has the planned area divided into the scales of urban village and urban neighbourhood, and proposes the development of urban/public facilities in consideration of the population density required to maintain the facilities. It also proposes a future Urban Hub outside the western part of the city. This will strengthen the urban functions of new residential areas that are expected to become urbanized in the next 30 years.

Table 5.3.21 shows the comprehensive proposal of the public facilities.

Table 5.3.21 Proposed Urban/Public Facilities by the Year 2035 in Sarpang, and by the Year 2025 in Gelephu

Sector	Facilities	Sarpang by 2035	Gelephu by 2025
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		Town Level	Urban Village Level	Town Level	Urban Village Level
Education	Nursery		2	-	2
	Primary school		1	-	1
	Secondary school		-	-	1
	High school		-	Upgradation of the existing Secondary School	-
	Higher education (college with hostel facilities)	1 (Vocational training)	-	1	-
Health	Clinic	-	3	-	2
	Dispensary	-	0	-	1
	Hospital	Upgradation (from 10 to 20 bedded)	-	Upgradation of existing one	
Open spaces	Group open space	-	1	-	2
	Central plaza	1	-	2	-
	Park/ Playground/ Sports complex	1	-	-	1
	Major public park/ Open space	1	-	2	-
Recreational facilities	Recreational club	1(Golf course)	-	1	-
	Performing art centre	1	-	1	-
	Meditation and spiritual centre	-	-	1	-
Commercial establishments	Local shopping	-	1	-	1
	Community shopping	-	1	2	-
	Weekly market	1	-	1	-
Social infrastructure	Community room	-	-	-	1
	Community hall	2	-	2	-
	Crematorium	1	-	-	-
Other amenities and services	Veterinary hospital	-	-	Upgradation of existing one	-
	Fire fighting	1	-	1 (independent premises)	-
	Petrol pump	1	-	4	-
	Vehicles service centre	1	-	4	-
	Postal office	-	-	1	-
	Postal agency (neighbourhood)	-	2	-	1
	Taxi stand	3	-	2	1
	Bus terminal	1	-	1 (independent premises)	-
	Police post (neighbourhood)	-	2	-	1
	Local police station	1	0	3	-
	Regional police station	-	-	1	-
	Infrastructure maintenance	1	-	-	1
Telecommunication	Upgradation	-	1	-	

	Electric transformer	7(Total)	-	-	-
	Refuse depot	1	-	1 (to be shifted)	

Source: Sarpang Structure Plan 2010-2035, Gelephu Structure Plan 2005

The Gelephu Structure Plan 2005 also proposes an open space system to identify a town level open space network which is classified in four zones as shown in the Table below.

Table 5.3.22 Proposed Open Space System in Gelephu

Zone	Location	Components
1. Mao River Front Recreational Open Space Zone	Along the Mao River front	Active recreational spaces like sports fields, golf course, jogging tracks, etc., tourism attraction facilities and various entertainment facilities, etc.
2. Town Central Open Space Zone (or) Royal Boulevard Green Zone	Along the Royal Boulevard in the centre of the town	Teak plantation area, vegetation cover along the existing road, institutional open spaces, community gathering grounds, avenue plantation, religious iconographies, children parks, town central park, indoor sporting areas, royal open spaces, etc.
3. Stadium Green Zone	Around the proposed stadium and future urban hub	Stadium with active sporting and physical training facilities, higher education institutions, active and passive open spaces along the riverbeds, etc.
4. Natural Storm Water Drain Side Green Zones	Along the dominant and primary natural storm water drain course	Various community and residential neighbourhood level open spaces, play areas and parks, toddler play areas, walkways, jogging tracks, cycle ways, etc.

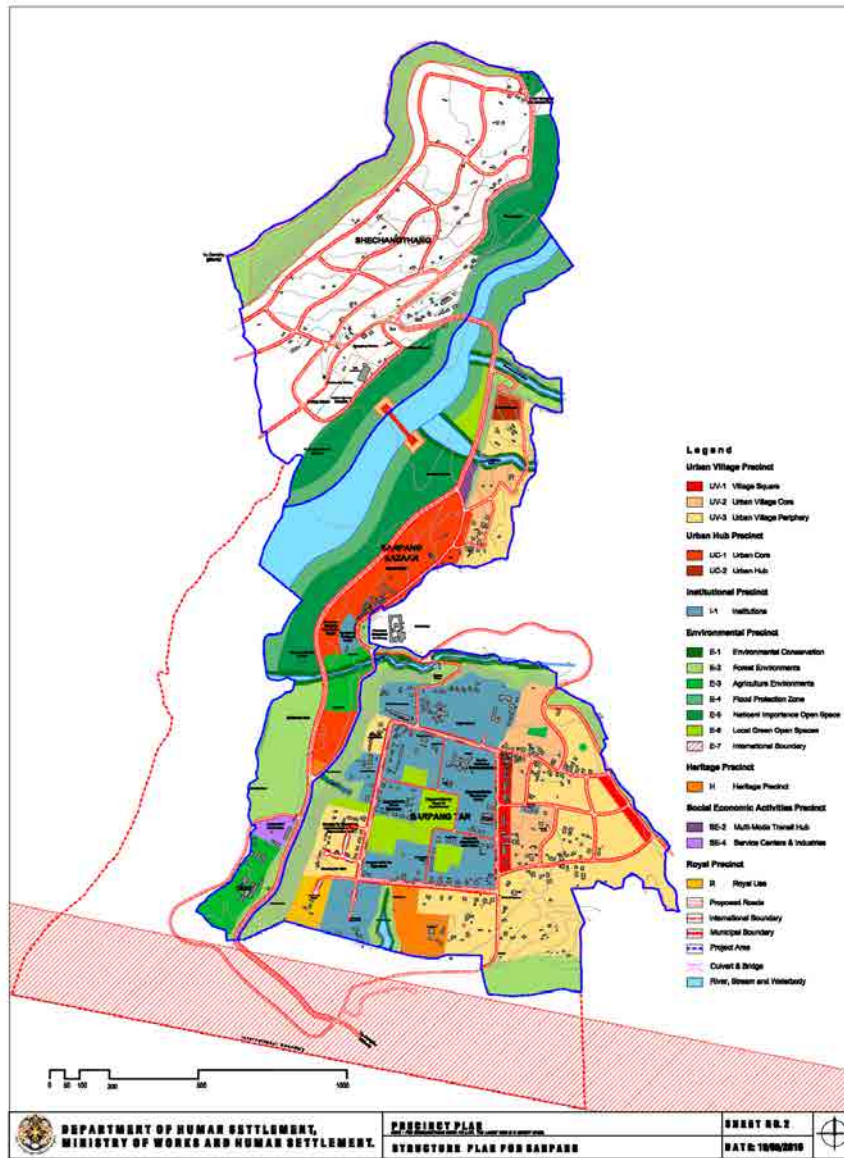
Source: Gelephu Structure Plan 2005

The Sarpang Structure Plan 2010-2035 proposes the investment plan with various sector-wise projects. As a landscape-related project, “Local Area Plan Implementation and Landscaping” is proposed in the urban village of Shechangthang. Flood protection zone (E-4), national importance open space (E-5), and local green open spaces (E-6) are planned to be established along the river bank.

Table 5.3.23 Proposed Landscape Related Project in Sarpang

Category	Project	Description	Estimated cost		Expected completion (year)
			Nu. in million	USD in million	
Landscape	Local area implementation and landscaping	- Landscape design along riverbanks (municipal area, outside municipal area)	18.197	0.404	2021-2025
		- Landscape design of golf course (outside municipal area)	49.162	1.092	2031-2035

Source: Sarpang Structure Plan 2010-2035



Source: Sarpang Structure Plan with Shechangthang Local Area Plan 2010-2035

Figure 5.3.38 Precinct Plan

The RCSP Area has an important role to play in the Project Area. How it develops and what it affords to provide will have a direct impact on Tsirang and Zhemgang Dzongkha. Therefore, the issues highlighted in Table 5.3.24 should be recognized and addressed accordingly so that the benefits that would be resultant out of RSP and RSS is maximized.

Table 5.3.24 Existing Conditions and Major Problems of the RCSP Area Related to Infrastructure and Transport for Sarpang, Tsirang and Zhemgang Dzongkhags

Existing Conditions by Sector		Major Problems
Road Infrastructure	The national highway between Sarpang Town and Gelephu Thromde (about 34 km) is parallel to the Indian border and is a straight two-lane road that takes advantage of the flat terrain. The urban areas of Sarpang Town and Gelephu Thromde are also formed on flat land with a grid road pattern,	The RCSP section of the southern east-west arterial road has no detour route, and the risk of disruption due to landslides and flooding in river areas, especially during

	<p>which is different from the urban landscape in other areas that is often formed in long and narrow valleys. In addition, Sarpang river and Maochu river are located in the west and east of Sarpang Town and Gelephu Thromde, respectively. So, the road is largely diverted to the north. Gelephu is expected to become a transportation hub as a logistics centre. On the other hand, there is concern that through traffic will flow into the urban area.</p>	<p>the rainy season, is unavoidable.</p> <p>From the viewpoint of preserving a favourable urban environment, it is desirable to separate traffic passing through the urban area.</p>
Public Transportation	<p>More than 15 long-distance bus routes are operated from the bus terminal in Gelephu Thromde, including those for Trongsa and Bumthang (via Tingtibi Town), Wangdue Phodrang, Punakha, and Thimphu (via Sarpang and Dampu Town).</p> <p>Short-distance bus services between Gelephu Thromde and Sarpang Town, between Gelephu Thromde and Serzhong, and between Construction Development Corporation Limited and Gelephu HSS/MSS/LSS are planned and were tendered in 2018. However, the tender was unsuccessful, and to date, no local bus service is in operation.</p> <p>MRT, specifically BRT, subway, and streetcar, is proposed to connect Sarpang town and Gelephu city by DHS.</p>	<p>There are confirmed problems in current public transport service.</p> <ul style="list-style-type: none"> - Size of bus fleet is limited by mountainous road geometric structure. - Facilities in terminal such as waiting lounge, transfer area, parking area, etc. are poor. - Information service regarding general information, transfer, operation status, and operation schedule is poor. - Bus service is undertaken by private operator with government tariff in entire country. <p>A mass transit system is planned between Sarpang and Gelephu, where traffic demand is high, but feasibility needs to be confirmed.</p>
Air Transport	<p>There are two domestic flights a week from Gelephu airport to Palo airport.</p> <p>Internationalization of Gelephu Airport has been proposed, but no concrete plan has been developed.</p> <p>There is Gelephu Airport, which is expected to become an international airport in the future. The feasibility study including the soil test was completed at the end of October 2021, and the draft master plan for the airport upgrade was submitted. It is also reported that the land replacement and compensation for the landowners of the extended areas are almost finished²⁰.</p>	<p>The airport plan is being studied with the assistance of ADB and should be reviewed.</p>
Power Supply System	<p>Electrification of the RCSP Area is almost complete, except only 7 rural households.</p>	<p>There are 7 non-electrified households.</p>
Water Supply System	<p>In urban areas, 0.6% of households have access to drinking water for more than 30 minutes, which is almost the same as the national urban average (0.5%). While in rural areas, especially in Dekiling, the percentage is 3.4%, which is higher than the national rural average (2.1%).</p> <p>The level of reliability of drinking water is also lower than the national rural average (79.8%), at 73.1% only in Dekiling.</p>	<p>Access to and reliability of drinking water is below the national average.</p>

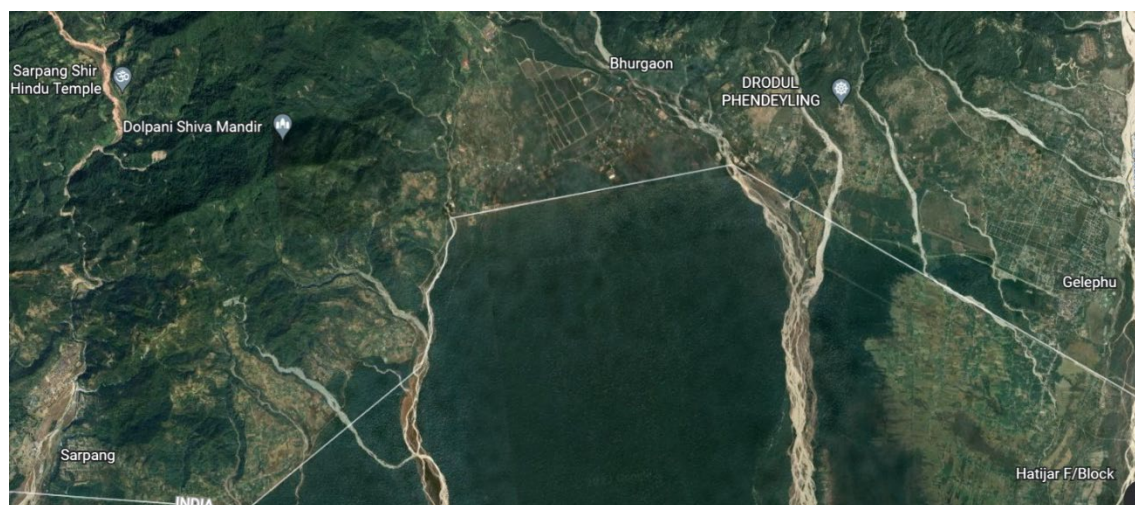
Source: JICA Project Team

5.3.7 Settlement studies: settlement pattern, building typology, building height, etc.

The Sarpang Town and the Gelephu Thromde have their respective structure plans to guide the development. The development within the intermediate belt area has been taking place based on it

²⁰ Kuensel, October 27, 2021: <https://kuenselonline.com/gelephu-airport-to-become-second-international-airport/>

being in a rural area. The laws and regulations related to rural areas such as Rural Construction Rules 2013 until the Bhutan Building Rules 2018 came into force and the different categories of land listed in the Land Act 2007 have dictated the development pattern in it. The pattern of development as it could be viewed in Figure 5.3.39 is distinctly different between urban and rural section of the RCSP Area and, planned and unplanned areas.



Source: Google Map

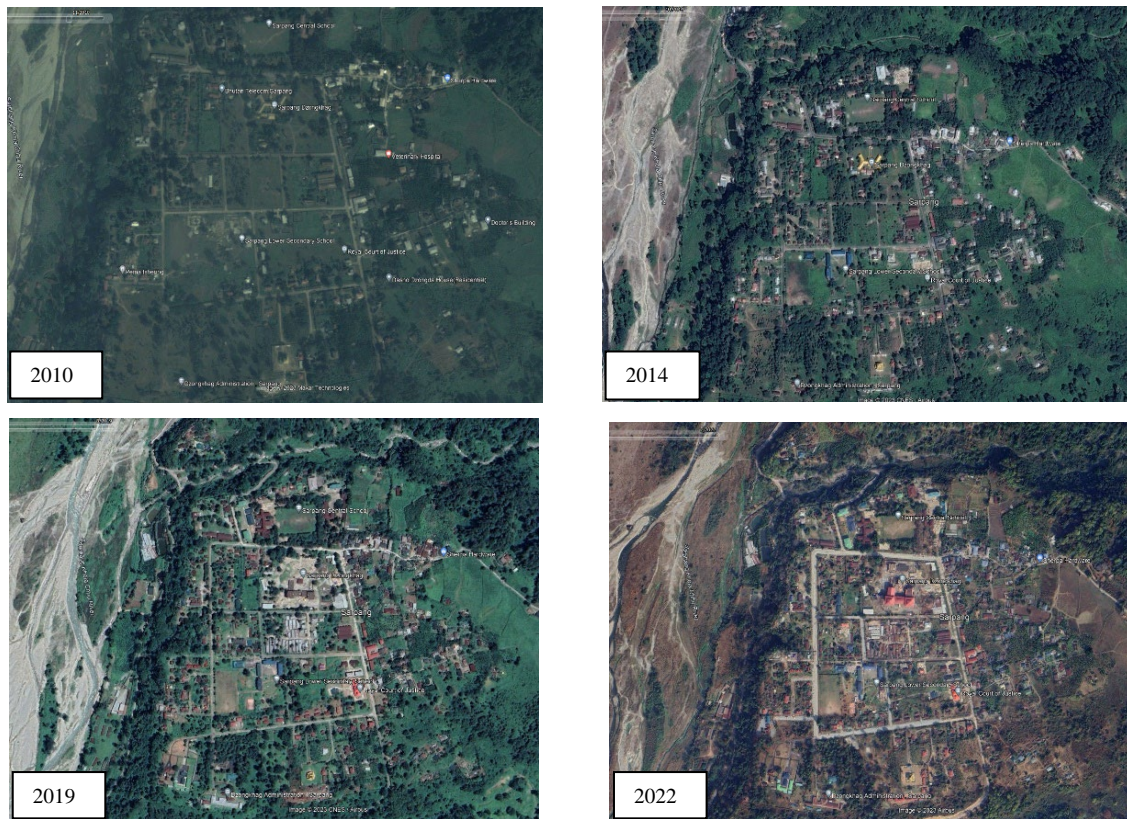
Figure 5.3.39 Planned and Unplanned Pattern of Settlement in the RCSP Area

In order to understand the settlement pattern comprehensively, the settlement of Sarpang Town, Intermediate belt area and Gelephu Thromde have to be studied individually.

(1) Sarpang Town

The Structure Plan of Sarpang 2010-2035 has the following salient features related to settlement pattern:

- Land use: The current land use pattern of Sarpang Town is a result of its unique physical setting, administrative importance of the town and the on-going urbanisation. It is a blend of environmental features, agriculture and land under urban functions. The land use pattern of Sarpang is distinct as there are clearly demarcated zones for every major land use.
- Related to the land use pattern Figure 5.3.40 shows development scenario in 2010, 2014, 2019 and 2022. Guided by the road layout, the number of buildings increase over the years. It is also evident that the size of buildings is increasing.
- Land Ownership: Data suggests that about 50.25 % of the total municipal area is under private ownership. The rest including riverbed is under government ownership. A major share of the municipal area is under the Sarpang riverbed (13.09%). Most of the Government Land is at Sarpang Tar and falls under the existing Institutional Precinct. The government land is underutilized and is best suitable for Institutional development. Shechangthang area has most of the land under private ownership.
- Open space: In spite of having more than 60% of the land area comprising of agricultural lands, forest lands, vacant land, water bodies etc, which are undeveloped, Sarpang has limited defined open spaces. It is due to the town population being too less to support more number of defined open spaces. For the population of approximately 4,000 residents a park and two football grounds are found to be adequate.



Source: Google Earth

Figure 5.3.40 Settlement Pattern from 2010 to 2022

- Building typology and height: The maximum floor height permissible is four. But most of the existing buildings at Sarpang Tar are one or two storied with a few new structures having an additional third floor. Shechangthang is sparsely developed with most of the structures being single storied.
- The building typology has changed from a single storied house to G+3 buildings and from a single unit home to multi-unit apartments. Regarding the building height the trend has been that the public pressure for raising number of building stories increased with time. And irrespective of where buildings are located, use of ground floor for commercial purpose has been a common preference. Generally, buildings have mixed uses with the intensity of residential and commercial uses depended on the precinct in which they are located. The buildings seen in Figure 5.3.41 are of Shechangthang. The buildings have commercial activities in them.



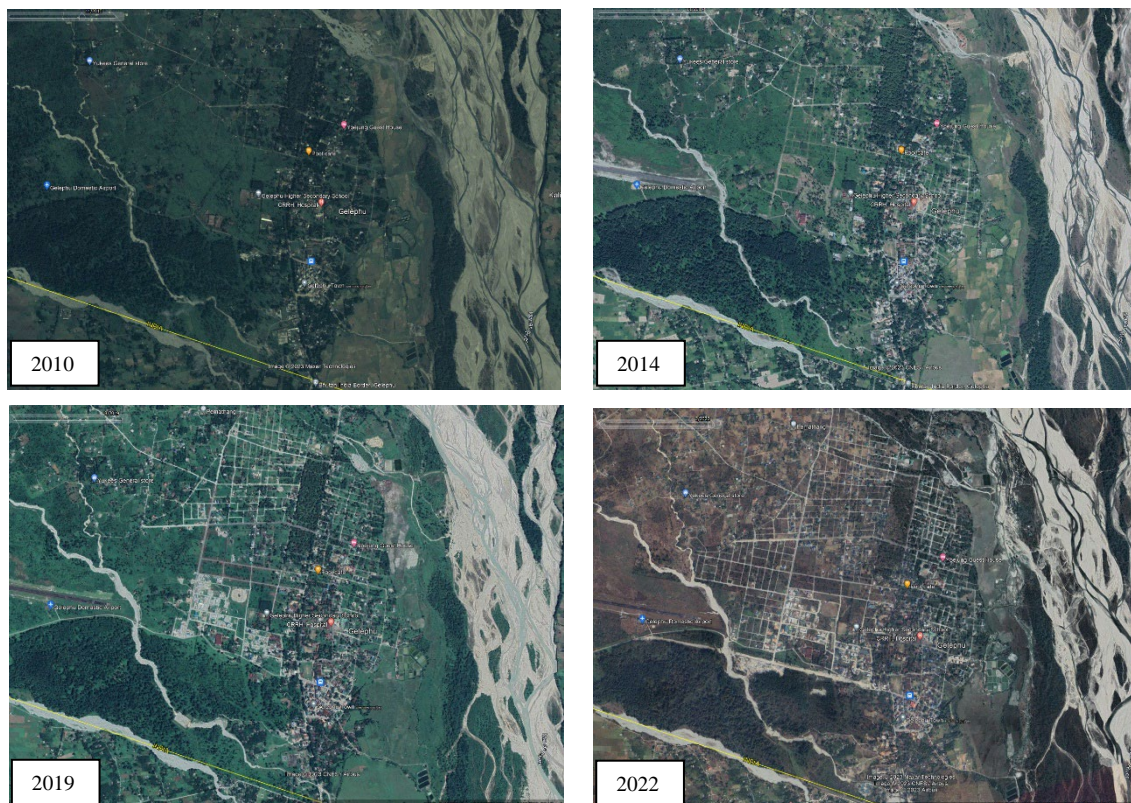
Source: JICA Project Team

Figure 5.3.41 Buildings at Shechangthang

(2) Gelephu Thromde

Development in the Thromde has been guided by the Gelephu Structure Plan 2005-2025. It is implemented through local area plans.

- **Settlement Pattern:** The existing spatial structure of the town is based on an irregular grid-iron pattern of streets. The city core is densely developed. The institutions comprising of dungkhag administration, schools, hospital, royal guest house and few other offices are located on the northern side of the commercial core. The north-west side of the commercial core has small and medium scale industrial developments like the Army Welfare Project and Lhaki Wood Industries. The town has expanded further north along the Trongsa Highway up to Setikhare Chhu. Figure 5.3.42 shows the development scenario in 2010, 2014, 2019 and 2022.

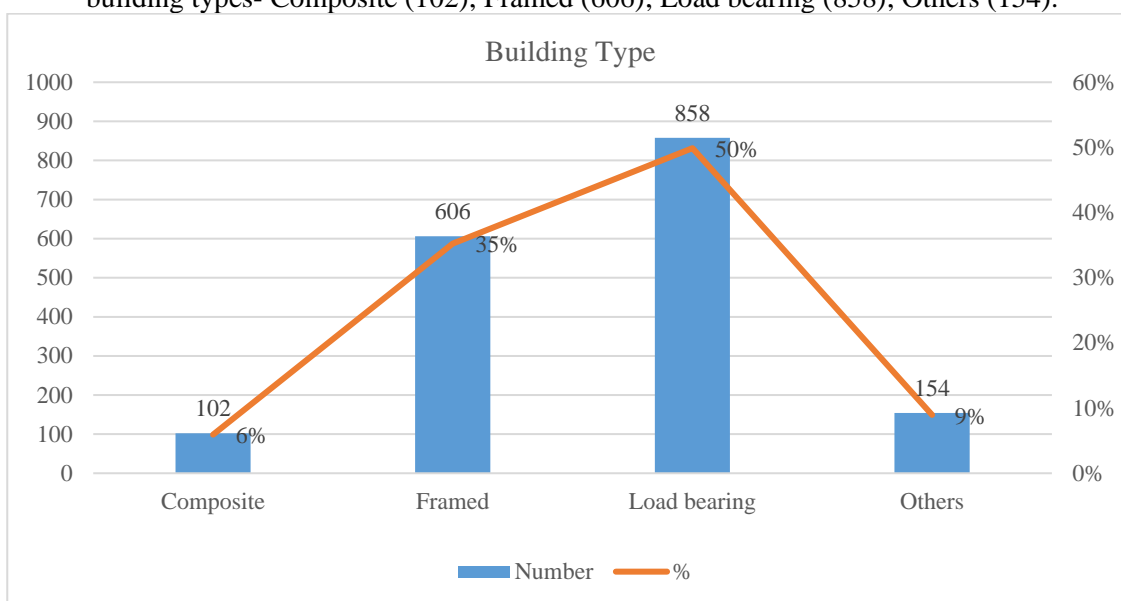


Source: Google Earth

Figure 5.3.42 Settlement Pattern of Gelephu from 2010 to 2022

The development pattern in Figure 5.3.42 shows that the density of development is decreasing northwards. The precinct sanctity based on which the building uses are permissible has it that the intensity of commercial activities decreases towards periphery and become functionally favourable for residential uses. However, unlike the Euclidean Zoning, the precinct system allows mixed uses: the commercial uses are allowed in the residential precincts but in a low intensity.

- **Building Typology:** As per the Zhichar Database for Building Type²¹, Gelephu Thromde has building types- Composite (102); Framed (606); Load bearing (858); Others (154).

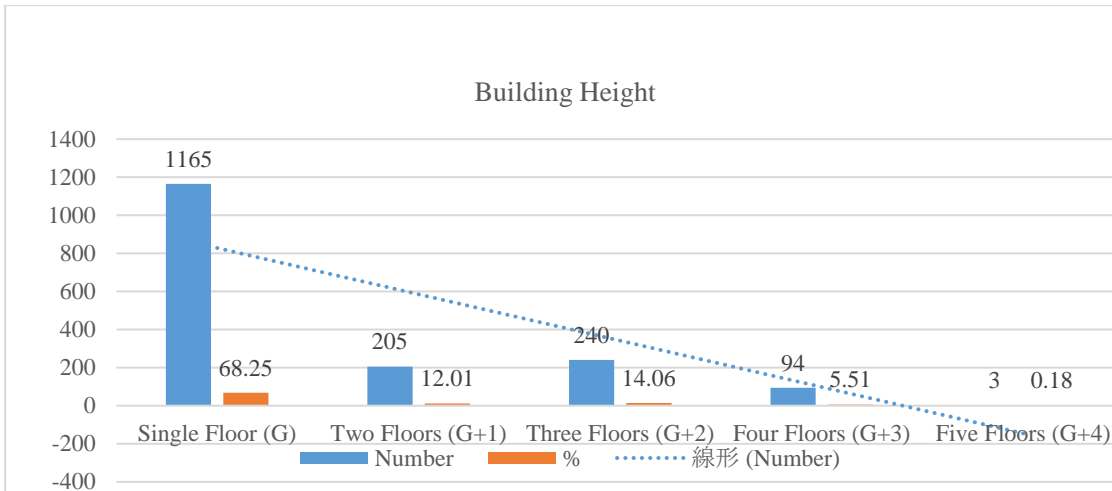


Source: JICA Project Team

²¹ Data compiled the Department of Human Settlement, MoWHS

Figure 5.3.43 Comparison of Building Types with Trend

The Zhichar Database data for Building Height²² shows the building heights in the Thromde ranges from single to five floors and their numbers also varied: G (1165); G+1 (205); G+2(240); G+3(94); G+4 (3). The comparison in the Figure 5.4.43 tells that 68.25% of buildings are single storied. Since the Development Control Regulation (DCR) allows more than single floor, all or most of these structures will be rebuilt or vertically extended in the future. Given the general trends in all the towns, there will be demand for increasing the building height beyond what is permissible in respective precincts.



Source: JICA Project Team

Figure 5.3.44 Comparison of Building Heights with Trend



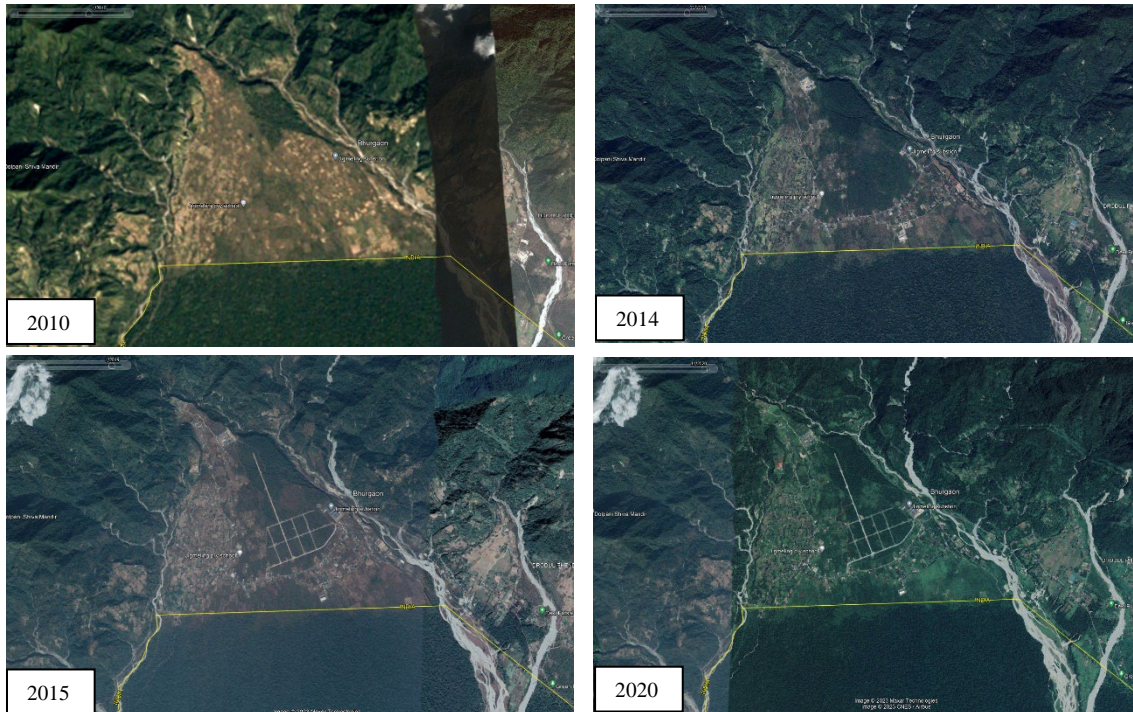
Source: JICA Project Team

Figure 5.3.45 Left- Buildings in the Commercial Core & Right- Buildings in Residential Area

²² Data compiled the Department of Human Settlement, MoWHS

(3) Intermediate belt area

The intermediate belt area of the RCSP falls within rural area. Except for the Jigmeling Industrial Park, development in general has taken place based on individual development application. The highway and the access roads appeared to have influenced the direction of settlement growth. Figure 5.3.46 shows the development scenario in the neighbourhood of Jigmeling Industrial Park.



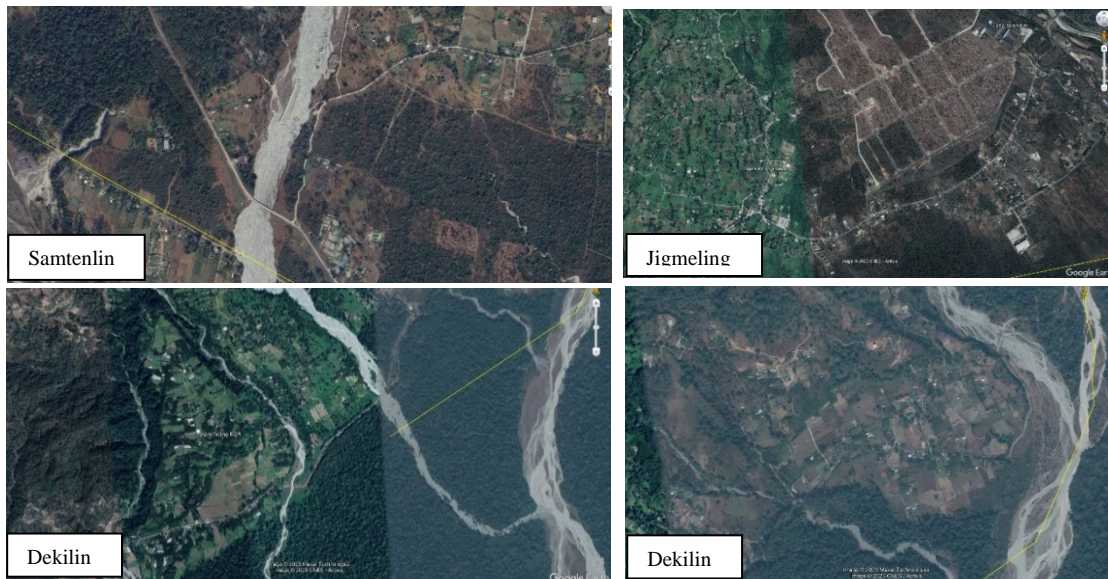
Source: Google Earth

Figure 5.3.46 Development Scenario from 2010 to 2020 at Jigmeling

Settlement pattern of the RCSP Intermediate belt area depend on the regulations related to the following land categories:

- i) Chhuzhing (Wet Land)
- ii) Kamzhing (Dry Land)
- iii) Land adjacent to highway and along river bank
- iv) Land under High Tension Power Lines and Forest

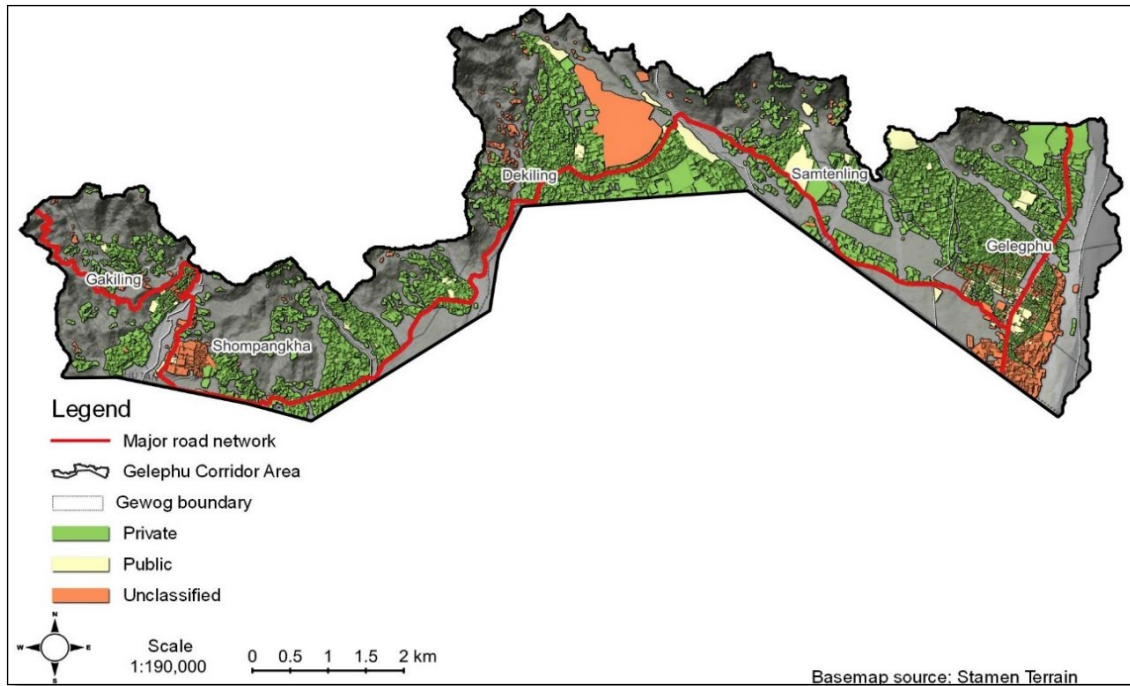
The Figure 5.3.47 shows settlement pattern along the RCSP Area. It has a mixture of scattered and clustered settlements. Unlike planned areas, the settlement pattern in these areas is rather sprawl (outside the Jigmeling Industrial Park).



Source: Google Earth

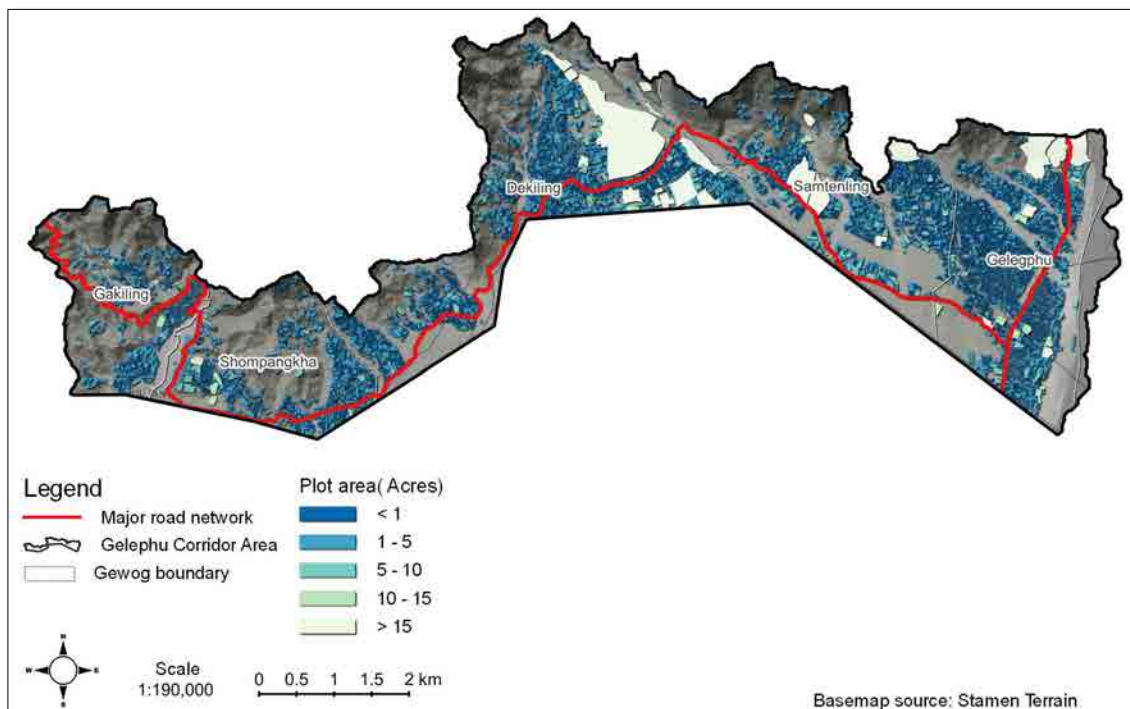
Figure 5.3.47 Settlement along the highway

- Land Ownership: From the Figure 5.4.48 it is observed that there are three categories of land ownership namely Private, Public, and Unclassified. Of the three, the Private land ownership is overwhelming. It is in this type of land that land fragmentation will occur. Without proper management of private land, it would become hindrance to bigger plans in the RCSP Area.
- Plot Sizes: The analysis in the Figure 5.4.49 supports the concerns related to land fragmentation. It already tells that the plot lesser than 1 acre is more among others. There should be further studies to get a clear picture about it. Land fragmentation if unchecked, the strength related to the vast flat land in the RCSP Area may not be as effective as we are hoping for to propose regional level infrastructure and services.



Source: JICA Project Team

Figure 5.3.48 Plot Ownership Based on Land Types



Source: JICA Project Team

Figure 5.3.49 Plot Analysis based on Plot Sizes

- **Building Typology:** The majority of buildings in the intermediate belt area are residential. There are institutional and industrial buildings also. Those which are located along the highway have commercial uses. Since most of the buildings constructed are family houses, as the Figure 5.3.50 shows, they are detached. However, the trend is changing particularly along the highway. There are bigger structures built with mixed uses.

- The buildings in the RCSP Area have their heights varying from single to three floors. The Bhutan Building Regulation 2018 restricts building height to 3 floors. Prior to it the Rural Construction Rules allowed only up to 2 floors. The RCSP Area has been a preferred location for retirement. It must be contributing to the detached and single storied buildings.

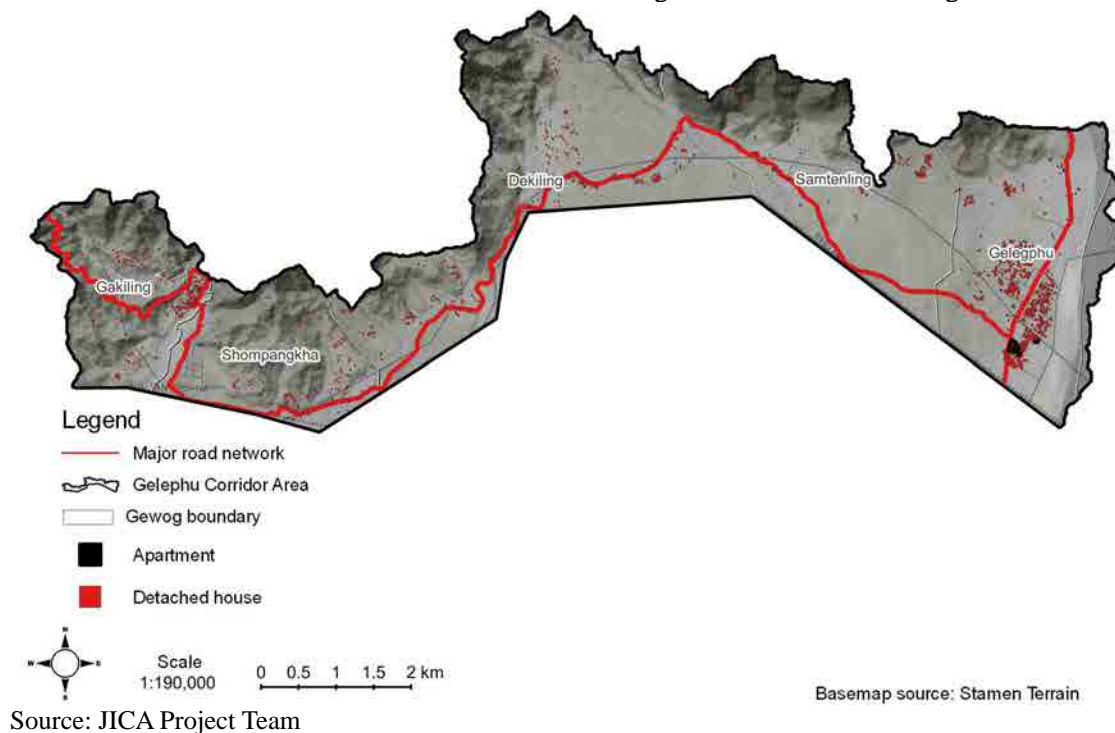


Figure 5.3.50 Building Classification

5.4 Planning Indicators

5.4.1 Conclusive summary of existing situations affecting the future

(1) Demography

As mentioned in section 5.3.2, the population of Sarpang amounted to 46,004 in 2017 with annual growth rate at 1.8% between 2005 and 2017. As for the annual population growth rate by Gewog, the increase in the three Gewogs, namely, Samtenling at 5.2%, Gelephu at 4.1%, and Dekiling Gewogs at 3.8%, respectively, in the eastern to the central region, is larger than in the urban areas (Gelephu Thromde and Sarpang Town). In terms of population density, Gelephu Thromde and Sarpang Town are densely populated settlements in the region.

The proportion of the urban population in Sarpang Dzongkhag, which is composed of Gelephu Thromde and Sarpang Town, is 28.3% in 2017 with a decrease of 3.5 percentage points from PHCB 2005. This may be due to an increase in the population of other gewogs defined as rural.

The RCSP Area runs along the southern border with India on the south side while towards the north it covers some of the gewogs and urban settlements in Gelephu and Sarpang and its boundary is not accorded with administrative one. Thus, the population of the area in 2017 is estimated as a basis of the future population projection through adjusting by the number of the settlements on GIS. As a result, the population in the RCSP Area in 2017 is estimated at 29,208.

It is difficult to estimate the recent migratory patterns of people in the RCSP Area. This is mainly because updated migration data disaggregated by gewogs or chiwogs are not available. However, given the existence of the larger urban settlements and smaller but important semi-urban centres along the Gelephu-Sarpang highway such as Samtenling (Bhur), it may be safe to say that most of the in-

migration to Sarpang Dzongkhag have occurred to the RCSP Area, which provide better economic opportunities.

(2) Socio-economy

1) Private sector activities

From the viewpoint of the private sector enhancement in the RCSP Area, the development of the Jigmeling Industrial Park is important. As of October in 2022, 79 proposals by companies/organizations are accepted in erstwhile MoEA. By economic sector, broadly three types of industries, namely (i) agro-processing and food-based industry, (ii) forest-based industry, and (iii) mineral-based industry such as manufacturing of ferro silicon alloys, are majorities. Total estimated number of workers shown in the proposals amounts to 6,392 in total.

The accumulation of medium or large-scale industries is not seen in the RCSP Area except Jigmeling Industrial Park, but small businesses of the industry and services sector are active in Sarpang Dzongkhag.

The data shows that the RCSP Area holds 90% of the business activities in Sarpang Dzongkhag whereas the non-RCSP Areas have just 10%. 95% of the contract/ construction businesses are in the RCSP Area. Also, 92% of the services (such as retail trade, hotels, transport services, etc.), and 84% of the manufacturing, processing, and production companies (such as furniture, manufacturing of bricks and blocks, etc.) are concentrated in the Area. This suggests that the RCSP Area is the main economic hub in Sarpang Dzongkhag.

Within the RCSP Area, Gelephu Thromde has the largest share at 56% of the small business establishments. Nearly three quarters of the services, two thirds of the contract/ construction firms are concentrated in Gelephu Thromde, followed by Dekiling, where Jigmeling Industrial Park is located, that holds 15% of business entities with 37% of the manufacturing firms.

Thus, development of new infrastructure/facilities such as Ago-processing Park, SEZ or IT Park will be needed for the balanced distribution, accumulation, and economic diversification in the Area.

2) Public infrastructure, amenities and services

As mentioned in section 5.3.2 and 5.3.6, the current situations of education and health services in the RCSP Area are generally sufficient. Both service facilities are distributed hierarchically from the advanced level for regional centres to the essential level for rural villages, except for the tertiary education facility.

Regarding the accessibility of these services, for example, the low school attendance ratio of females beyond urban areas is pointed. This kind of issue would not be solved by establishing new schools, but by improving life standards.

Jigme Wangchuck Power Training Institute (JWPTI) in Jigmeling is contributing majorly to Sarpang and the surrounding Dzongkhags in terms of human resource development. And the central regional referral hospital (CRRH) in Gelephu Thromde has been benefitting not only to the RCSP Area but also beyond the SCR including Dagana, Trongsa, Bumthang, Pemagatshel, and Samdrup Jongkhar. Thus, promoting the expansion of these existing facilities should be prioritized at least in the short term.

With reference to 5.3.6, the current situations of transport, commercial, recreation, and civic services are not sufficient but not insufficient either. Regarding the transport services, especially for industrial development, the inter-city transportation between Gelephu Thromde and Sarpang Town, and the roadside facilities in Jigmeling, should be installed gradually.

Gelephu Thromde, as the central of regional commercial services, has general post office, bank branches of all 4 major banks (BoB, BNB, BDB, and DPB). Sarpang town also has Post office, bank branches of BoB and BDB. Regarding civic services, Sarpang town provides a local government office function and Gelephu Thromde provides a municipal office function. These services would be delivered by using ICT in the near future. Then, ICT equipment should be installed properly.

(3) Land use and human settlement

In the RCSP Area, urbanisation is underway in two towns, Sarpang and Gelephu. In the area between the two towns, Jigmeling Industrial Park is being developed, while agricultural land and forests are spread. In developing the future land use plan, it is necessary to preserve the natural environment through the conservation of prime agricultural land and valuable forests. On the other hand, urbanisation through the conversion of agricultural land is necessary to accommodate the residential area for the future population, and thus a land suitability analysis of the urban area is required to identify the future residential area.

Sarpang and Gelephu, the main urban centres in the RCSP Area, are also the areas where various social services are concentrated. Therefore, Sarpang and Gelephu are expected to create the residential area with decent social services access to respond to population growth in the future. Carrying capacity in both towns should be ascertained when developing land use plans.

(4) Stakeholders

Table 5.4.1 summarises various stakeholders in the RCSP Area, whose interests have to be paid attention for the preparation of the RCSP proposals and have to be promoted their participation for the implementation of the RCSP.

The problems that the stakeholders in the RCSP Area are facing, and the direction to address the problems by taking advantage of the potential of the Area, can be described as follows.

1) Local Communities

According to the result of participatory workshop held on May 2022, organised by the DHS and JPT, many communities in Sarpang Dzongkhag faces various types of problems related to 1) land, 2) employment, 3) livelihood, 4) population (migration) and 5) infrastructure.

As for the land issue, water shortage can restrict the land usage variously, including the influence on the conversion from wet to dry land. In addition, scattered or absentee land ownership can expedite this issue. As the result, inefficient land use has become common in this Dzongkhag. This issue is also related to low employment rate, especially in youth, and low-income level.

Issues on livelihood and population are caused by plural factors such as inexistence of any major urban centre other than Gelephu, insufficient accessibility for primary industry, small market, etc.

As well as most of Dzongkhags, this Dzongkhag faces lack of sufficient infrastructure, including the issue of insufficient budget allocation for local area. Especially, community roads, such as farm roads and feeder roads, connecting a community and an artery and among communities, have not been developed enough.

In Gelephu, environmental problems – including poor waste management, traffic jam condition, air pollution – have emerged as urban issues and may be accelerated for the future in line with urbanisation, while population and infrastructure issues are not serious compared to the rest of Sarpang Dzongkhag.

From the spatial development viewpoint, many community-related issues described above are complicated. Therefore, to cope with complicated issues adequately, stepwise approach should be adopted in line with the gradual promotion of the RCSP Area. In other words, local communities in the RCSP Area will be benefited, although gradually, from improved connectivity among communities, better economic and life infrastructure services including irrigation water, and socioeconomic development of the RCSP Area.

2) Private sector/industries

Many stakeholders are closely related to economic and industrial development, but the key players are the private sector. Public sector and other organizations such as research institutes, vocational and training institutes, chambers of commerce and industry, and NPOs should support them through various policy measures.

General policy measures for economic development will be classified as follows:

- Formulation of legal and policy framework,
- Human resource development,
- Strengthening & diversification of enterprises capability,
- Promotion of foreign direct Investment (FDI) and domestic investment,
- Value-chain development and strengthening of marketing and business linkage, and
- Promotion of start-up and Innovation.

From the viewpoint of the regional spatial plan, among above mentioned policy measures, (i) promotion of foreign direct investment (FDI) through development of industrial parks and SEZs, (ii) value-chain development and strengthening of marketing and business linkage through industrial cluster development, and (iii) promotion of start-up and innovation through development of IT Park with science technology, will be directly applicable.

A range of these policy measures should be implemented by the central government, Dzongkhag and Thromde administrations, economic and industrial associations, research institutes, and so on.

3) Religious communities

Residents in each religious community and monks are the religious community-related stakeholders, which contribute to the development/maintenance of heritage sites and cultural landscape.

Presently, they are facing with the following problems:

- Funding needs to be secured for the preservation of the culturally and religiously important structures in the RCSP Area.
- The culturally and religiously important structures/ruins are scattered in the Area and some of them are isolated and remote from the road network and difficult to access.
- For some small structures, the importance of conservation is not recognised.

In order to ensure appropriate preservation continuously, first of all, the importance of each structure and heritage sites as a component of the cultural landscape needs to be widely recognised.

It would be also desirable to work with other stakeholders, such as the Department of Culture and local government, to consider securing funding for preservation, developing access roads, and utilizing the sites with other product/nature.

4) Natural environment-related stakeholders

Farmers, civilians and wildlife themselves such as elephants are natural environment-related stakeholders.

Presently, they are facing with the following problems:

- The expansion of farmlands and urban settlements, and the degradation of wildlife habitat have played a significant role for the rise of human wildlife conflict;
- Damage to farmlands, crops, property, and the lives and wellbeing of both humans and wildlife have been immensely affected by the recurring situation;
- It also has severe financial and socio-economic implications that create further negative sentiment towards wildlife, and
- A significant amount of resources is being put towards damage control, setting up countermeasures and dealing with economic loss, while there is no compensation for these losses.

These problems have the potential to be remedied by actively exploring the possibility of the RCSP Area becoming a model area that promotes the coexistence of humans and wildlife. The following are conceivable specific directions for addressing the problems.

- A holistic approach is needed to solve the current situation, taking into account all the stakeholders.
- Branding the RCSP Area as a model area to promote human-wildlife coexistence will be pursued (by improving wildlife habitat and establishing wildlife observation points throughout the area while implementing tangible animal damage prevention measures).

5) Local governments

Local governments are playing very important role in disaster management for realizing disaster prevention-related strategies/goals in the future, which require sufficient capacity of disaster management and related technologies of them including data collection, analysis and management, countermeasure design and selection, as well as the proper operation and maintenance. However, insufficient capacity of disaster management and related technologies is an apparent problem the local governments are facing to.

By improving the local governments' capacity described above, there is a potential that the RCSP Area would be established as a disaster mitigation technology centre in southern Bhutan.

Table 5.4.1 Stakeholder Matrix for the RCSP Area

Stakeholders	Problems	Potentials
1) Local Communities	<ul style="list-style-type: none"> • Scattered and absentee land ownership, and insufficient amount of water for agricultural use • Lack of major urban centre other than Gelephu • Low-income level and low employment rate • Lack of connectivity among communities and between each community and Gelephu Thromde 	<ul style="list-style-type: none"> • Promotion of socioeconomic development for the RCSP Area • Improvement of economic and life infrastructure services • Institutionalisation of community development committee that enables to unite neighbouring communities • Commercial farming supported by government subsidies collaborating with above mentioned committee to avoid unused agricultural land
2) Private sector/Industries	<ul style="list-style-type: none"> • No accumulation of medium and large-scale industries • Unbalanced distribution and accumulation of small business establishments (A large part of them are concentrated in Gelephu Thromde.) • No diversification of industries 	<ul style="list-style-type: none"> • Promotion of foreign Direct Investment (FDI) through development of industrial parks and SEZs, • Value-chain development and strengthening of marketing and business linkage through industrial cluster, and • Promotion of start-up and innovation through development of IT Park with the central government, local administrations, economic and industrial associations, research institutes, and so on.
3) Religious communities	<ul style="list-style-type: none"> • Isolated culturally and religiously important structures 	<ul style="list-style-type: none"> • Development for pilgrimage route/pilgrimage tourism • Holistic integration with other product/nature through establishment of proper connectivity

4) Natural environment-related stakeholders (farmers, residents, wildlife including elephants)	<ul style="list-style-type: none"> • rise of human wildlife conflict • damage to farmlands, crops, property, and the lives and wellbeing of both humans and wildlife • increment of negative sentiment towards wildlife • a significant amount of resources being put towards damage control measures and economic loss, while there is no compensation for the losses 	<ul style="list-style-type: none"> • Branding as a model area to promote human-wildlife coexistence (by improving wildlife habitat and establishing wildlife observation points throughout the area while implementing tangible animal damage prevention measures)
5) Local governments	<ul style="list-style-type: none"> • Insufficient capacity of disaster management and related technologies. 	<ul style="list-style-type: none"> • Establishment of a disaster mitigation technology centre in southern Bhutan

Source: JICA Project Team

5.4.2 Framework setting for the future

(1) Population projection

Based on the estimated population of the RCSP Area in 2017, the future population is projected until 2045 in accordance with the Macro-development Alternative A-2 of Chapter 2, which vitalizes the region through a large-scale infrastructure investment.

The projected population are calculated in the following steps.

First, the future population until 2045 is estimated by the component method, which considers the influences of demographic factors, such as the first-year single-age population, the age-specific fertility rate, the total fertility rate, and life expectancy, based on NSB projection data. The total fertility rate is expected to decline from 2017 to 2032 and then remain constant at 1.70 from that point until 2045, according to the assumptions of NSB.

Secondary, the internal and international migration or social increase as the impact of the existing and proposed several industrial development projects in the RCSP Area, namely, Jigmeling Industrial Park, Agro-processing Park, SEZs and IT Park with function of science technology, together with the newly proposed college in Sarpang Town, is additionally and simultaneously considered between 2022 and 2045 with employees and their families, students, staff, faculty, and their families under the projects.

Expected numbers of employees by industrial project as of the target year are shown in Table 5.4.2. Employees will be composed of Bhutanese and expatriate employees, but no distinction is made between them for calculation. Also, the expected locations of these industrial projects are shown in Figure 5.4.1.

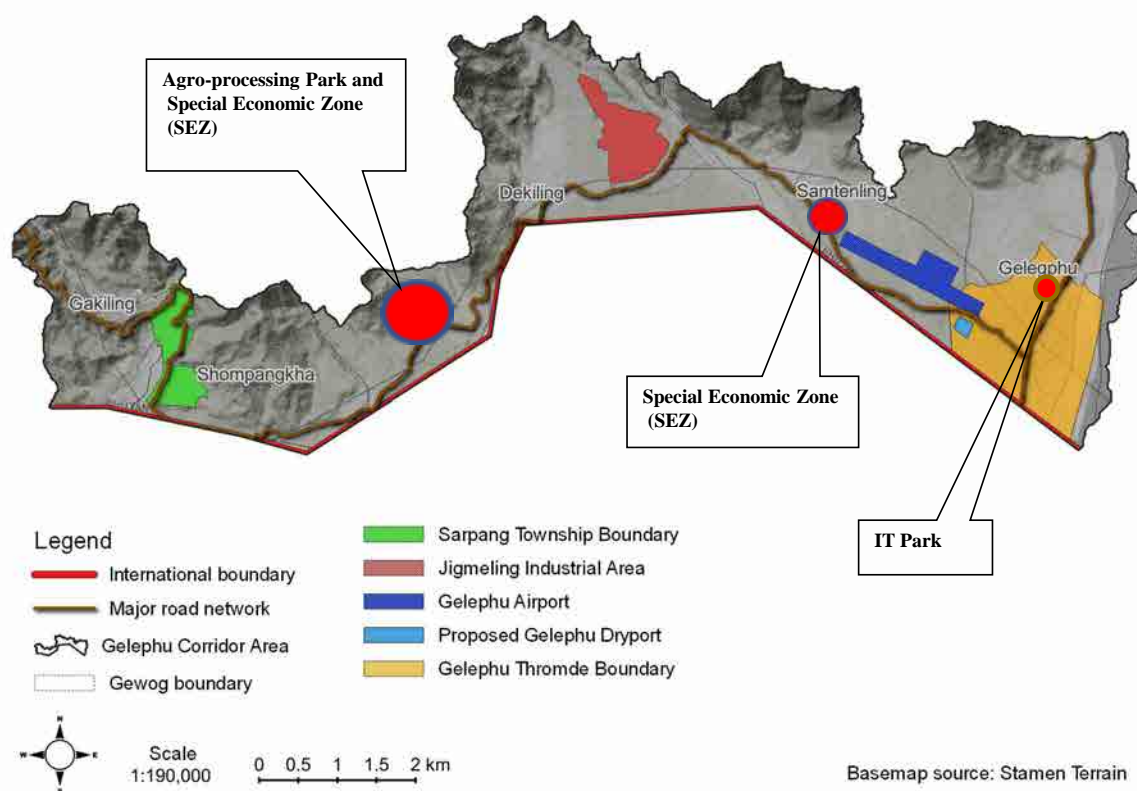
As for the proposed college, number of students, staff, faculty and their families will be estimated to be 1,200 by 2045.

Table 5.4.2 Expected Number of Employees of the Industrial Projects as of the Target Year

Existing or Proposed Industrial Projects	2030	2035	2045
Jigmeling industrial park (JIP)	6,500	7,000	8,000
Agro-processing Park	100	150	300
Special Economic Zones (SEZs: Two locations)	-	4,000	10,000
IT park (Science Technology Park)	50	200	500

Unit: persons

Source: JICA Project Team



Source: JICA Project Team

Figure 5.4.1 Expected Locations of the Industrial Projects

In conclusion, the population projection of the RCSP Area in 2030 and 2045 amounts to 46,200 in 2030 and 77,600 in 2045, respectively, and an annual average growth rate between 2022 and 2045 is about 4%, as shown in Table 5.4.3.

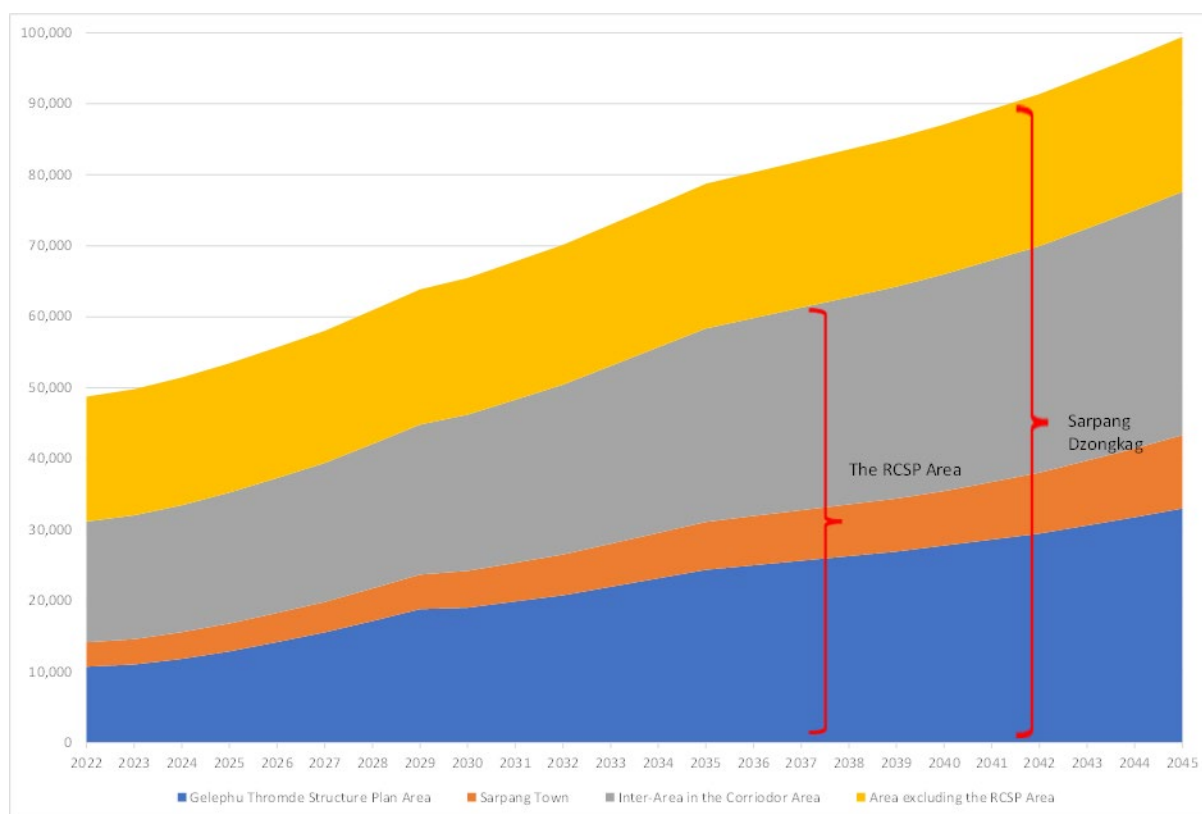
Table 5.4.3 Population Projection of the RCSP Area between 2030 and 2045 Based on Macro Development Alternative A-2

Unit: Persons/Percent (%)

Thromde, Town and Area	2022	2030	2035	2045	Annual Average Growth Rate (%)			
					2022–2030	2030–2035	2035–2045	2022–2045
Gelephu Thromde Structure Plan Area	10,700	19,000	24,300	33,000	7.4	5.1	3.1	5.0
<i>Gelephu Thromde</i>	<i>10,700</i>	<i>17,100</i>	<i>20,700</i>	<i>23,400</i>	6.0	3.9	1.3	3.5
Sarpang Town	3,400	5,200	6,800	10,300	5.3	5.5	4.3	4.9
Intermediate belt area between Gelephu and Sarpang	17,000	22,000	27,200	34,300	3.3	4.4	2.3	3.1
Total of the RCSP Area	31,200	46,200	58,300	77,600	5.0	4.8	2.9	4.0
Population of Sarpang Dzongkhag	48,700	65,400	78,600	99,400	3.8	3.8	2.4	3.1

Source: JICA Project Team

As shown in Figure 5.4.2, the share of the RCSP Area's population in Sarpang Dzongkhag in 2045 is larger than that in 2022.



Source: JICA Project Team

Figure 5.4.2 Population Projection of the RCSP Area and Sarpang Dzongkhag between 2022-2045

(2) Carrying capacity including land suitability

1) Extraction of urbanisation area

In the section above, future population is estimated for the RCSP Area. In this section, an urbanisation area is examined to serve the future population. The objective of the urbanisation area is not only to establish the extent of the urban area to accommodate the future population, but to conserve forests and prime agricultural land outside the urbanisation area in order to preserve the rich natural environment in the RCSP Area.

In establishing the urbanisation area, the following areas are set outside the area from the perspective of conserving the natural environment and excluding land unsuitable for urbanisation.

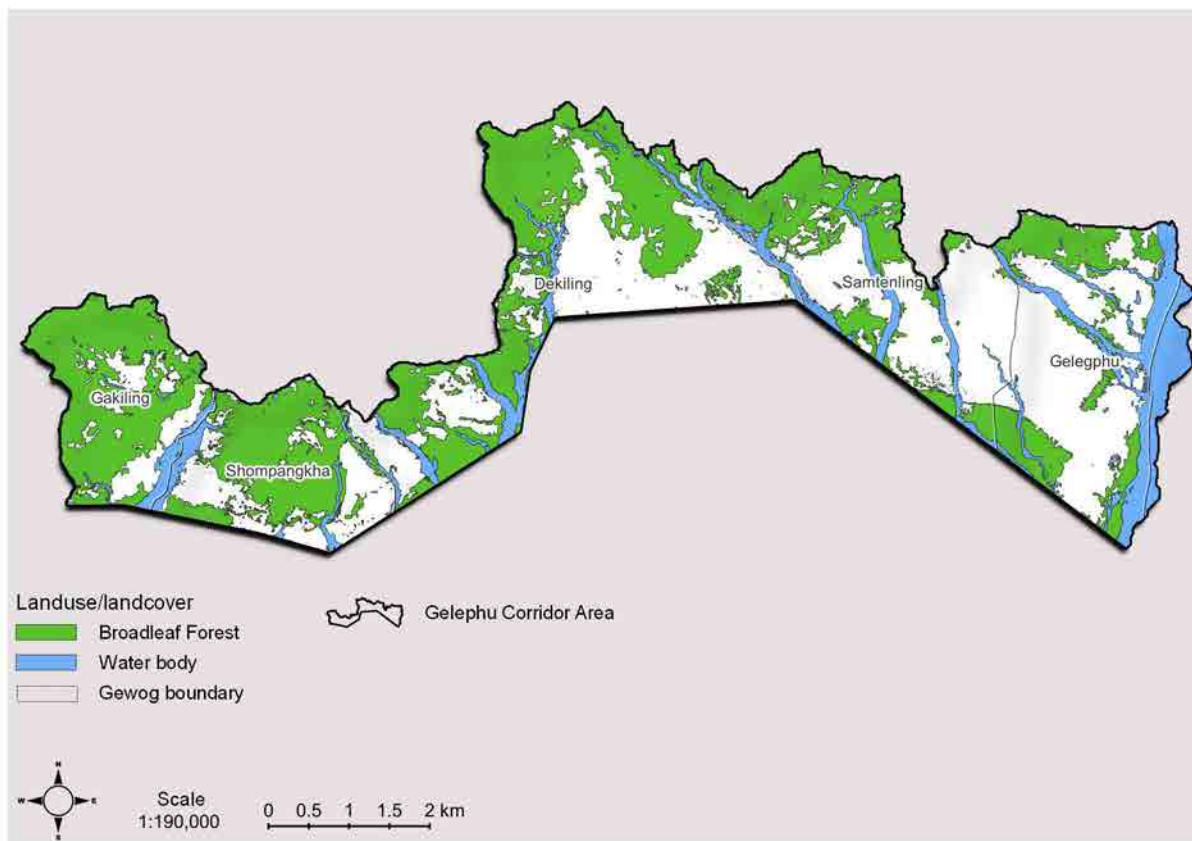
Areas for conserving natural environment

- Forest
- Community forest
- Agricultural land with irrigation facilities that should be conserved as prime agricultural land

Area unsuitable for urbanisation

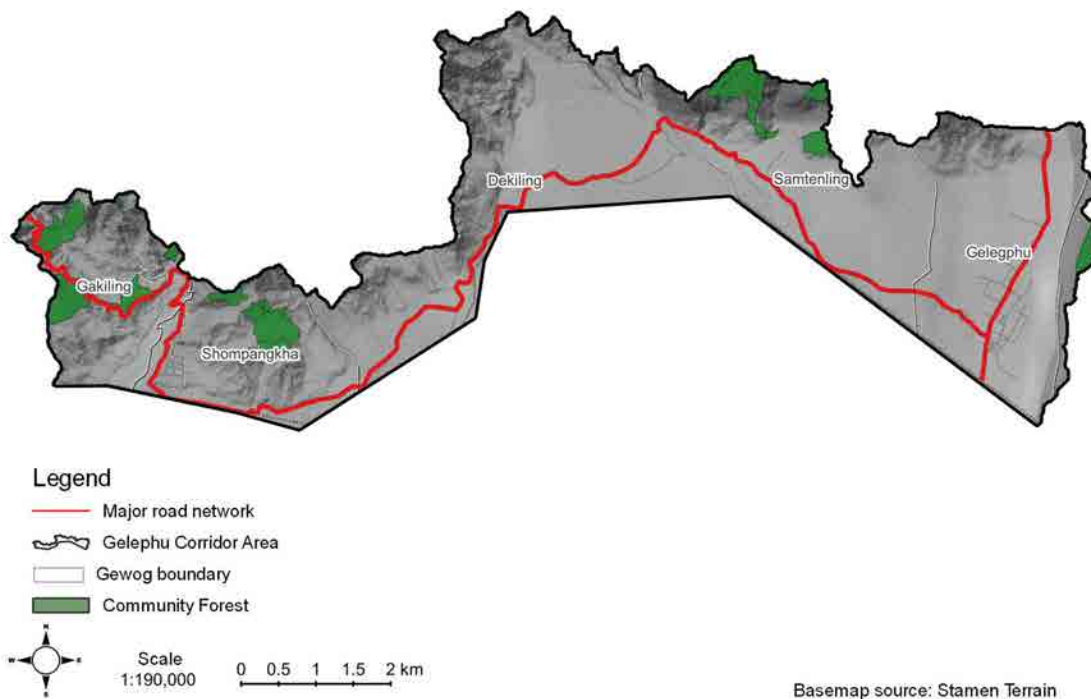
- Area within 500 m from the Indian border
- Areas with gradients exceeding 30%
- Water bodies such as river
- Flood inundation area
- Landslide risk area

Thematic maps of those areas are shown in figures from 5.4.3 to 5.4.8.



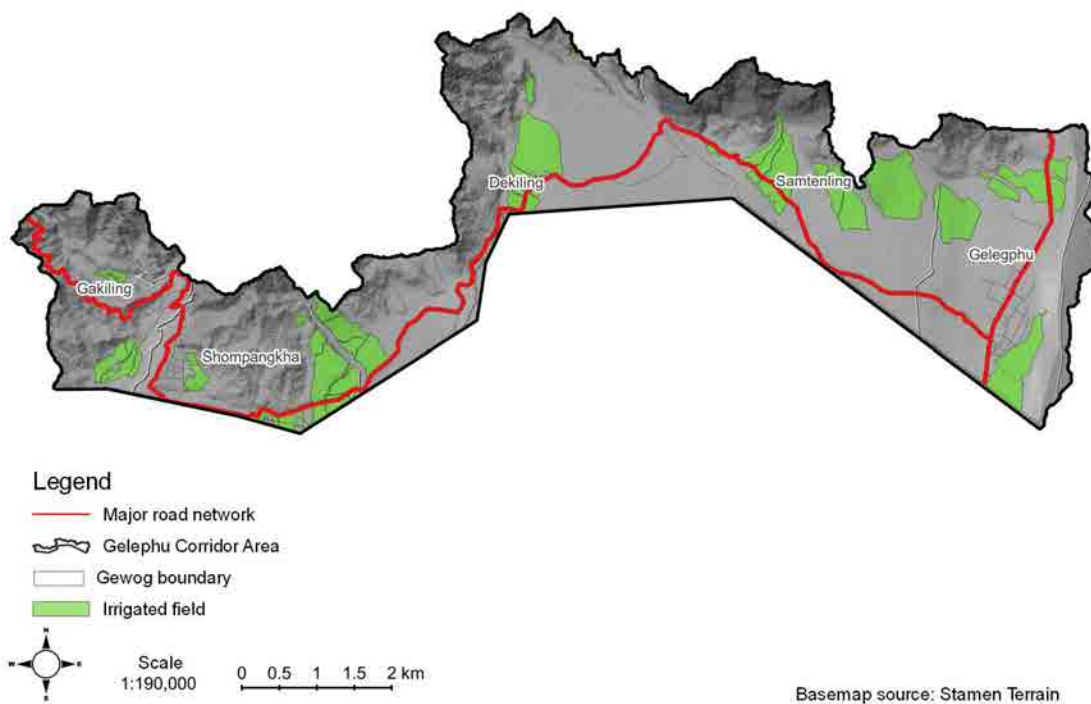
Source: JICA Project Team based on SPOT-6/7 satellite imageries acquired from October 2016 to April 2017

Figure 5.4.3 Forest and Water Body in Corridor Area



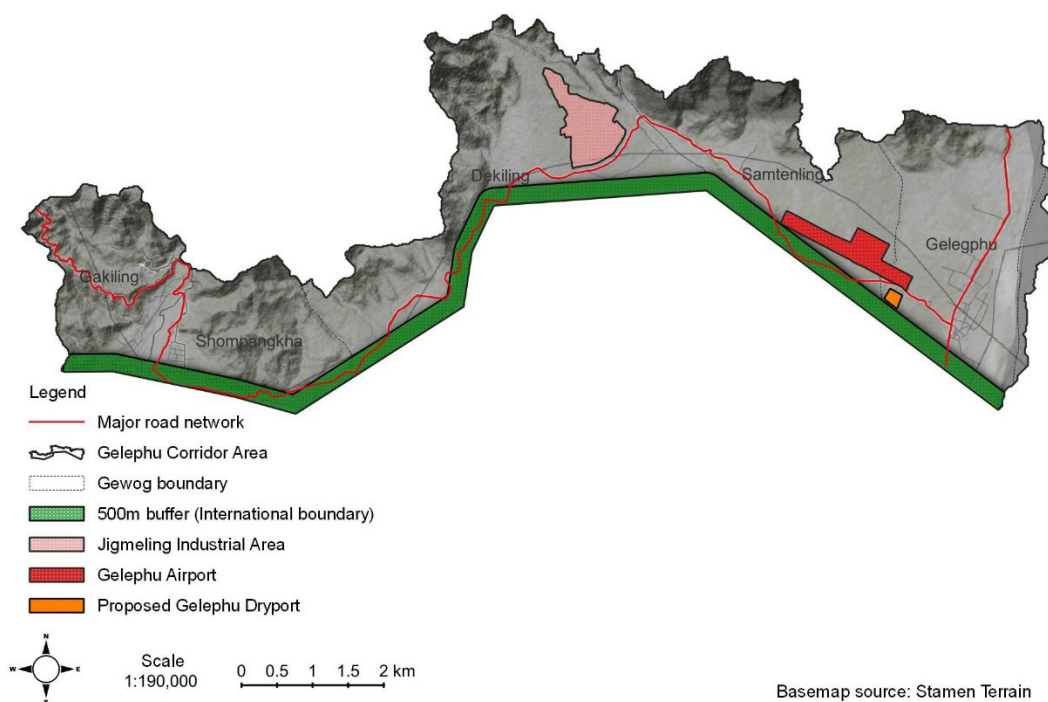
Source: Community Forest Division of Sarpang, Tsirang, and Zhemgang Dzongkhags

Figure 5.4.4 Community Forest in Corridor Area



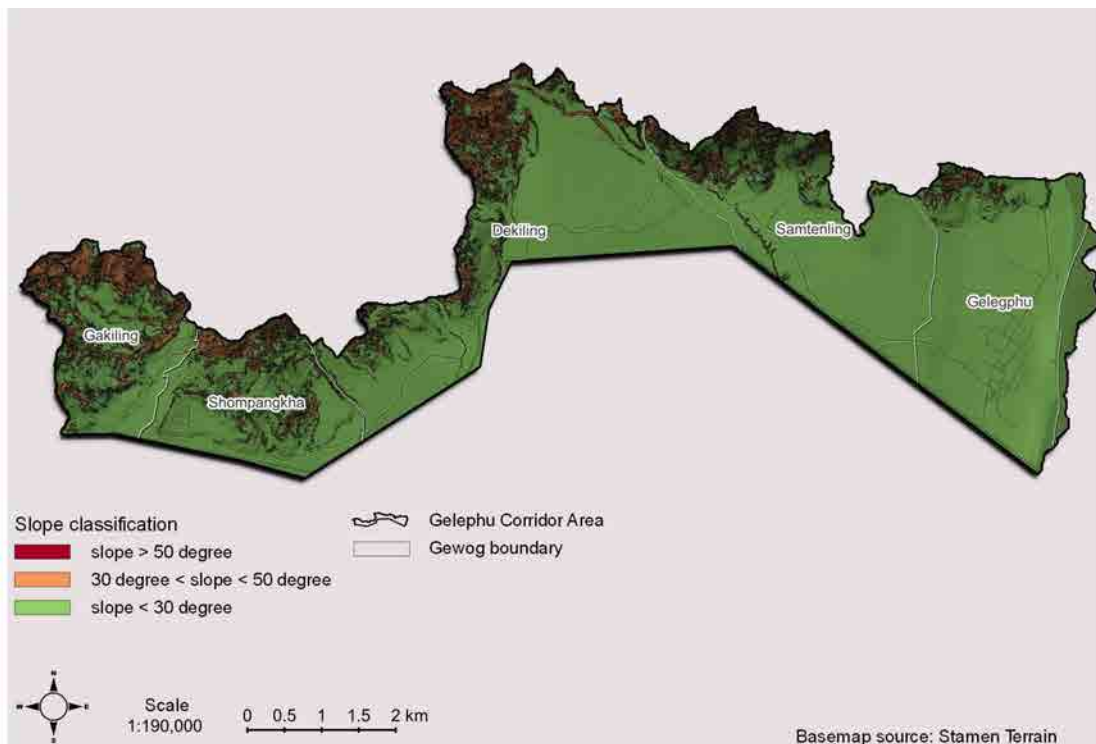
Source: Ministry of Agriculture and Livestock

Figure 5.4.5 Irrigated Agriculture Land in Corridor Area



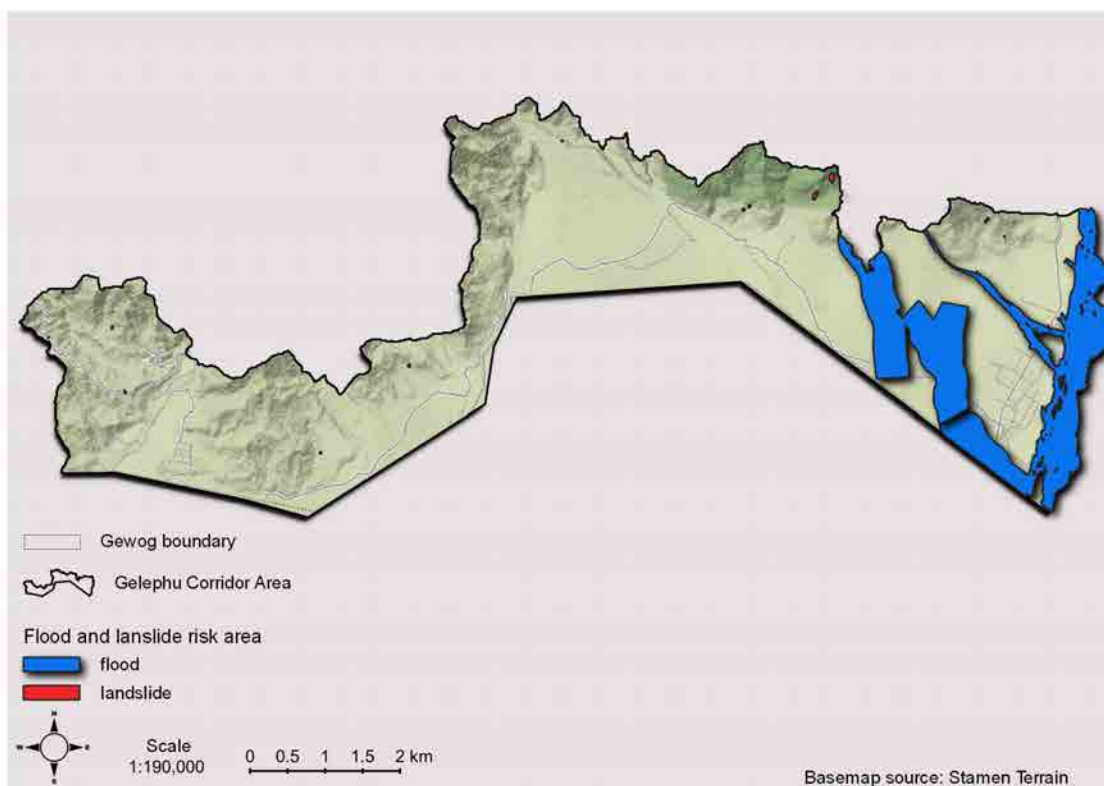
Source: JICA Project Team

Figure 5.4.6 500m Buffer from International Boundaries with India



Source: JICA Project Team based on digital elevation model data procured from Satellite Image Marketing Corporation

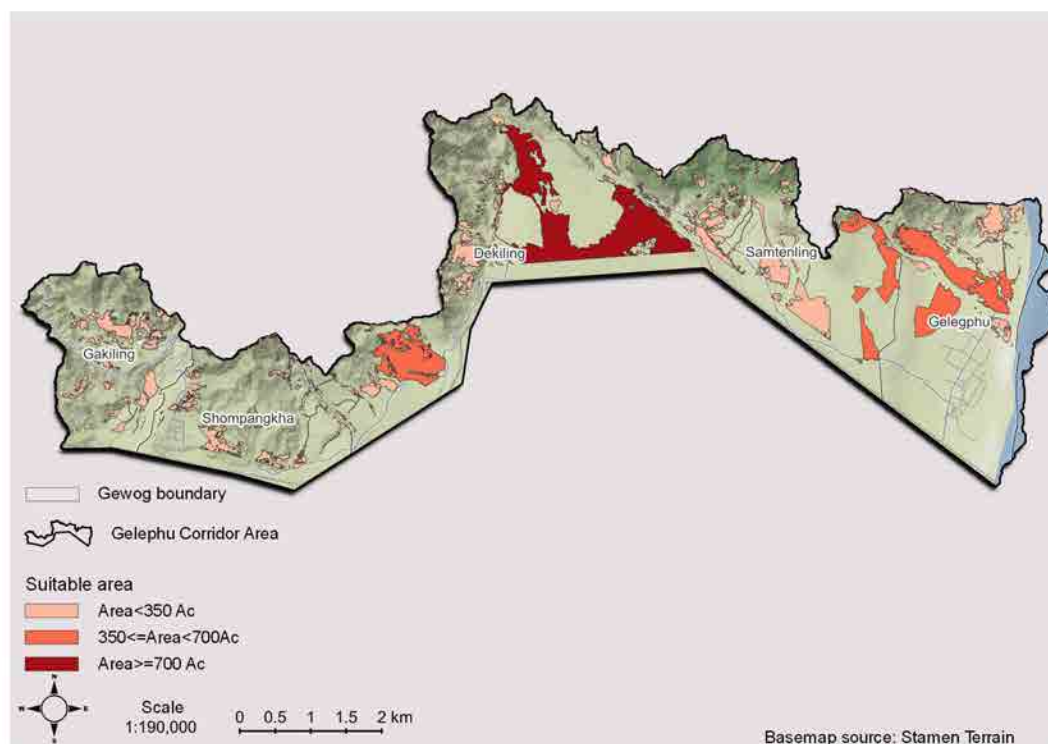
Figure 5.4.7 Slope Classification in Corridor Area



Source: JICA Project Team based on the report prepared by World Bank and FEMD

Figure 5.4.8 Flooded Area and Landslide Risk Area in Corridor Area

Figure 5.4.9 shows the areas which exclude areas unsuitable for development and nature conservation areas. Those areas are considered suitable for development.



Source: JICA Project Team

Figure 5.4.9 Land Suitable for Development in Corridor Area

2) Estimate of carrying capacity of urbanisation area

The candidate for urbanisation areas in the RCSP Area are (i) the planning area of the Structure Plans of Gelephu and Sarpang, (ii) the area of Jigmeling Industrial Park and (iii) the area excluding the area unsuitable for development. Of these, the Structure Plans for Gelephu and Sarpang estimate the planned population. This planned population of the two Structure Plans exceeds the future population for both areas of Gelephu and Sarpang, and thus the two Structure Plan areas have sufficient capacity to accommodate the future population (Table 5.4.4). In fact, satellite images of the existing urban areas reveal that there remains a sufficient amount of undeveloped areas in Gelephu and Sarpang to accommodate the future population (Figure 5.4.10), which have sufficient capacity to accommodate the future population. Therefore, there is no need to revise the Structure Plan for Gelephu and Sarpang to accommodate the future population.



Source: SPOT imageries

Figure 5.4.10 Satellite Imageries of Gelephu and Sarpang

Table 5.4.4 Population in Gelephu and Sarpang

Area	Population in 2022 ¹⁾	Estimated Population in 2045 ²⁾	Estimated Population in Structure Plan
Gelephu	10,746	33,200	40,200
Sarpang	3,460	9,800	11,000

Source: 1) Gelephu Thromde, 2) JICA Project Team, 3) Structure Plans for Gelephu and Sarpang

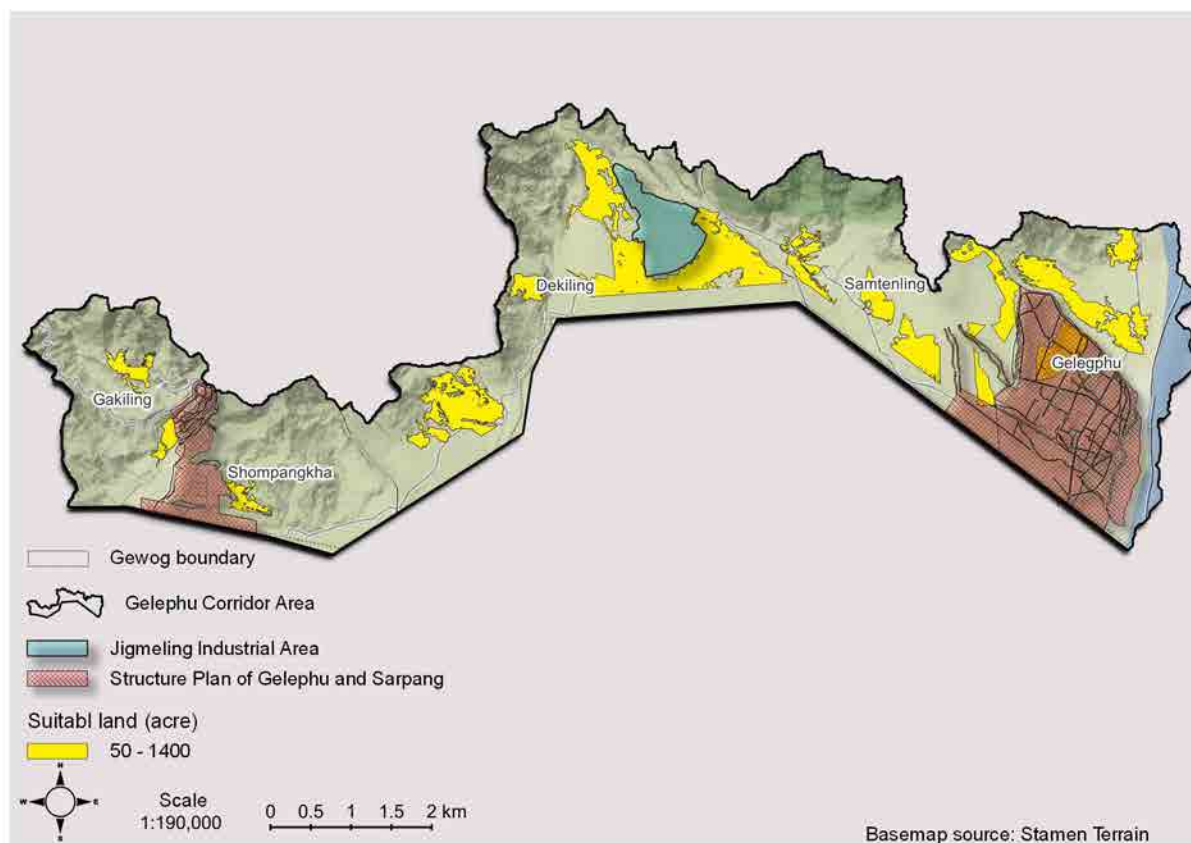
The future population in the intermediate areas between Gelephu and Sarpang in 2045 is 33,700. The population density in Bhutan is considerably low, and even in Thimphu, the largest population centre in the country, the population density is 44 persons/ha (Table 5.4.5). In order to preserve a large amount of agricultural land and natural environment as much as possible, it is desirable to create urban areas with moderate population density. In response, the population density in the intermediate area is expected to be 40 persons/ha, which is higher than the current population density of Sarpang and Gelephu and similar to that in Thimphu and the level of estimated population of structure plans for Sarpang and Gelephu. As a result, the area of urbanisation area required in the intermediate area is 8.4 km² to accommodate the future population of 33,700 persons.

Table 5.4.5 Population Density in Gelephu, Sarpang and Thimphu

	Population in 2017 ¹⁾ (person)	Population specified in Structure Plan (person)	Land Area ²⁾ (ha)	Population Density (person/ha)
Gelephu	9,858	-	1150	9
	-	40,200	1150	35
Sarpang	3,152	-	250	13
	-	11,000	250	44
Thimphu	114,551	-	2616	44

Source: 1) Population and Housing Census of Bhutan (PHCB) 2017 by National Statistics Office and 2) National Land Commission

Urbanisation areas are established to meet the above land demands, while excluding relatively small lands suitable for development but less than 50 acres. The distribution of urbanisation area is shown in Figure 5.4.11, and the urbanisation area covers 15.731 km². Taking into account that the new SEZ will cover 2.6 km² of the urbanisation area, the available land to accommodate future population is amounted to 13.131 km². Due to creation of urbanisation area, 7.44 km² of cropland will be urbanised among 26.91 km² crop land.



Source: JICA Project Team

Figure 5.4.11 Distribution of Urbanisation Area in Corridor Area

5.4.3 Planning standards for public infrastructure, amenities and services

As same as the Regional Spatial Plan in the last chapter, the Spatial Planning Standards (SPS)²³ should be referred to for the distribution of social services. In the SPS, social service facilities listed in the Holistic Service Delivery System are mentioned as public amenities or public spaces, and included amenities are categorized into health, education, recreation and sports, services, administration, community facilities, and public spaces. Table 5.4.6 shows the entire list of planning requirements in the SPS.

Table 5.4.6 Planning Requirements for Public Amenities and Spaces in the SPS

Category	Amenity	Location	Max Catchment Radius	Max Catchment Population	Land Requirement (sqm)
Health	Neighbourhood/ Out Reach Clinic	Neighbourhood centre	30 minutes walking	100-200	300-500
	Basic Health Unit	Centrally located	30 minutes walking	1,000-5,000	500
	Dzongkhag/District Hospital	Central in the District		15,000-20,000	3,000-5,000
	Regional Hospital	Central in the Region		30,000	5,000-20,000
	National Hospital	Out of standard because of its exceptional nature			

²³ DHS (2017a) "Spatial Planning Standards"

	Small pet clinic	Residential areas		15,000	500
Education	Nursery School (100 pupils) Include creche	Neighbourhood nodal point, secondary road	10 minutes walking	5,000	1,000
	Lower Secondary School (300 students)	Urban nodal point, primary road	15 minutes walking	5,000	5,000-10,000
	Middle Secondary School (600 students)	Periphery areas, primary road	45 minutes by school bus	20,000	15,000-20,000
	High Secondary School (600 students)	Periphery areas, primary road	45 minutes by school bus	20,000	20,000-30,000
Recreation and Sports	Indoor sport complex	Periphery areas with good access to public transport, primary road	5km	5,000-30,000	15,000-25,000
	Outdoor sport complex	Periphery areas with good access to public transport, primary road	5km	5,000-10,000	20,000-25,000
	Basic football ground	Primary road, semi-central location	30 minutes walking	5,000	10,000
	Football stadium	Primary road, central in the district	30 minutes driving	30,000	30,000
Administration	LG Offices	As per administrative boundaries	30 minutes walking	No Limit	200-1,000 *
	Regional government offices	Major town	30 minutes walking	Whole administrative area's population	200-1,000 *
Services	Waste treatment plant	In proximity of settlement	**	2,500-30,000	50,000 per 10,000 people **
	Water treatment plant	In proximity of settlement	**	2,500-30,000	50,000 per 10,000 people **
	Waste disposal site	In proximity of settlement	**	2,500-30,000	50,000 per 10,000 people **
	Fuel Station	Along or in proximity to main roads, primary road	30 minutes driving	No Limit	500-1,000
	Fire-fighting facilities	In the centre of the catchment area, along or in proximity to main roads, primary road	30 minutes driving	2,500-30,000	200-500
	Police Service	In the centre of the catchment area, along or in proximity to main roads, primary road	30 minutes walking	2,500-5,000	200-500

	Reservoir for fire protection system	Based on engineering design of fire protection network. Can be located underground, in the land of another amenity.			50-100
	Crematorium	Whole urban area (one in every town)	-	-	2,000-5,000
	Post, Power and Telecommunication	In the centre of the catchment area	30 minutes walking	Up to 15,000	200-500
Community Facilities	Community temple	Neighbourhood, secondary road	30 minutes walking	2,500	200-1,000
	Community hall	Neighbourhood, secondary road	30 minutes walking	2,500	200-1,000
	Library	Neighbourhood, secondary road	30 minutes walking	2,500	200-1,000
	Exhibition	Neighbourhood, secondary road	30 minutes walking	2,500	200-1,000
	Farmer's Market	Town or neighbourhood centre, high density areas, primary road	30 minutes walking	30,000	3,000-5,000
Public spaces	Parks	Location subject to existing natural spaces such as rivers, forest, etc.	No limit	No limit	>5,000
	Large gardens	Citywide, especially in high density areas	30 minutes walking	5,000	1,000-5,000
	Small gardens	Neighbourhood nodal point, secondary road	30 minutes walking	2,000	1,000-5,000
	Central plaza	Central areas, neighbourhood nodal points	30 minutes walking	2,500	1,000-4,000
	Children's Playground	Neighbourhood nodal point, secondary road	10 minutes walking	5,000	200-500

* Depending on LG level and requirements.

** To be determined based on preliminary engineering studies, depending on type of waste treatment selected.
Source: SPS

In the Paro Valley Development Plan (PVDP)²⁴, planning requirements are mainly based on the SPS, but partly adjusted. The following table shows the provision of amenities in the PVDP.

Table 5.4.7 Planning Standards for Provision of Amenities in the PVDP

Amenity	Location	Max catchment radius	Max catchment population	Land allocated (sqm)
Dzongkhag/District Hospital	Central in the District	30 minutes driving (10,000m)	15,000-20,000	3,000-5,000
Primary School (100 pupils)	Neighbourhood nodal point, secondary road	10 minutes walking (800m)	5,000	1,000
Lower Secondary School	Urban nodal point, primary road	15 minutes walking (1,200m)	5,000	5,000-10,000

²⁴ DHS (2017b) "Paro Valley Development Plan"

Middle Secondary School	Periphery areas, primary road	45 minutes by school bus (15,000m)	20,000	15,000-20,000
Higher Secondary School	Periphery areas, primary road	45 minutes by school bus (15,000m)	20,000	20,000-30,000
Waste disposal site	In proximity of settlement	10,000m from boundary of built area	2,500-30,000	50,000 per 10,000 people
Fire-fighting facilities	In the centre of the catchment area, along or in proximity to main roads, primary road	30 minutes driving (10,000m)	2,500-30,000	200-500
Police Service (Station)	In the centre of the catchment area, along or in proximity to main roads, primary road	30 minutes driving (10,000m)	2,500-5,000	200-500
Petrol Pump	Along or in proximity to main roads, primary road	30 minutes driving (10,000m)	No Limit	500-1,000
LG Office	As per administrative boundaries	30 minutes walking (2,400m)	No Limit	200-1,000
Children's Playground	Neighbourhood nodal point, secondary road	10 minutes walking (800m)	5,000	200-500
Town Centre	Town or Neighbourhood centre, high density area, primary road	30 minutes walking (2,400m)	30,000	3,000-5,000
Weekly Market	Area with good access to public transport, high density area, primary road	30 minutes walking (2,400m)	No limit	5,000-10,000
Neighbourhood Node	Along the major neighbourhood's street, primary road	30 minutes walking (2,400m)	5,000	500-2,000

Source: PVDP

Regarding the Holistic Service Delivery System, public facilities, infrastructure, or amenities are listed by function such as education, health, transport, commercial, recreation, and civic service. The following tables show the planning requirements for each facility by function.

Table 5.4.8 Planning Requirements for Education Facilities

	Location	Max Catchment Radius	Max Catchment Population	Land Requirement (sqm)	Remarks
HSS	Periphery areas, primary road	45 minutes by bus (15km)	20,000	20,000-30,000	If HSS includes lower schools, it should also follow the planning requirement of the lower category.
MSS	Periphery areas, primary road	45 minutes by bus (15km)	20,000	15,000-20,000	Same as above.

LSS	Urban nodal point, primary road	15 minutes walking (1.2km)	5,000	5,000-10,000	Same as above.
PS	Neighbourhood nodal point, secondary road	10 minutes walking (0.8km)	5,000	1,000	

Source: JICA Project Team

Table 5.4.9 Planning Requirements for Health Facilities

	Location	Max Catchment Radius	Max Catchment Population	Land Requirement (sqm)	Remarks
RRH	Central in the Region	45 minutes driving (15km) *	30,000	5,000-20,000	* Follow the planning requirement of HSS and MSS in the SPS
Hospital	Central in the District	30 minutes driving (10km)	15,000-20,000	3,000-5,000	
BHU/PHC	Centrally located	30 minutes walking (2.4km)	1,000-5,000	500	
ORC	Neighbourhood centre	30 minutes walking (2.4km)	100-200	300-500	

Source: JICA Project Team

Table 5.4.10 Planning Requirements for Transport, Commercial, Recreation, and Civic Service Facilities

	Location	Max Catchment Radius	Max Catchment Population	Land Requirement (sqm)	Remarks
Fuel Station (Petrol Pump)	Along or in proximity to main roads, primary road	30 minutes driving (10km)	No Limit	500-1,000	
Market Shed (Weekly Market)	Area with good access to public transport, high density area, primary road	30 minutes walking (2.4km)	No Limit *	5,000-10,000 *	* Follow the planning requirement in the PVDP
Playground (Children's Park)	Neighbourhood nodal point, secondary road *	10 minutes walking (0.8km) *	5,000 *	200-500 *	* Follow the planning requirement in the PVDP
LG Office	As per administrative boundaries	30 minutes walking (2.4km)	No Limit	200-1,000	
Police Station	In the centre of the catchment area, along or in proximity to main roads, primary road	30 minutes driving (10km)	2,500-5,000	200-500	

Source: JICA Project Team

5.5 Development Strategies for the RCSP

5.5.1 Strategy for the protection and creation of attractive environment and cultural identity

In order to create a region where human activities and the surrounding environment are in harmony, and where vitality and attractiveness coexist, it is important to inherit and develop environmental and cultural features that enrich the regional characteristics from the viewpoint of spatial planning.

To demonstrate the uniqueness of the region and achieving harmony with nature, enrichment of the landscape formed by the vast expanse of space and the forests in the backdrop will be promoted, together with the preservation/rehabilitation of cultural landscape formed by heritage sites and their surroundings.

In addition, development of recreational spaces along rivers within or adjacent to the urban areas in Gelephu and Sarpang will be promoted with the aim of creating a series of beautiful urban open spaces by interweaving water bodies and greenery. Such areas can also become wildlife viewing points that would be inviting locals and tourists.

In this context, attention will be paid to ensuring consistency among the existing structure plans for Gelephu and Sarpang, other existing plans including the City Central Plan of Gelephu for water park development and beautification of Sarpang-Gelephu-Trongsra Highway.

In the intermediate belt area, in order to avoid damage by infrastructure development along the national highway to the unique landscape consisting of a natural continuum from the plains to the forests in the hinterland, and then to the mountains, efforts should be made to preserve the natural environment along the national highway and carry out the roadside landscaping. This would help conservation activities for wildlife and reduce habitat destruction, while ensuring eco-system integrity.

In line with the concepts above, the environment and culture identity of the area will be created and protected. In the short-term, greenery, forest and cultural site will be conserved under the existing legislation after identifying the areas and routes forming unique cultural landscapes with nature. Therefore, awareness of environmental protection and cultural identity have to be raised for. The people's knowledge and attitudes about these issues play a significant role and contribution towards compliance and enforcement of laws and regulations.

In Gelephu and Sarpang, expansion of existing open spaces and recreational spaces will be promoted, while development of new open spaces, recreational spaces and viewpoints proposed in the existing plans as well as scenic highway will be examined during the feasibility study. In the mid-term, the action plan for landscape preservation/creation with the guideline for outdoor information and signboards will be developed.

Proposed open spaces, recreational spaces, viewpoints and scenic highway will be developed in Gelephu and Sarpang, and the heritage sites including monasteries will be developed as the basis for pilgrimage route in whole RCSP Area. In the long-term, unique landscape harmonized with nature will be enriched by creating a series of urban open spaces with water bodies and greenery along rivers in Gelephu and Sarpang. The roadside landscaping of the national highway as well as pilgrimage route in the intermediate belt area will be also promoted.

Table 5.5.1 Phase-wise Development Strategy: Environment and Cultural Identity

Target Area	Short-Term (groundwork phase) Strategy for 2030	Mid-Term (building up phase) Strategy for 2035	Long-Term (fulfilment phase) Strategy for 2045
Whole RCSP Area	<ul style="list-style-type: none"> Conserve greenery, forest and cultural site including monasteries under existing laws, regulations and guidelines 	<ul style="list-style-type: none"> Develop the action plan for landscape preservation/creation Develop/improve the base for pilgrimage routes 	<ul style="list-style-type: none"> Preserve/rehabilitate cultural landscape formed by heritage sites and their surroundings

	<ul style="list-style-type: none"> Identify the areas/routes that form unique cultural landscapes, and areas for natural conservation Raise awareness of environmental protection and cultural identity 	<ul style="list-style-type: none"> Develop the guideline for outdoor information and signboards 	<ul style="list-style-type: none"> Develop pilgrimage routes as cultural corridors Enrich the landscape formed by the vast expanse of space and the forests in the backdrop, to demonstrate the uniqueness of the region and achieving harmony with nature
Gelephu	<ul style="list-style-type: none"> Promote the expansion of existing open spaces and recreational spaces Conduct Feasibility Study (F/S) of urban open spaces and recreational spaces proposed in the existing plans Conduct F/S on the beautification of the Sarpang-Gelephu-Trongsa highway planned in the City Central Plan. 	<ul style="list-style-type: none"> Develop urban open spaces and recreational spaces proposed in the existing plans Develop the beautification of the Sarpang-Gelephu-Trongsa Highway 	<ul style="list-style-type: none"> Create a series of pleasant urban open spaces including recreational spaces by interweaving water bodies and greenery along rivers within/ adjacent to urban areas
Sarpang	<ul style="list-style-type: none"> Identify the area of heritage sites and their surrounding landscape area to be preserved (e.g., Sarpang Dzong) Promote the expansion of existing open spaces and recreational spaces Conduct F/S of urban open spaces, recreational spaces and viewpoints proposed in the existing plans 	<ul style="list-style-type: none"> Develop the action plan for landscape preservation Develop urban open spaces, recreational spaces and viewpoints proposed in the existing plans 	<ul style="list-style-type: none"> Create a series of pleasant urban open spaces including recreational spaces by interweaving water bodies and greenery along rivers within/ adjacent to urban areas
Intermediate belt area	<ul style="list-style-type: none"> Conduct F/S on establishing animal viewpoints along the animal movement corridors and naturscapes Conduct F/S on beautification of the national highway (scenic highway) Identify the viewpoints 	<ul style="list-style-type: none"> Develop and restore wildlife habitat along the movement corridors and viewpoints to maintain natural equilibrium and eco-system services Develop a scenic highway (e.g., removal of roadside utility poles, improvement of footpaths, planting flowers, etc.) Conduct F/S of roadside station 	<ul style="list-style-type: none"> Enabling the coexistence of wildlife and humans, maintaining a diversity of plants and animals, reducing environmental pollution Preserve the natural environment along the national highway and maintain the roadside landscaping Develop roadside station

Source: JICA Project Team

5.5.2 Strategy for the realisation of sustainable land use and human settlement

To realize a multi-core growth corridor, spatial integration of the entire RCSP Area connecting Sarpang, Jigmeling and Gelephu, as the urban cores, will be promoted. In addition, urban development in Gelephu, Sarpang, and Jigmeling will be promoted with the aim of developing them as multifunctional centres. In this context, attention will be paid to ensuring consistency between the existing structure plans for Gelephu and Sarpang and the newly prepared Sarpang-Gelephu Regional Centre Structure Plan.

In the intermediate belt area, in order to avoid urban development along national highway adversely impacting the conservation of agricultural and forest lands and the increase of disaster risks, efforts should be made to appropriately coordinate natural and agricultural land use with urban land use, and to prevent the spread of unplanned urban development. On the basis of such coordination, urban industrial clusters will be formed in appropriate locations, and residential areas for the employees of the clusters will be developed in a planned manner. On contrary, the agricultural lands will be used to create agriculture promotion area.

In line with the concepts above, a spatial plan that harmonizes agricultural land, forests, and urbanisation areas will be developed. Specifically, an urbanisation area will be established to conserve agricultural land and forests outside the urbanisation area and to develop efficient infrastructure for creating the venue of the incremental population in urbanisation area. Urbanisation will be carried out in these urbanisation areas to form urban cores and urban corridor, while the outside will be conserved as urbanisation control area.

In the short-term, hubs will be developed within the RCSP Area by establishing urban cores in Gelephu, Sarpang and Jigmeling. In the mid-term, the intermediate area between Gelephu and Sarpang will be developed for housing, and commercial uses along the trunk road. In parallel, agriculture and agro-processing establishments will be promoted in the intermediate area. In the long-term, residential development and a new SEZ along the trunk road will be promoted to form a corridor connecting Gelephu, Jigmeling and Sarpang.

Table 5.5.2 Phase-wise Development Strategy: Land Use and Human Settlement

Target Area	Short-Term (groundwork phase) Strategy for 2030	Mid-Term (building up phase) Strategy for 2035	Long-Term (fulfilment phase) Strategy for 2045
Whole RCSP Area	<ul style="list-style-type: none"> Implement development of urban cores at Jigmeling, and Gelephu and Sarpang in accordance with structure plan. 	<ul style="list-style-type: none"> Implement development of urbanisation areas within the intermediate area 	<ul style="list-style-type: none"> Achieve spatial integration of entire RCSP Area by creating urbanisation area connecting Sarpang, Jigmeling and Gelephu
Gelephu	<ul style="list-style-type: none"> Create business centre including IT centre in accordance with precinct plan 	<ul style="list-style-type: none"> Create multi-modal transit centre in accordance with precinct plan 	<ul style="list-style-type: none"> Establish the status of Gelephu as a multifunctional urban core
Sarpang	<ul style="list-style-type: none"> Provide housings to receive the incremental population in accordance with precinct plan 	<ul style="list-style-type: none"> Conduct F/S for the tertiary education as the core of the academic centre 	<ul style="list-style-type: none"> Implement the development of tertiary education to establish the status of Sarpang as a multifunctional urban core
Intermediate belt area	<ul style="list-style-type: none"> Formulate local spatial plan around Jigmeling Industrial Park 	<ul style="list-style-type: none"> Formulate local spatial plan for urbanisation area 	<ul style="list-style-type: none"> Implement local spatial plan for urbanisation area Establish the status of Jigmeling as a

	<ul style="list-style-type: none"> Establish a regulatory framework to control urbanisation area 	<ul style="list-style-type: none"> Implement local spatial plan around Jigmeling Industrial Park Provide infrastructure with housings in urbanisation area Plan a new SEZ in west of Gelephu Promote agriculture and agro-processing establishments as one of core industries in the RCSP Area 	<ul style="list-style-type: none"> multifunctional urban centre Prevent the spread of unplanned urban development to appropriately coordinate natural and agricultural land use with urban land use Develop urban industrial clusters and residential areas for the employees of the clusters, in a planned manner Develop the SEZ Enhance agriculture and agro-processing establishments
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Source: JICA Project Team

5.5.3 Strategy for the provision of quality public infrastructure, amenities and services

It will be a long-term goal for the RCSP Area to play a role in providing convenient and comfortable living to the residents of the Southern Central Region (SCR), strengthening the high-level livelihood service functions in Gelephu Thromde and Sarpang town, and installing ICT-oriented livelihood service functions.

Toward the above goals, a short-term priority should be to promote the expansion of existing service functions considering the population growth. In addition, it is also required to conduct feasibility study of ICT-oriented livelihood service functions for the residents of the whole SCR.

Regarding the town-wide development, Gelephu would aim to be a healthy and recreational urban destination with international-level service facilities in the country. As one of the key initiatives, the Central Regional Referral Hospital (CRRH) will be improved gradually. At the same time, the establishment of the central park with attractive amenities shall be right from the beginning.

For Sarpang Town, while taking into consideration its role-sharing function with Gelephu, it should consider introducing wide-area administrative functions to serve the whole SCR based on an ICT-oriented G2C system and the establishment of a tertiary education institute contributing to the human resource development beneficial to the region.

Then, as deemed appropriate for being located along the national highway, in the Intermediate belt area, Jigmeling will be upgraded as an urban centre second to Gelephu Thromde and Sarpang Town with community service functions such as educational and medical services. Starting from a few fundamental roadside facilities, in the long term, a roadside station (equipped with facilities such as fuel station, car workshop and car wash facility, electric charging station, ATM, restaurants/eateries, market sheds, recreational areas, footpath, and taxi parking) shall be established.

Table 5.5.3 Phase-wise Development Strategy: Public Infrastructure, Amenities and Services

Target Area	Short-Term (groundwork phase) Strategy for 2030	Mid-Term (building up phase) Strategy for 2035	Long-Term (fulfilment phase) Strategy for 2045
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Whole RCSP Area	<ul style="list-style-type: none"> Promote the expansion of existing service functions to cope with population growth Conduct F/S of ICT-oriented livelihood service functions for the residents of the whole SCR 	<ul style="list-style-type: none"> Pre-install ICT-oriented livelihood service functions in Gelephu 	<ul style="list-style-type: none"> Strengthen high-level livelihood service functions in Gelephu and Sarpang Install ICT-oriented livelihood service functions in the whole RCSP Area
Gelephu	<ul style="list-style-type: none"> Promote the functional expansion of the CRRH with installing the up-to-date telemedicine system Conduct F/S of the central park as a national-level recreation facility 	<ul style="list-style-type: none"> Promote the spatial expansion of the CRRH cope with population growth Establish the central park with attractive amenities 	<ul style="list-style-type: none"> Establish the status of a healthy and recreational urban destination with international-level service facilities in the country
Sarpang	<ul style="list-style-type: none"> Strengthen the civic service functions of and around Dzong Conduct a basic survey of the fundamental demand for tertiary education 	<ul style="list-style-type: none"> Conduct F/S of a tertiary education institute contributory to the human resource development of SCR 	<ul style="list-style-type: none"> Introduce wide-area administrative functions to serve the whole SCR based on ICT-oriented G2C system Establish the status of an academic town with establishment of a tertiary education institute
Intermediate belt area	<ul style="list-style-type: none"> Promote the expansion of the JWPTI contributory to the human resource development of SCR Install fundamental roadside facilities in Jigmeling 	<ul style="list-style-type: none"> Establish a roadside station with transport service facilities in Jigmeling 	<ul style="list-style-type: none"> Upgrade Jigmeling as an intermediate town with livelihood service functions

Source: JICA Project Team

5.5.4 Strategy for the development of integrated infrastructural network

In order to realize a multi-core growth RCSP Area that is contributory to the socio-economic development of the Southern Central Region, integrated strengthening of transportation links throughout the RCSP Area connecting Sarpang, Jigmeling, and Gelephu will be promoted.

In line with the above goal, ‘four directions of infrastructure network development’ will be pursued as follows:

- 1) Strengthening of transportation connectivity and accessibility to holistic urban services;
- 2) Improvement of accessibility to inter-regional transportation node;
- 3) Improvement of logistics efficiency and industrial productivity; and
- 4) Promotion of tourism.

Further, the four directions will be deployed for actions through ‘eight initiatives associated with the infrastructure networks’:

- 1) Development of redundant arterial road network for the RCSP Area;
- 2) Development of Urban Transportation System (UTS) for the RCSP Area;
- 3) Work towards facilitating the upgradation of Gelephu Airport;

- 4) Promotion of international logistics network with India;
- 5) Strengthening of network with logistics hubs (dry ports, multi modal transport hubs, industrial parks, etc.);
- 6) Reinforcement of network for access to airports, Indian transportation network, etc.;
- 7) Improvement of comfort and convenience of inter-district and intercity long-distance buses (bus location system, online ticketing), and
- 8) Examination of measures to support promotion of EV buses, EV stations, etc.

Then, a strategic stage-wise (by area and by phase) implementation plan will be prepared for the implementation of the proposed initiatives. Other than transport- and logistics-related infrastructures, introduction of the Smart City system is proposed for the whole RCSP Area with the aim of increasing the efficiency and reliability of urban infrastructure management.

In general, throughout the RCSP Area, feasibility studies (F/S) will be conducted during the short-term period, followed by implementation of development activities during the mid-term period and operation and management of developed facilities/system during the long-term period.

Table 5.5.4 Stage-wise Development Strategy: Infrastructural Network

Target Area	Short-Term (groundwork phase) Strategy for 2030	Mid-Term (building up phase) Strategy for 2035	Long-Term (fulfilment phase) Strategy for 2045
Whole RCSP Area	<ul style="list-style-type: none"> • Conduct F/S of east-west bypass route (EW-2) • Conduct F/S of UTS between Gelephu and Sarpang • Conduct F/S and implement Bus IT System (Time table, Bus location, Ticket, etc.) 	<ul style="list-style-type: none"> • Develop EW-2 • Develop UTS between Gelephu and Sarpang (Stage development) • Introduce Smart Card System for bus services 	<ul style="list-style-type: none"> • Operate UTS between Gelephu and Sarpang • Operate intercity long-distance bus service equipped with Bus IT system and Smart Card system
Gelephu	<ul style="list-style-type: none"> • Seek decision on the development of 2nd International Airport • Conduct F/S of city bypass route • Conduct F/S of Smart City System to operation and maintenance (O&M) drinking water supply, electric supply and waste management • Conduct F/S of introducing EV Bus and Quick Charging Facility for City Bus 	<ul style="list-style-type: none"> • Construct 2nd International Airport • Develop city bypass route • Introduce Smart City System to O&M drinking water supply, electric supply and waste management • Introduce EV Bus and Quick Charging Facility for City Bus 	<ul style="list-style-type: none"> • Operate 2nd International Airport • Stabilize drinking water and electric supply throughout the year • Establish proper waste management system • Operate EV buses
Sarpang	<ul style="list-style-type: none"> • Conduct F/S of Smart City System to O&M drinking water supply, electric supply and waste management 	<ul style="list-style-type: none"> • Introduce Smart City System to O&M drinking water supply, electric supply and waste management 	<ul style="list-style-type: none"> • Stabilize drinking water and electric supply throughout the year • Establish proper waste management system
Intermediate belt area	<ul style="list-style-type: none"> • Conduct F/S of Smart City System to O&M drinking water supply, electric supply and waste management 	<ul style="list-style-type: none"> • Introduce Smart City System to O&M drinking water supply, electric supply and waste management 	<ul style="list-style-type: none"> • Stabilize drinking water and electric supply throughout the year • Establish proper waste management system of RCSP Area

Source: JICA Project Team

5.5.5 Strategy for the promotion of vigorous economic development

As part of the mission to develop a multicore growth corridor, economic development will be promoted to drive the achievement of economic prosperity in the Southern Central Region. Economic activities such as agro-processing, manufacturing, services, and ICT sector with infrastructure development should be concentrated in the RCSP Area, namely the two linked urban centres (Gelephu and Sarpang), new sub-urban centre(s) between the two (intermediate belt area) through full utilization of existing resources and introduction of new technology and private and public investment. Also, the linkage between the RCSP Area and the whole Project Area will be promoted with the acceleration of a globalization.

The general policy measures and strategies for industrial development are classified into several categories such as:

- 1) formulation of legal and policy framework;
- 2) human resource development;
- 3) strengthening of private processing/manufacturing industries, mainly cottage and small industries (CSIs), through technical, marketing and financial assistance;
- 4) promotion of foreign direct investment (FDI) and domestic investment including development of industrial park and SEZ;
- 5) value-chain development and strengthening of business linkage including industrial cluster, and
- 6) support business start-up, incubation, and innovation.

As for the phasing, categories 1), 2) and 3) should be consecutively implemented. In the Short-Term Strategy for 2030 which is a groundwork phase, preparatory activities for categories 4), 5) and 6) are expected to be done. In the Mid-Term (building up phase) Strategy for 2035, a building up phase, some projects on these categories will be a starting operation. As for the Long-Term (fulfilment phase) Strategy for 2045 which is the fulfilment phase, the projects/programs on all categories will be implemented.

In order to pursue the strategy, Gelephu will further promote agro-processing, manufacturing, trade and commerce, and other services which are already located there. Development of IT Park with function of science technology will be expected. In addition, the tourism as the gateway to the Royal Manas National Park and health industries will be promoted in consideration of the Thromde's development potential.

Meanwhile, Sarpang Town should be developed as a wholesale and distribution centre of agricultural products, with an emphasis on its relationship with the agricultural areas in the hinterland. The industrial cluster development is also promising with the linkage of Tsirang in particular. In addition, Sarpang Town will be developed as a tourist gateway, taking into consideration its location in relation to the Phibsoo Wildlife Sanctuary.

In the intermediate belt area between Sarpang Town and Gelephu Thromde, several industrial bases, namely the Jigmeling Industrial Park, Agro-processing Park, and Special Economic Zone will be developed. They can fully utilize important infrastructures and facilities such as airport, dry port, and trunk road. Especially time-sensitive business activities that demand immediate attention or priority handling for timely completion or delivery, such as agricultural produce, order processing, high-value-added manufacturing, logistics, customer service, or any other operation, will be developed. Also, industrial clusters will be developed to maintain and strengthen the function as one of the leading agricultural production bases in the country.

Further, the whole RCSP Area will work towards vitalizing its industries by developing storage and distribution facilities with the intention of promoting exports of agricultural and

processing/manufacturing products to India and other countries; strengthening the concentration of CSIs in the secondary; and tertiary industries and promoting tourism.

Table 5.5.5 Phase-wise Development Strategy: Economic Development

Target Area	Short-Term (groundwork phase) Strategy for 2030	Mid-Term (building up phase) Strategy for 2035	Long-Term (fulfilment phase) Strategy for 2045
Whole RCSP Area	<ul style="list-style-type: none"> • Prepare the formulation of industrial clusters (Conducting a study to select the appropriate product through participatory approach and providing trainings) • Strengthen processing, storage/distribution facilities to support Jigmeling Industrial Park • Strengthen CSIs and SMEs • Maintain and strengthen function as a leading agricultural production base 	<ul style="list-style-type: none"> • Develop industrial clusters • Strengthen and develop processing, storage/distribution facilities to promote exports of agricultural products etc. • Strengthen CSIs and SMEs • Promote tourism and related services • Maintain and strengthen function as a leading agricultural production base 	<ul style="list-style-type: none"> • Develop industrial clusters • Develop processing, storage/distribution facilities to promote exports of agricultural products etc. • Strengthen CSIs and SMEs • Promote tourism and related services • Maintain and strengthen function as a leading agricultural production base
Gelephu	<ul style="list-style-type: none"> • Develop touristic gateway functions • Promote existing agro-processing, manufacturing, trade services etc. • Prepare the formulation of IT Park 	<ul style="list-style-type: none"> • Develop IT Park • Promote existing processing, manufacturing, trade, and other services etc. • Promote tourism and health industry 	<ul style="list-style-type: none"> • Operate IT Park fully • Promote existing processing, manufacturing, trade, and other services etc. • Promote tourism and health industry
Sarpang	<ul style="list-style-type: none"> • Prepare the formulation of industrial clusters 	<ul style="list-style-type: none"> • Develop industrial clusters • Develop agro-products distribution functions • Strengthen the linkage with Agro-processing Park • Develop touristic gateway functions 	<ul style="list-style-type: none"> • Develop industrial cluster • Develop agro-products distribution functions • Strengthen the linkage with Agro-processing Park • Develop and strengthen touristic gateway functions
Intermediate belt area	<ul style="list-style-type: none"> • Operate Jigmeling Industrial Park fully • Prepare the formulation of Agro-processing Park and start partial operation • Prepare the formulation of industrial clusters 	<ul style="list-style-type: none"> • Operate Agro-processing Park fully • Formulate a master plan of Special Economic Zones (SEZs) and prepare the zone development • Develop industrial clusters 	<ul style="list-style-type: none"> • Develop SEZ fully • Develop industrial clusters

Source: JICA Project Team

5.5.6 Strategy for the establishment of secure disaster risks management system

The RCSP Area as a whole will be developed as a foundation for harmonizing the richness and comfort of human life with the natural environment and with an emphasis on risk management for safe and secure living.

Typically, the strategy that involves both structural and non-structural countermeasures for disaster risk will be considered. Besides it, as human resource is so important for proper and sustainable disaster management in the future of SCR, promotion of the capacity related to disaster management are also considered to be necessary part of the strategy. Furthermore, specifically, the area will be developed to prepare for disaster risks such as floods and landslides, which may be intensified by the cascading effects of global warming.

In addition, based on the characteristics of the area with a subtropical climate and its location in a border zone, the quarantine system for new infectious diseases, zoonotic diseases, and livestock infectious diseases will be strengthened. As regards the environmental pollution prevention measures related to industrial parks, rather than specific pollution-abatement facilities, transition to an Eco-Industrial Park is considered.

In the short-term, necessary preparation will be done for the next stage, including the necessary F/S of proposed countermeasures, capacity promotion of disaster management on some basic items. In the mid-term, most of the proposed countermeasure works and facilities, as well as necessary system for disaster management will be completed. In the long-term, proper operation and maintenance will be ensured for all countermeasures and facilities, and the sufficient capacity of disaster management including the climate change and infectious diseases are anticipated.

Table 5.5.6 Phase-wise Development Strategy: Disaster Risks Management System

Target Area	Short-Term (groundwork phase) Strategy for 2030	Mid-Term (building up phase) Strategy for 2035	Long-Term (fulfilment phase) Strategy for 2045
Whole RCSP Area	<ul style="list-style-type: none"> Promote the capacity of data collection, field survey etc. for main disaster (landslide, flood, human-wildlife conflicts, infectious diseases) Strengthen the monitoring system and disaster database system for disaster management 	<ul style="list-style-type: none"> Promote sufficient capacity of countermeasure design, construction supervision, operation and maintenance Establish adequate and decent disaster monitoring system and database system Strengthen the quarantine system for new infectious diseases, zoonotic diseases, and livestock infectious diseases 	<ul style="list-style-type: none"> Promote sufficient capacity of analysis and preparation for natural disaster which may be intensified by the cascading effects of climate change Establish decent quarantine system for new infectious diseases, zoonotic diseases, and livestock infectious diseases
Gelephu	<ul style="list-style-type: none"> Conduct F/S of countermeasure work for flood (completed) and landslide 	<ul style="list-style-type: none"> Develop countermeasure work for flood and landslide 	<ul style="list-style-type: none"> Properly operate and maintain (O&M) countermeasure work for flood and landslide
Sarpang	<ul style="list-style-type: none"> Conduct F/S of Disaster Mitigation Research Centre (natural disaster and infectious diseases) 	<ul style="list-style-type: none"> Develop Disaster Mitigation Research Centre 	<ul style="list-style-type: none"> Establish Sarpang Town as the disaster mitigation technology centre in southern Bhutan

Intermediate belt area	<ul style="list-style-type: none"> • Design and construct buffer zones for industrial parks for environmental pollution prevention • Conduct F/S of Jigmeling Industrial Park (JIP) to transition to Eco-Industrial Park (EIP) • Conduct F/S of elephant corridor and related facility • Conduct F/S of anti-disaster countermeasure for bypass route 	<ul style="list-style-type: none"> • Introduce step-by-step approach for transitioning towards EIP • Develop elephant corridor and related facility • Develop anti-disaster countermeasure for bypass route 	<ul style="list-style-type: none"> • Establish JIP as an EIP in compliance with international standards • Properly O&M elephant corridor and related facility • Properly O&M anti-disaster countermeasure for bypass route
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Source: JICA Project Team

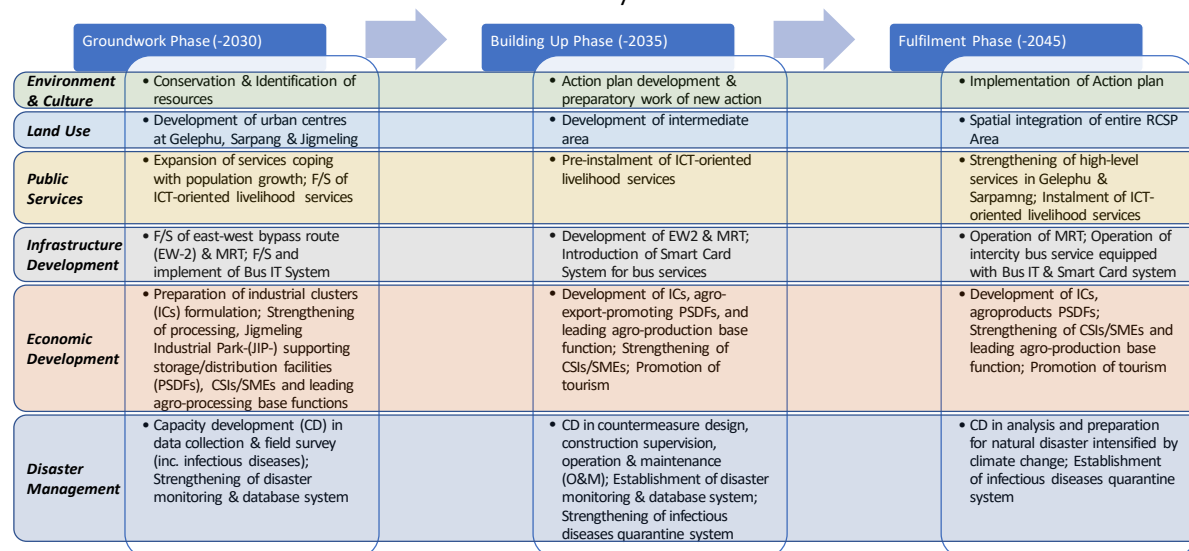
5.5.7 Summary of development strategy by geographical area

The thematic development strategies summarised above are briefly recapitulated into the whole RCSP Area and three sub areas as shown in Figure 5.5.1.

In a nutshell, efforts to create the 'multi-core growth corridor' for the whole RCSP Area, the 'Bhutan's central gateway city' for Gelephu, the 'hillside garden city' for Sarpang Town, and the 'green-fringed active service link' for intermediate belt area will be pursued through initiatives to achieve every short-, medium- and long-term objectives -- i.e., groundwork, building up and fulfilment respectively -- by comprehensively addressing all the above-mentioned themes.

Development Strategy for Whole RCSP Area:

Multi-Core Growth Corridor harmonizing richness & comfort and guiding Bhutan towards a middle-income country



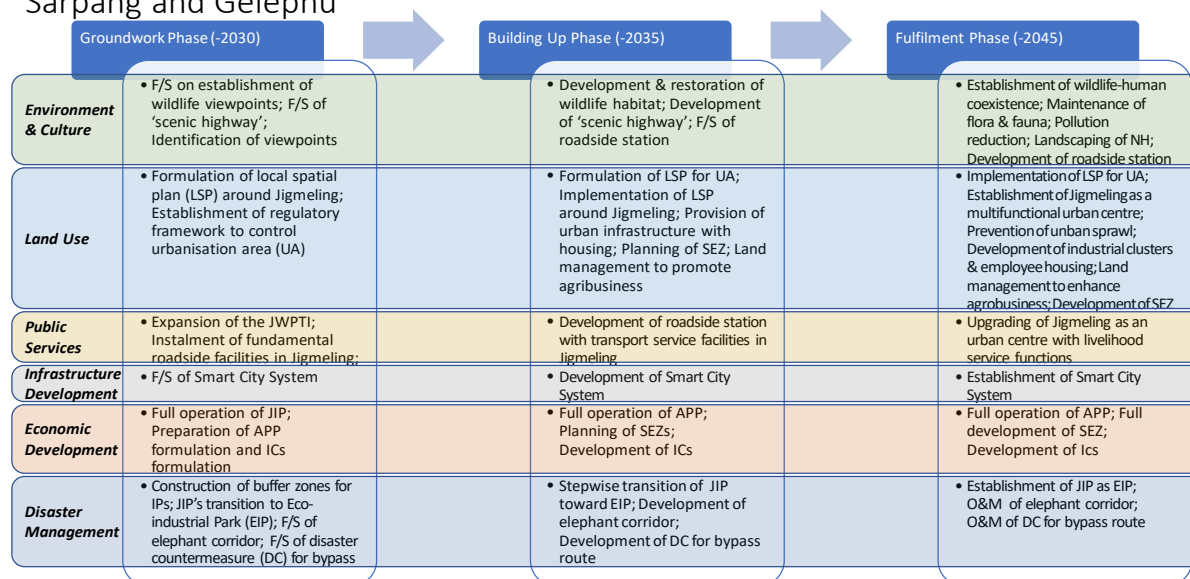
Development Strategy for Gelephu:
Bhutan's Central Gateway City with vibrant business & wellness activities
and open to the world & the whole country

	Groundwork Phase (-2030)	Building Up Phase (-2035)	Fulfilment Phase (-2045)
Environment & Culture	<ul style="list-style-type: none"> Expansion of existing open/recreational(O/R) space; F/S of developing already-proposed O/R spaces/landscapes 	<ul style="list-style-type: none"> Development of already-proposed O/R spaces/landscapes 	<ul style="list-style-type: none"> Creation of pleasant O/R spaces network utilising rivers
Land Use	<ul style="list-style-type: none"> Creation of business centre 	<ul style="list-style-type: none"> Creation of multi-modal transit centre 	<ul style="list-style-type: none"> Establishment of status as a major urban health/recreation destination
Public Services	<ul style="list-style-type: none"> Functional expansion of CRRH; E/S of the central park 	<ul style="list-style-type: none"> Spatial expansion of CRRH; Development of the central park 	<ul style="list-style-type: none"> Establishment of Gelephu as a health/recreation destination in the country
Infrastructure Development	<ul style="list-style-type: none"> Decision seeking on developing 2nd International Airport; Development of city bypass route; F/S of Smart City System; F/S of EV Bus system 	<ul style="list-style-type: none"> Construction of 2nd International Airport; Development of city bypass route; Introduction of Smart City System; Introduction of EV Bus system 	<ul style="list-style-type: none"> Operation of 2nd International Airport; Development of city bypass route; Establishment of Smart City System; Operation of EV Bus system
Economic Development	<ul style="list-style-type: none"> Development of touristic gateway function; Promotion of existing industries; Preparation to formulate IT park 	<ul style="list-style-type: none"> Development of IT Park; Promotion of existing industries, tourism & health industry 	<ul style="list-style-type: none"> Full operation of IT Park; Promotion of existing industries, tourism & health industry
Disaster Management	<ul style="list-style-type: none"> F/S of countermeasure work for flood & landslide 	<ul style="list-style-type: none"> Development of countermeasure work for flood & landslide 	<ul style="list-style-type: none"> Proper O&M of countermeasure work for flood & landslide

Development Strategy for Sarpang:
Hillside Garden City with administrative, academic, cultural & recreational
functions coexisting in a tranquil setting and synergic relationship

	Groundwork Phase (-2030)	Building Up Phase (-2035)	Fulfilment Phase (-2045)
Environment & Culture	<ul style="list-style-type: none"> Expansion of existing open/recreational(O/R) space; F/S of developing already-proposed O/R spaces; Identification of landscape preservation area 	<ul style="list-style-type: none"> Development of already-proposed O/R spaces; Development of landscape preservation action plan 	<ul style="list-style-type: none"> Creation of pleasant O/R spaces network utilising rivers and greenery along rivers
Land Use	<ul style="list-style-type: none"> Housing provision to accommodate population growth 	<ul style="list-style-type: none"> Development of tertiary education as academic centre 	<ul style="list-style-type: none"> Establishment of Sarpang as a multifunctional urban centre
Public Services	<ul style="list-style-type: none"> Strengthening of the civic service functions of and around Dzong; Survey of demand for tertiary education 	<ul style="list-style-type: none"> F/S of a tertiary education institute 	<ul style="list-style-type: none"> Introduction of ICT-oriented wide-area administrative functions; Development of a tertiary education institute
Infrastructure Development	<ul style="list-style-type: none"> F/S of Smart City System 	<ul style="list-style-type: none"> Introduction of Smart City System 	<ul style="list-style-type: none"> Establishment of Smart City System
Economic Development	<ul style="list-style-type: none"> Preparation of ICs formulation 	<ul style="list-style-type: none"> Development of ICs, agro-products distribution function and touristic gateway function; Strengthening of linkage with Agro-processing Park (APP) 	<ul style="list-style-type: none"> Development of ICs, agro-products distribution function and touristic gateway function; Strengthening of linkage with APP
Disaster Management	<ul style="list-style-type: none"> F/S of Disaster Mitigation Research Center (coping with natural & infectious diseases) 	<ul style="list-style-type: none"> Development of Disaster Mitigation Research Center 	<ul style="list-style-type: none"> Establishment of status as the disaster mitigation technology center in south region

Development Strategy for Intermediate Belt Area: Green-Fringed Active Service Link connecting twin urban centres of Sarpang and Gelephu



Source: JICA Project Team

Figure 5.5.1 Development Strategy by Geographical Area

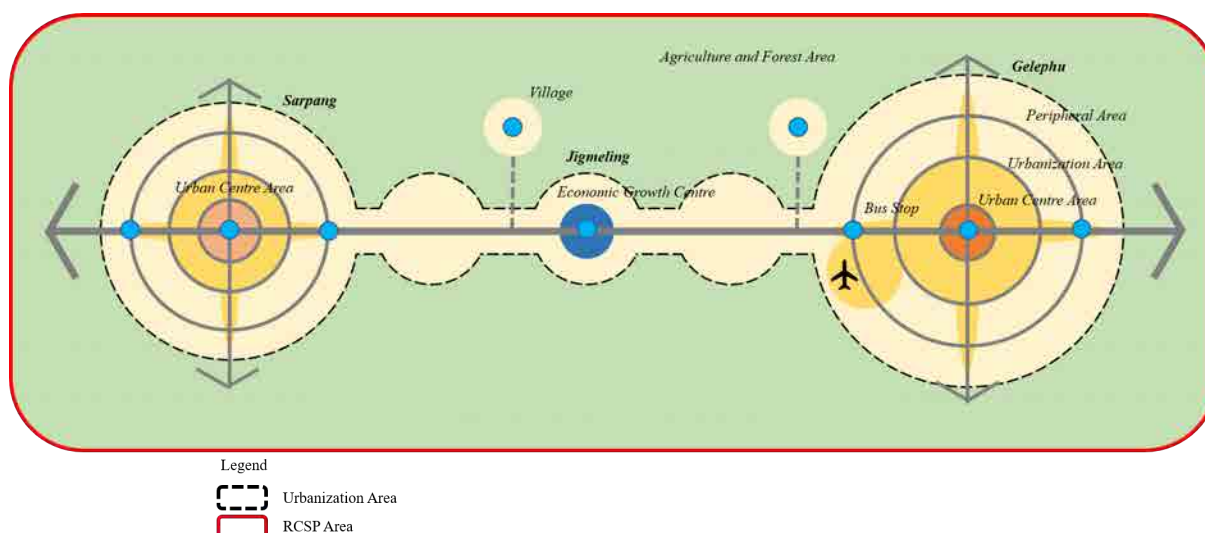
5.6 Proposals for Action with Thematic Plans for RCSP

5.6.1 Future spatial structure of the RCSP Area

In the RCSP Area, intensive urban structure with the multi-polar urban centre is formed to achieve balanced development. The formation of this urban structure will be realized through the designation of urbanisation areas and the development of infrastructure, including public transport networks.

Specifically, the urbanisation area is positioned as the area with high livelihood and convenient transport. The Urban Centre Area with high living and transport convenience in urbanisation area is linked by arterial roads and public transport. The rest of the urbanisation area will be positioned as a Peripheral Area, where residential space will be created in harmony with the natural environment. Area along arterial road linking the Urban Centre Area of Sarpang and Gelephu is developed as urbanisation area to create the urban corridor. At the intermediate area, the Jigmeling Industrial Park will be developed to create an Economic Growth Centre.

In addition, rural area containing agricultural land and human settlements will be designated as Villages, to create living space in combination with public transport. Outside the urbanisation area, the area will be surrounded by rich nature with farmland and forests.



Source: JICA Project Team

Figure 5.6.1 Spatial Structure of the RCSP Area

5.6.2 Land use plan with recommendation for preparation of Local Area Plans

(1) Land use plan for the RCSP Area

In developing a land use plan for the RCSP Area, the following policies will be applied.

- Prime agricultural lands in the RCSP Area where irrigation facilities have been installed will be preserved as agricultural promotion areas.
- Similarly, forested areas and community forests will be preserved as prime environmental areas.
- Future urbanisation zones will be designated and the areas to be urbanised will be set aside for suitable development, excluding these conservation areas and flood-prone areas.
- A contiguous urbanisation area will be designated from Gelephu to Sarpang to form an urban corridor.
- Special economic zones (260ha), an agro-processing zone (20ha) and roadside station (2ha) will be designated in urbanisation areas to form future industrial cluster.
- Within each urbanisation area, a Village Square and Urban Village Core will be designated to ensure accessibility to daily services.
- An Urban Core in the vicinity of the Jigmeling Industrial Park will be designated to create an urban centre.

The land use plan drawn based on the above policy is shown in Figure 5.6.2. It should be noted that the land use categories are set to be consistent with the Precinct Plan of Sarpang and Gelephu Structure Plan for succeeding the planning concept, while the land use categories for the area outside the urbanisation area is set to meet the definition specified in the following table.

Table 5.6.1 Basis of Land Use Category to Be Applied outside the Urbanisation Area

Land Use Category	Target Area
Rural Settlement	Scattered detached housing and agriculture land
Agriculture Promotion Area	Irrigated paddy field
Forest	Forest area based on land cover map
Community Forest	Community forest area
Water Body	Water body based on land cover map

Source: JICA Project Team

Based on this land use plan, the population that can be accommodated within urbanisation area is calculated. In calculating carrying capacity or allowable population, a planned population density for each land use category is established, taking into account the population density in urbanised areas in Japan. In general, the allowable population in the urbanisation area is 54,100, which is large enough to accommodate the planned population in the intermediate area. Taking the capacity of Sarpang and Gelephu Structure Plan areas (40,200 people and 11,000 people), the total capacity of the RCSP area is estimated at 105,300 people which is sufficient to accommodate the future population.

Table 5.6.2 Population Density and Capacity by Land Use Category in Urbanisation Area

	Population Density (person/ha)	Land Area (ha)	Capacity (person)
Urban Village Periphery	40 ¹⁾	823	32,901
Urban Village Core	60 ²⁾	331	19,878
Village Square	80 ³⁾	13	1,036
Urban Core	80 ³⁾	4	319
Total (rounded)		1,171	54,100

Source:

- 1) Minimum population density of urbanisation area in Japan.
- 2) Population density of medium to high density residential area in central city in local area in Japan.
- 3) Population density of commercial area in central city in local area in Japan.

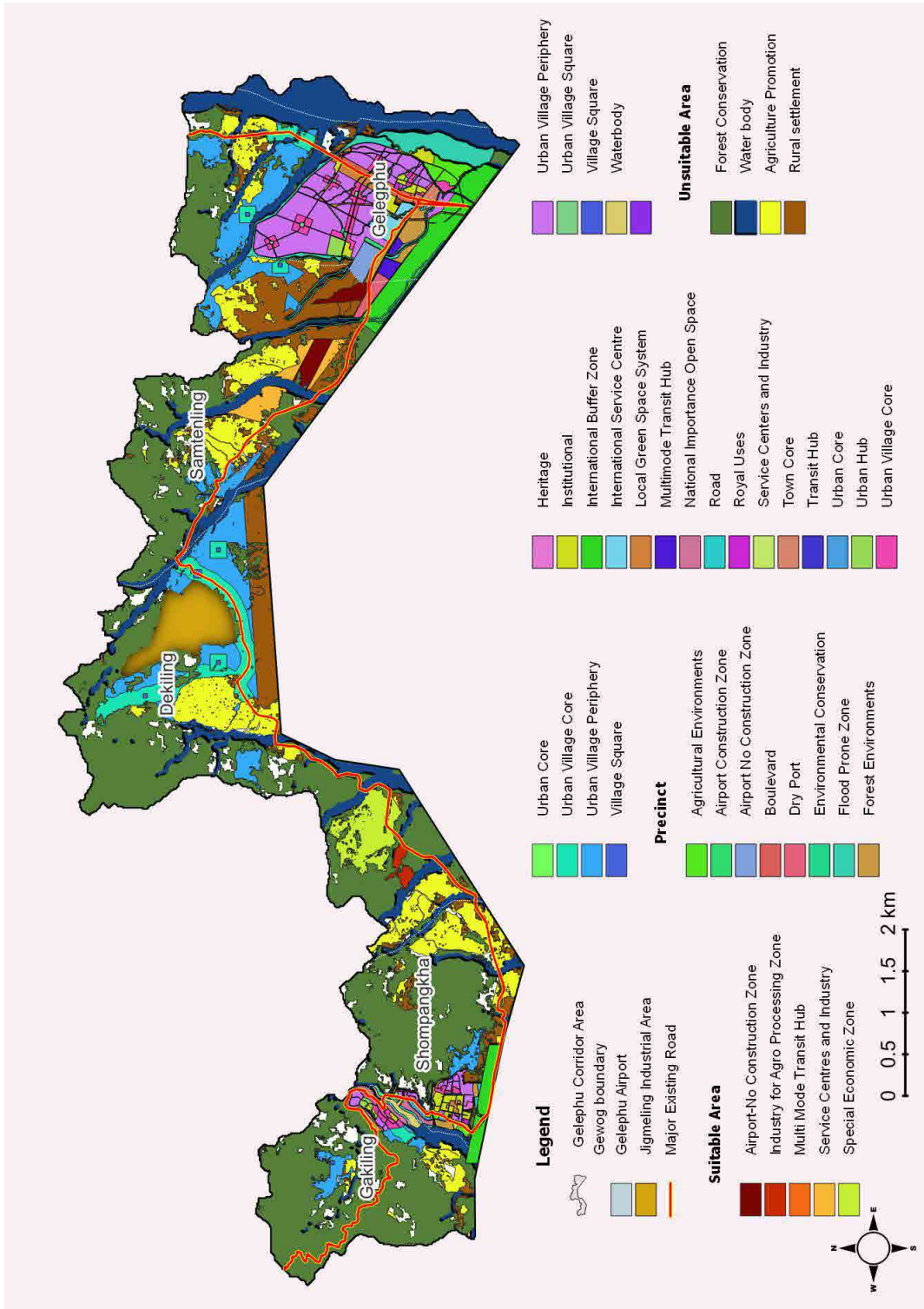


Figure 5.6.1 Land Use Plan for RCSP Area

Box 5.6.1. Floor Area Ratio and Building Coverage Ratio in Japan

In setting the population density, a comparison was made between the floor-area ratio and the building-coverage-ratio in Japan and Bhutan. The figure below shows the floor-area ratio and building-coverage-ratio by land use in Japan. In Japan, there are six types of residential-related land uses, with floor-area ratios ranging from 50% to 500%. As for the building-coverage-ratio, it ranges from 30% to 80%.

Category of Land Use Zone	Maximum floor-area ratios (%)	Maximum building coverage ratios (%)
Category I exclusively low-rise residential zone	50 60 80 100 150 200	30 40 50 60
Category II exclusively low-rise residential zone	50 60 80 100 150 200	30 40 50 60
Category I mid/high-rise oriented residential zone	100 150 200 300 400 500	30 40 50 60
Category II mid/high-rise oriented residential zone	100 150 200 300 400 500	30 40 50 60
Category I residential zone	100 150 200 300 400 500	50 60 80
Category II residential zone	100 150 200 300 400 500	50 60 80
Quasi-residential zone	100 150 200 300 400 500	50 60 80
Neighborhood commercial zone	100 150 200 300 400 500	60 80
Commercial zone	200 300 400 500 600 700 800 900 1000 1100 1200 1300	80
Quasi-industrial zone	100 150 200 300 400 500	50 60 80
Industrial zone	100 150 200 300 400	50 60
Exclusively industrial zone	100 150 200 300 400	30 40 50 60

Source: Ministry of Land, Infrastructure, Transport and Tourism

Figure 5.6.2 Floor Area Ratio and Building Coverage Ratio by Land Use in Japan

(2) Actions for the sustainable land use and human settlement

To implement the strategy mentioned in 5.5.2, ten actions for the sustainable land use and human settlement are proposed as following Table 5.6.1.

Action (1), establishment of urbanisation area along the Primary National Highway EW-2 linking Sarpang, Jigmeling and Gelephu, will create the urban corridor which will be backbone of the RCSP Area where the urban functions will be concentrated.

Action (2), review and revision of land use category to be used in precinct plan, will be means to achieve the rational land use.

Action (3), modification of structure plan to revise the precinct plan of Gelephu including designation of urban core and logistic hub, will support to create economic and logistic service hub in Gelephu.

Action (4), designation of Special Economic Zones in the periphery of Gelephu and Sarpang, will create the area to diversify the economic activities in the RCSP Area.

Action (5), designation of IT Park in the structure plan area of Gelephu, will also create the area to diversify the economic activities in the RCSP Area..

Action (6), designation of urban core in the precinct plan of Sarpang, will create the tertiary education service centre in Sarpang.

Action (7), designation of agro-processing area in the vicinity of Sarpang, will create the focal point to utilize the local agriculture produce from Tsirang, Zhemanga, and Sarpang Dzongkhags.

Action (8), preparation of local spatial plan for Jigmeling Industrial Park and its surroundings, will create the well-ordered urbanisation area in mixture of industrial, commercial and residential areas.

Action (9), designation of land use plan for the coexistence of areas for urbanisation, agriculture and forest, will promote the urbanisation with rich environment of agriculture and forest in surroundings.

Action (10), preparation of local spatial plans for new urban cores along the EW-2, will create well-ordered urbanisation area with good access to services.

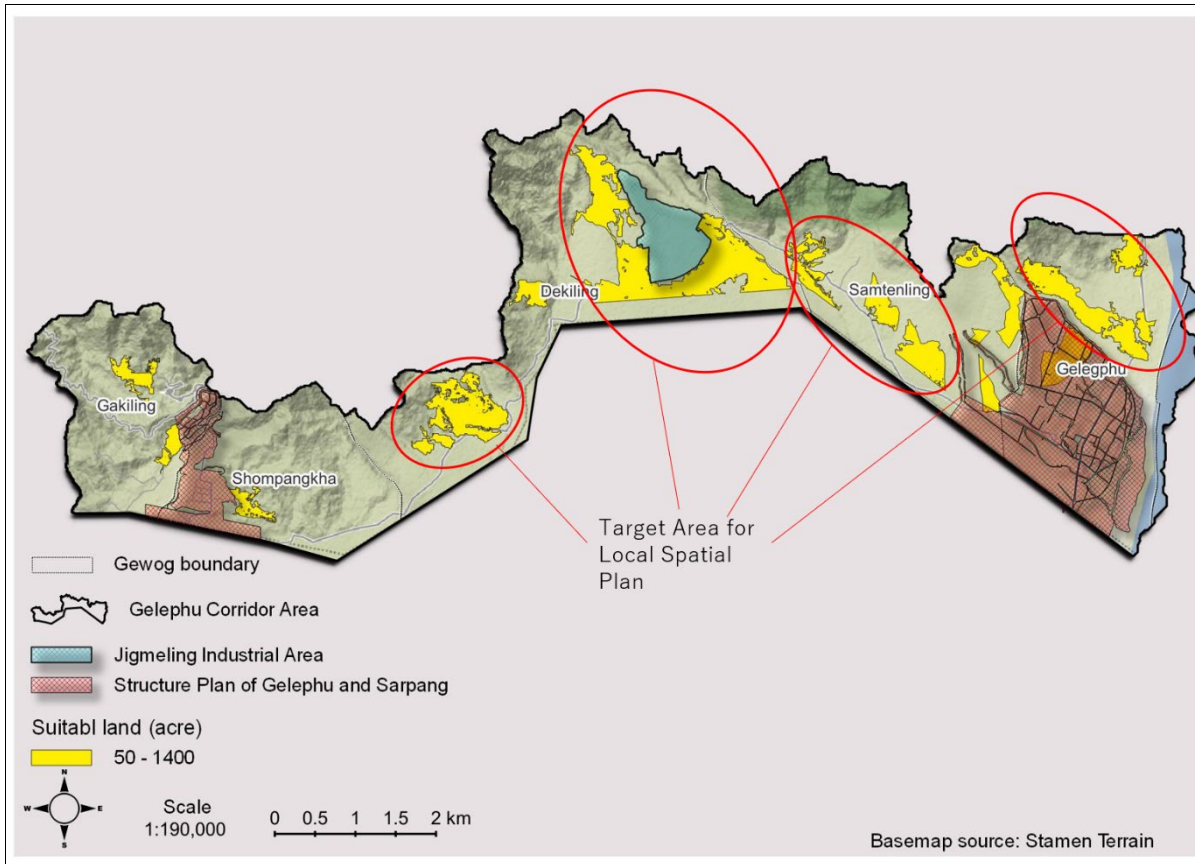
Table 5.6.3 Proposed Actions for Realising Sustainable Land Use and Human Settlement

Target Area	Development Strategy ● Long-term; ▲ Mid-term; ■ Short-term	Proposal for Action
Whole SCRP Area	<ul style="list-style-type: none"> ● Achieve spatial integration of entire Area by creating urbanisation area connecting Sarpang, Jigmeling and Gelephu ● Develop industrial clusters [<i>economic development strategy</i>] ● Develop processing, storage/distribution facilities to promote exports of agricultural products etc. [<i>same as above</i>] ● Maintain and strengthen function as a leading agricultural production base [<i>same as above</i>] 	<ol style="list-style-type: none"> (1) Establishment of urbanisation area along the Primary National Highway EW-2 linking Sarpang, Jigmeling and Gelephu (2) Review and revision of land use category to be used in the precinct plan
Gelephu	<ul style="list-style-type: none"> ● Establish the status of Gelephu as a multifunctional urban core ● Operate IT Park fully [<i>economic development strategy</i>] 	<ol style="list-style-type: none"> (3) Modification of the structure plan to revise the precinct plan of Gelephu including designation of urban core and logistic hub (4) Designation of Special Economic Zones in the periphery of Gelephu and Sarpang (5) Designation of IT Park in the structure plan area of Gelephu
Sarpang	<ul style="list-style-type: none"> ● Establish the status of Sarpang as a multifunctional urban core ● Develop industrial cluster [<i>economic development strategy</i>] ● Develop agro-products distribution functions [<i>same as above</i>] ● Strengthen the linkage with Agro-processing Park [<i>same as above</i>] 	<ol style="list-style-type: none"> (6) Designation of urban core in the precinct plan of Sarpang (4) Designation of Special Economic Zones in the periphery of Gelephu and Sarpang [repeat] (7) Designation of agro-processing area in the vicinity of Sarpang
Intermediate belt area	<ul style="list-style-type: none"> ● Establish the status of Jigmeling as a multifunctional urban centre 	(8) Preparation of local spatial plan for Jigmeling Industrial Park and its surroundings
	<ul style="list-style-type: none"> ● Prevent the spread of unplanned urban development to appropriately coordinate natural and agricultural land use with urban land use ● Maintain and strengthen function as a leading agricultural production base [<i>economic development strategy</i>] 	(9) Designation of land use plan for the coexistence of areas for urbanisation, agriculture and forest
	<ul style="list-style-type: none"> ● Develop urban industrial clusters and residential areas for the employees of the clusters, in a planned manner ● Develop SEZ fully [<i>economic development strategy</i>] ● Develop industrial clusters [<i>same as above</i>] 	(10)Preparation of local spatial plans for new urban cores along the EW-2 (4) Designation of Special Economic Zones in the periphery of Gelephu and Sarpang [repeat]
	<ul style="list-style-type: none"> ● Enhance agriculture and agro-processing establishments ● Operate Agro-processing Park fully 	(7) Designation of agro-processing area in the vicinity of Sarpang [repeat]

Source: JICA Project Team

The detail of each action is shown as follows. A map showing the geographical locations of all the proposed Actions (except for Actions that cannot be identified their locations) is also posted at the end of this section.

In the future, development will proceed in urbanisation areas. In order to create an appropriate urban area, local spatial plan in the urbanisation area is necessary. For this reason, the JICA Project Team proposes the preparation of local spatial plan for the urbanisation area, as shown in Figure 5.6.3.



Source: JICA Project Team

Figure 5.6.3 Target Area to Prepare Local Spatial Plans

- 1) Establishment of urbanisation area along the Primary National Highway EW-2 linking Sarpang, Jigmeling and Gelephu

Corridor development will be promoted by designating an urbanisation area from Sarpang to Gelephu via Jigmeling. The urbanisation areas will host a mix of urban activities, including residential, commercial, business, industrial, and SEZs. In the urbanisation area, infrastructure development is promoted intensively. This forms a central part of the RCSP Area.



Source: JICA Project Team

Figure 5.6.4 Image of Urbanisation Area (Moderately Dense Area)

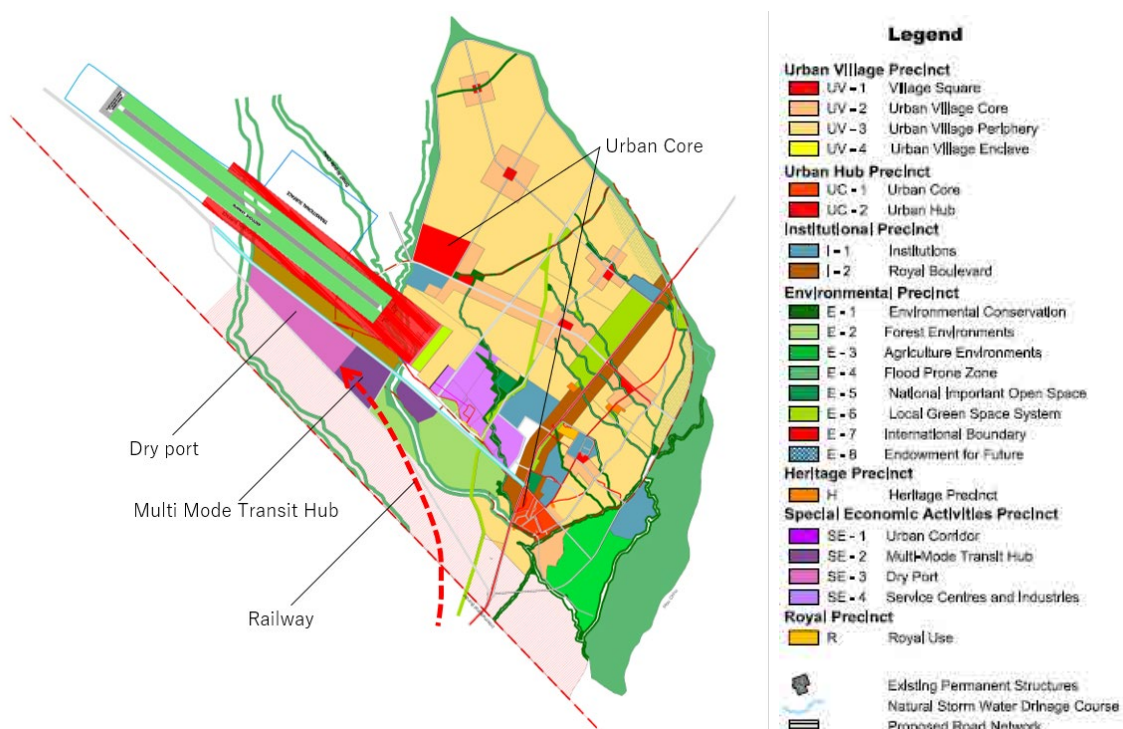
2) Review and revision of land use category to be used in the precinct plan

The current land use definitions of the precinct plans are all mixed-use, which allow for many types of uses, and are not differentiated. A review of land use categories is needed to create central areas and residential areas with different densities and characteristics, such as, low density, medium density and high density.

3) Modification of the structure plan to revise the precinct plan of Gelephu including designation of urban core and logistic hub

Gelephu is the location of the concentration of higher functions in the RCSP Area. With an airport located in the area and bordering India, Gelephu has great potential for economic development. Therefore, the precinct plan aims to develop a higher-order economic activity and logistics hub, including ICT in Gelephu (Figure 5.6.4). In addition, the multi mode transit hub proposed in the current structure plan will be connected with railway to India, if the railway is developed. Perspectives on modifying the precinct plan of Gelephu are as follows.

- To expand Urban Square to accommodate the expected increase in commercial and business functions,
- To designate the area around Urban Square as Urban Village Core rather than Urban Village Periphery in order to create Urban Centre,
- To allocate a land (25 acre) for the ICT centre proposed in the industrial development, and
- To consider the location of a railway line (ROW=20m) and railway station in multi mode transit hub if a railway development is materialized.



Source: Gelephu Structure Plan

Figure 5.6.5 Proposed Logistic Hub and Urban Core in Precinct Plan in Gelephu

4) Designation of Special Economic Zones in the peripheries of Gelephu and Sarpang

As noted above, Gelephu has excellent accessibility, as well as an abundance of flat and developable land. The development of an SEZ is proposed to drive economic development in Gelephu for Tsirang, Zhemgang and Sarpang Dzongkhags and, by extension, throughout the country.

Several types of industries such as electrical equipment and pharmaceuticals, which are designated as priority industries by the Economic Development Policy 2016 and FDI policy 2019, are expected to locate in SEZs.

5) Designation of IT park in the structure plan area of Gelephu

The RCSP area is also expected to grow as a hub for IT sector. Thus, it is imperative to develop IT park, following the IT park in Thimphu, with function of science and technology development.

6) Designation of urban core in the precinct plan of Sarpang

Sarpang is expected to be developed as a centre for higher education. In response to this, a centre that consolidates facilities related to higher education will be planned in Sarpang. The candidate site for higher education is identified in central part of Sarpang Yenlag Thromde.



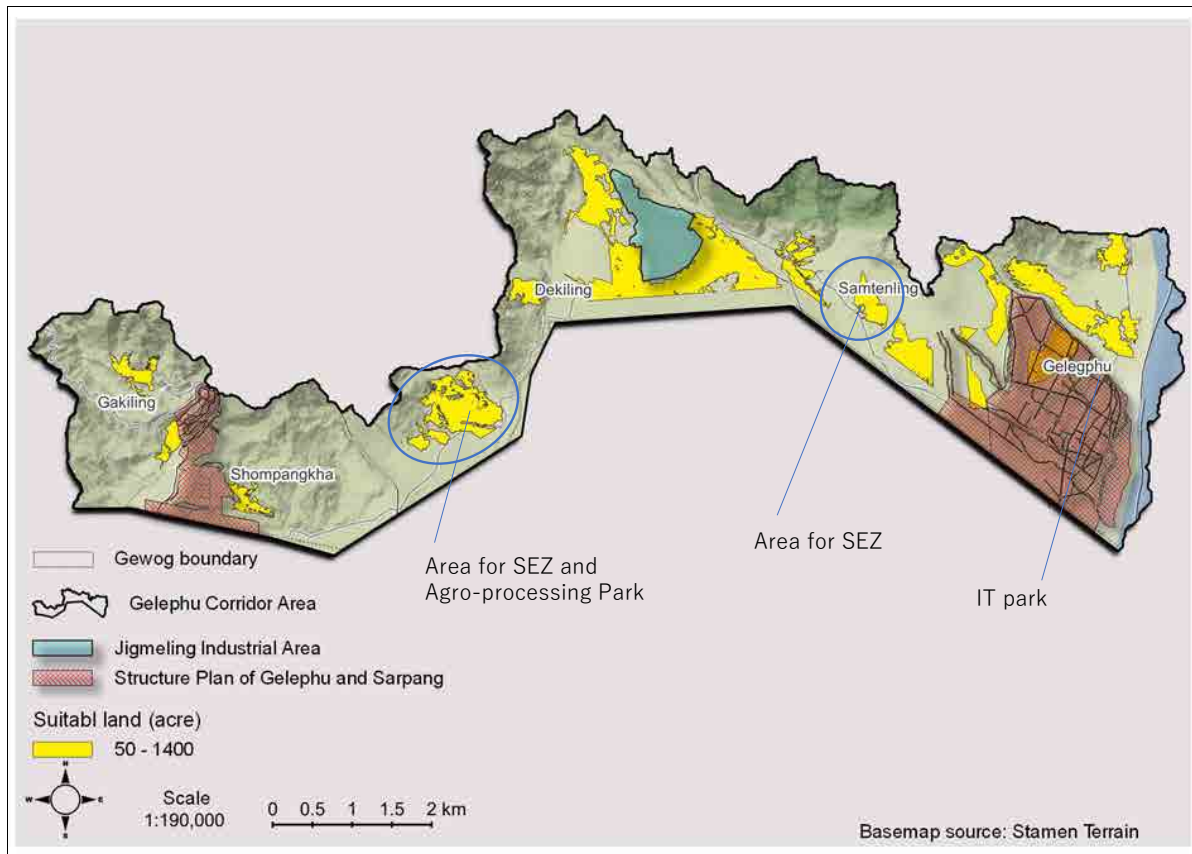
Source: JICA Project Team based on precinct plan for Sarpang

Figure 5.6.6 Candidate Site for Higher Education in Sarpang

7) Designation of agro-processing area in the vicinity of Sarpang

The RCSP area is expected to grow as a hub for economic activities in Tsirang, Zhemgang, and Sarpang Dzongkhags. In particular, since agriculture is the major industry in the three Dzongkhags, it is important to develop industries, which utilize existing raw materials from organic farming such as fruits, vegetables, spices and so on, with appropriate technologies. For this reason, an agro-processing area will be established together with SEZ along the EW-2 road between Sarang Town and Jigmeling Industrial Park.

Expected locations for Agro-processing Park, SEZs and IT park are shown in the figure below.



Source: JICA Project Team

Figure 5.6.7 Location Map of SEZ, Agro-processing Park and IT Park

The table below summarizes the estimated area size for Agro-processing Park, SEZs and IT park.

Table 5.6.4 Estimated Area Size for Agro-processing Park, SEZs and IT park

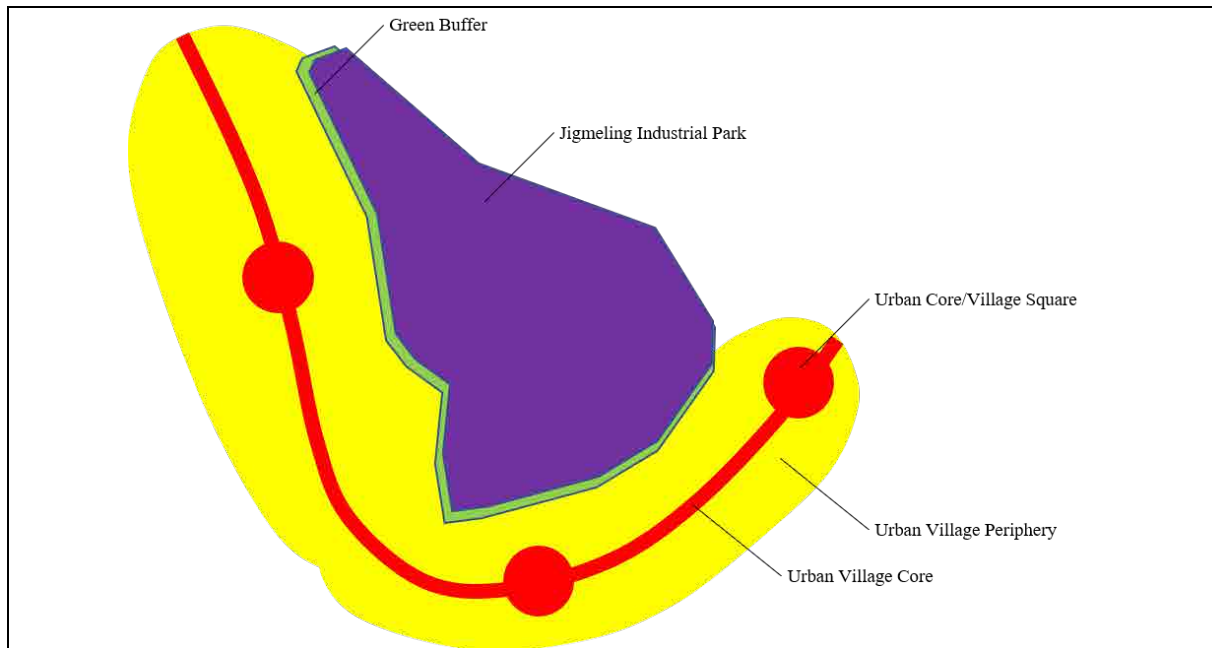
Proposed projects	Total area	Net area	Remarks
Special Economic Zones (SEZs)	620 acre (248 ha)	For industrial use: 420 acre (170 ha)	Two locations in RCSP area
Agro-industrial Park	50 acre (20 ha)	For industrial use: 35 acre (14 ha)	-
IT park	25 acre (10 ha)	-	-

Source: JICA Project Team

8) Preparation of local spatial plan for Jigmeling Industrial Park and its surroundings

Jigmeling Industrial Park will be economic growth centre of the RCSP Area. Residential, commercial, and business functions are likely to be located in its surrounding area. In order to appropriately spatialize these different activities, a local spatial plan will need to be developed for the area surrounding the Jigmeling Industrial Park. Figure 5.6.7 shows the conceptual diagram for local spatial plan of Jigmeling area.

Through the promotion of planned industrial and urban development in accordance with the local spatial plan, the area around the Jigmeling Industrial Park will become the third urban centre following Gelephu and Sarpang in the RCSP Area.



Source: JICA Project Team

Figure 5.6.8 Conceptual Diagram for Local Spatial Plan of Jigmeling Industrial Park and its Surrounding

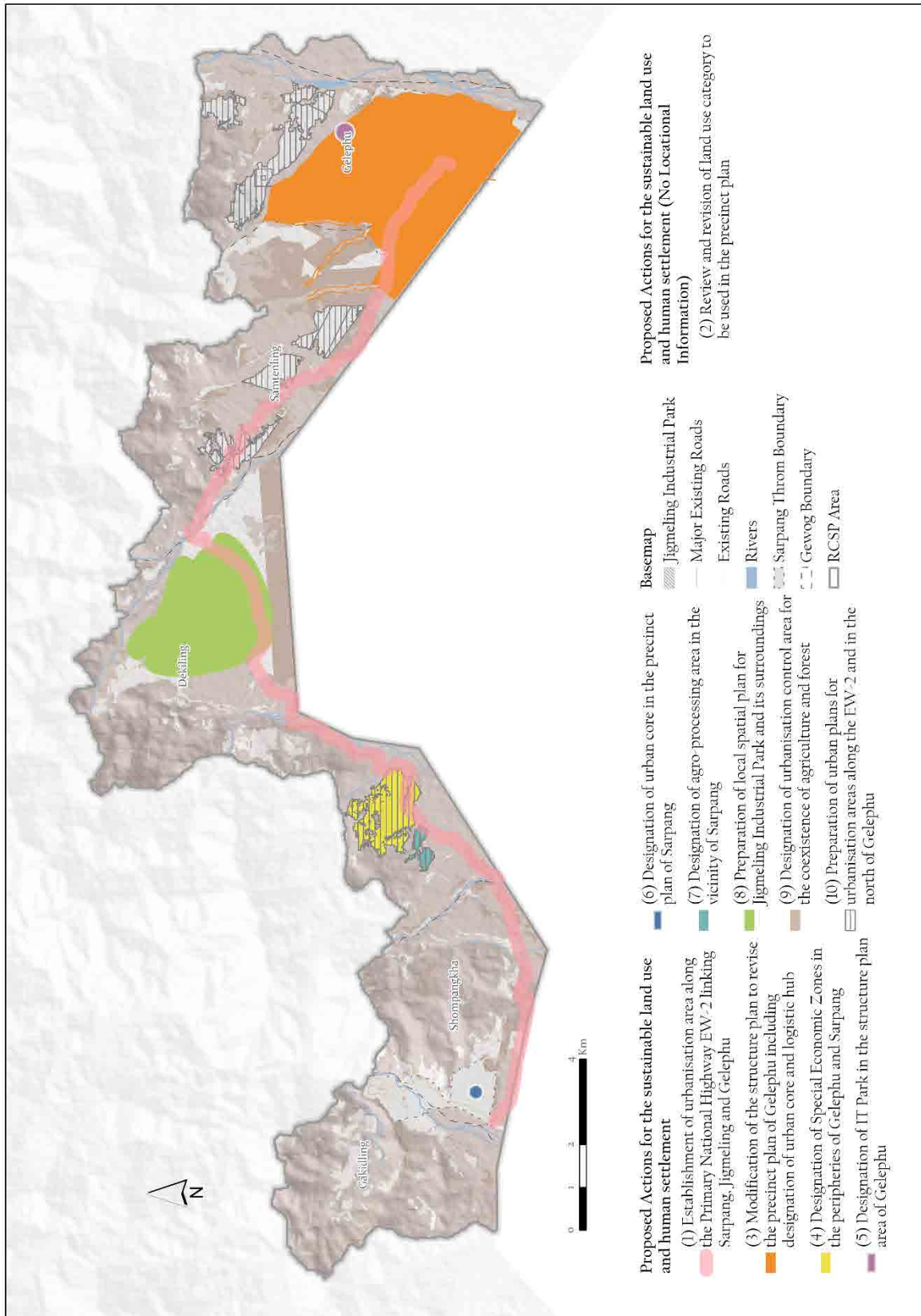
9) Designation of urbanisation control area for the coexistence of agriculture and forest

Area outside the urbanisation area is basically unsuitable for development. This area will be designated as urbanisation control area where in principle development is restricted. But the economic activities and daily life of local residents have to be recognized in the area. Thus, limited development will be accepted to support agriculture and forest related industries and daily life of local residents as follows. This concept will be materialized as the development guideline for the RCSP Area will be formulated.

- Cemetery and athletic ground
- Public facility (education and health) and shops necessary for daily life of local residents
- Facility to utilize tourism resource
- Facility for processing and storage of agriculture produce
- Facility to promote forestry
- Facility such as housing necessary for existing residents (e.g. expansion of existing house)

10) Preparation of urban plans for urbanisation areas along the EW-2 and in the north of Gelephu

In addition to the area surrounding Jigmeling Industrial Park, urbanisation areas along EW-2 and in the north of Gelephu will be covered by urban plans, such as a Local Spatial Plan and an Action Area Plan, to control the urban development adequately. In such urbanisation areas, the village square will be designated by Urban Plans to accommodate convenient access to shopping, basic amenities and social services.



Source: JICA Project Team

Figure 5.6.9 Locations of All Proposed Actions for the Sustainable Land Use and Human Settlement

Box 5.6.2. Mega City Concept

The Government of Bhutan is exploring plans for new urban development in the Sarpang-Gelephu area. As part of this process, the Government of Bhutan requested to estimate the maximum capacity of the RCSP area in case of full use of this area. The maximum capacity is calculated based on a higher population density in the residential areas. Including the capacity of the Structure Plan area of Sarpang and Gelephu, the maximum capacity of the RCSP area would be 133,300 people. In order to realise this concept, Bhutan government has to work considerably harder to attract and promote further industries.

Table 5.6.5 Maximum Capacity of Intermediate Area

Land Use Category	Area (ha)	Density (person/ha)	Capacity (person)
Urban Village Periphery	823	70 ¹⁾	57,577
Village Square	13	80 ²⁾	1,036
Urban Core	4	80 ²⁾	319
Urban Village Core	331	70 ³⁾	23,191
Total (rounded)	1,171		82,100

Source:

- 1) Population density of residential area in satellite city in metropolitan area
- 2) Population density of commercial area in satellite city in metropolitan area
- 3) Population density of high density residential area in satellite city in metropolitan area

5.6.3 Urban Infrastructure Plan

To implement the strategy mentioned in 5.5.3, seven actions for the improving infrastructural networks are proposed as following Table 5.6.6.

Action (1), Development of redundant arterial road network for the corridor will provide redundancy in the east-west direction of the corridor to guide urban development and provide a detour route in case of disaster.

Action (2), Development of Urban Transportation System for the corridor will connect Gelephu and Sarpang, which have high traffic demand, by Urban Transportation System, and also ensure access to Jigmeling Industrial Park in the middle.

Action (3), Improvement of comfort and convenience of inter-district and intercity long-distance buses will enhance passenger access to the corridor area from across the country and within the three districts.

Action (4), Promotion of internationalization of Gelephu Airport will promote the development of a wide-area transportation hub that will contribute to industrial development.

Action (5), Establishment of a freight transport system utilizing the favourable access to India and Gelephu Airport will promote the development of a wide-area transportation network to the corridor area, which aims to become an industrial hub.

Action (6), Examination of measures to support promotion of EV buses will promote public transportation with low energy consumption and environmental impact by utilizing abundant electricity.

Action (7), Establishment of a Smart City System for the management of basic utilities will promote efficient operation and maintenance of developed infrastructure and urban functions using smart technology.

Table 5.6.6 Proposed Actions for Improving Infrastructural Networks

Target Area	Development Strategy ● Long-term; ▲ Mid-term; ■ Short-term	Proposal for Action
Whole RCA Area	<ul style="list-style-type: none"> ▲ Develop east-west bypass route (EW-2) ● Operate UTS between Gelephu and Sarpang ● Operate intercity long-distance bus service equipped with Bus IT system and Smart Card system 	<ul style="list-style-type: none"> (1) Development of redundant arterial road network for the corridor (2) Development of Urban Transportation System for the corridor (3) Improvement of comfort and convenience of inter-district and intercity long-distance buses
Gelephu	<ul style="list-style-type: none"> ● Operate 2nd International Airport ● Operate EV buses ● Promote existing processing, manufacturing, trade, and other services etc. [<i>economic development strategy</i>] ● Develop SEZ fully (in Intermediate belt area) [<i>same as above</i>] 	<ul style="list-style-type: none"> (4) Promotion of internationalization of Gelephu Airport (5) Establishment of a freight transport system utilizing the favourable access to India and Gelephu Airport (6) Examination of measures to support promotion of EV buses
	<ul style="list-style-type: none"> ● Develop city bypass route 	<ul style="list-style-type: none"> (5) Establishment of a freight transport system utilizing the favourable access to India and Gelephu Airport (repeat)
	<ul style="list-style-type: none"> ● Stabilize drinking water and electric supply throughout the year 	<ul style="list-style-type: none"> (7) Establishment of a Smart City System for management of basic utilities
	<ul style="list-style-type: none"> ● Establish proper waste management system 	<ul style="list-style-type: none"> (7) Establishment of a Smart City System for management of basic utilities (repeat)
Sarpang	<ul style="list-style-type: none"> ● Stabilize drinking water and electric supply throughout the year 	<ul style="list-style-type: none"> (7) Establishment of a Smart City System for management of basic utilities (repeat)
	<ul style="list-style-type: none"> ● Establish proper waste management system 	<ul style="list-style-type: none"> (7) Establishment of a Smart City System for management of basic utilities (repeat)
Intermediate belt area	<ul style="list-style-type: none"> ● Stabilize drinking water and electric supply throughout the year 	<ul style="list-style-type: none"> (7) Establishment of a Smart City System for management of basic utilities (repeat)
	<ul style="list-style-type: none"> ● Establish proper waste management system of corridor area 	<ul style="list-style-type: none"> (7) Establishment of a Smart City System for management of basic utilities (repeat)

Source: JICA Project Team

The detail of each action is shown as follows. A map showing the geographical locations of all the proposed Actions (except for Actions that cannot be identified their locations) is also posted at the end of this section.

(1) Development of redundant arterial road network for the RCSP Area

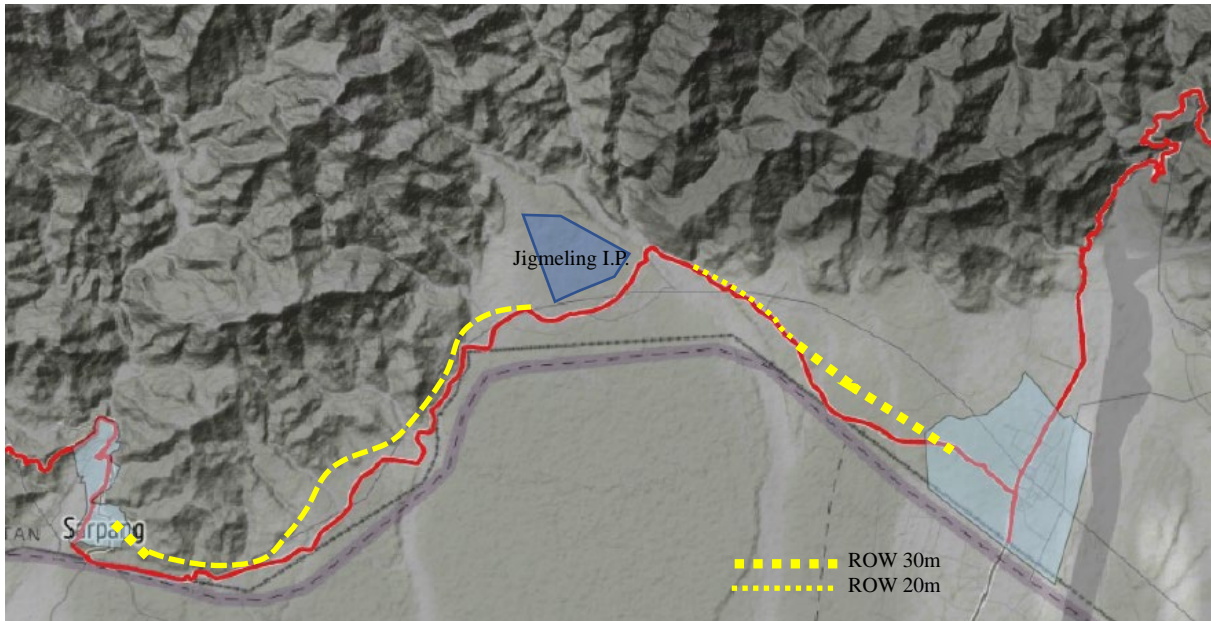
Road sections parallel to the Primary National Highway (EW-2) between Gelephu and Sarpang is proposed as shown in Figure 5.6.1. The proposed road sections will have the following roles and functions:

- Ensure redundancy of EW-2 in the event of a disaster
- Sharing functions with EW-2, which is expected to have industrial traffic
- Providing access to residents in the northern part of EW-2
- Guiding development along the road

The concept of the road alignment plan is as follows:

- Avoid large structures such as tunnel
- Provide a good alignment for the future use of track-based public transportation

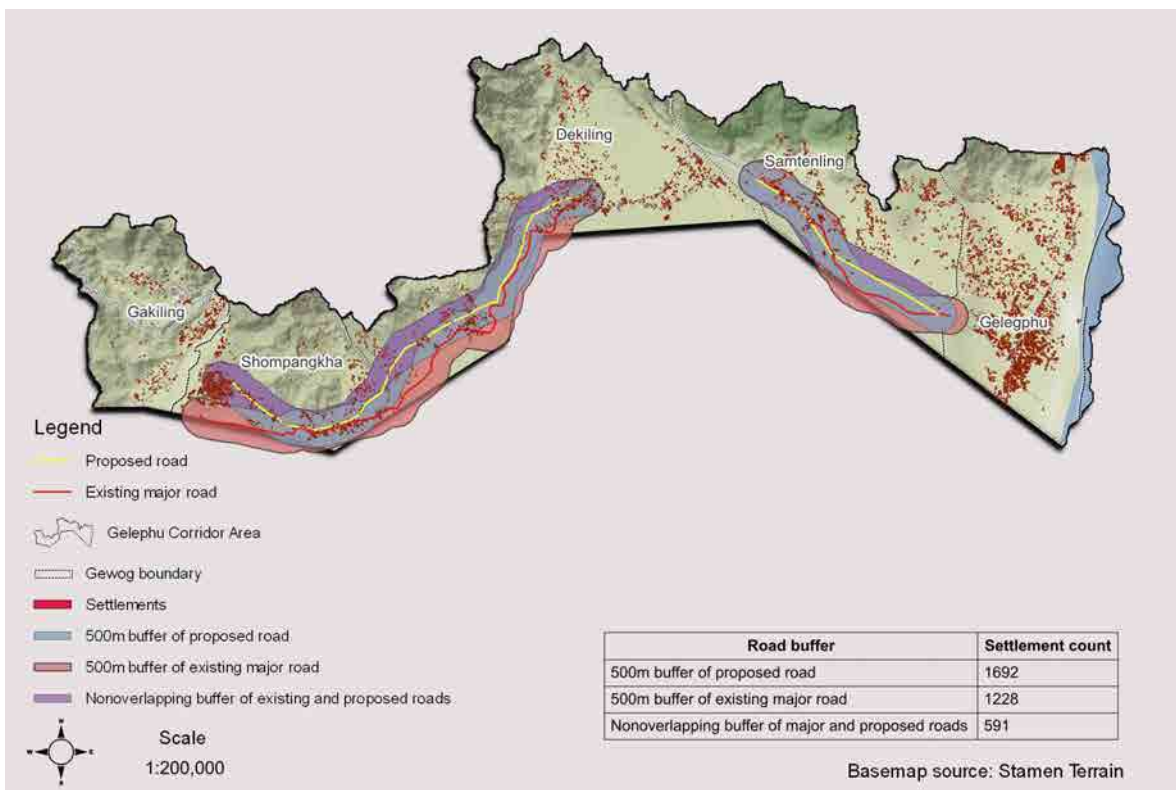
ROW of the proposed road is set at 30 m in sections of the land use plan area and 20 m in other sections. The former sections are set to be equivalent to the DOR standard secondary national highway and the latter sections to Dzongkhag Road.



Source: JICA Project Team

Figure 5.6.10 Proposed New Road between Gelephu and Sarpang

The accessibility of the existing national highway and the proposed road is assessed in terms of the number of buildings in a 500 m area along the road. The number of buildings on the existing national highway is 1,228 and the number of buildings on the proposed road is 1,692. The number of new buildings due to development of the proposed road is 591, which means that the beneficiaries of the proposed road are as large as 50% of the existing national highway.



Source: JICA Project Team

Figure 5.6.11 Coverage of the Proposed New Road and Existing Road

The land required for the proposed road project is described in the table below. The area of private land within the ROW is approximately 60 acres. The private land is divided into plots for each owner, but the above is only the area overlapping with the proposed road. If the entire parcels are to be purchased, the subject area would be much larger, approximately six times larger. However, as most of the land is used for agriculture and forestry, it is unlikely that the entire plot would need to be purchased.

Table 5.6.7 Necessary Land for the Proposed New Road






Items	Proposed New Road
Length	East: 6.24km West:13.42km
ROW (acres)	107.15
Private Land (acres)	60.4
Private Land(Entire Plot) (acres)	368.0

Source: JICA Project Team

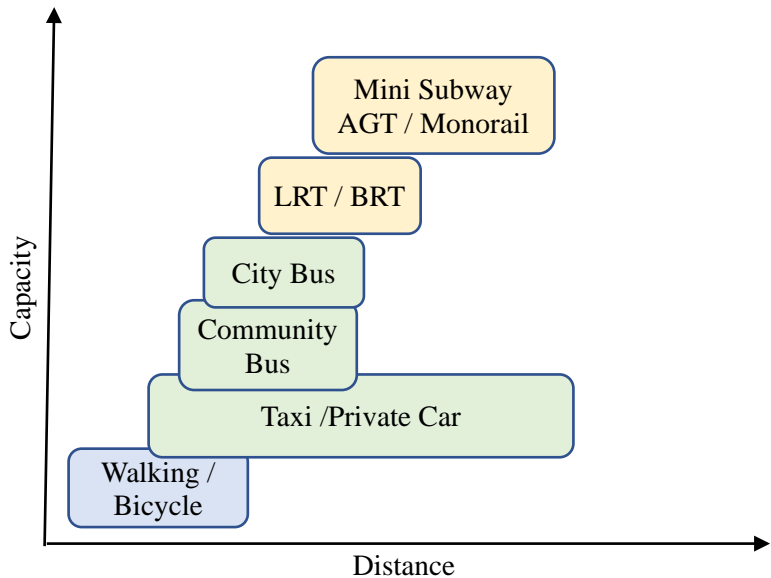
(2) Development of Urban Transportation System for the RCSP Area

The Urban Transportation System connecting Gelephu and Sarpang was considered. The study considered features such as current EW-2 traffic and users of the Jigmeling Industrial Park and the capacity of each System of the Urban Transportation System as future demand. The capacity of each system is greater than the assumed demand. Therefore, it is considered that the demand can be met by City Bus operation for the time being, but considering the increase in demand around 2045, it is proposed that the introduction of BRT be considered in the future.

Table 5.6.8 General Description of Urban Transportation System

Type of Urban Transportation System				
Mini Subway	Monorail	AGT	LRT	BRT
				
A subway with a smaller diameter steel wheel that lowers the height from the rail surface to the car floor and reduces the width of the car body compared to conventional subways, thereby reducing the cross section of tunnels and other structures.	A system of transportation with vehicles straddling the top or hanging from the bottom of a single track girder that is erected primarily over the road. The vehicle runs on rubber tires.	A system with a relatively small vehicle body that runs on rubber tires guided by guide rails on a dedicated track installed mainly over the road.	LRT is a medium-volume track-based transportation system that uses high-performance vehicles with improved acceleration /deceleration performance, riding comfort, and barrier-free accessibility compared to conventional tram. Direct connection with existing railroads is also possible.	There is no clear definition other than "bus," but it is a system that has exclusive lanes as a driving method and is operated by articulated vehicles with high transportation capacity.






Source: JICA Project Team



Source: JICA Project Team

Figure 5.6.12 Conceptual Diagram of Transportation Role

Table 5.6.9 Comparison Table of Urban Transportation System

Type	Mini Subway	Monorail	AGT	LRT	BRT
Photo					
Alignment Flexibility	△	△	△	○	◎
Adaptability to Urbanized Area	△	△	△	◎	◎
Impact to Road Space	◎	○	○	△	△
Symbol Characteristic	△	△	△	◎	○
Riding Comfort	◎	◎	◎	◎	△
Average Speed (km/h)	30	30	25	20	20
Capacity (pax/h)	11,400~ 23,400	12,000 (6,000~18,000)	9,000	2,880~5,400 Bidirectional	3,120 Articulated Bidirectional
	Transport capacity assumes 4~8 rolling stock (90pax/a rolling stock), 3 minute intervals, 150% congestion rate	Transport capacity assumes 2~6 rolling stock (100pax/a rolling stock), 3 minute intervals, 150% congestion rate	Transport capacity assumes 4~6 rolling stock, 3 minute intervals, 150% congestion rate	Transport capacity assumes 18m~30m rolling stock, 5 minute intervals, 150% congestion rate	Transport capacity assumes articulated vehicle, 5 minute intervals, 150% congestion rate
Cost (Mil. USD)	150~220	75~110	40~110	15~22	4~11

Note: ◎Excellent, ○Good, △Average

Source: JICA Project Team

(3) Improvement of comfort and convenience of inter-district and intercity long-distance buses

Considering the importance of bus routes within and beyond the region, and considering the current bus routes and their frequency and economic ties, it is important to improve the bus route connecting Zhemgang - Gelephu – Sarpang-Tsirang - Thimphu using the PNH, and to ensure year-round traffic on the above route. It is also important to ensure year-round traffic on the above route.

In addition to improving the roads on the bus route, it is necessary to improve the convenience and comfort of the buses. Specifically, these improvements include the introduction of vehicles that match passenger demand and travel times, and improvements to bus terminal facilities and information provision that enhance user convenience and comfort.

In Bhutan, the following issues are generally identified regarding bus vehicles, bus terminals, and services for bus users:

- Size of bus fleet is limited by mountainous road geometric structure.
- Facilities in terminal such as waiting lounge, transfer area, parking area, etc. are poor.
- Information service regarding general information, transfer, operation status, and operation schedule is poor.
- Bus service is undertaken by private operator with government tariff in entire country.

The above issues are identified in RCSP Area. Sarpang has no bus terminal, and although a new bus terminal is planned for Gelephu town, the existing bus terminal is not functional as shown in the figure 5.6.13.



Source: JICA Project Team

Figure 5.6.13 Existing Bus Terminal in Gelephu

Followings are proposed to achieve issues in RCSP Area:

- Considering accessibility, the required area and the appropriate sharing of functions, it is preferable that the intercity bus terminal is located in the planned Muti-mode Transport Hub in the suburbs, while the existing bus terminal in the city centre is dedicated to intra-city buses and Paratransit.
- Development of bus terminal in Sarpang town
- Introduction of bus information system (centre, bus location system, bus schedule), smart card for city bus, EV bus for city bus for introductions of advanced IT system to enhance convenience for users and environmentally friendly systems

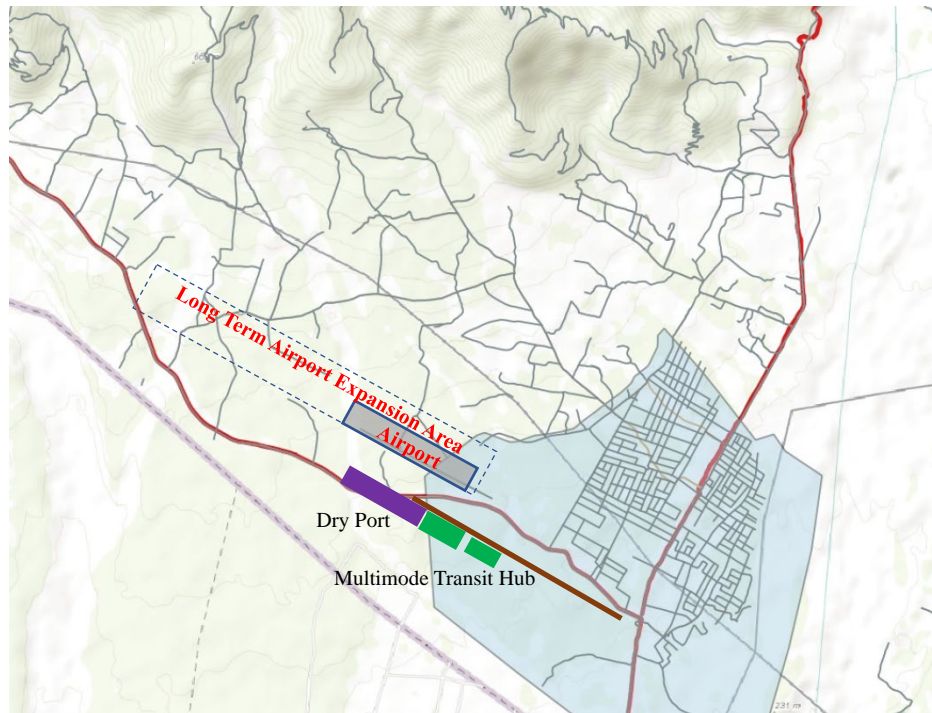
(4) Promotion of internationalization of Gelephu Airport

ADB conducted “Enhancing Aviation Sector Development Capacity, Master Plan for the Upgradation of Gelephu Airport” from 2020 to 2022, which included the following;

- Analysis of challenges in Bhutan's aviation sector
- Formulation of short-, medium-, and long-term aviation development strategies
- Provision of capacity strengthening programs to local aviation authorities and relevant agencies

A Master Plan of Gelephu Airport was implemented within the above study. The Master Plan proposes a phased development of Gelephu Airport in three phases based on future demand projections. The short term is targeted for 2027, the medium term for 2030, and the long term for 2040.

In the long term, a 2,200-meter runway is proposed along with the conversion to an international airport, in which case the land requirements are generally within the range shown in Figure 5.6.14.



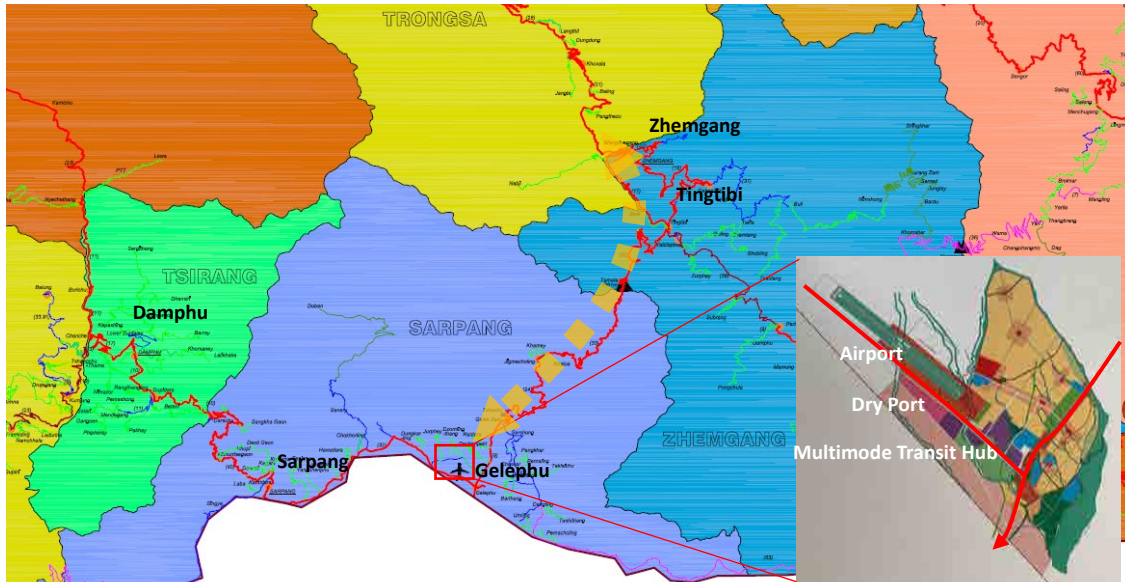
Source: JICA Project Team

Figure 5.6.14 Proposed Long Term Gelephu Airport Expansion Area proposed by ADB M/P

(5) Establishment of a freight transport system utilizing the favourable access to India and Gelephu Airport

1) Reinforcement of network for access to airports and Indian transportation network

Gelephu faces the Indian border and has a strong geographical advantage as a hub for international trade. In addition, the airport is planned to be internationalized and the Dry Port and Multi-modal transport hub are being developed.

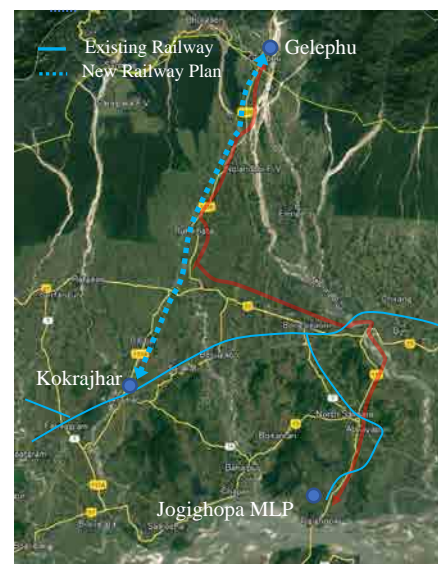


Source: JICA Project Team

Figure 5.6.15 Logistic Hub in Gelephu

International trade with India, Bangladesh, and other countries using the port of Kolkata is conducted via Indian roads. Currently, the Jogighopa multi-modal logistic park, which has access functions to road, rail, shipping, and air routes, is under construction at a point about 95 km away from Gelephu in Assam State. In addition, the government of India and Bhutan have initiated preliminary investigation of a new railway project that would connect between Kokrajhar in India and Gelephu. The length of the new railway project is 57km with broad-gauge and the estimated project cost is about Rs 10bn (\$US 129.9m). Those projects further increase geographical advantage of Gelephu as an international trade hub.

In order to improve accessibility to Gelephu as a logistics hub from various parts of Bhutan, the challenge is to ensure year-round traffic on the road between Gelephu and Zhemgang.



Source: JICA Project Team (Google Earth)

Figure 5.6.16 Route from Gelephu to Jogighopa MLP

According to “Preliminary Engineering cum Traffic Survey for New BG Railway Line from Kokrajhar (India) to Gelephu (Bhutan)” 03 February 2023 by Northeast Frontier Railway (India), the location of the terminal station at Gelephu is planned to be on the banks of the Manas River.

The location of the terminal station is considered preferable to the west for the following reasons.

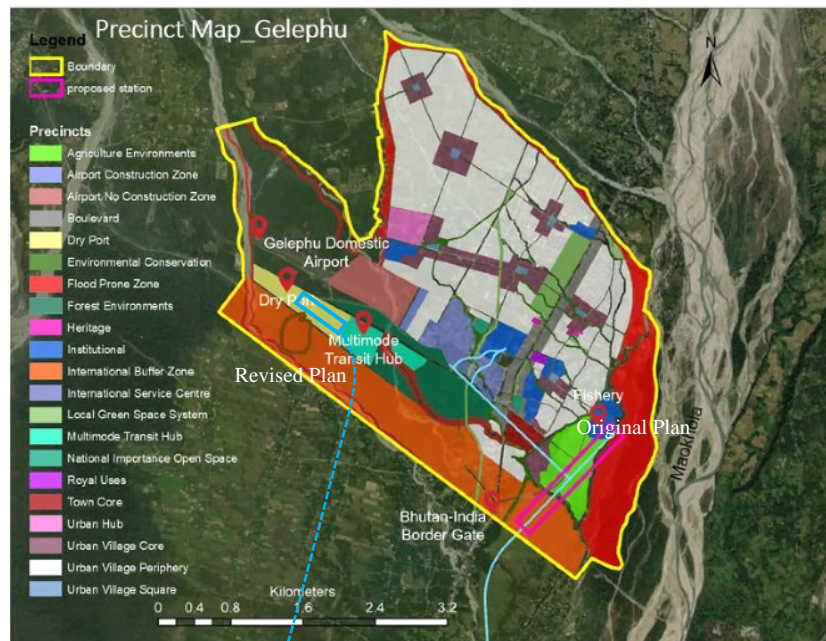
- To avoid deterioration of the roadside environment due to the access of freight vehicles to the terminal station
- To ensure smooth transshipment of goods between trains and freight vehicles
- Consideration of the possibility of future extending the rail line to the Jigmeling industrial park

For the above reasons and the geometric constrains on alignment, the alignment of the original plan was reviewed by the Indian side and Bhutan side through the field investigation. As a result, the revised alignment plan shown in Figure 5.6.17 was proposed and is currently being evaluated by the Indian side to determine whether further engineering survey should be conducted.

The site for the terminal station proposed in “Preliminary Engineering cum Traffic Survey for New BG Railway Line from Kokrajhar (India) to Gelephu (Bhutan)” is considered excessive in relation to the initial freight demand, so it is desirable to develop it in stages, taking cost-effectiveness into account.

Considering the magnitude of the project’s potential impact on the logistics hub function of RCSP, a feasibility study, including cargo demand prediction, economic and financial validation and organizational institutional planning, should be conducted in addition to the engineering survey described above.

Furthermore, given that a terminal station is planned to be located near the dry port or Multi-modal transportation hub in the new railway project, the dry port and Multi-modal transport hub plan should additionally consider the size and layout of facilities such as platforms for containers, container yards, each railway feeder line, etc.

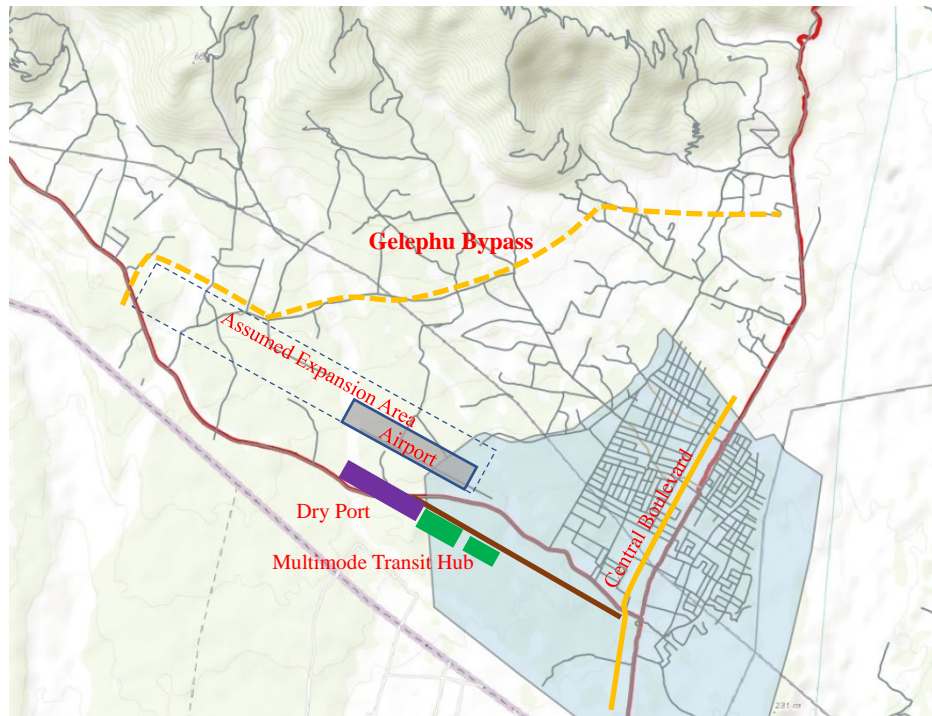


Source: JICA Project Team on the Proposed Plan by Northeast Frontier Railway India

Figure 5.6.17 Original and Proposed Railway Terminal Plan

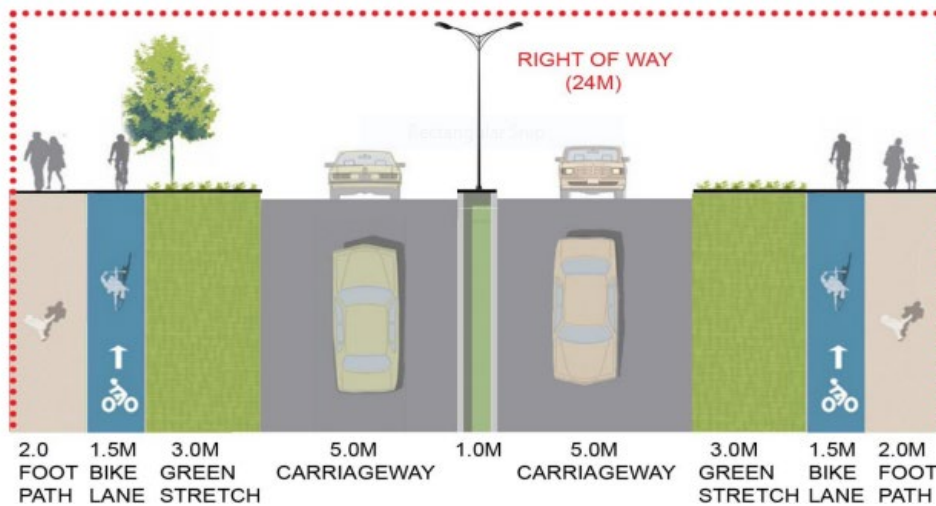
2) Strengthen network with logistics hubs and industrial parks

Gelephu is expected to become a transportation hub as a logistics centre. On the other hand, a land use plan has been prepared to create a favourable urban environment of the Gelephu urban area. In addition, a symbolic Central Boulevard consisting of sidewalks, bicycle lanes, greenways, and roadways is planned along the primary national highway that runs northward from the Indian border to the centre of the city, with a length of 3.5 km and a ROW of 24 m as shown in Figure 5.6.17. It is desirable to develop a bypass road to separate traffic passing through the urban area to preserve the urban environment. The location of the bypass is proposed to avoid the future widening area of Gelephu Airport and to use the current road as much as possible from the viewpoint of minimizing land acquisition, the route shown in Figure 5.6.18.



Source: JICA Project Team

Figure 5.6.18 Conceptual Plan of Gelephu Bypass



Source: Gelephu Thormde

Figure 5.6.19 Proposed Typical Cross Section of Central Boulevard

The land required for Gelephu Bypass project is described in the table below. The area of private land within the ROW is approximately 18 acres. The private land is divided into plots for each owner, but the above is only the area overlapping with the proposed road. If the entire parcels are to be purchased, the subject area would be much larger, approximately seven times larger. However, as most of the land is not yet urbanized, it is unlikely that the entire plot would need to be purchased.

Table 5.6.10 Necessary Land for Gelephu Bypass

Items	Gelephu Bypass
Length	7.18 km
ROW (acres)	35.46
Private Land (acres)	18.11
Private Land (Entire Plot) (acres)	121.96

Source: JICA Project Team

(6) Examination of measures to support promotion of EV buses

Private electric vehicles are being introduced in Bhutan, and inexpensive electricity contributes to economic mobility. The public transportation sector should also consider the feasibility of applying electric buses, taking into account passenger demand and other factors.

F/S should be conducted to determine the feasibility of introducing electric buses based on passenger demand and cost.

(7) Establishment of a Smart City System for management of basic utilities

In RCSP Area region with high potential for industrial development, it is essential to propose a plan to develop industrial functions and the supporting wide-area transportation network and wide-area logistics hubs and urban functions including social infrastructure for increasing population in a balanced manner. In addition, sustainable and efficient operation and maintenance of the infrastructure and urban functions to be developed is required. As a new driving force for this, it is proposed to provide solutions to urban issues through smart technologies. The major urban issues in the RCSP Area identified in the previous sections and proposed solutions through smart technologies are listed in Table 5.6.11.

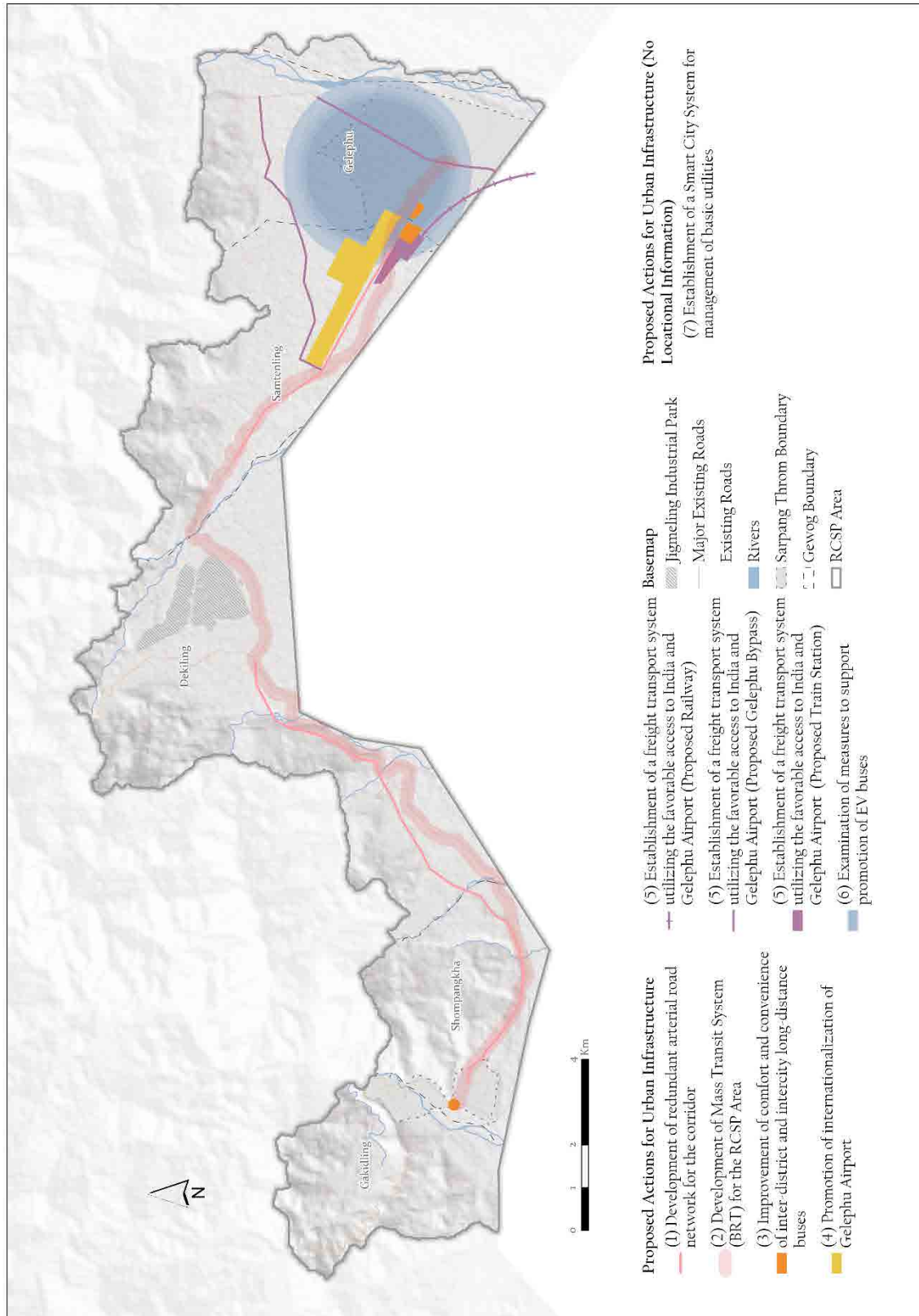
Moreover, for integrated management of the collected data by these smart technologies, it is necessary to develop data management hardware and communication facilities, as well as systems and institutions for information sharing and disclosure. Human resource development and technology transfer through pilot projects are proposed for this purpose.

Table 5.6.11 Major Urban Issues and Proposed Solutions by Smart City System on RCSP Area

Sector	Major Urban Issues	Proposed Smart Services	Service Outline
Lifeline	<ul style="list-style-type: none"> • Stable supply of electricity • Stable supply of clean drinking water 	<ul style="list-style-type: none"> • Smart Grid System • Smart drinking water meter 	<ul style="list-style-type: none"> • Efficient automatic control of electricity supply and demand on the supply side of power plants and on the demand side, such as homes and businesses, through the use of IT technology. • Visualization and data use of drinking water consumption

Sector	Major Urban Issues	Proposed Smart Services	Service Outline
			through the introduction of smart meters
Mobility	<ul style="list-style-type: none"> • Convenient public transport services 	<ul style="list-style-type: none"> • Introduction of MaaS application • Introduction of on-demand bus and taxi 	<ul style="list-style-type: none"> • Introduction of an application that allows residents and visitors to search, book, and pay for various means of transportation all at once. • Based on individual reservations, the vehicle runs AI-optimized routes to transport multiple users and goods.
Security	<ul style="list-style-type: none"> • River flood management 	<ul style="list-style-type: none"> • Installation of Sensors and Cameras on Rivers 	<ul style="list-style-type: none"> • Sensors, cameras, and other measuring devices are installed in rivers to detect water level information, etc.
Environment	<ul style="list-style-type: none"> • Integrated Waste Management 	<ul style="list-style-type: none"> • Optimization of waste collection and facility operation 	<ul style="list-style-type: none"> • Sensors are attached to industrial refuse collection boxes to visualize the amount of loading in the refuse collection box and select the optimal collection route. • Efficient operation of waste treatment facilities through accumulation of waste generation and treatment data.
Tourism	<ul style="list-style-type: none"> • Convenience for tourism activities • Tourism promotion 	<ul style="list-style-type: none"> • Introduction of Tourism MaaS application 	<ul style="list-style-type: none"> • Introduction of an application that enables access to a wide range of tourism-related services, such as viewing tourist information and planning itineraries

Source: JICA Project Team



Source: JICA Project Team

Figure 5.6.20 Locations of All Proposed Actions for Urban Infrastructure

5.6.4 Plan for distribution of key urban functions and public amenities and spaces

To implement the strategy mentioned in 5.5.3, seven actions for the distribution of key urban functions and public amenities and spaces are proposed as following Table 5.6.11.

Action (1), expansion of the CRRH, and Action (2), development of Gelephu City Central Park as a regional recreational park, will strengthen high-level livelihood service functions in Gelephu, and establish the status of a healthy and recreational urban destination with international-level service facilities in the country in Gelephu.

Action (3), strengthening the civic service functions, will also strengthen high-level livelihood service functions in Gelephu and Sarpang, install ICT-oriented livelihood service functions in the whole RCSP Area, and introduce wide-area administrative functions to serve the whole SCR based on ICT-oriented G2C system in Sarpang.

Action (4), establishing a tertiary education institute, will also strengthen high-level livelihood service functions in Gelephu and Sarpang, and establish the status of an academic town in Sarpang.

Action (5), promoting ICT-oriented commercial and delivery services, will install ICT-oriented livelihood service functions in the whole RCSP area.

Action (6), expansion of the JWPTI, will contribute to the human resource development of the SCR.

Action (7), establishment of Jigmeling Life-Service Delivery Hub, will upgrade Jigmeling as an intermediate town with livelihood service functions.

The detail of each action is shown as follows.

Table 5.6.12 Proposed Actions for Distributing Key Urban Functions and Public Amenities & Spaces

Target Area	Development Strategy ● Long-term; ▲ Mid-term; ■ Short-term	Proposal for Action
Whole RCSP Area	● Strengthen high-level livelihood service functions in Gelephu and Sarpang	(1) Expansion of the CRRH (2) Development of Gelephu City Central Park as a regional recreational park (3) Strengthening the civic service functions (4) Establishing a tertiary education institute
	● Install ICT-oriented livelihood service functions in the whole RCSP Area	(5) Promoting ICT-oriented commercial and delivery services (3) Strengthening the civic service functions (repeat)
Gelephu	● Establish the status of a healthy and recreational urban destination with international-level service facilities in the country	(1) Expansion of the CRRH (repeat) (2) Development of Gelephu City Central Park as a regional recreational park (repeat)
Sarpang	● Introduce wide-area administrative functions to serve the whole SCR based on ICT-oriented G2C system	(3) Strengthening the civic service functions (repeat)
	● Establish the status of an academic town with establishment of a tertiary education institute	(4) Establishing a tertiary education institute (repeat)
Intermediate belt area	■ Promote the expansion of the JWPTI contributory to the human resource development of SCR	(6) Expansion of the JWPTI
	● Upgrade Jigmeling as an intermediate town with livelihood service functions	(7) Establishment of Jigmeling Life-Service Delivery Hub

Source: JICA Project Team

The detail of each action is shown as follows. A map showing the geographical locations of all the proposed Actions (except for Actions that cannot be identified their locations) is also posted at the end of this section.

(1) Expansion of the CRRH

The Central Regional Referral Hospital (CRRH) in Gelephu has played a vital role in regional-level health care since it was established in 1967. Promoting functional expansion will be required to realize the actual telemedicine service, and spatial expansion will be required to cope with population growth.

The MoH has been promoting the introduction of telemedicine services²⁵ and has already initiated pilot projects. However, the telemedicine currently provided in the CRRH is mainly consultations by e-mail or mobile phone, and is far from actual telemedicine. The introduction of telemedicine services, especially preventive therapies for remote villages, is an urgent issue.

It is necessary to install telemedicine service step-by-step by 2030, from the DtoN (Doctor to Nurse) to the DtoP (Doctor to Patient). Regarding the DtoN service in Bhutan, remote consultation or remote diagnosis connecting between a doctor in the CRRH and a medical staff in each PHC or ORC, based on the public health system, should be installed first. Secondary, the DtoP service connecting between a doctor in the CRRH and a patient directly, by using telemedicine software as shown in the following figure, needs to be inaugurated.



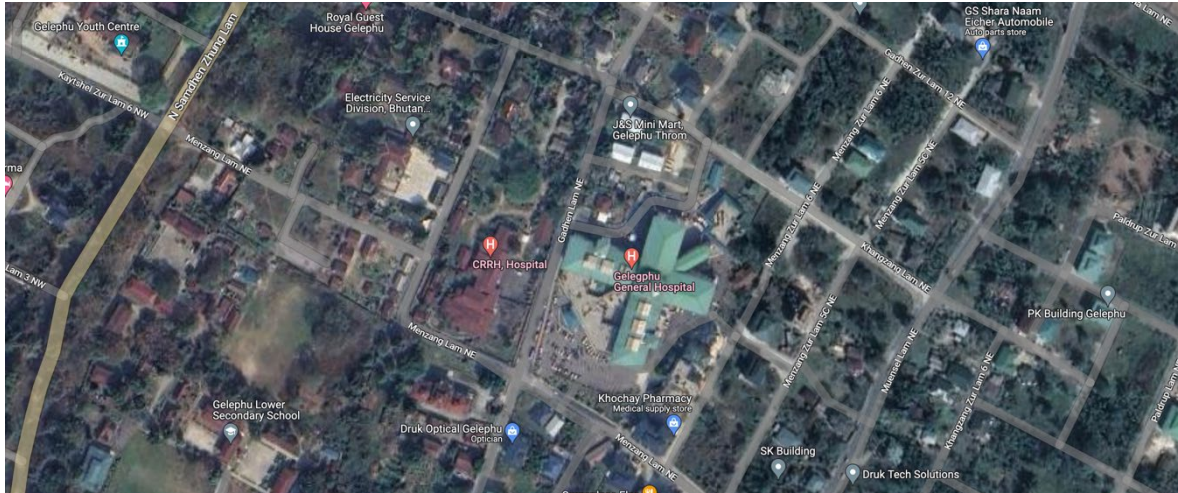
Source: Prasad, et al. (2020)²⁶

Figure 5.6.21 Image of DtoP telemedicine service

²⁵ MoH (2018) "National eHealth Strategy and Action Plan"

²⁶ Prasad A, Brewster R, Rajasekaran D and Rajasekaran K (2020) 'Preparing for Telemedicine Visits: Guidelines and Setup', "Frontiers in Medicine". 7:600794, doi: 10.3389/fmed.2020.600794.

Then, the current ward of the CRRH (the facility with the green roof in the following figure) was completed in 2018 and is fully equipped and maintained. However, the population in the region, especially in the Regional Centre, is showing a growing trend and the facilities are expected to become insufficient. The spatial and physical expansion of floor space, medical equipment, and human resources will therefore be essential in the med-term. The former facility of the CRRH (the facility with the red roof in the following figure) locates next to the current one. It will be renovated into the PEMA centre²⁷ to deliver mental health services. For more service expansion, the surrounding vacant lands could be reserved by the government.



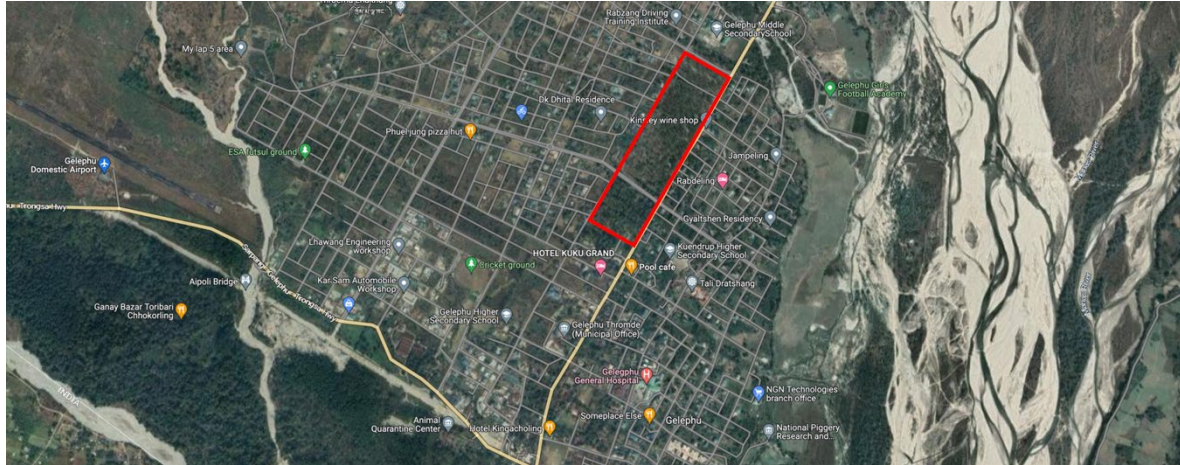
Source: Google Map

Figure 5.6.22 Satellite image of the CRRH and surrounding environments

(2) Development of Gelephu City Central Park as a regional recreational park

Although the preliminary study of the central park in Gelephu Thromde was carried out and the location of the park was specified already, the plan had been stuck due to budget limitations. The following figure shows the 49 acres-wide site of the park reserved by the Gelephu Thromde.

²⁷ PEMA stands for ‘Proactive And Responsive Mental Health Service Delivery Networks’, ‘Enabling Mental Health System’, ‘Multisectoral Collaboration And Coordination’, and ‘Active Advocacy And Awareness On Prevention And Promotion Of Mental Health’. (The PEMA, <https://thepema.gov.bt/>, 18 Mar 2023.)



Source: Google Map

Figure 5.6.23 **Satellite image of the candidate site of the central park**

The existing master plan in the following figure includes lots of amusement amenities. However, considering the existing conditions and the sustainability of the park itself, it would be more reasonable to design it as a city park like Central Park in New York or Yoyogi Park in Tokyo. Then, a feasibility study should be made to realize the construction of the park as a national-level recreation facility. After the study, the establishment of the central park with attractive amenities will start as soon as obtaining the required budget.



Source: Bhutan Architectural Service and Infrastructure Consulting

Figure 5.6.24 The existing master plan of the Gelephu City Central Park



Source: Central Park Conservancy, <https://www.centralparknyc.org/>

Figure 5.6.25 The image of the Central Park in New York



Source: Yoyogi Park, <https://www.tokyo-park.or.jp/park/format/index039.html>

Figure 5.6.26 The image of the Yoyogi Park in Tokyo

In a long term, not only the central park but also an indoor sports complex will be distributed in Gelephu, and Gelephu will be considered a healthy and recreational destination in the country.

(3) Strengthening the civic service functions

After the completion of the Dzong construction, the civic service functions of and around Dzong should be strengthened. In Sarpang Dzongkhag, there was a little confusing situation that Gelephu Thromde had its town management functions as a Dzongkhag Thromde and Sarpang, a Yenlag Thromde, had the municipal office to manage the whole Dzongkhag. The local administrative functions should be shared properly between Gelephu and Sarpang.

From the long-term perspective, wide-area administrative functions to serve the whole SCRP Area will be required. There are no such regional administrative functions provided by the central government of Bhutan, thus, the discussion among the related ministries, local governments and organizations, should be continued. There will be no advantage that citizens of Tsiwang and Zhemgang visit the administrative office in Sarpang to be served G2C services in person. Then, an ICT-oriented G2C system should be expanded to provide local government-oriented online services to citizens.

As of 2023, the Citizen Services Portal²⁸ operated by the G2C Office, Office of the Prime Minister, covers vast areas of services from passport application to land tax payment. However, It is pointed out that the majority of Bhutanese people prefer to visit service centres physically as they do not avail of online services due to the unreliability of the system. As one of the model cases of decentralization, some online applications or payment services are recommended to be operated by the regional administrative body.

(4) Establishing a tertiary education institute

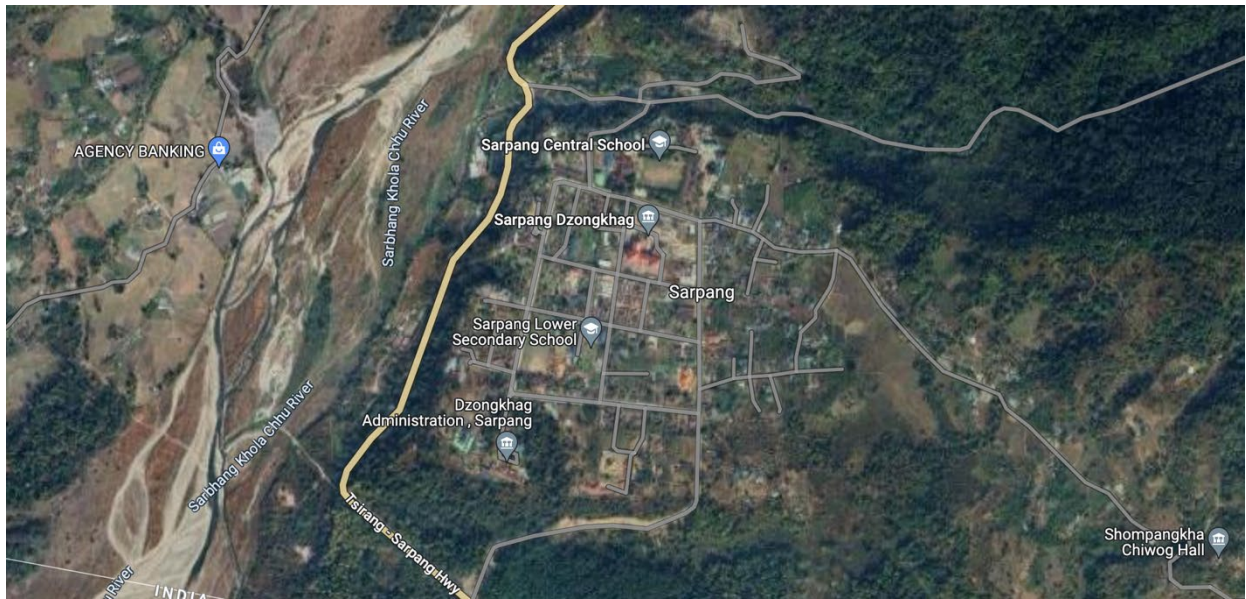
From a long-term perspective, the establishment of a tertiary education institute in this region is required for regional balanced development. However, as per the existing strategic plan²⁹, the Royal University of Bhutan (RUB) does not have plans to establish a new college until 2030. Thus, the feasibility of

²⁸ Citizen Services Portal, <https://www.citizenservices.gov.bt/>, 18 Mar 2023.

²⁹ RUB (2021) "Strategic Plan 2030"

establishing a tertiary education institute would be considered after 2030. Under the existing education system, the RUB takes care of public colleges and the Department of Adult and Higher Education (DAHE), MoESD takes care of private colleges. When the feasibility study is in progress, cooperation among the local government, the RUB, and the DAHE should be indispensable.

Although the location of a new college will be discussed in detail after the feasibility study starts, the old town area of Sarpang Town around the new Dzong construction site could be the candidate as per existing conditions. There are some vacant fields as shown in the following figure. Then, the programmes and courses of the new college shall be discussed in detail in the feasibility study.



Source: Google Map

Figure 5.6.27 Satellite image of the new Sarpang Dzong construction site and surrounding environments

Considering the contribution to the whole SCR, the location should be inside the RCSP Area. Then, Sarpang Town would be established the status of an academic town, distinguished from Gelephu and Jigmeling.

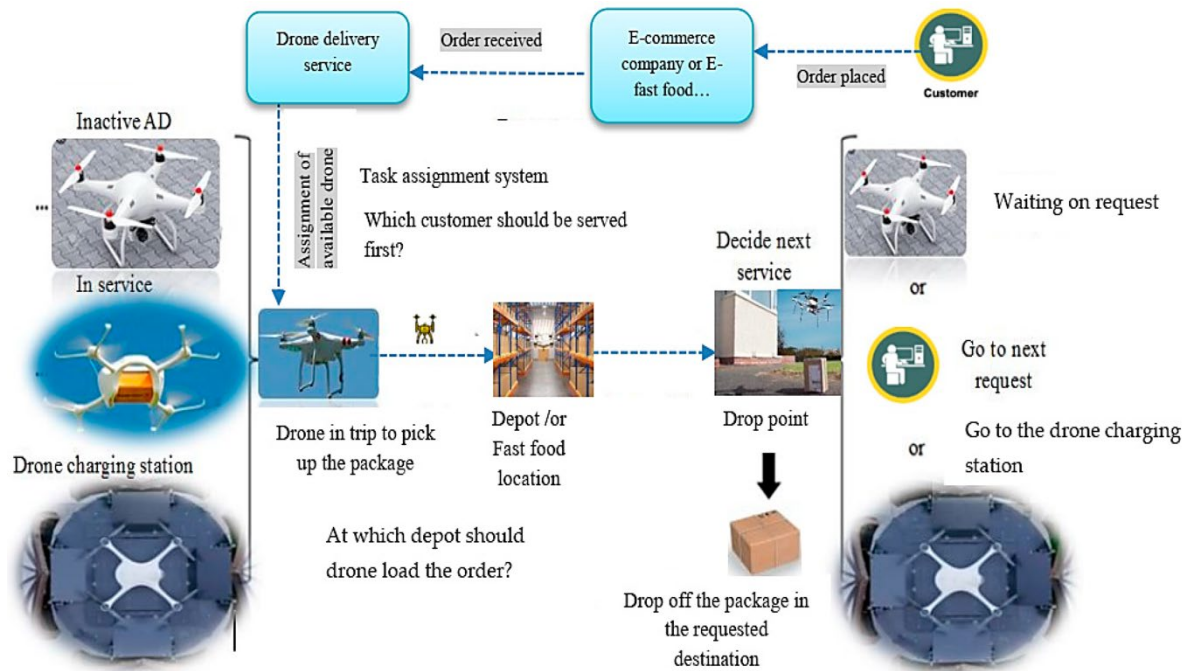
(5) Promoting ICT-oriented commercial and delivery services

The RCSP Area is well-distributed with bank branches, bank ATMs and post offices, which do not pose a major problem for the current provision of commercial services. However, cashless payments have been introduced in Bhutan in recent years, and the country is likely to move towards a more inclusive ICT-oriented economy by 2030. It is required to support entrepreneurs, who would introduce and customize cloud services, sharing services, etc. that have already been popularized in other countries.

In terms of logistics, the RCSP Area, which has relatively short transport times thanks to flat terrain as well as relatively dense urban populations, provides the groundwork for the pilot introduction of services such as express delivery of daily necessities and food. In the long term, the establishment of a logistics network using unmanned transport aircraft can also be considered as shown in the following figure.

The promotion of ICT-oriented commercial and delivery services in the private sector, as described above, will lead to the expansion of ICT facilities, specifically internet communication networks, communication devices and mobile applications. This is expected to form the basic infrastructure for the provision of

education, health and civil services through ICT, in addition to the further enhancement of commercial and delivery services.



Source: Benarbia and Kyamakya (2022)³⁰

Figure 5.6.28 Shared autonomous drone package delivery system operations

(6) Expansion of the JWPTI

Jigme Wangchuk Power Training Institute (JWPTI) is one of the eight Technical Training Institute (TTI) under the former MoLHR, focusing on various engineering courses such as construction carpentry, plumbing, masonry, furniture making, welding, fitting (mechanical engineering), power (transmission and distribution lineman, hydropower mechanical) and dual training program for construction trades. It was relocated from Serzhong in 2014 and changed its name from the Technical Training Institute, Dekiling. As of 2022, the JWPTI has 234 students³¹.

There is a mismatch of skills and materials provided during the training with the real-life practice, therefore there are no assurances of employment of the trainees. It is further aggravated by the availability of cheap labour from across the border. Cooperation among Gelephu Thromde, Sarpang Town, Industrial Park in Jigmeling, and surrounding organizations will be required to be the human resource pool in the region. JWPTI should be expanded in the proper fields required in the region.

Regarding the possibility of expansion of the JWPTI, the existing campus still has some vacant spaces for other engineering courses. Then, as shown in the following figure, there are lots of vacant areas surrounding it. It means the capacity of the JWPTI could be 300-500 students by 2030.

³⁰ Benarbia T, and Kyamakya K (2022) 'A Literature Review of Drone-Based Package Delivery Logistics Systems and Their Implementation Feasibility', "Sustainability", 14(1), 360, <https://doi.org/10.3390/su14010360>.

³¹ MoE (2022) "Annual Education Statistics 2022"



Source: Google Map

Figure 5.6.29 Satellite image of the JWPTI and surrounding environments

(7) Establishment of Jigmeling Life-Service Delivery Hub

As shown in the spatial structure, Jigmeling, located precisely intermediate between Gelephu Thromde and Sarpang Town, has not had enough essential roadside service facilities. The traffic will be expected to be heavier after the activation of the industrial park. It is recommended to locate road maintenance facilities with the Road Maintenance Office (RMO) which is planned to develop by the Department of Surface Transport (DoST). Then, other service functions listed in the following table are needed in Jigmeling as a roadside station by 2035.

Table 5.6.13 Functions to be installed in the roadside station

Function	Expected Facilities	Contents
Road Maintenance	Road Maintenance Office of DoST	<ul style="list-style-type: none"> ● Monitoring the road conditions ● Repair yard of road maintenance ● Office space/accommodation for road maintenance officers
Emergency Response	Disaster Prevention Base	<ul style="list-style-type: none"> ● Base of emergency rescue in case of disaster/natural calamities ● Emergency supplies warehouse ● AED
Regional Communication	Community Centre	<ul style="list-style-type: none"> ● Park/Open space/Play ground ● Community Centre ● Bus station/Taxi parking ● Cooperative unit, Child care centre, Outreach clinic
Information Dissemination	Information Dissemination Centre	<ul style="list-style-type: none"> ● Traffic Information (restriction, congestion, accident, etc.) ● Tourism Information (introduction of the region with history, local specialties, transportation, etc.)
Rest	Rest Space	<ul style="list-style-type: none"> ● Toilet ● Rest space with Wi-Fi, room for mother with baby ● Parking
Shopping/Car Service	Commercial Shop	<ul style="list-style-type: none"> ● Farmer's market ● Restaurant/Food court ● Fuel station, Car wash/workshop, Electric charging station ● ATM

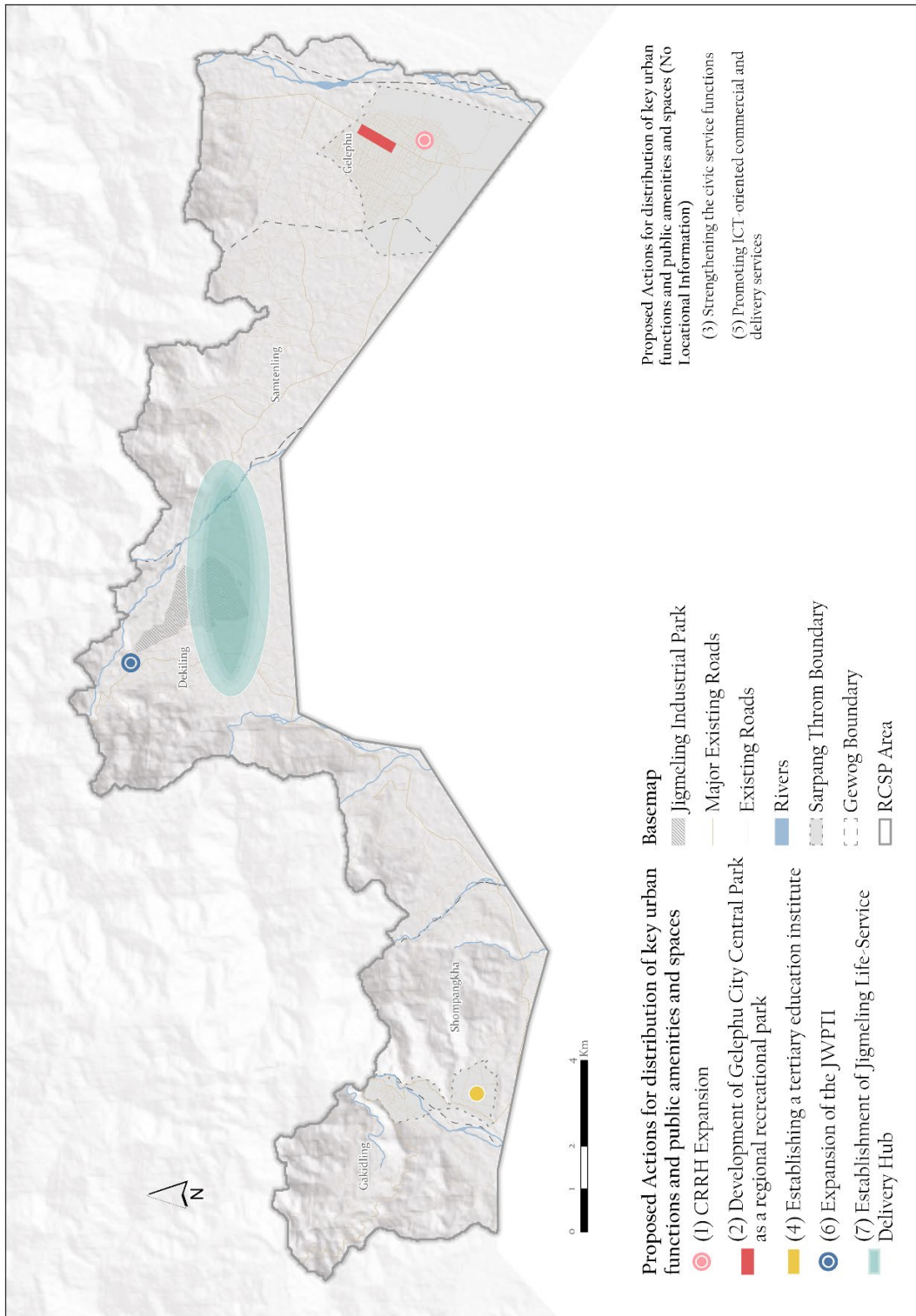
Source: JICA Project Team

Moreover, Jigmeling should be upgraded as Life-Service Delivery Hub next to Gelephu and Sarpang with livelihood service functions including urban infrastructure in the long term. The existing facilities such as Chokhorling MSS and Chokhorling PHC should be upgraded to HSS and a 10-bedded hospital. Then, Jigmeling should be regarded as the Sub-district centre (SDC). It means a market shed, post office, community hall, and playground shall be distributed as proposed in the Holistic Service Delivery System.



Source: Google Map

Figure 5.6.30 **Satellite image of the Jigmeling and surrounding environments**



Source: JICA Project Team

Figure 5.6.31 Locations of All Proposed Actions for distribution of key urban functions and public amenities and spaces

5.6.5 Plan for conservation and promotion of urban landscape and culture

To implement the strategy mentioned in 5.5.1, seven actions for the conservation and promotion of urban landscape and culture are proposed as following Table 5.6.13.

Action (1), preparation of landscape plan on an area basis, and Action (2), development of the guideline for outdoor information and signboards, will preserve/rehabilitate cultural landscape formed by heritage sites and their surroundings, and enrich the landscape formed by the vast expanse of space and the forests in the backdrop, to demonstrate the uniqueness of the region and achieving harmony with nature in the whole RCSP Area.

Action (3), development of scenic highway and viewpoints, will also develop pilgrimage routes as cultural corridors in the whole RCSP Area, and preserve the natural environment along the national highway and maintain the roadside landscaping in the intermediate belt area.

Action (4), establishment of tourism-related service functions, and Action (6), develop the tourism gateway with traditional landscape linked with scenic highway, will also promote tourism and health industry in Gelephu, develop and strengthen touristic gateway functions in Sarpang, which results in the promotion of tourism and related services in whole RCSP Area.

Action (5), development of open spaces and recreational spaces along rivers, will create a series of pleasant urban open spaces including recreational spaces by interweaving water bodies and greenery along rivers within/ adjacent to urban areas in Gelephu and Sarpang.

Action (7), development of animal viewpoints with enriched habitat and greenery will help enable the coexistence of wildlife and humans, maintain a diversity of plants and animals, reducing environmental pollution.

Table 5.6.14 Proposed Actions for Conservation and Promotion of Urban Landscape and Culture

Target Area	Development Strategy ● Long-term; ▲ Mid-term; ■ Short-term	Proposal for Action
Whole RCSP Area	● Preserve/rehabilitate cultural landscape formed by heritage sites and their surroundings	(1) Preparation of landscape plan on an area basis (2) Development of the guideline for outdoor information and signboards
	● Develop pilgrimage routes as cultural corridors	(3) Development of scenic highway and viewpoints
	● Enrich the landscape formed by the vast expanse of space and the forests in the backdrop, to demonstrate the uniqueness of the region and achieving harmony with nature	(1) Preparation of landscape plan on an area basis [repeat]
	● Promote tourism and related services [<i>economic development strategy</i>]	(4) Establishment of tourism-related service functions
Gelephu	● Create a series of pleasant urban open spaces including recreational spaces by interweaving water bodies and greenery along rivers within/ adjacent to urban areas	(5) Development of open spaces and recreational spaces along rivers * Development of Gelephu Central Park as a regional recreational park [see section 5.6.3]
	● Promote tourism and health industry [<i>economic development strategy</i>]	(6) Develop the tourism gateway with traditional landscape linked with scenic highway (4) Establishment of tourism-related service functions [repeat]

Sarpang	<ul style="list-style-type: none"> ● Create a series of pleasant urban open spaces including recreational spaces by interweaving water bodies and greenery along rivers within/ adjacent to urban areas ● Develop and strengthen touristic gateway functions [<i>economic development strategy</i>] 	<p>(5) Development of open spaces and recreational spaces along rivers [repeat]</p> <p>(4) Establishment of tourism-related service functions [repeat]</p>
Intermediate belt area	<ul style="list-style-type: none"> ● Enabling the coexistence of wildlife and humans, maintaining a diversity of plants and animals, reducing environmental pollution 	(7) Development of animal viewpoints with enriched habitat and greenery
	<ul style="list-style-type: none"> ● Preserve the natural environment along the national highway and maintain the roadside landscaping 	(3) Development of scenic highway and viewpoints [repeat]
	<ul style="list-style-type: none"> ● Develop roadside station 	(4) Establishment of tourism-related service functions [repeat]

Source: JICA Project Team

The detail of each action is shown as follows. A map showing the geographical locations of all the proposed Actions (except for Actions that cannot be identified their locations) is also posted at the end of this section (Figure Conceptual diagram will be).

(1) Preparation of landscape plan on an area basis

The RCSP Area has a rare landscape in Bhutan, with flatlands that connect from the mountains behind it through forests. Although the existing structure plans for Gelephu and Sarpang propose the land use categories and several landscape-related projects, but the area covered are limited. In addition, the area without the structure plan is usually protected by the Bhutan Building Regulation 2018 and Guideline for Development Industrial Land 2018, which guide the development in a harmony with the surrounding landscape consisting of traditional architecture. However, the above-mentioned regulations and guideline do not represent specific landscape preservation policies or activities that are unique to the intermediate belt area.

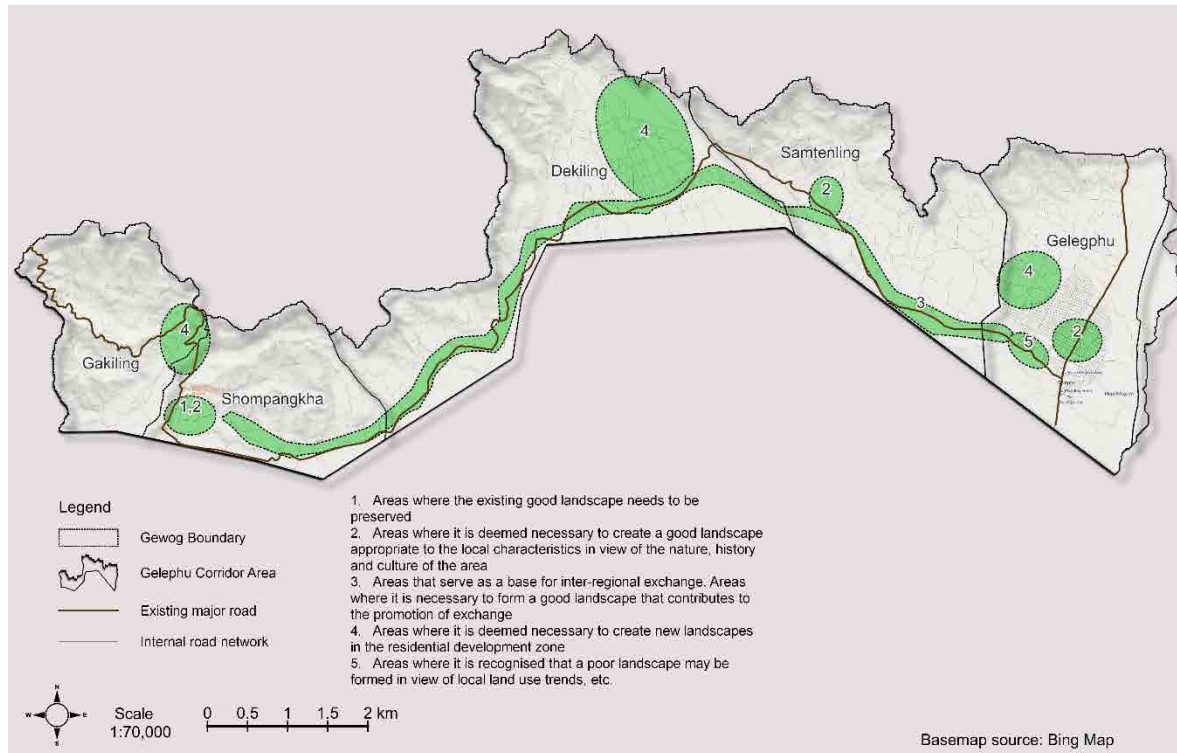
To preserve the landscape of the RCSP Area, preparation of landscape plan on an area basis is essential, which identifies the area to be preserved and specific actions to be taken. The areas may be set up mainly from the following five perspectives:

Table 5.6.15 Perspectives for the Landscape Planning Area and the Expected Location

Perspectives for Landscape Planning Area	Expected Location
1. Areas where the existing good landscape needs to be preserved	• Whole RCSP Area where forests and mountains of the hinterland can be seen from the plains
2. Areas where it is deemed necessary to create a good landscape appropriate to the local characteristics in view of the nature, history and culture of the area	• Monasteries and Dzong in Gelephu and Sarpang such as Sarpang Dzong, Zangdo Pelri, etc.
3. Areas that serve as a base for inter-regional exchange. Areas where it is necessary to form a good landscape that contributes to the promotion of exchange	• Roadside of national highway between Gelephu and Sarpang
4. Areas where it is deemed necessary to create new landscapes in the residential development zone	• Jigmeling Industrial Park and its surrounding area • Extended area of Gelephu Thromde

Perspectives for Landscape Planning Area	Expected Location
	• Shechangthang
5. Areas where it is recognised that a poor landscape may be formed in view of local land use trends, etc.	• Gelephu Dry Port and its surrounding area

Source: JICA Project Team



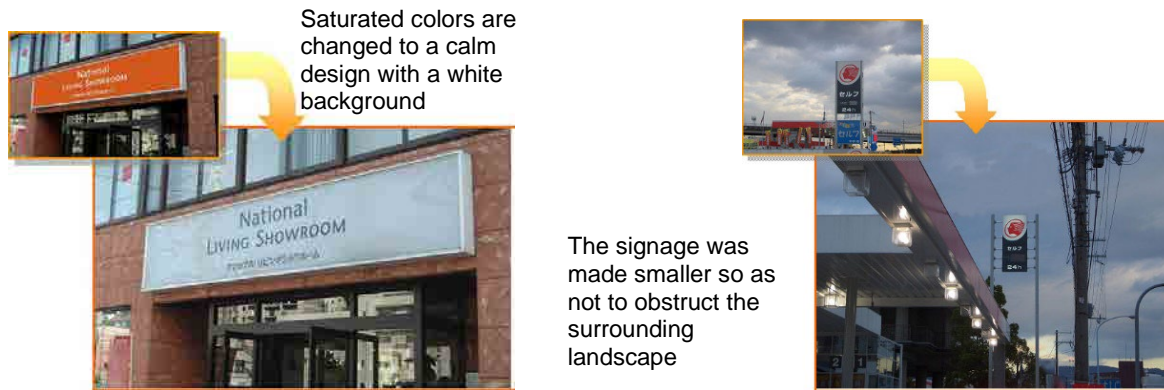
Source: JICA Project Team

Figure 5.6.32 Expected Location of Landscape Planning Areas

(2) Development of the guideline for outdoor information and signboards

The geographical characteristics of RCSP indicate that it is a promising area for industrial/commercial estates and urbanisation. There is also potential for tourism development, taking advantage of the area's unique landscape. As the above development progresses, there will be a need to regulate outdoor information and signboards, which will be an obstacle to the landscape.

Currently, there is no guidelines specific to outdoor information which can be applied to the whole RCSP Area, though Development Regulatory Division of Gelephu Thromde provides the verification and approval of locations for display of banners/advertisement boards, while preparing the guideline for it. In order to protect good landscaping, it is necessary to apply the guideline to the whole RCSP Area for the proper and safe installation of outdoor information.



Source: Nara City

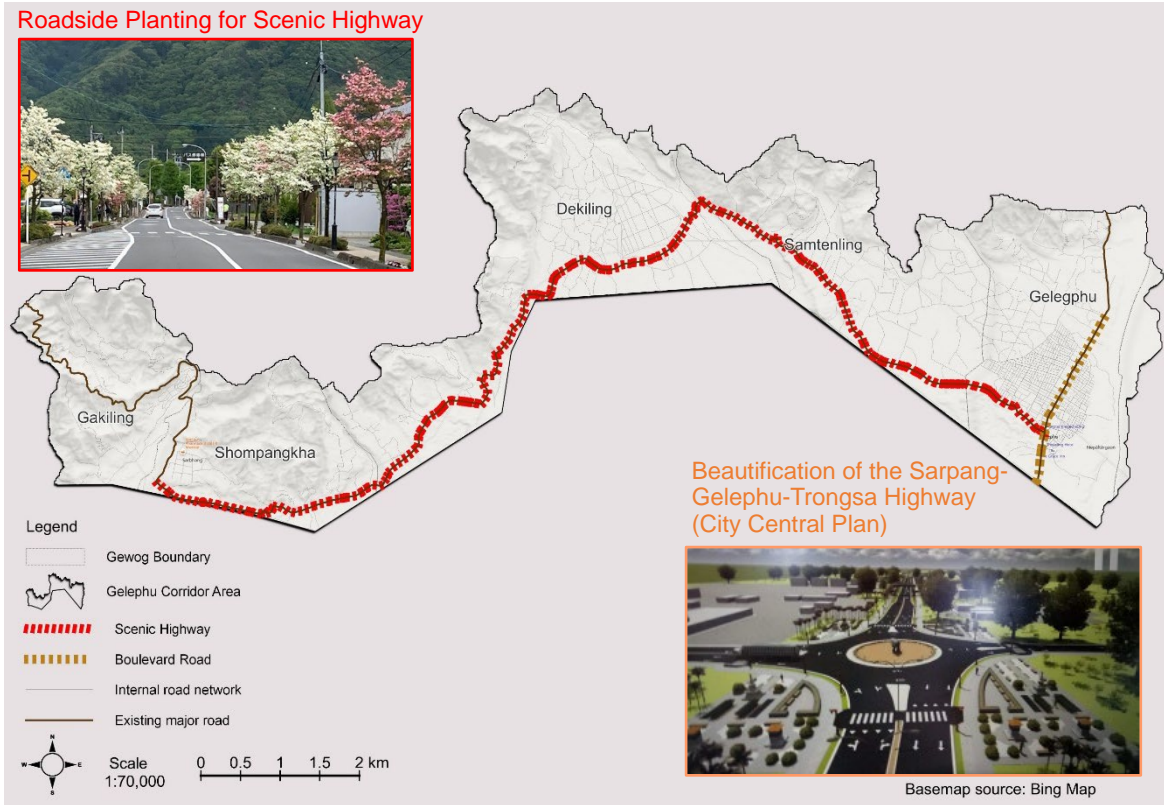
Figure 5.6.33 Examples of Improvements to Advertisements obstructing the Landscape

(3) Development of scenic highway and viewpoints

In order to further enhance the rich landscape with its vast spaces and forests, and to demonstrate the unique characteristics of the RCSP area, scenic highway and pilgrimage routes (lines) and viewpoints (points) will be developed to guide people from visitor attraction points such as open spaces and recreational facilities to form an integrated landscape.

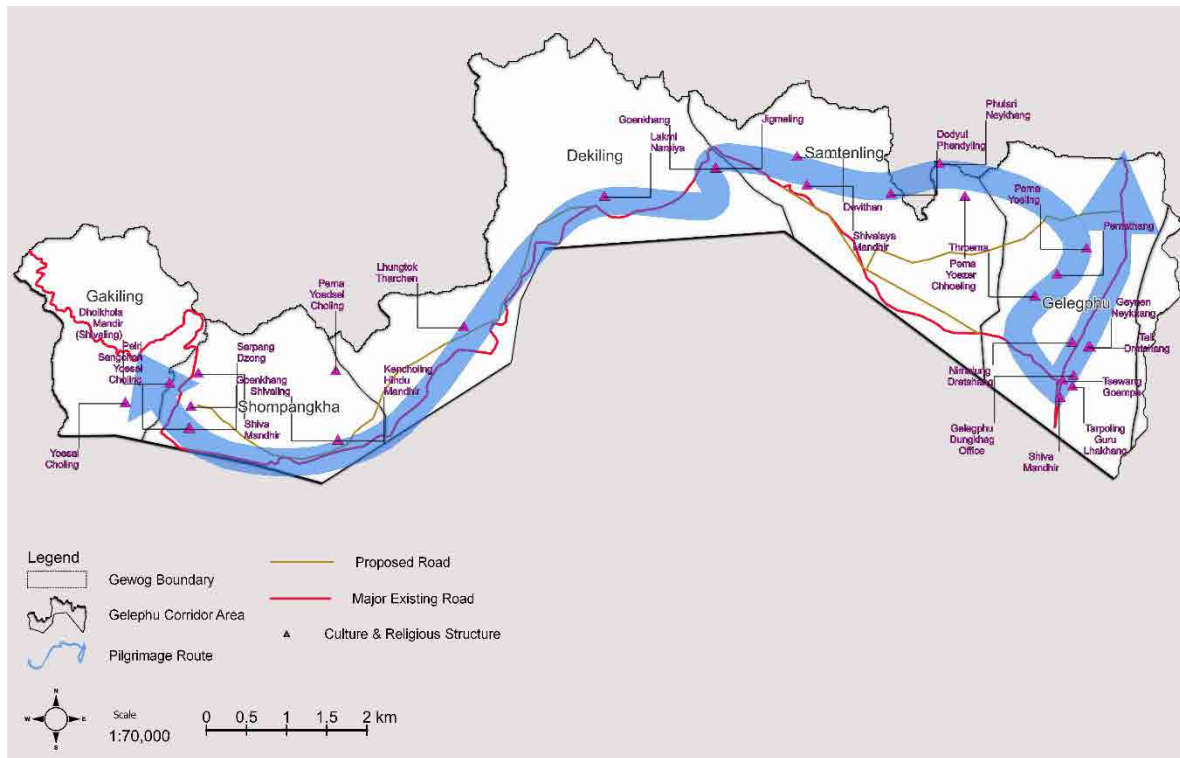
The landscape area consisting of the Heritage Site and its surroundings, the attractive open spaces and recreational facilities along rivers with hinterland forests are also visitor attraction centres where people gather. The development of scenic routes and viewpoints with the function of connecting these individual centres will form an integrated landscape of the whole RCSP Area and lead to regional revitalisation, such as tourism that makes use of the landscape.

As scenic routes, development of scenic highway on national highway between Gelephu and Sarpang and the formation of pilgrimage routes proposed in the Preliminary Study on Sarpang-Gelephu Corridor prepared by the DHS in May 2019 will be promoted. In Gelephu area, the City Central Plan proposes the beautification of the boulevard which is a part of Sarpang-Gelephu-Trongsa highway, by developing the wide footpath, bike lane, median with rich green, streetlights, and rest place with canopy, etc. Scenic highway aims to create original regional landscapes by utilising local resources, i.e., landscape with nature, history and culture under the collaboration of diverse actors. Such holistic integration of religious structure with other nature/product through establishment of proper connectivity as scenic highway and pilgrimage routes provides great opportunity for religious community development as well.



Source: JICA Project Team, Gelephu Thromde

Figure 5.6.34 Scenic Highway and Road Beautification



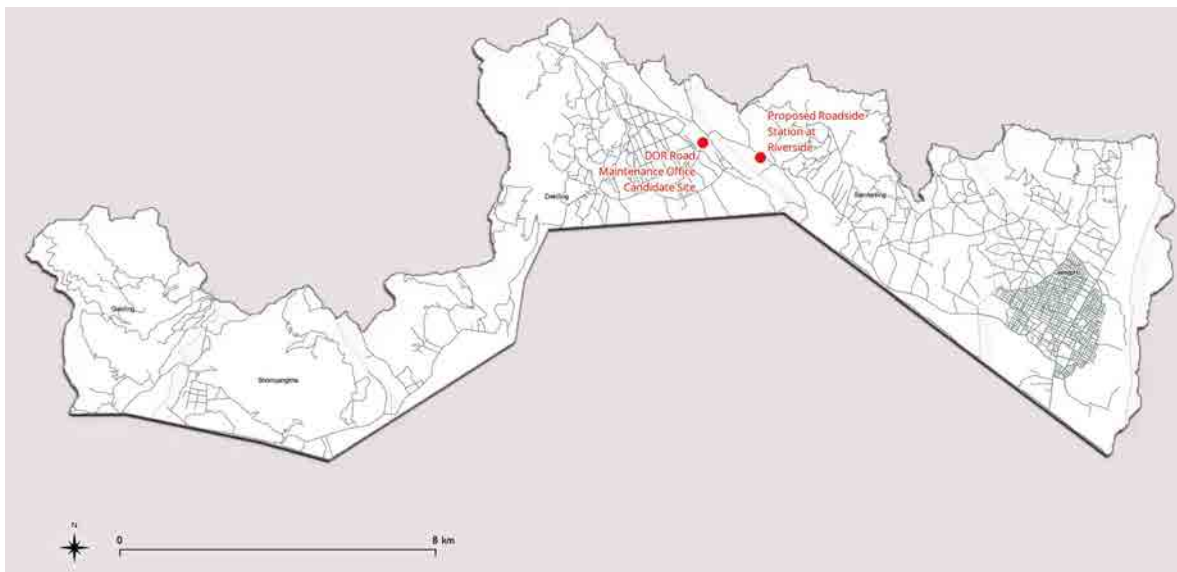
Source: JICA Project Team

Figure 5.6.35 Culture/ Heritage Site and Pilgrimage Routes

(4) Establishment of tourism-related service function

With the development of the above scenic highways, pilgrimage routes, and viewpoints, the number of tourists visiting the area is expected to increase. For the convenience of these tourists, it is necessary to expand tourism-related service functions.

Therefore, a roadside station with tourism-related service functions (See the proposal in 5.6.4) would be established in the area between Sarpang and Gelephu, which provides local information such as water park and golf course, local specialties and food, rest facilities, restrooms, and parking. This would encourage tourists to tour around the area and benefit local economy. The roadside station could be developed near the existing leisure park along the Buri River, close to the Road Maintenance Office (RMO) planned by DOR in Jigmeling area. By operating in tandem with the RMO, it will ensure the safety of road users while complementing the services of the adjacent leisure park and providing recreation for both residents and visitors.



Source: JICA Project Team

Figure 5.6.36 Location of Roadside Station



Source: <http://chiba-kisarazu.com/floorguide/>

Figure 5.6.37 The Image of the Kisarazu Roadside Station

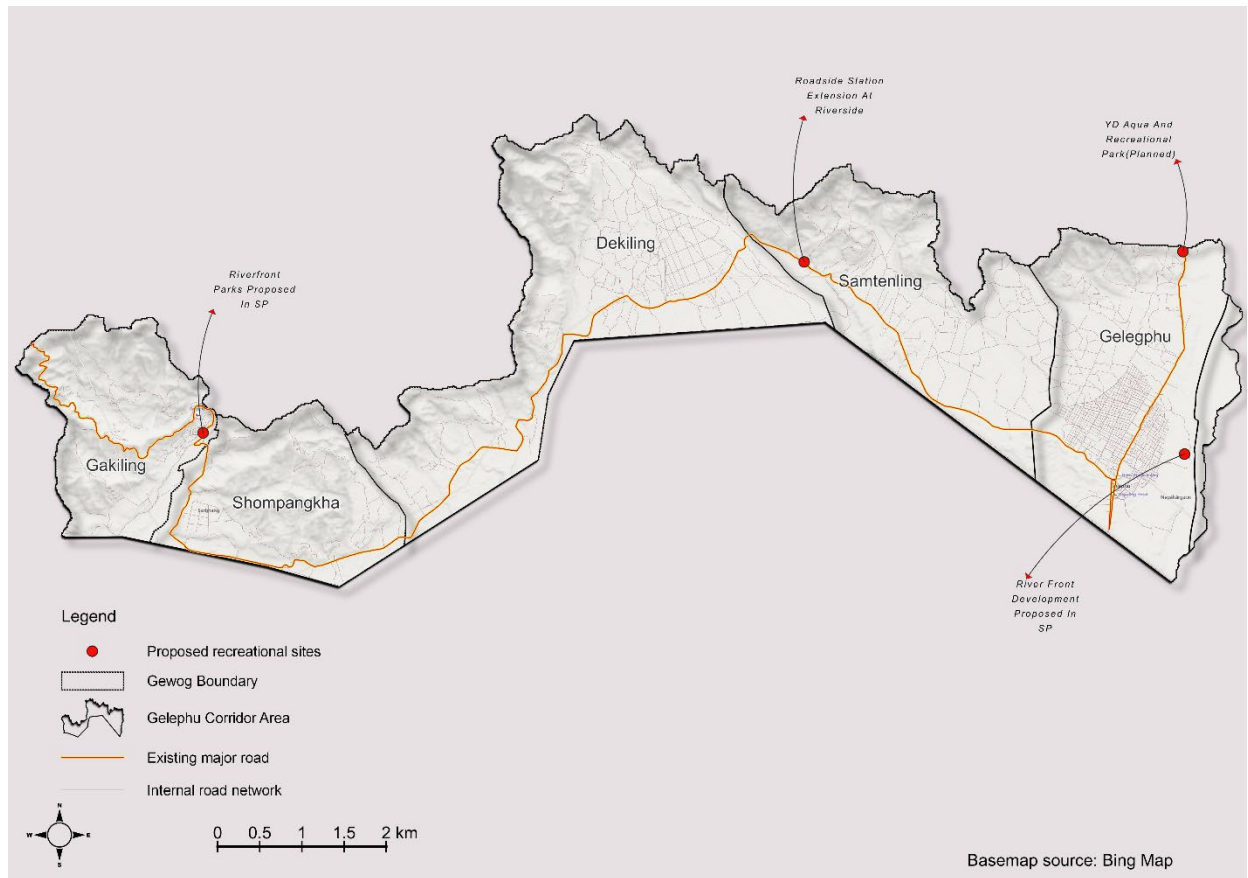
Currently, there are no departments specializing in tourism in Sarpang Dzongkhag and Gelephu Thromde. However, the local government will develop a tourism-related service functions in cooperation with the Department of Tourism of MoICE, local Tourism-related operators, and organizations involved in urban development. Specifically, the development of tourism products such as hands-on activities including horse riding, bird watching, etc. by taking advantage of the region's unique food and nature with panoramic view, the improvement of transportation between tourism hubs and the dissemination of information both domestically and internationally are considered.

(5) Development of open spaces and recreational spaces along rivers

The creation of comfortable and lively open spaces and recreational spaces will be promoted in riverside areas that have value as tourist resources such as rich nature and as valuable open spaces in urban areas, while taking care not to cause any obstacles in terms of flood control, water utilisation or the river environment.

The existing structure plans for Gelephu and Sarpang propose the development of open spaces along rivers. In Gelephu Structure Plan, the river front development along Mou Chhu with tourist attractions and other recreational facilities is proposed, towards creating a tourism focus in the region and to develop an active recreation open space for the residents. Similarly, several town parks with jogging track, picnic point, drive-in theatre, etc. are proposed at the riverfront of Sarpang Chhu in Sarpang Structure Plan. As riverbank uses are at risk of flooding, these are mainly sports fields, golf courses, parks and other uses that do not require permanent buildings. In addition to the use of these sports facilities, further use of the riverbanks will increase the attractiveness of open spaces and recreational facilities and create a lively atmosphere, such as picnic/camping site with sanitary cookhouse and toilets, skydrive station, which is not only as a transportation, but also a ride attraction. It is desirable to provide such recreation facilities at the roadside

station proposed at the riverside, considering from the safety and convenience of the residents and tourist. In Gelephu, a plan is also underway to develop a water park by the private sector. The enhancement of recreational facilities along the river by the public and private sectors is expected to attract domestic and international tourists and revitalize the region.



Source: JICA Project Team

Figure 5.6.38 Location of Riverside Open Space



Source: Saitama Museum of Rivers, National Michinoku Forest Lakeside Park/ Nodashi Public Golf Course/ SkyDrive Inc.

Figure 5.6.39 Examples of Riverside Open Space

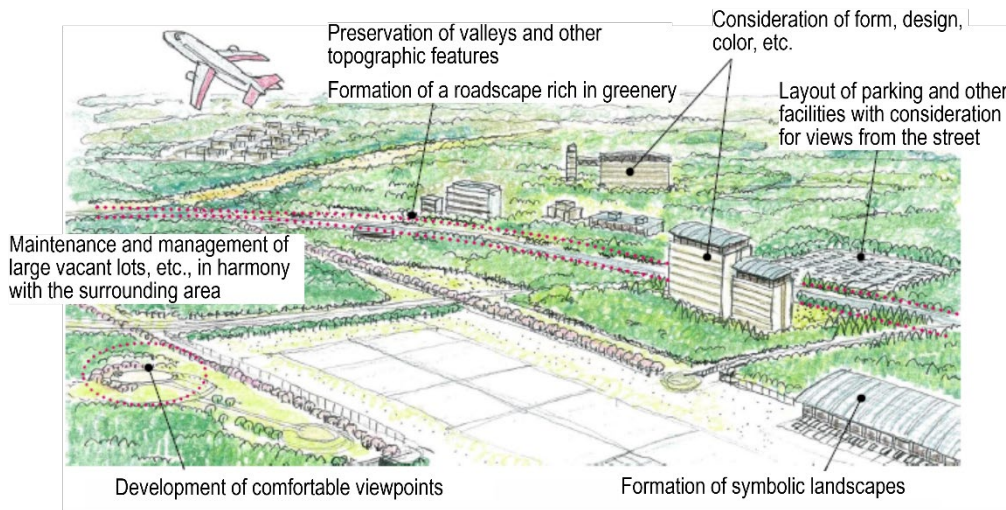
(6) Develop the tourism gateway with traditional landscape linked with scenic highway

The RCSP area could be the first gateway for tourists coming to Bhutan due to its proximity to the Indian border and the advantage of having an airport. The scenery along the roads leading to the airport and the border will be seen not only by the people who visit the RCSP area from other parts of the country, but also by many people who visit Bhutan from abroad and will influence their impression of Bhutan. In other words, the RCSP area as the gateway represents Bhutan. Therefore, it is necessary to create a dignified landscape befitting the gateway to Bhutan.

Furthermore, the RCSP area is an important transportation hub with the airport, which, combined with the geographical characteristics of its flat land, will inevitably lead to the development of industrial locations. Therefore, when locating these industrial facilities, it is important to create a landscape that is in harmony with nature and the local landscape that has been inherited and nurtured by our predecessors.

To create such landscape, not only the border and airport areas as entry points, but also tourist sites in the area will be decorated with traditional Bhutanese architecture, natural scenery, and landscapes, and the roads connecting these sites will be developed as scenic highways, creating spaces where the uniqueness

of Bhutan can be enjoyed in a continuous manner. Specific measures will be considered in the landscape plan on an area basis to be implemented in Action 1.



Source: Landscape Plan of Narita City

Figure 5.6.40 The Image of Landscape around the Narita International Airport

(7) Development of animal viewpoints with enriched habitat and greenery

The RCSP area's nature and environment are quite unique within Bhutan; though, it has undergone significant land use change over the past 35 years, including deforestation, development of industrial estates, urbanisation, and development of agricultural areas. The trend will most likely continue due population increase and attractiveness of urban settlements. Therefore, it is quintessential to preserve the natural settings that form important wildlife habitat and serve as migratory routes, which are linked with the human-wildlife conflicts. HWC in turn creates negative sentiment towards wildlife.

HWC incidences can be reduced by developing animal viewpoints that ensure habitat connectivity for all wildlife. The existing migratory routes will be identified and the critical habitats and connectivity to them will be protected that may include additional areas for protection, including the national highways. Through the enrichment of the habitat and greenery in these corridors, the natural environment and habitat will be protected.

Development of wildlife viewpoints will attract both locals and tourists; therefore, it will have implications for tourism development. Through the development approach that considers the balance between development and conservation activities, the RCSP can be a model case within Bhutan and in the region. An example of a bird viewpoint in Japan is illustrated below. As Bhutan has abundant bird species, the designated bird viewpoints may attract more tourists with less impact and disturbance to the species, thus helping conservation initiatives.



Overview and pathway to the bird viewpoint



Bird viewpoints' canopy



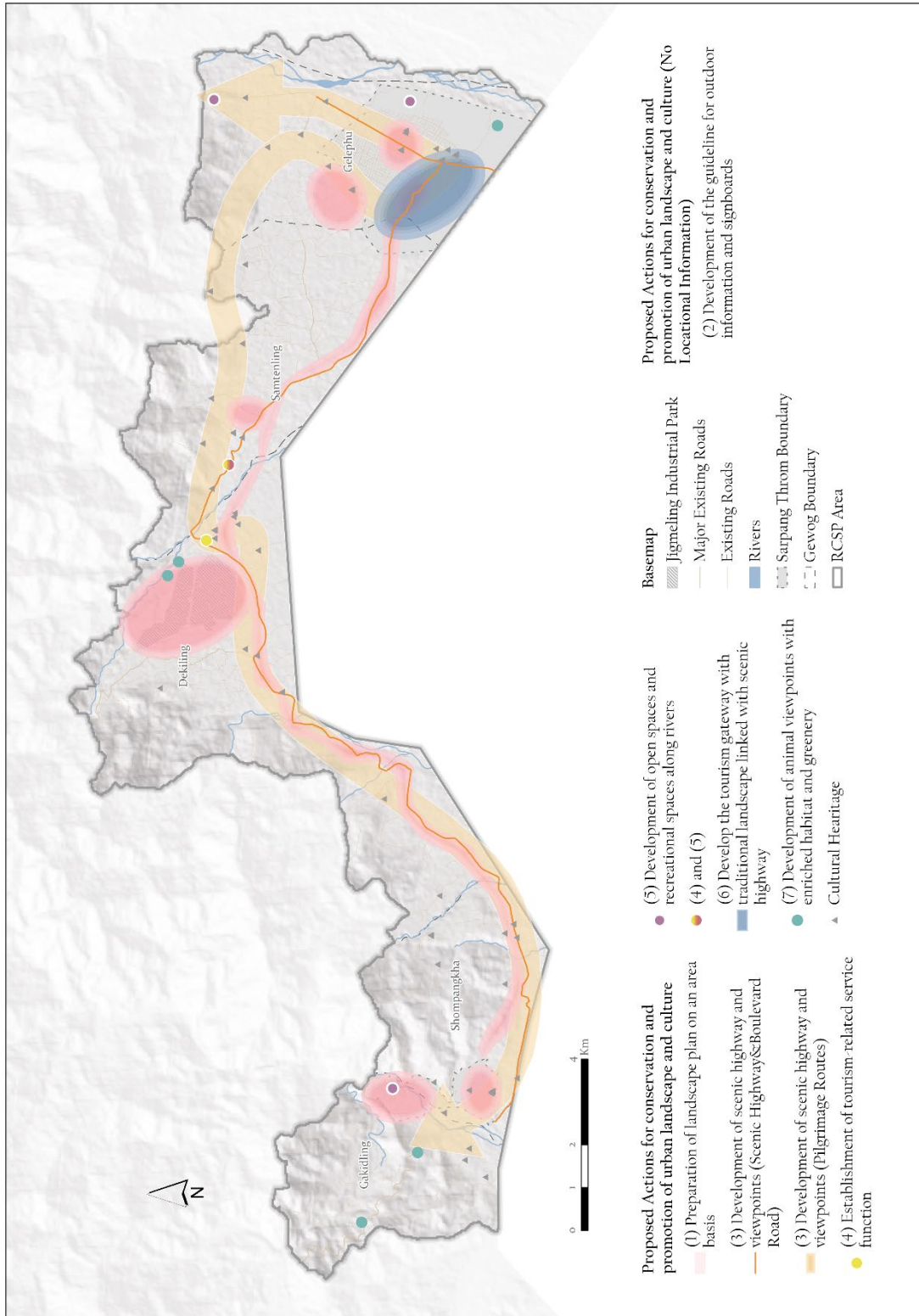
Bird stands through the viewing decks



Information board of the bird species / Photo of a flying great egret

Source: JICA Project Team; bottom right: <https://tokyo-in-pics.com/first-time-birdwatching-at-kasai-rinkai-park/>

Figure 5.6.41 Bird sanctuary and bird viewpoints at Kasai Rinkai Park in Tokyo, Japan



Source: JICA Project Team

Figure 5.6.42 Locations of All Proposed Actions for Conservation and Promotion of Urban Landscape and Culture

A map visualization of a new pond in Gelephu and eco-trails in Proposed Action (7) is under consideration.

5.6.6 Plan for mitigating and managing disaster risks including environmental pollution

To implement the strategy mentioned in Table 5.5.6, the following actions are proposed as shown in Table 5.6.16. Particularly, for Action (1) ~ (5) related to disaster management, the alignments of them with the Disaster Management Act of Bhutan (DMAB) have also been described as below.

Action (1), improvement of government organization and management related to disaster risk mitigation including infectious diseases, will greatly contribute to the attainment of the strategy and smooth implementation of proposed action plans. (Alignment with DMAB: Chapter 3 Section 31 k) and 1), Section 39 e), f) and g))

Action (2), technology transfer from central to local government or through the technical cooperation project, will strengthen the capacity of local administrative unit related to disaster prevention and management. (Alignment with DMAB: Chapter 3 Section 31 k) and l))

Action (3), installation of necessary monitoring equipment, creation and update of disaster vulnerability map and establishment of early warning system, will supply fundamental and important information in disaster risk assessment and analysis, and help build an area with disaster resilience. (Alignment with DMAB: Chapter 3 Section 31 b) and c), Chapter 10 Section 108)

Action (4), establishment of Institute for Disaster Risk Mitigation Research and Preparedness, will supply technical support for disaster prevention and management for the whole Southern Central Region. (Alignment with DMAB: no specified but no violation of the act)

Action (5), flood and landslide risk mitigation and management plan, will help develop structural and non-structural countermeasures and their proper operation and maintenance for the sites with high risk to mitigate flood and landslide risk. (Alignment with DMAB: Chapter 3 Section 31 f), Section 39 j), Chapter 10 Section 108)

Action (6), development of buffer zone for Jigmeling Industrial Park, as a major instrument to establish the Industrial Park as an Eco-Industrial Park in compliance with international standards, will help set a new standard for industrial parks in Bhutan and in the region.

Action (7), human wildlife conflict mitigation and management plan: Elephant Corridor, will help properly operate and maintain elephant corridor and related facilities.

Table 5.6.16 Proposed Actions for Mitigating and Managing Disaster Risks including Environmental Pollution

Target Area	Development Strategy ● Long-term; ▲ Mid-term: ■ Short-term	Proposal for Action
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Whole corridor area	<ul style="list-style-type: none"> ● Promote sufficient capacity of analysis and preparation for natural disaster which may be intensified by the cascading effects of climate change ▲ Achieve an adequate and decent disaster monitoring system and database system ● Establish decent quarantine system for new infectious diseases, zoonotic diseases, and livestock infectious diseases 	<ol style="list-style-type: none"> (1) Improvement of government organization and management related to disaster risk mitigation including infectious diseases (2) Technology transfer from central to local government or through the technical cooperation project (3) Installation of necessary monitoring equipment, creation and update of disaster vulnerability map and establishment of early warning system (4) Establishment of Institute for Disaster Risk Mitigation Research and Preparedness
Gelephu	<ul style="list-style-type: none"> ● Properly operate and maintain (O&M) countermeasure work for flood and landslide 	<ol style="list-style-type: none"> (1) Improvement of government organization and management related to disaster risk mitigation including infectious diseases (repeat) (2) Technology transfer from central to local government or through the technical cooperation project (repeat) (5) Flood and landslide risk mitigation and management plan
Sarpang	<ul style="list-style-type: none"> ● Establish Sarpang Town as the disaster mitigation technology centre in southern Bhutan 	<ol style="list-style-type: none"> (1) Improvement of government organization and management related to disaster risk mitigation including infectious diseases (repeat) (2) Technology transfer from central to local government or through the technical cooperation project (repeat) (4) Establishment of Institute for Disaster Risk Mitigation Research and Preparedness (repeat)
Intermediate belt area	<ul style="list-style-type: none"> ● Establish JIP as an EIP in compliance with international standards 	(6) Development of buffer zone for Jigmeling Industrial Park
	<ul style="list-style-type: none"> ● Properly O & M elephant corridor and related facilities 	(7) Human wildlife conflict mitigation and management plan: Elephant Corridor
	<ul style="list-style-type: none"> ● Properly O & M anti-disaster countermeasure for bypass route 	(5) Flood and landslide risk mitigation and management plan (repeat)

Source: JICA Project Team

The detail of each action is shown as follows. A map showing the geographical locations of all the proposed Actions (except for Actions that cannot be identified their locations) is also posted at the end of this section.

(1) Improvement of government organization and management related to disaster risk mitigation including infectious diseases

The government plays a vital role in disaster risk (including natural disaster such as flood, landslide as well as infectious diseases, the same hereafter) mitigation and management due to the scale of those issues and accompanied complex administrative procedure when considering the measures of disaster risk mitigation and management.

For the attainment of the strategy and smooth implementation of proposed action plans, improvement of the administrative organization and the way of management related to disaster risk mitigation including the infectious diseases should be approved firstly. The proposed actions and assumed detail plans are

shown in Table 5.6.17 below. Especially, as a key component of the DMAB, community engagement is critical for disaster risk mitigation and management, so the improvement in disaster-related knowledge public education and diffusion plan in community level has also been proposed.

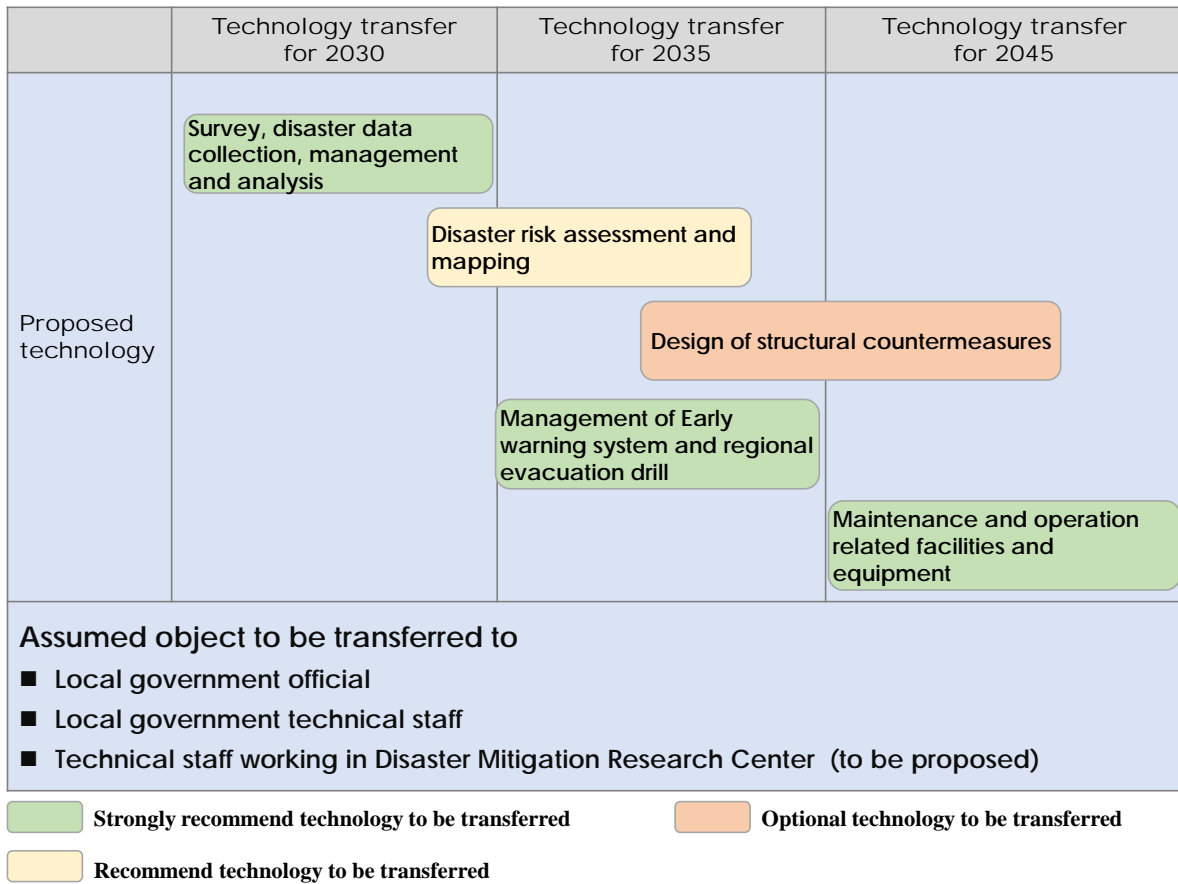
Table 5.6.17 Proposed actions and detail details for the improvement of government organization and management related to disaster risk mitigation

Proposed Actions	Description
Strengthen and ensure the function of Disaster Management & Preparedness Micro Pan (previous Dzongkhag Disaster Management and Contingency Plan)	<ul style="list-style-type: none"> • Timely update or revise the Plan • Faithfully implement the regular meeting to exchange information and make sure the members understand the plan (e.g., the emergency response protocol, the designated response to each member)
New establishment of disaster data collection office or position	<ul style="list-style-type: none"> • Clearly designate which office and who is in charge of disaster events data collection and recording. • Establish website for sharing disaster information (including all types of disaster in the area) • Assumed to be merged with Disaster Information and Monitoring Research Division in Disaster Risk Mitigation Research Centre proposed in sub-section (5)
Establishment of personnel exchange or temporary-transfer system	<ul style="list-style-type: none"> • To well understand each other between different disaster type response office/department • Dzongkhag or Thromde disaster management office² road, flooding, forest, agriculture, etc.
Development of disaster-related knowledge public education and diffusion plan in community level (Community engagement)	<ul style="list-style-type: none"> • Diffusion of basic knowledge about disaster (especially, flooding, landslide, infectious diseases): Types, trigger reason, measures, etc. • Education and promotion of disaster events report, including the use of proposed early warning system • Make brochure of emergency disaster response instruction (e.g., what to do when facing the elephant) • Plan of evacuation drills

Source: JICA Project Team

(2) Technology transfer from central to local government or through the technical cooperation project

Personnel is another key factor for effective disaster risk mitigation and management. There are a few resident technical staffs involved with disaster management in the RCSP area. However, disaster-related knowledge system is not sufficient to qualify for proper disaster management. Thus, technology transfer is proposed, which includes the very basic but important technologies, such as data collection and analysis, to countermeasure design and decision as well as appropriate facilities and system operation and maintenance. The proposed technology transfer and its object are shown in Figure 5.6.43.



Source: JICA Project Team

Figure 5.6.43 Proposed technology transfer plan

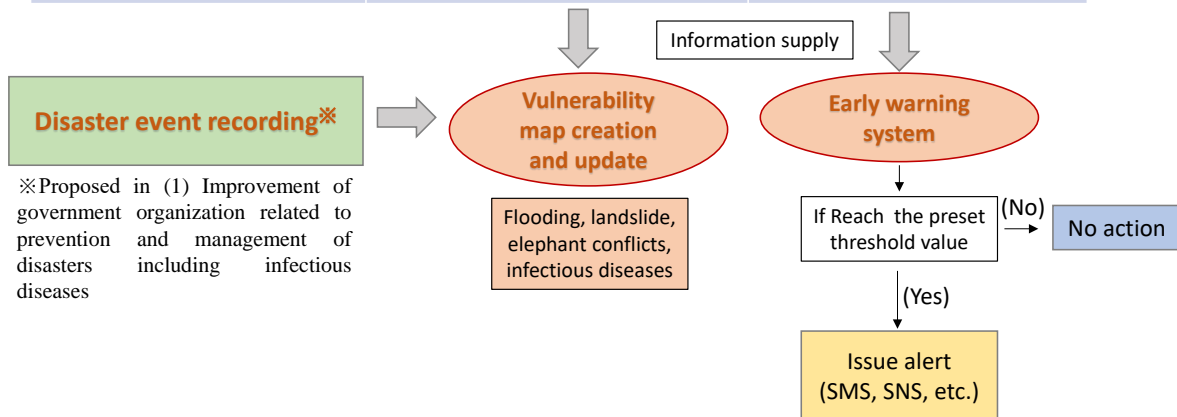
(3) Installation of necessary monitoring equipment, creation and update of disaster vulnerability map and establishment of early warning system (EWS)

In view of the fact that collection and accumulation of disaster data is basic as well as quite important to disaster risk mitigation and management, it is proposed to install the monitoring equipment in the RCSP Area

The data and information collected through the monitoring equipment are considered to be used in disaster feature analysis, disaster risk assessment and simulation, countermeasure design, which greatly support proper disaster risk mitigation and management. Besides, to build a disaster resilience area, it is proposed to link the data and information supplied by those monitoring equipment with a warning system to notify all vulnerable population and responding agencies of threatening disaster situation or a disaster.

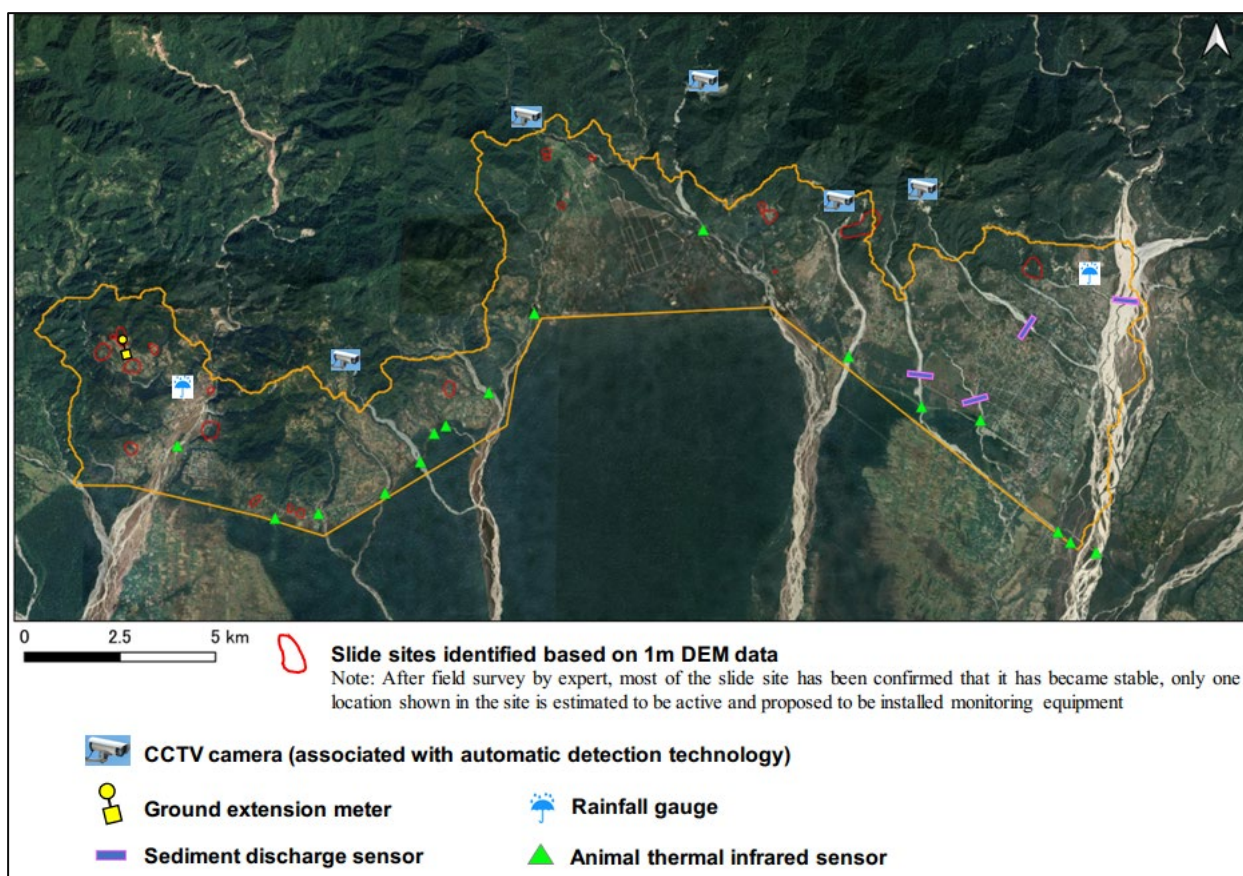
The proposed monitoring equipment, and the conceptual image of its relationship with vulnerability map creation and EWS are shown in Figure 5.6.44. The proposed locations to install the equipment is shown in Figure 5.6.45.

Proposed Monitoring equipment	Objective	Proposed installation location
CCTV camera (associated with automatic detection technology)	Automatically detect the collapsed in the upstream and roughly estimate the collapsed sediment volume	Nearby collapsed area in the upstream of the river in the RCSP area
Ground extension meter	Monitoring the movement speed of the sliding block	Identified potential sliding block
Sediment discharge sensor	Auto-measure the flowed sediment volume	River-bed of Mow River, Aiepoly stream and Shetikhari stream
Rainfall gauge	To record the local rainfall amount	Two locations inside the corridor area
Animal thermal infrared sensor	To inspect the movement of elephant and auto-count numbers	Main path which the elephant use to migrate into the Bhutan side



Source: JICA Project Team

Figure 5.6.44 Proposed monitoring equipment and the conceptual image of its relationship with vulnerability map creation and EWS



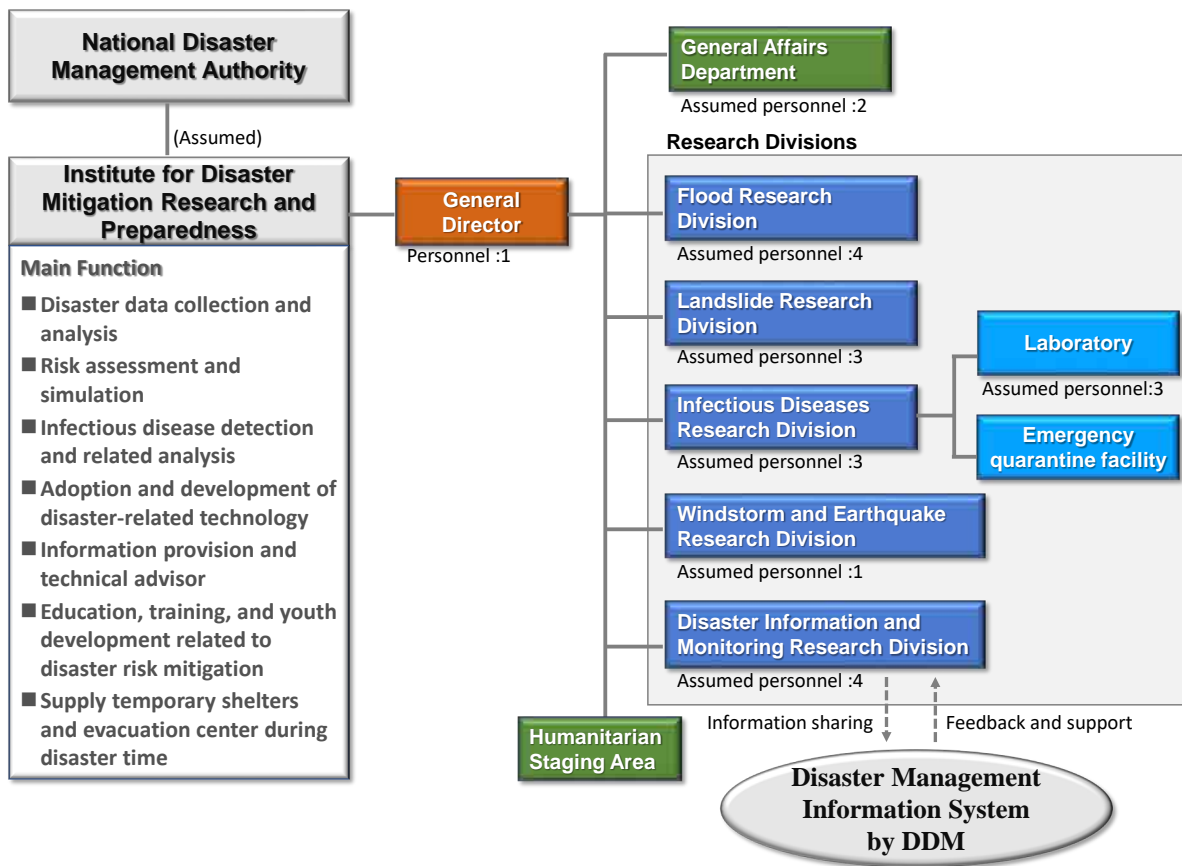
Source: Made by JICA Project Team in the based map of Google Earth

Figure 5.6.45 Proposed location for the proposed monitoring equipment

(4) Establishment of Institute for Disaster Mitigation Research and Preparedness

Considering that Sarpang Town plays the role of administrative centre in Sarpang Dzongkhag, it would be very valuable to have it as a technical centre for disaster prevention in the Dzongkhag or even the southern region. Thus, it is proposed to establish the Institute for Disaster Mitigation Research and Preparedness (tentative name), and the study object is supposed to include natural disaster and infectious diseases.

Such kind of institute is expected to become a regional top level in the field of disaster risk mitigation technology and play an important role in technical support related to disaster risk mitigation for the whole South Centre Region. Specifically, a Humanitarian Staging Area (HSA), which will provide a temporary shelters and evacuation centre during the time of disaster, is also proposed to be included in this institute. The HSA is expected and proposed to be set at Gelephu considering the environmental and social condition. Assumed organization structure and expected main function of the Institute for Disaster Mitigation Research and Preparedness are shown in Figure 5.6.49.



Source: JICA Project Team

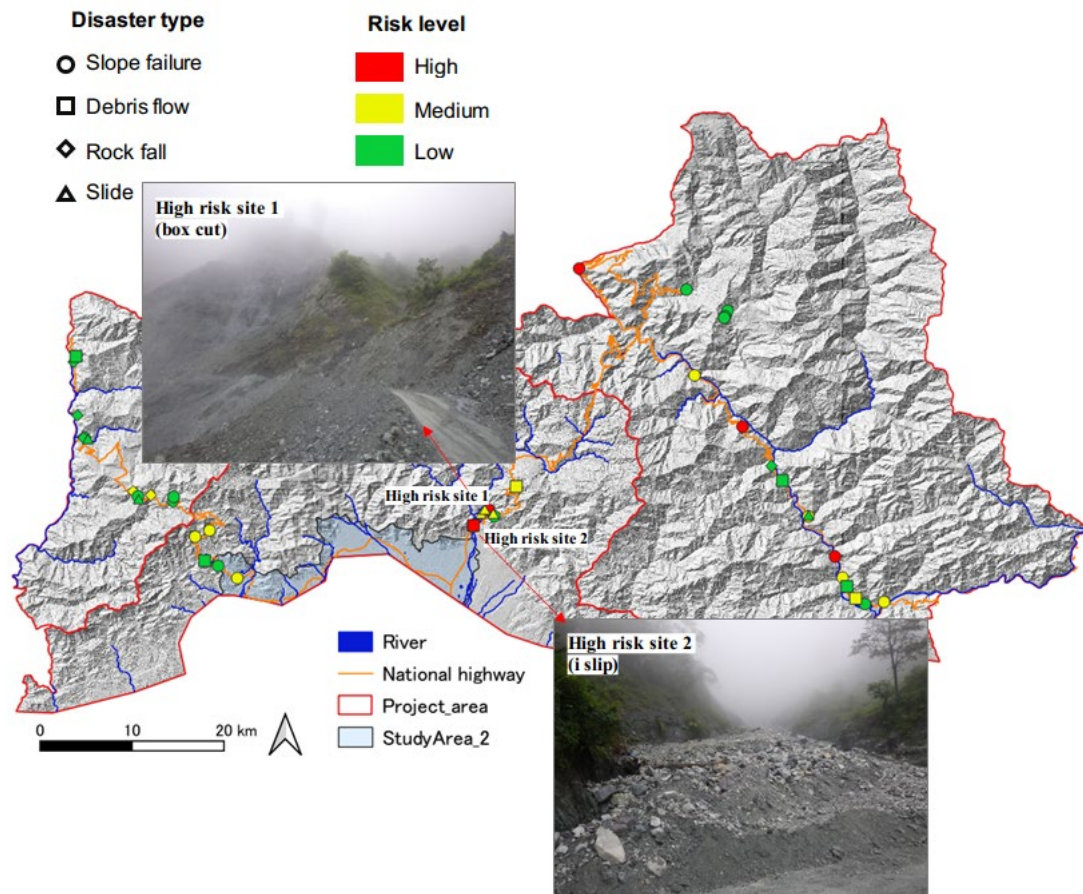
Figure 5.6.46 Organization structure and main function of proposed Institute for Disaster Mitigation Research and Preparedness

(5) Flood and landslide risk mitigation and management plan

As flood and landslide are two actual main disaster types threatening Gelephu Thromde, structural and non-structural countermeasures are proposed for the sites with high disaster risk in or near the Gelephu Thromde.

1) Landslide disaster risk mitigation and management plan

Based on the results of field survey, terrain interpretation and risk assessment described in **section4.6.1**, no high-risk landslide site can be identified inside the Regional Centre area. However, two high risk sites with considerable scale are located on the national way and closed to Gelephu Thromde (High risk site 1 and 2 in Figure 5.6.46). The national road is blocked lots of times during the rainy season every year and significantly affect the connectivity of between Zhemgang and Reginal Centre area. Due to those reasons, the landslide disaster risk mitigation and management plan has been discussed in **section4.6.1**.



Source: JICA Project Team

Figure 5.6.47 High risk landslide site near to the RCSP area

Besides the two high-risk landslide sites discussed above, some other slope failure and slide sites with various scale can be identified inside or around the Regional Centre Area through photograph and terrain interpretation using satellite image. However, After field survey, slide sites interpreted by using high-resolution terrain data is considered to have become stable according to the existing disaster record and hearing survey. Thus, it is considered that no mitigation measure is necessary for those slide sites. Only one site in Loring Village has been proposed to install the ground extension meter as stated in sub-section (3) above.

As for the slope failure sites all of which are located in the upstream of the rivers, according to the previous studies and hearing survey, those sites do not affect the settlement area directly and has unstable slope due to similar geological condition with Box cut sites. Taking into account of the low urgency and risk of those sites as well as the technical and financial situation, it is considered that the structural measure is unnecessary for those sites in the upstream of the river. However, some low-cost measures like re-vegetation, jute matting installation for slope erosion control are recommended for those sites.

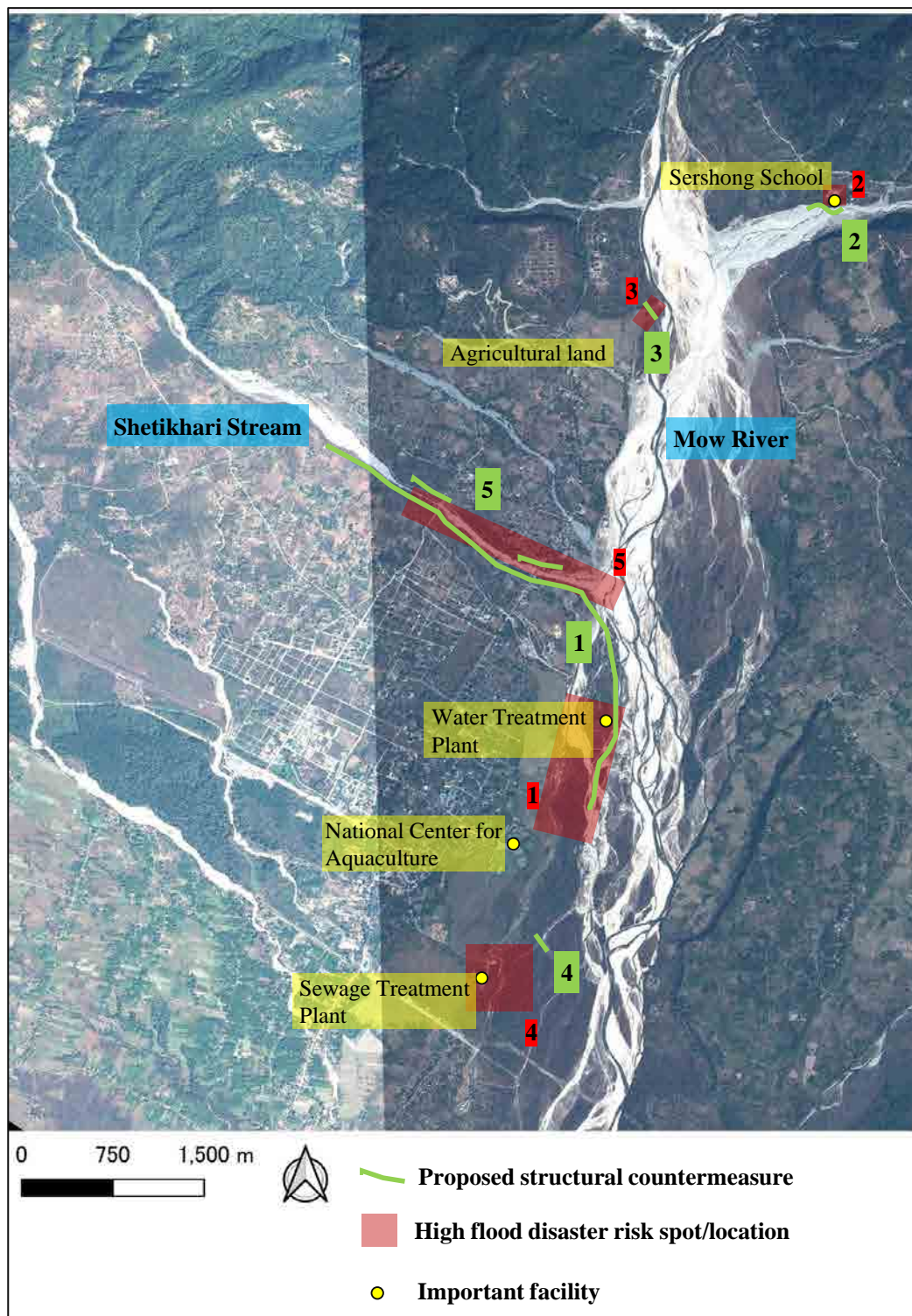
2) Flood disaster risk mitigation and management plan

In the Regional Centre Area, the severe damage caused by flooding disaster are mainly from Mow River and its tributaries, especially the Shetikhari Stream and the Aiepoly (Big and Small) Streams. The flood disaster risk mitigation and management and management plan are discussed concerning these three rivers and streams.

Mow River and Shetikhari Stream

The vulnerability and risk assessment has been carried out in 2019 (CDR International), five high risk spots and locations (so called hotspot) have been identified as shown in Figure 5.6.47. Those hotspots include (FEMD Report, 2021):

- ✓ Hotspot 1: Infiltration gallery and water treatment plant (WTP)
- ✓ Hotspot2: Sershong School. The school is on the east bank of Mow River along Thewar stream and located on a cliff, toe of which is being eroded by the river.
- ✓ Hotspot3: Flow regulation. A channel has been developed as part of the natural braiding behaviour of the Mow River. Due to the braiding character, the channel may develop into a larger channel with increased discharge.
- ✓ Hotspot4: Sewage Treatment Plant and the flow regulation. The Sewage Treatment close to the Bhutanese Indian border is inundated during low, medium and high flooding events.
- ✓ Hotspot5: Shetikhari Stream. The vulnerability assessment by CDR International (2019) shows that a total of 6.5km of unpaved and 190m of paved road, and a total 1,380m² residential area and 64,400m² agricultural land might be inundated along the Shetikhari Stream during a flood event with a return period of 50 years considering the climate change impact of Representative Concentration Pathway (RCP) 4.5.



Source: Remade by JICA Project Team based on the report by FEMD

Figure 5.6.48 High flood risk location and proposed mitigation work

For disaster mitigation and prevention, structural countermeasure works are expected to be designed and developed for those high-risk locations. As mentioned in 5.5.6, corresponding structural countermeasure (the intervention) has been proposed by FEMD after working together with Netherlands Enterprise Agency (2021). Considering the report reliability and efficiency, it is suggested to adopt the proposed interventions in the Project. Additionally, development of a drainage master plan for Gelephu town will be more effective on the mitigation of flood disaster risk in this area. The interventions are described as follows (see locations in Figure 5.6.47).

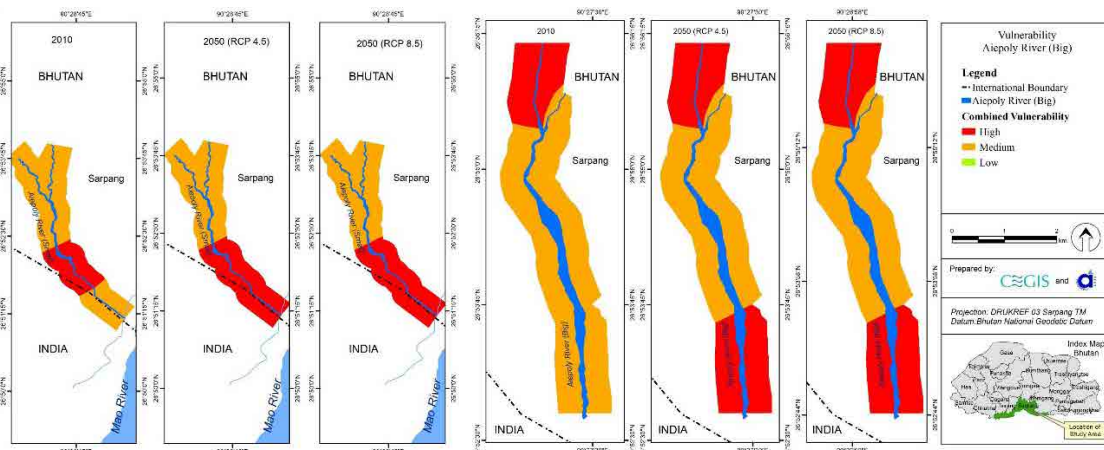
Table 5.6.18 Structural countermeasure for Mow River and Shetikhari Stream

Location	Proposed intervention works
Hotspot 1: Infiltration gallery and water treatment plant (WTP)	Flood and riverbank protection by means of a revetment
Hotspot2: Sershong School	Erosion protection by means of a revetment
Hotspot3: Flow regulation	Erosion protection by means of a groyne
Hotspot4: Sewage Treatment Plant and the flow regulation	Erosion protection by means of a groyne
Hotspot5: Shetikhari Stream	Erosion and flood protection measures along the Shetikhari Stream by means of a revetment. Development of Drainage Master Plan for Gelephu town.

Source: Remade by JICA Project Team based on the report by FEMD

Aiepoly Stream (Big and small)

A combined vulnerability assessment of Aiepoly Stream (big and small) considering the indicators of geotechnical vulnerability, flood vulnerability and social vulnerability has been completed by a World Bank funded study (2019) shown in the following Figure 5.6.48.



Source: World Bank (2019)

Figure 5.6.49 Combined vulnerability of Small (left) and Big (right) Aiepoly Stream

When considering disaster mitigation in Aiepoly River, besides the prevention of flooding-induced damage, appropriate sediment flow control and bank erosion prevention countermeasure should also be considered. Though Mow River is also facing a sediment management problem, there is higher priority in Aiepoly Stream due to the location (near to the airport and crossing the national road) and width of it.

The structural countermeasures are proposed as below with referring to the output of the World Bank funded study (2019).

- ✓ Installation of sediment trap.
- ✓ Re-sectioning of channel with bank protection.
- ✓ Hardening of Special Sections, and
- ✓ Harvesting of Sediment.

(6) Development of buffer zone for Jigmeling Industrial Park

The Jigmeling Industrial Park falls in the Sarpang-Gelephu Urban Corridor and there is a need to determine the need for buffer zone between the designated industrial area and other land use, particularly, residential, commercial and agricultural areas. While Bhutan does not have a legal

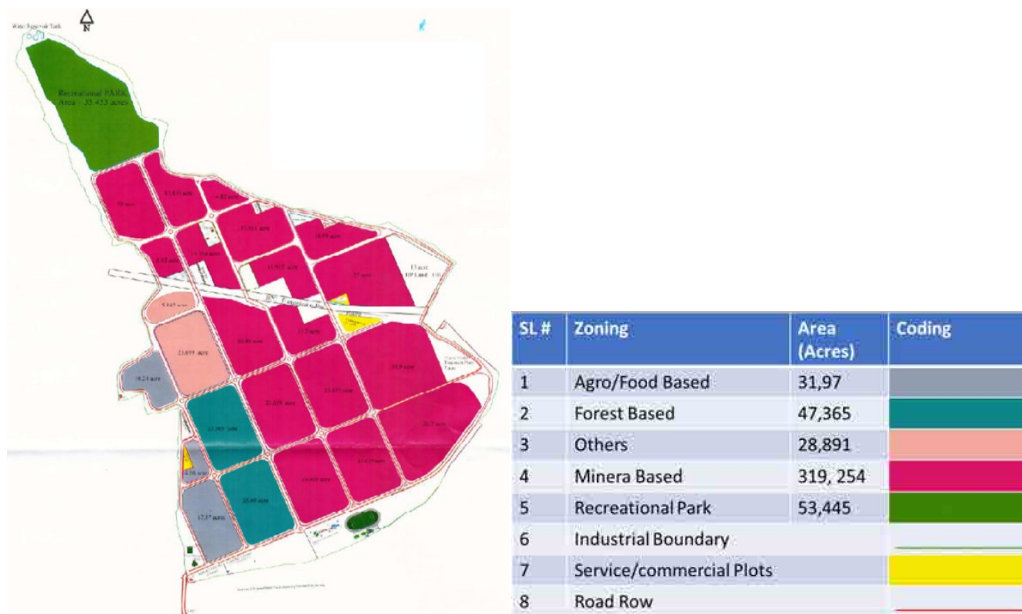
requirement of a buffer zone and existing guidance on the need for industrial building setbacks and buffers within the industrial estate/park focuses only for development inside the designated industrial estate/park and is silent on development outside the industrial parks.

Recognizing the need for safeguarding public health and the natural environment, a study was carried out to determine the impact of the industries in the industrial park on the surrounding lands and to determine the need for a buffer strip following the general principle that impacts on the environment decrease with increasing distance from the source of the emission (See Box 5.6.1). With the objective of preventing public health and aesthetic nuisance in the area towards the west of the industrial park, it is recommended that a buffer starting from 20 meters to 200 meters be maintained from the boundary of the industrial park where agricultural land use could be permitted. Additionally, a green buffer of at least 10-15 m width could be maintained around the industrial park planted with endemic tree species to further serve as both noise and dust barriers.



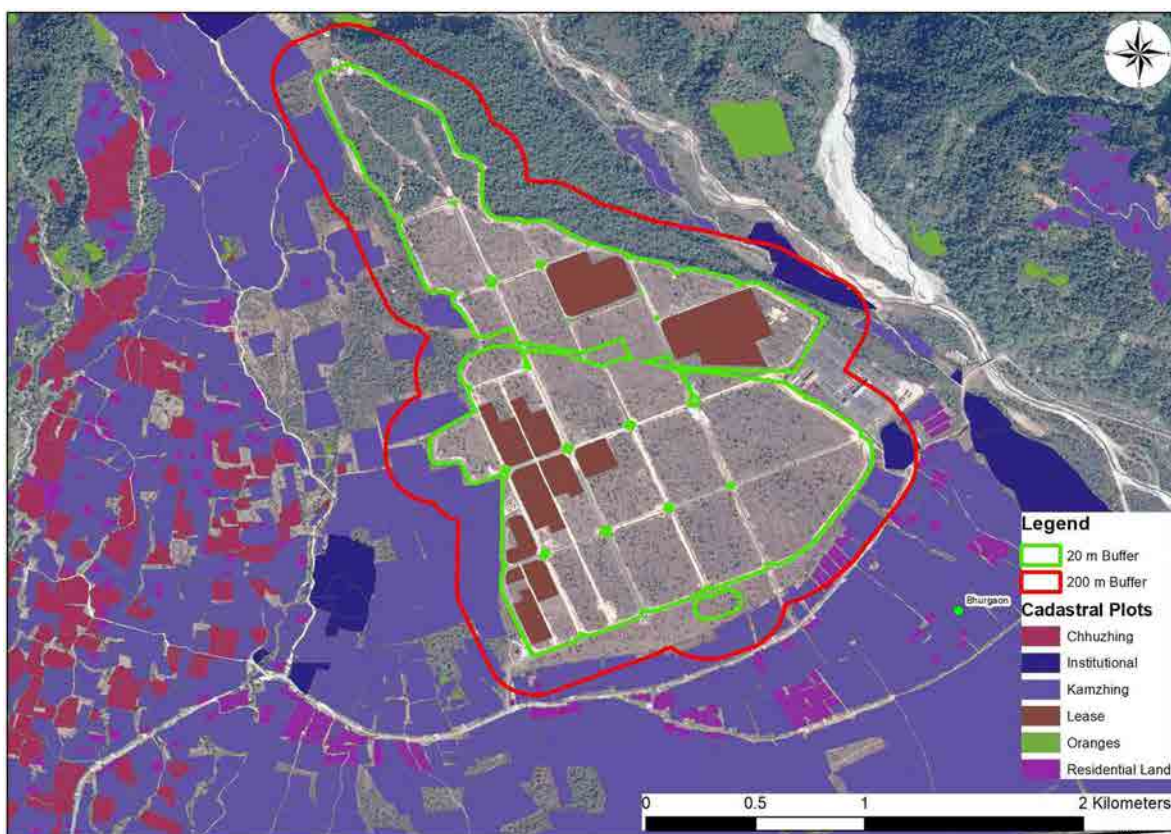
Source: JICA Project Team

Figure 5.6.50 Satellite Image of Jigmeling Industrial Park



Source: Jigmeling Industrial Park Management

Figure 5.6.51 Proposed Master Plan of Jigmeling Industrial Park



Source: JICA Project Team

Figure 5.6.52 Buffer Zone and Cadastral Plots surrounding Jigmeling Industrial Park

Box 5.6.3. Buffer Zone for Jigmeling Industrial Park

The Jigmeling Industrial Park falls in the Sarpang-Gelephu Urban Corridor and there is a need to determine the need for buffer zone between the designated industrial area and other land use, particularly, residential, commercial and agricultural areas. While Bhutan does not have a legal requirement of a buffer zone and existing guidance on the need for industrial building setbacks and buffers within the industrial estate/park (see Guidelines for the Development of industrial land 2018, available at www.moea.gov.bt) focuses only for development inside the designated industrial estate/park and is silent on development outside the industrial parks.

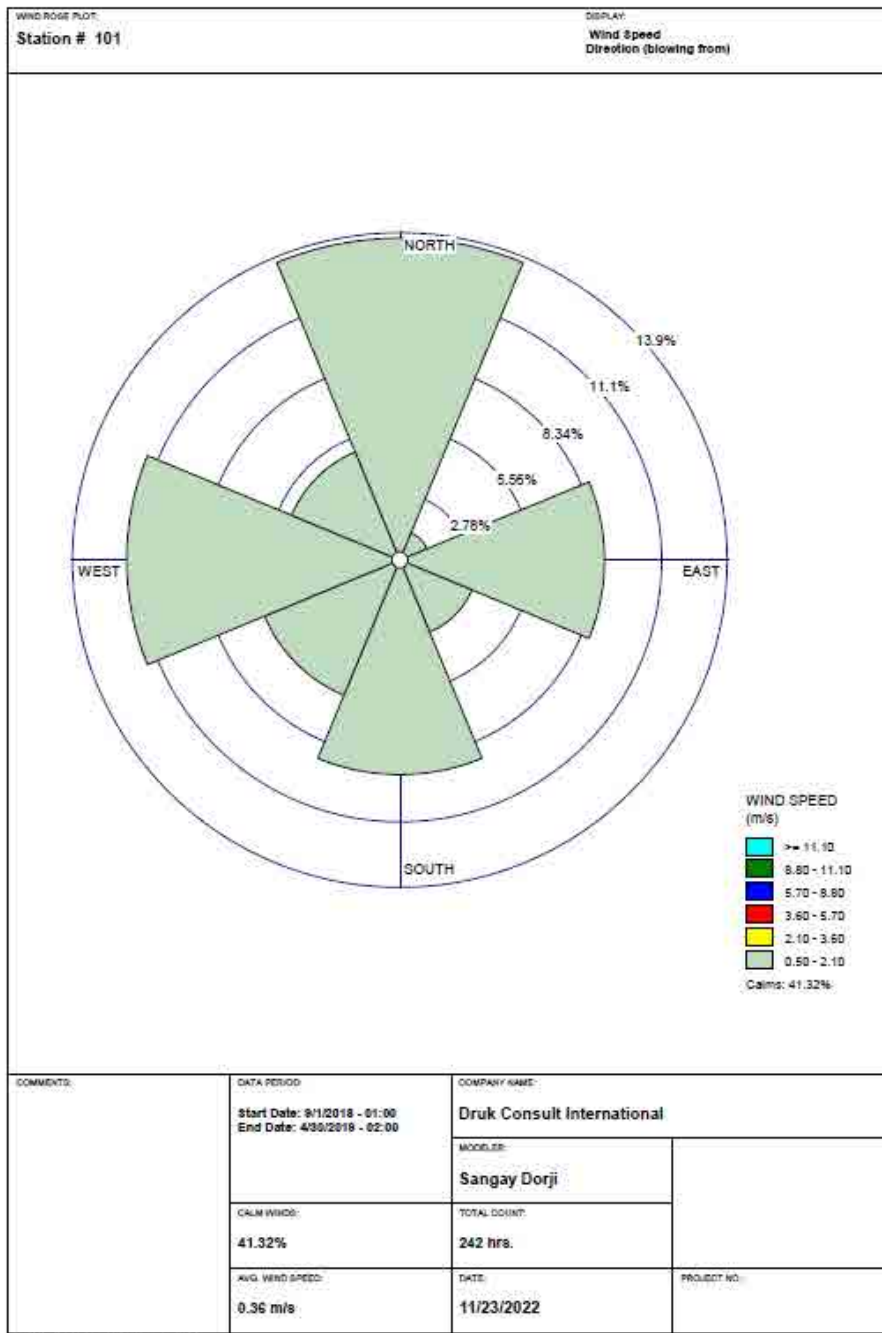
Recognizing the need for safeguarding public health and the natural environment, a study was carried out to determine the impact of the industries in the industrial park on the surrounding lands and to determine the need for a buffer strip following the general principle that impacts on the environment decrease with increasing distance from the source of the emission. If the impacts from the industrial estate are found to be unacceptable at the boundary of the site or estate, then a buffer area to separate industrial land use and other land use is to be recommended.

In a discussion with the Department of Industry (Dorji, 2022), considering the types of applications received by the Department of Industry, the industries with the significant impacts on the surrounding land are the ferro silicon industries, located in the Mineral Industries Zone. While ferro silicon plants emit sulfur dioxides and oxides of nitrogen along with volatile organic compounds, the Department of Industry, based on experiences from the Pasakha Industrial Estate felt that the priority pollutants are particulate matters which have impacts on both public health and agricultural productivity. The Department had received a total of 18 applications for the allotment of plot for ferro silicon industries.

For the purpose of the study and based on expert judgement (Dorji, 2022), an average furnace rating of 36 MVA per industry was chosen and the emissions are considered as point source emissions located at the centre of the industrial park. Using wind speed and direction from the Bhur Agro-meteorology station for the years 2018-2019, a pollutant dispersion model was developed using the Lakes Environmental Software. The background particulate concentration of 17 $\mu\text{g}/\text{m}^3$ was measured physically on 26th and 27th of November 2022 and was used in the model.

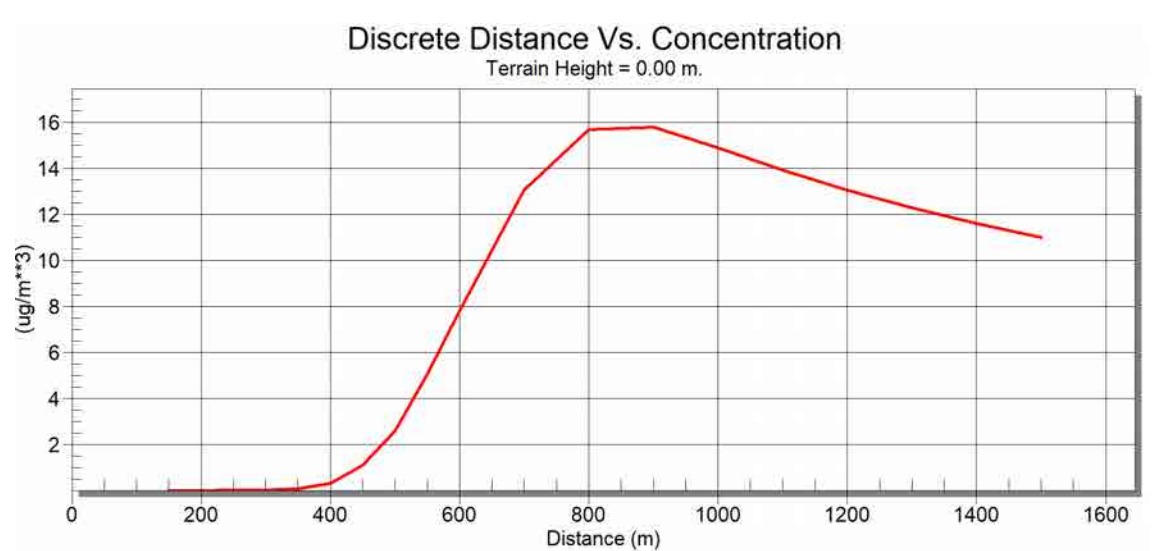
The dispersion model resulted in maximum pollutant concentration of 15.79 $\mu\text{g}/\text{m}^3$ at a scaled distance of 900 m from the pollutant source working out to an aggregated particulate (PM 2.5) of 32 $\mu\text{g}/\text{m}^3$ against the prescribed ambient particulate concentration of 50 $\mu\text{g}/\text{m}^3$ (NECS, 2020) (average of 24-hour and yearly averages). The pollutant concentration from the dispersion model is presented in Figure 1. Pollutant dispersion model result. Considering the wind speed and direction depicted in Figure 2. Windrose Diagram, wind data from Bhur Agromet Station (2018-2019), the dispersion spread is more towards west and south direction from the industrial park. As the area to the south of the industrial park already has sufficient buffer in the form of the national highway, the area to the west of the industrial park has private land with high potential to be converted into residential and commercial areas.

With the objective of preventing public health and aesthetic nuisance in the area towards the west of the industrial park, it is recommended that a buffer of starting from 20 meters to 200 meters be maintained from the boundary of the industrial park where agricultural land use could be permitted. Additionally, a green buffer of at least 10-15 m width could be maintained around the industrial park planted with endemic tree species to further serve as both noise and dust barriers.



Source: JICA Project Team

Figure 5.6.53 Windrose Diagram, wind data from Bhur Agromet Station (2018-2019)



Source: JICA Project Team

Figure 5.6.54 Pollutant Dispersion Model Result



Source: JICA Project Team

Figure 5.6.55 Endemic tree species

(7) Human wildlife conflict mitigation and management plan: Elephant Corridor

The Asian Elephant (*Elephas maximus*) is a symbol of peace and harmony, revered for its magnificence and sheer power in history and culture. However, the population of wild elephants has declined significantly in the last two hundred years because of habitat fragmentation and destruction caused by the expansion of agriculture and human settlement.

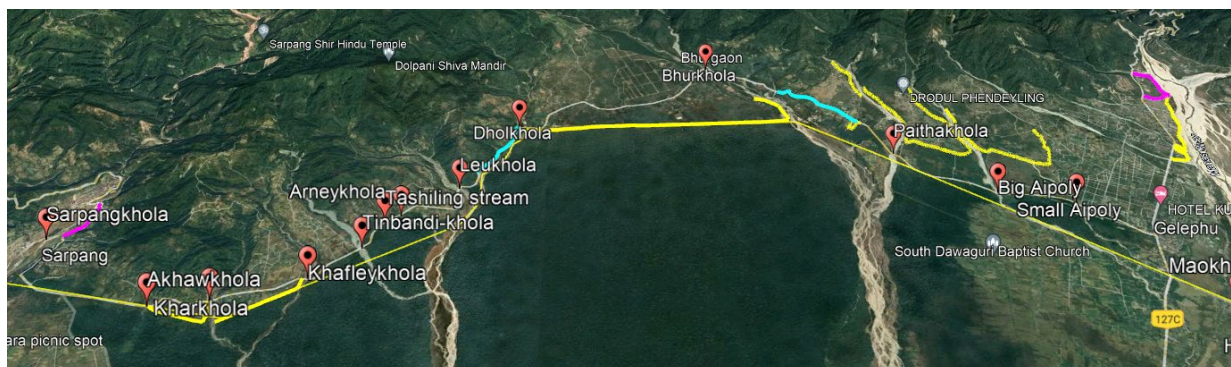
Elephants are classified as endangered by the International Union for Conservation of Nature (IUCN) Red List of Threatened Species and listed on Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). In Bhutan, elephants are protected under Schedule I of the Forest and Nature Conservation Act, 1995.

Due to the expansion of urban areas and the development of linear infrastructures, the elephant migratory routes are disrupted. Therefore, strategies need to be put into place to secure the habitats, prevent loss of habitat, and ensure habitat connectivity. This would also require a deeper understanding of the conflict pattern in the area.

The situation will further aggravate if development planning does not account for the need of elephant habitat use. Thus, future planning should assess the critical use area by elephants through the fine-scale habitat use and migratory pattern studies.

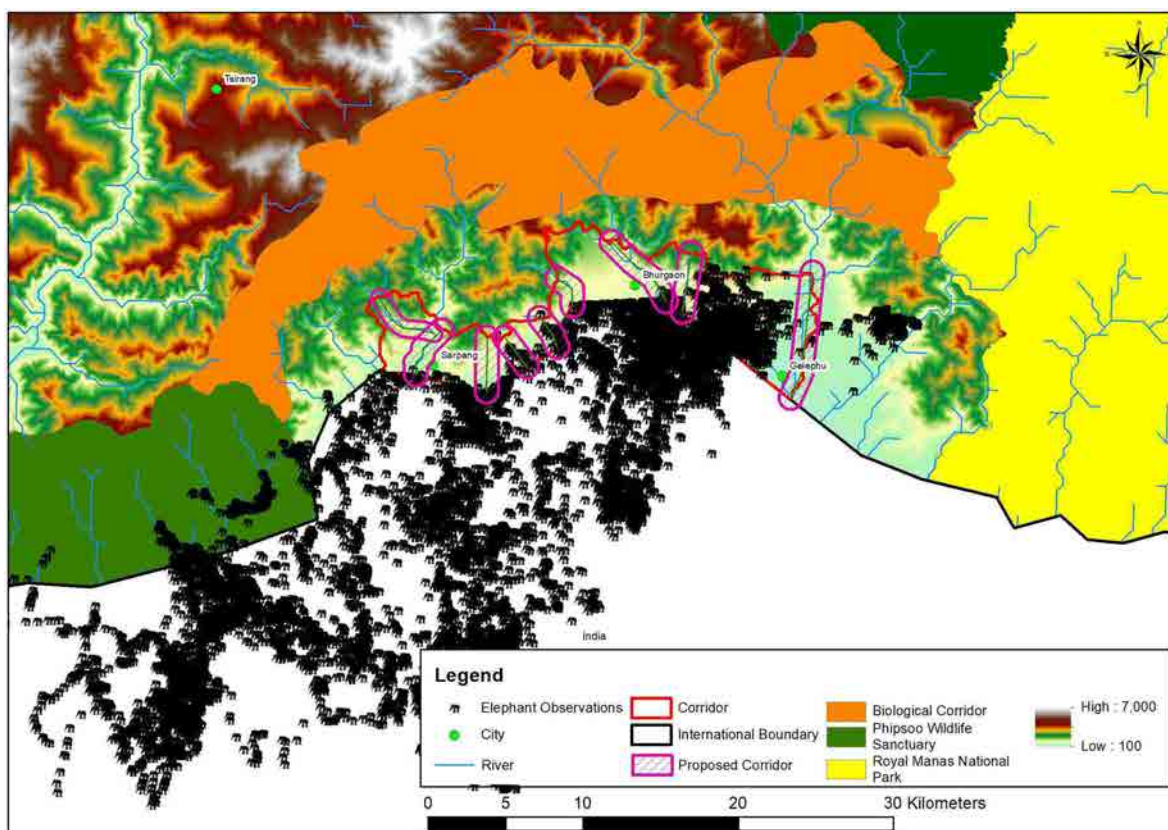
Establishment of designated elephant corridors and migratory routes will enable coexistence of elephants and humans in the region. Elephants are an inseparable part of the South of Bhutan, therefore elephant friendly designs should be incorporated into the overall development, which requires upgrading and redesigning infrastructure including certain bridges, designating movement corridors and habitat enrichment activities.

The elephant abundance and habitat use are favoured by high forest cover with a mosaic of the river system and the abundance and habitat use decrease with increased elevation. Maintaining continuous forest cover is an essential part of conservation efforts. The elephant corridor will be set along the major river bodies stretching from Sarpang to Gelephu, and using the 500 m international buffer in Gelephu Thromde.



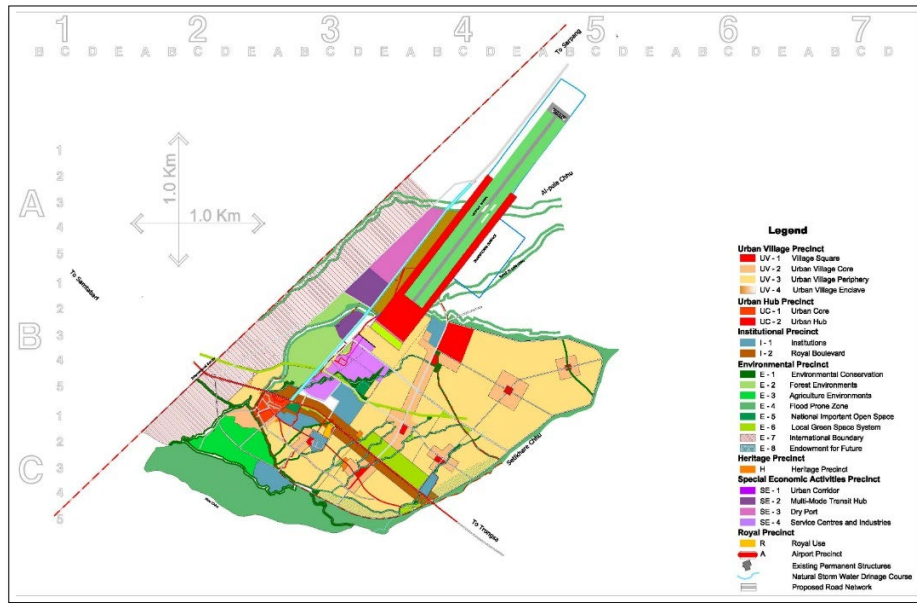
Source: JICA Project Team, Divisional Forest Office, Sarpang

Figure 5.6.56 Satellite Image of installed electric fences and walls



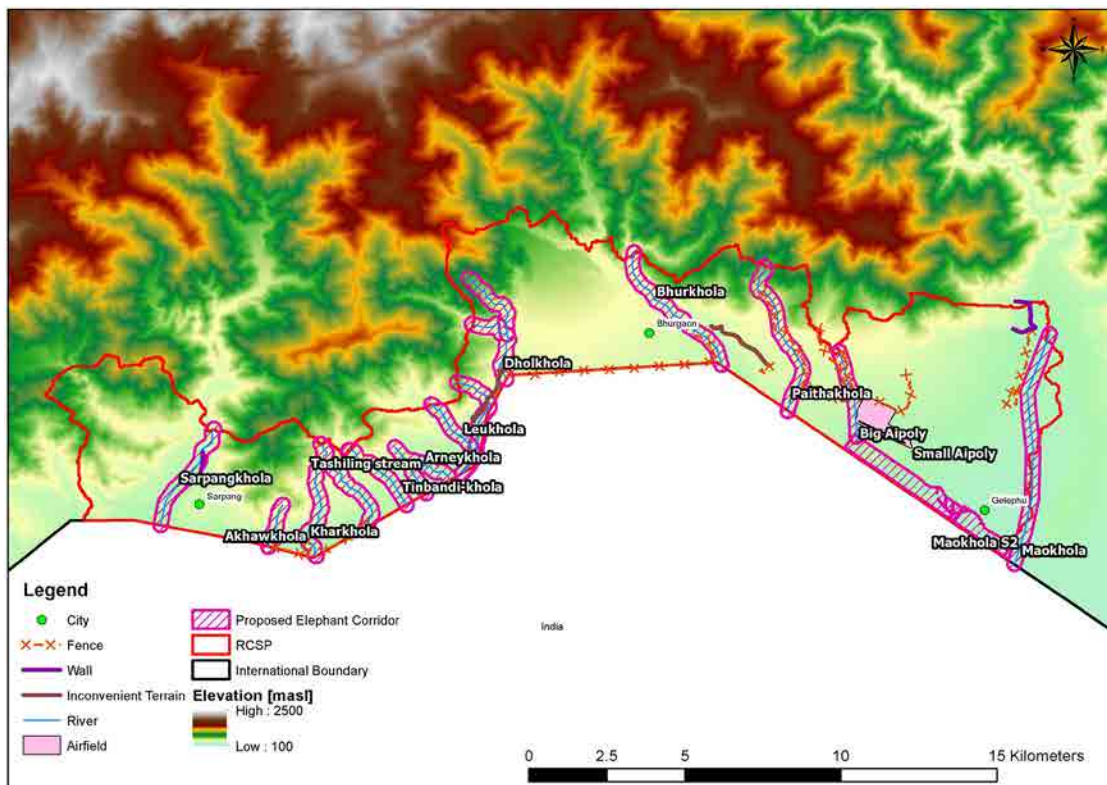
Source: JICA Project Team, Erstwhile MoAF

Figure 5.6.57 Tracking of elephants – a survey conducted by the Department of Forests and Park Services



Source: Gelephu Thomde

Figure 5.6.58 Construction of elephant corridor wall in Gelephu along the 500 m international buffer zone



Source: JICA Project Team

Figure 5.6.59 Proposed elephant corridor in the RCSP, along the Sarpang-Gelephu stretch



Source: JICA Project Team

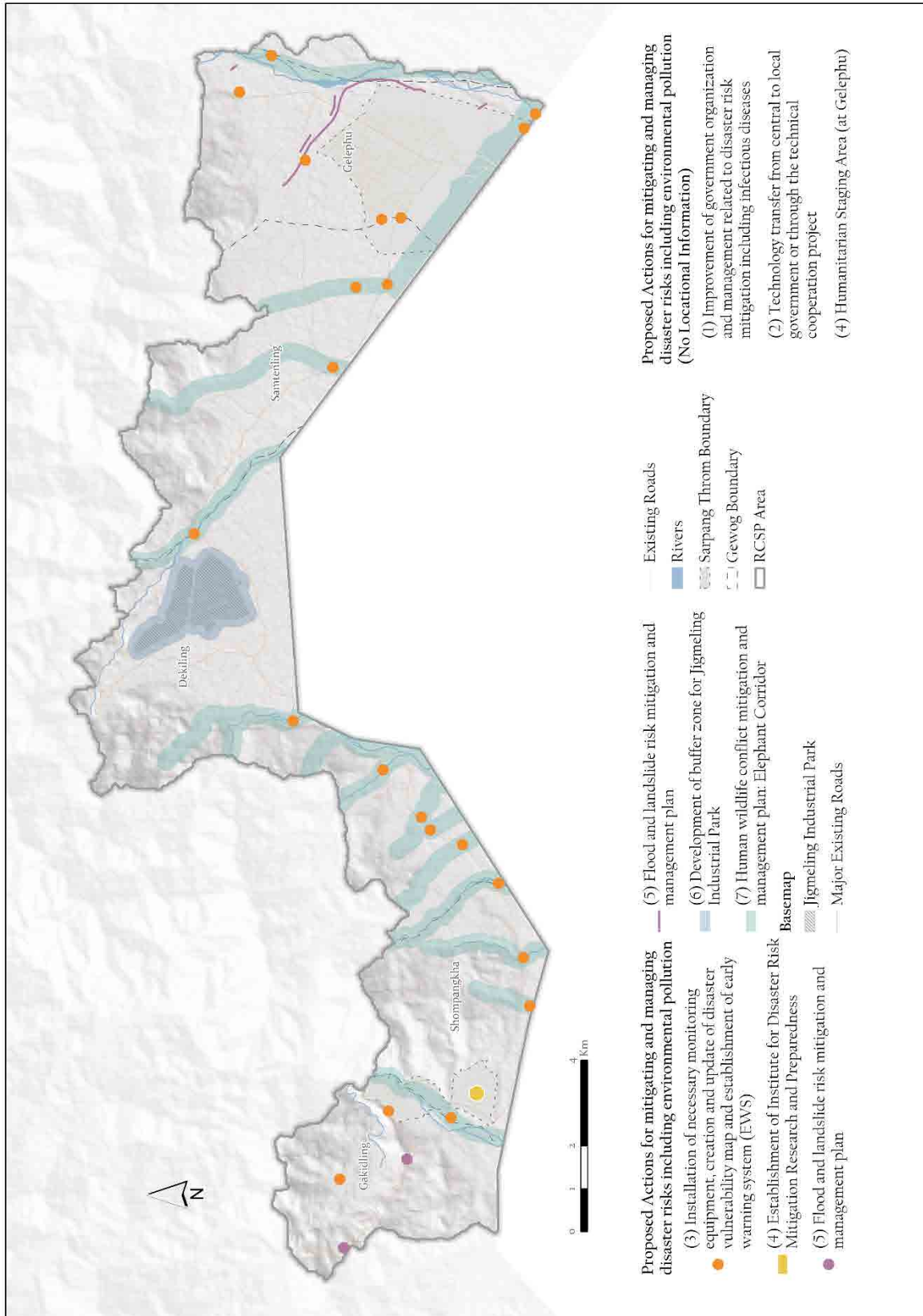
Figure 5.6.60 Elephant habitat related disturbances (top), infrastructure deficiencies (middle), and countermeasures including electric fences and trenches (bottom)

Finally, to ensure that the proposed actions could achieve their intended outcomes, the monitoring and evaluation index for each action plan have been considered as below.

Table 5.6.19 Monitoring and Evaluation Index for the Action Plan

Action Plan	Monitoring and Evaluation Index
Improvement of government organization and management	<ul style="list-style-type: none"> • Numbers of the regular meeting related to disaster management • Completion of the website for sharing disaster information • Numbers of the person exchanging between different office/department related to the disaster risk mitigation and management • Number of times of the training to diffuse basic knowledge about disaster • Number of brochures of emergency disaster response to be made and distributed • Number of times of evacuation drills
Technology transfer from central to local government or through the technical cooperation project	<ul style="list-style-type: none"> • Numbers and contents of the technology transfer
Installation of necessary monitoring equipment, creation and update of disaster vulnerability map and establishment of early warning system	<ul style="list-style-type: none"> • Number and type of the monitoring equipment • Number of updated disaster vulnerability map • Number and type of the early warning system
Flood and landslide risk mitigation and management plan	<ul style="list-style-type: none"> • Completion of F/S • Construction completion
Establishment of Disaster Mitigation Risk Research Centre	<ul style="list-style-type: none"> • Completion of F/S • Construction completion
Development of buffer zone for Jigmeling Industrial Park	<ul style="list-style-type: none"> • Completion of F/S • Construction completion • Environmental monitoring activities
Human wildlife conflict mitigation and management plan	<ul style="list-style-type: none"> • Completion of F/S • Infrastructure upgrade along the corridors • Construction completion • Habitat enrichment • Community engagement • Continuous research activities

Source: JICA Project Team



Source: JICA Project Team

Figure 5.6.61 Locations of All Proposed Actions for Mitigating and Managing Disaster Risks Including Environmental Pollution