CHAPTER 5   SPATIAL PATTERN AND ENVIRONMENTAL CONDITIONS OF BHUTAN

5.1   Existing Land Cover

5.1.1   Land Cover in 2010

Collected existing land cover data from the Ministry of Agriculture and Forestry (MoAF) was generated by a supervised classification method using satellite images from ALOS AVNIR-2, acquired between 2006 and 2009. The collected land cover data can be broken down into 11 main classes and 15 sub-classes. A list and map of the land cover classes are shown below.

Table 5.1.1   List of Land Cover Classes (1)

Class	Sub-Class	Category	Symbol	Area (ha)	%
Forests	Conifer Forest	Fir Forest	FCf	183,944	4.74
		Mixed Conifer Forest	FCm	614,545	15.85
		Blue Pine Forest	FCb	77,398	2.00
		Chir Pine Forest	FCc	107,353	2.77
	Broadleaf Forest	Broadleaf Forest	FB	1,688,832	43.56
		Broadleaf and Conifer Forest	FBc	31,463	0.81
Shrubs	-	-	SH	419,128	10.81
Meadows	-	-	GP	157,238	4.06
Cultivated Agricultural Land	Chhuzhing Land	-	AC	31,127	0.80
	Kamzhing Land	-	AK	69,487	1.79
	Horticultural Land	Apple Orchard	HA	2,039	0.05
		Citrus Orchard	HC	5,086	0.13
		Areca Nut Plantation	HAa	984	0.03
		Cardamom Plantation	HCo	3,398	0.09
		Others	HO	17	0.00
Built-Up Area	-	-	BA	6,194	0.16
Non-Built Up Area	-	-	NB	330	0.01
Snow Cover	-	-	OS	299,339	7.72
Bare Areas	Rocky Outcrops	-	RR	107,539	2.77
	Scree	-	RS	23,263	0.60
	Bare Soils	-	BS	27	0.00
Water Bodies	Lakes	-	WL	4,751	0.12
	Reservoirs	-	WRe	131	0.00
	Rivers	-	WR	22,563	0.58
Marshy Areas	-	-	MA	319	0.01
Degraded Areas	Landslides	-	DL	6,999	0.18
	Gullies	-	DG	7	0.00
	Ravines	-	DR	0	0.00
	Moraines	-	DM	13,596	0.35
Total Area				**3,877,096**	**100.00**

Source: Bhutan Land Cover Assessment 2010 (LCMP-2010), National Soil Services Centre and Policy and Planwning Division, MoAF
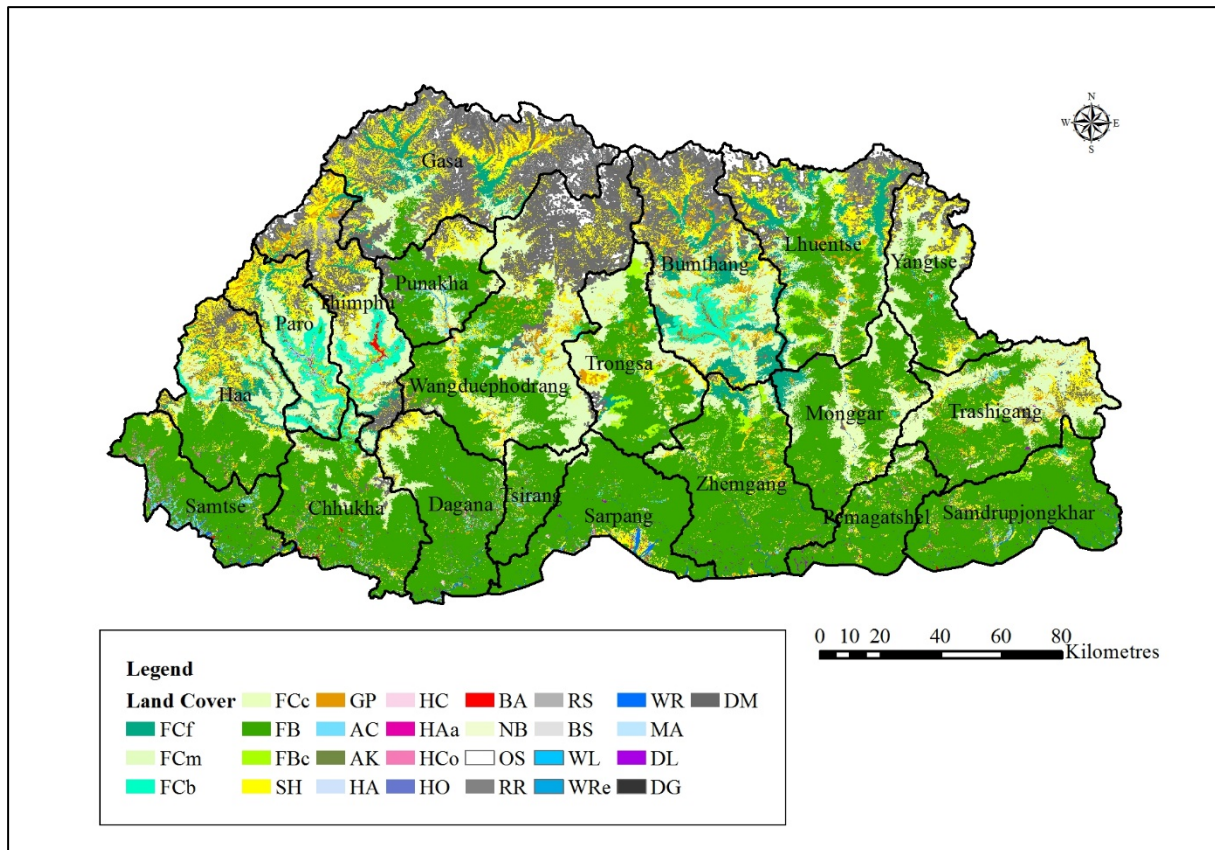
Source: Bhutan Land Cover Assessment 2010 (LCMP-2010), National Soil Services Centre and Policy and Planning Division, MoAF

Figure 5.1.1   Land Cover Map Prepared in 2010

Characteristics of typical classes are described below.

(1) Forests

The forest class is divided into two sub-classes: Conifer Forest (FC) and Broadleaf Forest (FB). There are four categories of FC: Fir Forest (FCf), Mixed Conifer Forest (FCm), Blue Pine Forest (FCb) and Chir Pine Forest (FCc). FCm covers around 16% of the national land of Bhutan and is largely distributed between elevations of 2,500 m and 3500 m. FCf covers approximately 5% of the national land and is mostly distributed at elevations of above 3,000 m.

There are two classes of FB: Broadleaf Forest (FB) and Broadleaf and Conifer Forest (FBc). FB covers about 44% of the national land and is commonly distributed at elevations of below 3,000 m.

Given these circumstances, it is notable that Bhutan's forest cover ratio is about 70% of the national land, which means that it has one of the highest forest coverage ratios in the world.

(2) Shrubs

Shrubs comprise the second most common land cover class, occupying approximately 11% of the national land. They are widely distributed across Northern Bhutan.

(3) Meadows

This class has no sub-class or category and includes any areas dominated by grass with a few or no scattered trees or shrubs. Although meadows can be found at all elevations, they tend to

cover higher locations.

(4) Cultivated Agricultural Land

This class has three sub-classes: Chhuzhing Land (AC), Kamzhing Land (AK) and Horticultural Land. In addition, there are five categories of Horticultural Land (see Table 5.1.1).

AC is used for irrigated paddy fields and takes the form of terraced fields. It covers roughly 1% of the land in Bhutan, which means there are very few irrigated cultivation areas of this type in Bhutan.

AK refers to cultivated rain-fed areas (dryland) and occupies approximately 2% of the national land.

Horticultural land includes land for growing apples, citrus fruits, nuts and cardamom. However, these categories cover only a tiny fraction of the land (less than 0.3%) in Bhutan.

(5) Built-up Areas

This class contains settlements, urban areas, rural areas, airports, public facilities and industrial areas. About 0.2% of the land in Bhutan is covered by this land class. In other words, there are very few built-up areas in Bhutan because it is a mountainous country with land at extremely high elevations and steep slopes.

(6) Snow Cover

As described above, Bhutan is a mountainous region with certain areas located at elevations of more than 5000 m. Therefore, there are many snow-covered areas and glaciers. The total land cover ratio of this class is approximately 8%, and it is found in Northern Bhutan.

(7) Bare Areas

This class is divided into three sub-classes: Rocky Outcrops (RR), Scree (RS) and Bare Soils (BS). These three sub-classes cover about 3.4 % of the national land. This means that this class of land covers more area than AK, Horticultural Land and built-up areas.
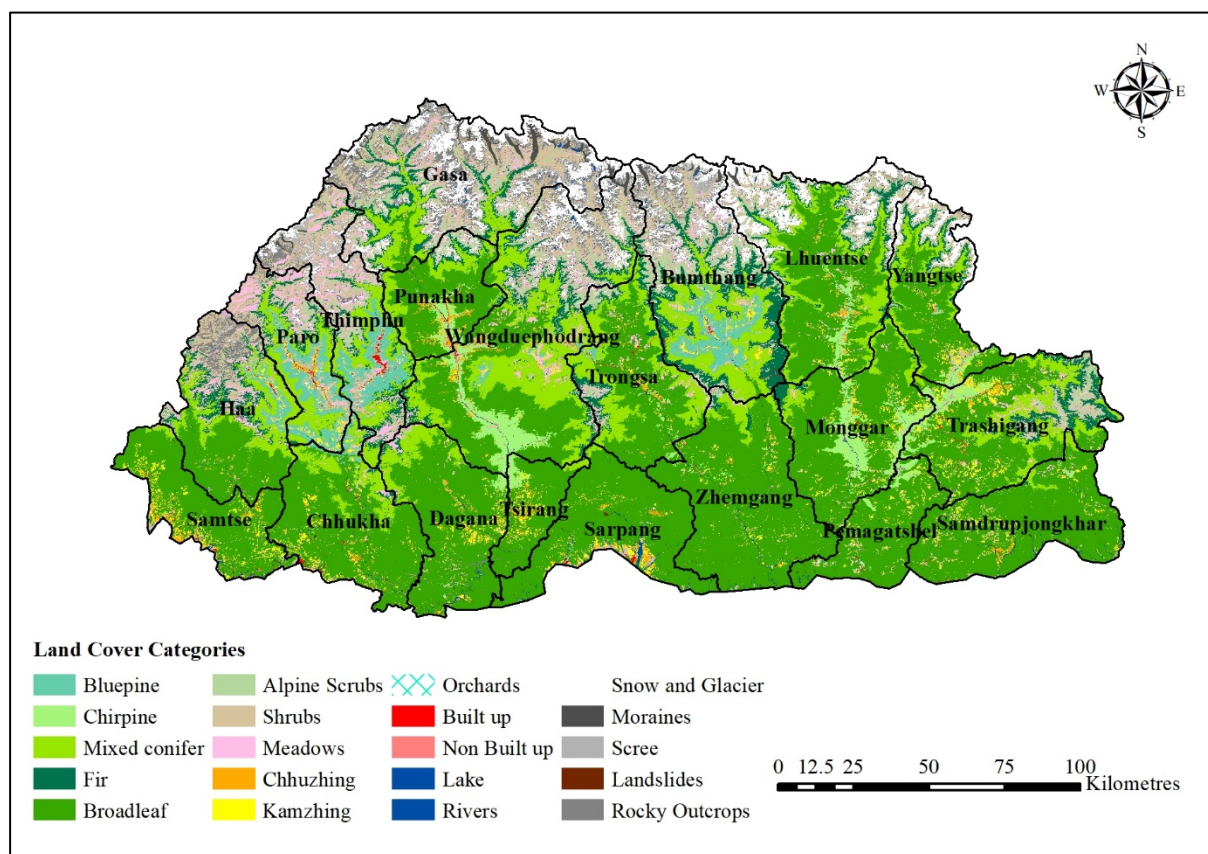
5.1.2   Land Cover in 2016

The MoAF carried out the third Land Use Land Cover assessment based on Landsat 8 satellite image data acquired from November to December in 2015.According to the collected data, there are 12 main classes and sub-classes. A list and map of the land cover classes are shown below.

Table 5.1.2   List of Land Cover Classes (2)

Main Class	Sub-class	Area (ha)	Ratio (%)	Main Class	Sub-class	Area (ha)	Ratio (%)
Alpine Scrubs		130,097.72	3.39	Meadows		96,273.61	2.51
Forests		2,717,161.64	70.77	Built-up		7,457.03	0.19
	Blue Pine	101,155.06	2.63	Non-Built Up		595.89	0.02
	Chir Pine	101,537.45	2.64	Rocky Outcrops		159,455.55	4.15
	Fir	230,983.99	6.02		Rocky Outcrops	119,754.16	**3.12**
	Mixed Conifer	519,585.68	13.53		Scree	39,701.39	1.03
	Broadleaf	1,763,899.46	45.94	Moraines		14,393.94	0.37
Shrubs		374,032.56	9.74	Landslides		3,730.22	0.10
Cultivated Agriculture		105,682.43	2.75	Snow and Glacier		205,343.63	5.35
	Chhuzhing	31,891.87	0.83	Water Bodies		25,175.78	0.66
	Kamzhing	68,260.64	1.78		Lake	6,252.58	0.16
	Orchards	5,529.92	0.14		Rivers	18,923.20	0.49
				Grand Total		3,839,400.00	100.00

Source: Land Use and Land of Bhutan 2016, Forest Resources Management Division, Department of Forests and Park, MoAF

Source: Land Use and Land of Bhutan 2016, Forest Resources Management Division, Department of Forests and Park, MoAF

Figure 5.1.2   Land Cover Map Prepared in 2016

The characteristics of typical land cover classes in 2016 are described below.

(1) Forests

The forest class is divided into five sub-classes: blue pine, chir pine, mixed conifer, fir and

broadleaf forests. Broadleaf forest is typically distributed below 3,000 m and its area ratio is around 46% of the national land of Bhutan. Regarding mixed conifer forest, this is usually found between 2,500m and 3,500m and the area ratio is approximately 14% of the national land.

As the results show, the forest cover ratio in 2016 was about 71% of the national land, while, from 2010 to 2016, the forest cover ratio increased by about 1% of the national land.

(2) Alpine Scrub

This is a new category, which refers to a woody plant characterized by stunted growth and a height less than 5 m, due to harsh conditions. In addition, it occurs above 3,500 m and the area ratio is about 3% of the national land.

(3) Shrubs

In 2016, shrubs were the second most common land cover class, distributing about 10% of the national land. The area ratio decreased by 1% compared to the previous land cover analysis in 2010. They are also widely found across Northern Bhutan.

(4) Meadows

Meadows include any area dominated by grass with a few or no scattered trees or shrubs. Although meadows can be found at all elevations, they tend to cover higher locations. Their area ratio decreased by about 1.5% from 2010 to 2016.

(5) Cultivated Agricultural Land

This class has three sub-classes: Chhuzhing, Kamzhing and orchards. The area ratio of cultivated agriculture is approximately 2.8% in total, while its ratio decreased a little compared with the 2010 results. Chhuzhing land is wetland used for irrigated paddy fields and takes the form of terraced fields. On the other hand, Kamzhing land is dryland, used for vegetables.

(6) Built Up Areas

This class contains urban areas, rural settlements, airports, education facilities, health facilities, industrial areas and roads. The area increased by about 1,260 ha from 2010 to 2016.

5.1.3   Latest Land Cover in 2017

For the project, prepared SPOT-6/7 satellite image data was acquired from October 2016 to April 2017 by the JICA Headquarters, while a land cover classification analysis was conducted based on an unsupervised classification method to determine Bhutan's latest land cover conditions. Regarding the unsupervised classification method, it involves an automatic computer classification analysis without any ground sampling data. This classification only uses statistical data on each band of the SPOT-6/7 satellite data, such as visible bands (blue, green and red) and the near infrared band. Therefore, the accuracy of classification result is essentially inferior to the results from 2010 and 2016.

However, on the Project, the digital elevation model (DEM), normalized vegetation index (NVI) and the results of the land cover data from 2016 were utilized to improve the results of the initial land cover classification data. The DEM was used in terms of the vertical distribution of vegetation, in particular, to identify coniferous forest areas. The NVI is useful for distinguishing between vegetation and non-vegetation areas. Meanwhile, the results of the land cover data from 2016 were used for comparison with the classification results. There are nine main classes in total and three sub-classes in the forest main class. A list and map of the land

cover classes are shown below.

Table 5.1.3   List of Land Cover Classes (3)

Main Class	Sub-class	Area (ha)	Ratio (%)
Forests		2,846,222.92	73.41
	Coniferous	497,333.16	12.83
	Mixed Forest	476,818.50	12.30
	Broadleaf	1,872,071.27	48.28
Shrubs		353,423.18	9.12
Cropland		103,868.70	2.68
Meadows		90,402.19	2.33
Built-Up		10,014.35	0.26
Non Built-Up		554.04	0.01
Bare land		156,999.29	4.05
Snow / Glacier		282,840.27	7.30
Water Bodies		32,813.28	0.85
	Grand Total	3,877,138.22	100.00

Source: SPOT 6/7 Satellite Data Classification Analysis in 2017
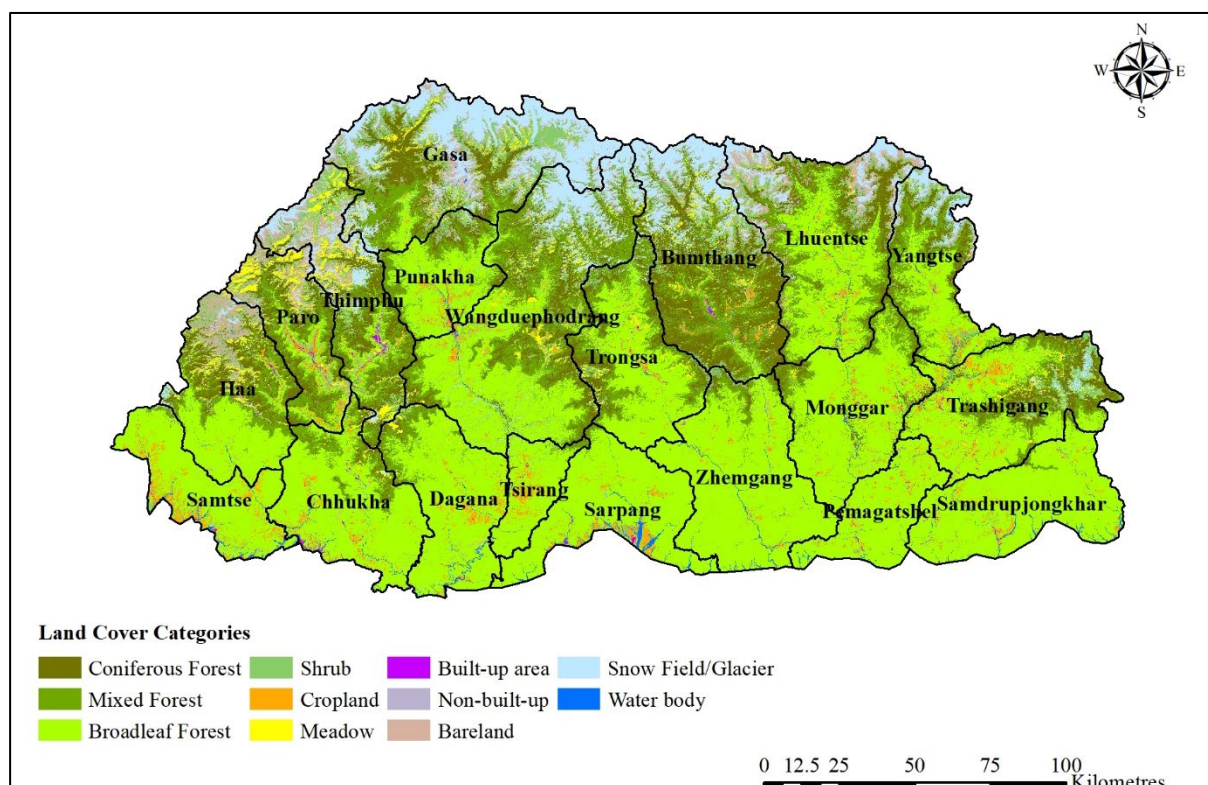
Source: SPOT 6/7 Satellite Data Classification Analysis in 2017

Figure 5.1.3   Land Cover Map Prepared in 2017

The results of main land cover categories are described below.

(1) Forests

There are three sub-categories, conifer forest, mixed forest and broadleaf forest, in the main forest category. The area ratio of forests is about 73.4% of the national land. It seems that forest

area has increased since the 2016 results; however, there is no 'alpine scrubs' category in our analysis because it is difficult to classify alpine scrubs under the unsupervised classification method.

Therefore, it is assumed that forest area includes alpine scrubs in our results, with the forest ratio having decreased by about 0.8% compared to land cover in 2016.

(2) Shrubs

In this analysis, shrubs are also the second most common land cover class, occupying approximately 9% of the national land. The area ratio was reduced by about 0.6% compared to the previous land cover analysis in 2016. They are largely distributed across Northern Bhutan.

(3) Meadows

Meadows mainly occur at higher elevations, such as in Gasa, in the northern part of Thimphu and Paro. This class has no sub-class or category and includes any area dominated by grass with a few or no scattered trees or shrubs. Although meadows can be found at all elevations, they tend to cover higher locations.

(4) Cropland

It was difficult to classify detailed agricultural land types, such as Chhuzhing, Kamzhing and orchard, under the unsupervised classification method. Therefore, only one main class was set as cropland in this project, which contains an irrigated paddy field, a terrace, and other crops and orchards.

The area ratio of cropland is about 2.7% of the national land of Bhutan, with a slightly decrease (0.07%) compared to the previous land cover analysis.

(5) Built-up Areas

Built-up areas increased by approximately 2,500 ha (0.07%) since the land cover analysis in 2016. These areas have expanded by about 3,800 ha (0.1%) since 2010. This may be related to the reduction in cultivated agricultural land. From 2010 to 2017, the cropland area ratio decreased by about 0.2% and was also reduced by approximately 0.07% from 2016 to 2017. These reduced ratios for cropland are almost the same as the increased ratio of built-up areas.

5.2 Urban Area and Settlement Distribution

5.2.1 Settlement Distribution

The whole of Bhutan is occupied by steep terrain and the land available for living and cultivation is extremely limited. According to Land Cover 2010 (National Soil Services Centre and Policy and Planning Division, MoAF), Forest occupies 70% of the national land, Shrubs cover 10% and Snow Cover and Bare Areas make up 11 %. The rest of the limited usable land is shared by residential and cultivation areas. Built-up areas, both urban and rural, cover only 0.16% of the national land.

Furthermore, 51% of the national land, mainly in the northern region, is designated as a Protected Area. This means that development activities are severely restricted. The altitude of the northern region exceeds 3,000 m, which by nature makes the area unfit for habitation. In such regions, people have a nomadic way of life and settlements migrate over the year in accordance the areas suitable for yak grazing.

Settlements in Bhutan basically take the form of hamlets formed in valleys made by several

large/medium rivers flowing down from the northern highlands to the southern lowlands. Hamlets in these valleys are at an advantage in terms of irrigation, but also face the risk of disasters such as floods.

Villages are also sometimes formed along major roads. Villages distributed along the highway connecting the eastern and western regions, as well as those located along the highway between the capital, Thimphu and Phuentsholing in the south, are typical examples. Villages can also be found along the main roads connecting adjacent Dzongkhag Thromdes each other; most Yenlag Thromdes are also located along these roads.

Regarding the relationship between the formation of villages and the construction of roads, there seem to be two development processes. The first of these concerns roads constructed for the purpose of connecting already existing major villages; the other takes the form of villages that gradually developed along existing roads, therefore steadily enhancing the convenience of these places. Tsimalakha in Chhukha Dzongkhag is a village representative of the latter development process.

In the southern region along the Indian border, the terrain is relatively moderate with fairly large flat spaces; villages therefore developed on these flat surfaces. In some cases, settlements also developed as facilities attached to large-scale development projects, such as hydropower plant towns.

Figure 5.2.1 shows the country's existing settlements. Of the 61 towns, 60 are located less than 3,000 m above sea level. Gasa is the only town located higher than this at 3,519 m. The highest settlement is located at 4,941 m above sea level. Most of Bhutan's settlements and Gewog Centres have been developed in areas less than 3,000 m in altitude; these settlements and Gewog Centres occupy more than 96% of the total number of settlements and Gewog Centres in Bhutan. Figure 5.2.2 shows the number of towns, Gewog Centres and settlements by altitude.
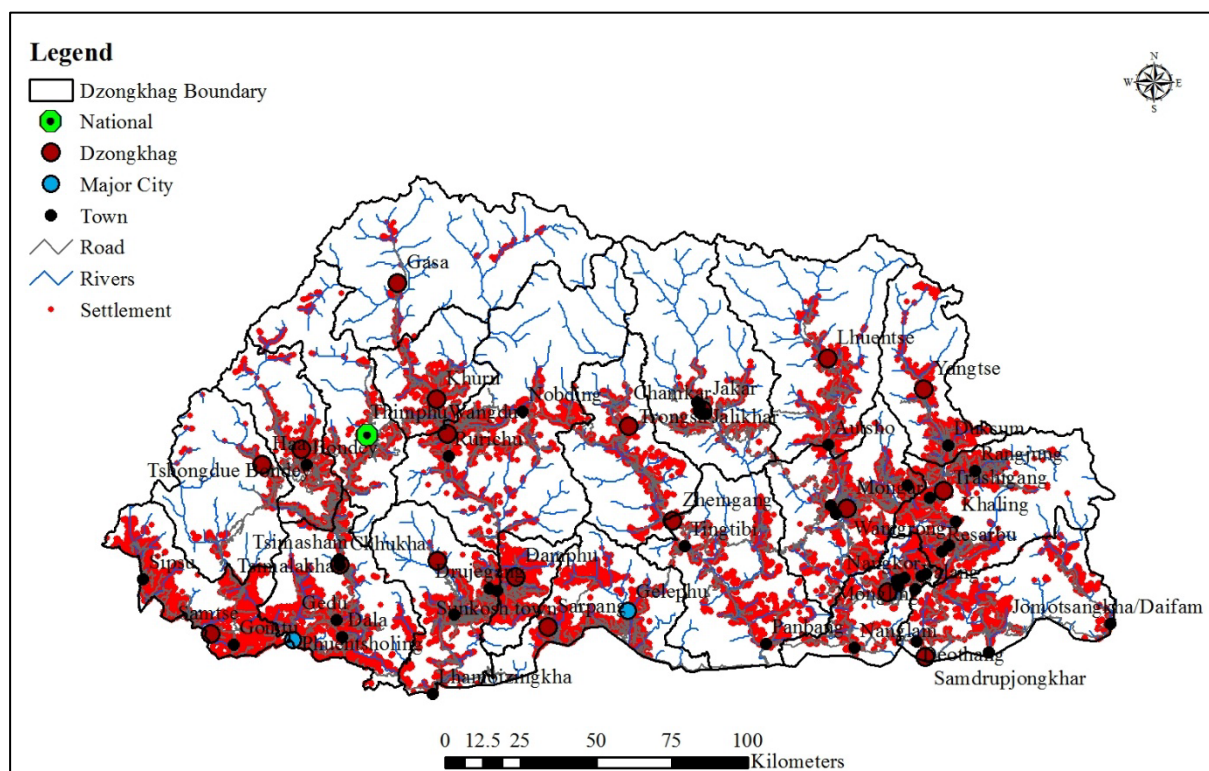
Source: National Statistics Bureau

Figure 5.2.1   Distribution of Settlements by Altitude
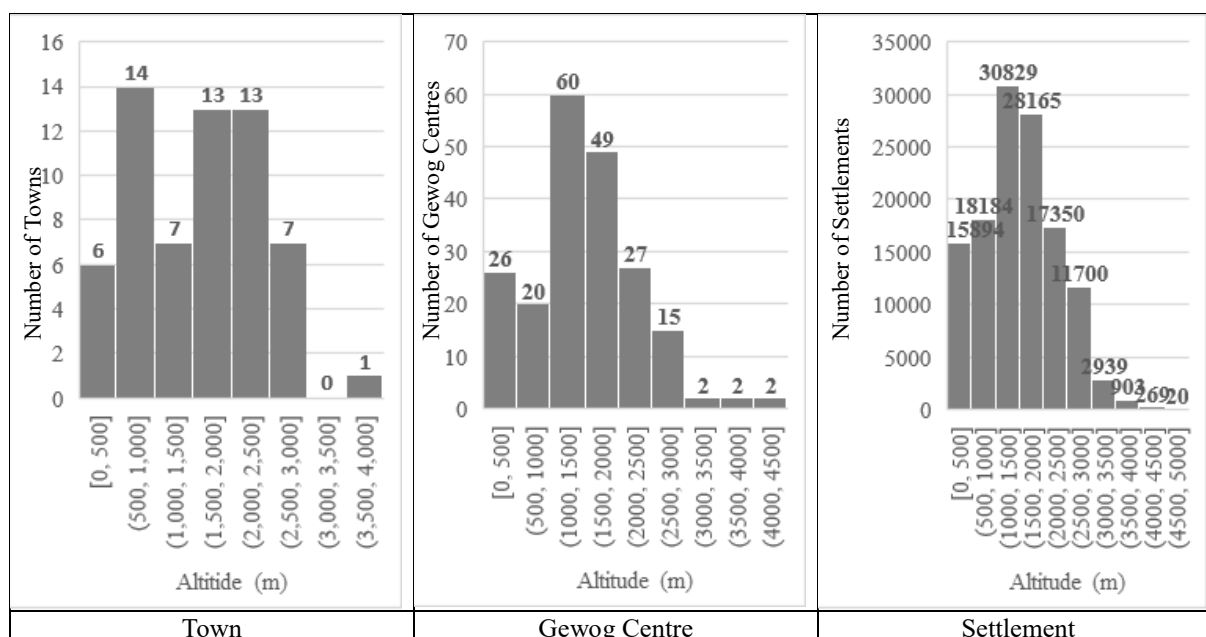
Source: National Statistics Bureau for Settlements, ASTER DEM for Altitudes

Figure 5.2.2   Towns, Gewog Centres and Settlements by Altitude

Settlements in urban area and rural area of the existing Dzongkhag Thromdes, the accumulation of settlements in the capital city of Thimphu stands out. Developments are moving out towards the highlands on slopes bursting with buildings, while to the south, settlements are continuously springing up along the highway towards Khasadrapchu, one of the Yenlag Thromdes. To the north, urban development has also been progressing using land pooling measures within the framework of the local area plan, which has caused serious problems with road congestions and a lack of parking spaces in a core area of Thimphu. As very little room is left for development in the city of Thimphu itself, further development is expected to extend outwards to the north and south.

The settlement patterns of other Dzongkhag Thromdes vary depending on the terrain and other conditions. There are some settlements which have been newly developed as alternatives to existing older towns at some distance from the existing ones, such as Khuruthang in Punakha Thromde, Bajo in Wangduephodrang and a new town in Dagana,

As mentioned earlier, settlements in rural areas are often distributed along major roads. However, there are also many settlements that take the form of clustered villages or that are dispersed over slopes of mountains. Lobnekha, which is located at the end of a long and winding farm road leading to the mountain peak in Chhukha, is a typical case of clustered villages. However, village formations like this are not nearly so commonly found as the scattered settlements spread all over the country. The reason for this is considered to be that people used to build houses in the middle of their own farmland for more convenient and efficient farm work; this must have been a rational way of doing things in times when car transportation was unavailable. However, even in today's era of automobile transportation, it takes several days to access the main roads from houses in scattered settlements, which makes for harsh living conditions.

In Protected Areas, there are also settlements where the original inhabitants live. These areas are categorized as Multiple Use Zones, in which a certain level of human activity is allowed, including residence and cultivation.

5.2.2　Urban Population and Population Density

The largest town in Bhutan in 2017 was Thimphu with a population of 114,551 people, followed by Phuentsholing with 27,658 people, Gelephu with 9,858 people, Samdrupjongkhar with 9,325 people and Wangdue with 8,954 people. Other large towns with population more than 5,000 people are Punakha (6,262), Bumthang (6,243), Nganglam (5,418) and Samtse (5,396). Only two cities exceed over the population size of 10,000 in Thimphu and Phuentsholing. Counting the accumulated number of populations in main and adjacent cities, the total population become 8,598 people in Mongar and 6,260 people in Trashigang. The population size of towns in Bhutan is considerably small except Thimphu.

Thimphu and adjacent towns of Paro, Punakha and Wangdue form the largest populated area in the country. At the national southern border, the secondary towns are established in Phuentsholing, Gelephu, Nganglam and Samdrupjongkhar. Bumthang is a precious town in highland in the Central East region.
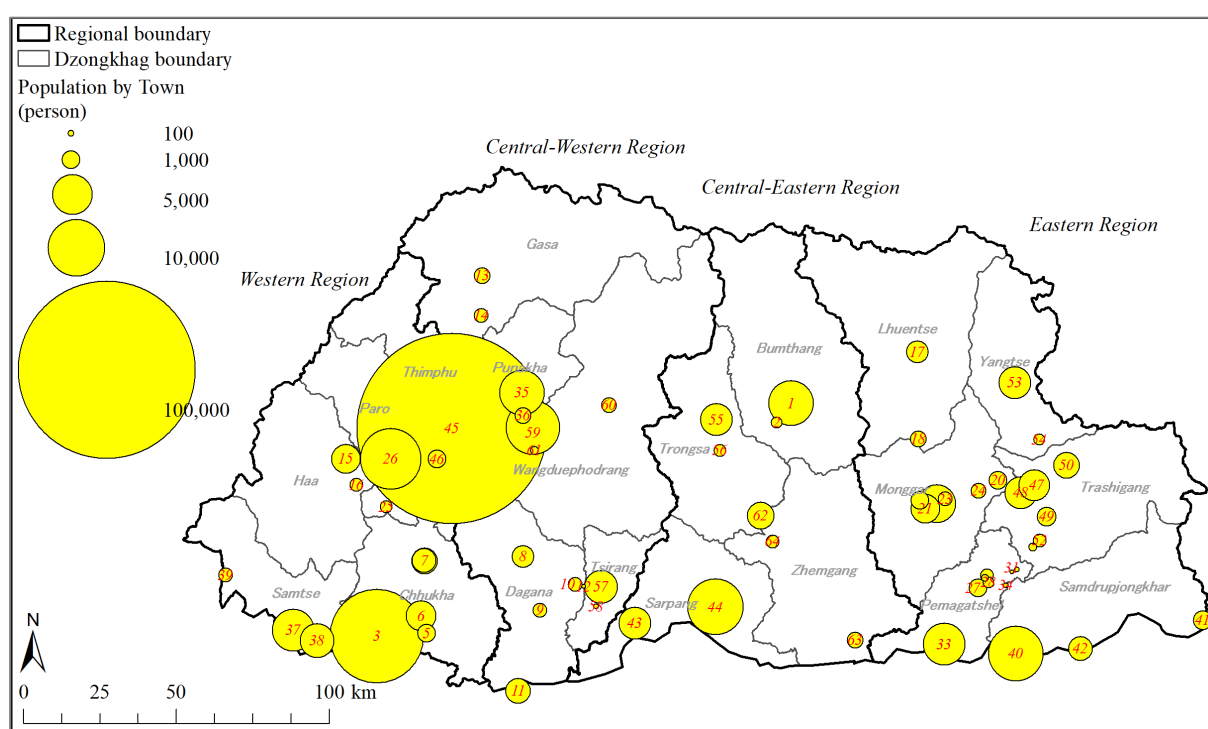
Source: Population and Housing Census, 2017

**Figure 5.2.3　The Urban Population of the 64 Towns**

Figure 5.2.4 shows urban population growth by town from 2005 to 2017. The increase in Thimphu and surrounding cities is obvious. Other towns with increase more than 2,000 people are Paro, Phuentsholing, Nganglam, Punakha, Wangduephodrang, and Bumthang. Other than Bumthang, the population is growing around Thimphu or a town with major industries. Population has not increased in Gelephu and Samdrupjongkhar which are relatively large towns in 2005.
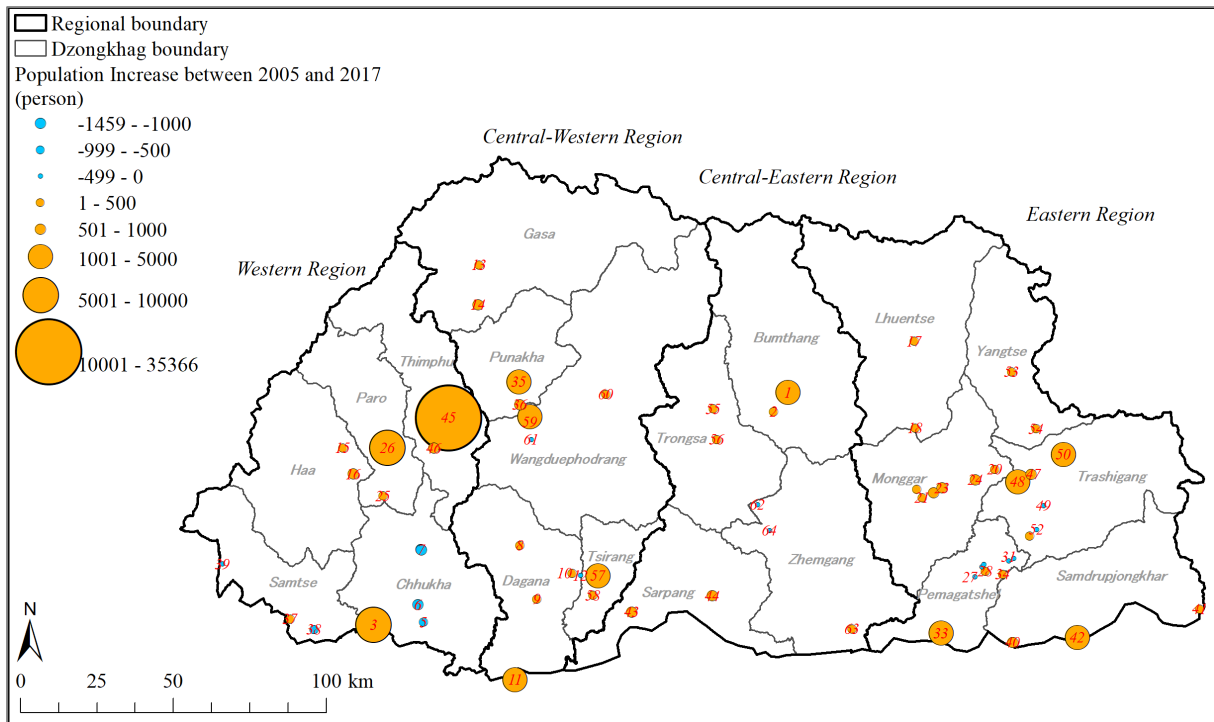
Source: Population and Housing Census in 2005 and 2017

Figure 5.2.4   Urban Population Increase of the 64 Towns between 2005 and 2017

The population growth rate for each gewog from 2005 to 2017 is shown in Figure 5.2.5. Population has decreased in many gewogs in eastern region. On contrary, population has increased in gewogs in western and central-western regions. The population growth widely distributes to gewogs in Paro, Haa, Wangduephodrang, Punakha and Chhukha around Thimphu plus Trongsa and Sarpang.
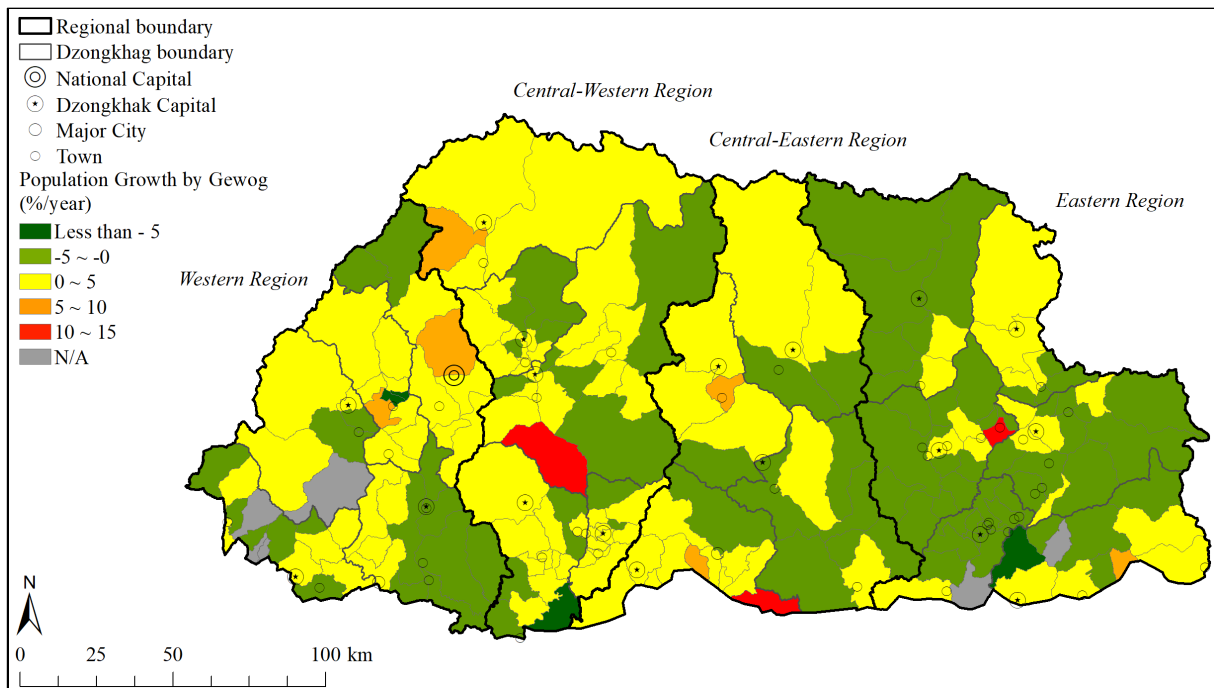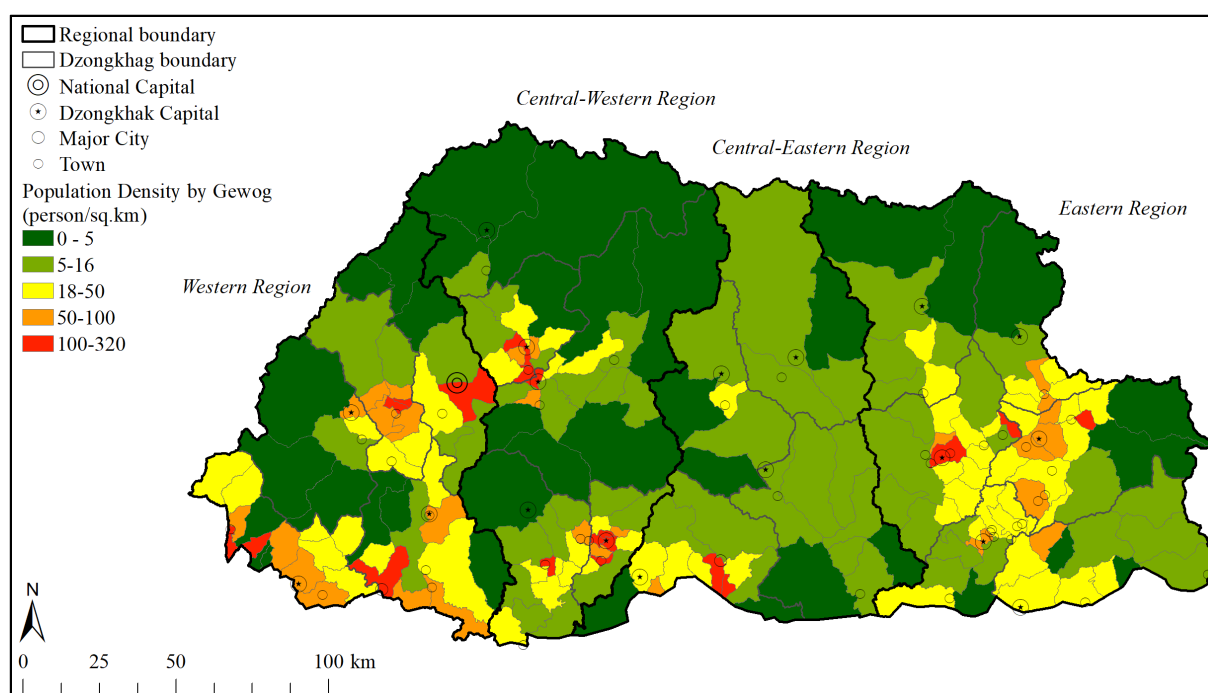

Source: Population and Housing Census in 2005 and 2017

Figure 5.2.5   Annual Population Growth Rate of 205 Gewogs between 2005 and 2017

The estimated average population density in Bhutan in 2017 was low, at 18.8 people/km^2. Figure 5.2.6 presents the population densities across the country by Gewog. It shows that population densities higher than the national average (yellow and orange) are present in Gewogs around Samtse, Phuentsholing, Sarpang and Samdrupjongkhar which are located beside the country's borders with India. Gewogs with relatively higher population densities also extended along the North-South national highways from Phuentsholing to Thimphu and from Samdrupjongkhar to Trashigang.

Gewogs with population densities higher than 100 people/km^2 (red) are limited to Paro, Wangduephodrang, Samtse, Damphu, Gelephu, Tsirang and Trashigang. Gewogs coloured in light green and deep green represent areas with a relatively lower density. These Gewogs are spread across the northern region and the mountainous areas of the central region.
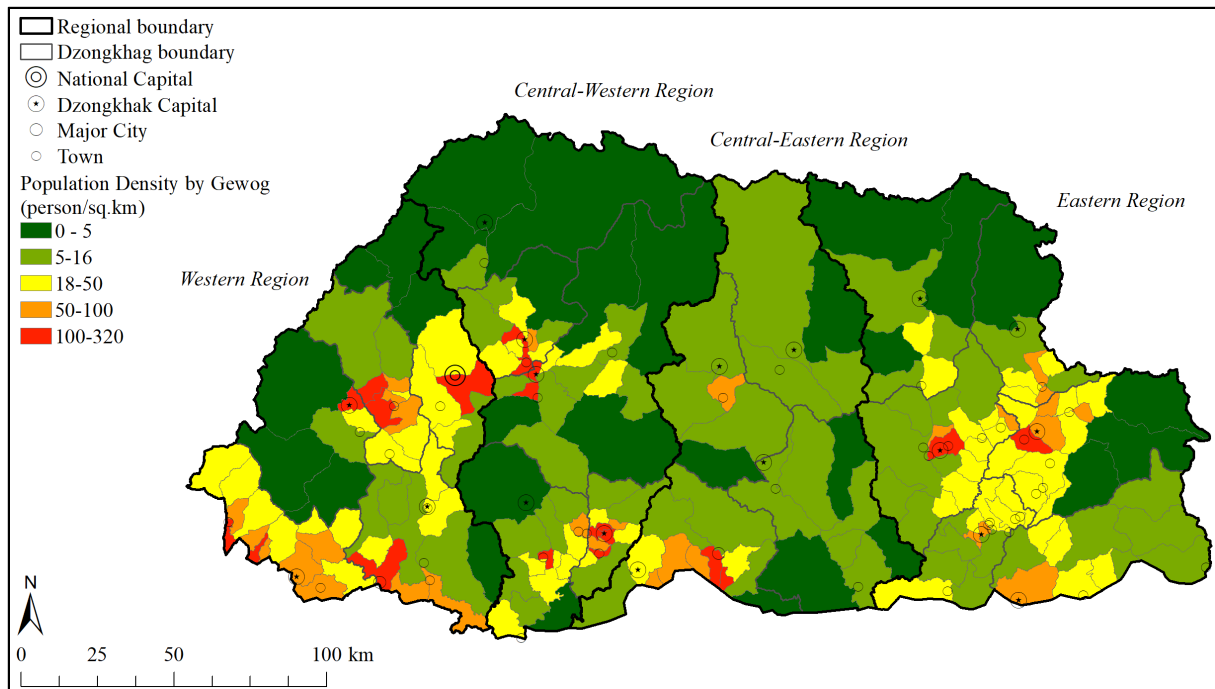

Note: Some gewogs are not consistent in names used in GIS data and Population and Housing Census in 2005.

Source: Population and Housing Census, 2005

Figure 5.2.6   Population Density by Gewog in 2005

Of the Dzongkhags, Thimphu is the most densely populated with a population of 138,736 and a density of 67 people per square kilometre in 2017, while the least populated is Gasa with a population of one person per square kilometre. At gewog level, Figure 5.2.7 shows the rural population density per gewog in 2017. A similar pattern in distribution of population density from 2005 can be recognized. As a change, the population density increases in Trongsa and Sarpang, though it decreases in gewogs in eastern region.

Note: Some gewogs are not consistent in names used in GIS data and Population and Housing Census in 2017.

Source: Population and Housing Census, 2017

Figure 5.2.7   Population Density by Gewog in 2017

5.3   Transport Network

The transport network system of Bhutan is primarily composed of inter/intra-city transportation services by roads and regional transportation services by air transport. The geographical coverage of road and air transportation services has expanded during the last 20 years.

The development of the road transport sector has focused on formulating grid-like inter-city and intra-district networks, both through the new construction and rehabilitation of roads and the upgrading of the existing road infrastructure. The first airstrip in Bhutan was developed for an international airline in Paro in 1968, and the first scheduled international flights began operating in 1983 with the upgrade of the airstrip into an airport. Domestic flight services began in 2011.

5.3.1   Inland Transport Network

The road transport network is the predominant form of inland transport in Bhutan; other inland transportation services, such as rail, inland waterway, ropeway and cable-car, have not been developed.

(1)   Road Administration

Road administration in Bhutan is the responsibility of the Department of Roads (DoR) and the local governments of each Dzongkhag, Gewog and Thromde. The responsibilities of each road administrator are stipulated in the Road Act of Bhutan 2013, as shown in Table 5.3.1.

Table 5.3.1   Road Administration in Bhutan

Administrator	Responsibility
Department of Roads (MoWHS)	All of the country's roads
Dzongkhag and Gewog Administrations	Administration and management of all roads, including access roads constructed or maintained by the Dzongkhag and Gewog Administration
Thromde Administrations	Administration and management of all roads, including any access roads constructed or maintained by the Thromde Administration

Source: The Road Act of Bhutan 2013

1)   Department of Roads

The DoR is a Department under the Ministry of Works and Human Settlement (MoWHS) with responsibility of administrating all of the country's roads. The DoR headquarters are made up of four divisions, planning, design, construction and maintenance, as shown in Figure 5.3.1, and are responsible for institutional issues and the planning and implementation of large-scale projects.
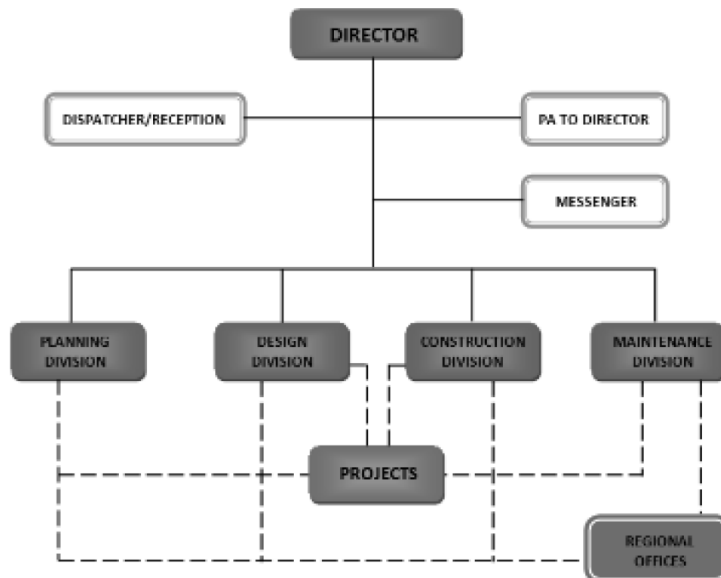
Source: MoWHS website

Figure 5.3.1   Organization of the Department of Roads

The nine regional offices of the DoR are mainly responsible for the implementation of national highway projects outside of those projects implemented by Department headquarters or those pertaining to Dzongkhag or farm roads. The administrative areas presided over by the regional offices are shown in Table 5.3.2.

Table 5.3.2   Name and Administrative Area of Regional Offices

Division	Name of Regional Office	Administrative Area (Dzongkhag)
Division-1	Phuentsholing	Samtse, Chhukha
Division-2	Thimphu	Paro, Haa, Thimphu
Division-3	Lobeysa	Wangduephodrang, Punakha, Gasa
Division-4	Trongsa	Trongsa, Bumthang
Division-5	Sarpang	Sarpang, Tsirang, Dagana
Division-6	Tingtibi	Zhemgang
Division-7	Lingmethang	Mongar, Lhuentse,
Division-8	Trashigang	Trashigang, Yangtse
Division-9	Samdrupjongkhar	Samdrupjongkhar, Pemagatshel

Source: MoWHS website, DoR

2)   Dzongkhag and Gewog Administrations

The engineering division in each Dzongkhag Administration is responsible for the administration of Dzongkhag roads. Gewog Administrations, which fall under Dzongkhag Administrations, are also responsible for Gewog roads. A chart showing the overall organization of Dzongkhag and Gewog Administrations is shown in Figure 5.3.2.
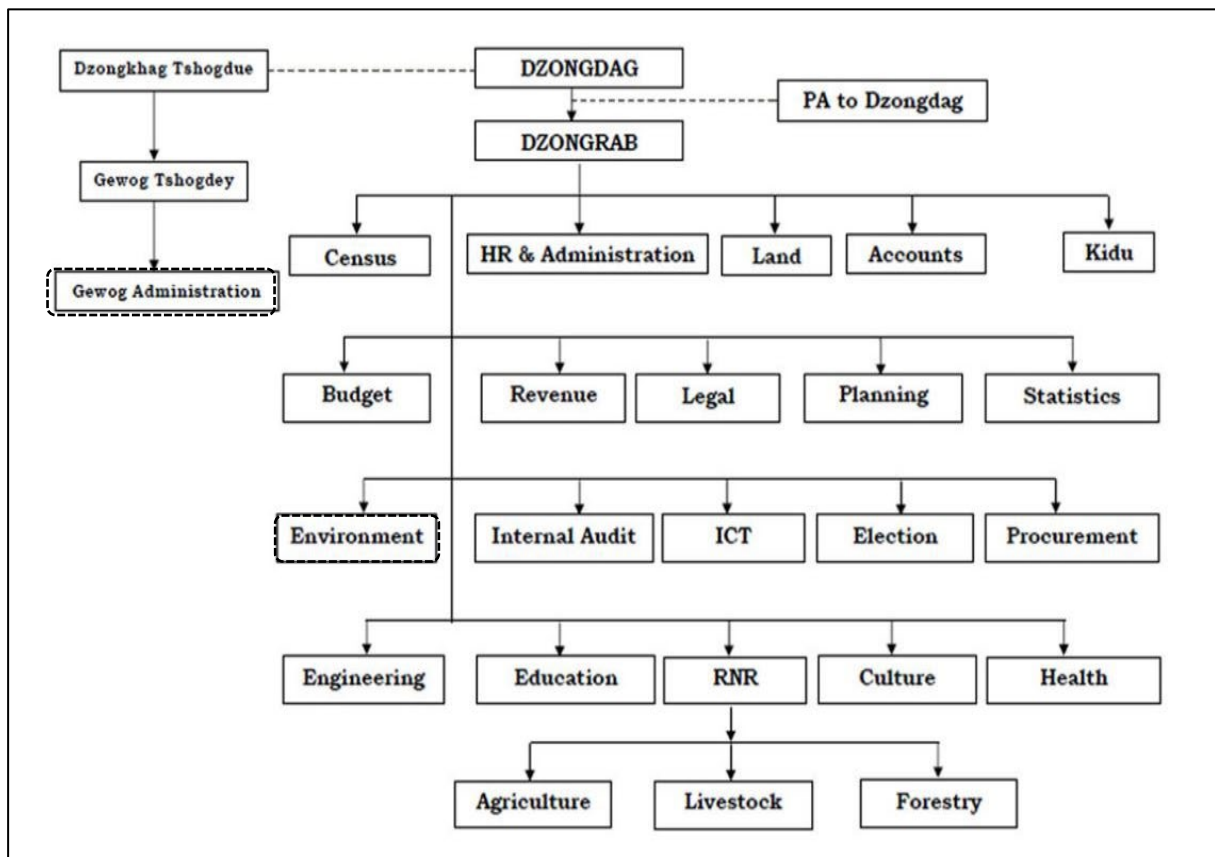
Source: Dagana Dzongkhag Administration website

Figure 5.3.2   Organization of Dzongkhag and Gewog Administrations

3)   Thromde Administrations

The infrastructure division of Thromde Administrations is responsible for urban infrastructure, such as roads, sewage, water supply and electricity. The administration of Thromde roads also falls under their jurisdiction. An overall organization chart of Thromde Administrations is shown in Figure 5.3.3.
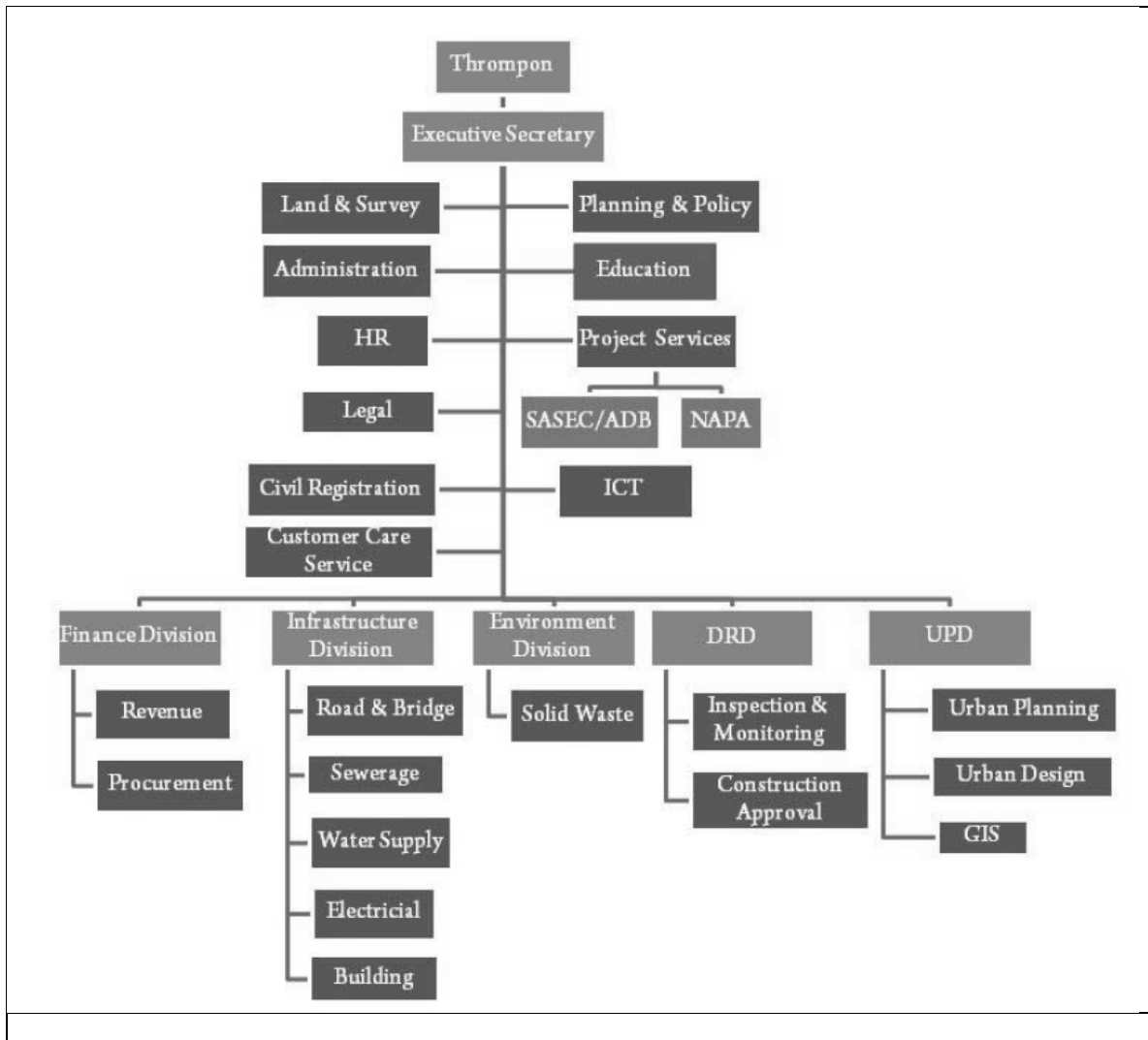
Source: Phuentsholing Thromde website

Figure 5.3.3   Organization of Thromde Administrations

(2) Road System

1)   The road classification system

The road classification system in Bhutan is stipulated in Chapter 2 (Administration of Roads) of the Road Act of Bhutan 2013, which classifies roads into five categories as shown in Table 5.3.3

Table 5.3.3   Road Categories in Bhutan

No.	Categories	
1	National Highways	Asian Highway (AH 48 Class II, Phuentsholing - Thimphu Highway)
		Primary National Highway (PNH)
		Secondary National Highway (SNH)
2	Dzongkhag Roads	
3	Thromde Roads	
4	Farm Roads	
5	Access Roads	

Source: Road Act of Bhutan 2013

2) Existing road network

The total length of the existing road network is 12,348 km as of 2017, representing an increase in the average annual growth rate of 9.7% between 2008 and 2017, as shown in Table 5.3.4. The growth rate of farm roads has been about 17.5%, which is the highest rate among all road categories, although the growth rate has been 2.2% for primary national highways. Farm roads account for almost 40% of Bhutan's roads, while the combined share of primary and secondary national highways is 23%. The paved ratio of expressway and primary national highway is almost 100%, and 73% and 80%, respectively, for secondary national highway and urban roads. However, the paved ratio of dzongkhag roads is still 41%, while there is no asphalt pavement on farm roads and access roads as shown in Table 5.3.4.

Table 5.3.4   Length of Roads by Category and Average Annual Growth (2016/2008)

Road Type	As of June 2008 (km)	As of June 2017 (km)	Annual Growth of Road Length (2017/2008) (%/year)	Share in 2017 (%)	Asphalt Paved Length in 2017 (km) (%)
Expressway	6.20	6.2	-	0.1	6.2 (100.00)
Asian Highway (PNH)	Nil	(174.00)	-	-	-
Primary National Highway	1,621.10	1,964.58	2.2	15.9	1,560.52 (96.26)
Secondary National Highway	482.00	878.39	6.9	7.1	641.80 (73.06)
Dzongkhag Roads	820.70	2,606.22	13.7	21.1	1,075.30 (41.25)
Urban Roads	163.00	436.82	11.6	3.5	350.0 (80.12)
Farm Roads	1,186.40	5,049.65	17.5	40.9	0 (0)
Access Roads, incl. Forest Roads, etc.	1,083.10	1,406.24	2.9	11.4	0 (0)
Total	5,362.50	12,348.10	9.7	100.0	3,633.82 (29.42)

Note: Expressway was classified into other categories in the Road Act of Bhutan 2013. Length in June 2017 include Dzongkhag Roads and GC Roads

Source: Review of the RSMP 2007-2027, DoR(Length and asphalt paved length in June 2017)
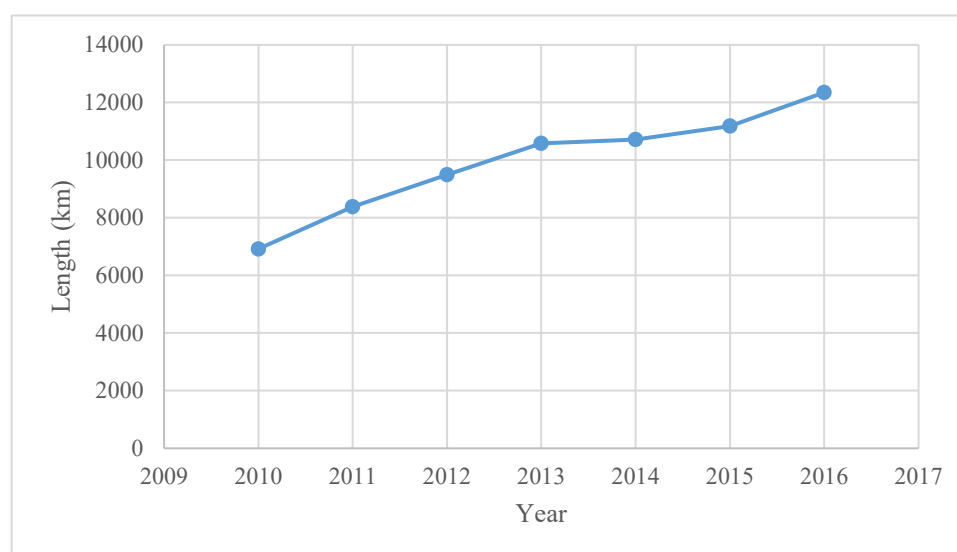

Source: Review of the RSMP 2007-2027, DoR(2016)

Figure 5.3.4   Growth of Road Length between 2010 and 2015

The primary national highways were constructed to connect all Dzongkhag centres. Subsequent road networks, such as the secondary national highways, Dzongkhag roads, farm roads and urban roads, were then developed and now cover the entire country, as shown in Figure 5.3.5.

A new Secondary National highway is being constructed by DoR from Dagapela till Dalbari near Lhamoizingkha under Dagana Dzongkhag. The length of the road is 80.58 km. Estimated cost of this project is BTN 1.4 billion and split between RGoB and ORIO (50:50). The ORIO is the Facility for Infrastructure Development which is funded by Ministry of Foreign Affairs of the Netherlands. This road is expected to provide connectivity to remote areas within Dagana Dzongkhag. The road is expected to be completed by end of 2019 and will be an important north-south link for people of Dagana Dzongkhag.
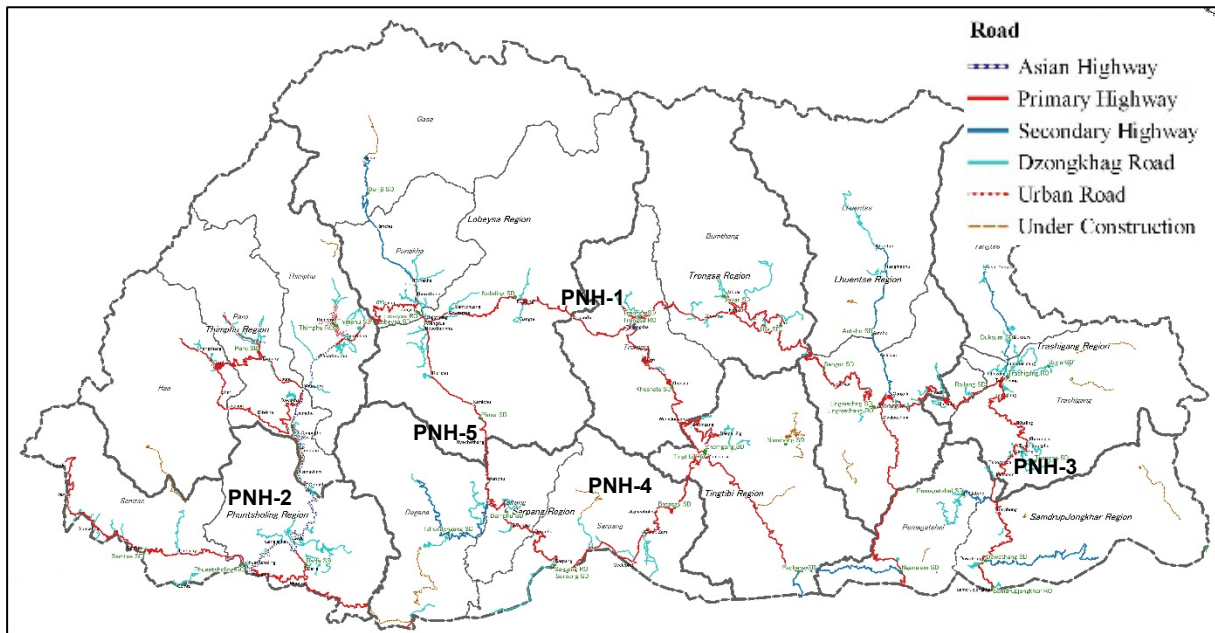
Source: DoR

Figure 5.3.5   Road Network in Bhutan by Classification

The ratio of road length per square kilometre is estimated at 0.105 in Bhutan, which is a considerably lower rate than the 0.412 ratio in Nagano prefecture, the local government in the mountainous area of Japan, as shown in Table 5.3.5.

Table 5.3.5   Comparison of Road Ratios Based on 2016 Statistics

Country/Prefecture	Area (km^2)	Road Length (km) *1	Road Ratio (km/km2)
Bhutan	38,390	4,062	0.105
Japan	377,972	184,928	0.489
Nagano	13,562	5,589	0.412

Note: Road length (Bhutan: Asian Highway, PNH, SNH, Dzongkhag Roads; Japan/Nagano: National and Prefectural Roads)

Source: Bhutan, Review of the RSMP 2007-2027; Japan/Nagano, Ministry of Land and Transport Japan

Figure 5.3.6 shows existing the condition of PNH and SNH based on a site investigation in April 2017.
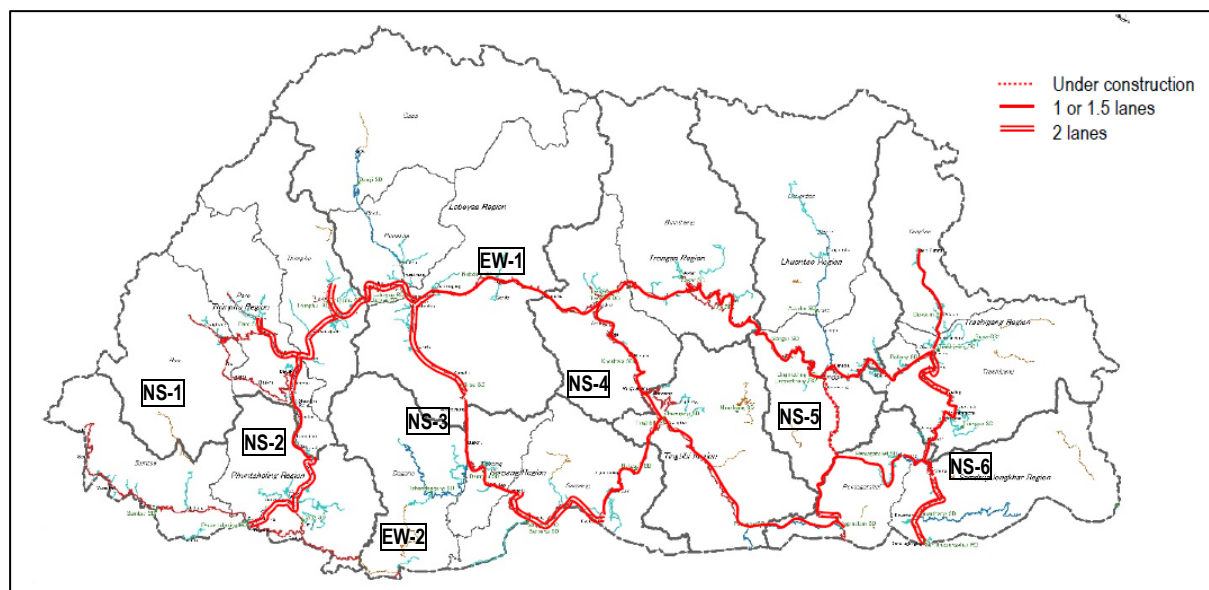
Figure 5.3.6   Existing Condition of PHN and SHN

(3) Current Road Financing

Table 5.3.6 shows the division of roles related to road development, including the financing, administration and implementation of each road category based on an interview survey of the DoR and the Dzongkhag Administrations. The DoR is responsible for the implementation of some Dzongkhag roads, farm roads and access roads.

Table 5.3.6   Division of Roles for Road Development, Including Finance, Administration and Implementation

No.	Categories		Source of Funding	Administration	Implementation
1	National Highways	Asian Highway (AH 48 Class II, Phuentsholing - Thimphu Highway)	MoWHS /GoI	DoR	DoR
		Primary National Highway (PNH)			
		Secondary National Highway (SNH)			
2	Dzongkhag Roads		Dzongkhag/ MoWHS	Dzongkhag Administrations	Dzongkhag Administrations/DoR
3	Thromde Roads		Thromde/ MoWHS	Thromde Administrations	Thromde Administrations
4	Farm Roads		MoAF /GoI	Dzongkhag/Gewog Administrations	Dzongkhag/Gewog Administrations/DoR
5	Access Roads		Dzongkhag/ MoWHS	Dzongkhag Administrations	Dzongkhag Administrations/DoR

Source: Interview Survey of the DoR and Dzongkhag Administrations

(4) Road Development Policy and Plan

The development of modern roads started in 1961, when the First Five-Year Plan was formulated in Bhutan. The Five-Year Plans have been updated periodically, including the road development plan. Supplementing the Five-Year Plans, national policies and the vision for the road transport sector have been provided by the RGoB, as shown in Table 5.3.7.

Table 5.3.7   National Policies and Vision for the Road Transport Sector in Bhutan

Provided Year	Policies and Vision	Coverage
1961 – 2013	Five-Year Plan (First to 11th)	Multiple Sectors
1999	Bhutan 2020	Multiple Sectors
2006	Road Sector Master Plan (RSMP) (2007-2027)	Road Transport Sector
2013	Bhutan Transport 2040 Integrated Strategic Vision	Transport Sector

1)   Five-Year Plan

The road network in Bhutan has been being expanded through the implementation of the Five-Year Plan since 1961. Most of the planned primary and secondary national highways, including the East-West highway, were constructed to provide connectivity between major settlements in the country.

The 11th Five-Year Plan is in force from 2013 until 2018, and its main aims for the road sector are:

- Completion of the national highway grid using environmentally-friendly technology
- Construction and upgrading of roads connected to hydropower projects
- Enhancement of the safety, reliability and quality of roads

Major issues for the road sector in the 11th Five-Year Plan were:

- Securing road safety due to an increase in traffic volume
- Ensuring financial sustainability in terms of improving the specifications of existing roads, maintenance costs and the cost of blacktopping cost unpaved roads
- Improving the unpaved roads connected Gewogs with a length of about 2,000 km

The strategies for overcoming the major issues above are proposed below:

- Strengthening the capacity of the road sector to plan, design, build and maintain the road network
- Developing road specifications and standards to improve the geometric design and regular maintenance of roads
- To explore the possibilities of tunnelling certain stretches of the country's highways through PPP projects wherever feasible
- To explore the involvement of the private sector in road maintenance in order to ensure financial sustainability

Table 5.3.8 Key Projects in the 11th Five-Year Plan

Key Project	Contents	Budget (BTN Millions)
Construction and upgrading of the Southern East-West highway	Construction of Sipsu – Jomotsangkha, Gelephu – Panbang, Sarpang – Lhamoizingkha, Deothang – Nganglam and Samrang – Jomotsangkha highways	7,295
Upgrading/improvement of the East-West highway	Upgrading and improvement of the Thimphu – Trashigang highway	1,364
Construction/upgrading of the North-South highways	Construction and upgrading of the Gyalpozhing – Nganglam, Gomphu – Panbang, Gesarling – Lhamoizingkha and Damchu – Chhukha bypass roads	2,964
Construction and upgrading/improvement of roads connecting hydropower projects	Construction and upgrading/improvement of the Mandelpong – Digala, Riphay – Koshala, Tingtibi – Praling and Shazam – Trashiyangtse roads	1,443
Construction of Dzongkhag roads	Construction of ongoing Dzongkhag roads, including the Tsebar – Mikuri – Durungri roads	556

Source: the 11th Five-Year Plan

2) Bhutan 2020

Bhutan 2020 was prepared in 1999 as a vision document providing a comprehensive policy direction for pursuing the country's development process, with the overarching goal of "Gross National Happiness". Most of the salient road sector targets outlined in this document have already been achieved and some are still being pursued.

Bhutan 2020 sets forth the following quantitative targets and strongly promotes road development as a major national project:

- Improvement of arterial roads by 2007 to allow the passage of 30 ton trucks
- Development of a road network by 2012 that can be reached on foot in half a day by 75% of the country's population
- Complete the Southern East-West Highway (about 794 km) by 2017

3) Road Sector Master Plan (RSMP) 2007-2027/Review of the Road Sector Master Plan 2007-2027

The MoWHS prepared the Road Sector Master Plan 2007-2027 in 2006. It is a 20-year planning document to provide guidance to planners in the development of Bhutan's road transport network. The Master Plan consists of road network expansion, road realignment, tunnelling, roads for inter-Dzongkhag connectivity and the Southern East-West Highway.

The Road Act of Bhutan 2013, which was enacted in 2013, required the periodical review of the RSMP every 10 years and the first review was undertaken in the "Review of the Road Sector Master Plan 2007-2027" in 2016. An action plan for the next 10 years (from 2017) has been proposed based on this review.

The RSMP proposed a detailed tunnel plan, as shown in Table 5.3.9, and the updated tunnel plan is shown in the Review of the Road Sector Master Plan, as shown in Table 5.3.10.

Table 5.3.9   Proposed Tunnel Plan by RSMP

Tunnels Between	Name of Existing Road	Priority Ranking**
Thimphu and Paro	TBD*	2
Thimphu and Wangdue	East-West highway	3
Gedu and Ganglakha	Thimphu-Phuentsholing Highway	1
Nobding and Chendebji	East-West highway	4
Dorji Goenpa and Geytsa	East-West highway	5
Gayzamchu and Sengor	East-West highway	6
Kilikhar and Ningala	East-West highway	7
Tama and Surey	Trongsa-Gelephu highway	8
Sunkosh and Sarpang	Wangdue-Sarpang highway	9
Trashigang and S/Jongkhar	T/Gang-S/Jongkhar highway	10

Note: *TBD: To Be Determined   **Based on strategic importance and national assembly decisions
Source: Road Sector Master Plan

Table 5.3.10   Proposed Tunnel Plan in the Review of the RSMP

Tunnel Name/ Section	Length (km)	Proposal	Related Plan
Thomangdrak (Trongsa)	0.82	New construction	Action Plan 2017-2022 Pre-F/S with JICA assistance
Thimphu and Wangdue	TBD*	New construction	Action Plan 2022-2027
Gedu and Ganglakha	10.5	New construction	Action Plan 2022-2027

Note: *TBD: To Be Determined
Source: Review of the RSMP 2007-2027

4)   Bhutan Transport 2040 – Integrated Strategic Vision

In accordance with the "Bhutan Transport 2040 – Integrated Strategic Vision", the development of the road network will be based on one integrated strategy covering all roads (except Thromde roads), from national highways through to Dzongkhag roads, farm roads and access roads. The Road Network Development Strategy covers:

- National highways (both PNH and SNH), which provide connections to border crossings and links to all Dzongkhag headquarters;
- Dzongkhag roads, which provide access to all Gewogs in a given Dzongkhag, as well as major villages;
- Farm roads, which provide access to individual communities not served by other roads; and
- Access roads, which provide access to hydropower plants, schools, health facilities, forest land and others.

Based on the above strategies, the following six activities have been proposed as important actions:

- The widening of the existing East–West highway (and other key routes) to two lanes, with alignment improvements to reduce travel times and to enhance safety;
- The completion of the Southern East–West highway by upgrading existing routes and undertaking the construction of new roads to connect new industrial growth centres;
- The construction of new alignments and diversions, including tunnels and viaducts, on key routes to reduce distances and allow the driver to increase their speed and/or travel in more comfort;

- The improvement of access routes between industrial centres and major border crossings, including the existing North–South highway;
- The introduction of improved engineering and construction technology to reduce overall lifecycle costs and provide better pavement quality; and
- The establishment of a maintenance regimen for all national highways and Dzongkhag roads, including pavement management systems and performance contracts.

In accordance with Bhutan Transport 2040, the following road improvements have been undertaken to reduce travel time and enhance safety:

- The expansion of the East-West highway into two lanes, to be completed by December 2017.
- The widening of the Thimphu-Phuentsholing highway (AH 48), which has now been completed and upgraded to Asian Highway Class II.
- The widening of the Samdrupjongkhar-Trashigang highway is currently in progress.
- The introduction of thicker road pavement to enhance durability and driving comfort and to reduce lifecycle costs.
- Manual road construction methods are being replaced with semi or fully mechanized methods.
- Conventional road construction methods are being replaced with more sustainable EFRC (Environmentally-Friendly Road Construction) methods.

5.3.2 Air Transport Network

(1) Air Transport Administration

The Department of Air Transport (DoAT), which is a department under the Ministry of Information and Communications (MoIC), was formally established in 1986 as Department of Civil Aviation and bifurcated in 2015 as DoAT and Bhutan Civil Aviation Authority (BCAA). The DoAT is responsible for accelerating integrated development, expansion and modernisation of air traffic services, passenger terminals, operational areas and cargo facilities at the airports across the country.
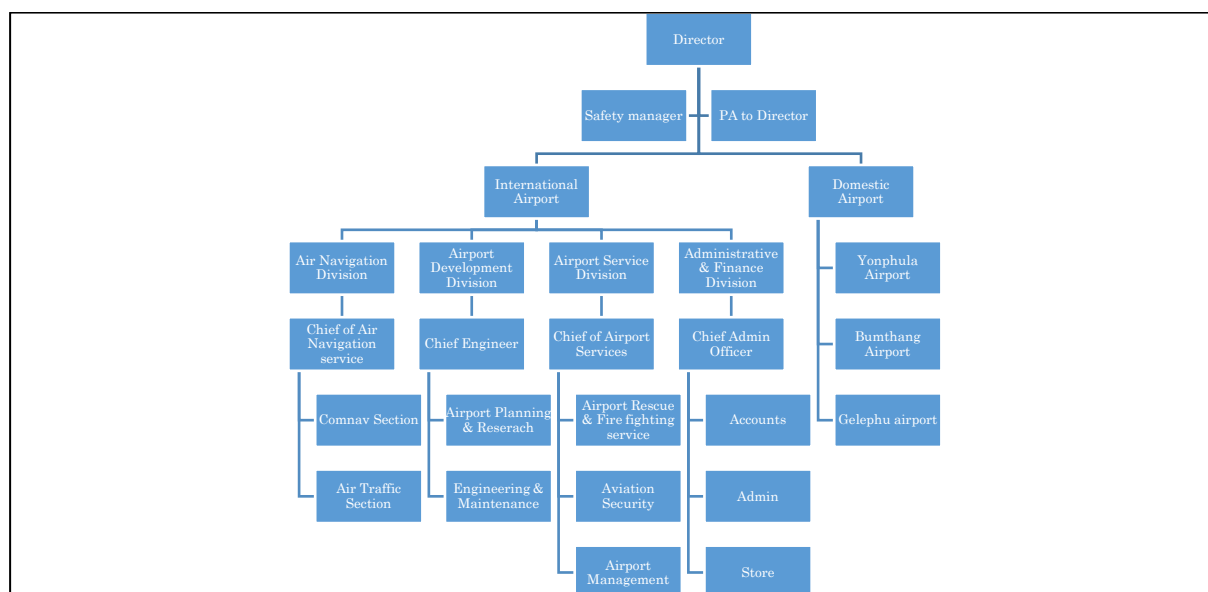
Source: Department of Air Transport website

Figure 5.3.7 Organization of the Department of Air Transport

(2) Air Transport System

1) Airports

There is one international/domestic airport and three domestic airports in Bhutan. An outline of these airports is shown in Table 5.3.11.

Table 5.3.11   Outline of Airports in Bhutan

Airport Name	Paro	Bumthang	Gelephu	Yonphula
Type	International/Domestic	Domestic	Domestic	Domestic
Location	Paro	Bumthang Dzongkhag	Gelephu, Sarpang Dzongkhag	Trashigang Dzongkhag
Elevation	2,235 m	2,637 m	300 m	2,750 m
Runway	2,265 m × 30 m	1,200 m	1,500 m	Under construction
Facilities	Passenger Terminal (5,500 m^2) ATC (Air Traffic Control) System	Passenger Terminal (145 m^2)	Passenger Terminal	Passenger Terminal (145 m^2)

Source: Air Transport Connectivity Enhancement Project 2012, ADB

Yonphula airport was upgraded, as shown in Figure 5.3.8, and it started operating in 2017.


North-West from centre of runway	South-East from centre of runway	Terminal

Figure 5.3.8   Yonphula Airport (Under Construction as of 11 April 2017)

2) Existing aviation network

Domestic scheduled flights have been operating along four routes since 2011, as shown in Figure 5.3.9. The route between Paro and Yonphula is operational after the upgrading of Yonphula airport.
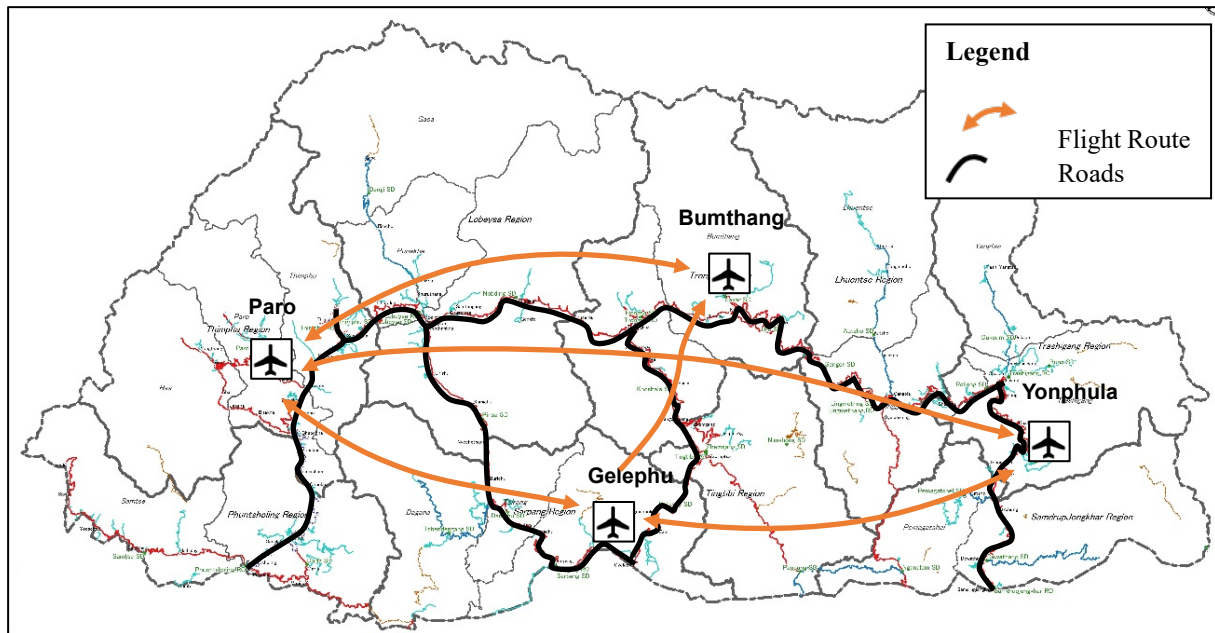
Figure 5.3.9   Domestic Aviation Network in Bhutan

The total number of international passengers was 204,746 in 2015 and the annual passenger growth rate was 5.3% between 2011 and 2015, as shown in Table 5.3.12. Meanwhile, the total number of domestic passengers was only 4,676, since the operation of domestic aviation services only commenced in 2011; its annual average growth rate was 30% between 2013 and 2015.

Table 5.3.12   Number of Passengers Using International and Domestic Aviation Services

Area of Operation	2011	2012	2013	2014	2015	Annual Growth	Remarks
International	166,264	193,405	208,125	210,338	204,746	5.3%	2011-2015
Domestic	60	878	2,766	3,007	4,676	30.0%	2013-2015
Paro - Bumthang	23	271	990	1,363	2,032		
Bumthang - Paro	21	388	1,410	1,644	2,600		
Paro - Gelephu	NR	NR	21	NR	33		
Gelephu - Paro	NR	NR	20	NR	11		
Paro - Yonphula	6	120	175	NR	NR		
Yonphula - Paro	10	99	150	NR	NR		

Note: NR=No Record
Source: Statistical Yearbook of Bhutan 2016

The total number of international flights was 5,238 in 2015 and the average annual growth rate was 8.3% between 2011 and 2015, as shown in Table 5.3.13. Meanwhile, the total number of domestic flights was only 295 and the annual average growth rate was 1.9% between 2013 and 2015.

Table 5.3.13   Number of International and Domestic Flights

Area of Operation	2011	2012	2013	2014	2015	Annual Growth	Remarks
International	3,810	4,382	4,683	4,997	5,238	8.3%	2011-2015
Domestic	8	148	284	263	295	1.9%	2013-2015
Paro - Bumthang	3	56	118	132	142		
Bumthang - Paro	3	56	118	131	144		
Paro - Gelephu			1		3		
Gelephu - Paro			1		3		
Gelephu - Bumthang					3		
Paro - Yonphula	1	18	23				
Yonphula - Paro	1	18	23				

Source: Statistical Yearbook of Bhutan 2016

(3) Airport Development Policy and Plan

1)   The Five-Year Plan

The 11th Five-Year plan points out the major issues for the airport sector, below:

- The capacity of Paro airport to take on double the number of passengers, flights and air cargo.
- The conflicting functions of regulation and implementation being carried out by the Department of Civil Aviation.

The strategies proposed to overcome the major issues above are:

- The expansion of infrastructure facilities and the upgrading of security and navigational equipment to increase the capacity of Paro airport to handle more passengers, cargo and flights.
- A feasibility study of the upgrading of Gelephu to an international airport.
- Improvements to the three domestic airports to enhance safety and reliability and to facilitate increased domestic air transport.
- An exploration of ways to ensure the greater independence and autonomy of the Department of Civil Aviation.
- A review and strengthening of legal and policy instruments.

2)   Bhutan Transport 2040 - Integrated Strategic Vision

In accordance with the Bhutan Transport 2040 - Integrated Strategic Vision, the expansion and upgrading of the existing facilities at Paro airport, as well as at domestic airports in other parts of the country, will be required to attract tourists from neighbouring countries and to boost economic and commercial activities.

The introduction of domestic aviation services is proposed as a key element in the Government's strategy to promote development and integrate the remote eastern and southern Dzongkhags into the economic mainstream. Strategies for the aviation sector are proposed below:

- The expansion of international links with other Asian hubs and regional centres.
- The provision of air carrier services and airport facilities sufficient to meet growth targets.
- The availability of domestic scheduled services to link the main population centres.

- The construction of airstrips in remote areas for short take-offs and landings and helicopter services.
- The provision of helicopter services for search and rescue, emergencies and charter services.
- Private sector participation in services and facilities.
- The effective regulation of and compliance with international safety and environmental standards.

(4) Surface Transport

The number of vehicles in Bhutan has gradually increased, especially in urban areas. In accordance with the increase in vehicle numbers, road traffic accidents have also increased.

Table 5.3.14   Surface Transport in 2015

Vehicle Data	2014	2015
Number of vehicles	69,602	75,190
Number of taxis	4,109	3,939
Number of motor vehicles crashes	791	715
Number of deaths due to vehicle crashes	76	99
Number of injuries due to vehicle crashes	426	373

Source: Annual Info-Comm and Transport Statistical Bulletin, 2015

5.4   Information and Communication Network

The expansion and improvement of the Information, Communication and Technology (ICT) network will be an effective means of connecting people, since each region of Bhutan is isolated by mountainous terrain and valleys. Additionally, ICT and the media play an essential role in developing more open, just and democratic societies. It is a key issue for encouraging people and enhancing transparency, accountability and good governance. The right to information, as stipulated under the Constitution, is a fundamental right of every Bhutanese citizen. Bhutan has formulated the e-Government Master Plan, which aims to provide public services through the ICT infrastructure to both urban and rural areas. Figure 5.4.1, below, shows the fibre network in Bhutan.
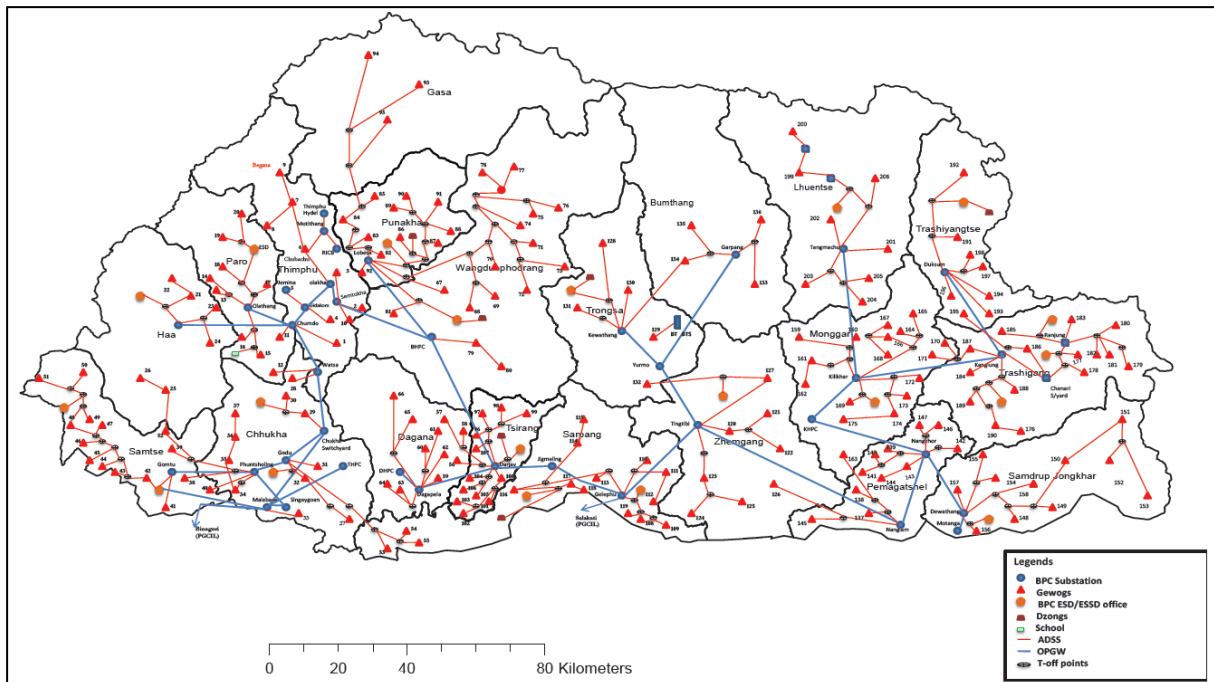
Source: National Fibre Network Map

Figure 5.4.1   National Fibre Network Map

(1) ICT

National Broadband Master Plan Implementation Project connects 20 districts and 201 blocks with high speed fibre optics networks. There are currently fibres in all 20 Dzongkhags and all 205 Gewogs, owing to the implementation of the e-Government Master Plan. National Broadband Master Plan Implementation Project is carried as per the Bhutan Information Policy and Strategy document and National Broadband Master Plan document drafted in 2006-2007. Internet subscribers have continuously increased, reaching 455,656 in 2015. Similarly, mobile cellular subscribers have increased, while fixed line telephone subscribers have decreased. All Dzongkhag headquarters have a basic ICT infrastructure, such as fixed line connections and access to mobile services. All 205 Gewogs have mobile network access. As a result, ICT development in Bhutan has progressed.

However, the development of the ICT network has drastically changed Bhutan's society and lifestyle from traditional to modern. In 2003, mobile phone services were launched and then spread across the country. Mobile telephony has become fixed as a communication tool, even in rural areas.

Table 5.4.1   Key ICT Indicators in 2015

Sector	Data	Note
Number of Internet subscribers	455,656	349,116 in 2014
Number of fixed line telephone subscribers	21,811	23,823 in 2014
Number of Dzongkhag HQs with fixed line connections	All 20 Dzongkhags	
Number of mobile cellular subscribers	675,747	628,289 in 2014
Population with access to mobile services (%)	87.06	84.32 in 2014
Number of Dzongkhag HQs with access to mobile network services	All 20 Dzongkhags	
Number of Gewog HQs with access to mobile network services	All 205 Gewogs	

Source: Annual Info-Comm and Transport Statistical Bulletin 2015

Ministry of Information and Communication manages a long-distance backbone network in Bhutan. The network using optical fibers connect Thimphu and the other Dzongkhag capitals in a loop. MoIC has allocated one core of each of these optical fibers to Bhutan Telecom Limited (BTL) and TashiCell. The maximum transmission capacity is 320 gigabits capable for 5 million telephone circuits. BTL is a joint-stock company converted from a supplier of telecommunications services under MoIC and had the largest market share of 72% in terms of the number of mobile phone subscribers in 2015. Using these optical fibers, BTL connects intra-city access networks to provide a fixed-line and mobile phone services by connecting a mobile core system installed in Thimphu with mobile phone base stations installed all over Bhutan. Figure 5.4.2 depicts the backbone network used by BTL.
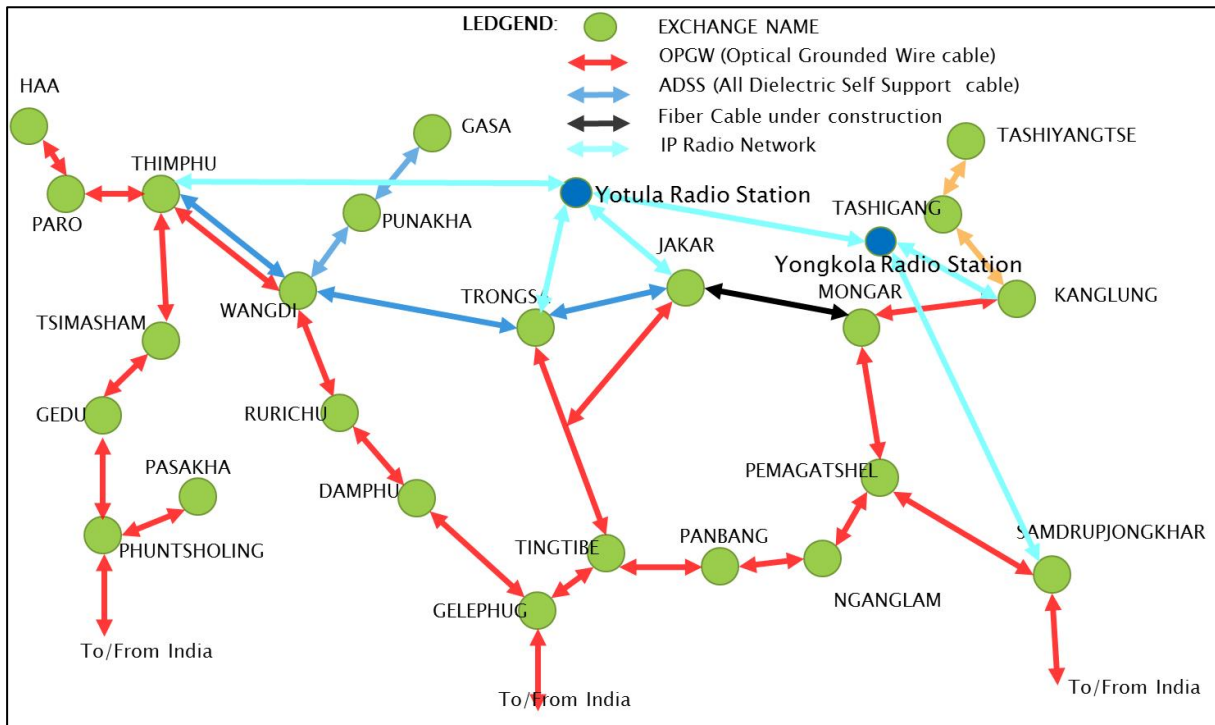
Source: The Project for Building the Disaster Resilient Emergency Mobile Network

Figure 5.4.2   Backbone Networks of BTL

BTL has installed a mobile core system in Thimphu to monitor and control communication services to mobile phone users nationwide. All mobile phone services provided by BTL may suffer a system failure if a disaster strikes and severely damages Thimphu. BTL is planning to build a disaster-resistant communications network by ensuring a redundant configuration by means of the installation of other mobile core system and by dispersing the mobile core systems so that communication is possible during emergencies. Jakar, Dzongkhag capital of Bumthang, is the candidate site for a new core system where BTL has an exchange office. The existing mobile communications facilities and equipment operated by BTL are shown in Figure 5.4.3. A mobile switching center and ancillary equipment need to be installed in Jakar as highlighted orange. In order to make transmission links between BTL headquarters in Thimphu and Jakar exchange office more reliable, the link should be improved in loop shape.
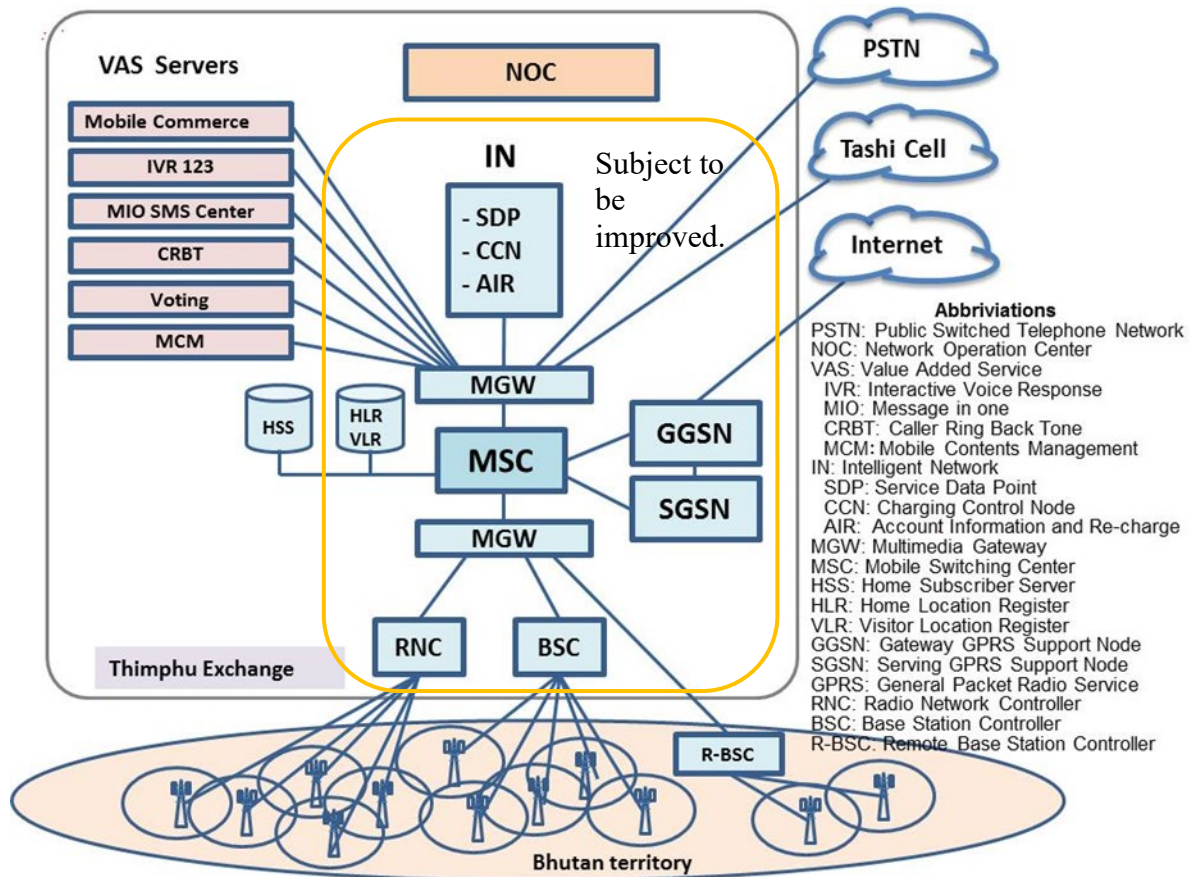
Source: The Project for Building the Disaster Resilient Emergency Mobile Network

Figure 5.4.3 Configuration of Existing Mobile Communications Facilities and Equipment Operated by BTL

(2) Information and Media

Table 5.4.2, below, summarizes the situation of information and the media, such as television stations, radio stations, newspapers, magazines and films currently being produced. It is worth noting that 19 films were produced and released in 2014.

Table 5.4.2 Statistics on Information and the Media in 2015

Sector	Data	Note
Number of television stations	1 (BBS Channel 1 and Channel 2)	
Number of radio stations	11 (including community and radio campus)	
Number of newspapers	8	
Number of magazines	4	6 in 2014
Number of films produced and released in 2014	23	

Source: Annual Info-Comm and Transport Statistical Bulletin 2015

(3) Organization

1) Department of Information Technology and Telecom

The Department of Information Technology and Telecom (DITT), which falls under the Ministry of Information and Communications (MoIC), is the leading department for promoting ICT in the country as an enabler of national development. It ensures the creation of an enabling environment for the ICT sector.

2)   Private sector

Bhutan Telecom Ltd (BTL), Tashi InfoComm Ltd. (TICL) and Drukcom are the three licensed Internet service providers in the country. Apart from Bhutan Telecom, both of the other internet service providers are private sector venture. Bhutan Telecom Ltd. is the sole provider of fixed line telecommunication services, while mobile telephony services are provided by B-Mobile (Bhutan Telecom Ltd.) and TashiCell (Tashi InfoComm Ltd.).

(4) Acts and Policies

1)   Act

The Bhutan Information, Communication and Media Act 2006 provides the overall legal framework for the development of the ICT and media sector. The Act is being revised to incorporate provisions on cyber security, data protection, privacy, broadcasting, etc. Furthermore, the e-Government Master Plan, the Telecom and Broadband Policy and the Film Policy are approved. The Media Policy and the Advertisement Policy have been submitted to the RGoB.

2)   e-Government Master Plan

The MoIC has embarked on the development of Bhutan's first e-Government Master Plan, building on existing ICT policies and strategies, including the ICT Roadmap which has been aligned with the country's overall ICT vision. The **e-Government Master Plan** seeks use ICT to drive social and economic development in the 11th Five-Year Plan. It provides a coherent and holistic view of the ICT strategies, initiatives and projects that the RGoB will undertake over the next five years.

3)   Revised ICT Roadmap

The RGoB formulated the Bhutan ICT Roadmap in 2011 and revised it in 2015 in recognition of the value that ICT can bring to social and economic development, guided by the values of Gross National Happiness. The vision is "an ICT-enabled knowledge society as a foundation for Gross National Happiness".

## 5.5   Electric Power Network

(1) Basic Information

Electricity in Bhutan is almost all generated by hydropower. Bhutan's total hydropower potential is recognized as being 30,000 MW. An economically viable power output is seen as being 23,500 MW out of the total potential. Almost all areas in Bhutan, including rural areas, have access to both grid and off-grid electricity. Currently, existing hydropower stations generate around 1,600 MW. The total generation capacity of the hydropower stations currently under construction will be around 3,600 MW. The country's existing transmission lines, of 66 KV and above, are 1,015.3 km in length.

The RGoB has incorporated the key programme "Accelerated Hydropower Generation and Transmission Network Strengthening" into the 11th Five-Year Plan. The major activities of this programme include studying new hydropower projects and constructing new system infrastructure, new transmission lines and associated substations. Operational hydropower stations, stations under construction, hydropower projects in the pipeline and power transmission system are summarized in Figure 5.5.1 to 5.5.3 and Table 5.5.1 to 5.5.3, below.
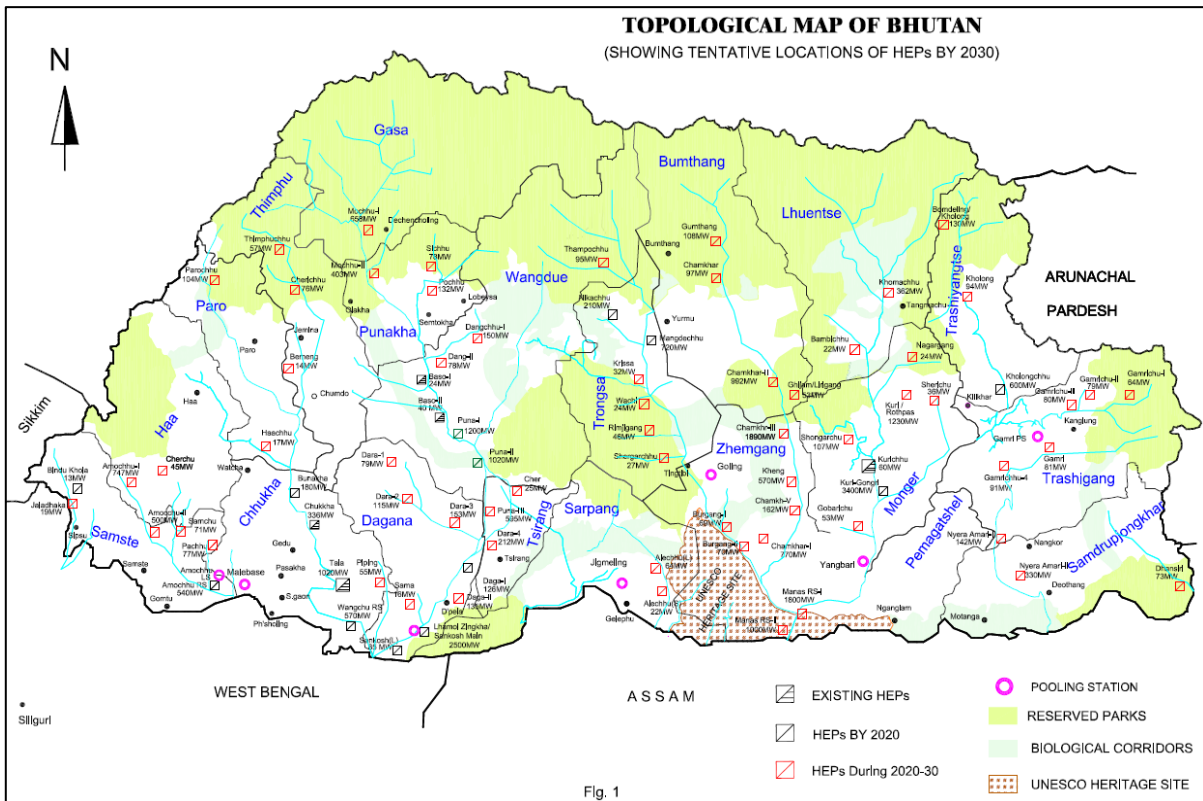
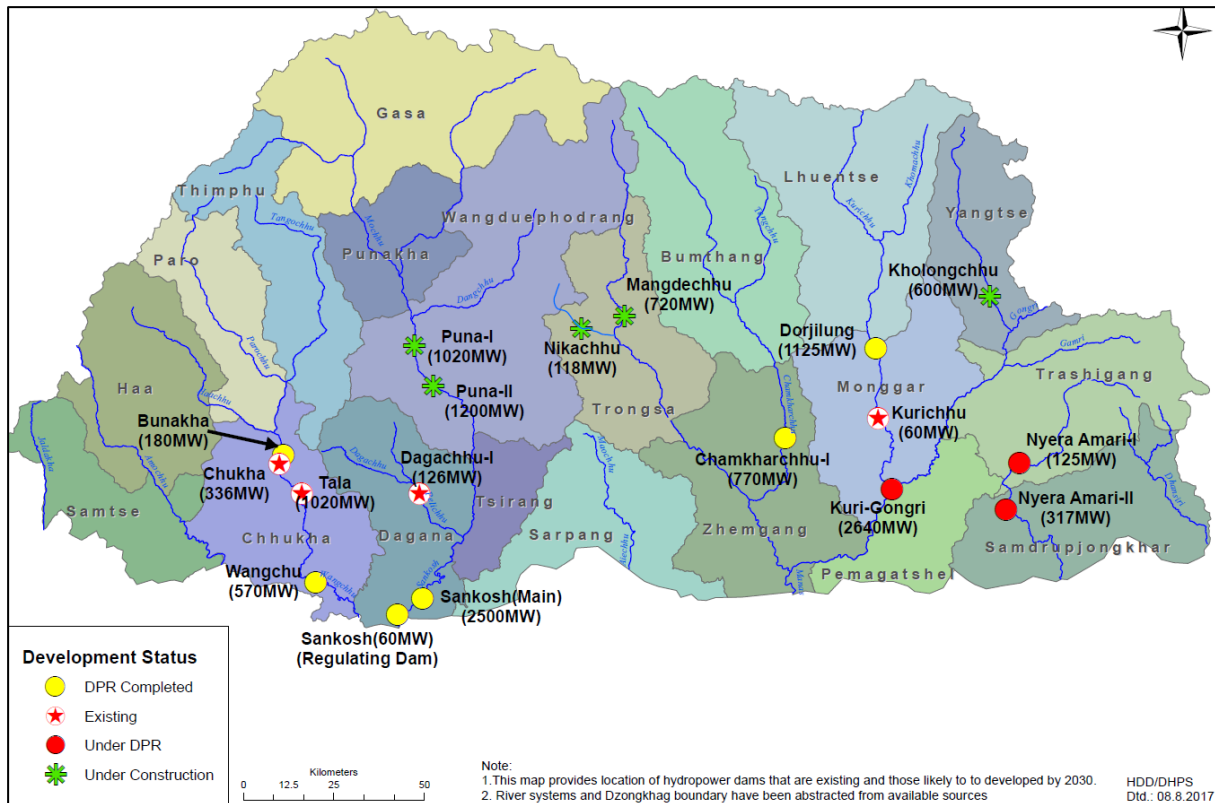Source: National Transmission Grid Master Plan for Bhutan

Figure 5.5.1 Topological Map of Hydropower Projects
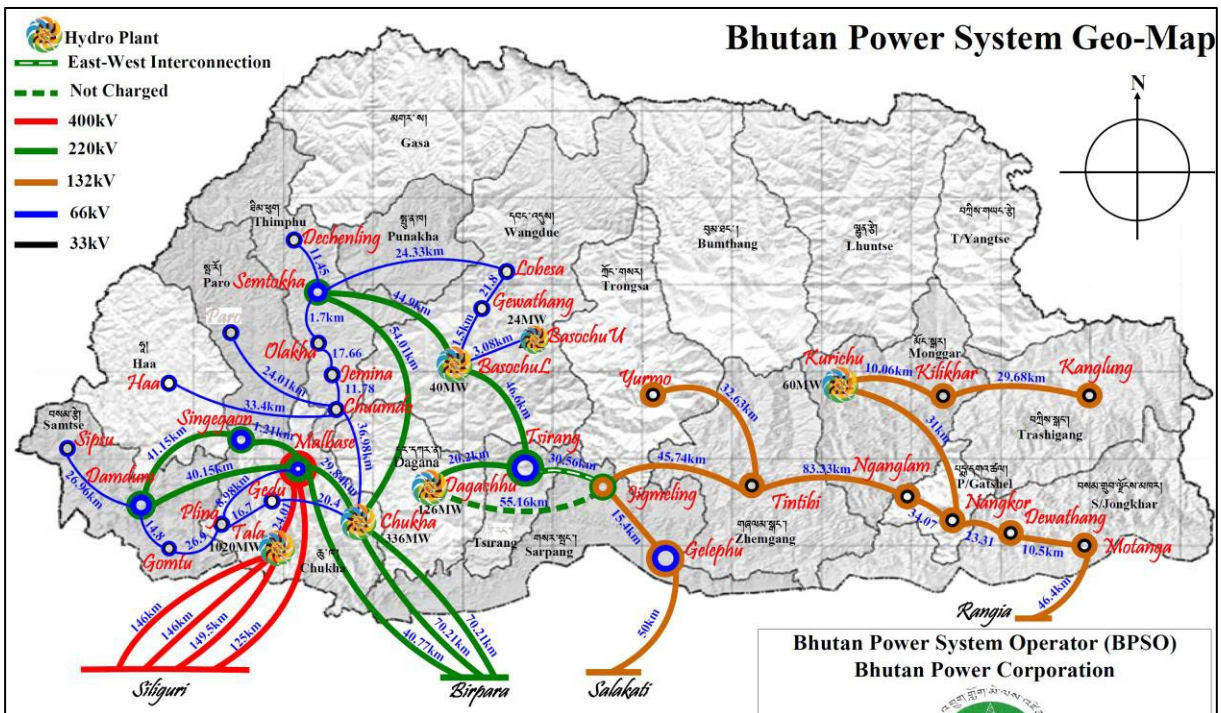
Source: Bhutan Power Corportion

Figure 5.5.2 Current Power Transmission System

Source: Based on information from Bhutan Power Cooperation and the Department of Hydropower and Power Systems, Ministry of Economic Affairs

Figure 5.5.3   Hydropower Plants by Development Status

Table 5.5.1   Operational Hydropower Stations

No	Name	Capacity (MW)	Start (Year)	Completion (Year)	Development Model
1	Tala	1,020	1997	2007	Government of India
2	Chhukha	336	1974	1988	Government of India
3	Dagachhu	126	2009	2015	Public-private partnership (PPP)
4	Basochhu	64	1997	2001	Austrian Government
5	Kurichhu	60	1995	2001	Government of India

Source: Department of Hydropower and Power Systems, Ministry of Economic Affairs

Table 5.5.2   Hydropower Stations Under Construction

No	Name	Capacity (MW)	Start (Year)	Completion (Year)	Development Model
1	Punatsangchhu I	1,200	2008	2021	Government of India
2	Punatsangchhu II	1,020	2011	2020	Government of India
3	Mangdichhu	720	2011	2018	Government of India
4	Kholongchhu	600	2015	2023	Joint Venture(JV) (India and Bhutan)
5	Nikachhu	118	2015	2022	PPP

Source: Department of Hydropower and Power Systems, Ministry of Economic Affairs

Table 5.5.3   Hydropower Stations Projects in the Pipeline

No	Name	Capacity (MW)	Cons Date	Com Date	Development Model
1	Bunakha	180	2015	2021	JV (India and Bhutan)
2	Chamkharchhu	770	2016	2025	JV (India and Bhutan)
3	Wangchhu	570	2016	2022	JV (India and Bhutan)
4	Sankosh Storage	2,560	2017	2025	Government of India

Source: Department of Hydropower and Power Systems, Ministry of Economic Affairs

(2) Trend of Hydropower Generation of Bhutan

1)   Current demand and supply situation in Bhutan

The total amount of hydropower generation in 2015 was 7,731 GWh, of which 1,984 GWh was for the domestic supply and 5,542 GWh was exported to India. The domestic supply demand showed an increase of around 10% on average, while the increase in exports to India was around 3%. Bhutan imported 158 GWh at the same time due to the lack of capacity for peak electricity demand in the dry season, in particular, between 18:00 and 19:00 from the end of October to the end of December.

Table 5.5.4   Trend of Electricity Demand, Supply and Trade with India from 2008 to 2015

Particulars	2008	2009	2010	2011	2012	2013	2014	2015
Gross Generation (GWh)	7,135	6,898	7,305	7,046	6,811	7,531	7,147	7,731
Sale to Bhutan Power Cooperation (GWh)	1,125	1,414	1,628	1,689	1,779	1,794	1,877	1,984
	16.0%	20.7%	22.6%	24.3%	26.7%	24.4%	27.1%	26.4%
Export to India (GWh)	5,922	5,405	5,579	5,273	4,896	5,558	5,044	5,542
	84.0%	79.3%	77.4%	75.7%	73.3%	75.6%	72.9%	73.6%
Total Energy Supply (GWh)	7,047	6,819	7,208	6,962	6,675	7,351	6,921	7,525
Import from India (GWh)	--	--	--	--	56	108	187	158
Total Sale to BPC (GWh)	1,125	1,414	1,628	1,689	1,835	1,902	2,064	2,142

Source: Detailed Planning Survey on the Project for the Formulation of Electricity Development Master Plan for Bhutan 2040

The unit cost of export tariff for India is shown in the table below.

Table 5.5.5   Unit Cost of Export Tariff for India

Hydropower	Completion year	Unit cost (Nu/Unit)
Chhukha	1988	2.25
Kurichhu	2001	1.80
Tala	2007	1.80
Dagachhu	2015	2.90

Source：Annual Report 2015-16, Royal Monetary Authority

(3) Situation of Power Sector in India

1)   Current situation of the electricity sector in India

The table below shows the recent electricity demand and supply situation in India. The capacity for power generation cannot meet peak demand although the gap has been narrowed.

Table 5.5.6   Trend of Electricity Demand and Supply in India

Period	Peak Demand (MW)	Peak Met (MW)	Peak Deficit/Surplus (MW) (-/+)	Peak Deficit Surplus (%) (-/+)	Energy Requirement (MU)	Energy Availability (MU)	Energy Deficit/Surplus (MU) (-/+)	Energy Deficit/Surplus (%) (-/+)
2012-13	135,453	123,294	-12,159	-9.0	998,114	911,209	-86,905	-8.7
2013-14	135,918	129,815	-6,103	-4.5	1,002,257	959,829	-42,428	-4.2
2014-15	148,166	141,160	-7,006	-4.7	1,068,943	1,030,800	-38,143	-3.6
2015-16	153,366	148,463	-4,903	-3.2	1,114,408	1,090,850	-23,558	-2.1

Source : Draft National Electricity Plan in India

2)   Plan for additional power capacity

The main installed capacities comprise hydropower, nuclear, gas, coal, renewable energy and diesel. In response to the international trend for CO_2 reduction, India will focus more on renewable energy. India has also taken measures to not only increase the capacity of power generation but also control demand.

Table 5.5.7   Plan of Additional Capacity of Power

Type	Installed Capacity (MW)	Likely Addition from 2017 to 2022(MW)	Likely Addition from 2022 to 2027(MW)	Remarks
Hydropower	42,780	15,330	12,000	Currently, 50% of the total potential developed
Nuclear	5,780	2,800	4,800	20 stations are operating
Gas	24,510	43,400 (Construction)	0	Lack of capacity of generation due to increasing demand
Coal	185,172	0	46,000	Main source of power in India
Renewable Energy	42,849	175,000	275,000	Future main sources of power such as solar, biomass and wind
Diesel	993	n.a.	n.a.	

Source : Draft National Electricity Plan in India

3)   Export and import plan with neighbouring countries

In addition to the generation capacity increase plan, India has an export and import plan with Bangladesh, Nepal, Pakistan and Bhutan. By 2026, India plans to import 14,000 MW of electricity in total from Bhutan.

Table 5.5.8   Export and Import Plan with Neighbouring Countries by 2026

	Bangladesh	Nepal	Pakistan	Bhutan	Total
Export	1,500	400	500	0	2,400
Import	0	10,000	0	14,000	24,000
Net Imports					21,600

Source : Draft National Electricity Plan in India

4)   Peak demand and power requirement in Eastern region and North-Eastern region in India

The Eastern and North-eastern Regions can meet the peak demand for electricity. In particular, the North-eastern Region is landlocked and experiencing slow growth. Strategies have been formulated for the removal of infrastructure bottlenecks including the generation of electricity.

Table 5.5.9   Export and Import Plan with Neighbouring Countries from 2015 to 2016

Region	Power Requirement (MU)	Power Availability (MU)	Surplus (MU)	Peak Demand (MW)	Peak Capacity (MW)	Surplus (MW)
Eastern	103,522	102,748	-774	18,076	17,972	-104
North-Eastern	12,180	11,485	-695	2,573	2,356	-217

Source: Power Supply Master Plan in India

(4) Estimated Power Demand and Capacity in Bangladesh

According to the Power Supply Master Plan of Bangladesh, it is predicted that there will be surplus power demand in relation to peak demand and capacity in 2025 and thereafter. The master plan suggests an interconnected system between Bangladesh, Nepal and Bhutan passing through India.

Table 5.5.10   Estimated Power Demand and Capacity in Bangladesh

	Unit	2016	2020	2025	2030
Peak Demand	MW	11,405	17,304	29,717	38,685
Capacity	MW	14,943	22,509	25,199	33,708
Surplus	MW	3,538	5,205	-4,518	-4,977

Source: Power Supply Master Plan 2010, Bangladesh

(5) Development Plan of Transmission Line to Neighbouring Countries

When electricity from Bhutan's hydropower stations is sent to other countries, all transmission should be transferred via the Indian system, indicated by the black line in the figure below. It is extremely difficult to secure a land for the next transmission line from Bhutan to India because of the very narrow area in the West Bengal State of India. Based on the current situation, there is a plan between India and Bangladesh to build a new transmission line via Bangladesh, indicated by the blue line in the figure below. If Bangladesh purchases electricity from Bhutan, Bangladesh will utilize this transmission line and receive electricity via the Barapukuria Sub-station in Bangladesh.
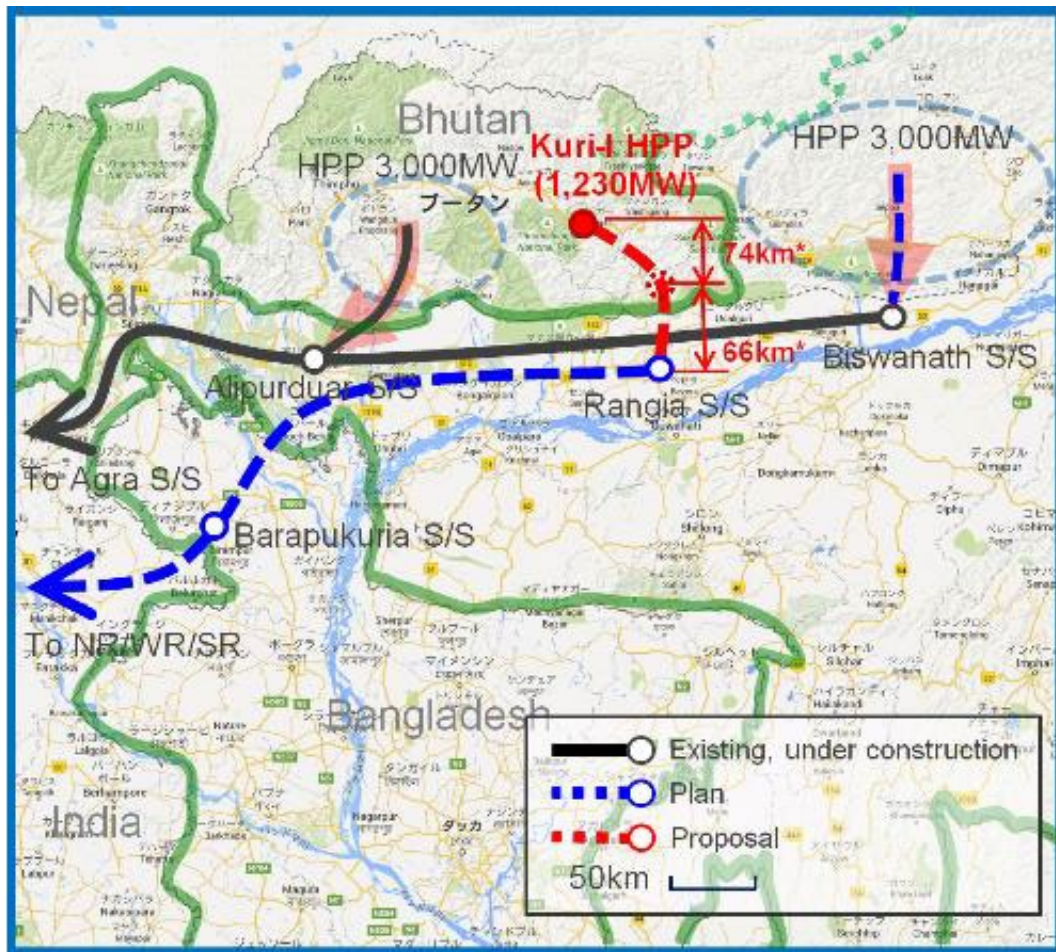
Source: Detailed Planning Survey on the Project for the Formulation of Electricity Development Master
    Plan for Bhutan 2040

Figure 5.5.4   Development Plan of Transmission Line to Neighbouring Countries

(6) Renewable Energy

Renewable energy technologies provide generation facilities such as photovoltaic generation, wind power generation and small-scale hydropower projects. In addition, a programme promoting renewable energy solutions, such as the construction of around 900 biogas plants and 10 solar heating systems, has been implemented.

(7) Mini and Small Hydropower[1]

Mini and small hydropower projects are classified under renewable energy. Before starting to pursue the medium-scale development of hydropower, mini and small-scale hydropower has been the mainstream of hydropower projects since 1967. There are currently 23 mini and small hydropower stations generating 8,068 kW. As a renewable energy, the importance of mini and small hydropower is increasing again and will be developed. Four small-scale hydropower projects are planned to be constructed, according to the Renewable Energy Master Plan 2017-2032.

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[1] Classification of hydropower: mini = installed capacity 1 MW or less; small = installed capacity greater than 1 MW and up to 25 MW; medium = installed capacity greater than 25 MW and up to 150 MW; large: installed capacity greater than 150 MW and up to 1,000 MW.

(8) Electric Power Network

Figure 5.5.2, shows the powerlines and substations in Bhutan. The transmission network in Bhutan is composed of the western and eastern grids, which operate in isolation due to there being no interconnecting line between the two regions. The transmission network in western Bhutan is relatively large compared to eastern grid, with 400 kV, 220 kV and underlying 66 kV systems supplying the load centres. The 220 kV lines were primarily developed to supply power from the Chhukha hydropower project and the Bosochhu-II (Rurichhu) hydropower project. The Chhukha hydropower project supplies three 220 kV circuits from Chhukha to the Indian border.

(9) Electrification Rate

To ensure electricity for all as well as inclusive growth, the Government has actively pursued rural electrification since the Sixth Five-Year Plan (1988-1993). To date 82,270 of the country's households have been electrified out of the total 88,642 households, resulting in an overall electrification coverage of 92.82% as of the 11th Five-Year Plan. According to data from the World Bank, electrification coverage improved by almost 100% in 2014.

(10) Organization

1) Department of Hydropower and Power Systems

The Department of Hydropower and Power Systems (DHPS) under the Ministry of Economic Affairs is responsible for the formulation of the power policy and the development of hydropower. Its missions are as follows:

- To govern and facilitate the integrated, regionally balanced and optimal use of water resources for the development of hydropower with minimal environment impact.
- To ensure that hydropower exports generate maximum national revenue.
- To ensure secure, reliable and affordable energy for domestic consumers.
- To provide an enabling environment for the participation of public and private sectors in the development of hydropower resources.
- To implement institutional reforms for the efficient planning and management of the sector.
- To develop and train professionals in hydropower development and management.

2) Bhutan Electricity Authority

The Bhutan Electricity Authority is an autonomous regulator of the electricity sector. The Authority's function is to develop and implement technical, safety and performance regulations, standards and codes for the sector.

3) Bhutan Power Corporation

The Bhutan Power Corporation is responsible for electricity transmission, distribution and supply functions. The Corporation also manages and operates some embedded generation units, consisting of micro and mini hydro generators and diesel generating units.

4) Druk Green Power Corporation

The Druk Green Power Corporation is responsible for managing all hydropower plants that are fully owned by the Royal Government of Bhutan.

(11) Policy

1) Sustainable Hydropower Development Policy 2008

This Policy was formulated by the DHPS in 2008 to achieve sustainable hydropower development. The Policy recognized the importance of hydropower development for Bhutan. Based on the development plan, the Policy outlined institutional arrangements, project solicitation processes and project investment issues, among other issues.

2) National Transmission Grid Master Plan

The National Transmission Grid Master Plan (NTGMP) was formulated in 2012 by the Central Electricity Authority in India and the RGoB. The NTGMP summarized the system data, such as existing power systems and prospective hydropower projects, the transmission system scenario and the system planning guideline. The NTGMP also suggested the formulation of a National Transmission Grid Master Plan by 2020.

5.6 Natural Disasters

5.6.1 Topographical and Geological Features in Bhutan

Topographical and geological features make Bhutan prone to multiple kinds of disaster, especially earthquakes landslides and floods.

The Bhutan Himalayan area, as well as Pakistan and Nepal, is located in a collision zone between the Eurasian and Indian plates. This collision zone is the world's pre-eminent seismic zone. Therefore, Bhutan has a high risk of earthquakes throughout the country. In particular, the Eastern, South-eastern and South-western Regions are at high risk based on records of seismic centres of past earthquakes.

In terms of topographical features, more than 45% of the national land has a steep pitch with a slope of more than 50%. A big flat area can only be found in Bhutan-Indian border area in the south and Jakar in Bumthang Dzongkhag. A peneplain with a glaciated terrain can be found in the northern area at an altitude of 4,000-4,500 m.

National highways in Bhutan are constructed in precipitous mountains; thus, there are numerous landslide areas and rockfall points. Landslide hazards often occur, especially in the rainy season. Therefore, travelling by road during this season is extremely difficult.
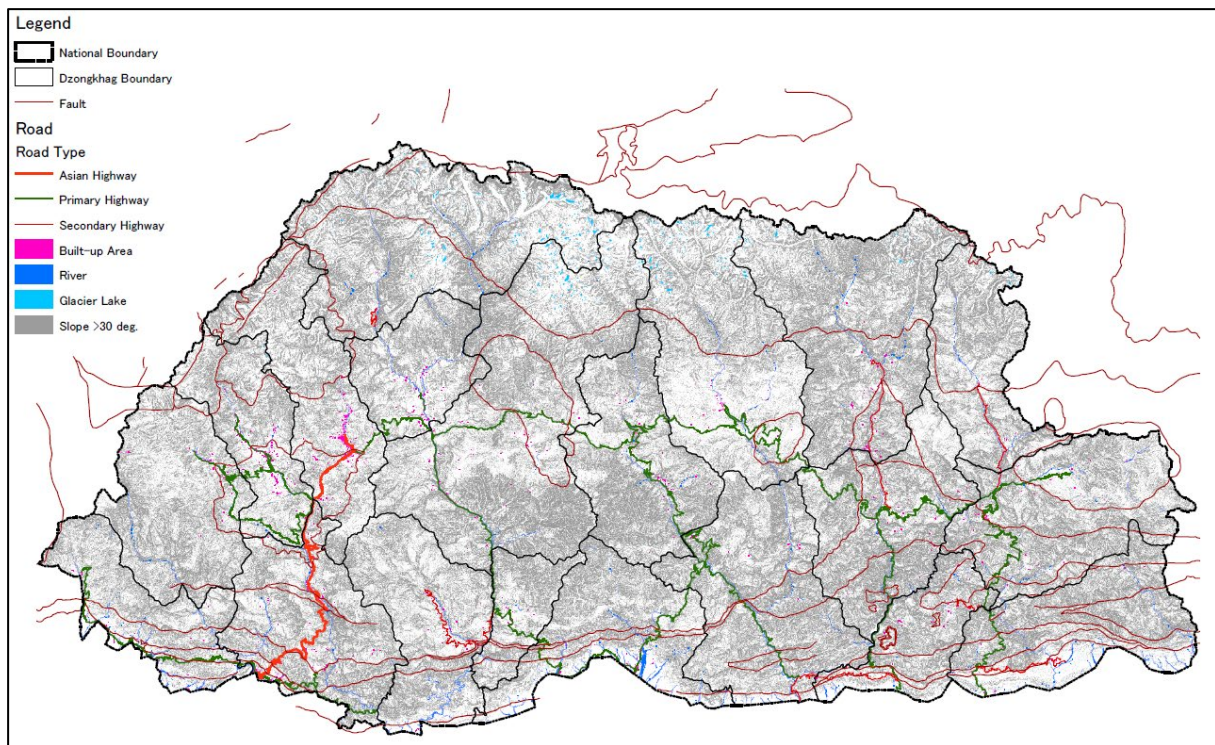
Figure 5.6.1   Slope in National Land of Bhutan (Slope More than 30% Degree)

In terms of geological features, the national land of Bhutan is categorized according to three main ranges: Higher Himalaya, Lower Himalaya and Siwalik. There are two major thrusts in Bhutan: Main Central Thrust (MCT) and Main Boundary Thrust (MBT). Landslides often found on the north-south fault in the Higher Himalaya range, near the MCT and low-grade metamorphic sedimentary rock area in the Lower Himalaya range, and particularly in the area near the Bhutan-Indian border, which does include Siwalik (Samtse, Chhukha and Sarpang). Considering the location of the two major thrusts and the geology, the Southern and Eastern Regions have a higher risk of landslides.
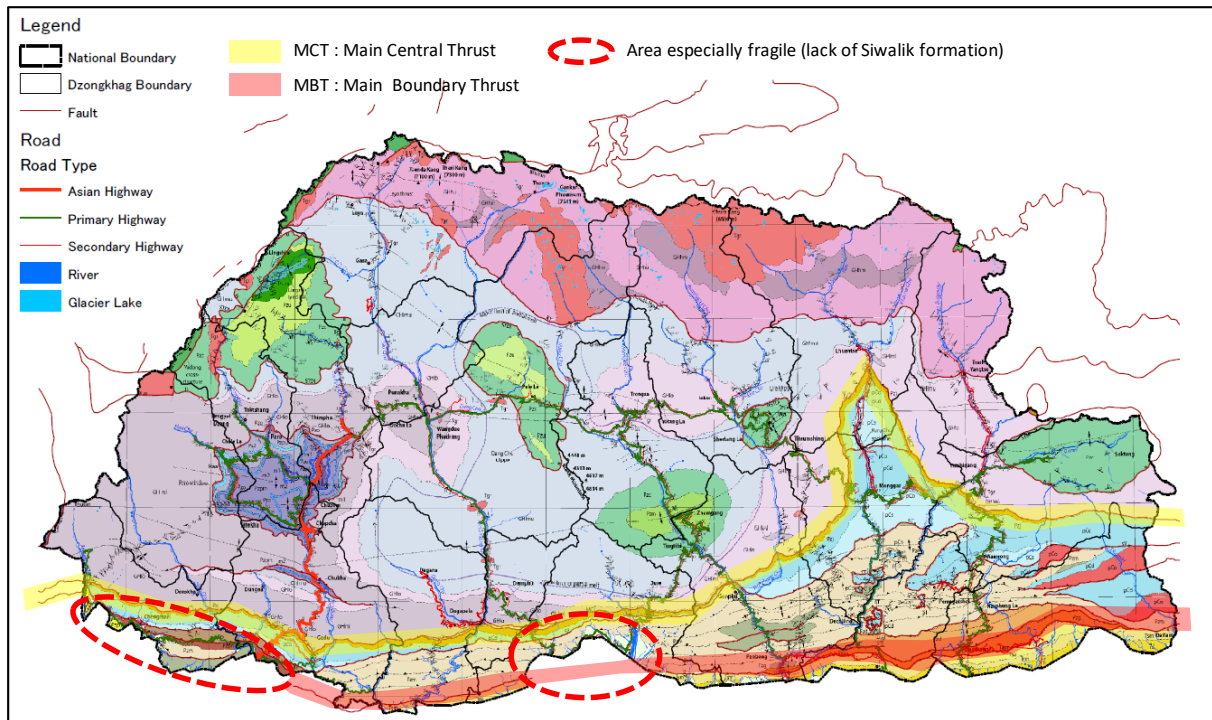
Figure 5.6.2   Geology and Thrust in Bhutan

5.6.2   Past Natural Disasters

Bhutan is prone to many types of natural hazards due to its fragile geological conditions. The country is located in one of the world's most active seismic zones and is composed of steep, precipitous terrain, deep valleys and vast differences in altitude. These natural hazards include earthquakes, windstorms, forest fires, landslides, flash floods, glacial lake outburst floods (GLOF), droughts and outbreaks of pests and other epidemic diseases.

These natural hazards threaten people's lives and property causing the country to experience huge human and economic losses. This section focuses on six major natural hazards.

(1) Earthquakes

Bhutan, as same as Pakistan and Nepal is located at collisional belt of Eurasian plate and Indian plate, which is the world's pre-eminent seismic zone. On collisional belt of Eurasian plate and Indian plate, Pakistan in the west was hit by an earthquake with M7 over in 2005, and Nepal in the central area in 2015. Bhutan in the east had not experienced an earthquake with M7 over during 20th century, although it had M8.3 earthquake in Assam, India in 1897.

However, Bhutan was hit by an inland earthquake with M6.1 having it is epicenter in East Bhutan in 2009 and it brought 12 fatalities, approximately 5,000 damaged houses, 800 damaged traditional buildings, 177 damaged school buildings. In addition, Paro and surrounding West Bhutan had damaged by an earthquake with M6.9 having it is epicenter in Sikkim, India in 2011, which brought approximately 7,000 damaged houses, 36 damaged school buildings, 22 damaged hospitals and 1 fatality by landslide.

It is discussed among professionals that seismic activity in the east area of collisional belt of Eurasian plate and Indian plate might become active.
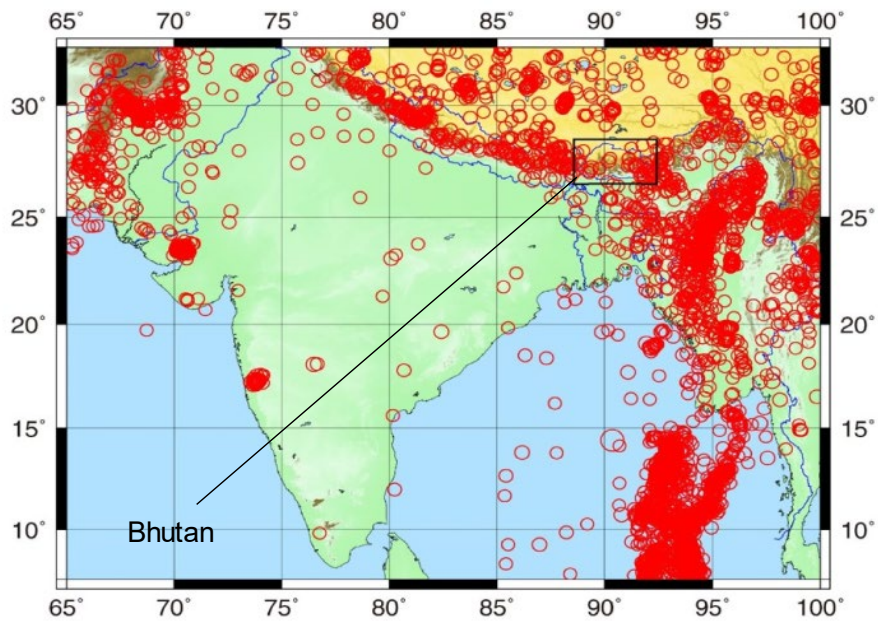
Source: Takayoshi AOKI Laboratory, Nagoya City University

Figure 5.6.3   Epicentres in South Asia after 1960 (more than M5.0) Recorded in ISC Catalogue
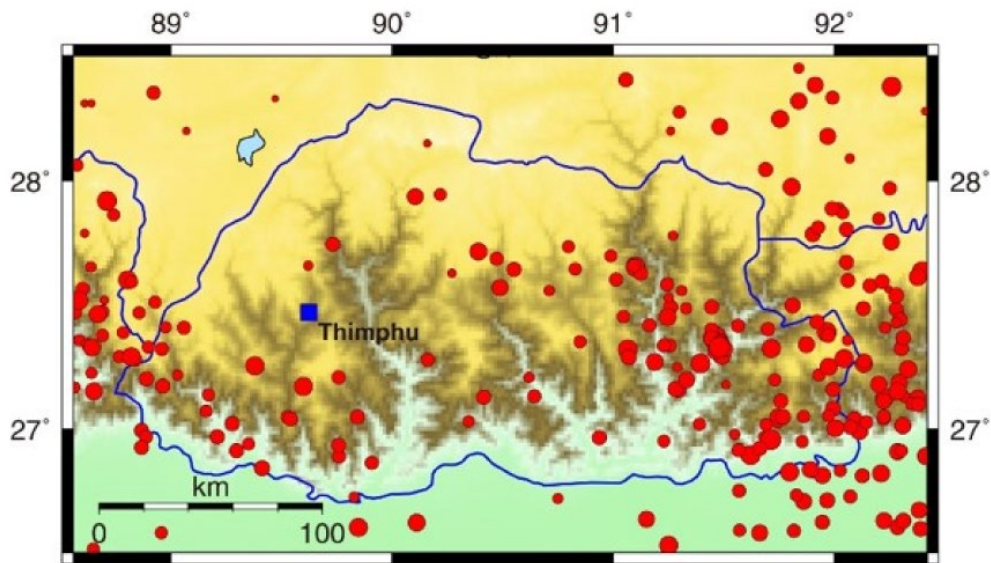

Source: Takayoshi AOKI Laboratory, Nagoya City University

Figure 5.6.4   Epicentres in Bhutan after 1990 Recorded in ISC Catalogue

The DDM of MoHCA has carried out the seismic analysis by the technical support from NORSAR or Norwegian Seismic Array. A set of key figures recommended by the DDM are shown in Box 5.1.

Box 5.1   Key Figures of Seismic Analysis for Bhutan by NORSAR
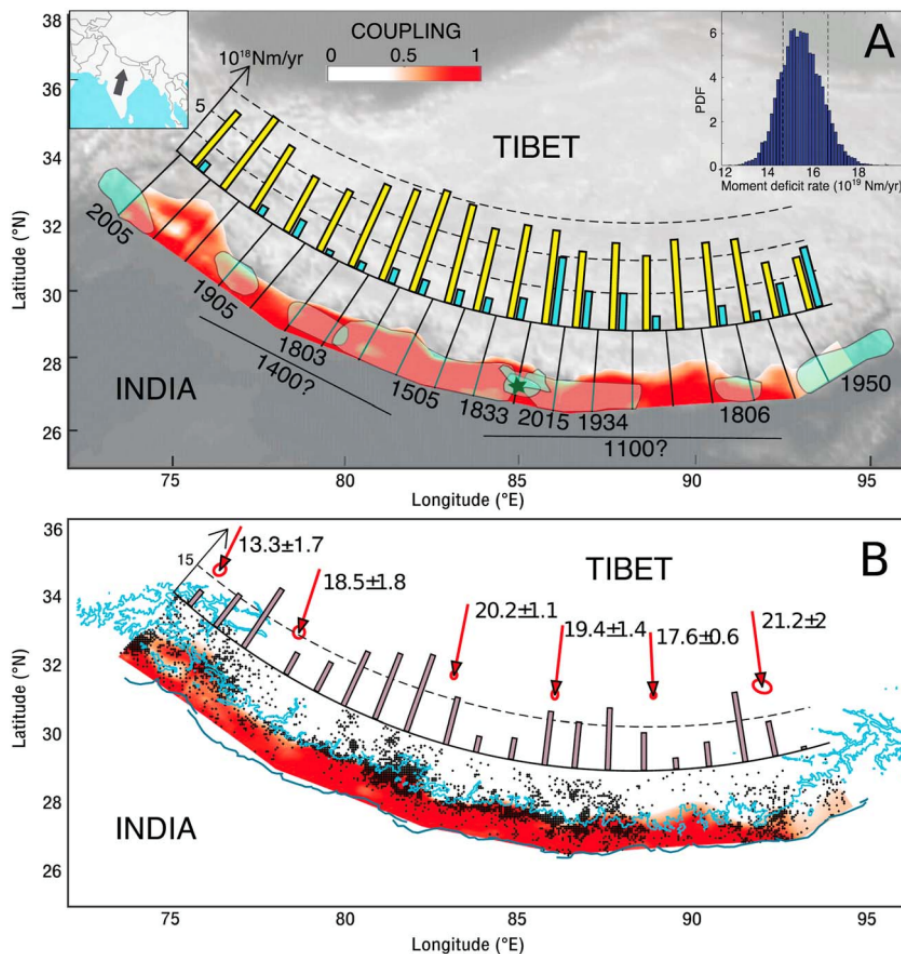
Figure 1. Interseismic coupling and moment buildup on the Main Himalayan Thrust. (a) The pattern of coupling [*Stevens and Avouac*, 2015] is shown in red, overlain by the rough locations of earthquakes M_w7.5–8 for the past 200 years and ≥8 for the past 500 years (4), [*Galetzka et al.*, 2015], which are used in calculating the rate of seismic moment release (light blue bars). The approximate extent of surface ruptures of two potential major earthquakes, dated to ~1400 A.D. and ~1100 A.D. from paleoseismic studies, is also shown. The probability distribution function (pdf) in the inset shows the seismic moment buildup calculated from the coupling model, and the yellow bars show its distribution along the strike of the arc. (b) Same coupling pattern, now with the surface trace of the Main Frontal Thrust [*Styron et al.*, 2011] in dark blue and the 3500 m elevation contour line in light blue. The 3500 m contour seems to mark the downdip extent of the locked fault zone. The MHT appears locked from the surface, where is emerges along the front of the sub-Himalaya, following the trace of the Main Frontal Thrust to beneath the front of the high Himalaya. Red arrows show convergence across the range in mm/yr (7). Black dots show seismicity from the National Seismic Centre (NSC) and NEIC catalogs [*Ader et al.*, 2012; *Stevens and Avouac*, 2015]. The grey bars show the distribution of the number of earthquakes above 4.9 (the magnitude of completeness) of the declustered NEIC catalog (see supporting information for details).
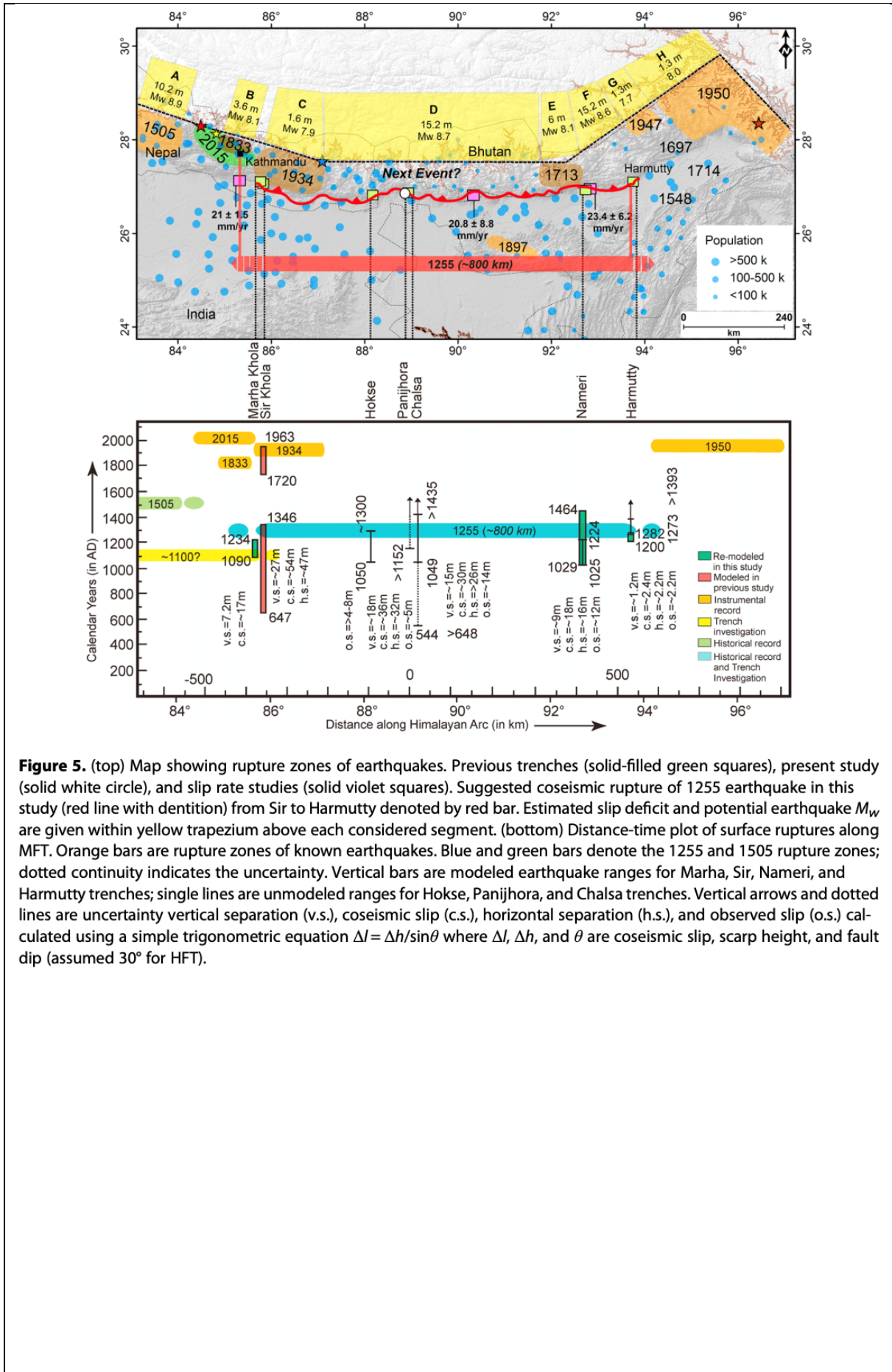
Figure 5. (top) Map showing rupture zones of earthquakes. Previous trenches (solid-filled green squares), present study (solid white circle), and slip rate studies (solid violet squares). Suggested coseismic rupture of 1255 earthquake in this study (red line with dentition) from Sir to Harmutty denoted by red bar. Estimated slip deficit and potential earthquake M_w are given within yellow trapezium above each considered segment. (bottom) Distance-time plot of surface ruptures along MFT. Orange bars are rupture zones of known earthquakes. Blue and green bars denote the 1255 and 1505 rupture zones; dotted continuity indicates the uncertainty. Vertical bars are modeled earthquake ranges for Marha, Sir, Nameri, and Harmutty trenches; single lines are unmodeled ranges for Hokse, Panijhora, and Chalsa trenches. Vertical arrows and dotted lines are uncertainty vertical separation (v.s.), coseismic slip (c.s.), horizontal separation (h.s.), and observed slip (o.s.) cal-culated using a simple trigonometric equation $\Delta l = \Delta h / \sin\theta$ where Δl, Δh, and θ are coseismic slip, scarp height, and fault dip (assumed 30° for HFT).

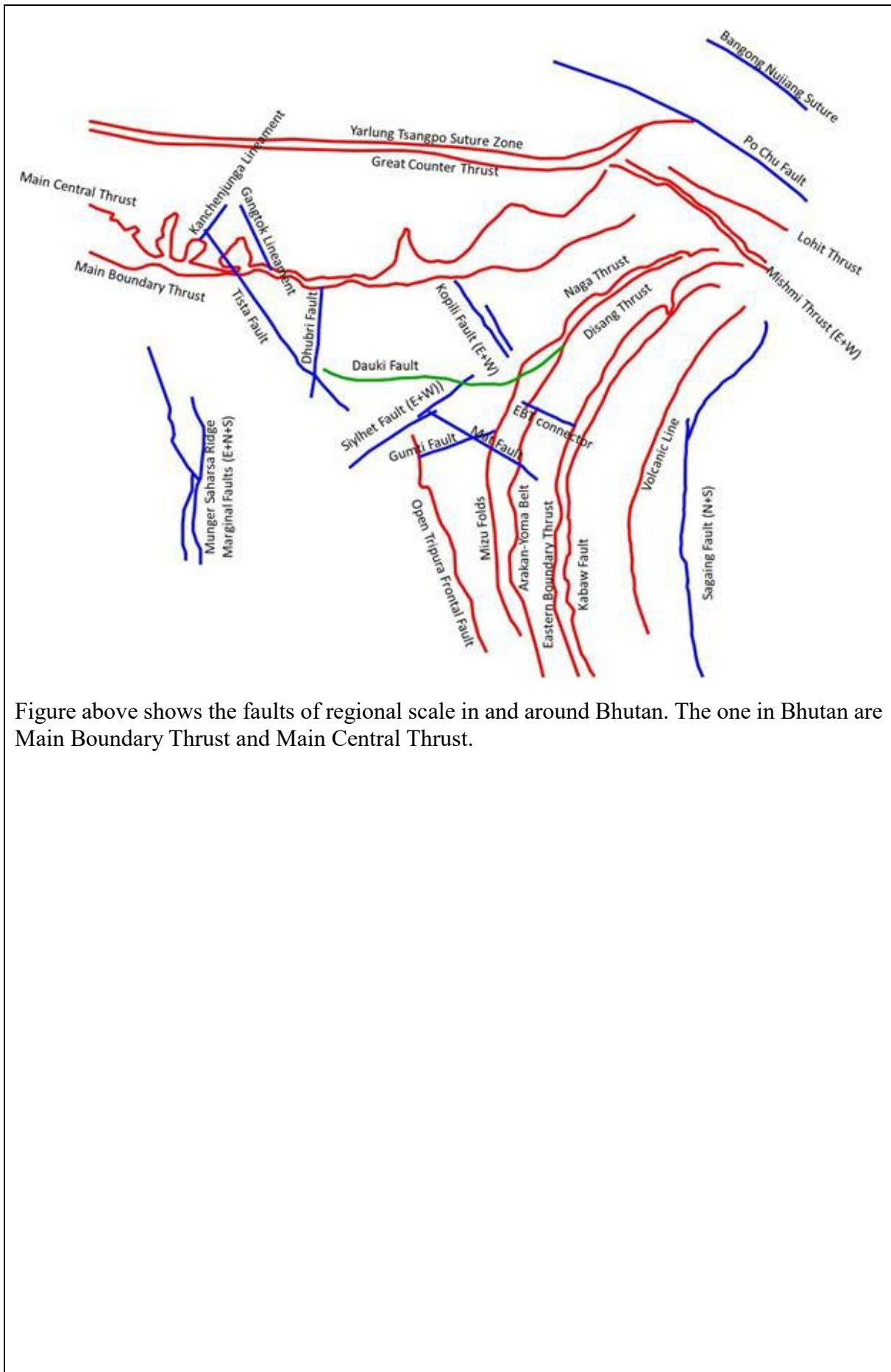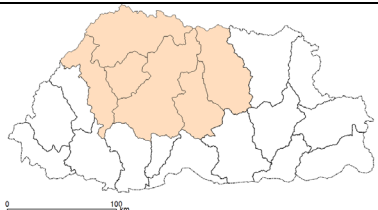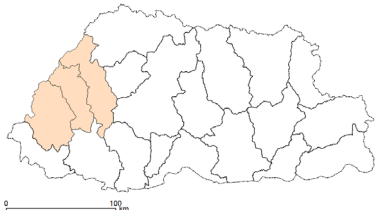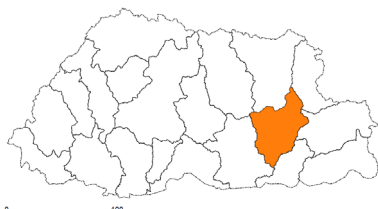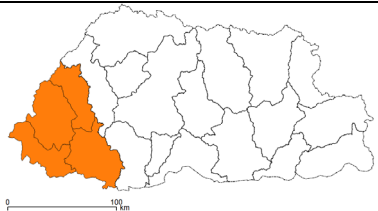Figure above shows the faults of regional scale in and around Bhutan. The one in Bhutan are Main Boundary Thrust and Main Central Thrust.

A list of previous major earthquakes is shown in Table 5.6.1 and Figure 5.6.1. The numbers and their locations (dzongkhags) in Figure 5.6.5 correspond to the numbers in Table 5.6.1. The earthquakes in 2009 in the Eastern Region and in 2011 in the Western Region caused 'serious damage', such as fatalities and thousands of destroyed houses. This damage stands out in the records of earthquakes in the last century.

Table 5.6.1   List of Previous Major Earthquakes

| No.	Year	Magnitude[1]	Affected Area		Losses
1	1897	8.7 (re-evaluated as 8.0)	[Epicentre: Shillong Plateau, India]		• Punakha and Lingzhi Dzongs (destroyed) • Wangduephodrang, Trongsa, Jakar and Tashichho Dzongs (damaged)
2	1906	6.5	[Epicentre: Bhutan-China-India border]	N/A	N/A
3	1910	5.7	[Epicentre: North of Punakha]	N/A	N/A
4	1934	8.3	[Epicentre: Bihar, India-Nepal border]	N/A	N/A
5	1941	6.75	[Epicentre: West of Trashigang]	N/A	N/A
6	1947	7.9	[Epicentre: Bhutan]	N/A	N/A
7	1980	6.1	[Epicentre: Gangtok, capital of Sikkim, India]	N/A	N/A
8	1988	6.4	[Epicentre: Udayapur Garhi, Nepal and Bihar, India]	N/A	N/A
9	2003	5.5	Gunitsawa, Paro		• Some landslides along highways • Minor damage to buildings in Paro, Haa and Thimphu
10	2006	5.8, and 5.5	[Epicentre : near Dewathang, Samdrupjongkhar]		• Successive strikes at 2:04 a.m. and 2:07 a.m. local time • Around 126 houses (minor damage)
11[2]	2009 21, Sep.	6.1	Narang, Monggar		• 12 deaths and 4,950 households, 45 Basic Health Units (BHU), 117 schools and over 800 cultural heritage buildings affected • 29 Renewable Natural Resources (RNR) centres and 26 Gups (head of Gewog) offices affected • Total estimated loss was USD 42 million
12[2]	2011 18, Sep.	6.0	Greater Sikkim area, (Haa, Paro, Samtse and Chhukha Dzongkhags)		• One death from a landslide and 14 injured. • 6,977 houses, 36 schools, 22 hospitals, 286 heritage sites and

No.	Year	Magnitude[1]	Affected Area		Losses
					monasteries and 27 RNR centres affected
13	2015 28, June	5.5	[Epicentre: Assam, India] Chhukha, Paro, Thimphu, Wangduephodrang		• Minor cracks on houses
14	2016 4, Jan.	6.7	Epicentre: Imphal, Manipur, India] 13 Dzongkhags (Dagana, Gasa, Monggar, Pemagatshel, Punakha,Tsirang, Samdrupjongkhar, Sarpang, Thimphu, Trashigang, Yangtse, Wangduephodrang and Zhemgang)		• Minor cracks on houses

[1]: Richter Scale
[2]: Earthquakes in 2009 and 2011 brought the most serious damages in record.
Source: DDM (2017)
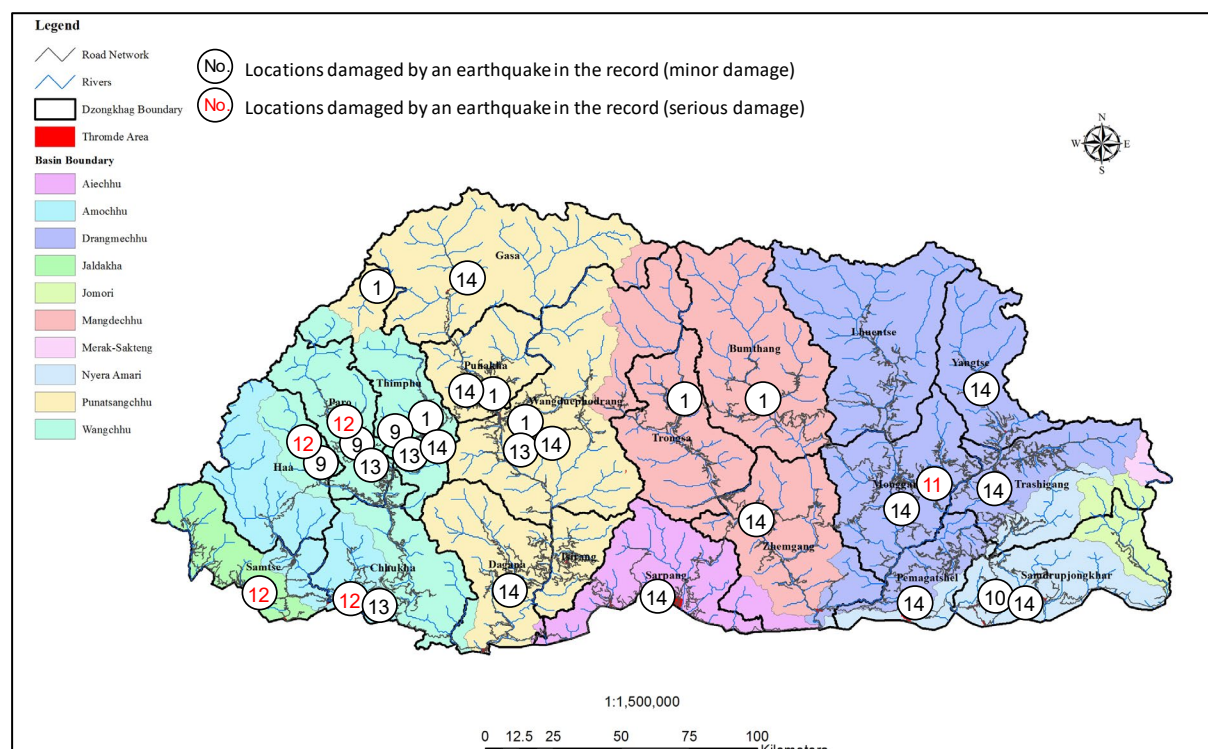
Note: The Numbers in circles correspond to the numbers in the paired table(Table 5.6.1)to identify an earthquake.
Source: DDM (2017) (Record of Earthquake)

Figure 5.6.5   Locations Damaged by Past Earthquakes in Bhutan

(2) Windstorms

In Bhutan, windstorms have become more frequent and widespread in recent years. As the
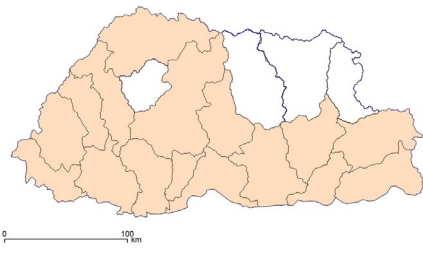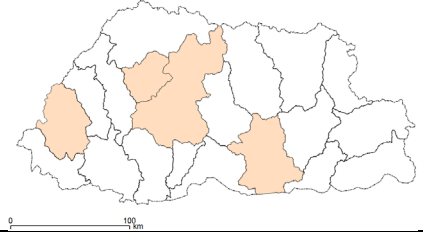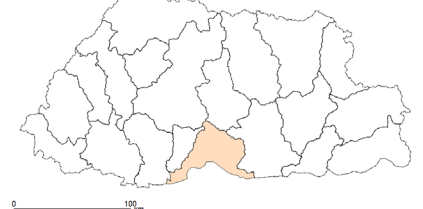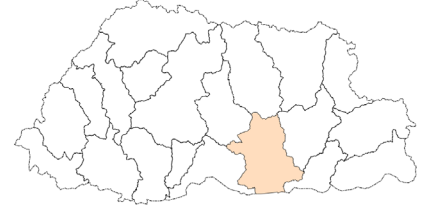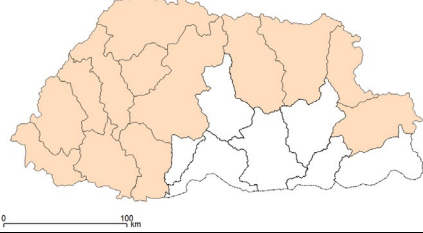
rooves of traditional houses are particularly vulnerable to strong winds, it is mostly rural households that are affected by wind storms. A list of the most recent major windstorms is as shown in Table 5.6.2.

| Damaged house in Punakha (April, 2017) | Damaged house in Chhukha |
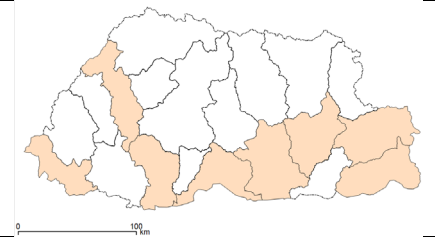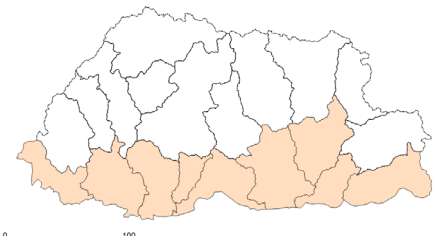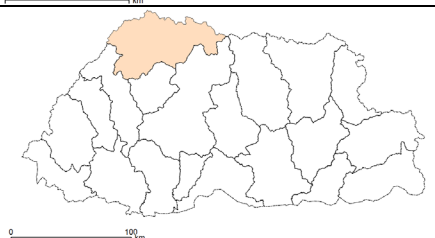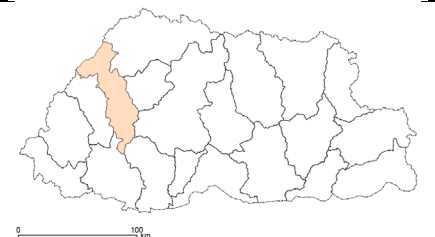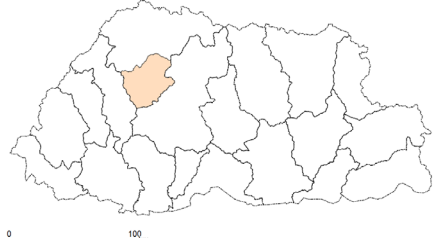
Source: Kuensel (left), BBSC (right)

Figure 5.6.6　Rural Houses Damaged by Windstorms

Table 5.6.2   List of Recent Major Windstorms

No.	Month and Year	Affected Area (Dzongkhag)		Losses
1	2011 April	Gasa, Thimphu, Paro, Haa, Wangdue, Chhukha, Tsirang, Pemagatshel, Dagana, Trongsa, Zhemgang, Sarpang, Samtse, Samdrupjongkhar, Monggar, Trashigang		• 2,424 houses, 77 lhakhangs, four chortens, 57 schools/ Non-Formal Education (NFE) centres, 21 BHU/ Outreach Clinics (ORC), six RNR centres, four Gups offices and three Royal Bhutan Police (RBP) buildings were damaged
2	2012 March-April	Zhemgang, Wangduephodrang, Punakha and Haa		• 221 houses, 10 lhakhangs, four schools and one RNR centre were damaged
3	2013 July	Sarpang		• Four houses were damaged
4	2013 Sep.	Zhemgang		• 22 houses, one RNR office, one Extended Classroom (ECR) and 100 acres of maize fields were damaged
5	2013 Dec.	Bumthang, Chhukha, Dagana, Gasa, Haa, Lhuentse, Paro, Punakha, Samtse, Trashigang, Yangtse, Thimphu, Wangduephodrang		• 1,012 houses, 12 schools and ECRs, 58 cultural heritage sites, three local government offices and eight BHUs/ORCs were damaged
6	2014 March	Dagana, Monggar, Samdrupjongkhar, Sarpang, Trashigang and Zhemgang		• 102 houses, two schools and four Lhakhangs were damaged

No.	Month and Year	Affected Area (Dzongkhag)		Losses
7	2014 May	Samtse, Dagana, Monggar, Samdrupjongkhar, Sarpang, Trashigang, Zhemgang and Thimphu		• 106 houses and 20 government buildings were damaged
8	2015 April	Southern Bhutan		• Three people were injured • 792 houses were damaged[2]
9	2015 December	Gasa and Lunana (Thanza, Toenchay and Tshojong)		• 80 houses and public offices were damaged[3]
10	2015 December	Lingzhi and Thimphu		• Dungkhag Administration Office and Lingzhi Gewog Office were damaged • 19 houses and 13 solar panels were damaged
11	2017 April	Punakha		• 318 houses, including several government structures and Lhakhangs, were damaged[4]

Source: DDM (2017), Kuensel

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[2] http://www.kuenselonline.com/windstorm-damages-792-homes/
(access date:2017/9/10, article published on 2015/4/6)
[3] http://www.kuenselonline.com/80-houses-conformed-damaged-in-lunana/
(access date:2017/9/10, article published on 2015/12/29)
[4] http://www.kuenselonline.com/more-than-300-households-affected-by-windstorm-in-punakha/
(access date:2017/9/10, article published on 2017/4/18)

(3) Floods

A list of recent major floods is shown in Table 5.6.3. The number of deaths from floods is a somewhat larger than that related to other hazards. In addition, according to the Flood Engineering Management Division and the MoWHS, some areas are affected by small-scale floods every year, mostly during the monsoon season.

In terms of flood risk, there is no reliable information such as flood records with locational data and accurate flood-prone area simulations. Although, a map of flood-prone areas, analysed with GIS, is shown in the National Integrated Water Resources Management Plan 2016 (National Environment Commission), the report notes that it may underestimate risk to the Southern Region due to the limitations of analysis methodology.

Flood records for 2016 and 2017 (DDM) show that the Southern Region tended to experience more floods. Besides, floods involving fatalities and injured persons mainly occurred in dzongkhags downstream of river basins.

However, at least it can be said that, because of the steep and mountainous nature of the country's land, most human settlement areas are located near rivers in valleys. Therefore, human settlement areas in Bhutan are generally prone to flooding. Floods, including flash floods, could constitute one of the country's biggest threats in terms of damage and the frequency of occurrence.
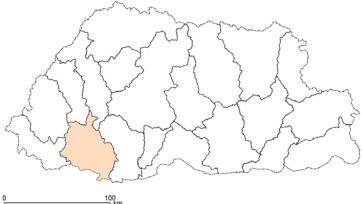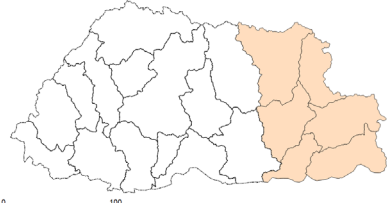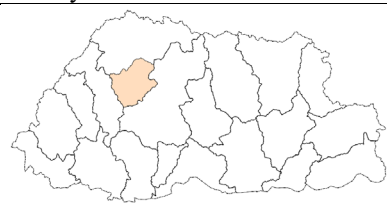
| Photo taken on 23 July 2016 | Photo taken on 4 August 2016 |

Source: Flood Engineering Management Division (FEMD), Ministry of Works and Human Settlement (MoWHS)

Figure 5.6.7   Buildings Damaged by Floods

Table 5.6.3   List of Recent Major Floods

No.	Year	Cause	Affected Area		Losses
1	2000	Heavy rain	Phuentsholing, Pasakha and other southern cities		• 49 deaths • Factories and infrastructure in Pasakha were damaged
2	2004	Heavy rain	Six eastern Dzongkhags; Trashigang, Yangtse and Samdrupjongkhar were the most affected		• 49 deaths. • 29 houses were completely washed away, 26 houses collapsed and 107 houses were partially damaged • 161 acres of wetland and 503 acres of dryland were washed away • 39 irrigation channels were damaged
3	2009 May	Cyclone Aila	17 Dzongkhags were affected	 Note:The Dzongkhags not flooded by Cyclone Aila can not be specified. However, generally Cyclone Aila affected whole country.	• 12 deaths • Estimated monetary losses due to damage came to BTN 719 million
4	2013 June	Heavy rain	Five villages in Kabisa Gewog, Punakha		• Over 14 acres of agricultural land were filled with debris
5	2016 July	Heavy rain	Sarpang river basin and 20 Dzongkhags		• Highway roads, bridges, houses and agricultural lands were damaged, with a particular impact in Sarpang, Chhukha and Samtse Dzongkhags • The whole of Sarpang Town was washed away • Damage and loss was estimated at BTN 555 million. • Relief and response expenditure was estimated at BTN 19.8 million

Note: The exact points of floods can not be specified.
Source: DDM (2017)

(4) Landslides

Landslides are a frequently occurring natural hazard in Bhutan. The country's slopes are highly susceptible to landslides, especially during the rainy season. Landslides are closely linked with

seasonal rain, earthquakes and flooding. According to the Department of Roads (DoR) under the Ministry of Works and Human Settlement (MoWHS), the damage caused by landslides often involves the blocking of national highways and other roads, while damage to areas of human settlement tends to be limited. However, as shown in Table 5.6.4, there have been some deaths and injuries as a result of landslides.

A list of recent major landslides is shown in Table 5.6.4, as well as the number of landslides occurring annually (although organized records are not available). Figure 5.6.9 shows an inventory of landslides that have taken place in Chhukha and Dagana Dzongkhags. The Department of Geology and Mines (DGM), under the Ministry of Economic Affairs (MoEA), has developed a land inventory database for these two Dzongkhags, which are relatively more prone to landslides.

| Landslides block a part of the highway between Bumthang and Monggar | Jumja landslide in Chhukha |

Source: Asian Disaster Reduction Centre (left), Department of Local Governance, Ministry of Home and Cultural Affairs (right)

Figure 5.6.8   Huge Landslides in Bhutan

Table 5.6.4   List of Recent Major Landslides

Month and Year	Cause	Affected Areas	Losses
August 2000	Seasonal monsoon	Thimphu, Chhukha, Trashigang, Samdrupjongkhar, Monggar, Lhuentse, Pemagatshel, Samtse, Tsirang, Sarpang, Zhemgang and Wangduephodrang	• The Phuentsholing-Thimphu highway was severely disrupted by numerous major landslides (Sorchen, Jumja and Chhukha). • Highways and roads between and within Dzongkhags were blocked due to landslides. • Most feeder roads were reported to be blocked.
August 2002	Sudden burst of sliding mud and debris	Thimphu-Tsirang highway	• Two pre-primary school children died when the vehicle they were travelling in to school was buried in a sudden landslide in Tsirang.
April 2005	Heavy rainfall	Palamphu, Monggar-Lhuentse highway	• Two people buried but alive, one injured.
July 2006	N/A	Bemsisi, Thimphu	• A total of 7,150.9 m^2 of wetland was affected.
July 2010	Seasonal monsoon	Pasakha and Phuentsholing	• Three deaths.
September 2011	Sikkim earthquake	Haa	• Three deaths.
July 2016	Heavy rainfall	20 Dzongkhags	• 34 buildings, three bridges and many acres of fields were affected. • Highways and GC roads were blocked.

Source: DDM (2017), Department of Local Governance, Ministry of Home and Cultural Affairs
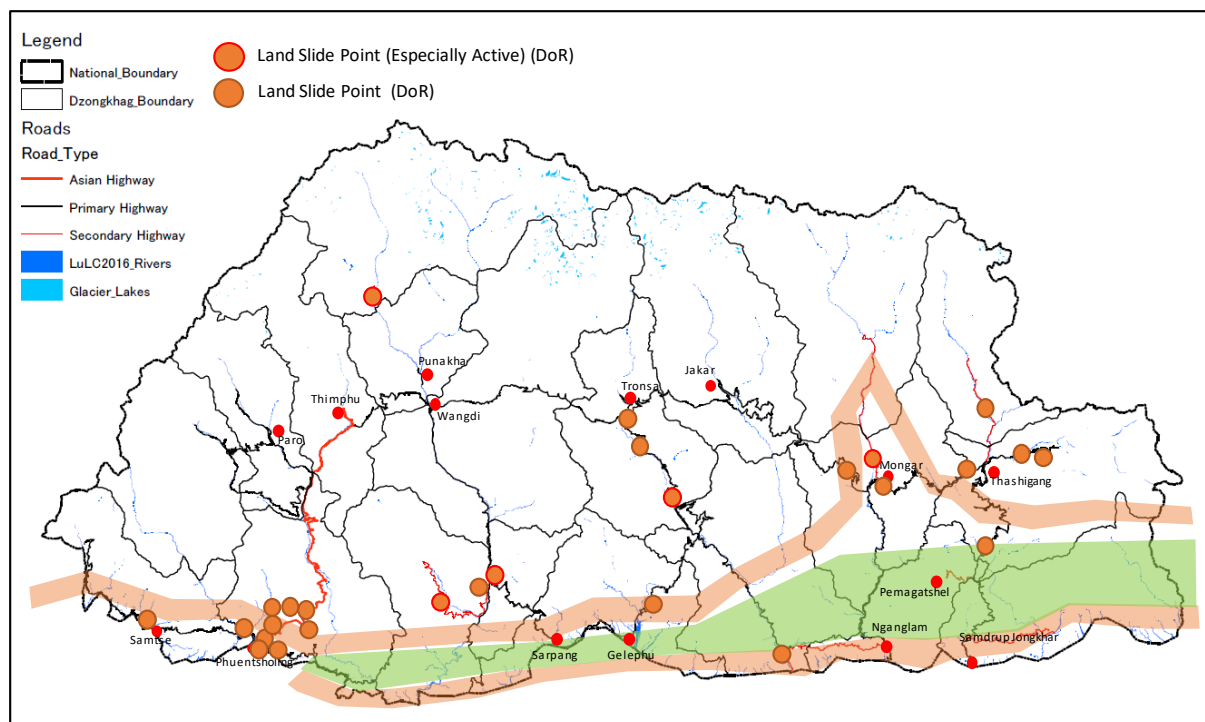
Source: DOR (landslide point data)

Figure 5.6.9   Inventory Map of Landslides in Chhukha and Dagana

(5) Glacial Lake Outburst Floods (GLOFs)

GLOFs have always been most serious phenomenon of all the country's potential natural hazards. In addition, climate change is supposed to increase the risk of GLOFs. The biggest GLOF disaster occurred in 1994, causing massive downstream damage in the Punakha-Wangdue valleys. The most recent GLOF occurred in 2015. Six wooden bridges in Gaza Dzongkhag were destroyed, but people downstream of the disaster were evacuated and nobody died. The list of the two most recent GLOFs is shown in Table 5.6.5.
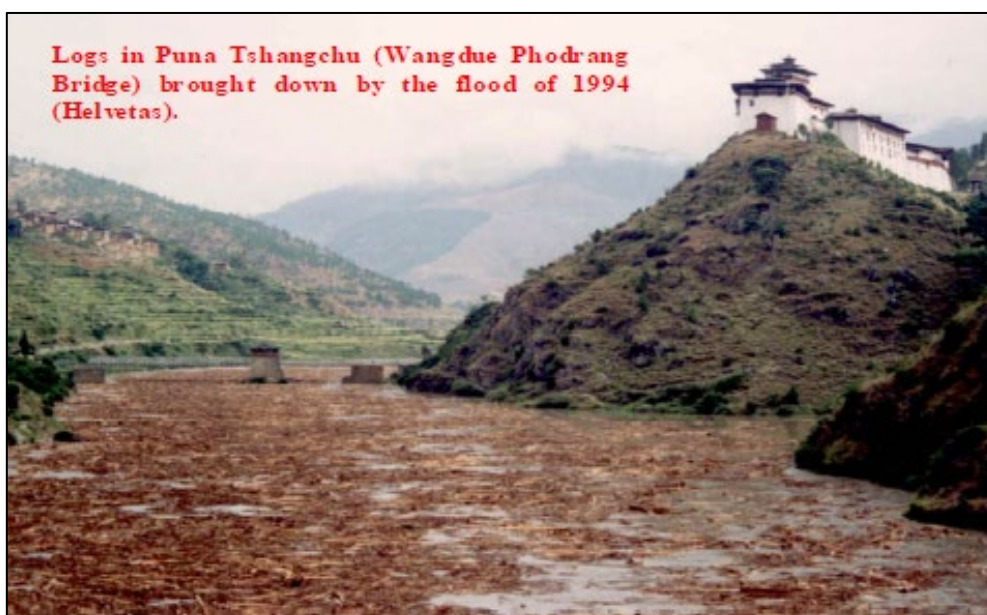
Source: Department of Geology and Mines, Ministry of Economic Affairs

Figure 5.6.10   Flow of Debris in Punatshangchhu, Caused by a GLOF in 1994

Table 5.6.5   List of Recent GLOFs

Year	Cause	Affected Area	Losses/Remarks
1957	N/A	Punakha-Wangdue valley	• Part of the Punakha Dzong was destroyed.
1960	N/A	Punakha	• Part of the Punakha Dzong was destroyed.
1994	Burst of Lugye Tsho	Punakha-Wangdue valley	• 21 deaths, 91 households affected and 12 houses, five water mills and 816 acres of dryland were washed away. • 965 acres affected by sand and silt. • Damage to livestock and stored grains and materials. • Four bridges were washed away, two chortens were destroyed and one temple in Tsojug was badly damaged.
2015 June	Burst of Lemthang Tsho	Gasa	• Six wooden bridges were damaged. • Residents downstream were evacuated and safe.

Source: DDM (2014), Asian Disaster Reduction Centre
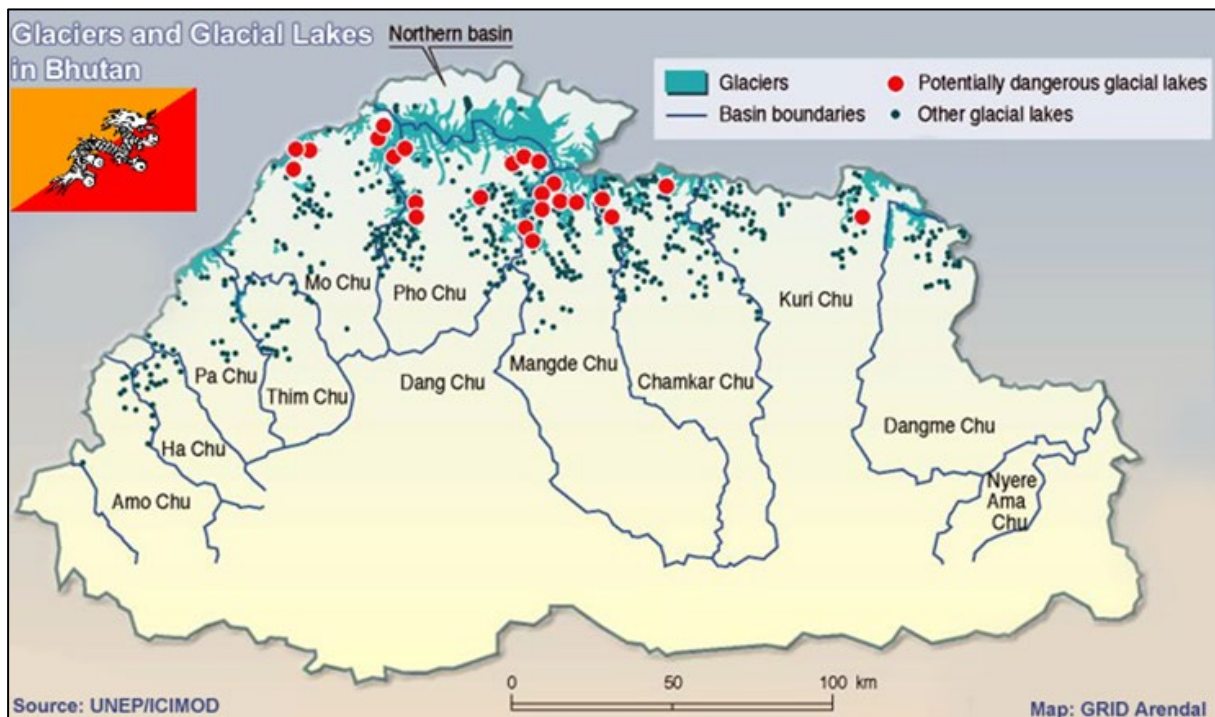
Source: Raonline[5], based on data from UNEP/ICMOD

Figure 5.6.11   Potentially Dangerous Glacial Lakes in Bhutan

(6) Forest Fires

Bhutan is prone to forest fires, especially during the dry season from November to April. The numbers of recent forest fires are listed for each Dzongkhag in Table 5.6.6.

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[5] http://www.raonline.ch/pages/story/bt/btbg_glacier01d.html   (access date:2017/9/10)

Source: Kuensel

Figure 5.6.12   Forest Fire in Monggar (March 2017)

Table 5.6.6   List of Forest Fires That Occurred Between 2008 and 2014

Dzongkhag	No. of Cases	Dzongkhag	No. of Cases	Dzongkhag	No. of Cases
1. Bumthang	4	8. Paro	8	15. Yangtse	18
2. Chhukha	10	9. Punakha	9	16. Thimphu	64
3. Dagana	5	10. Pemagatshel	3	17. Tsirang	1
4. Gasa	1	11. S/Jongkhar	5	18. Trongsa	4
5. Haa	4	12. Sarpang	7	19. Wangduephodrang	26
6. Lhuentse	32	13. Samtse	15	20. Zhemgang	13
7. Monggar	35	14. Trashigang	29	**Total**	**303**

Source: Asian Disaster Reduction Centre

5.6.3   Current Measures for Disaster Management

(1) Legal System

The first framework for natural disasters, the National Disaster Risk Management Framework (NDRMF), was adopted in 2006. Following an earthquake in 2009 and Cyclone Aila in 2011, Bhutan decided to push forward the Disaster Management Act for a more systematic approach to disaster prevention and response.
Today, disaster management in Bhutan is implemented based on the Disaster Management Act of Bhutan 2013, which was enacted in 2013. Its rules and regulations were adopted in 2014.

(2) Administrative System

The Disaster Management Act of Bhutan 2013 outlines the administrative system for disaster management and the roles and obligations of each agency. An outline of the administrative system for disaster management in Bhutan is shown in Table 5.6.7 and Figure 5.6.13.

Table 5.6.7   Major Agencies of the Disaster Management Administrative System

Agency	Outline
National Disaster Management Authority (NDMA)	• The highest disaster management decision-making body. • The chairperson is the prime minister and the vice-chairperson is the minister of the MoHCA.
Department of Disaster Management (DMM), Ministry of Home and Cultural Affairs	• The secretariat to the NDMA. • The DDM is responsible for laying down the strategic disaster management policy framework shown in the Disaster Management Act. • The DDM ensures that agencies incorporate disaster risk reduction into their development plans, policies, programmes and projects. • The DDM shall establish a National Emergency Operation Centre and Dzongkhag Emergency Operation Centres for emergency situations.
Inter-Ministerial Task Force	• The NDMA shall create an Inter-Ministerial Task Force. • The Inter-Ministerial Task Force a temporary organization that forms during emergencies. • The Inter-Ministerial Task Force comprises technical experts from related agencies for the inter-ministerial coordination of disaster response.
Dzongkhag Disaster Management Committee	• Every Dzongkhag Administration shall create a Dzongkhag Disaster Management Committee. • The Dzongkhag Disaster Management Committee shall be responsible for coordinating and managing all disaster management operations in the Dzongkhag under the direction and supervision of the NDMA.
Dzongkhag Disaster Management Officer (DDMO)	• A DDMO shall be assigned to each Dzongkhag. • The DDMO shall assist in the preparation, implementation, review and updating of the Dzongkhag Disaster Management and Contingency Plan and facilitate the incorporation of disaster risk reduction into the development plans, policies, programmes and projects of the Dzongkhag. • The DDMO shall coordinate response and relief operations in the Dzongkhag during a disaster.

Source: Disaster Management Act of Bhutan 2013
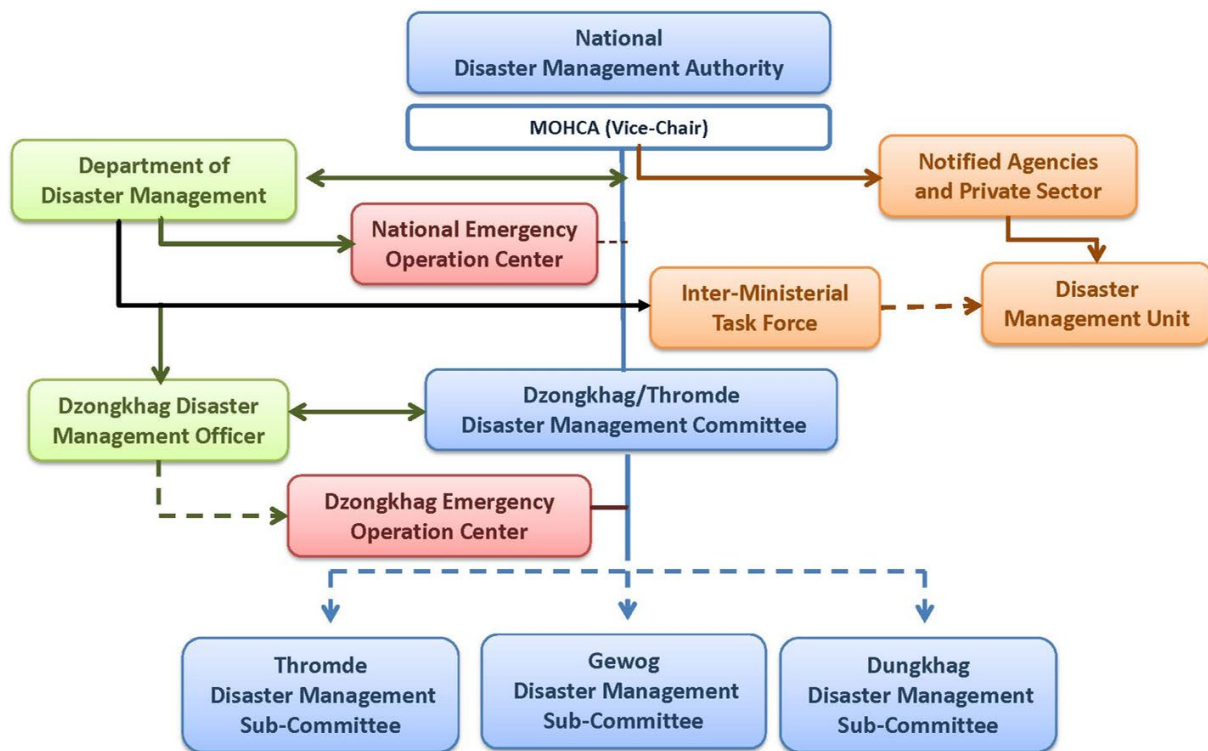
Source: Ministry of Home and Cultural Affairs

Figure 5.6.13   Administrative Systems for Disaster Management

(3) Related Policies and Plans

In accordance with the Disaster Management Act of Bhutan 2013, the Department of Disaster Management has formulated the following policies and plans in collaboration with the relevant agencies:

  (a) Disaster Management Strategic Policy Framework (DMSPF) 2014
  (b) Disaster Management Rules and Regulations
  (c) Disaster Management Planning and Contingency Guidelines
  (d) School Disaster Management Planning Guideline
  (e) Guideline on Proper Construction Practices for Non-Engineered Buildings (Stone Masonry)
  (f) National Action Plan for School Earthquake Safety
  (g) National Action Plan for Earthquake Safety of Health Facilities
  (h) Post-Earthquake Safety Assessment Guidance Document
  (i) National Recovery and Reconstruction Plan for the 2009 and 2011 Earthquake
  (j) Dzongkhag Disaster Management and Contingency Plan (under development)

As of August 2017, a Dzongkhag Disaster Management and Contingency Plan is under development in each Dzongkhag, guided by the DDM. Draft plans are expected to be finished by the end of 2017.

(4) Prevention Measures

Structural measures, such as retaining walls, rockfall prevention nets and bank revetment, could be taken in some areas at high risk from floods and landslides. However, the areas covered by these measures are very limited. The DHS is working to restrict land use in high-risk settlement areas.

Figure 5.6.14   Retaining Wall on a Road between Thimphu and Paro

(5) Monitoring and Early Warning Systems

The National Centre for Hydrology and Meteorology (NCHM, formerly the Department of Hydromet Services under the Ministry of Economic Affairs) installed a GLOF/Early Warning System (EWS) and an evacuation framework in the Pho Chu basin through the National Adaptation Programme of Action (NAPA), supported by the United Nations Development Programme (UNDP) and the Global Environment Facility (GEF). The NCHM also installed EWS for GLOFs in Mangde Chhu and Chamkhar Chhu through the Technical Cooperation Project (Project for Capacity Development of GLOF and Rainstorm Flood Forecasting), which

was supported by JICA. As is as shown in Figure 5.6.11, Pho Chhu, Mangde Chhu and Chamkhar Chhu have many potentially dangerous glacial lakes in their basins.

Since EWS for GLOFs and floods are the most essential measures for Bhutan, the NCHM is willing to install more EWS in other river basins, such as Thimphu Chhu and Paro Chhu, which are home to the country's biggest populations. Meanwhile, the development of hazard maps is still in its preliminary phases. Although the NCHM has developed GLOF hazard map for Mangde Chhu and Chamkhar Chhu, generated by a hydraulic simulation model as part of the JICA Technical Cooperation Project, and the DGM has generated its first original seismic risk map, hazard maps for floods are not currently available. In order to develop hazard maps, a division of labour between the related ministries and agencies is required. The lack of human resources is also a significant issue for these agencies.

5.7   Environmental Conditions

5.7.1   Environmental Conditions in Urban Areas

(1) Overview

The Kingdom of Bhutan, located at the eastern edge of the Himalayan Mountains, was until recently believed to not to be experiencing many environmental problems due to its population size and the scale of its economy. However, due to rural-urban migration and economic development in recent years, a wide range of environmental issues has begun to appear. In spite of this growing situation, environmental monitoring systems for the detection of environmental issues have not yet been established. The following sub-sections will summarize the current environmental status of urban areas in terms of land, water quality, air quality and waste management.

(2) Land

Bhutan's land is made up of steep mountain slopes, deep gorges and glaciers in the northern areas. Flat and gently sloping areas of land are very limited, which makes it difficult to secure land for housing, agriculture and infrastructure development. The pressure on the land is described in the National Action Programme (NAP) to Combat Land Degradation (MoAF, 2014) and the National Biodiversity Strategy and Action Plan 2014. A list of the factors exerting direct pressure on urban land are itemized as below, among others:

- Urbanization
- Infrastructure development, including the construction of roads, power transmission lines and distribution grids
- Industrial activities
- Unsustainable mining
- Solid waste

Urbanization and migration to urban areas will exert pressure on the land due to the necessity of constructing more housing on the limited urban land. According to the Bhutan State of the Environment Report (BSER) 2016, although 55% of Bhutan's population resides in rural areas, the pace of urbanization is accelerating. Only 5% of the total population was estimated to be living in urban areas in 1980. This increased to 15% in 1994 and to 30.8% in 2005. The western region, including the capital city of Thimphu, has the highest urban population (65.1%).

(3) Water Quality

The monitoring and management of water quality has just begun in Bhutan. The NEC, a

competent environmental monitoring authority, started to monitor the river water quality of Thimphu Chhu in 2014. The water quality monitoring of other rivers is only done on an ad hoc basis when a project is underway.

Water quality monitoring of Thimphu Chhu is currently conducted twice a year, in the dry and wet seasons, by the Water Resource Coordination Division of the NEC. Water samples were taken from the mainstream, tributaries and effluent outlets of Thimphu Chhu. The parameters monitored include pH, DO (Dissolved Oxygen), BOD (Biochemical Oxygen Demand), COD (Chemical Oxygen Demand), T-P (Total Phosphorous), T-N (Total Nitrogen) and electrical conductivity (EC). The monitoring conducted in January 2017 took a total of 39 water samples consisting of six mainstream samples, 24 tributary samples and nine samples from effluent outlets. The monitoring results indicate the following status and issues:

- The water quality of the effluent outlets showed the lowest DO levels (2.85 – 7.36 mg/L) and high EC, BOD, COD, TP and TN content. The highest BOD level (8.05 mg/L) was detected at the Centenary Farmer's Market sampling site in Thimphu city centre.
- The water quality of the Thimphu Chhu mainstream varies and is affected by the water quality of its tributaries and effluents. The sampling site below Desi Zampa showed a slightly higher COD value at 5.0 mg/L and a BOD value of 2.3mg/L. Possible reasons for this could be the release of effluent from Sewage Treatment Plant (STP), Babesa and high levels of BOD and COD from Nabirongchu, which is just upstream of the sampling site.
- Further downstream at Khasadrapchu, the last sampling site on the mainstream, the water seems to have recovered with all parameters at normal levels; in particular, the level of BOD drops to 0.18mg/L and COD drops to 2.5mg/L.
- Consequently, the monitoring results suggest that increasing urbanization and development has caused strain on water resources. Many forms of waste are now starting to flow into streams and rivers. There is an urgent need to establish a long-term monitoring programme for the collection and management of data.

Meanwhile, recent water quality monitoring results obtained by the water quality monitoring programme launched by Clean Bhutan and Water Keeper Alliance (NGO) have also indicated that rivers in Thimphu and Paro contain E. coli bacteria. This monitoring result suggests that sewage water leaking from septic tanks is entering the rivers (Kuensel, Local Newspaper, 22 July 2017).

(4) Air Quality

Bhutan's air quality has long been regarded as pristine. However, recent rapid development is placing pressure on air quality in major urban centres as well as in several industrial areas. Today, air pollution is becoming one of the emerging issues posing a threat to human and environmental health (BSER, 2016).

Ambient air pollution in Bhutan has been being monitored to varying degrees of reliability since the early 2000s. PM10 monitoring started in 2004, meaning that data on this parameter goes back the longest. The monitoring of other parameters, such as SOx, NOx, O_3 and black carbon (BC), started late 2016. Monitoring stations of air quality includes Thimphu, Pasakha Industrial Estate, Rinchending (Phuentsholing), Kanglung and Bajo (Wangdue).

The PM10 monitoring results indicate that it is on the increase; although it is still within the national permissible limit in Thimphu, it currently exceeds the levels set out in WHO guidelines

and EU directives for annual average levels.

The 2016 PM10 monitoring results are shown in Figure 5.7.1. They indicate that the yearly average (43.9μg/m^3) is less than the standard value (Bhutan annual limit) for sensitive areas, which is 50μg/m^3, but that the monthly average from January to April and November to December, the dry months, exceed the standard value.
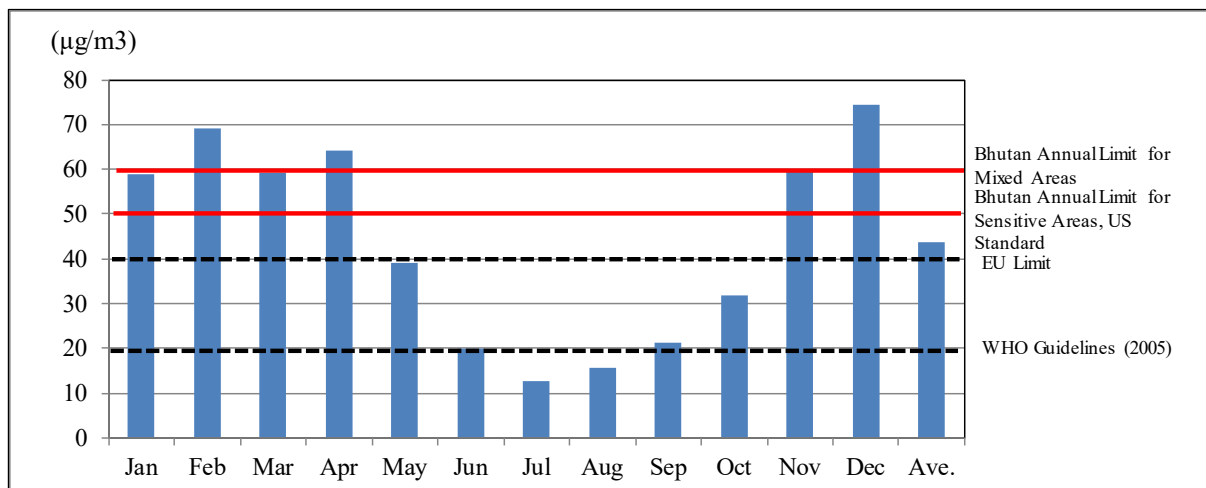
Source: NEC

Figure 5.7.1   Monthly Average PM10 Levels in Thimphu in 2016

Furthermore, the monitoring results from cities and near industrial areas are as follows. PM10 levels at the Pasakha Industrial Estate from 2011 to 2014 exceeded the national permissible limits (120μg/m^3) for industrial areas. In addition, the annual average PM10 levels in the town of Rinchending (in eastern Phuentsholing) and Bajothang (in Wangduephodrang) exceeded the national permissible limits (60μg/m^3) for mixed areas. The increased number of areas that exceed the permissible limits indicate that overall air quality has deteriorated over the years. Thus, the monitoring results of ambient air quality show an increasing pressure on urban environments.

Other sources of air pollution are also exerting pressure on air quality in urban areas (figure 5.7.1). In addition, there is the significant issue of trans-boundary air pollution in South Asia (UNEP, 2013), an issue that also affects Bhutan. This phenomenon manifests itself as hazy pollution that can be observed along the southern belt of the country, especially during the winter months (BSER, 2016).

(5) Waste Management

The issue of waste management has started to put big pressure on city environments in recent years, and it is getting more serious by the year. Poor waste management practices are threatening public health and the natural environment through water and air pollution and the emission of greenhouse gases (BSER, 2016).

The issue of waste management in Bhutan can be categorized by the type of waste, as follows:

- Municipal solid waste management.
- Liquid waste (effluent) management.
- The management of other waste, such as medical waste, e-waste, industrial waste, etc.

The following sections summarize the current status of waste management and the issues for urban areas.

1) Municipal solid waste management

In most Dzongkhags, a common waste management practice is the open burning of waste or the dumping of waste in open landfills. Waste segregation and recycling is minimal; the collection of recyclable materials takes place on an informal basis and is slowly picking up across the country. However, there are also some cities that have a segregation system for solid waste and that have established sanitary landfill facilities.

Municipal solid waste is managed by city governments in Bhutan. According to the MoWHS, the cities of Phuentsholing, Samdrupjongkhar and Gelephu operate solid waste collection, transport and disposal services and segregation systems, although these systems are primitive and not always sufficiently functional. Solid waste that remains after segregation in these cities is transported to sanitary landfill sites for disposal. A survey by the MoWHS estimated that the amount of municipal solid waste per capita was 0.53 kg/capita/day in 2008.

However, most of the other cities have no sanitary landfill sites or segregation systems. In Haa Dzongkhag, solid waste not only from Haa city centre but also from remote areas in the Dzongkhag, are disposed of at the dumping site without being segregated. The types of wastes dumped even include e-waste and construction waste.

In the city of Thimphu, solid waste used to be managed directly by the city government. Solid waste was collected, transported and disposed of at an open disposal site at Memelhakha, located about 12 km south of the city centre. In the beginning, there was no segregation system. The disposal site was not a sanitary landfill site but rather an open dumping site, because no membrane (impermeable liner), leachate treatment facility or landfill gas treatment equipment was installed.

More recently, solid waste management was sub-contracted to two organizations: Greener Way, a private firm, and Clean Bhutan, a local NGO. Greener Way started the collection of recyclable waste, like plastic bottles and paper, in 2010. According to BSER, 2016, there are several other non-formal scrap collectors/dealers in Thimphu and other urban centres.

Waste management by incineration is not developed in Bhutan. Currently, there is no incinerator for solid waste management in the country, although a proposal to install an incinerator is being prepared by the Thimphu Municipality and under discussion. With regard to the installation of a waste management system, the Waste Prevention and Management Regulation 2012 stipulates the following:

- The installation and operation of incineration facilities for municipal waste shall be authorized by Thromde subject to clearance from concerned authorities (Clause 102).
- The incineration system shall meet the standards set by the National Environment Commission (NEC) for the operation of such a facility (Clause 103).

Regarding Clause 103, emission standards for industry were provided by the NEC in 2010, although they do not refer to incinerators but industry in general. There is no specification for incineration facilities in Bhutan at the moment.

2) Liquid waste management

Liquid waste management is not sufficiently developed everywhere in Bhutan. Sewage treatment systems have only been established in limited areas of Thimphu and other cities. Septic tanks are the most prominent sewer management system for houses and buildings, and are cleaned and emptied when they reach maximum capacity. The sewage treatment system in Thimphu can be summarized as follows:

The sewage treatment system in Thimphu was developed by the MoWHS at Babesa, using a grant fund provided by Denmark, and was made operational in 1996. It is an open stabilization pond system with a capacity of 1.75 MLD (million litres per day). A sewage treatment plan with a capacity of 12 MLD is currently under construction at the location of an existing STP under an ADB project. It is expected to be operational within two years.

Other than Thimphu, the following cities have sewage treatment plants installed: (i) Phuentsholing, (ii) Samtse, (iii) Tsirang, (iv) Khuruthang (Punakha) (under construction), (v) Wangduephodrang, (vi) Trashigang and (vii) Samdrupjongkhar, according to the MoWHS.

3)   Management of other waste

Medical waste management

Medical waste management is a critical issue due to the inclusion of hazardous waste such as pathological waste, infectious waste, sharps, pharmaceutical waste, etc. The agencies dealing with medical waste management are basically those that generate the waste including hospitals, clinics, BHUs, and so on.

Deep pit burial is the predominant method of treating and disposing of medical waste in Bhutan. Infectious waste is autoclaved, the process of sterilizing supplies and equipment with the use of high pressure, before being disposed of and dumped into a pit. There are, however, only four waste autoclaves in Bhutan at present. This is far below the necessary level the country needs for proper waste treatment. According to the Ministry of Health, the issue of medical waste treatment will become critical due to Bhutan's aging population and the increasing prevalence of non-communicable diseases.

E-waste management

The term e-waste covers all items of electrical and electronic equipment. The current method of managing e-waste from government offices is to surrender non-functional electronics/appliances to the Department of National Properties. Meanwhile the e-waste generated by the private sector is usually repaired and reused, while items beyond repair are sold to scrap dealers (Kuensel, 2 January 2016).

The necessity of establishing a practically adequate e-waste management system is crucial, considering the increasing amount of electrical and electronical equipment in the country.

Automobile-related waste management

The issue of automobile-related waste management is putting increasing pressure on the environment. The issue is divided into two aspects: one is wastewater from car washing at auto-workshops, and the other is discarded vehicles.

Wastewater from car washing, which contains washing agent (detergent), oil and grease, is not adequately treated prior to disposal in the river. Thimphu City once built two oil and grease separator tanks, but it appears that these are no longer fully functional because nobody took responsibility for nor ownership of them, according to the MoWHS. Moreover the number of discarded vehicles will increase because the number of vehicles is rapidly increasing.

Industrial waste management

The Waste Prevention and Management Regulation, 2012, stipulates that the generator of industrial waste must be responsible for segregating hazardous/non-hazardous wastes, carrying out pre-treatment, ensuring proper waste collection practices and disposing of waste in appropriate manner. The Department of Industry, MoEA, shall be the authority monitoring compliance with industrial waste management procedures. Common industrial procedure,

however, has been to stockpile waste on their premises and the Pasakha industrial landfill has only been operational since July 2015.

5.7.2 Environmental Conditions in Rural Areas

(1) Overview

The landscape of rural Bhutan is characterized by steep mountain slopes and scattered settlements and farmlands on relatively gently sloping plots along the slope. There appear to be no pollution sources and these rural areas are far away from any environmental issues. Other than settlements and farmland, the only things that can be seen are dense forests, deep gorges, bushes and scrubs across the country. All of these elements contribute to Bhutan's pristine natural environment and rich biodiversity.

In contrast with this environment, there has also been increasing pressure on rural areas caused by anthropogenic activities for subsistence, industry and development. Because there is no environmental monitoring activity, ambient air and water quality, etc., are not always quantitatively identified in rural areas. The following sub-sections will summarize the current status of the rural environment in Bhutan from the viewpoints of land, water quality, air quality, waste management and biodiversity, focusing on existing issues and pressures.

(2) Land

Similarly to urban areas as described in the previous section, various types of pressures are being placed on the land in rural areas, including:

- Demand for land for rural development and industry
- Unsustainable agricultural practices
- Forest fires
- Overgrazing
- Waste dumping

1) Demand for land for rural development and industry

The demand for land on Government Reserved Forest (GRF)/state land is mainly for the purpose of infrastructure development (hydroelectricity and roads) and mining, business and commercial activities. The demand for land for development services, particularly for rural development, has increased in the past decade with the acceleration of rural electrification and the construction of rural farm roads after 2008. The largest areas of state land have been leased for the construction of electricity transmission lines, especially low voltage distribution lines of 33 kV and 11 kV, to achieve an 100% rural household electrification rate by 2020. The second largest demand was for road construction on GRF land, especially for the accelerated construction of rural farm roads, the total length of which has increased from 1,045 km in 2008 to 5,218 km by 2013.

2) Unsustainable agricultural practices

Unsustainable agricultural practices include farming on steep slopes, the increasing and imbalanced use of inorganic fertilizers, the increasing use of chemical pesticides and shifting cultivation (NAP, 2009). The problems of steep slope agriculture mainly arise from the fact that 31% of farming is on land with more than a 50% slope (Land Cover Mapping Project (LCMP), 2010). Farming on steep slopes often causes soil erosion, which decreases land productivity and causes sedimentation in rivers.

The imbalanced use of inorganic fertilizers is largely due to the high use of urea (a nitrogen supplying compound), which is more affordable than other inorganic fertilizers. This would create an imbalance between N (Nitrogen), P (Phosphorus) and K (Potassium) in soil nutrient management (NAP, 2009).

The increasing use of chemical pesticides has been pointed out as an unsustainable agricultural practice, although the impact of chemical pesticides on the land and environment is not yet known (NAP, 2009). Shifting cultivation, known as Tseri in Bhutan, is an age-old farming practice prevalent among many of the country's farming communities, especially in the east and south-central regions. The concern arises from prolonged cultivation and shortened fallow cycles, leading to a decline in the productivity and stability of the land. However, the government has currently imposed a ban on Tseri cultivation.

3) Forest fires

Forest fires are a repeated occurrence every year in most areas of the country, especially during the dry season from November to February. Forest fires are one of the main causes of forest degradation and the loss of forests and associated biodiversity in Bhutan. The DoFPS has recorded an average of 48 annual fire incidents in the last five years, causing damage to a total of 47,501 acres of forest land (BSER, 2016). Most forest fires are human-induced, commonly from the burning of agricultural debris, careless smokers, road workers, the short-circuiting of transmission lines, the burning of lemongrass by harvesters and children playing with matches.

4) Overgrazing

Cattle grazing takes place in forests, open pastures and grasslands on a free-range basis. Due to migratory practices, most grazing areas in temperate zones are grazed on throughout the year by cattle in summer and yaks in winter. Overgrazing is seen to be contributing to land degradation in Bhutan. However, the overall cattle population appears to be declining, which would imply a declining pressure on forests and grasslands from cattle grazing.

5) Waste dumping

Waste dumping is exerting pressure on land and environmental pollution. Refer to sub-section (5) Waste Management for details.

(3) Water Quality

The quality of water bodies in rural areas is generally in good condition. According to Haa Dzongkhag, the quality of the river water in Haa Chhu is good enough that the only treatment necessary to meet requirements for drinking water is chlorination. This is just one example demonstrating the quality of river water in rural areas, but it suggests that water quality is largely intact and that there is no contamination. When looking deeper into the situation, however, there is a wide range of increasing and/or potential pressures on water quality in rural areas.

These pressures on water quality include the use of synthetic agro-chemicals such as fertilizers and pesticides in agriculture, waste dumping and effluent discharge.

The use of synthetic agro-chemicals like fertilizers and pesticides started in the 1960s in Bhutan. However, the rate of application on cropped land is considered low compared to the global fertilizer application rate. Furthermore, the use of these chemicals is restricted to regions that are accessible by roads and are many used for major food and cash crops such as potatoes, apples, rice and maize. Farmers use inorganic fertilizers mixed with farmyard manure (National Organic Programme, 2016). Thus, the pressure that these chemicals are putting on water quality

is not critical at present.

(4) Air Quality

Air quality in rural areas is good because, until recently, there have been no large-scale continuous pollution sources. However, the causes of air pollution have been listed as follows (BSER, 2016):

- Industrial mining activities: manufacturing industries and mining activities are generating significant dust pollution in local areas due to excavation and the loss of vegetation.
- Construction activities: dust particles blown away from construction sites, such as hydropower plants, roads, etc., are sources of dust pollution. Rapid urbanization has fuelled a boom in the construction industry in the past decade.
- Forest fires and hazards: forest fires are contributing to local air pollution.
- Fuelwood and kerosene for heating and cooking: the use of fuelwood and kerosene for household heating and cooking is contributing to air pollution in the form of smoke and soot. This issue is often seen in colder regions of the country, according to the Executive Engineer of Haa Dzongkhag.

(5) Waste Management

The main factor in the pressure on environmental quality due to waste dumping and effluent discharge is the fact that there are no proper waste management practices in rural areas. Waste is disposed of in pits dug on the periphery of individual housing lots. If the pit becomes full, another pit is prepared. This disposal method increases the risk of water pollution, firstly from groundwater and then from discharge into rivers. The situation is similar with effluent, including human excreta. These contamination factors are still minimal compared to the carrying capacity; therefore, the risk of the deterioration of environmental quality has so far been negligible. However, their impact could become more significant if these factors were concentrated in one location and/or occurred over a prolonged period of time.

(6) Biodiversity

Bhutan features one of the richest concentrations of biodiversity in the world. rural areas are surrounded by rich flora and fauna and pristine natural landscapes. However, the following issues have been observed in rural areas:

1) Human-wildlife conflicts

Human-wildlife conflicts are becoming a growing concern for the country. Livestock depredation and crop damage are two of the major problems caused by wildlife, posing serious a threat to livelihoods and domestic diversity. Records show that about 55% of crop damage in Bhutan can be attributed to damage by wildlife, while there were more than 2,035 cases of livestock losses from 2002 to 2012. This continual conflict is having an impact on rural livelihoods and quality of life. It is also leading to agricultural land becoming fallow and to rural-urban migration.

Due to the fact that human-wildlife conflicts are incurring substantial economic and social costs for rural communities, they are also resulting in retaliatory killings, resentment against policies, and the lack of support for conservation initiatives. For example, the retaliatory killing of dholes from poisoning a few decades ago almost eliminated the species in the wild (Human Wildlife Conflict Report, Wildlife Conservation Division (WCD), 2013).

2)   Ecological imbalance

Invasive plant, animal, bird and fish species are creating ecological imbalance. The Global Invasive Species Database records 46 Invasive Species (a non-native species that has a negative effect on a region's economy, environment or public health) in Bhutan, of which 11 are alien (a species introduced outside its normal distribution), such as tree marigold (*Tithonia diversifolia*), whitetop weed (*Parthenium hysterophorus*), Spanish Flag or LAVA (*Lantana camara*), bark beetle (*Ips scmuzinhoferin*), etc. (BSER, 2016). However, there has been no systematic and comprehensive inventory of invasive alien species (IAS) in Bhutan, apart from a few scattered studies. A pilot inventory carried out by the National Biodiversity Centre (NBC) recorded more than 30 invasive plant species, of which eight were categorized as major invasive plant species.

Nor has any assessment been carried out on the socioeconomic and environmental impact of IAS. However, the spread of some of IAS, such as *Trifolium repens* (white clover), into local landscapes and water bodies is well known. Concerns are also arising from the accelerated establishment of IAS due to the changing climate and the fact that native plant species are becoming invasive.

5.8   Land Use Control and Environmental Management Systems

5.8.1   Spatial Planning at the National, Regional and Local Levels

(1) Planning Terms Used in Bhutan

"Spatial planning" is a synonym for "town and country planning", "urban and rural planning" and "physical planning" (Hall & Tewdwr-Jones, 2010[6]). These terms are also interchangeable with another term, "land use planning", because, for instance, it has been said that the traditional British "town and country planning" system from the Town and Country Planning Act 1947 has also been called the British "land use planning" system (Corkindale, 2004[7]) and that the 1947 Act extended the notion of "land use planning" or "physical planning" (Cherry, 1996[8]).

In Bhutan, as shown in Table 5.8.1, various legal terms related to spatial planning have been used in a diverse range of acts, rules and regulations, and there have been a number of planning practices under the jurisdiction of the Department of Human Settlement (DHS) (formerly the Department of Urban Development and Engineering Services) under the Ministry of Works and Human Settlement.

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[6] Hall, P and M Tewdwr-Jones (2010) *Urban and Regional Planning: Fifth Edition*. London, Routledge

[7] Corkindale, J (2004) *The Land Use Planning System: Evaluating Options for Reform*. London, The Institute of Economic Affairs, Hobart Papers 148

[8] Cherry, G E (1996) *Town Planning in Britain since 1900*. Oxford, Blackwell Publishers

Table 5.8.1   Planning Terms Used in Bhutanese Acts, Rules and Regulations

	Land Act 2007	Land Rules and Regulations 2007	Thromde Act 2007	Local Government Act 2009	Thromde Rules 2011
development plan			✓	✓	
Dzongkhag plan		✓			
land use plan		✓		✓	✓
land use planning			✓		
local area plan		✓		✓	✓
local area planning				✓	✓
regional development plan		✓			
spatial planning					✓
strategic planning					✓
structure plan		✓		✓	✓
Thromde development plan	✓	✓			
Thromde plan			✓		
town planning					✓
urban development plan		✓	✓	✓	✓
urban planning			✓	✓	
zoning plan			✓		

(2) Draft Spatial Planning Act 2016

As stated above, spatial planning has already been institutionally established in Bhutan. It is not, however, under a unified planning legal system, but under the two legal systems of land and public administration. In addition, there is a systematic problem in that the Thromde Act 2007, which was repealed upon the enactment of the Local Government Act 2007, has not yet been replaced by any new act determining the definition of an urban area (or the criteria for what constitutes a Thromde) under the new governance system. Having said that, the establishment of the Thromde Rules 2011, a ministerial rule, was an attempt by the MoWHS to bridge this gap.

Under these circumstances, there has been a move towards the enactment of the Spatial Planning Act of Bhutan 2016, which would be a unified planning act. A draft was prepared by the DHS with the assistance of the World Bank and submitted to the Cabinet. As of the writing of this report, the DHS has submitted the final draft version of the Act of April 2017 to the MoWHS' Policy and Planning Division, and the Cabinet has approved the Concept Note on the Spatial Planning Act.

The purpose of implementing the Act is "to establish a framework for planning the use, development and protection of land in the Royal Kingdom of Bhutan in the present and long-term interest of the country" (draft Section 2). For this purpose, the draft Act proposes the introduction of a three-tiered planning framework composed of:

  (a) The highest level: a National Spatial Plan
  (b) The second level: Regional Spatial Plans
  (c) The third level: Regulatory Plans, comprising Valley Development Plans, Structure Plans, Local Area Plans and Action Plans (draft Section 19) (DHS, 2016a[9]).

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[9] Department of Human Settlement (DHS), Ministry of Works and Human Settlement (2016a) *Consultancy Services for the Preparation of a Spatial Planning Act and a Set of Spatial Planning Standards: Spatial*

Geographically, the planning area encompassed by each Plan is described as follows (KEIOS, 2016b[10]).

Table 5.8.2   National Spatial Planning Framework (Draft)

Tiers/Types of Plans		Planning Area
National Spatial Plan		The whole country
Regional Spatial Plans		An area comprising one or more Dzongkhags
Regulatory Plans	Valley Development Plan	A valley
	Structure Plan	An urban area
	Local Area Plan	Determined by the Valley Development Plan or Structure Plan in question, or by the planning authority
	Action Plan	Determined by the planning authority

Source: DHS, 2016b

The difference in the planning areas encompassed by Local Area Plans and Action Plans is that the former concerns "certain portions of a Valley Development Plan or Structure Plan" (draft Section 38), while the latter concerns "an area not within a Thromde … guiding the implementation of the development of a small settlement area and its environs in the absence of a higher level plan" (draft Section 43). It should be noted here that a Structure Plan is formulated for an area "covering a Thromde, village, commercial service centre or other rural settlement area" (draft Section 37) (DHS, 2016a), while the area described above is simply expressed as "an urban area" in Table 5.8.2. What constitutes an "urban area", however, is not clearly defined in any Bhutanese acts and regulations currently in effect, although an "urban area" maybe considered as identical to a 'Thromde area', because the Land Rules and Regulations 2007 (currently in force) categorizes an area outside of a Thromde as a "rural area".

It should be noted here that there used to be a clear legal definition of "urban area" in Bhutan. According to the repealed Thromde Act 2007, an "urban area" was declared by the Government to be an administrative area with a Gyelyong Thromde (a national city or a municipality), Dzongkhag Thromde (a District/Dzongkhag town or a municipality), Yenlag Throm (a satellite/medium town) or Gewog Throm (a town of the block/Geog). The criteria used to categorize a Thromde (a large urban area or a municipality) and a Throm (a small urban area) were then stipulated in the Act, as shown by Table 5.8.3.

Planning Act, Bhutan Urban Development Project II. Thimphu, Department of Human Settlement (DHS), Ministry of Works and Human Settlement

[10] DHS (2016b) *Consultancy Services for the Preparation of a Spatial Planning Act and a Set of Spatial Planning Standards: Spatial Planning Standards*, Bhutan Urban Development Project II. Thimphu, DHS

Table 5.8.3   Criteria for the Establishment of Thromdes and Throms in the Thromde Act 2007

Type of Thromde/Throm	Gyelyong Thromde	Dzongkhag Thromde*	Yenlag Throm	Gewog Throm
Population of the area (people)	10,000 or more	5,000 to 9,999	1,500 to 4,999	100 to 1,500
Population density (people/km^2)	1,000 or more	1,000 or more	--	--
Area of Thromde/Throm (km^2)	More than five	More than one	--	--
Percentage of employment in non-primary activities (%)	More than 50	More than 50	More than 50	More than 50
Revenue generated for the maintenance of its services	Sufficient to finance its services	--	--	--
Trade and commercial significance	National administrative significance, such as the capital city or servicing more than one Dzongkhag	Dzongkhag administrative significance	Service jurisdiction of more than one Gewog	--

Note: *:All Throms in Dzongkhag headquarters shall be eligible for the status of Dzongkhag Thromde, regardless of their conformity with the criteria.

(3) Spatial Planning at the National Level

No statutory national spatial plan has been formulated for Bhutan, although the Ministry of Agriculture did make one attempt by to make a national land use plan with the support of the Danish International Development Agency in the early 1990s.

However, there is now a certain need to formulate a national spatial plan, as it is stated in the EDP that that "The NLCS shall prepare a national land use zoning plan, which will outline the optimal use of land by 2017". It is therefore expected that the Comprehensive Development Plan for Bhutan 2030 will become Bhutan's first statutory national spatial plan, although it will need certain adjustments (including the sharing of roles between the DHS and the NLCS).

(4) Spatial Planning at the Regional Level

The terms "regional" or "sub-national" can have various definitions, but we define it here as 'an area comprising one or more Dzongkhags', with reference to the definition used in the draft Spatial Planning Act of Bhutan.

In that sense, no statutory regional spatial plan has been formulated for Bhutan, although the Land Rules and Regulations 2007 uses the terms of 'Dzongkhag plan' and 'regional development plan', although with no clear definition of either.

(5) Spatial Planning at the Local Level

According to our abovementioned definition of "regional", "local" or "sub-regional" spatial plans are made up of various types of plans, as stipulated in the draft Spatial Planning Act. These include Valley Development Plans, Structure Plans, Local Area Plans and Action Plans.

Table 5.8.4 shows the list of local spatial plans that have either been approved/formulated[11] or are under preparation as of the writing of this report. According to the Table, there are still only three Valley Development Plans, which only began to be formulated relatively recently, while there are many Structure Plans (or equivalent ones), as these began to be formulated in the 1980s, and Local Area Plans. As of the writing of this report, there is still a lack of information on Action Plans.

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[11] In the case of Action Plan, approval is not required.

Table 5.8.4   Spatial Plans Either Approved or Under Preparation (Tentative, as of August 2017)

Dzongkhag	Valley Master/Development Plan (VMP/VDP)	Structure Plan (SP), (Urban) Development Plan (UDP/DP) etc.	Local Area Plan (LAP)	Action Plan (AP)
Bumthang	Bumthang VMP	Bumthang SP 2003	*Dekiling LAP* *Chamkhar LAP* *Jalikhar LAP* Bathpalathang LAP Jakar LAP	
Chhukha		Phuentsholing SP 2013-2028 Tshimasham SP Gedu SP Tshimasham DP 2002	Phuentsholing Core Area LAP Rinchending LAP Pekarzhing LAP Alay LAP Pasakha LAP Laptsakha LAP Below Meritshimo Junction LAP Darla LAP 1999 Above Meritshimo Junction LAP	Lobneykha AP Shemagangkha AP
Dagana			Dagana Town LAP 2002 Sunkosh LAP 2001 *Dagapela LAP* Drujegang LAP (Satellite town) *Lhamoyzingkha LAP*	
Gasa		Gasa SP 2015-2030 Gasa DP 2000 Gasa Tshachu DP 2011	Kolikha LAP Damji LAP	
Haa		Haa SP 1987-2000 (revised in 2006)		
Lhuentse		Autsho DP 2016	Phaling LAP 2002 Autsho LAP Gorgan LAP	Khoma Infrastructure Development Plan (DP)
Monggar		Monggar SP 1986-2000 Gyalpozhing UDP (revised in 2008) Monggar Core (Kilikhar) 2001-2015	Trailing LDP Changsingpeg LDP Gyalpozhing LDP Jarukhashor LDP Naling LDP Core Commercial Areas LDP Dramitse LDP	
Paro	Paro VDP 2015-2035	Tshogdu UDP 2003 Bondey UDP 2004 (SP)	Tshongde LDP Phase-I, II, III Bondey Core Area LDP	
Pemagatshel		Denchi UDP 2013 (SP) Rinchenthang DP 2011 Nganglam Regional Hub 2015-2035	Denchi LDP	
Punakha		Khuruthang DP 1997 Punakha UDP 2016		Lobesa AP
Samdrup Jongkhar		Samdrupjongkhar SP (revised in 2013)	*Samdrup Choling (Bangtar) LAP* *Jomotsangkha (Daifam) LAP 2015-2040*	Narphung DP
Samtse		Samtse SP 2000	Gola Bazaar LAP Sipsu LAP	
Sarpang		Sarpang SP 2010-2035 Gelephu SP	Schechangthang (Rani Bagan) LAP *Lhamoizingkha (Kalikhola) LAP*	
Thimphu		Thimphu Structural Plan 2002-2027	Debsi LAP Kabesa LAP	

Dzongkhag	Valley Master/Development Plan (VMP/VDP)	Structure Plan (SP), (Urban) Development Plan (UDP/DP) etc.	Local Area Plan (LAP)	Action Plan (AP)
		Debsiphakha Urban Development Plan 2012	Babesa LAP Taba LAP Lanjopakha LAP Lungtenphu LAP Simtokha LAP Serbithang LAP Hejo LAP Jungshina LAP Changbangdu LAP Dechen Choling LAP Khasadrapchu LAP Changjiji LAP	
Trashigang		Trashigang SP 2009-2029 Rangjung DP 2002 Wamrong DP 2008 Kanglung DP 1987 (not implemented) Kanglung SP 2008 (not implemented) Kanglung Regional Hub SP 2016 (approved and forwarded to the Dzongkhag)	Melphey LAP Core Market Area LAP Rangjung Core Area LAP Khaling 2016 LAP (Final Report to be approved)	Merak and Sakteng Infrastructute DP
Trongsa		Trongsa SP 2003 Buli DP Taktse DP	Trongsa Town LDP DOR and Industrial Area LDP Sherubling LDP	Taktse DP
Tsirang		Damphu SP 2006	Damphu LAP for UV-03 (completed) and UV-02 (ongoing)	
Wangdue Phodrang		Bajo UDP 2002 (approved) Wangdue UDP 2016 Nobding 1998 UDP (approved but not implemented)	Bajo LAP phase -I (under implementation) and phase -II (yet to be implemented)	Chitokha AP
Yangtse		Trashiyangtse DP 2000 Duksum SP 2012-2037		
Zhemgang		Zhemgang SP 2003-2023 Tingtibi DP 1996 Panbang DP 1996 (not implemented) *Panbang DP 2016*	Trong Village LAP Phaling Residential Area LAP School and Residential Area LAP	Buli Commercial DP

Source: the DHS
Note: Block Letters: plans approved/formulated
               Italic Letters: plans under preparation

5.8.2   Land Use Control System

(1) The Current Land Use Control System

At present, there is no nationwide system which comprehensively controls land use in Bhutan. It has so far been implemented by each sector under the various acts and rules related to land use. The table below shows the current legislation regulating the land use control system.

Table 5.8.5   Legal Structure of Land Use Control in Bhutan

Area / Act	Urban Areas		Rural Areas		Forest Areas	Protected Areas
		Agricultural Land				
Relevant Act	The Local Government Act of Bhutan 2009				Forest and Nature Conservation Act 1995	
		Land Act 2009				
Relevant Rules	Building Rules 2002		Rural Construction Rules 2013		Forest and Nature Conservation Rules and Regulations 2017	

Recently, a new piece of legislation named the "Spatial Planning Act" has been prepared and a draft was submitted to the Cabinet. This new Act would work to liaise between and coordinate the various land use legislative systems currently being implemented independently by each sector.

1)   Land use control in urban areas

The two land use control systems

There are two systems to control land use in urban areas. According to the first system, each Thromde implements land use control procedures in accordance with the provisions of the Bhutan Building Rules 2002. Under the second system, a Thromde formulates a Structure Plan for its own jurisdiction and implements land use control procedures under the Development Control Regulation formulated as a part of the Structure Plan, which works as an alternative regulation to the Building Rules 2002. In this case, the legal basis for this implementation is the Local Government Act 2009.

Building Rules 2002

The Building Rules 2002 apply to "declared urban areas", where building permits issued by the implementing authority are required for the construction of all new buildings and building additions and alternations.
The Rules embrace two aspects of building regulations. The first of these is a building code which covers the architectural design, structure, facilities, water supply/drainage, electricity, etc. of buildings. The other aspect is planning, which includes site coverage, set-back lines, building height, etc.
The Rules also establish "urban control zones" which are defined as "peripheral areas immediately outside the municipal boundary", in which building construction is not permitted without a development plan approved by the municipal council (Thromde Tshogde).

Structure Plans and Development Control Regulations

In accordance with the Local Government Act, a Thromde may prepare a Structure Plan which serves as a land use master plan for the Thromde area. In order to execute the Structure Plan, the Thromde will implement Development Control Regulations (DCR), which are formulated as part of the Structure Plan. The provisions of the DCR supersede those of the Building Rules 2002, which are uniformly applied all over the country, so as to implement a more detailed land use control system suited to each specific area.

2)   Land use control in rural areas

Rural Construction Rules 2013

In rural areas, land use control is implemented by the Rural Construction Rules 2013, formulated by the MoWHS. The basis for exercising this authority lies in the Local Government Act 2009. According to these Rules, a "rural area" is defined as "any area or settlement outside the declared municipal boundary, including the semi- and peri-urban areas that lie immediately

outside the municipal boundary" (Article 5).

Objective of the Rules

The objective of these Rules is to facilitate the planned and harmonized development of settlements. The Rural Construction Rules complement the provisions of the Building Rules; however, if there are conflicts between the two, the Rural Construction Rules take precedence.

Scope of application

The Rules apply to all rural areas where there are no approved human settlement plans or Local Area Plans (Article 1). All construction, including the development of sites and changes of land use (excluding temporary agricultural facilities) require the written approval of the Dzongkhag Administration (Article 4).

Contents of the DCR

There are restrictions on the use of developed land, according to which the land should be used for residential or mixed-use development (construction should primarily be for residential purposes, with parts of it used for commercial activities). For other cases, it is necessary to get special permission from the Dzongkhag Administration (Article 12).

In principle, the construction of hotels, resorts, offices, group housing and hostels is not permitted in existing clustered villages (Article 13).

No construction is permitted in environmentally sensitive areas, within a certain distance of rivers or where scenery, areas of historical or cultural significance or traditional settlements may be adversely affected (Article 14-17).

Challenges of land use control

The land use planning system in Bhutan is less strict than that of European nations, where development outside of urban areas is prohibited in principle, while development near existing urban centres and their surroundings is recommended.

Under the principle of "where no plan exists, no development takes place", it is currently an international standard that development outside of urban areas is only permitted where a Local Area Plan has been prepared, except for agricultural facilities and the alteration of existing buildings. In rural areas of Bhutan, however, the construction of residential or mixed-use buildings is permitted without any development plan, according to the Rural Construction Rules.

On the other hand, agricultural land, which makes up the majority of rural areas, is regulated by the Land Act 2007, which is not a regulation created from the perspective of land use planning. It may not be appropriate to adapt the whole system used in other nations to Bhutan, where the terrain conditions are exceptionally difficult. Nevertheless, in the near future, the improvement of land use control will become an important issue for Bhutan as a nation that places the highest value on landscape and culture.

3)   Land use control on agricultural land

The Land Act 2007 provides criteria and procedures for the conversion of the category of agricultural land to other uses. The criteria differ depending on whether or not the land in question is currently used as Chhuzhing (paddy fields), whether or not it will be used residentially after the conversion and whether or not the land is located in a Thromde.

The conversion of agricultural land other than Chhuzhing (Articles 89 and 165)

The conversion of agricultural land other than Chhuzhing is permitted when the land owner

submits an application to the Local Authority in a format prescribed by the National Land Commission Secretariat.

The conversion of Chhuzhing to residential use (Articles 92 and 167-169)

If a person has only inherited Chhuzhing in his/her Thram, he/she may apply to the Local Authority for 50 decimals from said Chhuzhing in rural areas in a format prescribed by the Ministry of Agriculture and Forests (MoAF).

The conversion of Chhuzhing to uses other than residential (Articles 91 and 166)

Land owners may apply to the Local Authority to convert Chhuzhing to uses other than residential purposes in a format prescribed by the MoAF. The Local Authority verifies the application and either rejects it or submits it to the MoAF. The MoAF assesses the application based on technical criteria (including the availability of water, soil and environmental conditions) and makes a decision on whether the conversion is reasonable enough for approval.

Conversion of land within the Thromde (Articles 302 and 304)

The land category may be converted when the Structure Plan designates that the land in question is to be included in an urban area, subject to the relevant laws and regulations.

4) Land use control of forest and nature conservation areas

Forest areas

In Bhutan, all forest areas have been nationalized and are now State Reserved Forests. The management and regulation of forests and matters related to Community Forests are outlined in the Forest and Nature Conservation Act of Bhutan 1995 (FNCA) and the Forest and Nature Conservation Rules and Regulations 2017 (FNCRR).

Restrictions on logging, residence, cultivation, etc. are in place for forest areas, which are regulated by two levels of strictness. The first of these is "prohibited activities" and the second is "restricted activities", the latter being allowed if special permission is granted. In forest areas, previously existing residences and cultivated land are allowed to continue but new developments are not permitted. However, permission may be issued for a certain area in unavoidable circumstances, such as the lack of living space.

Nature conservation areas

(a) Designation of Protected Areas: 51% of the national land in Bhutan is has been categorized as Protected Areas (PA). The various types of PA, their management and the regulations governing them are specified in both the FNCA and the FNCRR, as are those for forest areas. In both the Act and the Rules, many types of PAs are listed; however, there are currently 10 PAs, which can be placed in three categories, as well as several biological corridors. Presently, there are five National Parks, four Wildlife Sanctuaries, one Strict Nature Reserve and some Biological Corridors which form links between the 10 PAs. The management of and regulations for National Parks and Wildlife Sanctuaries are basically the same, even though the area of a National Park is much larger than that of a Wildlife Sanctuary.
The PAs in Bhutan were designated based on the classification of protected areas adopted by the International Union for Nature Conservation (IUCN), i.e., Strictly Protected Areas, National Parks, etc., taking the actual situation of Bhutan into account.

(b) Management of PAs: A Conservation Management Plan is prepared for each PA, based on which management activities are carried out by the local government office (Department of Forests and Park Services, MoAF), not by the Dzongkhag. The management and regulation activities carried out are basically the same for all PAs, with the exception of Biological Corridors. The Department is currently preparing a revised version of the Vision and Strategy for the Nature Conservation Division 2003, in which they intend to raise the level of management required for Biological Corridors to the same level as other PAs.

(c) Zoning within the PAs: Each PA, except for Strict Nature Reserves, is divided into three zones, i.e., the Core Zone, the Multiple Use Zone and the Buffer Zone. Regulations for each zone are specified in the FNCA and the FNCRR. Each of the three zones is defined in the FNCRR as follows:

The Core Zone is the area in which no human activities are allowed, with the exception of research activities. In the Multiple Use zone, existing residents may continue to live there only if they do so in a sustainable manner. The Buffer Zone performs a cushioning function between the inside and outside of each PA; it actually used to be located outside of the PA but is now inside. There is no Buffer Zone if the Protected Area is totally surrounded by forests and there is no human pressure.

(d) Regulation of PAs: As with the case of forest areas, the FNCRR also stipulates prohibited activities and restricted activities for PAs. There are also regulations which are applied commonly to all PAs and those which are applied respectively to Core Zones and Multiple Use Zones.

(2) Integration of Land Use Planning Systems by the Spatial Planning Act

The Spatial Planning Act is being prepared based upon the description in the section "National Spatial Policy" of the SGNH, which says that "the National Spatial Policy will be backed by a Spatial Act that will henceforth be an umbrella Act for governing the use of land and natural resources."

The objective of spatial planning is to provide for fair, orderly, economic and sustainable use of land consistently with the pursuit of Gross National Happiness.

1) The integration of policies through Strategy Plans

The draft Spatial Planning Act (SPA) states that the scope of spatial planning includes "coordinating sectoral policies". In the SGNH, the Spatial Planning Act is also recognized as "an umbrella act for the use of land and natural resources". As such, the SPA is required to play the role of coordinating the various policies created by each individual sector. In particular, the National Spatial Plan and Regional Spatial Plans are categorized as Strategy Plans, which are expected to help liaise between an extensive range of policies and strategies.

The draft of the SPA makes some amendments to existing acts, including the insertion of a new subject into the Land Act (Article 169). The content of this article is: "Conversion Subject to the Spatial Planning Act – 171A Conversion of a land category must not be approved if it does not conform to a Spatial Plan approved under the SPA". This provision implies an intention to assess and determine the conversion of agricultural land from the perspective of the total land use plan, rather than merely from an agricultural viewpoint. In this sense, it could be said that this provision will take a step towards policy integration.

2) Improvement of the adjustment function through Strategy Plans

The Spatial Plan is also expected to fulfil the function of adjusting the various land use plans

and development regulations proposed by related sectors when they come into conflict. It is important to create a separate adjustment mechanism as a platform allowing the Spatial Plan to function practically and effectively.

3)   The systematization of regulatory plans

Currently, each Thromde is preparing a Structure Plan, Local Area Plans and Development Control Regulations under the Local Government Act 2007. However, the definition of each plan has not been provided in the Act. When the SPA is enacted, it will provide a clear definition of every Spatial Plan and their relationship with the Local Government Act will be clarified. It is also expected that the regulatory planning system will become clearer and more effective in urban areas.

The Action Plans introduced in the draft SPA are to serve as Spatial Plans in rural areas. Their function is stated as "guiding the implementation of the development of a small settlement area and its environs." This new approach is expected to play an important role in rural areas, where land use has not previously been appropriately controlled.

5.8.3   Environmentally Protected Areas

Environmentally Protected Areas in Bhutan fall under the Protected Areas system, which covers more than half of the nation's total territory. The Bhutanese system was initiated in the early 1960s, and at that time it covered almost all of the country's southern and northern regions. In 1993, the system was revised for a better ecological representation and realistic management of the country's natural resources. Today, Bhutan has 10 formally Protected Areas covering 16,396.43 km^2, which is more than 40% of the country.

Protected Areas are composed of three categories: National Parks, Wildlife Sanctuaries and Strict Nature Reserves. These Protected Areas accounted for 26.23% of the total land when Protected Areas were first designated. The RoGB, however, believed that isolated Protected Areas would not guarantee the long-term genetic viability of biological resources. The Biological Corridor, therefore, was established to connect Protected Areas and therefore avoid the genetic erosion of plants and animals (Vision and Strategy for the Nature Conservation Division, 2003). Biological Corridors covers about 9% of the country. In addition, the Royal Botanical Park was established in 2004 below the Dochula Pass. The park is a nature recreation and eco-tourism site. Together, all of these areas cover more than 50% of the country, and are managed by the Department of Forests and Park Services (MoAF).

(1) Outline of Protected Areas in Bhutan

Protected Areas in Bhutan include five National Parks, four Wildlife Sanctuaries and one Strict Nature Reserve. Furthermore, Biological Corridors and recreational parks also fall under the Protected Areas system in Bhutan. More than half of the country's land is under the Protected Area system, corresponding to 19,750.57 km^2 or 51.44%. This is composed of Protected Areas (16,396.43km^2 or 42.71%), Biological Corridors (3,307.14km^2 or 8.61%) and recreational parks (47 km^2 or 0.12 %).

Table 5.8.6   The Protected Area System in Bhutan

Name of Protected Areas	Year Established	Total Area (km²)	Dzongkhags
A. National Parks			
1. Wangchuck Centennial Park	2008 (gazetted)	4,914.00	Gasa, Wangdue, Bumthang, Trongsa and Lhuentse
2. Jigme Dorji National Park	1995	4,316.00	Punakha, Gasa, Thimphu and Paro
3. Jigme Singye Wangchuck National Park	1995	1,730.00	Trongsa, Wangduephodrang, Sarpang, Tsirang and Zhemgang
4. Royal Manas National Park	1966	1,057.00	Sarpang and Zhemgang
5. Thrumshingla National Park	2000	905.05	Bumthang, Lhuentse, Monggar and Zhemgang
B. Wildlife Sanctuaries			
1. Bumdeling Wildlife Sanctuary	1998	1520.61	Trashiyangtse, Lhuentse and Monggar
2. Sakteng Wildlife Sanctuary	2003	740.60	Trashigang and Samdrupjongkhar
3. Phibsoo Wildlife Sanctuary	1993	268.93	Sarpang and Dagana
4. Khaling Wildlife Sanctuary	1993	334.73	Samdrupjongkhar
C. Strict Nature Reserve			
1. Jigme Khesar Strict Nature Reserve	2010*	609.51	Haa
Total Protected Areas		**16,396.43**	
D. Biological Corridors	1999	3,307.14	Haa, Paro, Thimphu, Punakha, Wangduephodrang, Sarpang, Tsirang, Trongsa, Zhemgang, Bumthang, Monggar, Lhuentse, Trashigang and Samdrupjongkhar
E. Recreational Park			
1. Royal Botanical Park	2004	47.00	Thimphu and Punakha
Total		**19,750.57**	

Note) *: Year operationalized.
Source: Forest Facts and Figures 2016, DOFPS

The locations of Protected Areas and Biological Corridors are shown on Figure 5.8.1. Almost all of northern Bhutan is part of a Protected Area. In addition, there are three National Parks in the central region from east to west, as well as two Wildlife Sanctuaries located along the country's border with India to the south. The Biological Corridors aim to connect these Protected Areas.
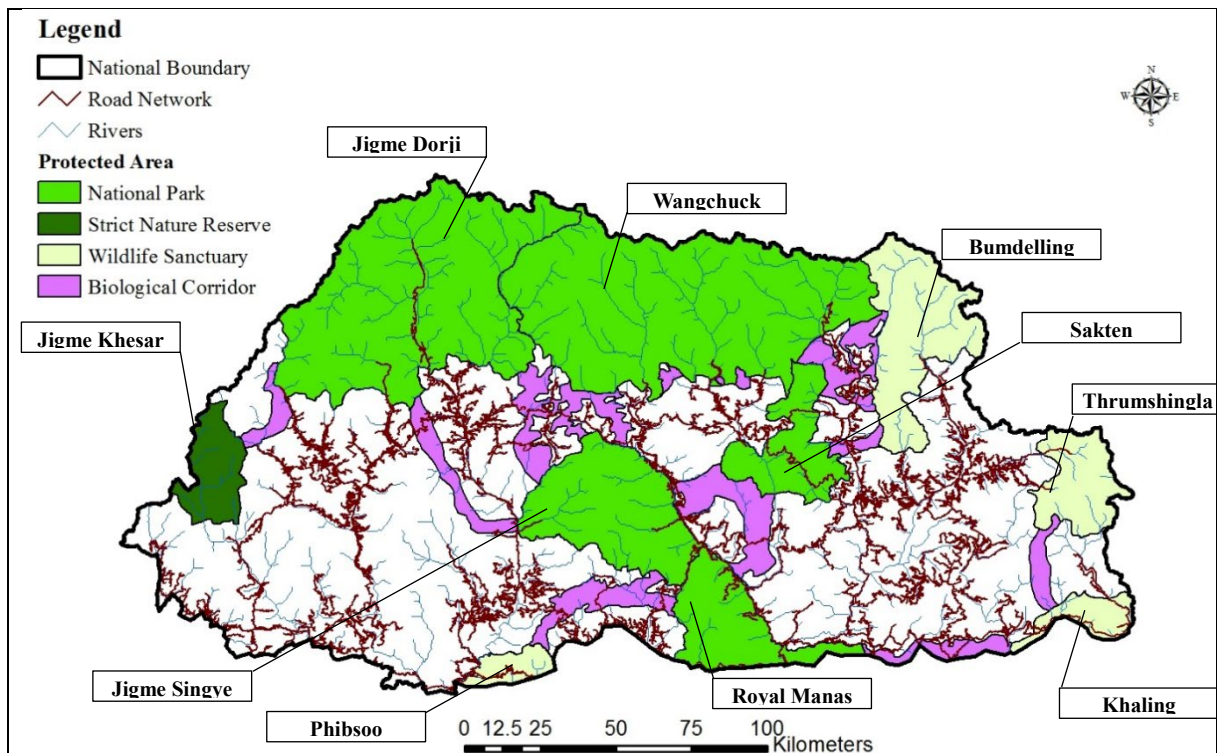
Source: Forest Facts and Figures 2016, DOFPS

Figure 5.8.1   Location Map of Protected Areas and Biological Corridors

(2) Description of the Protected Areas

The features of each Protected Area are summarized below based on the Bhutan Biodiversity Action Plan 2009.

1)   Wangchuck Centennial Park

Inaugurated in December 2008 as a tribute to the Kings of Bhutan and in commemoration of 100 years of monarchy, Wangchuck Centennial Park is the country's newest Protected Area. It has some of the country's highest mountain peaks, such as Gangkar Puensum and Rinchen Zoegila, and is the headwater source of three major rivers, namely Puna Tsang Chhu, Mangde Chhu and Kuri Chhu. The park is so far known to harbour 23 species of mammal, including several globally threatened species like the snow leopard, the Bengal tiger, the takin, the musk deer, the Himalayan black bear and the red panda. The Tibetan wolf, which is found nowhere else in Bhutan, is also known to inhabit the park. More than 8,000 people live in eight major villages within the park. As the Park is located in the highlands, the local people are mostly yak herders and farmers.

2)   Jigme Dorji National Park

The Park is situated in the north-western corner of the country, transcending the boundaries of Paro, Thimphu, Gasa and Punakha Dzongkhags. With altitudes ranging from 1,400 to over 7,000 masl, more than 30 species of mammals, 300 species of birds and 1,400 species of plants have been recorded in the Park, including several globally threatened species such as the tiger, the snow leopard, the Himalayan black bear, the takin, the musk deer and the black-necked crane.

Some 6,500 people live in the Park, largely subsisting on semi-nomadic yak-herding, the raising of other livestock, agriculture, the harvesting of medicinal and incense plants and the use of

other forest products.

3)   Jigme Singye Wangchuck National Park

The Park shares a contiguous boundary with Royal Manas National Park to its south. This Park is most characterized by its temperate forest, which is reportedly one of the largest and richest forests in the whole of the Himalayas. Largely as a result of its vast tracts of primary forest, the park is very rich in birdlife. Three hundred and ninety-five species of birds have been recorded in and around the Park. These include the rufous-necked hornbill, the Ward's trogon, the Satyr tragopan, and the white-bellied heron. The adjacent Phobjikha valley, to the north-west, is the country's most important wintering site for the black-necked crane, with more than 200 cranes roosting there each year.

Around 5,000 to 6,000 people live within the park, with another 10,000 to 15,000 estimated to be living within three to five km of the Park boundaries. As in most parts of rural Bhutan, the local people make their living from crop farming and livestock rearing. The use of forest products is also crucial for local subsistence. A partial ethnobotanical inventory lists some 95 species of plants used by locals for food, shelter, household implements and medicine.

4)   Royal Manas National Park

The Park is the country's oldest Protected Area. Even prior to its official classification as a Protected Area in 1966, it was maintained as a de facto wildlife reserve for many years under the patronage of the Royal Family. More than 900 species of plants have been recorded there, including 348 species of trees, 206 species of shrubs, 90 species of climbers and twiners, 192 species of herbs and nine species of orchids. With respect to fauna, 45 species of mammals and 366 species of birds have been recorded. The mammal species include several globally threatened species, such as the Bengal tiger, the clouded leopard, the Asian elephant, the sloth bear *Melursus ursinus*, the Himalayan black bear, the gaur *Bos gaurus*, the wild water buffalo *Bubalus arnee*, the serow, the golden langur and the hispid hare *Caprolagus hispidus*. The birds recorded also include globally threatened species, such as the rufous-necked hornbill, the chestnut-breasted partridge, the white-naped yuhina and Pallas's fish eagle.

Around 2,800 people live inside the Park area and 4,500 live in the Buffer Zone (Norbu, 1998). The economic mainstay of the local people is largely subsistence crop farming.

5)   Thrumshingla National Park

Mixed conifer and broadleaf forests are predominant in the Park, covering more than 66% and 23% of the Park's area, respectively. A prominent feature of the Park is the old-growth fir forest with its thick undergrowth of rhododendrons. Some 622 species of plants have so far been recorded in the park. Plant endemism is high with 21 endemic species listed, including *Lobelia nubigena*, which is found only in the Park. In terms of fauna, 68 species of mammals and 341 species of birds have been recorded. Of the mammals, key species include the Bengal tiger, the leopard, the leopard cat, the clouded leopard, the Himalayan black bear, the red panda, the musk deer, the capped langur and the Malayan giant squirrel. The Park's birdlife includes globally important species, such as the rufous-necked hornbill, the beautiful nuthatch, the Ward's trogon, the white-naped yuhina and the brown wood owl *Strix leptogrammica*.

The Park is estimated to have around 2,000 people living inside its boundaries and 11,000 living in the Buffer Zone.

6) Bumdeling Wildlife Sanctuary

The Sanctuary is situated in the north-eastern corner of the country. The highest point in the sanctuary is 6,450 masl and the lowest is 1,500 masl. However, much of the Sanctuary lies between 2,400 and 5,000 masl, with temperate broadleaf forest, pine forest, conifer forest, alpine scrub and meadows being the dominant types of vegetation. Key fauna includeing the Bengal tiger, the snow leopard, the Himalayan black bear, the musk deer, the capped langur, the red panda, the rufous-necked hornbill, the Assamese macaque *Macaca assamensis*, the Asiatic wild dog *Cuon alpinus* and the Himalayan serow. More importantly, the Bumdeling Valley is the country's second biggest wintering habitat for the black-necked crane, with some 150 to 170 cranes roosting there each year.

More than 2,200 people live in the Sanctuary and its adjoining Buffer Zone. The majority of these people are farmers subsisting on crop farming and livestock rearing. The most important crops are millet, maize, rice and potatoes. The main livestock kept are cattle, equines and sheep.

7) Sakteng Wildlife Sanctuary

The Sanctuary is bordered by India to the north-east. Local anecdote has it that the abominable snowman, also known as the Yeti or Migoe (the existence of which is yet to be scientifically proven) inhabits the Sanctuary. The Sanctuary's conservational significance lies in its vast, pristine tracts of mixed conifer forest and the diversity of its rhododendron species, which is said to be the highest in the country.

8) Phibsoo Wildlife Sanctuary

Phibsoo Wildlife Sanctuary is the country's smallest Protected Area. This Protected Area lies entirely inside Sarpang Dzongkhag and borders the Indian State of Assam to the south. The Sanctuary is unique, for it has the only natural sal *Shorea robusta* forest in the country and is a prime habitat for the spotted deer *Axis axis*. It is the country's strongest example of a tropical/sub-tropical ecosystem. Other key fauna including the tiger, the Asian elephant and the golden langur. In terms of the human population, it is relatively uninhabited except for the south-western edge.

9) Khaling Wildlife Sanctuary

Khaling Wildlife Sanctuary is the second smallest Protected Area and lies entirely inside Samdrupjongkhar Dzongkhag. It is situated along the south-eastern edge of the country, and is bordered by the Indian State of Assam to its east and south.

The sanctuary is known to be a very good habitat for the rare pygmy hog *Sus salvanius*, the Asian elephant and the tiger. Its population is concentrated in the south-western and south-eastern niches of the Sanctuary, with Samrang and Daifam being the major settlements.

10) Torsa Strict Nature Reserve

Torsa Strict Nature Reserve lies mostly in Haa Dzongkhag, with a very small area spreading south into Samtse Dzongkhag. It protects the country's westernmost example of central, temperate forests. As the reserve is virtually uninhabited, it is known to have one of the most pristine temperate forests and alpine vegetation in the whole of the Himalayas.

(3) Restriction of Activities in Protected Areas

1) Zoning in Protected Areas (PAs)

The Forest and Nature Conservation Act stipulates the grounds upon which the Protected Areas have been established. The Protected Areas are divided into three zones, pursuant to the Forest and Nature Conservation Rules and Regulations of Bhutan (FNCRR), 2017. These zones are:

Core Zone: An area within a PA, designated in accordance with the technical regulations, in which human-related activity is not permitted (with the exception of regulated research and monitoring programmes).

Multiple Use Zone: An area within a PAs in which sustainable harvesting and the use of natural resource are allowed for local consumption.

Buffer Zone: An area that functions as a cushion between adjoining rivers, streams, transmission lines, and roads and the area contained within PAs.

The Protected Area zoning guidelines specify how Protected Areas can be used.

2) Regulated activities within PAs

The restrictions imposed on activities within PAs consist of two categories, namely prohibited activities and restricted activities (which are allowed when special permission has been issued). Table 5.8.7 shows the regulated activities within a PA classified by the zones described above.

Besides PA regulations, general requirements are also applied to forest areas, and naturally, they must also be applied to PAs with forest areas.

Table 5.8.7   Prohibited and Restricted Activity in State Reserved Forest Land and Protected Area

	Prohibited Activities —Article 393—	Restricted Activities (allowed with a special permit) —Article 394—
The Entire Protected Area	・Quarrying and mining	・The construction of any infrastructure or irrigation channels ・The clearing of corridors for electricity transmission lines and telephone lines ・The recording of documentary/commercial films or any sound recording ・The collection of any specimen of tree/climber/shrub/medicinal plant/ornamental plant/soil/ rocks ・Visits from tourists/foreigners ・The removal of stray dogs
Core Zone	・Felling	・The harvesting of non-wood forest products
Multiple Use Zone		・The construction of placing of any permanent or temporary structure, fence, marker or other device

Source: Articles 393, 394, FNCRR2017

(4) Other Environmentally Protected Areas in Bhutan

1) Ramsar sites

There are three UNESCO-designated Ramsar sites in Bhutan, which are as follows:

Table 5.8.8   List of Ramsar Sites in Bhutan

Name	Site number	Administrative region	Area (ha)	Coordinates
Bumdeling	2032	Yangtse Dzongkhag	141.5	27°40'N 91°26'E
Khotokha	2033	Wangduephodrang Dzongkhag	113.5	27°26'N 90°00'E
Gangtey-Phobji	2264	Wangduephodrang Dzongkhag, within Phobji and Gangtey Gewogs/blocks	970.0	27°27'N 90°11'E

Source: https://rsis.ramsar.org/ris-search/?f%5B0%5D=regionCountry_en_ss%3ABhutan&pagetab=1

2) Natural World Heritage Sites

There are no UNESCO-designated natural World Heritage Sites in Bhutan, but the following four sites are listed in the Tentative List, an inventory of the areas a country intends to consider for nomination to the World Heritage List. These sites are all also Protected Areas.

- Bumdeling Wildlife Sanctuary
- Jigme Dorji National Park
- Royal Manas National Park
- Sakteng Wildlife Sanctuary

5.8.4   Cultural and Historical Protected Areas

Bhutan has a unique climate and topographic features, which have created natural valleys and separated villages from each other. Each community has developed its own traditions, customs and culture due to the isolated environment. In this environment, these unique cultures have remained. In addition to the unique geographical conditions of Bhutan, Buddhism has also had a big impact on Bhutan's culture. Buddhism came to Bhutan in the seventh century, and the new practices it brought with it became common among the Bhutanese people. The rich and unique culture became integrated with Buddhist values and flourished within the region, refining the arts, drama, architecture, literature and social structure. Buddhism is central to Bhutan's way of living and thinking. Although Bhutan is only a small land, with a small population and economy, its culture is like nothing else on Earth, a symbol of the country's unity and national identity. Therefore, the preservation and promotion of the country's cultural heritage, a task that has been taken on by the Royal Government of Bhutan, is stipulated as the third pillar of Bhutan's development philosophy, Gross National Happiness (GNH). GNH consciously focuses on maintaining the ideal balance between material and spiritual development, which benefits the body and spirit of the Bhutanese social structure.

(1) Bhutanese Culture

The Bhutanese term for culture is "lamsol", or "following a path" in English. Bhutanese culture could be separated into tangible and intangible aspects. The preservation and promotion of cultural heritage includes both tangible and intangible heritage.

Tangible culture includes things that can be touched and seen, such as dzongs, houses, temples, art and antiquities; intangible culture, on the other hand, could be conceptual or lack a tangible form, such as knowledge, skills, attitudes, beliefs, songs, music, drama, oral traditions, festivals and other such recordable events. The Figure below shows the distribution of historical sites like dzongs and lhakhangs (Buddhist temples). There are many historical sites distributed across the country, including Dzongs, monasteries and temples. However, these historical sites are mostly located in the central part of the country when it is divided into horizontal zones. In particular, these historical sites are located in central Dzongkhags such as Paro, Punakha, Wangduephodrang, Monggar, Pemagatshel and Trashigang. In contrast with those in the centre

of Bhutan, northern and southern Dzongkhags such as Gasa, Samtse, Chhukha, Dagana, Tsirang and Sarpang have a relatively small number of the historical sites.
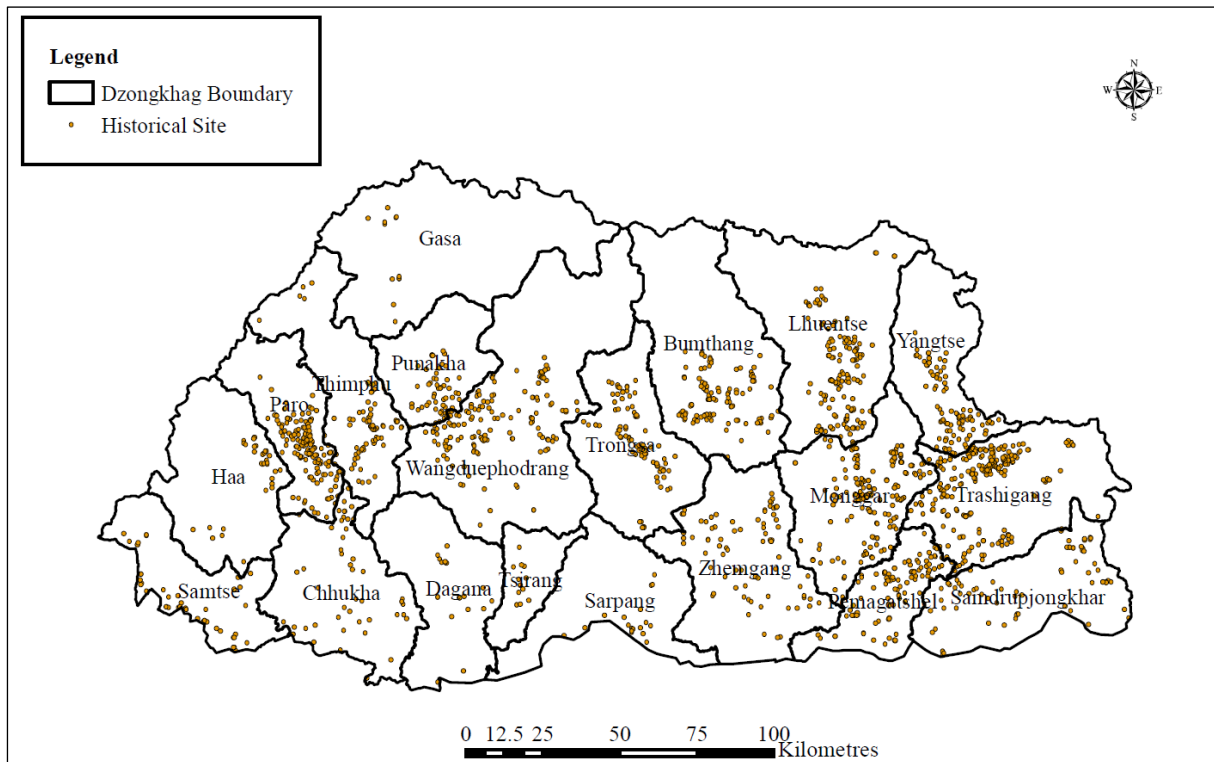
Source: Based on NSB data

Figure 5.8.2   Distribution Map of Historical Sites

Bhutanese culture, both tangible and intangible, stems from village communities and dzongs. Social needs and the specific environment helped to develop community-based cultures made up of diverse cultural aspects. Culture based on dzongs and monasteries stems from government leaders, officials and monks. Historically, dzongs originally served as fortresses, before becoming religious and civil cultural administration centres. The Department of Culture is engaged in the renewal and reconstruction of dzongs in various Dzongkhags.

(2) Organization

The Department of Culture (DoC), under the Ministry of Home and Cultural Affairs, is responsible for the preservation and promotion of culture and tradition. The Department is supposed to prepare a plan to this end. As mentioned earlier, the DoC is also engaged in the preservation of tangible culture, such as the construction and renovation of dzongs. The DoC also collaborates with other authorities to preserve and promote culture.

The DoC is currently working on the projects to preserve and promote tangible culture under the 11th Five-Year Plan, while work to preserve and promote intangible culture is in the planning stage.

(3) Act

The DoC has been tasked with formulating a draft cultural heritage bill of Bhutan with the aim of sustaining cultural heritage, such as movable cultural properties, heritage buildings and archaeological sites, as well as the cultural landscape, such as built structures, distinct architectural styles, settlement patterns, land use patterns, natural settings and geographical formations of cultural significance, for the benefit of present and future generations. The bill

stipulates the roles to be played by the related authorities and the plan for the protection of the cultural landscape, the protection of cultural properties, the safeguarding of intangible cultural heritage, and so on. Once enacted, the bill will serve as a compass for the preservation and promotion of culture and tradition.

5.9 Review of National Spatial Structure

5.9.1 Regional Zoning

Various Bhutanese policy papers and planning documents divide the national territory into regions either latitudinally/horizontally and/or longitudinally/vertically.

(1) Latitudinal Zoning

"Bhutan may be conveniently divided into three zones". This had already been stated by the Second Five-Year Plan (1967 – 1971), which summarized geographic characteristics of the three regions as below (hereafter, in this report, the terms "zone" and "region" are unified into the latter, no matter which term is used in the original document(s)).

Table 5.9.1   Three Latitudinal Regions Described in the Second Five-Year Plan (1967-1971)

Region	Characteristics
Northern Region	***High mountain ranges on the Tibetan frontier*** • The region comprises valleys at elevations of between 12,000 and 18,000 feet running down from the snowy mountain ranges separating Bhutan and Tibet. • These valleys are mainly used for grazing in the summer months.
Southern Region	***Foothills adjoining India and mostly populated by Nepalese settlers*** • The region roughly includes the whole of the southern mountain ranges to a depth of about 20 to 30 miles. • The annual rainfall in this area is excessive (from 200 to 250 inches) and the vegetation and forest are very dense.
Central Region	***Central belt*** • The region consists mainly of valleys at elevations between 3500 and 10,000 feet and includes the valleys of Haa, Paro, Thimphu, Punakha and Bumthang. • The rainfall is about 30 to 60 inches. • The elevation in eastern Bhutan is lower and the rainfall is between 50 to 80 inches.

This method of three-tiered latitudinal zoning continued to be used in governmental policy documents/plans for many years, including in the Strategy for Gross National Happiness (SGNH) formulated by the Gross National Happiness Commission (GNHC) in 2008.

Although none of the Five-Year Plans nor the SGNH clearly defines the borders of these regions, it seems certain that they are demarcated by natural geographic factors. Thus, for the purpose of writing this report the nation was divided into three regions as shown in Figure 5.9.1.
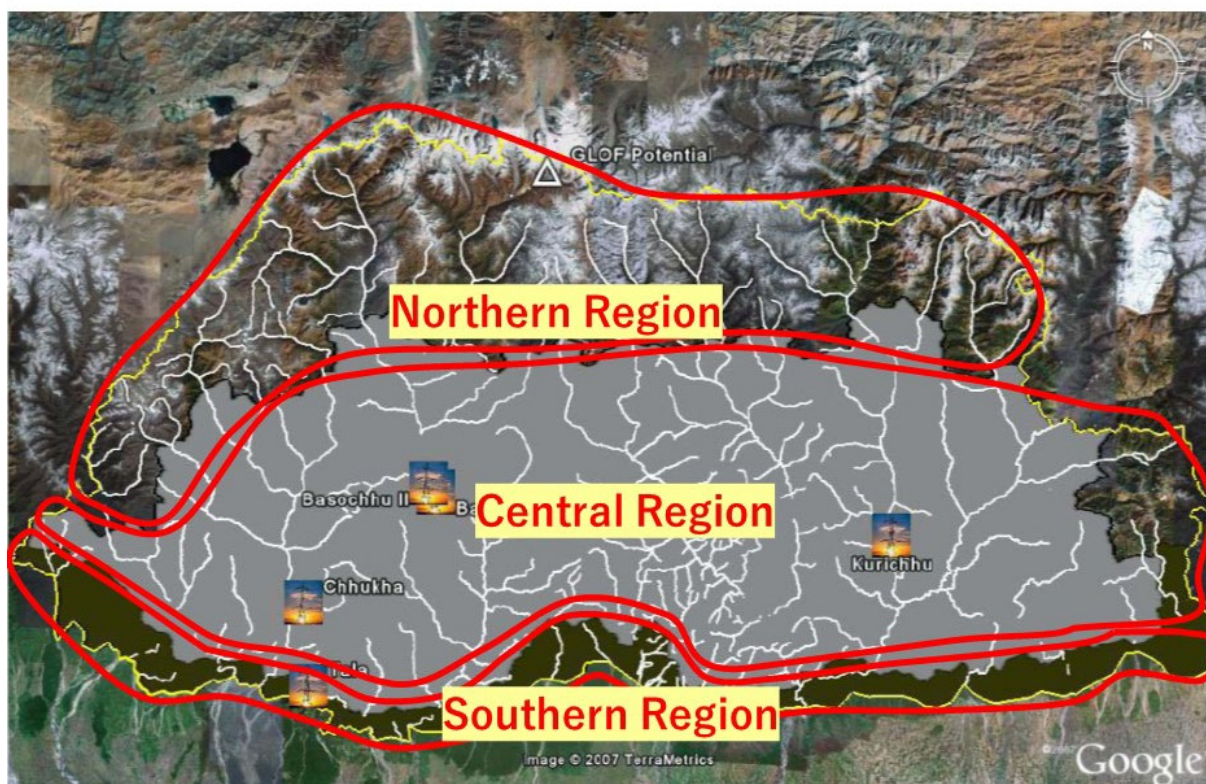
Source: Based on the map reprinted of Map 5, National Strategy for Gross National Happiness

Figure 5.9.1   Latitudinal Zoning of the National Territory

The three latitudinal zones show that the nation is composed of three homogeneous regions in terms of natural geography, but they can also be used to distinguish between the economic development potential of each region.

In practice, the SGNH proposes the development direction to be taken by each region, as summarized in Table 5.9.2.

Table 5.9.2   The Economic Development Directions of The Three Latitudinal Regions Proposed by the Strategy for Gross National Happiness

Region	Economic Development Directions
Northern Region	Minimal mainstream development should take place, with the focus largely on tourism and non-sedentary activities. The focus should be on maintaining the beautiful and pristine environment, diverse wildlife and ancient cultural living traditions.
Central Region	A service-oriented economy may be promoted through strengthening the potential of tourism and other services, as well as agriculture. The focus will be on the promotion of services and cultural and high value products.
Southern Region	As this region has better access to Indian markets and beyond, as well as the highest growth potential, the area can be identified as the main gateway and hub for Bhutan's economic development and as a home to large-scale, export-oriented industries, including services.

(2) Longitudinal Zoning

The use of the terms western, central and eastern Bhutan in governmental policy papers/plans also dates back to at least the Second Five-Year Plan. After that, some policy papers/plans have divided the nation into three regions and have divided it longitudinally into four regions.

Figure 5.9.2 shows examples of the country divided into three and four longitudinal regions. Of the two, dividing into four regional geographical units is more suitable as a development planning because of the following reasons: (a) better balanced in terms of area/size and (b) fits well with the geographic conditions represented by the spread of Catchment Areas.

Thus, hereafter, the four regions will only be used to analyse the nation's spatial structure, as the representative of longitudinal regions.

Three Regions with Dzongkhag Boundaries   Four Regions with Dzongkhag Boundaries

Three Regions with Catchment Areas   Four Regions with Catchment Areas
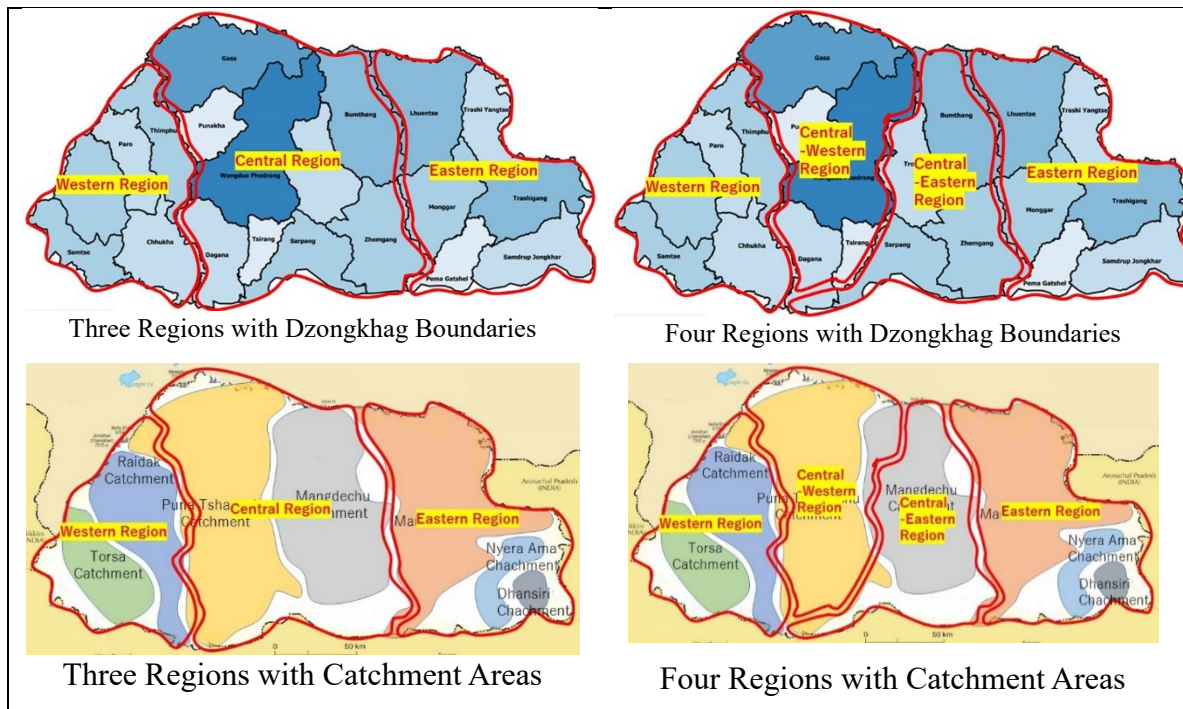
Figure 5.9.2   Longitudinal Zoning of the National Territory

(3) Comparison of Longitudinal and Latitudinal Regional Zoning

How suitable longitudinal and latitudinal zoning is compared for regional planning purposes. The comparison used the basic principles of regional planning that form the established indicators. The basic principles are the self-reliance of regional development, water resources and food crops, an environment rich in local resources, the regional integration of nature, the economy, culture and society, as well as well-established management.

Figure 5.9.3 shows the boundaries of the two types of zoning. The limits of the latitudinal regions follow the administrative boundaries of Gewogs, while the latitudinal regions follow Dzongkhag boundaries. Since the Strategy for Gross National Happiness specifies the boundaries for longitudinal zoning, those boundaries are taken into consideration when determining the limits of the latitudinal regions. Based on the established regional boundaries, the population of each region and the number of industrial firms they contain are counted to further develop the indicators. Table 5.9.3 shows the indicators for each region and Table 5.9.4 shows the evaluation for each region. The comparative analysis reveals that longitudinal zoning has more positive indicators than latitudinal zoning.

Longitudinal regions/blocks are better suited as regional planning units than latitudinal ones. This is because it is easier to consider the regional balance between development (e.g., of urban functions, industries, physical infrastructure, etc.) and preservation (e.g., of the natural environment, agriculture, etc.) in a functional region (e.g., an economic region, living sphere, etc.) than in a uniform region; in the Bhutanese context, the former region corresponds to a longitudinal region. However, latitudinal regions are also used to check whether the

characteristics of each latitudinal region are reflected in the regional planning of each longitudinal region.

| Latitudinal Zoning | Longitudinal Zoning |
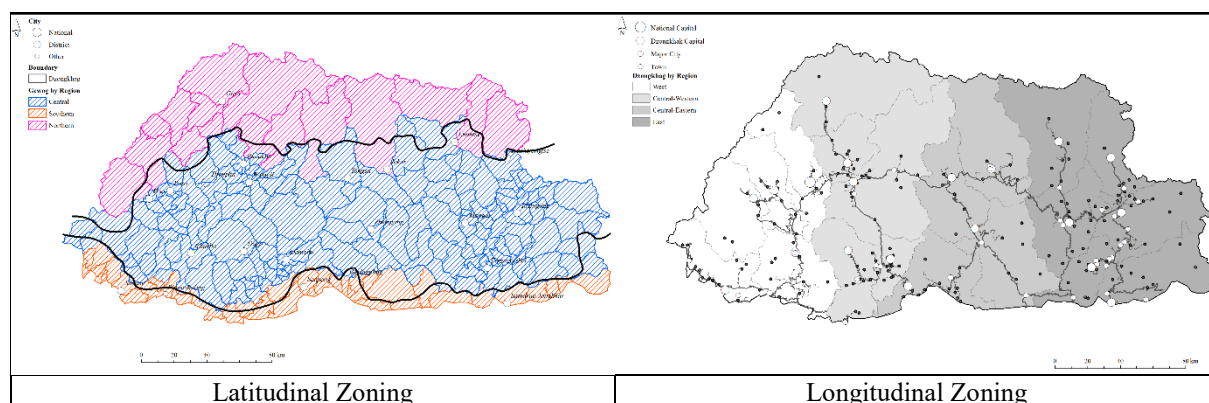
Figure 5.9.3   Latitudinal and Longitudinal Zoning

Table 5.9.3   Indicators of Latitudinal and Longitudinal Zoning

Basic Principle	Requirements	Indicator	Latitudinal Zoning			Longitudinal Zoning			
			Northern	Central	Southern	West	Central-Western	Central-Eastern	East
Self-reliance of development in of each region	Appreciable population size	Population size in 2017	33,045	525,897	166,242	330,263	122,219	101,547	173,116
	Accumulation of cities, industries and academies	Number of towns in 2017	3	48	12	14	14	9	27
		Number of industrial firms in 2015	NA	NA	NA	17,951	3,070	3,726	4,541
		Number of service firms in 2015	NA	NA	NA	16,285	2,880	3,369	3,931
		Number of satellite towns	1	13	6	5	5	4	6
		Number of universities	0	7	3	7	0	1	2
		Number of national and regional referral hospitals	0	2	1	1	0	1	1
	Availability of international gateways	Number of international airports	0	1	0	1	0	0	0
		Number of international inland gateways	0	0	3	1	0	1	1
Water resources and food crops	Availability of water resources	Watershed distribution	Inconsistent	Inconsistent	Inconsistent	Consistent	Consistent	Consistent	Consistent
	Availability of food crops (kg/person in 2015)	Rice per person	NA	NA	NA	68	254	96	62
		Maize per person	NA	NA	NA	22	113	121	209
		Wheat/barley per person	NA	NA	NA	5	15	16	7
		Buckwheat/millet per person	NA	NA	NA	5	12	17	9
Rich environment and local resources	Diversity of natural resources	Fauna	Limited	Limited	Limited	Various	Various	Various	Various
		Flora	Limited	Limited	Limited	Various	Various	Various	Various
Well-established management	Consistency of local administration	Administrative Dzongkhag boundaries	Inconsistent	Inconsistent	Inconsistent	Consistent	Consistent	Consistent	Consistent

Table 5.9.4   Comparison of Vertical and Horizontal Zones

Basic Principle	Requirements		Longitudinal Zoning		Latitudinal Zoning
Self-reliance of development in each region	Appreciable population size	++	Minimum population about 100,000 in the central-eastern region	-	Small population size at 33,000 in the north
	Accumulation of cities, industries and academies	++	Mixed composition of cities, industries and academies with more than 5,000 firms in each region	-	Low accumulation of cities and industries in the north No university in the north
	Availability of international gateways	+	No international airport or inland gateway in the central-western region	-	No international airport or inland gateway in the north No international inland gateway in the centre
	Connectivity within each region	++	Accessible within a day's travel by road transport	-	Two days' travel by road transport
Water resource and food crops	Availability of food crops	++	Mixed composition of food crops in each region	-	Limited diversity and amount of food crops in the north
Rich environment and local resources	Diversity of natural resources	++	Mixed composition of fauna and flora in each region	-	Limited composition of fauna and flora due to the uniform topography of each region
Well-established management	Consistency of local administration	++	Consistent local administration	-	Inconsistent local administration

Note: ++ Very positive, + Positive, - Negative, -- Very negative

5.9.2   Location of Urban Areas (Towns)

The Bhutan National Urbanization Strategy (BNUS) (2008) analyses the location of urban areas (towns) across the country using the data from the 2005 Census (Population and Housing Census of Bhutan), etc.

Figure 5.9.4 shows the location of 62 towns with a population of 100 or more people, in reference to the data from the PHCB 2017. There were 53 Census towns[12] in total in PHCB 2005. Supplementing this Figure, Table 5.9.5 lists all 62 towns.

Looking at the Figure, it is clear that, as of 2017:

(a) there are only limited number towns in the northern region – i.e., Gasa and Trashiyangtse with the possible inclusion of Haa and Lhuentse – although the number depends on the delineation between the northern and central regions. Furthermore, and there are no large or semi-large towns in this region; and

(b) there are at least over a dozen towns – composed of each of the three size tiers of large/semi-large, medium and small towns – in each longitudinal region, although large towns exist only in the western region (Table 5.9.6).

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[12] The urban-rural definition used in the 2005 census followed the classification of the Department of Urban Development and Engineering Services (the predecessor of the DHS). In the following year, the Ministry of Works and Human Settlement (MoWHS) formally resolved that, for an area to be declared as 'urban' (thromde), the following criteria should be met (by at least 75%, implying four out of the five criteria): a) a minimum population of 1,500 people; b) a population density of 1,000 persons or more per square kilometre; c) more than 50% of the population should depend on non-primary activities; d) the area of the urban centre should not be less than 1.5 km^2; and e) potential for future growth of the urban centre, particularly in terms of its revenue base (Bhutan National Urbanization Strategy 2008).

Location of Towns

Location of Towns and Latitudinal Regions

Location of Towns and Longitudinal Regions
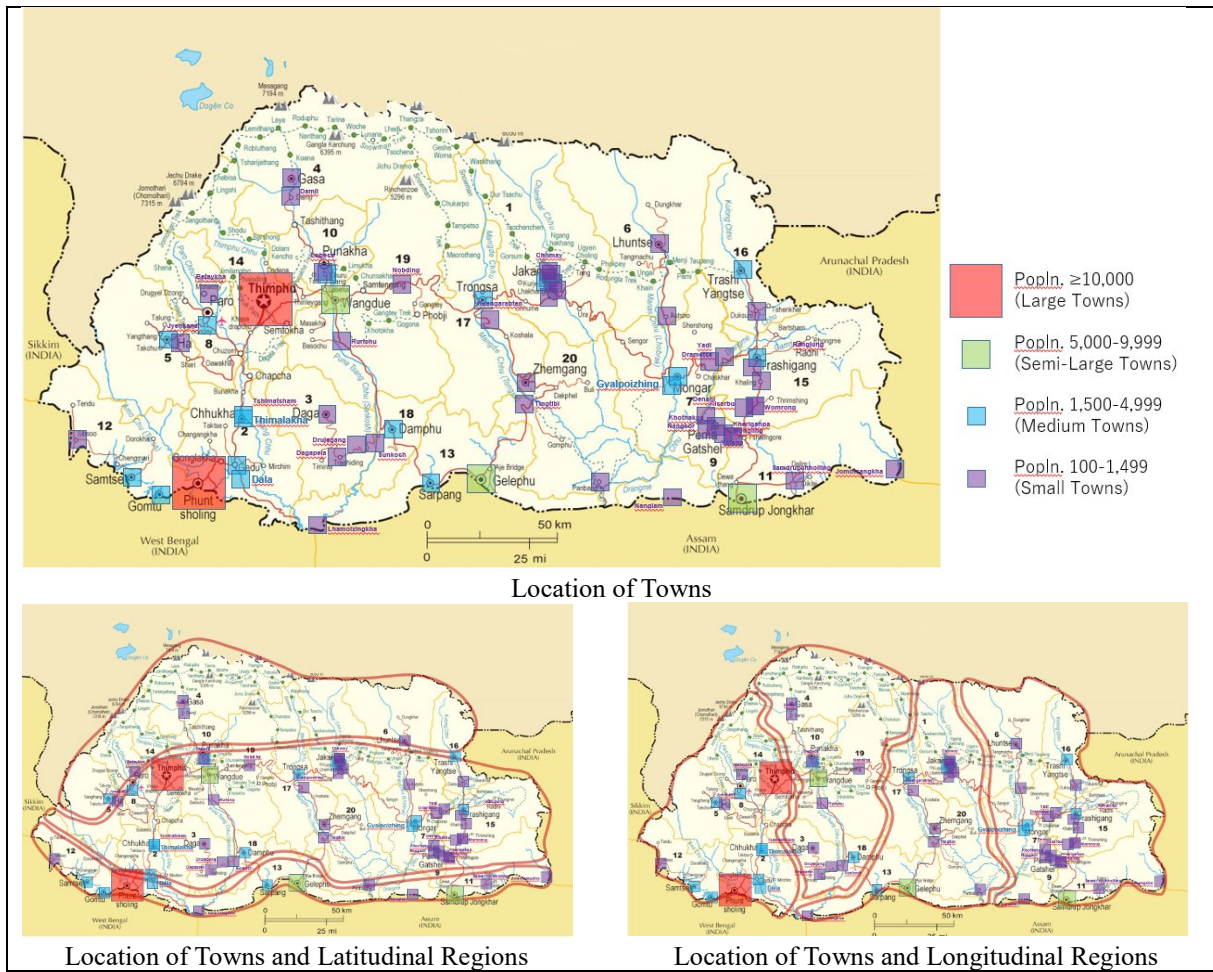
Figure 5.9.4   The Location of Towns with a Population of 100 and Over (2017 Census Data)

Table 5.9.5 List of Towns with a Population of 100 and More (2017 Census Data)

Category*	Urban Area	Popln. 2005	Popln. 2017	Dzongkhag	Longitudinal Region
Popln. >10,000 (Large Towns)	Thimphu	79,185	114,551	Thimphu	Western
	Phuentsholing	20,537	27,658	Chhukha	Western
	Paro	2,932	11,448	Paro	Western
Popln. 5,000-9,999 (Semi-Large Towns)	Gelephu	9,199	9,858	Sarpang	Central-Eastern
	Samdrupjongkhar	8,595	9,325	Samdrupjongkhar	Eastern
	Wangduephodrang	6,714	8,954	Wangduephodrang	Central-Western
	Punakha	2,292	6,262	Punakha	Central-Western
	Bumthang	4,203	6,243	Bumthang	Central-Eastern
	Nganglam	1,018	5,418	Samdrupjongkhar	Eastern
	Samtse	4,981	5,396	Samtse	Western
Popln. 1,500-4,999 (Medium Towns)	Monggar	3,502	4,452	Monggar	Eastern
	Gomtu	4,254	3,661	Samtse	Western Region
	Tsirang	1,666	3,448	Tsirang	Central-Western
	Kanglung	1,717	3,223	Trashigang	Eastern
	Trashiyangtse	2,735	3,187	Yangtse	Eastern
	Sarpang	2,619	3,152	Sarpang	Central-Eastern
	Trongsa	2,695	3,122	Trongsa	Central-Eastern
	Trashigang	2,383	3,037	Trashigang	Eastern
	Gedu	4,288	2,849	Chhukha	Western Region
	Zhemgang	2,332	2,711	Zhemgang	Central-Eastern
	Gyalpoizhing	2,291	2,629	Monggar	Eastern
	Haa	2,495	2,596	Haa	Western
	Rangiung	633	2,024	Trashigang	Eastern
	LhamoiDzingkha	778	1,961	Sarpang	Central-Eastern
	Bondey	570	1,863	Paro	Western
	Chhukha	2,855	1,842	Chhukha	Western Region
	Dewathang	2,644	1,776	Samdrupjongkhar	Eastern
	Samdrupchoelin	393	1,713	Samdrupjongkhar	Eastern
	Daga (dzong)	1,146	1,547	Dagana	Central-Western
	Lhuentse	1,175	1,500	Lhuentse	Eastern
Popln. 100-1,499 (Small Towns)	Tsimalakha	2,361	1,403	Chhukha	Western
	Jomotsangkha	957	1,136	Samdrupjongkhar	Eastern
	Khaling	1,349	1,129	Trashigang	Eastern
	Olde Pemagatshel	1,066	1,038	Pemagatshel	Eastern
	Dala	1,652	1,037	Chhukha	Western
	Drametse	541	969	Monggar	Eastern
	Khasadrapchu	—	966	Thimphu	Western
	Lingmethang	819	952	Monggar	Eastern
	Panbang	379	800	Zhemgang	Central-Eastern
	Lobesa	—	784	Punakha	Central-Western
	Gasa	402	779	Gasa	Central-Western
	Autsho	301	775	Lhuentse	Eastern
	Tsimasham	1,233	732	Chhukha	Western
	Yadi	—	730	Monggar	Eastern
	Nobding	473	713	Wangduephodrang	Central-Western
	Sipsu	904	617	Samtse	Western
	Damji	–	587	Gasa	Western
	Dagapela	145	578	Dagana	Central-Western
	Drukjeyganq	552	575	Dagana	Central-Western
	Kilkha		565	Monggar	Eastern
	Tingtibi	675	534	Zhemgang	Central-Eastern
	Nangkor	672	522	Pemagatshel	Eastern
	Jyenkana	—	502	Haa	Western
	Wamgrong	581	484	Trashigang	Eastern
	Beteykha	—	465	Paro	Western
	Kuengarabten	—	424	Trongsa	Central-Eastern
	Chhmay	—	393	Bumthang	Central-Eastern
	Duksum	283	360	Yangtse	Eastern
	Denchi	—	340	Pemagatshel	Eastern
	Rurichu	335	213	Wangduephodrang	Central-Western
	Resarbu	153	211	Trashigang	Eastern
	Khothakpa	238	146	Pemagatshel	Eastern

Source: Bhutan National Urbanization Strategy, 2008

Table 5.9.6   The Distribution of Towns with a Population of 100 or More (2017 Census Data) between the Four Longitudinal Regions

Category	Western Region	Central-Western Region	Central-Eastern Region	Eastern Region	Total
Large Towns	3	0	0	0	3
Semi-Large Town	1	2	2	2	7
Medium Towns	5	2	4	9	20
Small Towns	8	6	4	14	32
Total	17	10	10	25	62

5.9.3   Assumed Future Spatial Structure

(1)   Distribution of Urban Centres in Existing Proposals on the National Spatial Structure

The development/improvement of various types of urban centres has been proposed by/for the Bhutanese Government in several policy papers and plans, including the Strategy for Gross National Happiness (SGNH) 2008, Bhutan National Urbanization Strategy 2008, Bhutan Transport Vision 2040 (2011) and the 11th Five-Year Plan (2013).

Figure 5.9.5 shows the locations of these urban centres across the nation, and the definitions of each type of urban centre, including those mentioned above, are shown in Table 5.9.7.

Looking at the figure, it is clear that there:

(a) is no proposal for the development of regional urban centres, which serve plural Dzongkhags, in the northern region.
(b) would only be one regional urban centre in the western central region – i.e., Punakha/Wangdue as a 'Linked Growth Centre', according to the SGNH – while there would be several centres in the other three regions.

Figure 5.9.6 shows the population distribution, as of 2017, for all urban centres listed in Table 5.9.7. According to the figure, population distribution characteristics of major urban centre types, which are identified by the SGNH or designated by the competent government formally, are as follows:

(a) The 'Capital City Area' of Thimphu has a significantly large population size of 114,551, compared to any other cities/towns
(b) The 'Economic Hubs' along the proposed the East-West National Highway in the Southern Region, nationally make up the second-largest towns with a population, i.e., between 5,396 (Samtse) and 27,658 (Phuentsholing)
(c) The 'Growth Centres', along the East-West National Highway in the Central Region, are composed of the second-largest and medium towns with a population between 3,037 (Trashigang) and 11,448 (Paro)
(d) The 'Dzongkhag Headquarter Towns' are small and medium towns with a population between 779 (Gasa) and 3,448 (Tsirang)
(e) Other Towns' are medium towns comparable to 'Growth Centres' with a population between 1,403 (Tsimalakha) and 2,849 (Gedu)
(f) Regional Hubs' are small to medium towns with population of 5,418 (Nganglam) and 3, 223 (Kanglung)
(g) Most of the 'Satellite Towns' are small towns except for Rangiung (2,024), Sarpang (3,152), Gomtu (3,661) and Nganglam (5,418), which are categorized as medium towns

To summarize, as of 2017, the 'Capital City Area' (Thimphu), all four 'Economic Hubs' (Phuentsholing, Gelephu, Samdrupjongkhar, and Samtse), four 'Growth Centres' (Paro, Punakha, Wangdue, and Bumthang) and the largest 'Regional Hub' (Nganglam) comprised the

ten major towns of Bhutan, on account of having a population of 5,000 (approximately) or more.

Existing/Proposed Urban Centres

Urban Centres and Latitudinal Regions   Urban Centres and Longitudinal Regions
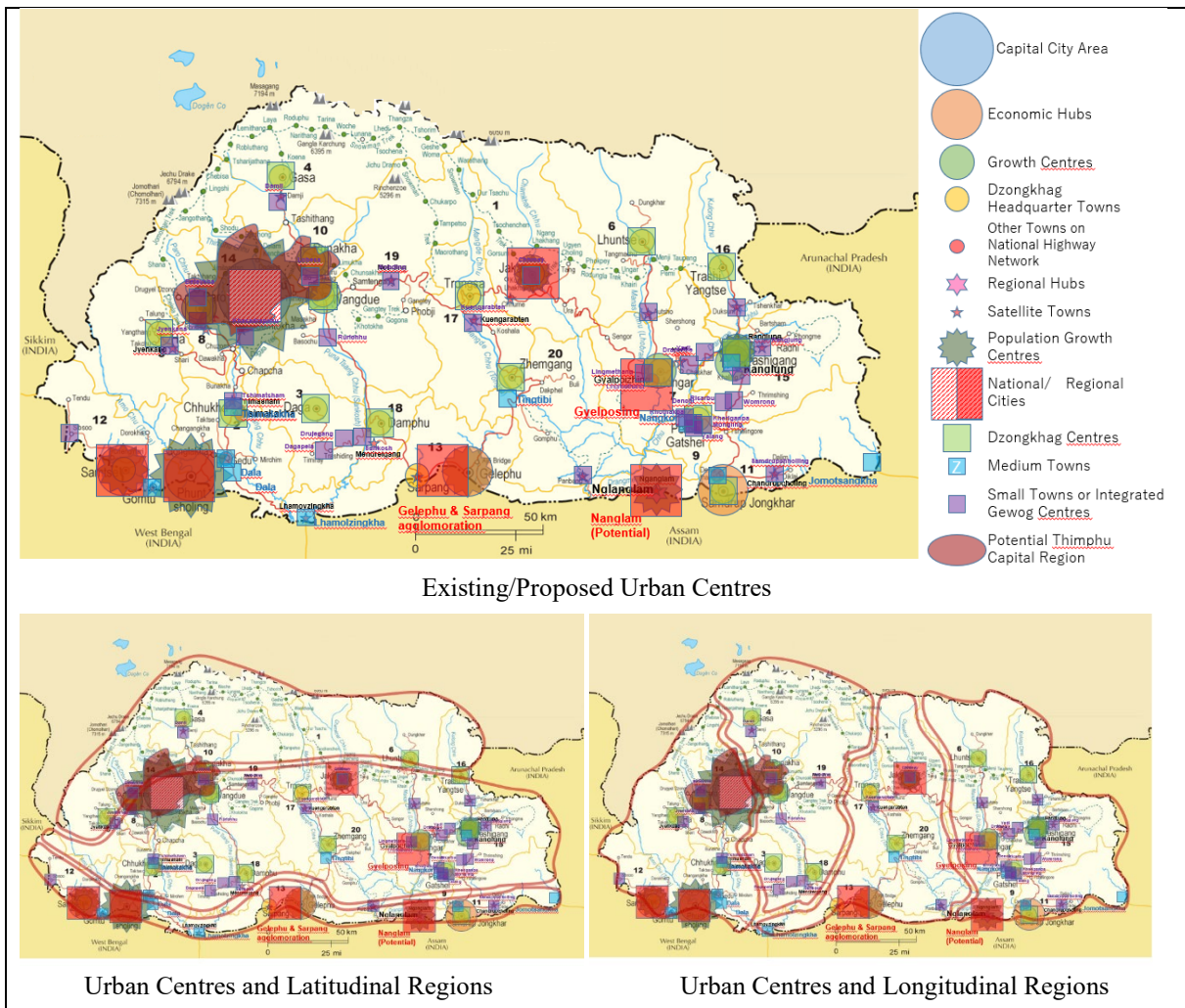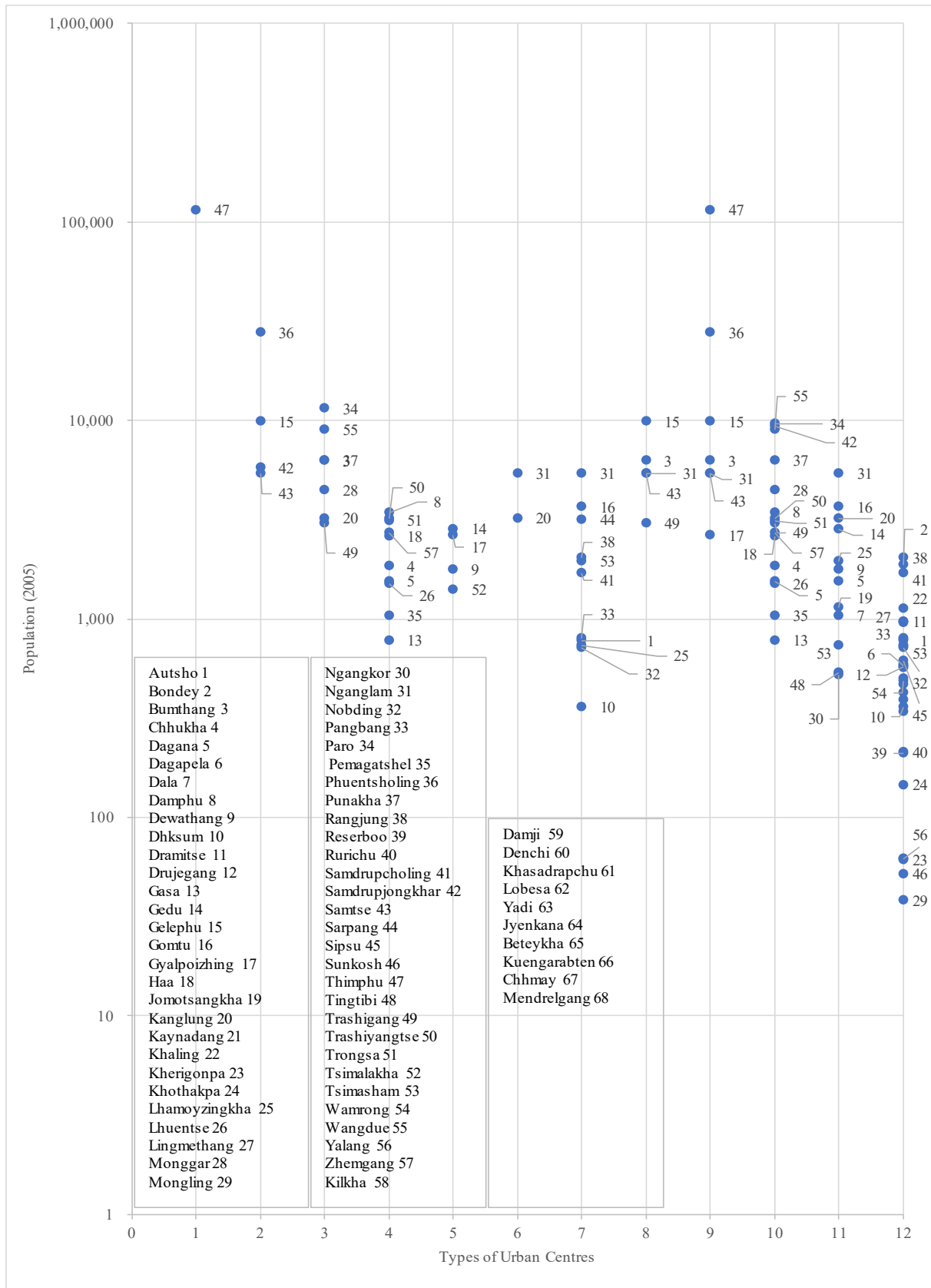
Figure 5.9.5   Existing and Proposed Urban Centres in Existing Policy Papers and Plans

Table 5.9.7   Definition of the Various Urban Centres Shown in Figure 5.9.5

Category	Definition	Proposed Location (Dzongkhag)	Information Source
Capital City Area	• Continues to be a key driver of Bhutan's economic growth	Thimphu (THI)	• Strategy for Gross National Happiness (SGNH)
Economic Hubs	• Will be strategically placed along the proposed east-west national highway in the south, both individually and in combination • Will be key elements in securing more balanced development	Phuentsholing (CHU), Samdrupjongkhar (SJO), Samtse (SAM), Gelephu (SAR)	• SGNH
Growth Centres	• Will be strategically placed along the east-west national highway in the central region, both individually and in combination • Will be key elements in securing more balanced development	Bumthang (BUM), Monggar (MON), Paro (PAR), Punakha/Wangdue (Linked Growth Centre) (PUN/WAN), Kanglung (TRG), Trashigang (TRG)	• SGNH
Dzongkhag Headquarter Towns, except for Capital City Area, Economic Hubs and Growth Centres	• Will complement balanced patterns of growth, capitalizing on local roles, and will serve important functions in the adjoining rural areas	Chhukha (CHU), Dagana (DAG), Gasa (GAS), Haa (HAA), Lhuentse (LHU), Pemagatshel (PEM), Trongsa (TRO), Damphu (TSI), Trashiyangtse (TRY), Zhemgang (ZHE)	• SGNH
Other Towns Located on the National Highway Network	• Will complement balanced patterns of growth, capitalizing on local roles, and will serve important functions in the adjoining rural areas	Gedu (CHU), Tsimalakha (CHU), Gyalpozhing (MON), Dewathang (SJO)	• SGNH
Regional Hubs	• Will be developed with the aim of boosting socioeconomic development in the eastern region and to provide alternatives to Thimphu and Phuentsholing for rural-urban migrants	Nganglam (PEM), Kanglung (TRG)	• 11th Five-Year Plan (11FYP)
Satellite Towns	• Are Yenlag Thromdes as defined by the Constitution of Bhutan 2008, and will be established in all 20 Dzongkhags by the Government • Used to be defined as Yenlag Throms or medium towns in the repealed Thromde Act 2007, and should have a resident population of more than 1,500 and an area of no less than 50 acres	Chumey (BUM), Tsimasham (CHU), Lhamoizingkha (DAG), Damji (GAS), Jyenkana (HAA), Autsho (LHU), Yadi (MON), Beteykha (PAR), Nganglam (PEM), Lobesa (PUN), Samdrup Choling (SJO), Gomtu (SAM), Sarpang (SAR), Khasadrapchu (THI), Rangjung (TRG), Kuengarabten (TRO), Mendrelgang (TSI), Nobding (WAN), Duksum (TRY), Panbang (ZHE)	• Constitution 2008 • Local Government (Amendment) Act 2014 • Thromde Act 2007 (Repealed) • 11FYP • National Human Settlement Strategy (Final Draft Report)
Population Growth Centres	• Will be developed as migration alternatives to Thimphu and Phuentsholing	Bumthang (BUM), Nanglam (PEM), Samtse (SAM), Gelephu (SAR), Trashigang (TRG)	• Bhutan Transport Vision 2040
National/Regional Cities	• Will be national/regional economic drivers with populations of more than 10,000	Bumthang (BUM), Phuentsholing (CHU), Gyalpozhing (MON), Nganglam (PEM), Samtse (SAM), Gelephu (SAR), Thimphu (THI)	• Bhutan National Urbanization Strategy 2008 (BNUS 2008)
Dzongkhag Centres	• Will be all the Dzongkhag Headquarter Towns (Dzongkhag Thromdes), excluding the regional centres, will exercise Dzongkhag Administration/Service Centre functions and will have populations of between 5,000 and 9,999 people	Samdrupjongkhar (SJO), Monggar (MON), Paro (PAR), Punakha (PUN), Wangduephodrang (WAN), Trashigang (TRG), Chhukha (CHU), Dagana (DAG), Gasa (GAS), Haa (HAA), Lhuentse (LHU), Pemagatshel (PEM), Trongsa (TRO), Damphu (TSI), Trashiyangtse (TRY), Zhemgang (ZHE)	• BNUS 2008
Medium Towns	• Will be Yenlag Throm(des) with populations of between 1,500 and 4,999 people, serving as service centres for nodes	20 towns	• BNUS 2008
Small Towns or Integrated Gewog Centres (IGC)	• Will be areas with 100 to 1,499 people and have the functions of RNR (Renewable Natural Resources) services, markets and Gewog Centres	32 (existing) plus approximately 50 IGCs	• BNUS 2008
Potential National Capital Region	• Is an expanded "Capital Region", initially encompassing the Paro Valley, Wangdue and Punakha, proposed in the Thimphu Structure Plan 2003-2027		• Thimphu Structure Plan 2003-2027

Autsho 1
Bondey 2
Bumthang 3
Chhukha 4
Dagana 5
Dagapela 6
Dala 7
Damphu 8
Dewathang 9
Dhksum 10
Dramitse 11
Drujegang 12
Gasa 13
Gedu 14
Gelephu 15
Gomtu 16
Gyalpoizhing 17
Haa 18
Jomotsangkha 19
Kanglung 20
Kaynadang 21
Khaling 22
Kherigonpa 23
Khothakpa 24
Lhamoyzingkha 25
Lhuentse 26
Lingmethang 27
Monggar 28
Mongling 29

Ngangkor 30
Nganglam 31
Nobding 32
Pangbang 33
Paro 34
Pemagatshel 35
Phuentsholing 36
Punakha 37
Rangjung 38
Reserboo 39
Rurichu 40
Samdrupcholing 41
Samdrupjongkhar 42
Samtse 43
Sarpang 44
Sipsu 45
Sunkosh 46
Thimphu 47
Tingtibi 48
Trashigang 49
Trashiyangtse 50
Trongsa 51
Tsimalakha 52
Tsimasham 53
Wamrong 54
Wangdue 55
Yalang 56
Zhemgang 57
Kilkha 58

Damji 59
Denchi 60
Khasadrapchu 61
Lobesa 62
Yadi 63
Jyenkana 64
Beteykha 65
Kuengarabten 66
Chhmay 67
Mendrelgang 68

Note: 1 = Capital City Area; 2 = Economic Hubs; 3 = Growth Centres, 4 = Dzongkhag Headquarter Towns; 5 = Other Towns; 6 =
Regional Hubs; 7 = Satellite Towns*; 8 = Population Growth Centres, 9 = National/Regional Cities; 10 = Dzongkhag Centres; 11
= Medium Towns; 12 = Small Towns
* excluding the areas lacking 2005 population data because of non-designation as Census towns

Figure 5.9.6   2017 Census Population of Existing and Proposed Urban Centres

(2) Distribution of Industrial Centres

Figure 5.9.7 maps the location of the existing and proposed industrial centres described in the 11th Five-Year Plan and Bhutan Transport Vision 2040. Moreover, Table 5.9.8 complements the Figure by explaining the legends of the Figure.

According to the Figure, it is clear that:

(a) the industrial centres are concentrated in the south while there are none in the north; and

(b) there would be no industrial centre in the central-western region.

Existing/Proposed Industrial Centres

Industrial Centres and Latitudinal Regions   Industrial Centres and Longitudinal Regions
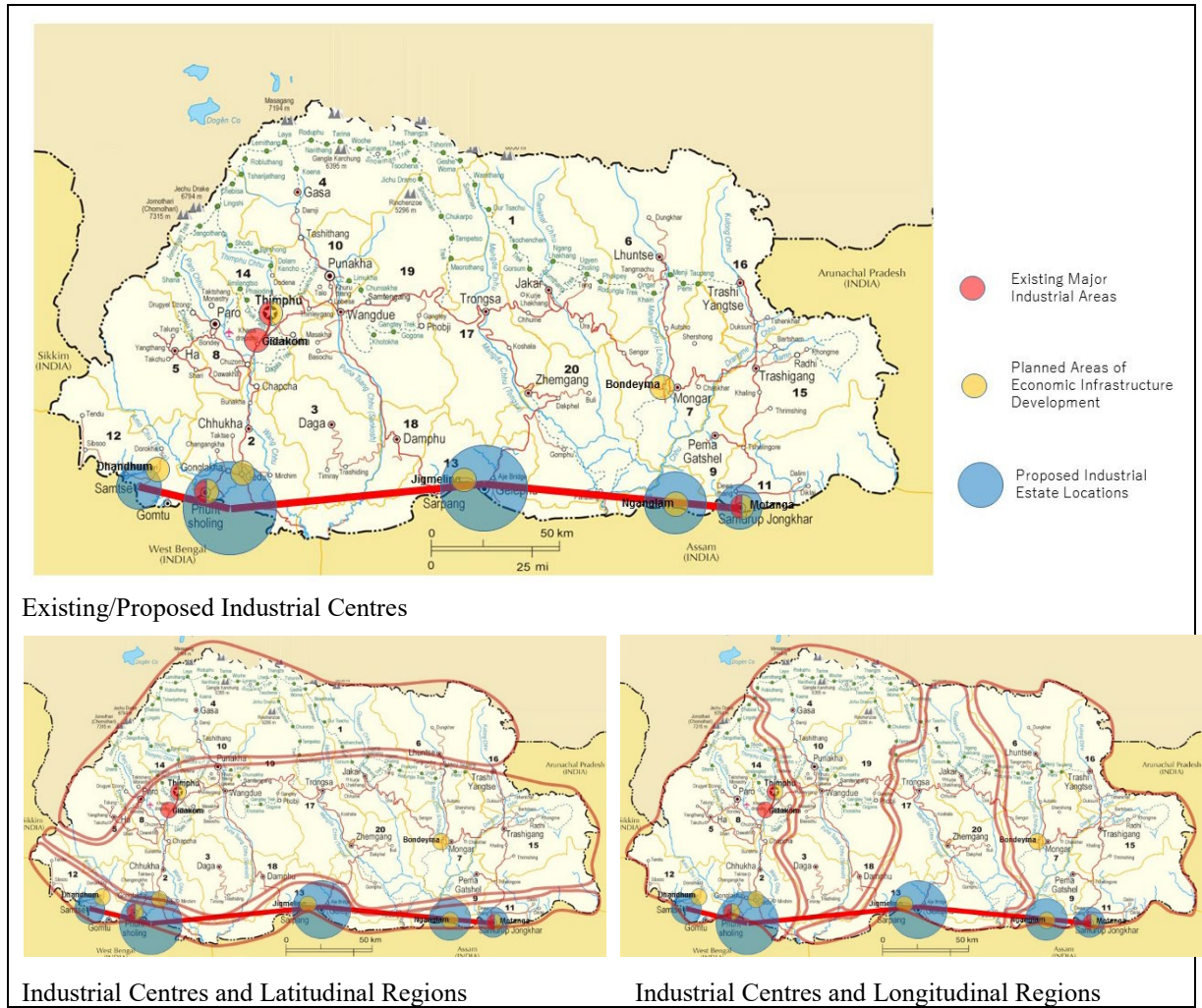
Figure 5.9.7   Existing and Proposed Industrial Centres in the 11th Five-Year Plan and Bhutan Transport Vision 2040

Table 5.9.8   Definition of the Three Categories of Industrial Centres Shown in Figure 5.9.7

Category	Definition	Location (Dzongkhag)	Information Source
Existing Major Industrial Areas	• Major industries	Samtse (*cement, fruit processing and liquor*) (SAM), Pemagatshel (*gypsum mining*) (PEM), Gelephu (*wood processing and liquor*) (SAR), Thimphu (*agro and wood processing*) (THI), Phuentsholing (*calcium carbide, ferrosilicon, plaster of Paris, steel, beverages, bottling plant*) (CHU)	• 11th Five-Year Plan (11FYP)
	• Industrial estates	Gelephu (SAR), Samdrupjongkhar (SJO), Phuentsholing (CHU)	• 11FYP
	• Service centres	Changzamtog (*Gidakom Industrial Estate*) (THI)	• 11FYP
Planned Areas of Economic Infrastructure Development	• Dry ports	Phuentsholing (CHU), Jigmeling/Nganglam (SAR/PEM)	• 11FYP
	• Industrial parks	Bondeyma (MON), Dhandhum (SAM), Motanga (SJO), Jigmeling (SAR)	• 11FYP
	• Industrial estates and service centres	Gidakom (*development of industrial estate*) (THI), Gedu (ditto) (CHU), Samdrupjongkhar (*development of industrial estate and upgrading of service centre*) (SJO)	• 11FYP
Proposed Industrial Estate Locations	• Heavy industrial activity	Samtse (SAM), Pasakha (CHU), Phuentsholing (CHU), Gelephu (SAR), Nganglam (PEM), Samdrupjongkhar (SJO)	• Bhutan Transport Vision 2040

Figure 5.9.8 shows the population distribution, as of 2005, of for all the industrial centres listed in Table 5.9.8. According to the figure, the population distribution of the industrial centres ranges from small to large towns.

(3) Distribution of Transport Axes and Hubs

The future locations of national highways, surface international gates with India, airports and airstrips, proposed in the Strategy for Gross National Happiness and Bhutan Transport Vision 2040, are mapped in Figure 5.9.9, supplemented with descriptions in Table 5.9.9.

The Figure shows that:

(a) the north would be served by new airstrips

(b) every longitudinal region would contain airports and/or airstrips, but not all the airstrips would be accessible via the primary/secondary highways, i.e., there would be no improved access to an airstrip (probably near Tampetso) in the central-western region.
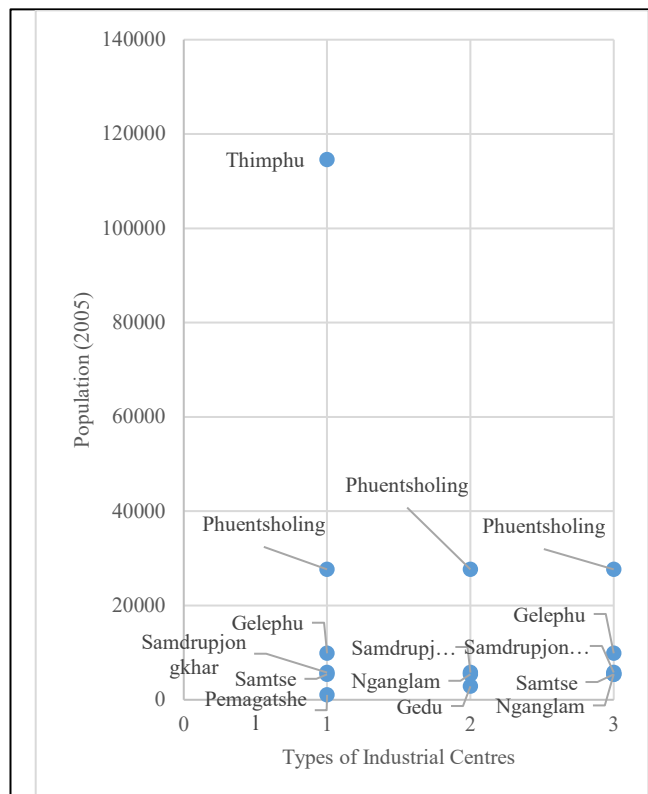
Note:1 = Existing Major Industrial Areas*; 2 = Planned Areas of Economic Infrastructure Development*; 3 = Proposed Industrial Estate Locations*
* excluding the areas lacking 2017 population data because of non-designation as Census towns

Figure 5.9.8   2017 Census Population of Existing and Proposed Industrial Centres

Existing/Proposed Transport Axes/Hubs

Transport Axes/Hubs and Latitudinal Regions

Transport Axes/Hubs and Longitudinal Regions
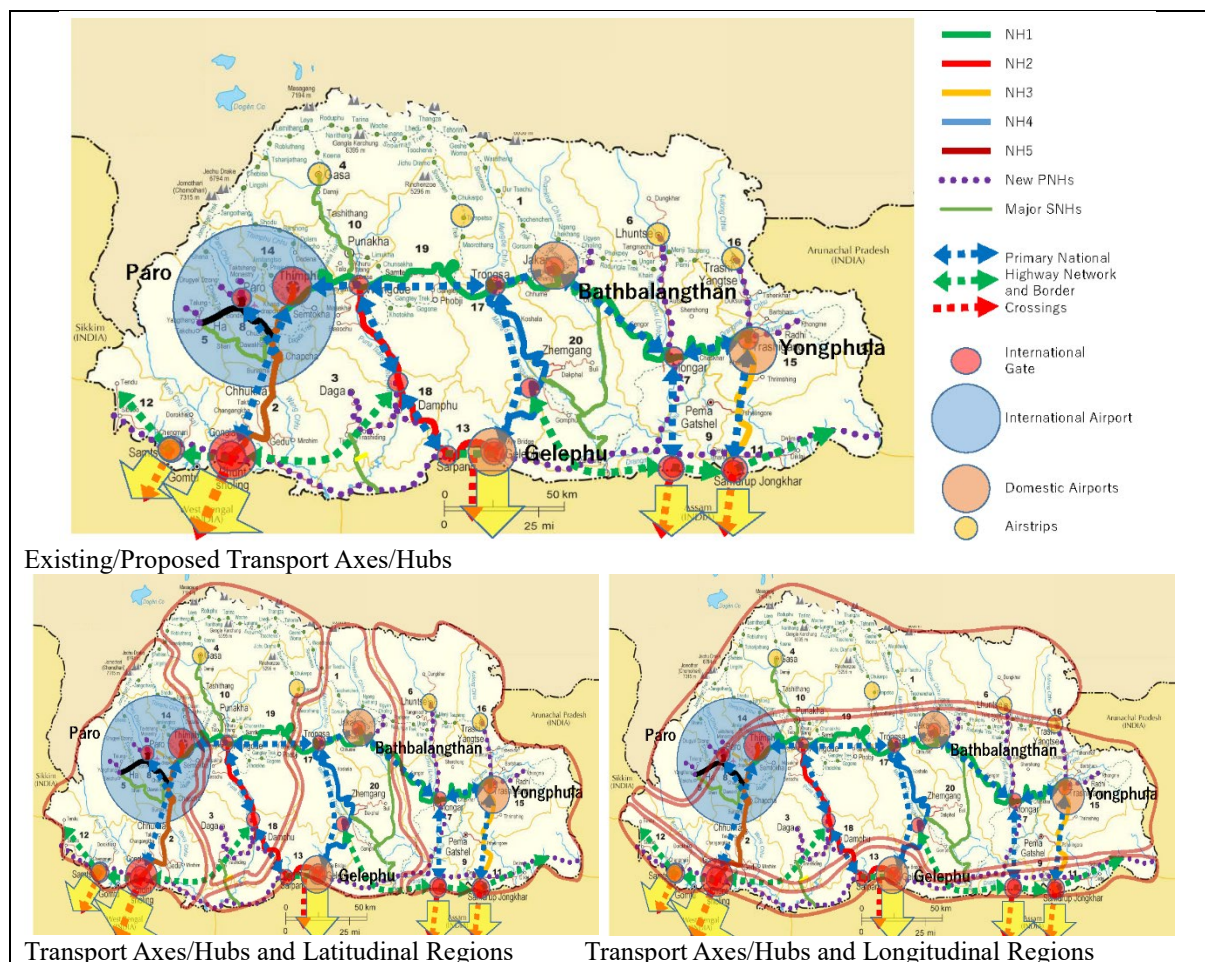
Figure 5.9.9   Existing and Proposed Transport Axes and Hubs in the Strategy for Gross National Happiness and Bhutan Transport Vision 2040

Table 5.9.9   Definitions of the Transport Axes and Hubs Shown in Figure 5.9.9 (Excluding Airports)

Category	Definition	Location (Dzongkhag)	Information Source
Primary National Highways (PNHs)	Link Bhutan's major centres and border crossings	■ East-west Highways: Thimphu-Trashigang (THI-TRG) (*NH1*), southern east-west highway (*proposed*) ■ North-south national highways: Thimphu-Phuentsholing (THI-CHU) (*NH5*), Wangdue-Sarpang (WAN-SAR) (*NH2*), Trongsa-Gelephu (TRO-SAR) (*NH3*), Trashigang-Samdrupjongkhar (TRG-SJO) (*NH4*), Gyalpozhing-Nganglam (MON-PEM) (*proposed*)	• Strategy for Gross National Happiness • Bhutan Transport Vision 2040 (BTV 2040)
Secondary National Highways (SNHs)	Previously known as Dzongkhag Roads, they basically provide internal links, with driving speeds of around 80% that of PNHs, to connect every Dzongkhag headquarter		• BTV 2040
Border Crossing	There are five existing cross-border connections to India	Samtse (SAM), Phuentsholing (CHU), Sarpang-Gelephu (SAR-SAR), Nganglam (PEM), Samdrupjongkhar (SJO)	• BTV 2040
	Main land international gateways to India, through which almost all international trade is conducted	Samtse (SAM), Phuentsholing (CHU), Gelephu (SAR), Nganglam (PEM), Samdrupjongkhar (SJO)	• BTV 2040
Airstrips	Aviation hubs in remote areas for Short Take-Off and Landing (STOL) and helicopter services	Lhuentse (LHU), near Tampetso* (WAN), Trashiyangtse (TRY)	• BTV 2040

* While BTV 2040 does not specify the location of the one airstrip in Wangduephodrang, it appears to be near Tampetso in reference to one figure in the document.

(4) Assumed Basic Future Spatial Structure for the Year 2030

As stated above, existing Government policy papers and plans present visions for the spatial distribution of urban and industrial centres and transport networks.

In comprehensive reference to the above policies and plans, an assumed future spatial structure can be drawn, as in Figure 5.9.10.

In this report, national spatial development alternatives are considered in Section 10.2 by taking into account various socioeconomic, environmental and infrastructural factors, among others, and by making modifications to the Figure to produce alternative spatial structure diagrams. In other words, the Figure is the base diagram from which alternatives are produced.

The main features of the Figure are summarized as follows:

(a) All Dzongkhag Thromdes, Dzongkhag Yenlag Thromdes, Regional Hubs and Other Towns on the National Highway Network (OTs: named in the 11th Five-Year Plan) are selected as future major urban centres. Subsequently, Dzongkhag Thromdes are classified into Capital City Area, Economic Hubs, Growth Centres and Others (Dzongkhag Headquarters) according to the classification set out in the 11th Five-Year Plan.

(b) All the urban centres are connected by improved road networks, i.e., national highways and those of a similar size.

(c) All airports, airstrips and international gates proposed in Bhutan Transport Vision 2040 are well linked with the road network. The internationalization of the domestic airport(s) will be considered to improve international access to the eastern part of the nation.

(d) The Figure pays divides Bhutan into a latitudinally three-tiered structure, because this structure represents the expansion of physically uniform regions within the nation and provides a useful basis for regional planning.
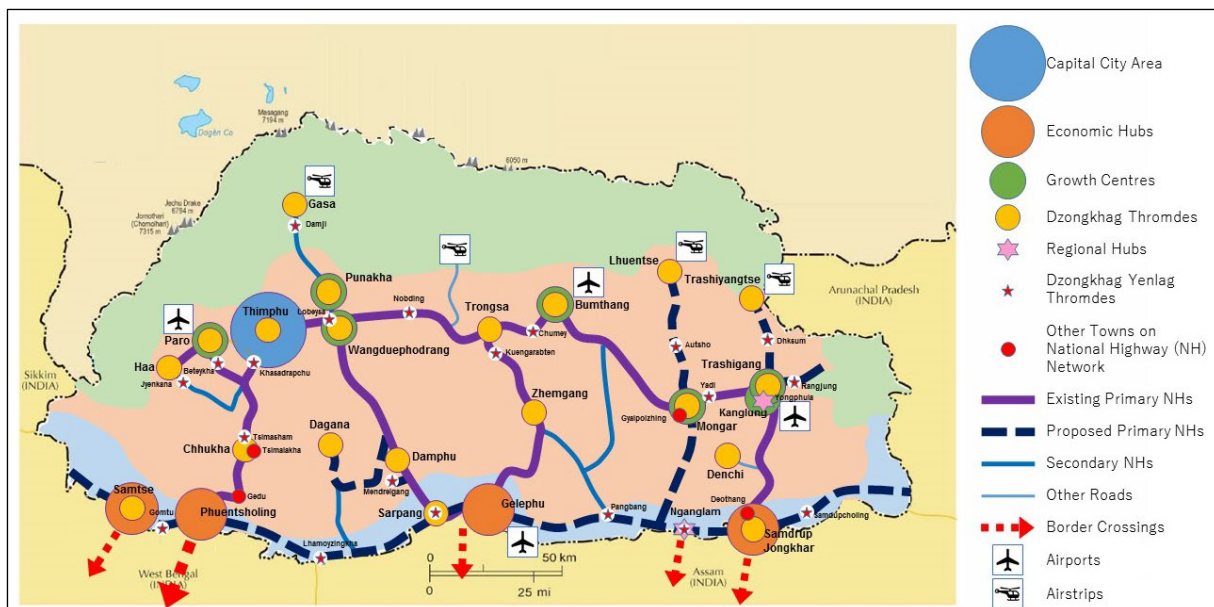
Figure 5.9.10   Assumed Future Spatial Structure – Base Model

CHAPTER 6   SOCIAL DEVELOPMENT

6.1   Lifestyle in Urban and Rural Areas

In order to have ideas about the future lifestyles of Bhutanese people, this section discusses aspects of life in rural and urban areas, using the data of GNH survey. This includes work, communal lives, cultural and social activities, leisure, and sleep. To supplement the GNH survey data, an interview survey was conducted in communities in Thimphu, Bumthang, Punakha, Sarpang, Trongsa, Wangduephodrang in both urban and rural areas. A total of 176 people in participated in this meeting. In these interviews, seven to 26 people from each location participated and 176 people in total participated.

6.1.1   Work

Working populations in rural areas are engaged in farming and livestock keeping. In GNH survey, 47.54% of respondents were farmers. Figure 6.1.1 indicates the percentages of people in rural areas spend time in farming and livestock keeping from five o'clock in the morning to 12 o'clock at night. Farming activities include land preparation, collecting and preparing manure, carrying and applying manure and other activities. Livestock keeping includes preparation of feed, feeding, grazing, grooming, and other activities. Working populations in urban areas are engaged in employment work or own their own businesses. In the GNH survey, 18.76% of respondents were engaged in employment work and privately owned businesses such as such as shops, construction businesses, travel businesses, trade, supply and catering services. Figure 6.1.2 indicates percentages of people in urban areas spending time in these categories of employment work and privately owned businesses.

In communities, people described different situations involving young people working in the agricultural sector. In Kabesa in Thimphu, people said that young people are interested in farming as they find it enjoyable, and it is easy to find working opportunities. Income in agriculture is also good, better than that enjoyed by civil servants (Kabesa, Thimphu). A 20-year-old farmer said that it is difficult to get labour for the field, but enjoys harvesting and improving farming skills with experience (Zomi village, Punakha).

In Yuling village in Trongsa, respondents said that unemployment is a problem among youth. After they complete 10th grade, they are not willing to engage in farming and there is not enough employment for them outside of farming. Before, they had only had education through 5th-6th grade, and they were able to get government jobs, but now, with 10th or 12th grade levels of education, they do not have employment opportunities (Yuling village, Trongsa).
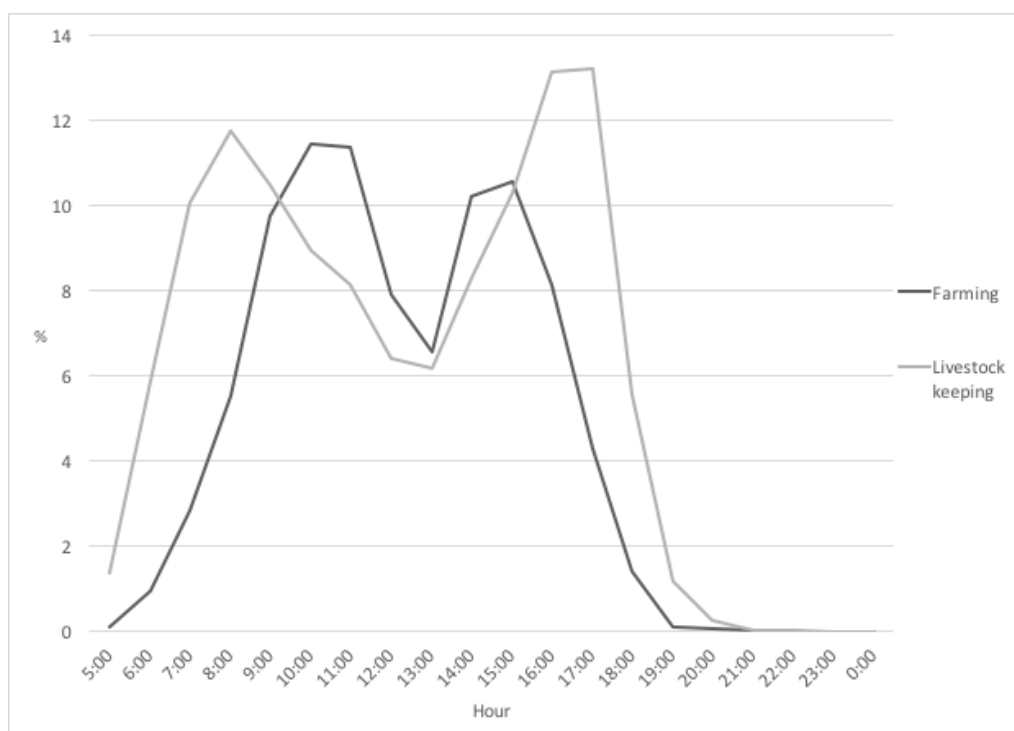
Source: Centre for Bhutan Studies and GNH Research

Figure 6.1.1   Use of Time for Farming and Livestock Keeping in Rural Areas
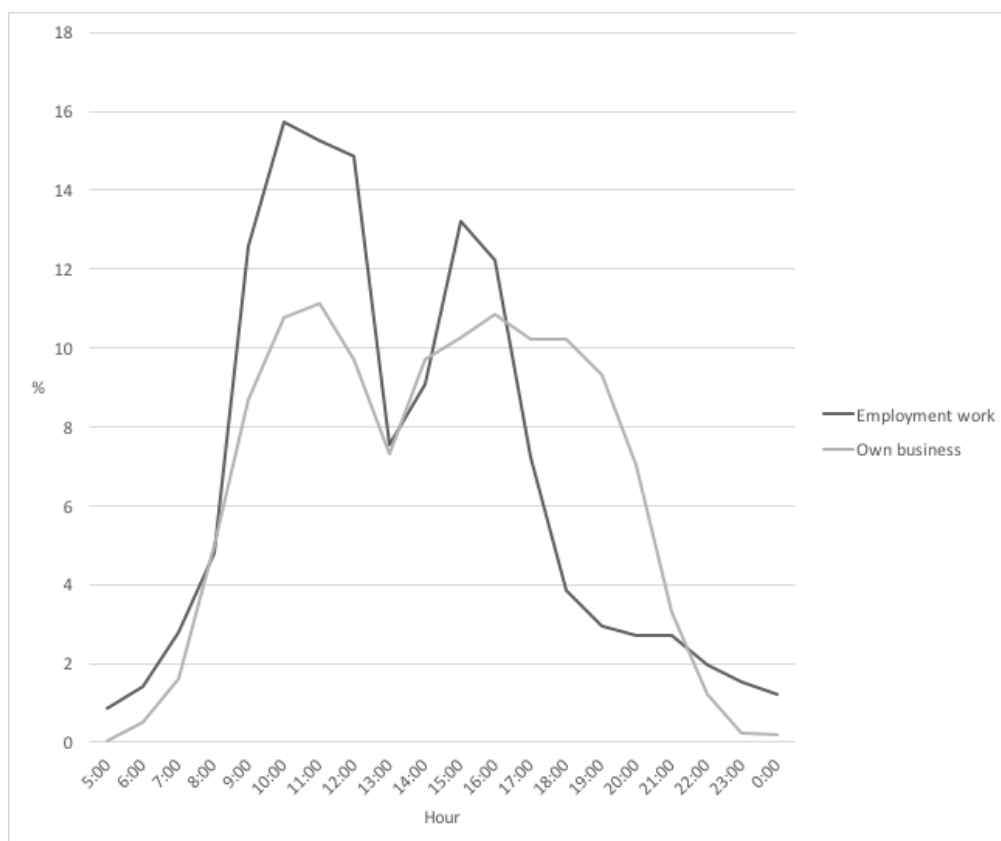
Source: Centre for Bhutan Studies and GNH Research

Figure 6.1.2   Use of Time for Employment Work and Privately Owned Business in Urban Areas

6.1.2   Community Service

Figure 6.1.3 indicates the percentages of people who are engaged in community services in both rural and urban areas. Community services include shopping, preparing and serving meals for other households, construction, renovation and repairs of dwellings for others, unpaid help in businesses/farms and employment in communities. The figure indicates that higher percentages of people in rural areas spend more time in community service than those in urban areas.
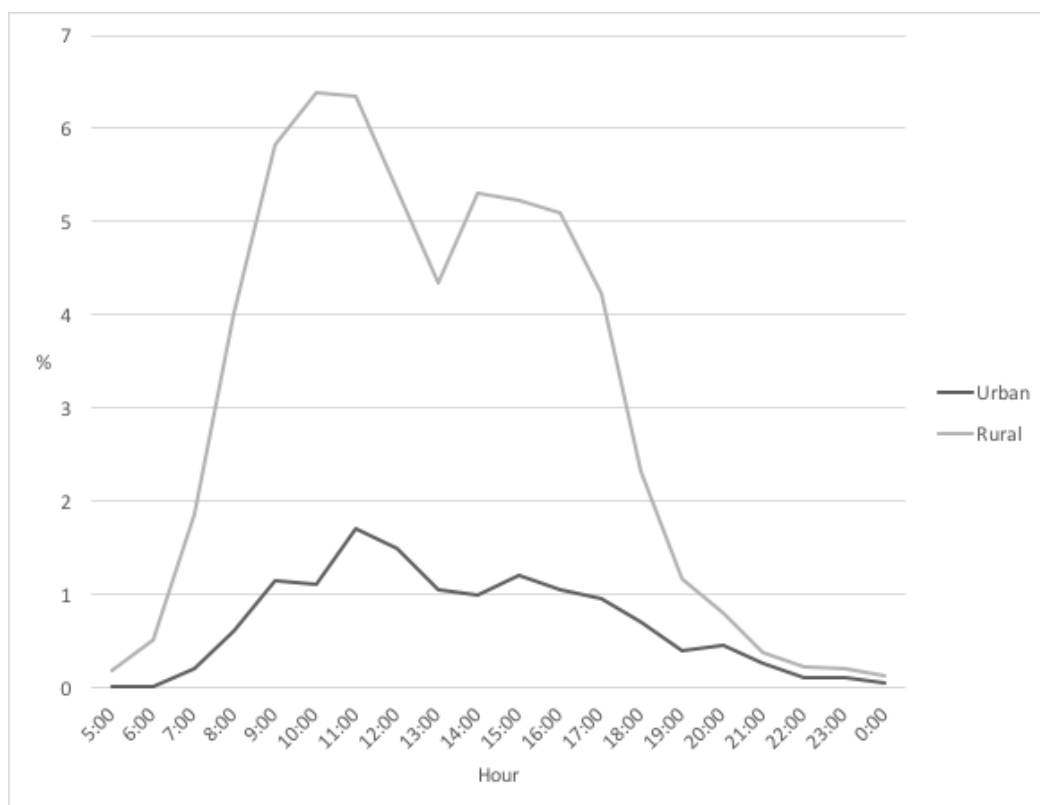
Source: Centre for Bhutan Studies and GNH Research

Figure 6.1.3   Use of Time for Community Services in Urban and Rural Areas

6.1.3   Cultural Diversity and Resilience

Figure 6.1.4 indicates percentages of people who are participating in community cultural/social events in both rural and urban areas. Such events can be celebration events such as weddings, births, religious events, or historic events. The figure indicates that similar percentages of people in rural and urban areas participate in cultural/social events, although a slightly higher percentage of those in rural areas participate in such events.

In communities, people said that young people are learning traditions and want to continue their traditions. They are not much influenced by foreign culture. They are happy, staying in their community (Trongsa town, Trongsa).
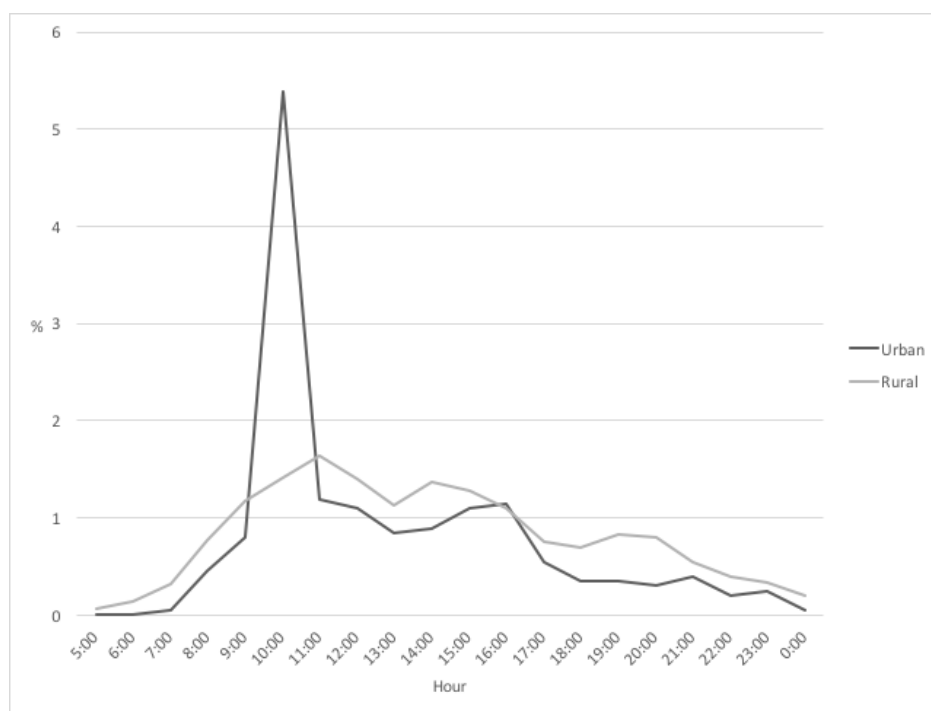
Source: Centre for Bhutan Studies and GNH Research

Figure 6.1.4   Use of Time for Participating in Community Cultural/Social Events

6.1.4   Socializing

Figure 6.1.5 indicates the percentages of people who are socializing with other people both in rural and urban areas. Such socialization includes talking/conversing face-to-face, by telephone, texting, short-wave radio, etc. It also included interaction using social media platforms such as Facebook. This also includes reading and writing mail, but does not include interactions with others in work and employment situations. Overall, people in rural areas spend more time in socializing with others than those in urban areas.

In the interviews at in some communities, people mentioned that there are some issues in community relationships because of disagreements over land boundaries. However, it is better than it was previously. Family relationships are generally good (Zomi village, Punakha). Community relationships have problems because land issues are increasing as there is more land fragmentation and as more people are buying and selling land (Yuling village, Trongsa). Elsewhere, community relationships are good, although land planning caused some issues over land borders (Dhamkhar town, Bumthang).

In Thimphu, people mentioned that relationships in neighbourhoods had been good before. Now neighbours do not know each other. People depend on money, and are busy earning livelihoods. Before, they had more opportunities to interact with each other. They used to walk to their workplaces and had conversations with others on the way. Now, they are busy every day, and they use vehicles, and so they have fewer opportunities to talk with others. People used to help each other (Thimphu Thromde, Thimphu).
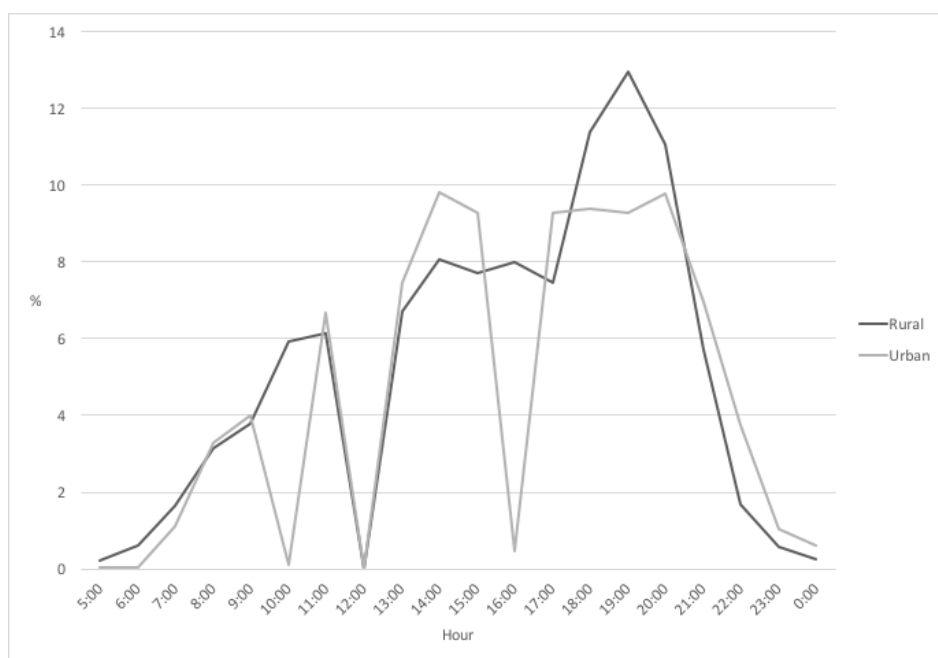
Source: Centre for Bhutan Studies and GNH Research

Figure 6.1.5   Use of Time for Socializing

6.1.5   Leisure

Figure 6.1.6 indicates the percentages of people who spend time in leisure activities, both in rural and urban areas. Such leisure activities include watching/listening to television or video programmes, either at home or at a neighbour's or friend's place (including using a television, computer, mobile phone or tablet). This indicates that a higher percentage of people in urban areas spend more time in this type of leisure activity than those in rural areas.
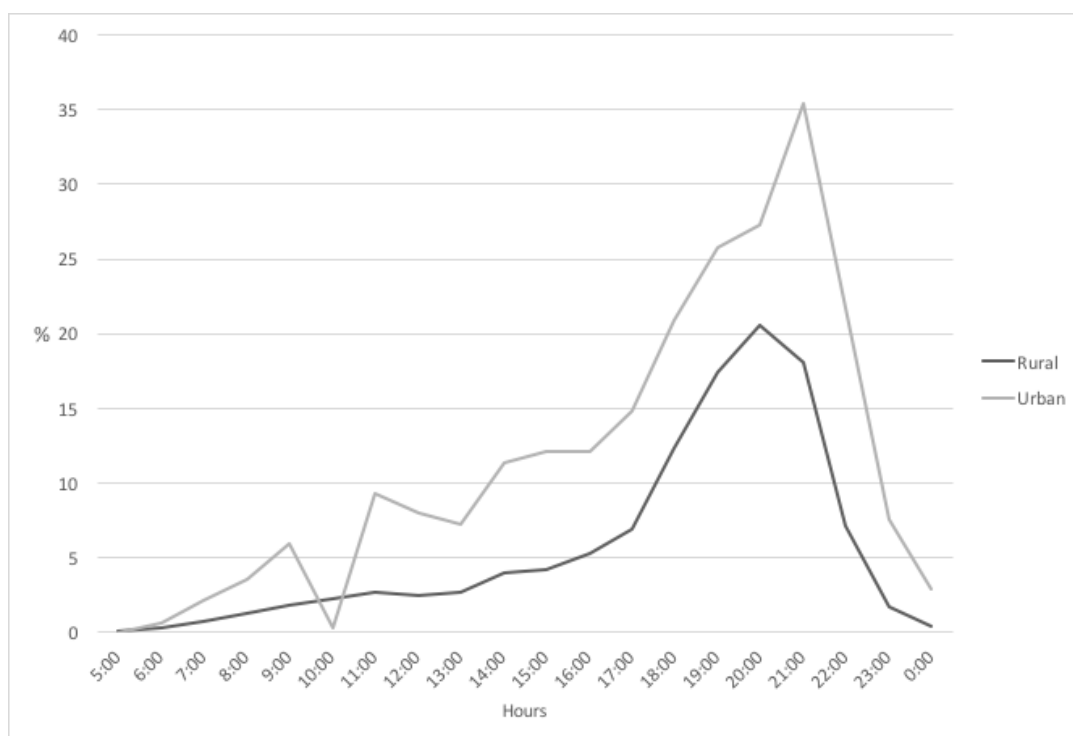
Source: Centre for Bhutan Studies and GNH Research

Figure 6.1.6   Use of Time for Leisure

6.1.6   Sleeping Hours

Figure 6.1.7 indicates the percentages of people who spend time sleeping, both in rural and urban areas.   This indicates that a higher percentage of people in rural areas wake up and go to bed earlier than those in urban areas.
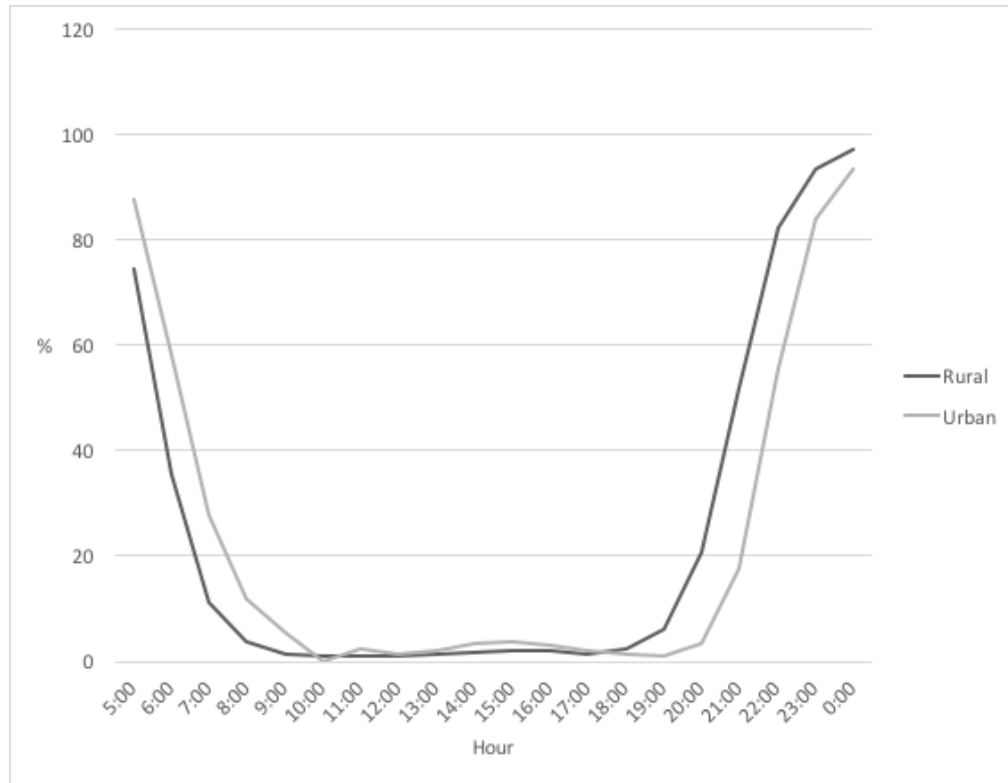
Source: Centre for Bhutan Studies and GNH Research

Figure 6.1.7   Use of Time for Sleeping

6.1.7   Summary

The above time use of those in rural and urban areas can be summarized as follows. Many people in rural areas are engaged in farming and livestock keeping and they are more engaged in community and socially oriented activities than those in urban areas. Their activities include helping others in their communities, and attending social and cultural events like weddings, births and religious events. They also spend more time socializing with others than do those in urban areas. Those in urban areas are engaged in employment and privately owned businesses for their work. They are less oriented to community and social activities than those in rural areas, and they are also more engaged in individually oriented activities for their leisure, such as watching/listening to television.

6.2   Living Standards and Poverty

(1) Income Poverty Rate and Multi-Dimensional Poverty Rate

A poverty analysis based on the Bhutan Living Standard Survey was carried out in 2003, 2007 and 2012. According to the latest Poverty Analysis Report 2012, the poverty rate declined from 31.7% in 2003 to 12% in 2012, exceeding the 10th Five-Year Plan target of reducing poverty to 15%. The provision of infrastructure facilities, such as roads, electricity, telecommunications, water and sanitation, led to the success of targeted poverty reduction.

Rural poverty fell from 38.3% to 16.7% while urban poverty fell from 4.2% to 1.8% over the same period. Similarly, inequalities in income, measured in terms of the Gini coefficient, fell from 0.416 in 2003 to 0.36 in 2012, as shown in Table 6.2.1.

Table 6.2.1   Poverty Indicators in 2003, 2007 and 2012

	Unit	2003	2007	2012
Total poverty line	BTN per person/month	740.36	1,096.94	1,704.84
Food poverty	BTN per person/month	403.79	688.96	1,154.74
Non-food allowance	BTN per person/month	336.57	407.98	550.10
Poverty rate	%	31.7	23.2	12.0
Rural	%	38.3	30.9	16.7
Urban	%	4.2	1.7	1.8
Gini coefficient		0.416	0.35	0.36

Source: The 11th Five-Year Plan

A review of the characteristics of the poor and non-poor examined in the Poverty Analysis Reports reveal that poverty is a rural phenomenon. Poverty is not a serious issue commonly shared in the country, but it does reflect the characteristics of rural areas. Those employed in agriculture are poorer, while poverty is less acute in households in which the head of the family is educated. The family size of poor families also tended to be bigger.

Table 6.2.2   Characteristics of Poverty in 2003, 2007 and 2012

	Poverty Analysis Reports 2003	Poverty Analysis Reports 2007	Poverty Analysis Reports 2012
Area	Rural areas were poorer than urban areas.	Rural areas were poorer than urban areas.	Poverty is a rural phenomenon.
Employment sector	95% of the rural poor are employed in agriculture, while 89 % of the rural non-poor are engaged in agriculture.	Among the employed, poverty levels are higher among those families whose head of household works in agriculture (33%).	Poor households are concentrated in the agricultural sector.
Education	62.8% of the urban poor were uneducated, compared to 34.98% of the urban non-poor. In rural areas, educational attainment made no significant difference as to whether a household was poor or not.	The literacy rate among the poor is 40%, compared to a 60% literacy rate among the non-poor.	The literacy rate among the poor is 52%, while it is 65% among the non-poor. There is a significant reduction in the poverty rate if the head of household was educated to secondary level, both in urban and rural areas.
Household size	The average family size of the poor is 6.6, while for the non-poor it is 4.6.	The average family size of the poor is 6.87, while for the non-poor it is 4.64.	Poor households tend to have larger families (around 6.3), while non-poor households have an average of 4.4.

Source: The 11th Five-Year Plan

Of the 20 Dzongkhags, nine Dzongkhags had poverty rates higher than the national average of 12%. The highest estimated rate is in Lhuentse, at 31.9%, followed by Pemagatshel (26.9%) and Zhemgang (26.3%). The 11th Five-Year Plan sets the target to reduce the income poverty rate to less than 5% by 2018.

A multi-dimensional poverty rate[1] was estimated at 12.7% in 2012, using 13 indicators of

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[1] The multi-dimensional poverty rate retains three dimentions: health, education and standard of living. Each dimention is comprised of indicators. The health dimention is consisited of two indicators: child mortality and food security. The eduation dimention includes two indicators: school attendance and schooling. The standard of living dimeition includes nine indicators: cooking fuel, sanitation, electricity, water, road, housing, asset,

health, education and living standards. Gasa has the highest multi-dimensional poverty rate at 37.6%, followed by Monggar (20.9%) and Samtse (18.7%). The target for the 11th Five-Year Plan is to reduce the multi-dimensional poverty rate to less than 10% by 2018. Figure 6.2.1 shows the income poverty rate and multi-dimensional poverty rate for each Dzongkhag, the national average in 2012 and the target specified in the 11th Five-Year Plan. The figure indicates the investment that must be still allocated to reduce the poverty rates in each Dzongkhags in order to achieve the target rates.
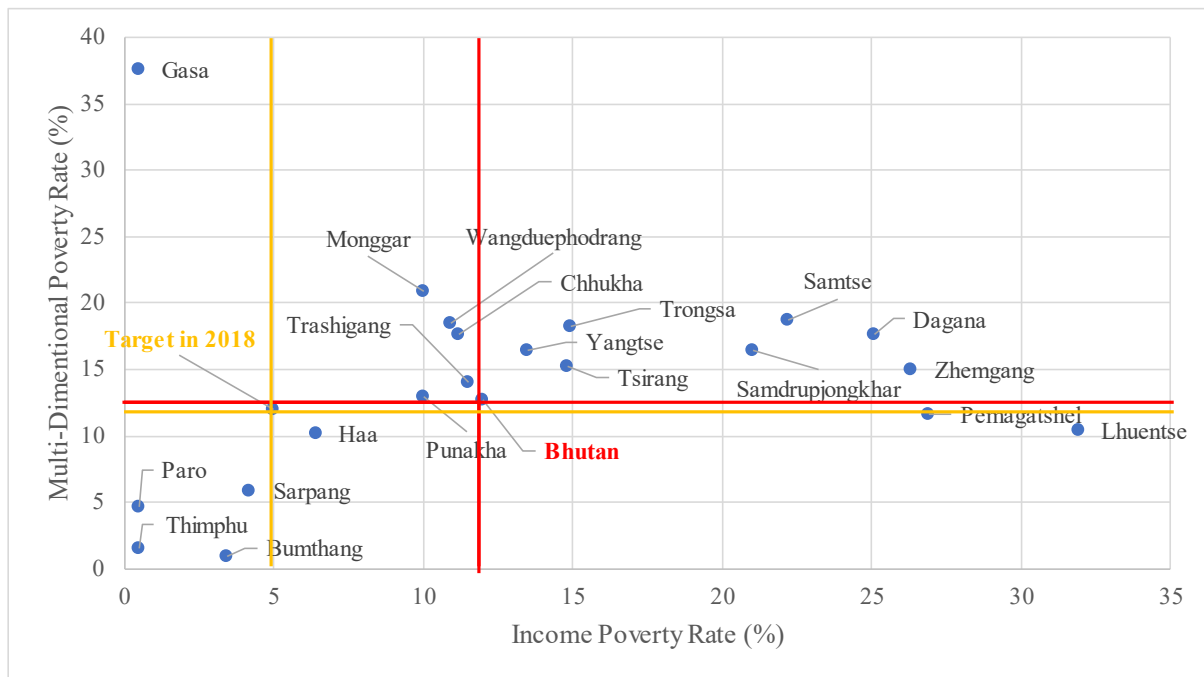
Source: Bhutan Multidimensional Poverty Index 2012

Figure 6.2.1 Income Poverty Rate and Multi-Dimensional Poverty Index by Dzongkhag and in Bhutan Overall

(2) Household Income and Expenditure

According to the Bhutan Living Standards Survey 2017, the mean monthly household expenditure is BTN 33,542 for the country overall, BTN 45,508 in urban areas and BTN 26,937 in rural areas, as shown in Figure 6.2.2. The mean monthly household expenditure per capita is estimated at BTN 7,939 for the country overall, BTN 11,452 for urban areas and BTN 6,174 for rural areas. Of the 20 Dzongkhags, Thimphu has the highest average monthly household expenditure of BTN 53,784, followed by Paro (BTN 43,092) and Haa (BTN 42,898).

Food consumption expenditure accounts for 43.9% of monthly expenditure in the country overall, 40.8% for urban areas and 46.8% for rural areas. Expenditure on non-food consumption accounts for 56.1% of total monthly expenditure. Of the major items included in the expenditure on non-food consumption, transport and communications occupy the highest share in urban areas (BTN 7,008 or 15.4%) and rural areas (BTN 3,502 or 13.0%). Of all the Dzongkhags, the average monthly rent is highest in Tsirang (BTN 7,140) and the second highest in Thimphu (BTN 6,950); it is lowest in Gasa (BTN 1,258).

According to the Bhutan Living Standards Survey 2012, the mean annual household income is BTN 164,829 for the country overall, BTN 282,671 in urban areas and BTN 104,091 in rural

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land and livestock.

areas, as shown in Figure 6.2.3. Household income is made up of wages, salaries, the sale of agricultural products and non-agricultural activities. If annual household expenditure in 2012 is estimated by multiplying monthly expenditure by 12, then annual household expenditure exceeds annual household income at the national level and in all Dzongkhags except Chhukha. It may be difficult to make savings due to the limited surplus available in family budgets. In emergencies, the majority of households (55%) use money from their savings and 27% borrow from other family members. This implies a significant reliance on the family in emergencies. However, there are urban–rural differences in where resources come from during emergencies. Eighty percent of urban households will use their own savings and only 14% will borrow from family members. In rural areas, a lower proportion of households (42%) will use their own savings and 34% will borrow from family. Possible reasons for this greater reliance on extended family in rural areas are stronger family ties due to low incomes, low household savings and low access to banking services.
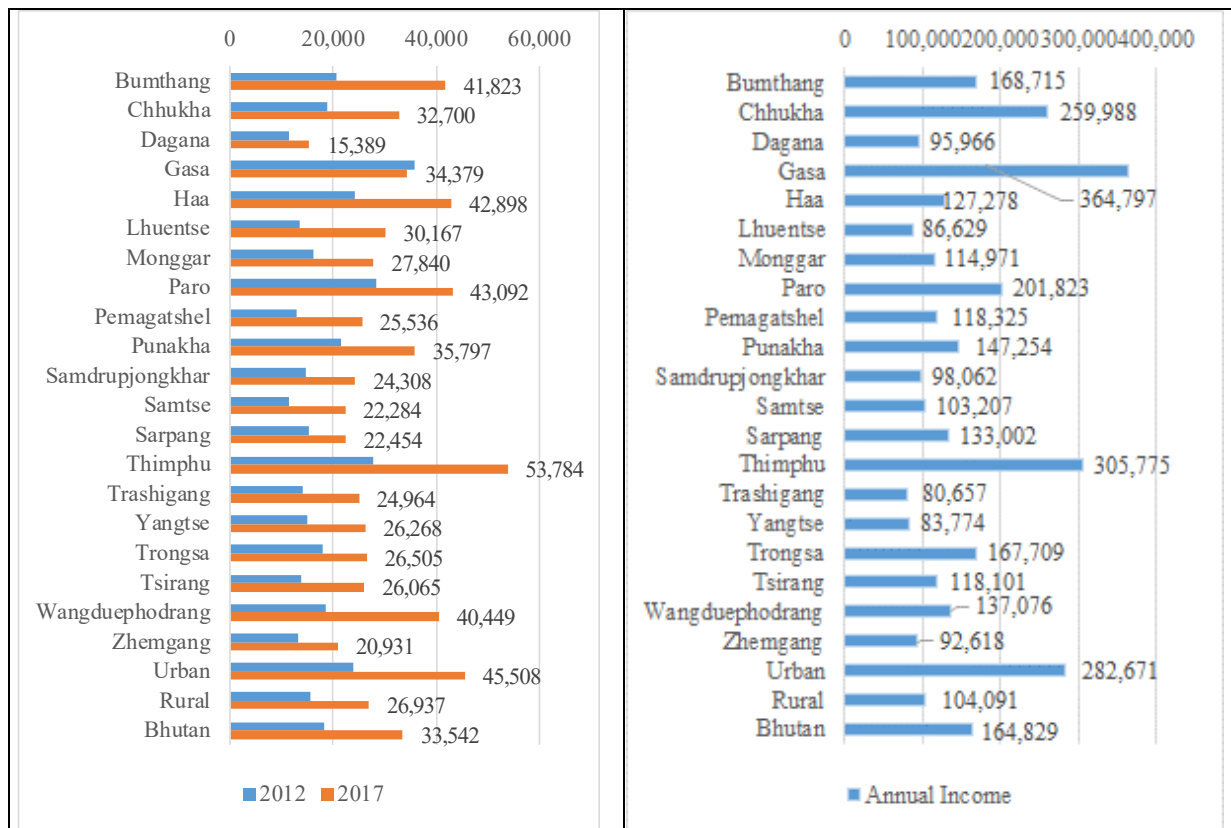
Source: Bhutan Living Standards Survey 2012 and 2017

Figure 6.2.2　Monthly Household Consumption Expenditure in 2017

Source: Bhutan Living Standards Survey 2012

Figure 6.2.3　Annual Household Income by Source and by Dzongkhag in 2012

(3) Living Conditions in Rural Areas

About 62.2% of the population lives in rural areas[2], and the RGoB has made significant investments to improve their livelihoods and reduce poverty. As a result, rural infrastructure, including electricity, water supply and farm roads, has been improving year on year.

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[2] 2017 Population & Housing Census of Bhutan - National Report, National Statistics Bureau, Royal Government of Bhutan, 2017

1) Electricity

In the early 1990s, less than 5% of Bhutan's total population had access to electricity (WB SE4ALL, 2016[3]). The lack of access to electricity and other modern energy sources led Bhutan to become one of the highest biomass consumers in the world, consuming 1.3 tons of biomass per capita annually (UNDP, 2012[4]). Since the early 1990s, the RGoB has included rural electrification as a priority in each of its Five-Year Plans. In terms of electrification outputs, these programmes have been very successful, with rural electrification rates improving from 23% in 2003 to 83% in 2012 (Litzow, 2017[5]). By 2012, more than half of all Dzongkhags had achieved a rural electrification rate of above 80%. As of 2016, there are 47,438 urban domestic consumers, while the number of domestic consumers in rural areas is more than double this amount at 99,417 (NSB, 2017[6]). According to the Bhutan Living Standards Survey Report (BLSS 2017)[7], 98% of rural households have access to electricity.

2) Water supply

Bhutan has plenty of water resources because of its geographical location. The mean annual flow per capita is 94,500 m^3, which is one of the highest in the world. For drinking purposes, water is fetched from various sources such as rivers, streams and springs. Groundwater and rainwater are rarely used. The BLSS 2017 report indicates that almost all (99.5%) households in rural areas have access to improved water sources. The proportion of households with unimproved water sources in rural areas is 0.5%, which include unprotected springs (0.2%), followed by surface water (0.1%), unprotected wells (0.1%), and carts with a small tank/drum (0.1%).

However, a rapid assessment of rural drinking water quality conducted by the Royal Centre for Disease Control (RCDC) in 2012 showed that only 17% of stream water sources and 28% of spring water sources were safe to use for drinking water. This implies that the assurance of safe drinking water is still a major challenge in Bhutan[8]. The following table shows the values of each parameter for safe drinking water in the rural drinking water supply.

Table 6.2.3   Parameters and its Concentration for Rural Drinking Water Supply

Parameters	Unit	Target limits/Risk assessment
Physical		
Conductivity	μS/cm	1,000
Odour		Unobjectionable
Appearance		Unobjectionable
pH		6.5–8.5
Taste		Unobjectionable
Turbidity	NTU	5
Microbiological		
E. coli	CFU/ml	0: Safe water
		1–10: Low health risk
		11–50: Intermediate to high health risk
		> 50: Grossly polluted

Source: Bhutan Drinking Water Standard, 2016

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[3] http://data.worldbank.org/indicator/EG.ELC.ACCS.ZS?locations=BT, accessed on 1 May 2017
[4] http://www.undp.org/content/bhutan/en/home/operations/projects/environment_and_energy/Bhutan-SRBE.html, accessed on 1 May 2017
[5] The impact of rural electrification in the Kingdom of Bhutan
[6] Statistical Yearbook of Bhutan 2017, National Statistics Bureau, September 2017
[7] Bhutan Living Standards Survey Report 2017, National Statistics Bureau, 2017
[8] Bhutan Drinking Water Standard 2016.

3) Farm roads

As the current 11th Five-Year Plan (2013-2018) states that "In Monggar, the incidence of poverty has drastically decreased to 10.5% (2012) from 44.7% in 2007. This reduction in poverty can be attributed to improved accessibility brought about by an extensive network of farm roads built in the 10th Five-Year Plan, increased market opportunities as well as the increased commercialization of agricultural and livestock products." This improvement in accessibility has been effective not only in reducing poverty, but also in modernizing agriculture.

Based on the concept of the production-access-marketing (PAM) approach, the MoAF has continued to invest its financial resources in improving access to markets and social services. As of 2011, 58% of households are connected by a network of farm roads[9].

Table 6.2.4   Percentage of Rural Households by Walking Distance to the Nearest Motor Road

					Unit: %
	< 1 hour	1–3 hours	4–6 hours	> 6 hours	Total*
2009	53	18	10	19	100
2012	68	19	7	7	100
2015	79	12	5	4	100

* Total may not add up to 100% due to rounding off
Source: DoA Agricultural Statistics

Table 6.2.5   Farm Road Length and the Number of Beneficiary Households

	2011	2013	As of May 2015
Length (km)	3,290	5,834	6,765
Beneficiary households	51,555	66,040	76,484

Source: Bhutan RNR Statistics, 2015

In rural areas, 87% of households can reach the nearest road in less than 30 minutes, but this distance increases by 99% in urban areas, according to the PHCB 2017. With regard to tarred roads, only 47% of households in rural areas can reach one within 30 minutes but the distance increases by 88% in urban areas.

4) Housing

According to the Bhutan Living Standards Survey for 2017, 72% of households in rural areas live in their own houses, whereas only 14% of urban households live in their own houses. The survey also indicates that about 65% of households are tenants in urban areas, while only 17% are tenants in rural areas. These figures represent an increase of 5% and 7%, respectively, as compared with the 2012 figures (60% and 10%).

5) Education

The Bhutan Living Standards Survey, 2017 also reveals the situation of education in rural areas. Forty two out of 100 heads of household have had no formal schooling in the country overall; this percentage in rural areas (50%) is more than double the percentage in urban areas (24%). Educational attainment also tends to be higher in urban areas than it is in rural areas. Hence, the urban literacy rate is about 81%, while rural literacy is about 58%.

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[9] 11th FYP for the RNR sector

6.3   Public Services

6.3.1   Education

(1) Education System

Bhutan's education system includes formal, non-formal and monastic schools. The first type of education is the biggest and is commonly seen as the only educational structure. Enrolment in the formal system begins at the age of six, but students can apply to monastic schools at any age. Non-formal centres teach basic literacy skills to people of all ages.

In line with Article 9, Section 16 of the Constitution of the Kingdom of Bhutan, the Government provides free education to all students up until Grade 10, as well as scholarships to students who meet the requirements for higher and professional studies. However, it is up to Bhutanese citizens as to whether or not they receive primary education, because much of the population lives in far-flung places where they follow traditional lifestyles.

The general educational structure is summarized in Figure 6.3.1 and the number of educational institutions as of 2017 is shown in Table 6.3.1.

Acronyms:
    ECCD = Early Childhood Care and Development; PP = Pre-Primary; TTI = Technical Training Institute; ISCED = International Standard Classifications of Education

Note on Continuing Education:
    In order to institute a system of life-long learning and to provide school leavers with the opportunity to upgrade their academic qualifications, the Ministry of Education started the Continuing Education programme at Kelki Higher Secondary School, Thimphu in 2006. The programme offers two-year courses for the completion of classes X and XII.

Source: Ministry of Education (MoE), 2016, Annual Education Statistics, 2016

Figure 6.3.1   General Education Structure

Table 6.3.1   Number of Schools, Institutes and Education Structure (Including General Education, Monastic Education and Non-Formal Education)

	Government	Private	Total
Early Childhood Development			
ECCD Centres[1]	245	62	307
School Education			
1) Primary Schools	296	14	310
2) Lower Secondary Schools	71	1	72
3) Middle Secondary Schools	70	2	72
4) Higher Secondary Schools	42	19	61
Subtotal (1-4)	**479**	**36**	**515**
Extended Classrooms	90	-	90
Central Schools[2]	60	-	60
Autonomous Schools	22	-	22
Schools with a SEN Programme and Special Institutes[3]	14	2	16
Institutes			
Tertiary Institutes within Bhutan	15	3	18
Technical Training Institutes	7	-	7
Institute of Zorig Chusum	2	-	2
Other forms of Education			
Monastic Education (Lobdra, Shedra, etc.)[4]	200	-	200
Continuing Education Centres	-	8	8
Non-Formal Centres	668	-	668

1. Private ECCD includes ECCD under NGOs, Private and in the Workplace.
2. Central Schools are already counted under School Education.
3. Includes the Muenselling and Wangsel Institutes, 12 general schools and two Draktsho centres.
4. Data on private monastic schools are not available.

Notes:
・ Central Schools are part of the school reform programme under the Bhutan Education Blueprint 2014-2024. These Schools will have the attributes of, among others: being centrally located with a large population catchment; serving a class range from PP-X/XII; providing residential facilities to 80% of the students; being equitably distributed across Dzongkhags/regions (Operational Guidelines of the Ministry of Education, 2016 (working document)).
・ SEN stands for Special Educational Needs.
・ Muenselling Institute in Khaling is for the visually impaired, and Wangsel Institute in Paro is for the deaf.
Source: MoE, 2017, *Annual Education Statistics 2017*

(2) Distribution of Educational Services Across the National Territory

Figure 6.3.2 shows the nationwide location of various types of education centres/facilities in Bhutan.
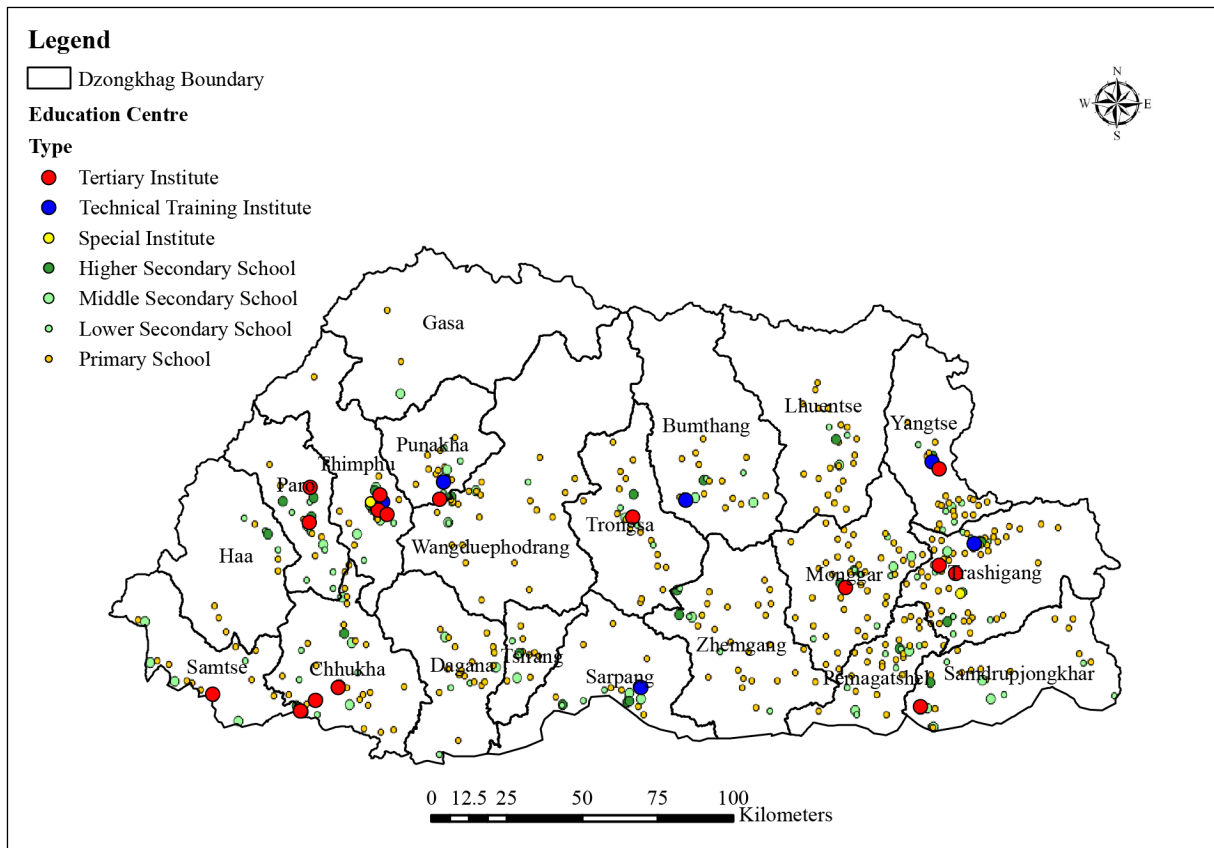
Note: Most of the information included in this map comes from GIS data provided by the National Statistics Bureau. Additional information on 11 tertiary colleges/institutes (including one college upgraded from a higher secondary school), five technical training institutes (including two Institutes for Zorig Chusum) and two special institutes (draktsho centres) was added by referring to the MoE (2017).
Source: Using data from the National Statistics Bureau

Figure 6.3.2   Distribution Map of Education Centres

Referring to an index of the number of schools per 1000 population, it seems that eastern parts of Bhutan (e.g., the eastern and central-eastern regions) are not generally behind in terms of educational opportunities. However, it should be noted that the index shows only a rough estimate because of the lack of highly reliable data.
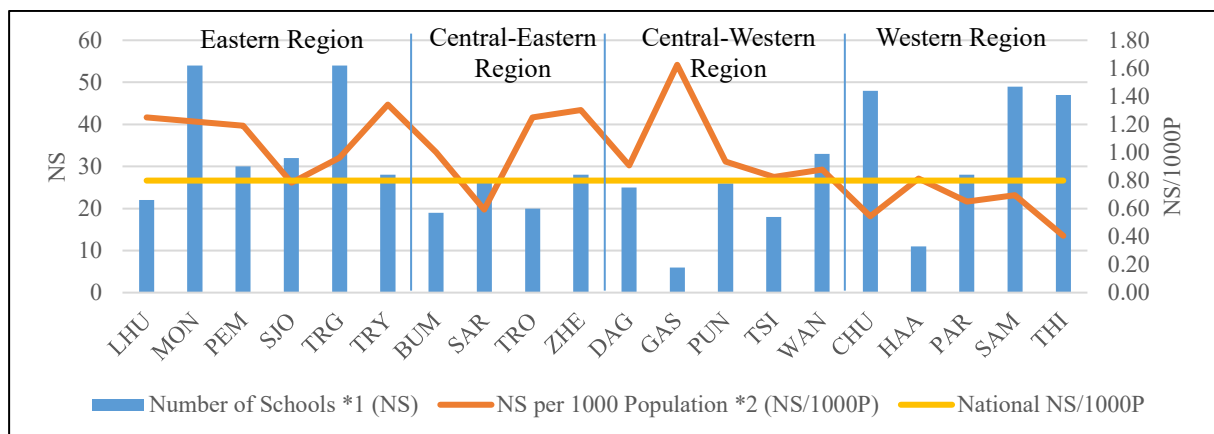
*1 Number as of 2017, MoE (2017)
*2 PHCB 2017

Figure 6.3.3   Number of Schools by Dzongkhag

(3) Pre-Primary and Primary Education

Statistics (MoE, 2017) show that the net enrolment rate (NER)[10] for ECCD (early childhood care and development, also known as pre-primary education) is estimated at 21.8%, as is the gross enrolment rate (GER)[11] for ECCD. It means all children in ECCD are between three and five years old. On the other hand, the NER for primary education (Grades PP-VI) is estimated at 104.0%, although the GER for primary is 109.9%. In Bhutan, 39% of children entering primary school for the first time are older than six years old. Thus, primary schools are taking care of students beyond the right age (from six to 12 years), such that the GER could be over 100%.

Figure 6.3.4 and Figure 6.3.5, which show the rough calculation of the rate of enrolment[12] by Dzongkhag in pre-primary education and primary education, show that eastern parts of Bhutan are not behind in terms of educational opportunities at those levels.

(4) Secondary Education

Secondary education is composed of lower (Grades VII-VIII), middle (Grades IX-X) and higher secondary (Grades XI-XII) schooling.

The lower and middle secondary levels can together be termed as the 'secondary' level. According to the latest statistics (MoE, 2017), the NER for 'secondary' education (Grades VII-X) is estimated at 98.2%, while the GER for 'secondary' is 106.9%. On the other hand, the GER for higher secondary education (Grades XI-XII) falls to 73.4%.

Figure 6.3.6 reveals the same result as the pre-primary and primary levels, in that the eastern parts of Bhutan are not behind. However, higher secondary schooling is another matter. The calculated enrolment rates for all dzongkhags in Eastern Bhutan and found that they are below the national average (Figure 6.3.7). However, this is not because there are not enough higher secondary schools in relation to the population of the region/dzongkhags (Figure 6.3.8).

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[10] NER = number of the right age group children in school/number of the corresponding population in a given school year.

[11] GER = number of children in school, regardless of age/number of the corresponding population in a given school year.

[12] "Estimated National ER" shown in Figure 6.3.4, 6.3.5, 6.3.6 and 6.3.7 is calculated what is the number of the children in school (referring to the MoE, 2017) expressed as a percentage of the corresponding population in a given school year (PHCB 2017, NSB). It is roughly equivalent to GER ("Gross National ER" shown in Figures).
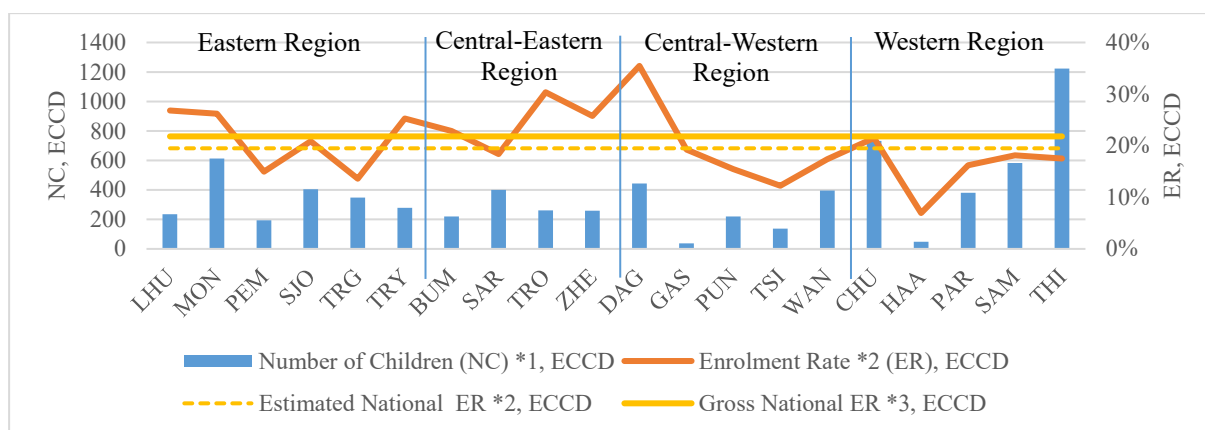
*1 Number as of 2016, MoE (2016)
*2 Quotient of NC divided by the estimated population of children aged between three and five in 2017, PHCB2017
*3 Rate as of 2017, MoE (2017)

Figure 6.3.4   ECCD Centre Enrolment by Dzongkhag
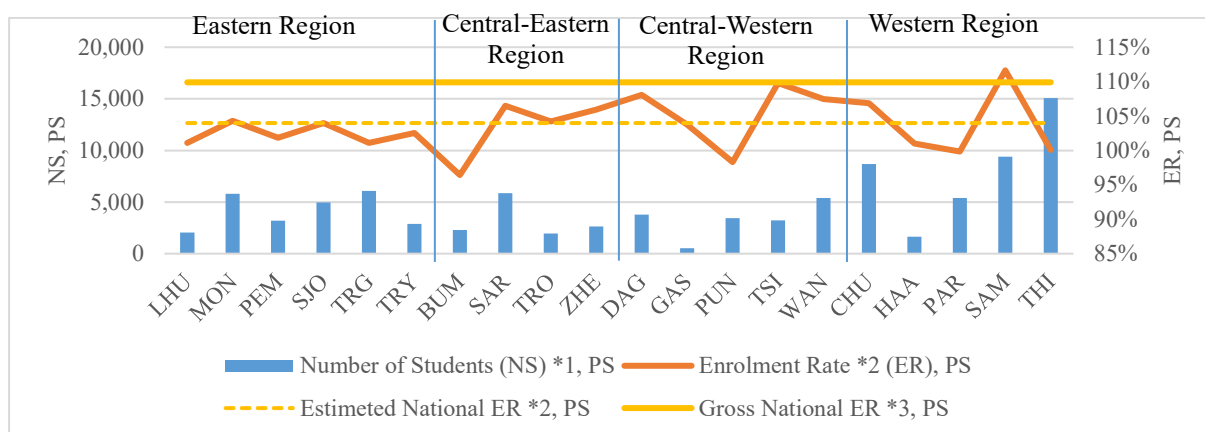
*1 Number as of 2017, MoE (2017)
*2 Quotient of NC divided by the estimated population of children aged between six and 12 in 2017, PHCB2017
*3 Rate as of 2017, MoE (2017)

Figure 6.3.5   Primary School (PS) Enrolment by Dzongkhag
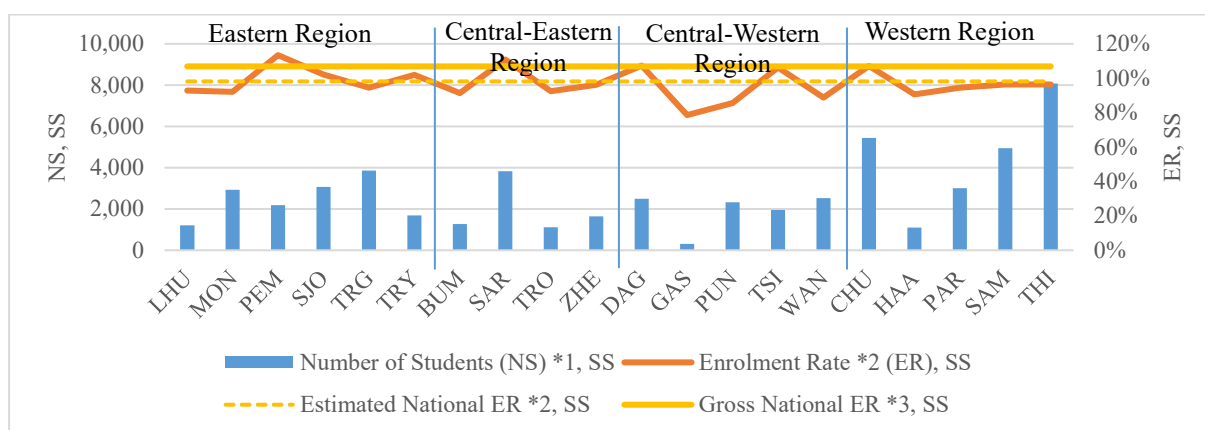
*1 Number as of 2017, MoE (2017)
*2 Quotient of NC divided by the estimated population of children aged between 13 and 16 in 2017, PHCB2017
*3 Rate as of 2017, MoE (2017)

Figure 6.3.6   Secondary School (SS) Enrolment by Dzongkhag, Including Both Lower and Middle Schools
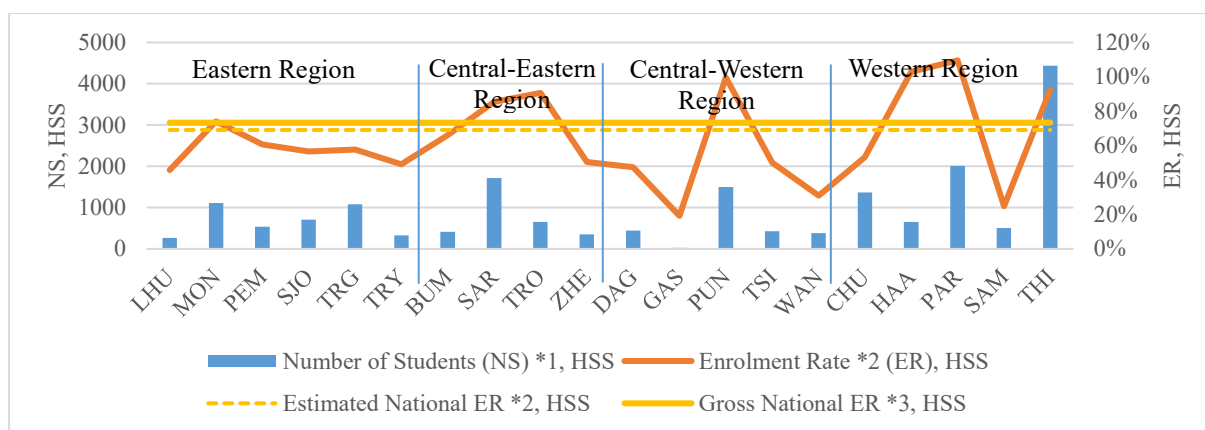
*1 Number as of 2017, MoE (2017)
*2 Quotient of NC divided by the estimated population of children aged between 17 and 18 in 2017, PHCB2017
*3 Rate as of 2017, MoE (2017)

Figure 6.3.7   Higher Secondary School (HSS) Enrolment by Dzongkhag
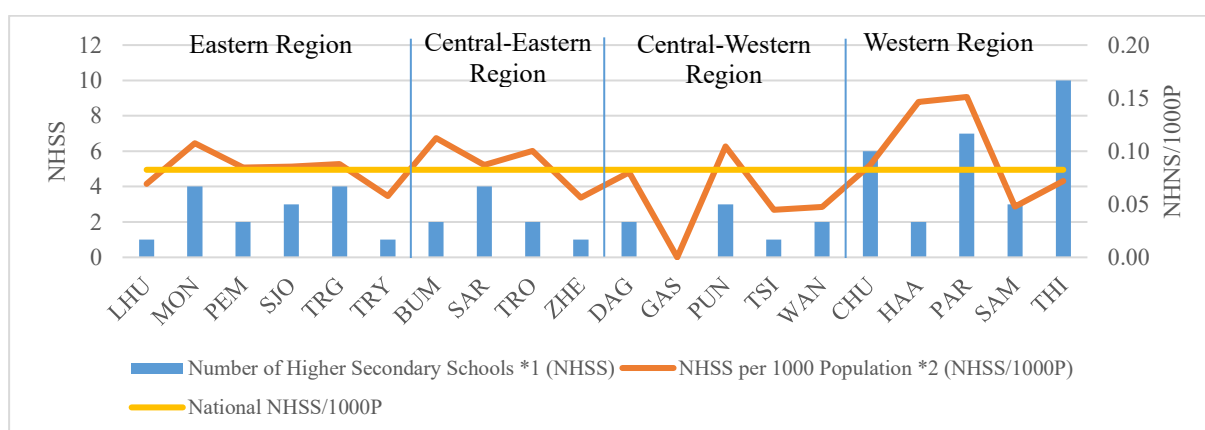
*1 Number as of 2017, MoE (2017)
*2 PHCB2017

Figure 6.3.8   Number of Higher Secondary Schools by Dzongkhag

(5) Technical Education

Students generally enter the Technical and Vocational Education and Training (TVET) programme after completing Grade X, and the theoretical entrance age for pursuing vocational education is 17.

Currently, there are seven Technical Training Institutes (TTIs), including one autonomous Institute of Tourism and Hospitality managed by Tourism Counsil of Bhutan (TCB), and two Institutes for Zorig Chusum (13 traditional arts and crafts) managed by the Ministry of Labour and Human Resources (MoLHR). As of 2017, there are 1,536 trainees and 163 instructors at these institutes.

As shown in Table 6.3.2, the numbers of trainees and instructors are all balanced between the four longitudinal regions of the nation.

(6) Tertiary Education

Currently, there are 18 tertiary institutes within Bhutan; 10 constituent colleges and two affiliate private colleges (Royal Thimphu College and Norbuling Rigter College) under the Royal University of Bhutan (RUB); one college known as the Rigney College under the MoLHR; three institutes under the Khesar Gyalpo University of Medical Sciences of Bhutan (KGUMSB) including one private Reldri Academy of Health Sciences affiliated to the KGUMSB; and two

autonomous institutes, these being the Royal Institute of Management and the Jigme Singye Wangchuck School of Law. In 2017, five out of the 18 colleges/institutes including three RUB colleges (Gyelpozhing College of Information Technology in Monggar, Yonphula College of Advance Studies in Trashigang and Norbuling Rigter College in Paro), one college under the MoLHR (Rigney College in Yangtse) and one autonomous institute (Jigme Singye Wangchuck School of Law in Thimphu) were newly established. As of 2017, there are 11,476 students in all tertiary institutions (Table 6.3.3).

The number of RUB graduates on each programme in 2016 is as shown in Table 6.3.4. Graduates from abroad are not included, but the popular majors in Bhutan can be grasped at a glance. The number of graduates by bachelor's degree is as follows:

- Bachelor of Arts = 727
- Bachelor of Education = 504
- Bachelor of Commerce = 427
- Bachelor of Science = 362
- Bachelor of Business Administration = 133
- Bachelor of Engineer = 129

The GER for tertiary education in Bhutan (excluding those tertiary students outside Bhutan) is estimated at 27.5%, with the GER for those both studying within and outside Bhutan is 35.8%. As of 2017, there are 3,457 students pursuing various undergraduate courses in different countries. There are 1,120 students studying abroad on government scholarships, while the remaining 2,337 students study with private funding. More than 75% of overseas students (653 on scholarships and 2,035 self-financing) are studying in India followed by Sri Lanka, Thailand and Bangladesh.

In contrast to other levels of education, tertiary education is rather concentrated in the western region. While this region houses some 45% of the overall population as of 2017 (according to the PHCB 2017), the region has 60% of Bhutan's tertiary students as of 2017. This reflects the fact that 11 colleges/institutes are concentrated in this region out of 18 nationwide (61% of tertiary education centres).

Table 6.3.2   Technical Training Institutes and Their Staff and Trainees, 2017

Dzongkhag/ Region	Name of the Institute	Trainees			Instructors		
		Male	Female	Total	Male	Female	Total
Trashigang	TTI, Ranjung	111	63	174	15	2	17
Yangtse	Institute for Zorig Chusum	93	71	164	11	4	15
Total, Eastern Region		*204*	*134*	*338*	*26*	*6*	*32*
Bumthang	TTI, Chumey	104	73	177	11	5	16
Sarpang	TTI, Dekiling	49	7	56	9	2	11
Total, Central-Eastern Region		*153*	*80*	*233*	*20*	*7*	*27*
Punakha	TTI, Khuruthang	144	82	226	12	10	22
Wangduephodrang	TTI, Samthang	107	22	129	11	4	15
Total, Central-Western Region		*251*	*104*	*355*	*23*	*14*	*37*
Thimphu	TTI, Thimphu	63	10	73	9	2	11
Thimphu	Institute for Zorig Chusum	212	96	308	25	2	27
Thimphu	Royal Institute of Tourism and Hospitality	53	51	104	9	10	19
Total, Western Region		*328*	*157*	*485*	*43*	*14*	*57*
Grand Total		**1,000**	**536**	**1,536**	**119**	**44**	**163**

Source: Modified from a table cited from the MoE (2017)

Table 6.3.3   Tertiary Institutes and Their Teaching Staff and Students, 2017

Dzongkhag/ Region	Name of Institute/College		Students			Teaching Staff		
			Male	Female	Total	Male	Female	Total
Monggar	RUB	Gyelpozhing College of Information Technology*	41	40	81	5	1	6
Samdrupjong khar	RUB	Jigme Namgyal Engineering College	565	261	826	7	47	54
Trashigang	RUB	Sherubtse College	912	870	1,782	24	75	99
	RUB	Yonphula College of Advance Studies*	21	11	32	1	2	3
Yangtse	MoLHR	Rigney College*	6	6	12	3	0	3
Total, Eastern Region			*1,545*	*1,188*	*2,733*	*40*	*125*	*165*
Trongsa	RUB	College of Language and Culture Studies	681	639	1,320	27	10	37
Total, Central-Eastern Region			*681*	*639*	*1,320*	*27*	*10*	*37*
Punakha	RUB	College of Natural Resources	317	204	521	51	20	71
Total, Central-Western Region			*317*	*204*	*521*	*51*	*20*	*71*
Chhukha	RUB	College of Science and Technology	662	285	947	18	71	89
		Gaeddu College of Business Studies	735	612	1,347	18	57	75
	KGUMSB	Reldri Academy of Health Sciences	17	36	53	3	5	8
Paro	RUB	Paro College of Education	775	689	1,464	18	54	72
		Norbuling Rigter College*	40	52	92	9	1	10
Samtse	RUB	Samtse College of Education	450	516	966	15	39	54
Thimphu	RUB	Royal Thimphu College	674	576	1,250	42	37	79
	KGUMSB	Faculty of Nursing and Public Health	151	186	337	13	18	31
		Faculty of Traditional Medicine	47	36	83	8	3	11
	Autonomous	Royal Institute of Management	192	146	338	19	8	27
		Jigme Singye Wangchuck School of Law*	12	13	25	5	9	14
Total, Western Region			*3,755*	*3,147*	*6,902*	*168*	*302*	*472*
Grand Total			**6,298**	**5,178**	**11,476**	**286**	**457**	**743**

Acronyms:
  RUB = Royal University of Bhutan; KGUMSB = Khesar Gyalpo University of Medical Sciences of Bhutan; RIM = Royal Institute of Management; RITH = Royal Institute for Tourism and Hospitality

Note:
  * Newly-established in 2017. Data as of 2017. Data for rest of the colleges and institutes as of 2016

Source: Modified from a table cited from the MoE (2017)

Table 6.3.4   RUB Graduates by Programme, 2016

Dzongkhag/ Region	College	Programme	No. of Graduates
Monggar	Gyelpozhing College of Information Technology*	Computer Applications (BCA)**	-
Samdrup jongkhar	Jigme Namgyal Engineering College	Civil Engineering (D)	120
		Electrical Engineering (D)	43
		Mechanical Engineering (D)	34
		Computer Hardware & Networking (D)	38
		Electronics & Communication Engineering (D)	28
		Surveying (D)	24
		Materials & Procurement Management (D) **	-
		Power Engineering (BE) **	-
		Total	**287**
Trashigang	Sherubtse College	Computer Science (BSc)	37
		Life Science (BSc)	57
		Environmental Science (BSc)	45
		Physical Science (Math & Chemistry) (BSc)	22
		Physical Science (Math & Physics) (BSc)	18
		Physical Science (Chemistry & Physics) (BSc)	18
		English & Dzongkha (BA)	39
		Dzongkha & History (BA)	48
		English & Media Studies (BA)	21
		Dzongkha & Media Studies (BA)	23
		Economics & Geography (BA)	45
		Economics & Population Studies (BA)	47
		Political Science & Sociology (BA)	64
		English (PgD)	25
		English (BA, Hons)	5
		Total	**514**
	Yonphula College of Advance Studies*	English (MA)	-
Total, Eastern Region			***801***
Trongsa	College of Language and Culture Studies	Bhutanese & Himalayan Studies (BA)	136
		Bhutanese & Himalayan Studies (BA, Hons)	4
		Language & Literature (BA)	158
		Language & Literature (BA, Hons)	7
		Language & Communication Skills (D)	27
		Choekey & Dzongkha (MA) **	-
		Language & Culture (BA) **	-
		Total	332
Total, Central-Eastern Region			***332***
Punakha	College of Natural Resources	Development Practice (MDP)	28
		Agriculture (BSc)	32
		Animal Science (BSc)	39
		Forestry (BSc)	53
		Sustainable Development (BSc)	41
		Agriculture (D)	27
		Animal Husbandary (D)	25
		Forestry (D)	30
		Natural Resources Management (MSc) **	-
		Environment & Climate Studies (BSc) **	-
		Total	**275**
Total, Central-Western Region			***275***
Chhukha	College of Science and Technology	Civil Engineering (BE)	47
		Electrical Engineering (BE)	39
		Electronics and Communication Engineering (BE)	15

		Information Technology (BE)	28
		Architecture (BArch) **	-
		Total	**129**
	Gaeddu College of Business Studies	Finance (MBA)	16
		Accounting (BCom)	132
		Finance (BCom)	199
		Human Resource Management (BBA)	42
		Marketing (BBA)	55
		Total	**444**
Paro	Paro College of Education	Education for Primary (BEd)	248
		Education for Secondary (BEd)	15
		Dzongkha (BEd)	106
		Education (PgD)	38
		Dzongkha (MEd)	-
		Dzongkha (PgD)	-
		Early Childhood Care & Development (D)	-
		Physical Education and Sports Coaching (D)	-
		Total	**407**
	Norbuling Rigter College*	Business Administration (BBA) **	-
		Commerce (BCom) **	-
Samtse	Samtse College of Education	Education for Primary (BEd)	39
		Education for Secondary (Arts) (BEd)	52
		Education for Secondary (Science) (BEd)	44
		Education (PgD)	113
		Guidance & Counseling (PgD)	13
		Higher Education (PgD)	14
		Higher Education (PgC)	31
		Total	**306**
Thimphu	Royal Thimphu College	Political Science & Sociology (BA)	33
		English & EVS (BA)	61
		Economics & EVS (BA)	23
		English & Dzongkha (BA)	13
		Human Resources (BBA)	36
		Finance (BCom)	72
		Accounting (BCom)	24
		Development Economics (BA)	-
		English Studies (BA)	-
		Dzongkha & History (BA)	-
		Anthropology (BA)	-
		Computer Applications (BCA)	-
		Environmental Management (BSc)	-
		Total	**262**
Total, Western Region			*1,548*
Grand Total			**2,956**

Acronyms: BA = Bachelor of Arts; BArch = Bachelor or Architecture; BBA = Bachelor of Business Administration; BCom = Bachelor of Commerce; BCA = Bachelor of Computer Applications; BE = Bachelor of Engineering; BEd = Bachelor of Education; BSc = Bachelor of Science; D = Diploma; Hons = Honours; MA = Master of Arts; MBA = Master of Business Administration; MDP = Master of Development Practice; MEd = Master of Education; MSc = Master of Science; PgC = Postgraduate Certificate; PgD = Postgraduate Diploma

Note: * Newly-established College after 2016; ** Newly-launched Programme after 2016

Source: Cited from the Royal University of Bhutan, 2017, *Annual Report 2016*

6.3.2   Health

(1) Health Services Provision System

In line with Article 9, Section 21 of the Constitution of the Kingdom of Bhutan, the State has

the responsibility of providing free access to basic public health services in both modern and traditional medicines. Thus, both traditional and modern medical methods are practiced and implemented in Bhutan without any sense of competition or discrimination; the Bhutanese people enjoy and have the right to access both types of medical treatments, depending on what is best to treat his/her disease.

As of 2016, modern healthcare services are delivered through:

(a) Thirty hospitals, made up of one national referral hospital (NRH), two regional referral hospitals (RRHs) in the eastern and central regions (excluding the NRH which concurrently functions as an RRH for the western region), as well as the other Dzongkhag and general hospitals.

(b) Two hundred and ten basic health units (BHUs), comprising 25 BHU-Is and 185 BHU-IIs.

(c) Forty-nine sub-spots managed by adequate health workers.

(d) Five hundred and fifty-three outreach clinics (ORCs) that provide maternal and child health services in remote communities in the mountains.

On the other hand, traditional medicine services are provided through:

(a) One National Traditional Medicine Hospital.

(b) Fifty-nine indigenous (or traditional medicine) units that exist in almost all Dzongkhag hospitals and in some BHU-Is (Table 6.3.5 and Table 6.3.6).

Table 6.3.5   Health Facilities by Dzongkhag - 2016

Dzongkhag	Facility Type					ORC With Shed	ORC Without Shed
	Hospital	BHU-I	BHU-II	Sub-Post	Ind. Unit		
Lhuentse	1	0	14	0	2	30	2
Monggar	1	1	22	5	5	52	0
Pemagatshel	1	1	11	7	4	32	4
Samdrupjongkhar	2	3	7	3	5	28	4
Trashigang	3	5	14	4	6	50	2
Yangtse	1	1	7	2	2	22	2
Total, Eastern Region	*9*	*11*	*75*	*21*	*24*	*214*	*14*
Bumthang	1	0	5	0	3	13	0
Sarpang	1	2	10	2	2	11	2
Trongsa	1	0	6	4	3	19	0
Zhemgang	1	2	11	4	4	30	5
Total, Central-Eastern Region	*4*	*4*	*32*	*10*	*12*	*73*	*7*
Dagana	1	2	7	0	3	29	4
Gasa	0	1	3	1	1	4	1
Punakha	1	0	7	1	1	10	0
Tsirang	1	0	7	0	1	14	6
Wangduephodrang	2	2	9	5	3	22	6
Total, Central-Western Region	*5*	*5*	*33*	*7*	*9*	*79*	*17*
Chhukha	3	2	13	1	4	39	6
Haa	1	1	4	2	3	7	10
Paro	1	0	3	3	1	17	5
Samtse	2	1	13	5	4	43	5
Thimphu	*5	1	**12	0	2	4	13
Total, Western Region	*7*	*5*	*33*	*11*	*14*	*110*	*39*
Grand Total	**30**	**25**	**185**	**49**	**59**	**476**	**77**

Note:*   Indigenous hospitals are included under hospitals. **   Satellite Clinics are included under BHU-II. These Clinics are similar in setup to BHU-IIs and provide similar services, but do not have inpatient beds or conduct outreach clinics. They have been set up to increase access to health services for growing suburban populations.

Source: Based on the Ministry of Health (2017) *Annual Health Bulletin 2017*

Table 6.3.6   Summarized Description of Health Facilities in Bhutan

Type of health facility	Geography	Staffing norm and pattern	Brief function
Outreach clinic (ORC)	One–three hours' walk or 10–30 minutes' drive from the nearest BHU or hospital	Monthly visit by one or two health staff	Provides monthly outreach services, e.g., immunization, antenatal care (ANC), postnatal care (PNC), environmental health and health education.
Sub-post	Three–four hours 'walk or one–two hours' drive from the nearest BHU/hospital	One health assistant	Provides health promotion and disease prevention services, early disease diagnosis and rehabilitation services.
BHU-II	Ranges from three hours to three days' walk and one–five hours' drive from the nearest hospital/BHU-I	Two–three staff members, preferably with one female	Provides health promotion and disease prevention services, early disease diagnosis and rehabilitation. They conduct ANC, PNC, normal delivery, immunization and provide family planning as well as health education services. BHU-IIs usually only have five beds.
BHU-I	Located at a Dzongkhag headquarters, a township or an area with a population of around 3000 to 5,000 people	A doctor, a dentist, nurses and a few other technicians	Inpatient services in addition to other primary healthcare services; normally 10 beds.
Dzongkhag hospital I/II or general hospital	Located at Dzongkhag headquarters or, if a general hospital, serving a population of about 10,000 people	Doctors, nurses, a dentist, a Drungtsho and other technicians, including ophthalmology, laboratory, etc.	Inpatient and emergency medicines in addition to other primary healthcare services. Hospital-I has 20–40 beds and hospital-II has 40–60 beds. Hospital-II has emergency obstetric care (EmOC) in the Emergency Medical and Trauma Centre.
Regional referral hospital	Located in the centre of a region	Doctors, specialists, nurses and other technicians	Tertiary levels of care and a centre for the training of health professionals in addition to other public health services. Both the RRHs in the eastern and central regions have 150 beds.
National referral hospital	Located in the capital	Doctors, specialists, super-specialists, nurses and other categories of health staff	Tertiary levels of care and a teaching hospital. Carries out public health services through community clinics and satellite clinics located in different areas. At present, this hospital has 360 beds.
National traditional medicine	Located in the capital	Drungtshos (traditional medicine doctors), sMenpas (traditional compounders)	Outpatient care services only
Traditional medicine units	Located in BHU-I and Dzongkhag and regional hospitals	Drungtshos and sMenpas	Outpatient care services
Private pharmacy	Located in towns	Competent pharmacy technician/pharmacist	Over-the-counter services
Private diagnostic centre	Located in cities such as Thimphu and Phuentsholing	Run by competent health professionals such as physicians and technicians	Laboratory and radiology services

Source: World Health Organization (WHO) (2017) *The Kingdom of Bhutan Health System Review*

The physical infrastructure of Bhutan's health system, which is organized into the three tiers of primary, secondary and tertiary healthcare, is summarized as follows (mainly in reference to

the WHO (2017)).

    (a) Primary level infrastructures are BHUs, sub-posts and ORCs based in blocks/villages. In the capital, however, satellite clinics located in various parts of the city provide primary care services, similar to BHU-IIs except for the community outreach services.

    (b) Secondary level infrastructures are Dzongkhag and other general hospitals based in Dzongkhag headquarters and major towns. BHU-Is located in some Dzongkhags can also be considered as secondary level infrastructures because their functions are similar to district hospitals. For example, Gasa has only one BHU-I and no district hospital due to a low workload and a small catchment population. Haa also has no district/public hospital and the Indian Military Training Team (IMTRAT) Hospital is a substitute for this.

    (c) Tertiary level care is available at the two RRHs and the NRH in the capital.

    (d) Besides curative services, all health facilities, including the NRH and RRHs, provide public health, maternal and child health, immunization and other preventive services.

(2) Distribution of Health Services Across the National Territory

Table 6.3.7 shows that eastern Bhutan has the highest number of health facilities (this is true of every category of hospital, BHU-I, BHU-II, sub-post, indigenous unit and ORC) compared to the other three regions. In addition, Table 6.3.7 shows that the east and central-eastern regions exceed the national average, both in terms of the number of health personnel per person and the number of hospital and BHU beds per person, while the western and central-western regions fall short. Thus, as far as can be gathered from Table 6.3.4 and Table 6.3.6, the east-west regional disparity - or the advantage of western Bhutan – cannot be observed in terms of access to healthcare, while the quality of healthcare services and disparities between Dzongkhags are not taken into consideration here.

Table 6.3.7   Distribution of Health Personnel and Beds by Region/Dzongkhag, 2015

Dzongkhag	Population	Health Personnel[1]	Health Personnel/1000 Population	Beds[2]	Beds/1000 Population
Lhuentse	17,618	26	1.801	20	1.385
Monggar	44,259	144	3.876	160	4.307
Pemagatshel	25,426	42	1.777	30	1.269
Samdrupjongkhar	40,766	90	2.566	90	2.566
Trashigang	20,874	35	0.769	30	0.659
Yangtse	56,168	116	6.705	110	6.358
Total, Eastern Region	*205,111*	*453*	*2.617*	*440*	*2.542*
Bumthang	18,965	37	2.076	40	2.245
Sarpang	45,636	179	3.891	160	3.478
Trongsa	16,012	38	1.904	20	1.002
Zhemgang	21,501	41	2.308	60	3.378
Total, Central-Eastern Region	*102,114*	*295*	*2.905*	*280*	*2.757*
Dagana	20,874	9	0.361	40	1.602
Gasa	3,694	8	2.024	10	2.530
Punakha	27,838	33	1.148	40	1.392
Tsirang	21,816	39	1.743	20	0.894
Wangduephodrang[3]	37,554	32	0.759	50	1.185
Total, Central-Western Region	*111,776*	*121*	*0.990*	*160*	*1.309*
Chhukha	88,342	119	1.725	110	1.595
Haa[4]	13,499	13	0.952	10	0.732
Paro	43,167	50	1.080	40	0.864
Samtse	70,618	112	1.789	70	1.118
Thimphu[5]	116,012	38	0.274	420	3.027
Total, Western Region	*331,638*	*332*	*1.005*	*650*	*1.968*
Grand Total	**750,639**	**1,201**	**1.652**	**1,530**	**2.104**

Notes: *1: Total number of doctors, Dungtshos (indigenous doctors), sowai menpa (indigenous medical technicians),
           assistant clinical officers, nurses and technicians
       *2: Total number of hospital beds and BHU-I beds
       *3: Excluding beds at the Royal Bhutan Army Hospital
       *4 Excluding beds at the IMTRAT Hospital
       *5 Excluding beds at the National Traditional Medicine Hospital, Royal Bhutan Army and IMTRAT Hospitals
Sources: Population and health personnel data are quoted from the National Statistics Bureau (2016)
         Dzongkhags at A Glance 2016, while the number beds come from the WHO (2017))

Figure 6.3.9 shows the distribution of health facilities across Bhutan.
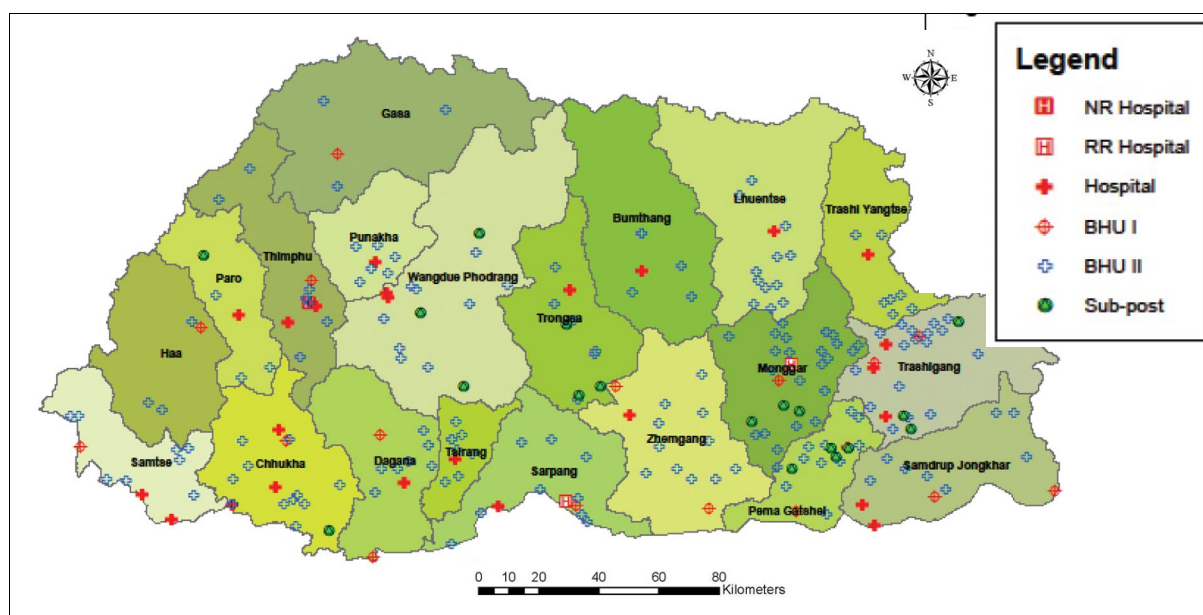
Source: WHO (2017) *The Kingdom of Bhutan Health System Review*

Figure 6.3.9   Distribution of Health Facilities Across Bhutan, 2016

6.3.3   Other Public Services

(1) Postal Services

Postal services are provided by the Bhutan Postal Corporation Limited (Bhutan Post). There are 74 post offices (or postcodes), according to the current statistics (Ministry of Information and Communications, 2017, *Annual Info-Comm and Transport Statistical Bulletin*), including four General Post Offices (one in each of the western, central, eastern and southern Regions), 36 Post Offices, and 34 Community Mail Offices.

As home delivery services are not available in Bhutan, people have to visit their post office to check for and collect their mail. Thus, the distance between a settlement area and its nearest post office is a critical factor for the postal services.

According to Figures 6.3.10 and 6.3.11, there seems to be no obvious interregional disparities between east and west in terms of accessibility to post offices, although they do not provide precise information on actual physical distances.
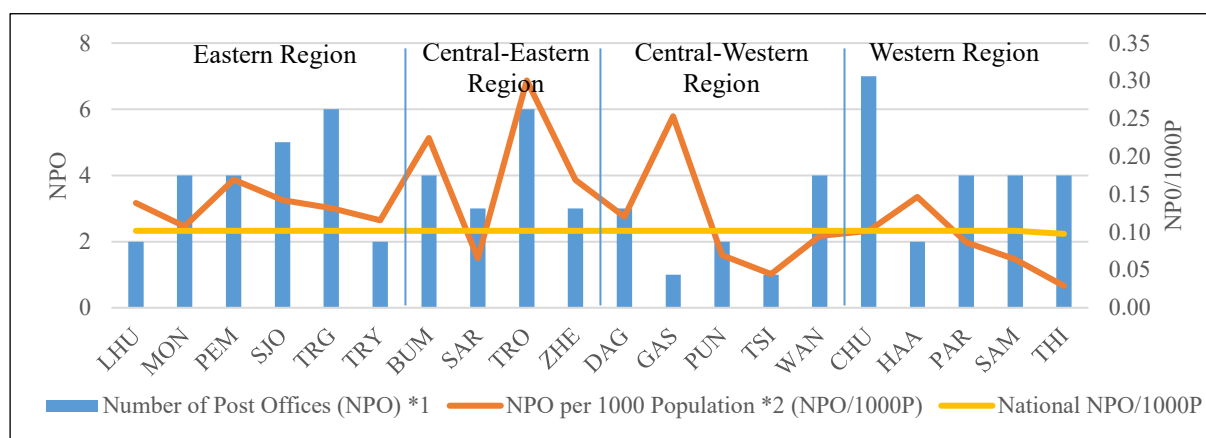
*1 Bhutan Postal Corporation Ltd., 'Look for Postcode', http://www.bhutanpost.bt/searchpostcode.php
*2 PHCB 2017

Figure 6.3.10   Number of Post Offices by Dzongkhag
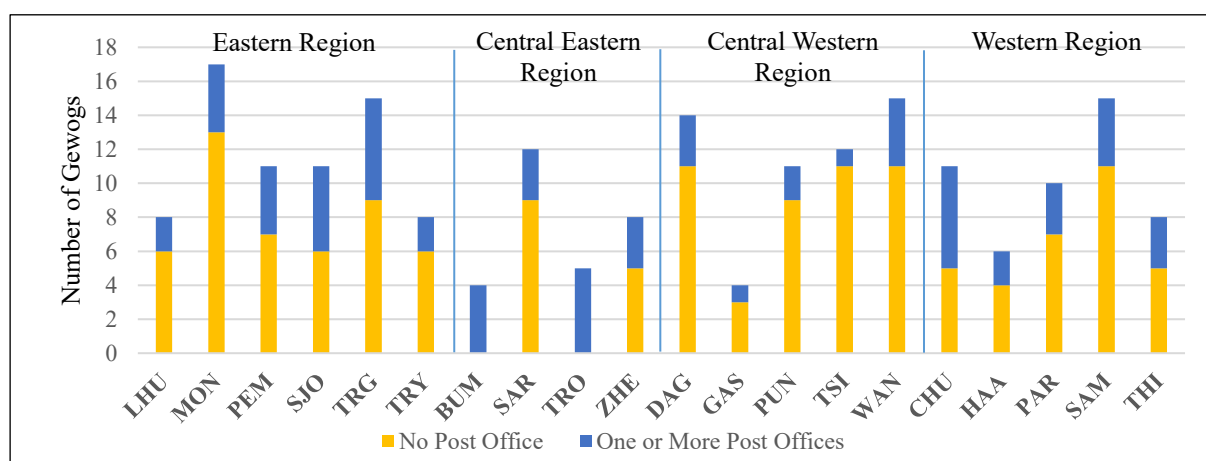
Figure 6.3.11   Number of Post Offices by Gewog

(2) Banking Services

Figure 6.3.12 shows the accessibility of each Dzongkhag to banking services, measured by the per capita number of financial institution branches (hereafter simply referred to as "bank branches", although this includes branches and extension offices of banks and insurance

corporations) in each Dzongkhag. The figure does not show any clear disparities in terms of interregional access (as far as the number per capita is concerned), although it can be presumed that there would be disparities in accessibility between Gewogs with urban centres (e.g., Thromde and commercial/service centres) and the other Gewogs in each Dzongkhag, due to the general locational orientation of bank branches. Figure 6.3.13 implies this assumption by showing that bank branches are geographically less widely dispersed than post offices.
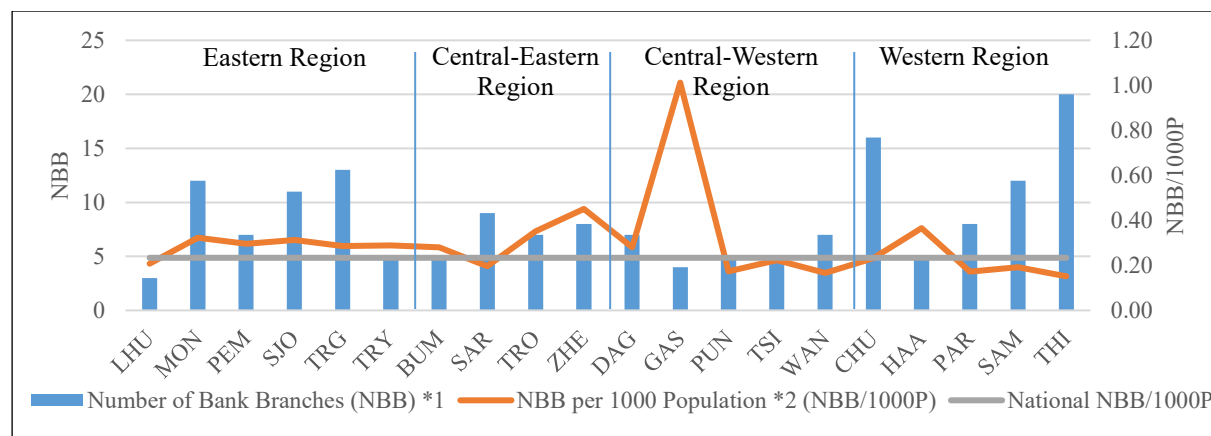
*1 Total number of the following financial institution branches (including central branches) and extension offices. Data were collected from the homepages of: the Bank of Bhutan, the Bhutan National Bank Limited, Druk PNB Bank Limited, T-Bank Limited, the Royal Insurance Corporation of Bhutan, the Bhutan Development Bank Limited and Bhutan Insurance Limited.
*2 PHCB 2017

Figure 6.3.12   Number of Bank Branches by Dzongkhag
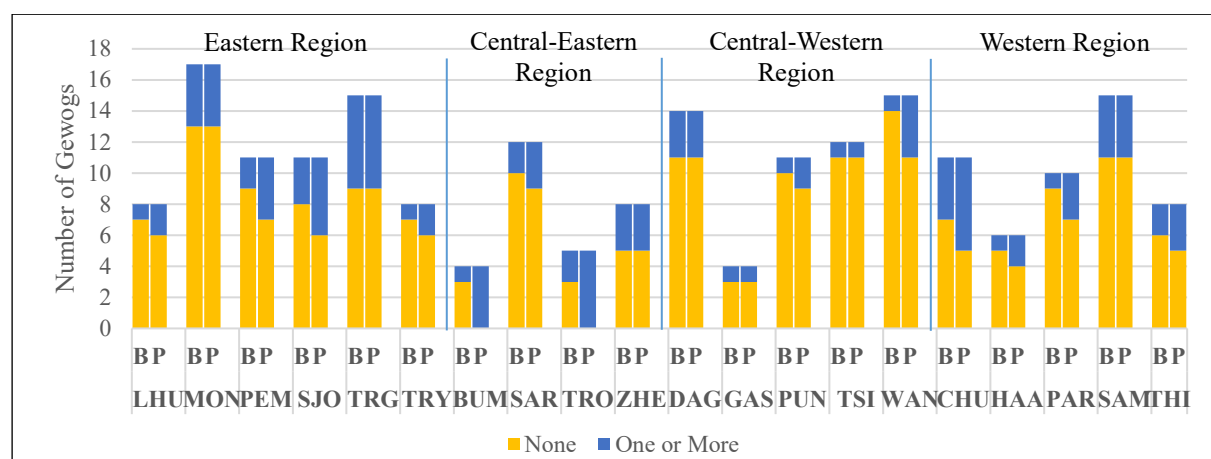
Figure 6.3.13   Number of Bank Branches (B) and Post Offices (P) by Gewog

(3) Fuel Supply

According to the licence information provided by the Ministry of Economic Affairs (MoEA), there are 60 licenced fuel stations nationwide.

The locations of these stations seem to be relatively even between the Dzongkhags when measured by the number per capita (except for Gaza, where the value is high due to it having a much smaller population than the other Dzongkhags) (Figure 6.3.14). However, the reality is that the location of fuel stations is not evenly spread nationwide. The reality is that it is inconvenient for citizens living in rural areas to use fuel stations, because most of the country's Gewogs have no station within their administrative boundaries (Figure 6.3.15).
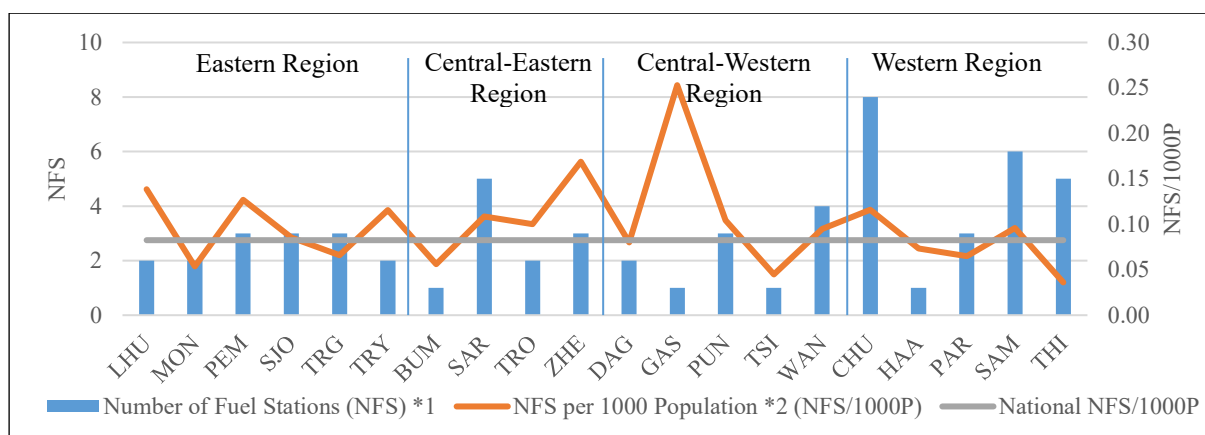
*1 Provided by the Ministry of Economic Affairs (MoEA)
*2 PHCB 2017

Figure 6.3.14   Number of Fuel Stations by Dzongkhag
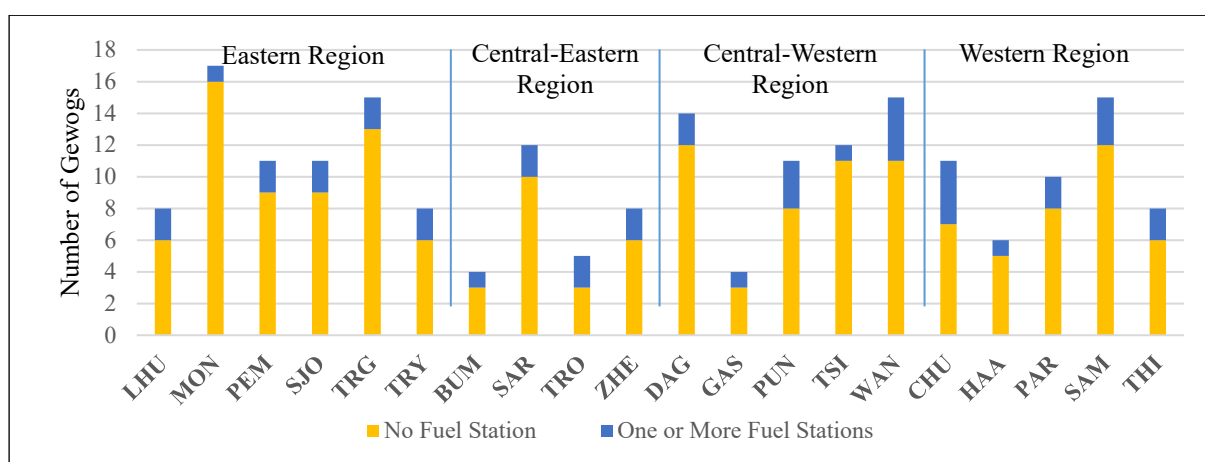
Figure 6.3.15   Existence of Fuel Stations by Gewog

(4) Convenience Goods Retailing and Bar Services

1) General stores

A licence from the MoEA is required to run a General Store and the licence should be renewed yearly. According to data on the number of licenses provided by the MoEA, General Stores are largely concentrated in a small number of Dzongkhags. While the per capita number of General Stores varies between Dzongkhags, all of the eastern Dzongkhags score low in this respect (Figure 6.3.16).

In addition, in the eastern and central western regions, the percentage of Gewogs with no General Store is generally higher than in the west (Figure 6.3.17).
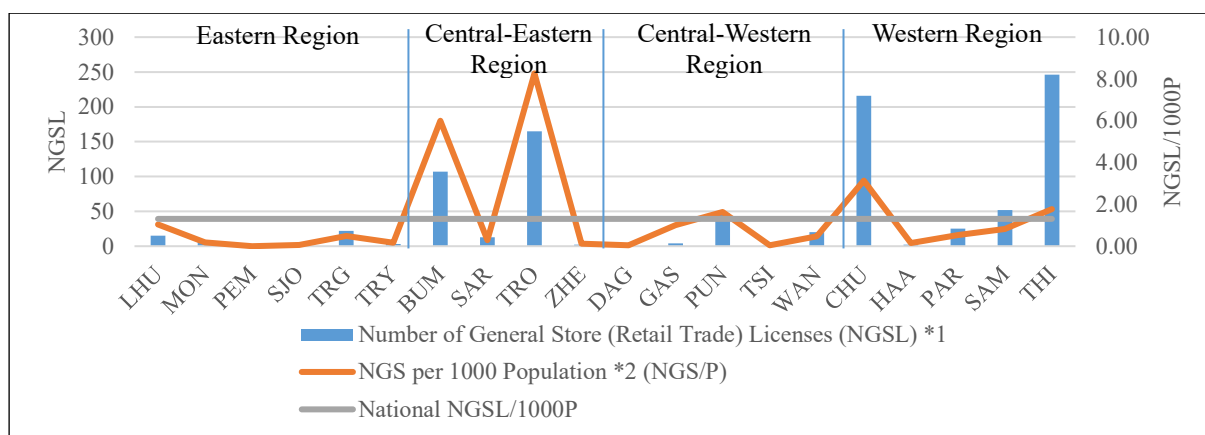
Figure 6.3.16   Number of General Store Licenses by Dzongkhag

*1 MoEA
*2 PHCB 2017
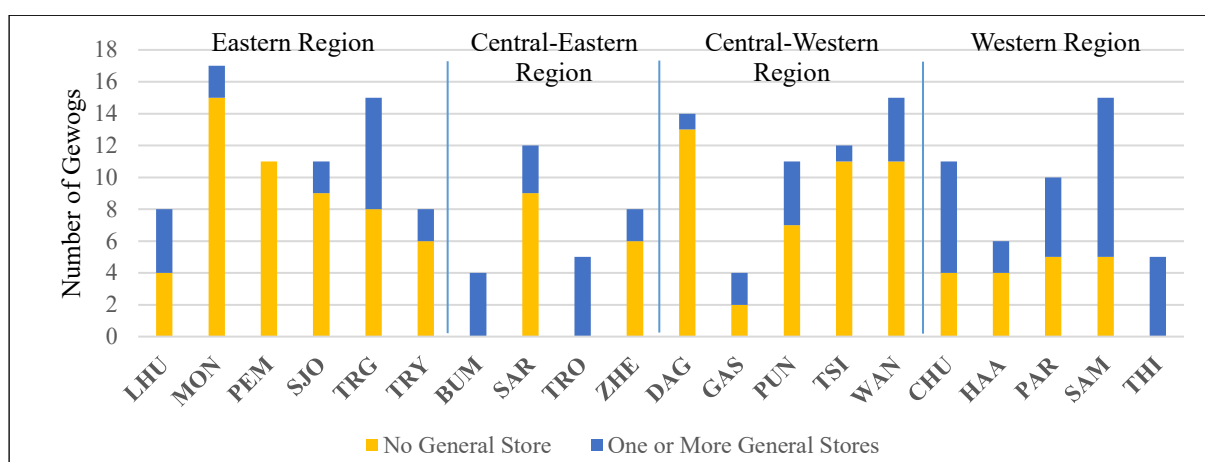
Figure 6.3.17   Existence of Licensed General Shops by Gewog

2)   Meat shops

A licence from the MoEA is required to run a meat shop (butchers), similarly to with a General Store; the licence should be renewed yearly.

Figure 6.3.18 shows that, while some Dzongkhags have a high number of meat shops per capita, the number of meat shops is more evenly dispersed than General Stores. According to Figure 6.3.19, there is not a marked interregional disparity in the percentage of Gewogs with no meat shop.
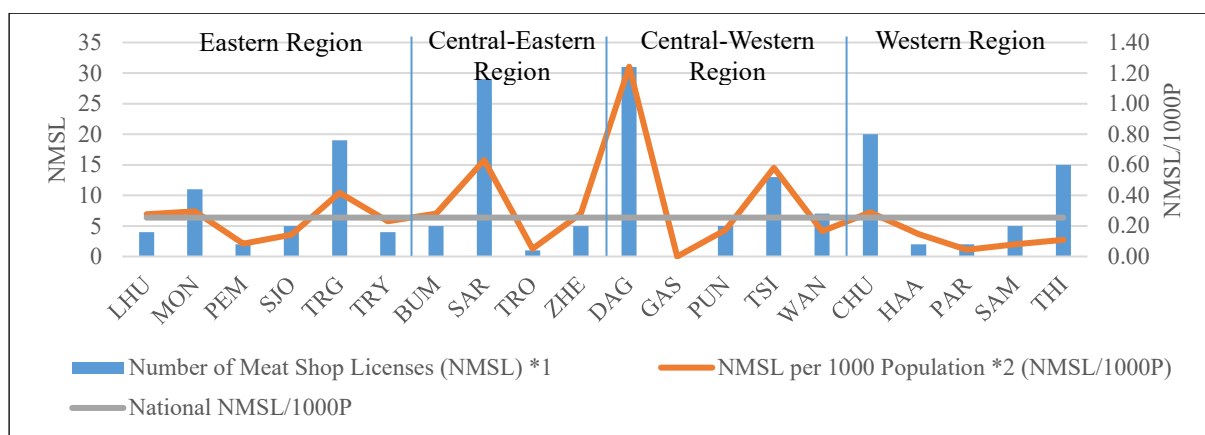
*1 MoEA
*2 PHCB 2017

Figure 6.3.18   Number of Meat Shop Licenses by Dzongkhag
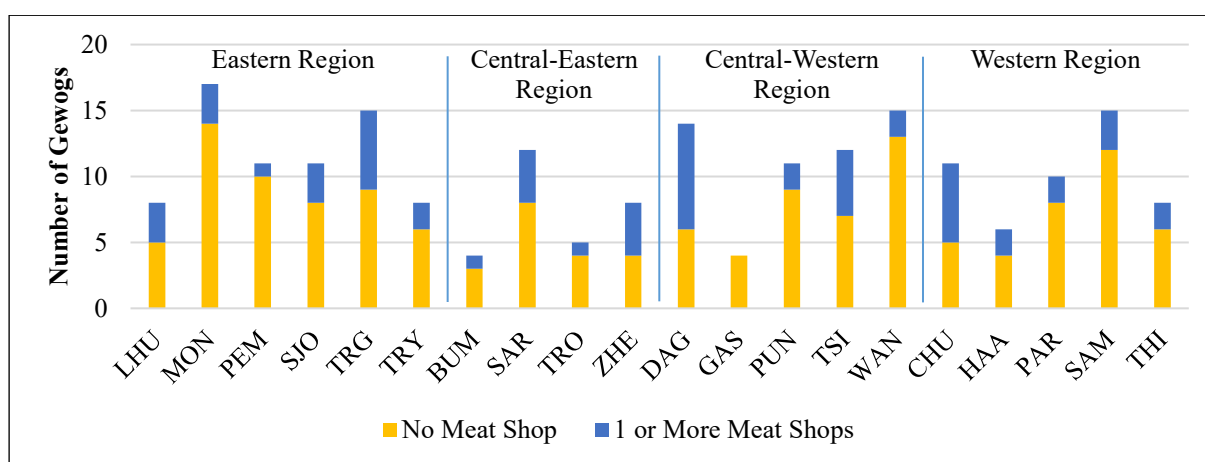
Figure 6.3.19   Number of Licensed Butchers by Gewog

3)   Bars

A licence is also needed to run a bar.

Figure 6.3.20, which uses the MoEA's licence data, shows that there is a rather narrow interregional disparity in the number of bars per capita compared to that of General Stores and butchers; it may also be possible to state that the eastern half of the country has better access to bars.

As shown by Figure 6.3.21, Gewogs without a bar are very rare throughout the country.
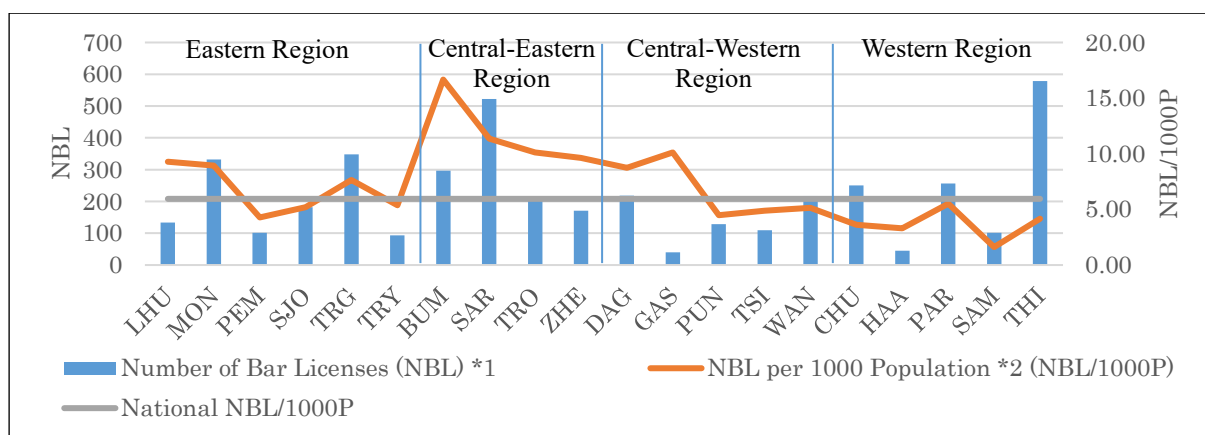
*1 MoEA
*2 Estimated 2015 population, NSB (2008)

Figure 6.3.20　Number of Bar Licenses by Dzongkhag
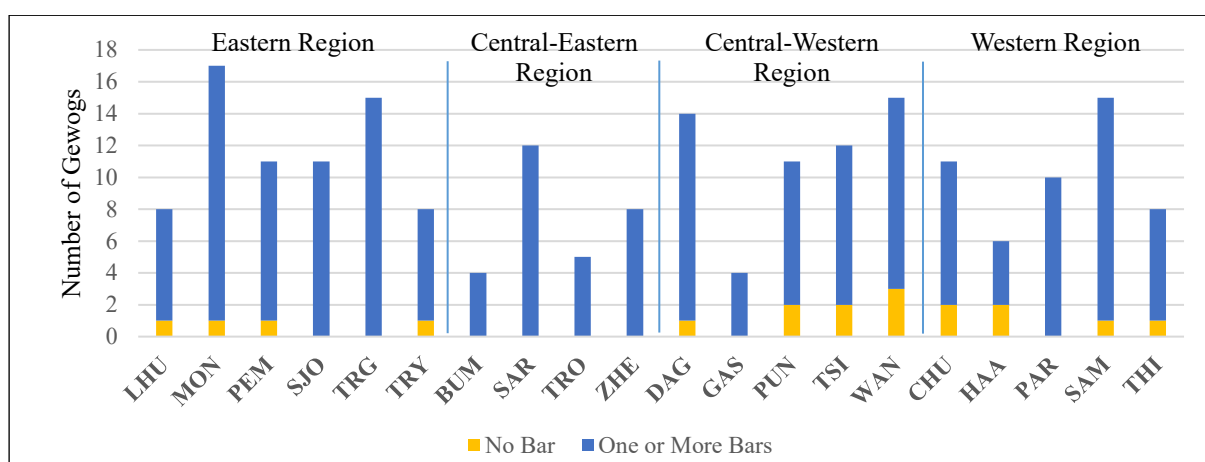
Figure 6.3.21　Number of Licensed Bars by Gewog

4) Facilities for the sale Renewable Natural Resources (RNR) products

According to the draft RNR Marketing Policy of the Kingdom of Bhutan 2016, "The domestic marketing of local RNR products is carried out mainly in roadside market sheds, at sales counters, weekly markets and rural and urban markets, as well as at auctions by growers, individuals, vendors and farmers' groups/cooperatives".

While we cannot obtain data on all the locations in which RNR products are marketed, the Agricultural Marketing Infrastructure Inventory 2016, published by the Ministry of Agriculture and Forests (MoAF), provides a certain level of information on where RNR products are sold in Bhutan.

The Inventory 2016 provides us with the location of farm shops, RNR market sheds, RNR sales outlets, produce stores, Bhutan Cooperatives (B-COOP) shops, milk processing units (MPU) and milk booths, livestock outlets and butchers, as well as a green tea outlet (of which there is only one in Bhutan), as of 2016.

Figure 6.3.22 is based on data taken from the Inventory 2016. According to the Figure, eastern Gewogs have relatively better access to facilities selling RNR products, in which local people can sell as well as buy RNR products. Here, it should be noted that the RGoB is planning to establish farm shops in all Gewogs, although there are currently 70 farm shops across the country as of 2016.
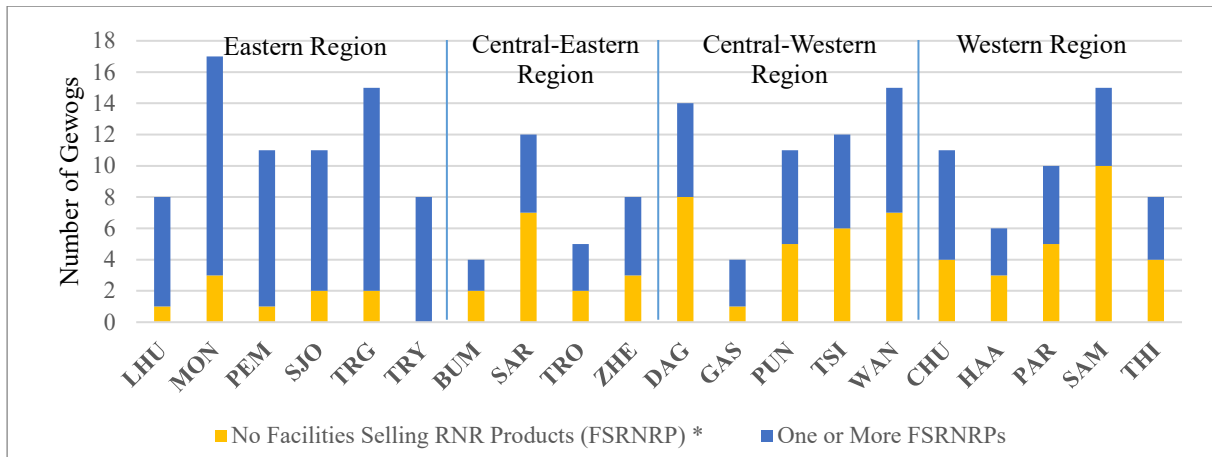
* The total number of the following facilities, calculated using data taken from the *Agricultural Marketing Infrastructure Inventory 2016*, Ministry of Agriculture and Forests (2016):
   Farm shops, RNR market sheds, RNR sales outlets, produce stores, B-COOP shops, milk processing units (MPU) and milk booths, livestock outlets and butchers, as well as a green tea outlet.

Figure 6.3.22   Number of Facilities Selling RNR Products by Gewog

6.4   Human Resource Development for the Economic Sector

The economic sector, which includes renewable natural resources (RNR), manufacturing, mining and tourism, is faced with a lack of human resources in both skilled and unskilled labour. As a result, Bhutan depends heavily on foreign labours for the economic sector, especially for hydropower, industry and mining. This should explain the current situation in RNR, manufacturing, mining and tourism. Subsequently, related issues and challenges, as well as the current human resources development plan by the government, will be extracted based on the current situation.

6.4.1   Human Resource Development for the RNR sector

(1) Current Human Resources of the MoAF

In the Statistical Yearbook of Bhutan 2017 (National Statistics Bureau, RGoB), the number of civil servants is given and categorized by government organization. As of 2016, there are 2,873 civil servants working for the MoAF, or 10.63% of the grand total of 27,029. This number presented an increase from that of the previous year (2,766 staff), meaning that there were 107 more staff members. In 2015, the staff of the MoAF accounted for 10.39% of the grand total of 26,611. In both years, the MoAF had the largest number of civil servants, followed by the Ministry of Health.

On the other hand, the number of civil servants listed in the statistics prepared by the MoAF is higher than the abovementioned figures. The total number of civil servants working for the MoAF as of April 2015 is 3,639 as shown below, sorted by agency. Of these, three agencies providing extension services in rural areas (the Department of Agriculture, the Department of Forests and Park Services and the Department of Livestock) accounted for 88.7% of the MoAF's total staff. Together with the staff of the Bhutan Agriculture and Food Regulatory Authority (BAFRA) stationed in the Dzongkhags, 2,182   appeared to work in the fields (Dzongkhags and Territorial Divisions/Parks), representing 60% of the total.

Table 6.4.1   Distribution of MoAF Staff by Agency (2015)

Agency	Headquarters	Territorial Divisions/Parks	Central Programme /Regional Offices	Training Institutions	Dzongkhags	Total	Percent
AFD	28	0	0	0	0	28	0.8%
BAFRA	21	0	12	0	150	183	5.0%
CoRRB	22	0	0	0	0	22	0.6%
DAMC	29	0	12	0	0	41	1.1%
DoA	**63**	**0**	**452**	**0**	**304**	**819**	**22.5%**
DoFPS	**147**	**1,093**	**70**	**50**	**231**	**1,591**	**43.7%**
DoL	**26**	**0**	**387**	**0**	**404**	**817**	**22.5%**
HRMD	15	0	0	0	0	15	0.4%
IAU	3	0	0	0	0	3	0.1%
ICS	18	0	0	0	0	18	0.5%
MAGIP	6	0	0	0	0	6	0.2%
NBC	39	0	0	0	0	39	1.1%
PPD	26	0	0	0	0	26	0.7%
RDTC	0	0	0	16	0	16	0.4%
RLP	0	0	8	0	0	8	0.2%
Min/Sec	7	0	0	0	0	7	0.2%
Total	450	1,093	941	66	1,089	3,639	100.0%
Percent	12.4%	30.0%	25.9%	1.8%	29.9%	100.0%	-

Source: Bhutan RNR Statistics 2015, Policy and Planning Division, MoAF

Note: AFD: Administration and Finance Division; BAFRA: Bhutan Agriculture and Food Regulatory Authority; CoRRB: Council for RNR Research of Bhutan; DAMC: Department of Agriculture Marketing and Cooperatives; HRMD: Human Resources Management Division; IAU: Internal Audit Unit; ICS: Information Communication Services; MAGIP: Market Access and Growth Intensification Project; NBC: National Biodiversity Centre; PPD: Policy and Planning Division; RDTC: Rural Development Training Centre; RLP: Rural Livelihood Project; Min/Sec: Office of the Minister and Secretary

The data as of June 2012 are included in the Bhutan RNR Statistics 2012 (Policy and Planning Division, MoAF, March 2013), and are given below.

Table 6.4.2   Distribution of MoAF Staff by Agency (2012)

Agency	Head-quarters	Territorial/ Regional Divisions	Parks	Central Programme	Training Institutions	Dzongkhags	Total	Percent
AFD	29	0	0	0	0	0	29	0.9%
BAFRA	28	20	0	3	0	128	179	5.6%
CoRRB	27	0	0	0	0	0	27	0.9%
DAMC	27	13	0	0	0	0	40	1.3%
DoA	**61**	**0**	**0**	**88**	**0**	**293**	**442**	**13.9%**
DoFPS	**162**	**733**	**269**	**28**	**42**	**241**	**1,475**	**46.5%**
DoL	**36**	**0**	**0**	**403**	**0**	**395**	**834**	**26.3%**
HRMD	14	0	0	0	0	0	14	0.4%
ICS	21	0	0	0	0	0	21	0.7%
NBC	41	0	0	0	0	0	41	1.3%
PPO	16	0	0	0			16	0.5%
PPD	27	0	0	0	0	0	27	0.9%
RDTC	0	0	0	0	17	0	17	0.5%
Min/Sec	10	0	0	0	0	0	10	0.3%
Total	499	766	269	522	59	1,057	3,172	100.0%
Percent	15.7%	24.1%	8.5%	16.5%	1.9%	33.3%	100.0%	-

Source: Bhutan RNR Statistics 2012, Policy and Planning Division, MoAF

Over these three years, the staff working for the MoAF increased by 467, a 14.7% rise from 2012. The three agencies providing extension services in rural areas (the DoA, the DoFPS and the DoL) accounted for 86.7% of the MoAF's total staff in 2012, meaning that their percentage of the total is the same. As compared to the 2015 data, the increase in DoA staff is remarkable

(from 442 to 819), an 85.3% increase. In the breakdown, the number of Central Programme/Regional Division staff greatly increased, from 88 in 2012 to 452 in 2015, but the number of staff stationed in the Dzongkhags is almost the same, with 293 in 2012 and 304 in 2015. There were 2,059 staff members who appeared to work in the fields (Dzongkhags and DoFPS staff working in Territorial/Regional Divisions and Parks), accounting for 64.9% of the total, meaning that its share had slightly decreased by 2015.

Detailed data on the distribution of extension officers in each Dzongkhag are summarized below.

Table 6.4.3　　Number of RNR Sector Extension Staff by Dzongkhag (2012 and 2015)

| Dzongkhag | Extension Service Sectors | | | | | | BAFRA | |
| | DoA | | DoFPS | | DoL | | | |
	2012	2015	2012	2015	2012	2015	2012	2015
Bumthang	10	9	8	8	13	14	4	5
Chhukha	15	17	14	16	20	19	15	17
Dagana	18	17	11	11	24	20	3	7
Gasa	7	5	5	5	8	7	3	2
Haa	10	10	9	10	14	17	4	3
Lhuentse	14	12	8	7	14	18	4	4
Monggar	20	18	12	17	27	26	3	4
Paro	14	16	17	14	22	25	9	15
Pemagatshel	16	15	10	11	23	22	4	6
Punakha	19	18	12	16	21	23	4	5
Samdrupjongkhar	17	14	15	16	18	20	9	13
Samtse	13	28	15	13	28	26	7	10
Sarpang	13	18	18	13	24	22	2	10
Thimphu	13	13	12	9	21	21	16	17
Trashigang	21	20	17	1	30	30	5	7
Yangtse	11	10	8	11	12	14	4	5
Trongsa	11	9	10	13	14	14	4	3
Tsirang	16	15	16	16	18	20	4	5
Wangduephodrang	19	26	15	14	27	27	4	6
Zhemgang	16	14	9	10	17	19	6	6
Bhutan	293	304	241	231	395	404	114	150

Source:　Bhutan RNR Statistics 2012 and 2015, Policy and Planning Division, MoAF

Between 2012 and 2015, the number of agricultural extension staff working in the Dzongkhags increased by 11, which was a 3.8% increase. Extension staff from the livestock sector working in the Dzongkhags also increased by 9, or a 2.3% increase. BAFRA staff stationed in the Dzongkhags greatly increased by 36 individuals, or 31.6%, although they are not considered as extension staff. On the other hand, extension staff from the forest sector working in the Dzongkhags decreased by 10, or -4.1%. As the above table does not include the number of staff working in Territorial/Regional Divisions and or Parks, this may have led to an underestimation of the availability of extension staff from the forest sector in rural areas.

The table below indicates the number of rural households to each member of RNR extension staff (agriculture, forest and livestock) in 2012 and 2015. In all the Dzongkhags, the number of households that one member of extension staff must cover decreased. In Chhukha, the number decreased by a third. This means that one member of extension staff can take more time and provide better services to each household.

Table 6.4.4   Number of Rural Households per Member of RNR Extension Staff (2012 and 2015)

Dzongkhag	Bumthang	Chhukha	Dagana	Gasa	Haa	Lhuentse	Monggar
2012	69	157	74	32	63	77	108
2015	31	52	48	17	37	37	61
Difference	38	105	26	15	26	40	47
Dzongkhag	Paro	Pemagatshel	Punakha	Samdrupjo ngkhar	Samtse	Sarpang	Thimphu
2012	124	95	81	119	168	90	61
2015	55	48	57	50	67	53	43
Difference	69	47	24	69	101	37	18
Dzongkhag	Trashigang	Yangtse	Trongsa	Tsirang	Wangdue	Zhemgang	
2012	135	104	63	66	78	67	
2015	51	35	36	51	67	43	
Difference	84	69	27	15	11	24	

Source: Bhutan RNR Statistics 2012 and 2015, Policy and Planning Division, MoAF

However, as the table above has indicated that extension staff numbers did not drastically increase between 2012 and 2015 (except for BAFRA staff), there may have been some misunderstanding in the course of the calculations.

(2) Issues and Challenges

One of the major issues facing the RNR sector concerns labour shortages, in terms of both farmers and civil servants. It has been reported by Agricultural Statistics 2015 that more than 50% of farmers feel they lack a sufficient labour force for their farming. As for extension staff from the civil service, just four such employees on average are allocated to each gewog. Under current circumstance, these four employees are responsible for different sectors such as agriculture, forestry and livestock. In addition to the lack of extension staff, the fields that staff must cover are burdensome and different.

(3)   Human Resources Development

As seen above, food and nutrition security and agricultural labour shortages are national concerns. The following ongoing programmes aim to overcome these issues.

Table 6.4.5   List of Human Resource Development Activities for the RNR Sector

Programme	Objective	Target	Duration	Department
Farm Business Training Programme	To provide theoretical production knowledge To support the entrepreneurial skills needed to start small farm businesses	Early school leavers/rural youths aged 25 or above	Three weeks	RDTC
Community Leaders Training	To enhance managerial knowledge and skills To enhance the functioning of existing groups and cooperatives	Office bearer	Two to three days	
Training on School Agriculture (for the SAP)	To develop young people's basic skills and knowledge about agriculture and livestock farming practices	School children (preferably Grade VII and above)	One to two weeks	
Farmers' Experience Exchange Programme	To visit and share progressive ideas through an exchange visit	Ex-participants	10 days	
Focal Agriculture Teacher Training	To improve teaching skills in agricultural and farming businesses	Focal teachers	10 days	
School Agriculture Program (SAP)	To supplement the diets of school children and teach them agricultural skills as part of a holistic education that raises awareness of employment opportunities in the agricultural sector.	School children	School term	CoRRB, DSE/MoE, WFP
Vegetable Go to School Project	To improve nutritional security and reduce malnutrition by establishing comprehensive school vegetable gardens	School children	School term	Swiss Agency for Development and Cooperation

Source: RDTC website[13], VGtS website[14]

The RDTC provides five training courses to develop agricultural production capacity and related skills for a wide range of participants. The table below shows the numbers of participants for each training programme.

Table 6.4.6   Numbers of Trained Participants (2012–2016)

Programme	2012	2013	2014	2015	2016
Farm Business Training Programme	0	56	55	29	105
Community Leaders Training	232	230	283	206	119
School Agriculture Programme	64	77	203	110	0
Farmers' Experience Exchange Programme	18	31	0	0	32
Focal Agriculture Teacher Training	0	19	0	20	0

Source: RDTC website

The Council for RNR Research of Bhutan (CoRRB) and the Department of School Education (DSE) under the Ministry of Education jointly coordinated the School Agriculture Programme (SAP) with financial support from the WFP. In this programme, school children establish a school garden as well as a livestock barn, and they are also intended to learn agricultural skills and harvest the garden's products as a source of supplementing their nutrition. Since 2000, the RGoB has introduced the SAP in about 300 of its 549 schools, ranging from primary to higher secondary schools across the country (Schreinemachers et al., 2017[15]).

The JICA Project on Community Entrepreneurial Capacity and Rural Enterprise Development is also currently implemented to support the Cottage, Small and Medium Industry Development Strategy 2012–2020. In the strategy paper, the RGoB sets out its aim to increase the number of enterprises and employees in the cottage sector from 13,000 to 20,000 and from 34,000 to

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[13] http://www.rdtc.gov.bt/, accessed on 1 May 2017
[14] http://vgts.avrdc.org/, accessed on 1 May 2017
[15] (2017) *School Gardening in Bhutan: Evaluating Outcomes and Impact*, Food Security, p. 1–14

52,000, respectively.

6.4.2   Human Resource Development for Manufacturing, Mining and Tourism

(1) Manufacturing

1)   Issues and challenges

According to the national workforce plan, 33% of industries in the manufacturing sector indicated that they are currently facing a shortage of workers. This indicates that these industries have the potential to hire more people in their current situation. Forty-eight percent indicated that the skills required for the jobs are not available in Bhutan. Twenty-six percent indicated that those skills are not available in their business location. Twelve percent indicated that they are not able to get the required people for the job due to competition from other, similar businesses requiring the same skillsets. The majority of them would employ new staff members if the requisite skills were available in the labour market.

2)   Human resources development plans

Wood-based industries

The MoLHR has formulated a human resources development plan (HRDP) to improve its competitive edge in the regional market and to provide for the domestic demand for qualified wood-based products. As part of the HRDP, the MoLHR will recruit three professionals to develop a plan to reorganize the wood-based industry. The professionals suggested for this are two architects who are well-versed in the construction industry and a representative from a furniture and joinery establishment that has established a good practice. The HRDP has tentatively suggested diploma programmes in wood-based technologies, such as wood treatment and furniture design, among others.

Agro-based industries

The HRDP will take on the task of creating a brand for Bhutan's existing agriproducts. High quality, organic and environmentally friendly production will lead to the creation of valuable products. For existing industries, education and training will be focused on the areas of marketing, packaging and the training of production workers to establish good standards of hygiene. To achieve this, the HRDP has included a Master of Science in agro-industry product development, a Master of Science in agro food processing with a specialization in fruits and vegetables, as well as a diploma programme for packaging studies. Furthermore, there is a plan to train production workers to meet hygiene standards.

Handicraft industries

According to the 11th Five-Year Plan, BTN 15 million will be spent on developing the skills of artisans and dealers. The programme provides training for 100 artisans in packaging and souvenir making, training workshops for improving products and training in cane and bamboo weaving skills for 100 young people. Furthermore, the programme will also train 30 artisans in wood turning, lacquering and material seasoning and will provide training for 100 craft cluster members in new product designs, improving the quality of metal products and bookkeeping and inventories. All of these proposed training programmes are highly focused and relevant. This may require people from other professions to be brought into the handicraft occupation, such as designers, artists and people with a broader education and training who can provide leadership in these fields.

(2) Mining

1) Issues and challenges for the mining sector

The mining sector has received a great deal of criticism in terms of environmental protection. The actual size of environmentally exposed and affected areas may have been made significantly larger due to the primitive technology adopted by the mining sector and the lack of adequate monitoring. The mining sector needs to abide by environmental codes and be professionally managed in order to promote sustainable mining. The Mines and Minerals Management Regulation 2002 already lays out criteria for the minimum human resources necessary to ensure proper management and mining. Apart from those mines largely owned by Government corporations, other mines have not implemented these human resource provisions, simply due to the lack of human resources.

2) Human resources development plan

The objective of the HRDP for the mining industry will be to professionalize it. To this end, the HRDP includes a Master's degree programme for mining engineers. Furthermore, the HRDP will support the creation of a professional group of mining supervisors within the establishments. In order to achieve this, diplomas and certificate courses in mining management will be included in the HRDP. Alternatively, one of the Technical Training Institutes will introduce a mining management course. The Ministry of Labour and Human Resources (MoLHR) has managed to recruit Bhutanese mining professionals to teach this programme.

In addition, the EDP has placed emphasis on improving the capacity of the relevant agencies, both in terms of institutional capacity and human resource development, focusing on the geological mapping of minerals in Bhutan.

(3) Tourism

1) Issues and challenges

The tourism sector employs graduates with basic or no prior experience, and skills are acquired on an on-the-job basis. Professionals for management positions educated to diploma or degree level are mostly produced by the Royal Institute for Tourism and Hospitality (RITH); there are also some who have undertaken hotel and tourism management studies by themselves outside of Bhutan.

2) Human resource development plan

For the 11th Five-Year Plan, the objectives of the HRDP for the tourism and hospitality sector will be firstly to substantially enhance the competencies and knowledge of senior management and executives to make them creative, resourceful and competitive. The sector should then be supported by the supply of a service-oriented human resources pool in various occupations. They should be able to create new products, improve the quality of services and provide visitors to Bhutan with a good impression of the country and its culture. To this end, certain strategies and actions have been recommended. A summary of the plan is as follows.

- The RITH should be the main institution providing tourism- and hotel management-related education at the diploma and degree levels, in order to increase their scope and intake to meet projections. It should also offer training for managerial and supervisory employees in the tourism and hotel management sector through targeted short-term courses in collaboration with other relevant institutes. To support and supplement the outcomes of the RITH, the MoLHR will have to continue supporting in-service short-term training programmes, both within and outside of Bhutan.
- A vocational institute for the tourism sector should be established, preferably by the MoLHR as it is the agency responsible for vocational education in Bhutan. It should offer national certificate courses, as well as short-term, pre-service certificate courses for jobseekers. This recommendation will be explored and pursued in the 11th Five-Year Plan.
- The proposed certificate course and short-term courses will mainly target school leavers and jobseekers in order to satisfy the skills requirements of the tourism sector.
- Furthermore, the HRDP will continue to support the short-term training of personnel in the hospitality sector in food and beverages, housekeeping and front desk and related hospitality services through these programmes. Depending on demand, additional pre-service training courses for these staff will be provided through private sector training facilities. A specific programme has been tentatively earmarked under the special training programme for this sector in order to cover training in hospitality-related skills, which is not adequately covered by apprenticeship programmes.

CHAPTER 7   ANALYSIS OF GROSS NATIONAL HAPPINESS

7.1   Approach to Analyse Gross National Happiness

7.1.1   Current Index of Gross National Happiness

The GNH Index measures wellbeing in a holistic way, and looks at each person's profile of GNH, using key indicators of wellbeing that are grouped under nine domains. The 2015 GNH Index value is 0.756 and it was 0.743 in 2010. Its improvement is by 1.7 percent. GNH index of urban area is 0.811, and that of rural area is 0.731. Urban residents tend to be happier than rural. Across districts, GNH was highest in Gasa (0.858), Bumthang (0.816), Thimphu (0.803), and Paro (0.792), and lowest in Dagana (0.715), Monggar (0.703), Yangtse (0.702), and Trongsa (0.693). The GNH Index grew 2010-2015 – from 0.743 to 0.756, showing across the 9 domains of GNH, overall people's lives are getting better.

7.1.2   Analytical Approach

The analytical approach in this chapter is summarized as below and in Figure 7.1.1.

(1) Recalculating GNH Index for each Domain for each Dzongkhag

GNH has nine domains, and CBS (Centre for Bhutanese Studies & GNH research) prepared the original GNH index by calculating indexes for each domain and summing all the indexes of domains. In order to differentiate indexes among different domains for each domain for each dzongkhag with distinction of rural and urban areas, indexes are recalculated. Then national average was calculated to set the borders below which priorities for support to improve GNH can be considered.

(2) Regression Analysis

To find out ways to promote each domain, statistical analyses are conducted as each GNH domains are interrelated with one another and are influenced by other factors. Since GNH indexes are composite measures containing various indicators, and not suitable for statistical analysis, proxy measures are selected to represent each domain as a domain indicator. Regression analyses revealed the interrelationships among domains and influence by other factors so that how respective domains can be promoted effectively and efficiently to better ensure GNH promotion.

(3) Summarizing Analyses Results

Results of the analyses are summarized in terms of priority areas and priority social categories that need more attention for support in promoting each domain of GNH by promoting factors identified by regression analysis for each domain.
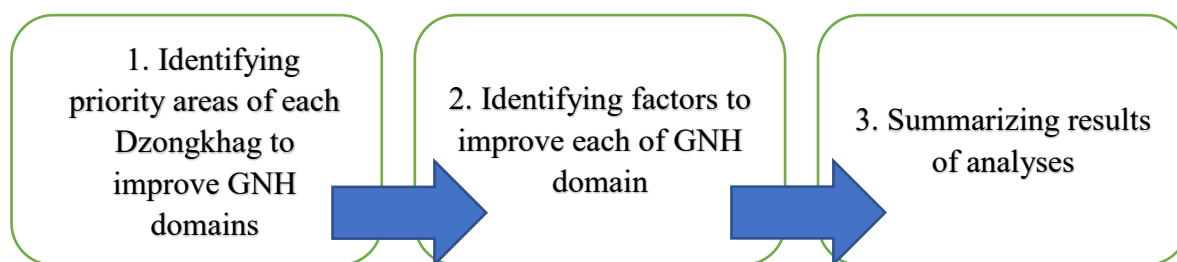
Figure 7.1.1   Analysis Flow

7.2   Nine Domains of Gross National Happiness

Since GNH survey in 2015, to foster measurement of a holistic range of GNH values, a domain-based framework has been developed. The framework contains nine constituent domains of GNH. They are: psychological wellbeing, health, time use and balance, education, cultural diversity and resilience, gwood governance, community vitality, ecological diversity and resilience, and living standard. They are described as below. The indicators of each domain are listed in Table 7.2.1.

Table 7.2.1   Domains and Indicators of GNH

Domain	Indicators
Psychological wellbeing	Life satisfaction, positive emotion, negative emotion, spirituality
Health	Self-reported health status, number of healthy days, disability, mental health
Time use	Time for work, time for sleep
Education	Literacy in native languages, formal schooling, knowledge, value
Cultural diversity and resilience	Zorig chusum skills (artisan skills), participation in cultural events, speak native language, driglam namzha (traditional code of conduct)
Good governance	Political participation, government services, governance performance, fundamental rights
Community vitality	Donation (time and money), safety in communities, community relationships, family relationships
Ecological diversity and resilience	Damage by wildlife, urban issues, sense of responsibility to environment, Ecological issues
Living standard	Income, assets, housing

Source: Centre for Bhutanese Studies & GNH Research (2016)

7.2.1   Psychological Wellbeing

This domain concerns how people experience the quality of their lives. They include indicators such as life satisfaction, affective reactions to life events such as positive and negative emotions. It also covers spirituality. Compared to the 2010 survey, there is an increase in the proportion of people who are highly satisfied (who rated either 'very satisfied' or 'satisfied') with the standard of living and work-life balance in 2015. Satisfaction with health also rose. On the other hand, the proportion of people satisfied or very satisfied with one's major occupation and their relationship with their immediate family members saw a slight decline in 2015. In terms of spirituality, the proportion of people who consider themselves 'very' spiritual has declined substantially from 50.4 percent to 44.5 percent. But the proportion of those who consider themselves 'moderately' spiritual has increased from 41.1 percent to 46.4 percent. The level of spirituality has changed both in the rural and urban areas. The proportion of respondents who reported being 'very spiritual' in nature declined from 53.5 percent to 46.7 percent in the rural areas and from 47.2 percent to 44.4 percent in the urban areas.

7.2.2   Health

This domain comprises of conditions of the human body and mind and thereby attempts to characterise health by including both physical and mental states. A healthy quality of life allows daily activities without undue fatigue or physical stress. The mean number of healthy days in the rural areas has increased from 25.67 days in 2010 to 28.31 days in 2015. That in the urban areas has increased from 27.31 days to 28.66 days by a lesser as compared to rural areas[1]. The number of people having a long-term disability has increased slightly from 13.03 percent in 2010 to 15.50 percent in 2015. However, the proportion of persons with a disability who reported that the disability has restricted their normal activities either 'all the time' or 'sometimes' has significantly reduced in 2015. The proportion of people who have 'normal mental wellbeing' has increased in 2015 from 85.82% to 89.68%.

7.2.3   Time Use

This domain attempts to analyse the nature of time spent on work, non-work and sleep, and highlights the importance of maintaining a harmonious work-life balance. The mean time spent on work and related activities increase by about three minutes from 475 minutes in 2010 to 478 minutes per day. People living in urban areas spend eight minutes more and those living in rural areas do four minutes more than the mean time in 2010[2].

7.2.4   Education

This domain incorporates both formal and informal education that includes assessing different types of knowledge, values and skills, which are mostly acquired informally. Literacy rates in native languages has increased to 52.34 percent in 2015 from 48.66 percent in 2010. That in the rural areas has increased to 43.0 percent from 40.2 percent. That in the urban areas has increased to 72.4 percent from 71.0 percent.

7.2.5   Cultural Diversity and Resilience

Despite the aims of policy to advance modernisation, traditional cultural values are deeply held by the people[3]. Traditional Bhutanese social structures remain largely intact due to the country's relatively isolated history and deliberately slow pace of modernisation[4]. This domain looks at the diversity and strength of cultural traditions including festivals, norms, and the artisan skills that been important part of Bhutanese culture. People have been self-sufficient in providing what they need. They often make their own clothing, bedding, floor and seat covers, tablecloths, and decorative items for daily and religious use. Weaving has been done normally by women of all ages using family-owned looms. In the rural areas, the number of people who have contributed more than five days in the community events increased to 50.4 percent in 2015 from 38.9 percent in 2010. That in the urban areas increased to 38.2 percent from 26.2 percent.

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[1] Jigme Phuntsho. (2017) Fruits of Happiness: How Horticulture Enhanced Gross National Happiness in Mongar, Bhutan. Centre for Bhutan Studies.

[2] Centre for Bhutanese Studies & GNH Research (2016) A Compass Towards a Just and Harmonious Society: 2015 GNH Survey Report. 2016. p. 86.

[3] Dorji, L. & Choden, T. (2005) Understanding civil society in Bhutan. Thimphu, Bhutan: Centre for Bhutan Studies.

[4] Pommaret, F. (2009) Bhutan: Himalayan mountain kingdom. Hongkong: Odyssey.

7.2.6 Good Governance

The domain of good governance evaluates how people perceive various governmental functions in terms of their efficacy, honesty and quality. Indicators help to evaluate the level of participation in government decisions at the local level and the presence of various rights and freedom. The proportion of people who rated the performance of the government as either 'very good' or 'good' has declined in 2015 from 2010. The highest decline in the proportion of people rating either 'good' or 'very good' is observed with regards to government's performance in creating jobs, reducing the gap between the rich and poor, and fighting corruption.

7.2.7 Community Vitality

In Bhutan, communities is the key area for maintaining its integrity where people live and work and maintain Bhutanese identity. Much of daily life of Bhutanese is governed by norms and values such as inter-dependence within communities[5]. This domain captures relationships and interactions within communities by gathering information on social cohesion among family members and neighbours and on practices like volunteering. The proportion of respondents whose sense of belong to the local community as 'very strong' has reduced to 65.75 percent in 2015 from 72.48 percent in 2010. On other hand, that of respondents whose sense of belonging to the local community as 'somewhat strong' has increased to 31.24 percent in 2015 from 23.77 percent in 2010. In the rural areas that of respondents whose sense belong to the local community as 'very strong' declined to 71.6 in 2015 percent from 79.6 in 2010. In that urban areas, the same has increased to 51.7 percent from 47.9 percent. The proportion of respondents who reported that they 'trust most' or 'trust some' of their neighbours has dropped to 61.6 percent in 2015 from 85.3 percent in 2010. In the rural areas, the same has dropped to 66.2 percent from 88.1 percent. In the urban areas, the same has dropped to 49.7 percent from 74.94 percent.

7.2.8 Ecological Diversity and Resilience

This encompasses indicators that measure people's own evaluations of the environmental conditions of their neighbourhood and assess eco-friendly behaviour patterns. It also covers hazards such as forest fires and earthquakes. The proportion of respondents who feel 'highly responsible' for conserving the natural environment has declined to 78.7 percent in 2015 from 82.4 percent in 2010. That in the urban areas has changed to 82.1 percent in 2015 from 82.6 percent in 2010.

7.2.9 Living Standards

This domain refers to the level of material comfort as measured by income, conditions of financial security, housing and asset ownership. The average annual total household income is Nu 231,502. The average annual total household income for urban residents is Nu 394,606, which is about 2.5 times larger than the annual total household income of rural residents (Nu 156,124). Compared to 2010, there is an increase in the proportion of people who own mobile phones (from 86.4% to 97.6%), computers/laptops (from 8.8% to 18.5%), refrigerators (29.9% to 51.1%), washing machines (7.5% to 16.7%), televisions (47.2% to 73.8%), and four-wheel vehicles (from 16.1% to 23.2%) in 2015. On the other hand, the proportion of people who own fixed line phones and radio sets has declined significantly from 9.88% to 5.15% and from 63.7% to 31.7%, respectively.

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[5] Ibid.

7.3 Analysis of Gross National Happiness by Dzongkhag, Urban and Rural

To clarify the priorities for each Dzongkhag for each domain, GNH indexes are calculated for each of nine domains in each Dzongkhag with urban and rural distinctions[6]. The index scale is from 0 (=poor) to 1 (excellent) as in Table 7.3.1. Besides the domain headings in the parentheses are the national averages of each index for each domain. For example, the national average of psychological wellbeing is 0.58. Each Dzongkhag has its own index for each domain. For example, GNH index of psychological wellbeing of Chukha in rural areas is 0.48. Below the national averages, the lower the indexes are, the higher the priorities should be. Thus, in this example, Chukha is the lowest in this index and it should have the highest priority.

Whether the indexes are actually below the national averages is examined by T-test, a statistical test. It is because these indexes are the results of the sample survey, and the sample has errors and there is probability that a next survey may have results higher than the national averages. T-test calculates probabilities that the index scores are not below the national averages. The next table indicates such probability by p-value. The lower the probability is, the stronger claim can be made that the index score is below the national average. For example, "$p < 0.01$" means that the probability that the score is not below the national average is less than 1 percent. Hence, we can reasonably assume that it is actually below the national average. In the table, the indexes below the national average with p-values are indicated in shade.

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[6] Originally, GNH index was calculated by Centre for Bhutanese Studies & GNH Research in such a way that the total of indexes of all the domains amount to 1 at maximum.

Table 7.3.1   GNH Indexes by Domains for Each Dzongkhag with Urban and Rural Distinctions

Dzongkhag	Psychological wellbeing (0.58)		Health (0.85)		Time use (0.59)		Education (0.47)		Cultural diversity (0.60)		Governance (0.52)		Community vitality (0.68)		Ecology (0.76)		Living standard (0.65)	
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
Bumthang	0.68	0.60	0.84	0.88	0.60	0.58	0.43**	0.63	0.68	0.58	0.59	0.66	0.75	0.57**	0.69***	0.86	0.63	0.86
Chukha	0.48***	0.57	0.86	0.87	0.64	0.67	0.48	0.65	0.53****	0.51****	0.50**	0.45****	0.65**	0.57***	0.81	0.78	0.66	0.84
Dagana	0.58	0.60	0.79**	0.92	0.55*	0.43**	0.49	0.50	0.57**	0.59	0.50	0.55	0.69	0.63	0.73	0.82	0.54***	0.81
Gasa	0.65	0.74	0.88	0.95	0.71	0.72	0.39**	0.59	0.68	0.60	0.45***	0.54	0.78	0.63	0.91	0.86	0.67	0.72
Haa	0.63	0.66	0.87	0.88	0.59	0.56	0.39****	0.56	0.67	0.55**	0.45***	0.57	0.67	0.68	0.76	0.86	0.66	0.82
Lhuntse	0.58	0.55	0.81**	0.87	0.60	0.65	0.38****	0.65	0.70	0.64	0.65	0.62	0.78	0.62	0.65***	0.83	0.56***	0.90
Monggar	0.56	0.61	0.88	0.90	0.49	0.43***	0.33****	0.56	0.65	0.55**	0.64	0.51	0.71	0.65*	0.66***	0.84	0.51***	0.81
Paro	0.67	0.60	0.86	0.93	0.64	0.45***	0.46	0.64	0.52****	0.48****	0.46***	0.75	0.69	0.59**	0.73***	0.92	0.78	0.88
Pemagatshel	0.57	0.57	0.81**	0.90	0.58	0.65	0.41**	0.74	0.71	0.49**	0.65	0.59	0.80	0.70	0.66***	0.80	0.50****	0.85
Punakha	0.59	0.50**	0.83	0.91	0.56	0.39****	0.37****	0.66	0.59	0.48****	0.58	0.51	0.70	0.57***	0.89	0.81	0.58****	0.91
Sandrupjongkhar	0.57	0.56	0.83	0.80	0.59	0.63	0.41**	0.58	0.72	0.62	0.43***	0.40***	0.77	0.60**	0.74	0.83	0.46****	0.76
Samtse	0.51***	0.58	0.82**	0.84	0.59	0.68	0.46	0.65	0.59	0.55**	0.52	0.44**	0.67	0.60**	0.82	0.83	0.61**	0.81
Sarpang	0.59	0.59	0.82**	0.83	0.51***	0.51**	0.45	0.63	0.58	0.53**	0.56	0.51	0.73	0.62**	0.63***	0.79	0.65	0.83
Thimphu	0.60	0.59	0.83	0.88	0.54*	0.62	0.45	0.59	0.66	0.55****	0.46**	0.42***	0.62**	0.57***	0.91	0.87	0.70	0.82
Trashigang	0.54**	0.63	0.86	0.91	0.56***	0.58	0.34****	0.61	0.72	0.62	0.51	0.58	0.68	0.65	0.78	0.84	0.44****	0.77
Yangtse	0.51***	0.52	0.85	0.88	0.59	0.77	0.38****	0.65	0.62	0.60	0.56	0.59	0.73	0.65	0.61***	0.89	0.42***	0.75
Trongsa	0.58	0.62	0.80****	0.87	0.59	0.48***	0.37****	0.61	0.59	0.48****	0.51	0.48	0.73	0.64	0.58****	0.90	0.53***	0.85
Tsirang	0.66	0.61	0.85	0.86	0.56	0.63	0.47	0.58	0.61	0.60	0.59	0.62	0.69	0.65	0.74**	0.94	0.61**	0.84
Wangduephodrang	0.55***	0.62	0.86	0.89	0.57	0.48***	0.35****	0.55	0.55****	0.51****	0.59	0.47**	0.70	0.66	0.70****	0.87	0.56***	0.81
Zhemgang	0.52****	0.55	0.78****	0.88	0.66	0.64	0.40****	0.65	0.70	0.64	0.61	0.53	0.78	0.67	0.58****	0.74	0.50****	0.88

*** $p<0.01$ ** $p<0.5$ * $p<0.1$

7.3.1   Prioritization

Below are the lists of Dzongkhags with rural and urban distinctions which are below the national average of each domain indexes. The list is in the order from the smaller to the larger figures, indicating the order of proposed priorities. In parentheses are the indexes of each domain in each Dzongkhag.

(1) Psychological Wellbeing

The national average index of psychological wellbeing is 0.58. In rural areas, those below the national average are Chukha (0.48), Samtse (0.51), Yangtse (0.51), Zhemgang (0.52), Trashigang (0.54) and Wangduephodrang (0.55). In urban areas, it is Punakha (0.50).

(2) Health

The national average index of health is 0.85. In rural areas, those below the national average are Zhemgang (0.78), Trongsa (0.80), Lhuentse (081), Pemagatshel (0.81), Samtse (0.82), and Sarpang (0.82). In urban areas, no Dzongkhag is below the national average. Health domain has more issues in rural areas.

(3) Time Use

The national average index of time use is 0.59. In rural areas, those below the national average are Sarpang (0.51), Thimphu (0.54), Dagana (0.55), and Trashigang (0.56). In urban areas, they are Punakha (0.39), Dagana (0.43), Monggar (0.43), Paro (0.45), Wangduephodrang (0.48), Trongsa (0.48), and Sarpang (0.51). The issues of time use are more in urban areas.

(4) Education

The national average index of education is 0.47. In rural areas, those below the national average are Monggar (0.33), Trashigang (0.34), Wangduephodrang (0.35), Punakha (0.37), Trongsa (0.37), Lhuentse (0.38), Yangtse (0.38), Haa (0.39), Gasa (0.39), Zhemgang (0.40), Pemagatshel (0.41), Samdrupjongkhar (0.41), and Bumthang (0.43). In urban areas, no dzongkhag is below the national average. Issues of education are mostly in rural areas.

(5) Cultural Diversity and Resilience

The national average index of culture is 0.60. In rural areas, those below the national average is Paro (0.52), Chukha (0.53), Wangduephodrang (0.55), and Dagana (0.57). In urban areas, they are Paro (0.48), Punakha (0.48), Trongsa (0.48), Pemagatshel (0.49), Chhukha (0.51), Wangduephodrang (0.51), Sarpang (0.53), Haa (0.55), Samtse (0.55), Thimphu (0.55), and Monggar (0.55). Problems of Cultural diversity is more in urban areas.

(6) Good Governance

The national average index of good governance is 0.52. In rural areas, those below the national average are Samdrupjongkhar (0.43), Haa (0.45), Gasa (0.45), Paro (0.46), Thimphu (0.46), and Chukha (0.50). In urban areas, they are Samdrupjongkhar (0.40), Thimphu (0.42), Samtse (0.44), Chhukha (0.45), Wangduephodrang (0.47). Many problems of Governance are in rural areas.

(7) Community Vitality

The national average index of community vitality is 0.68. In rural areas, those below the

national average are Thimphu (0.62) and Chhukha (0.65). In urban areas, they are Chhukha (0.57), Thimphu (0.57), Punakha (0.57), Bumthang (0.57), Samdrupjongkhar (0.60), Sarpang (0.62), and Monggar (0.65). Problems of community vitality is more in urban areas.

(8) Ecological Diversity and Resilience

The national average index of ecological diversity is 0.76. In rural areas, those below the national average are Trongsa (0.58), Zhemgang (0.58), Yangtse (0.61), Sarpang (0.63), Lhuentse (0.65), Monggar (0.66), Pemagatshel (0.66), Bumthang (0.69), Wangduephodrang (070), Paro (0.73), and Tsirang (0.74). In urban areas, no Dzongkhag are below the national average. Problems of ecological diversity are in rural areas.

(9) Living Standard

The national average index of living standard is 0.65. In rural areas, those below the national average are Trashiyangtse (0.42), Trashigang (044), Samdrupjongkhar (0.46), Zhemgang (0.50), Pemagatshel (0.50), Monggar (0.51), Trongsa (0.53), Dagana (0.54), Wangduephodrang (0.56), Lhuentse (0.56), Punakha (0.58), Tsirang (0.61), and Samtse (0.61). In urban areas, no dzongkhags are below the national average. Issues of living standard are in rural areas.

7.4 Identification of Factors to Improve Domains of Gross National Happiness by Regression Analysis

7.4.1 Domains for Regression Analysis

GNH survey data are analysed to find out relationships with various factors to find ways to improve each domain using regression analysis. For each domain, one indicator (domain indicator) is selected as summarized in Table 7.4.1. The regression analyses include factors of which relationship with the domain indicators can be reasonably assumed, and that have possible implications for designing and implementing concrete measures to improve each domain.

Table 7.4.1   Domains and Sub-domains of GNH for Structural Equation Modelling

Domain	Domain indicator	Definition
Psychological wellbeing	Happiness	Degree of happiness taking all things together in the scale from 0 (not happy at all) to 10 (very happy)
Health	Self-reported health status	Self-perception of healthiness in the five scale from 1 (poor) to 5 (excellent)
Time use	Work-life balance	Satisfaction with work-life balance in the scale from 1 (very dissatisfied) to 5 (very satisfied)
Education	Schooling	Number of years attending formal school
Cultural diversity and resilience	Cultural knowledge	Cultural knowledgeability in the scale from 1 (very poor) to 5 (very good) that include local legends and folktales, historical events of kings, National day (Gyalyong Duechhen), name of Kings, local festivals, and traditional Bhutanese songs.
Good governance	Government performance	Perception of government performance from 5 (very good) to 1(very poor) in creating jobs, reducing gap between rich & poor, providing educational facilities/services, providing health facilities/services, fighting corruption, protecting natural environment, and preserving culture and tradition.
Community vitality	Community relationships	Degrees of neighbours helping one another, trusting neighbours, and trusting Bhutanese people in general in the scale from 1 (not at all) to 4 (very much).
Ecological diversity and resilience	Ecological issues	Degree by which people are contented of environmental issues in the scale from 1 (very discontented) to 5 (very contented). Such issues include noise, air pollution, river and stream pollution, crime and violence, litter, pedestrian footpaths, and street lights.
Living standard	Satisfaction with living standard	Degree of satisfaction in living standard from 1 (very dissatisfied) to 5 (very satisfied)

7.4.2   Results of Regression Analysis

The results of the regression analyses are coefficients and p-value as reported from Tables 7.4.2 to 7.4.7 and from Table 7.4.9 to 7.4.11. Coefficients are degrees of change in the domain indicators as influenced by each factor. For example, the domain indicator of psychological wellbeing is happiness with its scale from 0 to 10, and a coefficient describes how much each factor can improve happiness on this scale if the sign is positive or degrade it if it is negative. P-values refer to probability that there is no relationship between dependent variable and independent variable.   Hence, the lower the probability is, the stronger claim can be made that they have the relationship. For example, "(p <0.01)" means that the probability that there is no relationship between them is less than 1 percent. In the tables, the P-values are indicated by asterisks besides the coefficients when applicable. Coefficients with no asterisk means that there is no relationship between the pertinent factor and the domain indictor.

Each analysis is presented with the determinant of coefficient (Adjusted R2) that indicates the proportion of the variance of the dependent variable is explained by the independent variables.   If it is 0.4, 40% of the variance is explained. The higher it is, the better it is. Adjusted R2 and N for each analysis is reported in subsequent tables.

Interpretations of these results are discussed as below with each coefficient and p-value in parentheses for each domain.

(1) Psychological Wellbeing

The domain indicator is the degree of happiness taking all things together in the scale from 0 (not happy at all) to 10 (very happy). The results of regression analysis are interpreted in terms

of changes in the scale of happiness as influenced by each variable. In Bhutan Living Standard Survey, respondents were asked how happy they consider themselves. The result is that most people (76%) are happy either very happy or moderately happy). More people in urban areas reported they are happy (at almost 79%) than in those in rural areas (74%), making the incidence of unhappiness (moderately unhappy or very unhappy) is slightly higher in rural areas[7].

A male tends to be less happy than a female by 0.086 in the scale of happiness ($p < 0.05$). A farmer tends to be less happy than those with other occupation by 0.149 ($p < 0.01$). With one-year increase at formal school, a person tends to be happier by 0.030 ($p < 0.01$). A married person tends to be happier than those not married by 0.076 ($p < 0.1$). With one unit increase in the scale of overall satisfaction (from 0=not at all satisfied to 10=very satisfied), a person is happier by 0.352 ($p < 0.01$). With one unit increase in the scale of previous day's happiness (from 0=not at all happy to 10=very happy), a person is happier by 0.278. ($p < 0.01$). With one unit increase in positive emotion (from 1=never to 7=few times a day)[8], a person tends to be happier by 0.044 ($p < 0.01$). With one unit increase in negative emotion[9], the person tends to be less happy by 0.092 ($p < 0.01$).

With one unit increase of community vitality (from 1=not at all to 4=very much), a person is happier by 0.114 ($p < 0.01$). With one unit increase in satisfaction with family relationship (from 1=very dissatisfied to 5=very satisfied), the person is happier by 0.052 ($p < 0.1$). With one unit increase in financial security (from 1=very difficult to 5=very easy), a person is happier by 0.078 ($p < 0.01$). With one unit increase in satisfaction with living standard (from 1=very dissatisfied to 5=very satisfied), a person is happier by 0.107 ($p < 0.01$). If the person is satisfied with his major occupation (from 1=very dissatisfied to 5=very satisfied), a person is happier by 0.054 ($p < 0.05$).

In the following Dzongkhags, people are happier than those in Thimphu: Dagana by 0.487 ($p < 0.01$), Lhuentse by 0.330 ($p < 0.01$), Mongar by 0.246 ($p < 0.01$), Sarpang by 0.159 ($p < 0.1$), Trashigang by 0.171 ($p < 0.05$), and Wangduephodrang by 0.247($p < 0.01$).

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[7] Bhutan Living Standard Survey Report 2017, Thimphu, P.89

[8] Positive emotion is captured in terms of frequency of having certain emotional conditions from 1 (never) to 7 (few times a day). Such positive emotional conditions include calmness, compassion, forgiveness, contentment, and generosity.

[9] Negative emotion is captured in terms of frequency of having certain emotional conditions from 1 (never) to 7 (few times a day). Such negative emotional conditions include anger, fear, sadness, worry selfishness and jealousy.

Table 7.4.2   Regression Analysis of Psychological Wellbeing

Factor	Coefficient
Age	-0.002
Male	-0.086**
Farmer	-0.149***
Formal Education	0.030***
Married	0.076*
Rural	-0.016
Yesterday Happiness	0.278***
Overall satisfaction	0.352***
Positive emotion	0.044***
Negative emotion	-0.092***
Satisfaction in health	0.028
Cultural knowledgeability	0.005
Importance of Driglam Namzha	-0.086
Change in Driglam Namzha	0.017
Government performance	0.031
Communal vitality	0.114***
Satisfaction in family relationship	0.052*
Satisfaction in standard of living	0.107***
Satisfaction in major occupation	0.052**
Financial security	0.078***
Satisfaction in work-life balance	0.017
Bumthang	-0.155
Chukha	0.113*
Dagana	0.487***
Gasa	-0.149
Haa	0.048
Lhuentse	0.330***
Mongar	0.246***
Paro	-0.005
Pemagatshel	0.082
Punakha	0.075
Samdrupjongkhar	0.091
Samtse	0.091
Sarpang	0.159*
Trashigang	0.171**
Yangtse	0.031
Trongsa	0.050
Tsirang	-0.042
Wangduephodrang	0.247***
Zhemgang	-0.055
Intercept	0.949***
Adjusted R2	0.417
N	7,092

*** p<0.01 **p<0.05 *p<0.1

Table 7.4.3   Regression Analysis of Health

Factor	Coefficient
Age	-0.007***
Male	0.086***
farmer	0.008
Formal Education	-0.006***
Rural	0.017
positive emotion	-0.013*
Negative emotion	-0.052***
Spirituality	0.027**
Frequency of visiting temples	0.021
Frequency of considering karma	-0.025**
Satisfaction in health	0.636***
Sick days	-0.012***
Days when mental health not good	-0.007**
Communal vitality	0.043***
Satisfaction in standard of living	0.019
Satisfaction in major occupation	0.029**
Financial security	0.015
Bumthang	0.031
Chukha	0.023
Dagana	-0.070
Gasa	0.109*
Haa	-0.107**
Lhuentse	-0.135***
Mongar	0.172***
Paro	0.075*
Pemagatshel	-0.178***
Punakha	0.089*
Samdrupjongkhar	-0.017
Samtse	-0.141***
Sarpang	-0.066*
Trashigang	-0.040
Yangtse	0.140***
Trongsa	-0.064
Tsirang	0.009
Wangduephodrang	-0.025
Zhemgang	-0.032
Intercept	1.147***
Adjusted R2	0.482
N	7,113

*** p<0.01 **p<0.05 *p<0.1

(2) Health

The domain indicator is the self-evaluation of health condition in the five scale from 1 (poor) to 5 (excellent). The results of regression analysis are interpreted in terms of changes in this health status as influenced by each variable as below.

With one-year increase of age, a person is less healthy by 0.007 (p<0.01). A male is healthier by 0.086 (p<0.01) than a female. With one-year increase in formal school, a person tends to be less healthy by 0.006 (p<0.01).

With one unit increase in positive emotion (from 1=never to 7=few times a day), a person is less healthy by 0.013 (p<0.1). With one unit increase in negative emotion (from 1=never to

7=few times a day), a person is less healthy by 0.052 (p<0.01). With one unit increase in spirituality (1=not at all to 4=very spiritual), a person is healthier by 0.027 (p<0.05). With one unit increase in frequency of considering karma in the course of daily lives (from 1=not at all to 4=regularly), a person is less healthy by 0.024 (p<0.05). With one additional day when physical health not good in the past 30 days, a person tends to be less healthy by -0.012 (p<0.01). With one additional day when mental health is not good, a person tends to be less healthy by 0.007 (p<0.01). With one unit increase in community vitality (from 1=not at all to 4=very much), a person is healthier by 0.043 (p<0.01). With one unit increase in satisfaction with major occupation (from 1=very dissatisfied to 5=very satisfied), a person is healthier by 0.029 (p<0.05).

In following Dzongkhags, people are healthier than Thimphu: In Mongar by 0.172 (p<0.01), Paro by 0.075 (p<0.1), Gasa by 0.109 (p<0.1), Punakha by 0.089 (p<0.1), and Yangtse by 0.140 (p<0.01). In following Dzongkhags, people less healthy than Thimphu: Haa, by 0.107 (p<0.05), Lhuentse by 0.135 (p<0.01), Pemagatshel by 0.178 (p<0.01), Samtse by 0.141 (p<0.01), and Sarpang by 0.066 (p<0.1).

(3) Time Use

The domain is captured by the degree of satisfaction with work-life balance in the scale from 1 (very dissatisfied) to 5 (very satisfied). The results of regression are interpreted in terms of changes in this scale of satisfaction with work-life balance as influenced by each variable.

With one-year increase of age, a person tends to be more satisfied with work-life balance by 0.001 (p<0.1). A male tends to be less satisfied with life-work balance than a female by 0.028 (p<0.1). With one-year increase with formal education, a person is less satisfied with work-life balance by 0.010 (p<0.01). Rural residents tend to be less satisfied with work-life balance by 0.069 (p<0.01) than urban residents.

With one scale increase in happiness (from 0=not at all to 10= very happy), a person is more satisfied in work-life balance by 0.012 (p<0.05). With one increase of unit in positive emotion (from 1=never to 7=few times a day), a person is less satisfied with work-life balance by 0.012 (p<0.05). With one more unit in negative emotion (from 1=never to 7=few times a day), a person is less satisfied with work-life balance by 0.018 (p<0.05). With one unit increase in satisfaction with health condition (from 1=very dissatisfied to 5=very satisfied), the person is more satisfied with work-life balance by 0.046 (p<0.01). With one unit increase in positive perception of government performance (from 1=very poor to 5=very good), a person is more satisfied with work-life balance by 0.080 (p<0.01). With one unit increase in the scale of satisfaction with relationship in family (from 1=very dissatisfied to 5=very satisfied), the person tends to be more satisfied with work-life balance by 0.214 (p<0.01). By one unit increase in the scale of satisfaction with standard of living (from 1=very dissatisfied to 5=very satisfied), the person would be more satisfied with work-life balance by 0.157 (p<0.01). By one unit increase in the scale of satisfaction with major occupation (from 1=very dissatisfied to 5=very satisfied), a person is more satisfied with work-life balance by 0.188 (p<0.01).

In the following Dzongkhags, people are more satisfied with work-life balance than Thimphu: Haa by 0.107 (p<0.05) and Trongsa by 0.086 (p<0.1). In the following Dzongkhags, people are less satisfied with work-life balance than Thimphu: Chukha by 0.102 (p<0.01), Gasa by 0.124 (p<0.05), Mongar by 0.122 (p<0.01), Samdrupjongkhar by 0.083 (p<0.1), Trashigang by 0.072 (p<0.1), Yangtse by 0.086 (p<0.01).

Table 7.4.4   Regression Analysis of Time Use

Factor	Coefficient
Age	0.001*
Male	-0.028*
Married	0.001
Farmer	0.026
Formal Education	-0.010***
Rural	-0.069***
Happiness	0.012**
Positive emotion	-0.012**
Negative emotion	-0.018**
Satisfaction in health	0.046***
Sick	-0.007
Communal vitality	0.012
Satisfaction in family relationship	0.214***
Government performance	0.080***
Satisfaction in standard of living	0.157***
Satisfaction in major occupation	0.188***
Financial security	0.000
Bumthang	-0.015
Chukha	-0.102***
Dagana	-0.041
Gasa	-0.124**
Haa	0.107**
Lhuentse	0.002
Mongar	-0.122***
Paro	0.014
Pemagatshel	0.054
Punakha	-0.053
Samdrupjongkhar	-0.083*
Samtse	0.023
Sarpang	-0.049
Trashigang	-0.072*
Yangtse	-0.086*
Trongsa	0.086*
Tsirang	0.052
Wangduephodrang	-0.051
Zhemgang	0.001
Intercept	1.266***
Adjusted R2	0.214
N	7,100

*** p<0.01 **p<0.05 *p<0.1

Table 7.4.5   Regression Analysis of Education

Factor	Coefficient
Age	-0.102***
Male	1.744***
Married	-1.944***
farmer	-2.473***
Rural	-1.442***
Positive emotion	0.054
Negative emotion	0.233***
Health condition	-0.196***
Satisfaction in health	0.357***
Satisfaction in work-life balance	-0.358***
Satisfaction in family relationship	0.366***
Financial security	0.807***
Satisfaction in standard of living	0.193**
Satisfaction in major occupation	-0.336***
Bumthang	0.155
Chukha	0.436**
Dagana	-0.299
Gasa	-0.923***
Haa	-1.098***
Lhuentse	-0.421
Mongar	-0.933***
Paro	0.808***
Pemagatshel	-0.042
Punakha	0.131
Samdrupjongkhar	-0.935***
Samtse	-0.393*
Sarpang	0.428*
Trashigang	-0.878***
Yangtse	-0.903***
Trongsa	0.067
Tsirang	0.704***
Wangduephodrang	-0.802***
Zhemgang	0.041
Intercept	7.371***
Adjusted R2	0.461
N	7,118

*** p<0.01 **p<0.05 *p<0.1

Table 7.4.6 Regression Analysis of Cultural Diversity and Resilience

Factor	Coefficient
Age	0.001
Male	0.258***
Married	0.003
farmer	-0.119***
Formal Education	0.095***
Rural	-0.024
Overall satisfaction	0.021***
Happiness	0.002
positive emotion	0.058***
Negative emotion	0.055***
Spirituality	0.072***
Frequency of reciting prayers	0.045***
Frequency of practicing meditation	0.035***
Frequency of visiting temples	0.052***
Frequency of considering karma	0.062***
Satisfaction in health	0.029***
Knowledge about HIV/AIDS	0.058***
Communal vitality	0.092***
Importance of Driglam Namzha	0.030
Change in Driglam Namzha	-0.077***
Government performance	0.048***
Satisfaction in family relationship	0.005
Believing nature as domain of spirits	0.048***
Satisfaction in standard of living	-0.013
Satisfaction in major occupation	0.008
Financial security	0.123***
house owned	0.079***
Bumthang	0.079
Chukha	0.106***
Dagana	-0.096*
Gasa	0.089
Haa	-0.010
Lhuentse	0.240***
Mongar	0.261***
Paro	0.098*
Pemagatshel	0.113*
Punakha	0.191***
Samdrupjongkhar	0.083*
Samtse	0.115***
Sarpang	-0.120***
Trashigang	0.134***
Yangtse	0.356***
Trongsa	-0.125*
Tsirang	-0.109*
Wangduephodrang	0.052
Zhemgang	-0.110*
Intercept	-0.366*
Adjusted R2	0.4905
N	7,088

*** p<0.01 **p<0.05 *p<0.1

Table 7.4.7 Regression Analysis of Good Governance

Factor	Coefficient
Age	0.001
Male	-0.034**
Married	-0.066***
farmer	-0.041**
Formal Education	-0.009***
Rural	0.034
Overall satisfaction	-0.002
Happiness	0.002
positive emotion	0.030***
Negative emotion	0.006
Spirituality	0.015
Frequency of reciting prayers	-0.024***
Frequency of practicing meditation	-0.001
Frequency of visiting temples	0.009
Frequency of considering karma	0.003
Satisfaction in health	0.028***
Knowledge about HIV/AIDS	-0.017***
Communal vitality	0.064***
Importance of Driglam Namzha	0.091***
Change in Driglam Namzha	0.008
Believing nature is domain of spirits	0.051***
Satisfaction in standard of living	-0.013
Satisfaction in major occupation	0.075***
Financial security	0.028***
house owned	-0.006
Bumthang	-0.056
Chukha	0.115***
Dagana	0.247***
Gasa	-0.001
Haa	-0.055
Lhuentse	0.089**
Mongar	0.157***
Paro	-0.033**
Pemagatshel	0.049
Punakha	0.092**
Samdrupjongkhar	-0.016
Samtse	-0.026
Sarpang	0.090**
Trashigang	-0.006
Yangtse	0.247***
Trongsa	-0.175***
Tsirang	0.441***
Wangduephodrang	0.144***
Zhemgang	0.023
Intercept	2.487***
Adjusted R2	0.085
N	7,091

*** p<0.01 **p<0.05 *p<0.1

(4) Education

The domain indicator is captured in the number of years in formal schools. The results of the regression analysis are interpreted in terms of how many years longer or less a person would attend formal school as influenced by each variable.

With an increase of age by one year, the person tends to attend school less by 0.102 year (p<0.01). A male tends to attend formal school longer than a female by 1.744 year (p<0.01). A married person attends school less by 1.944 year than non-married person (p<0.01). A farmer attends school less by 2.473 year than those with other occupation. Rural residents attend school less by 1.442 (p<0.01) than urban residents.

By one unit increase in the scale of negative emotion (from 1=never to 7=few times a day), one tends to attend school longer by 0.233 year (p<0.01). By one unit increase in health status (from 1=poor to 5=excellent), a person tends to school less by 0.196 year (p<0.01). By one unit increase in the scale of satisfaction with health (from 1=very dissatisfied to 5=very satisfied), a person tends to attend school longer by 0.357 year (p<0.01). By one unit increase in the scale of satisfaction with work-life balance (from 1=very dissatisfied to 5=very satisfied), a person tends to attend school less by 0.358 year (p<0.01). By one unit increase in the scale of satisfaction with relationship in family (from 1=very dissatisfied to 5=very satisfied), a person attends to school longer by 0.366 year (p<0.01). By one unit increase in financial security (from 1=very difficult to 5=very easy), a person attends to school longer by 0.807 year (p<0.01). By one unit increase in the scale of satisfaction with standard of living (from 1=very dissatisfied to 5=very satisfied), a person tends attend school longer by 0.193 year (p<0.05). By one unit increase in the scale of satisfaction with major occupation (from 1=very dissatisfied to 5=very satisfied), a person tends to attend school less by 0.336 year (p<0.01).

In the following Dzonghags, people attend formal school longer than those in Thimphu: Chukha by 0.436 year (p<0.05), Paro by 0.808 year (p<0.01), Sarpang by 0.428 year (p<0.1), and Tsirang by 0.704 year (p<0.05). In the following Dzonghags, people attend formal school less than those in Thimphu: Gasa by 0.923 year (p<0.05), Haa by 1.098 year (p<0.01), Mongar by 0.933 year (p<0.01), Samdrupjongkhar by 0.935 year (p<0.01), Samtse by 0.393 year (p<0.1), Trashigang by 0.878 year (p<0.01), Yangtse by 0.903 year (p<0.01), and Wangduephodrang by 0.802 (p<0.01).

(5) Cultural Diversity and Resilience

The domain indicator is the degree of cultural knowledgeability in the scale from 1 (very poor) to 5 (very good) that include local legends and folktales, historical events of kings, National day (Gyalyong Duechhen), name of Kings, local festivals, and traditional Bhutanese songs. The results of regression analysis are interpreted in terms of changes in this scale of cultural knowledgeability as influenced by each variable.

A male tends to be more knowledgeable of culture by 0.258 (p<0.01) than females. A farmer tends to be less knowledgeable of culture by 0.119 (p<0.01) than those of other occupation. With one-year increase with formal education, the person tends to be more knowledgeable of culture by 0.095 (p<0.01).

With one unit increase in the scale of overall satisfaction (from 0=not at all to 10=very satisfied), a person is more culturally knowledgeable by 0.021 (p<0.01). With one unit increase in the scale of positive emotion (from 1=never to 7=few times a day), a person is more culturally knowledgeable by 0.058 (p<0.01). With one unit increase in the scale of negative emotion (from 1=never to 7=few times a day), a person is more culturally knowledgeable by 0.055 (p<0.01). With one unit increase in the scale of spirituality (from 1=not at all to 4=very spiritual), a person

is more culturally knowledgeable by 0.072 (p<0.01). With one unit increase in the scale of frequency of reciting prayers (from 1=never to 5=several times a day), a person is more culturally knowledgeable by 0.045 (p<0.01). With one unit increase in the scale of frequency of practicing meditation (from 1=never to 5=several times a day) a person is more culturally knowledgeable by 0.035 (p<0.01). With one unit increase in the scale of frequency of visiting local temples and other places of spiritual significance (from 1=never to 5=several times a day), a person is more culturally knowledgeable by 0.052 (p<0.01). With one unit increase in frequency of considering Karma (from 1=not at all to 4 =regularly) a person is more culturally knowledgeable by 0.062 (p<0.01). With one unit increase in satisfaction with health (from 1=very dissatisfied to 5=very satisfied), a person is more culturally knowledgeable by 0.029 (p<0.01). With one unit increase in knowledgeability on HIV/AIDS (from 1=no knowledge to 4=clear understanding), a person is more culturally knowledgeable by 0.058 (p<0.01). With one unit increase in communal vitality (from 1=not at all to 4=very much), a person is more culturally knowledgeable by 0.092 (p<0.01). With one unit increase in the perception of Driglam Namzha getting stronger (1= getting weaker to 3=getting stronger), a person is less cultural knowledgeable by 0.077 (p<0.01). With one unit increase in the positive perception of government performance (from 1=very poor to 5=very good), a person is more culturally knowledgeable by 0.048 (p<0.01). With one unit increase in believing that nature is the domain of spirits of deities (from 1=strongly disagree to 5=strongly agree), a person tends to be more culturally knowledgeable by 0.048 (p<0.01). With one unit increase in financial security (from 1=very difficult to 5=very easy), a person is more culturally knowledgeable by 0.123 (p<0.01). If a person owns a house, he/she is more culturally knowledgeable by 0.079 (p<0.01).

In following Dzongkhags, people are more culturally knowledgeable than those in Thimphu: Chuka by 0.106 (p<0.01), Lhuentse by 0.240 (p<0.01), Mongar by 0.261 (p<0.01), Paro by 0.098 (p<0.1), Pemagatshel by 0.113 (p<0.1), Punakha by 0.191 (p<0.01), Samdrupjongkhar by 0.083 (p<0.1), Samtse by 0.115 (p<0.01), Trashigang by 0.134 (p<0.01), and Yangtse by 0.356 (p<0.01). In following Dzongkhags, people are less culturally knowledgeable than those in Thimphu: Dagana by 0.096 (p<0.1), Sarpang by 0.120 (p<0.01), Trongsa by 0.125 (p<0.05), Tsirang by 0.109 (p<0.05), Zhemgang by 0.109 (p<0.05).

In the interview in urban communities mentioned in Chapter 6, people mentioned some challenge in maintaining culture and tradition. They said that some young people like western cultures although still many youth are interested in promoting tradition　(Kabesa, Thimphu). Youth don't wear go and kira. One young participant in the interview in Bumthang mentioned that about half of their friends are respecting tradition and the other half not respecting tradition so much. Preserving culture will be challenge in the future (Dhamkhar tow, Bumthang).

In rural communities, people are more optimistic in maintaining tradition. Young people think tradition is important and they are willing to wear kira and go. They also mentioned that raising children in traditional ways is not a problem as they are little exposed to foreign culture by TV and internet (Nangar village, Bumthang). One young participant at the interview in Sarpang mentioned that all her friends are very much respecting tradition (Shechamthang town, Sarpang Dzongkhag). Others mentioned that maintenance of culture is not a problem and people wear go and kira (Phobjikha village, Wangduephodrang). Young people are learning tradition and want to continue tradition. They are not much influenced by foreign culture (Trongsa town, Trongsa). Young people feel comfortable in go and kira and all their young friends are very much respecting tradition (Drjithang village, Sarpang).

Bhutanese culture is best captured by Driglam Namzha which concerns code of etiquette and conduct. It is the official behaviour and dress code of Bhutan. It governs how citizens should dress in public and how they should behave in formal settings. It also regulates a number of

cultural assets such as art and architecture[10].

GNH survey asked a question of how important Driglam Namzha is with the scale from 1(=not important) to 3 (=very important). Figure 7.4.2 shows the percentages of those who consider Driglam Namzha as very important over different age groups (from 10s to over 60s) for both urban and rural areas. All these percentages are more than 92% and they are higher in urban areas than rural areas.
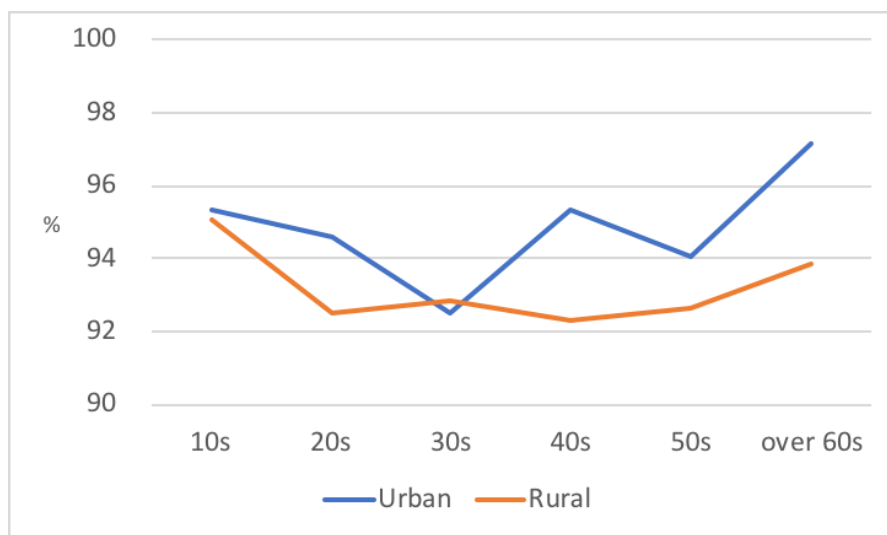
N=2,045 for urban areas & 5,065 for rural areas

Figure 7.4.1   Percentages Of Those Who Consider Driglam Namzha Very Important Over Age Groups In Urban And Rural Areas

GNH survey asked a question how they perceive the change in GNH survey asked how the change in Driglam Namzha is perceived in the scale of 1 (=getting weaker) to 3 (=getting stronger), and the results are summarized in Table 7.4.8. In urban area, people tend to perceive it is getting weaker than those in rural areas.

Table 7.4.8   About Change in Driglam Namzha

Perceived Changes	Urban areas (%) N=1,980[11]	Rural areas (%) N= 4,935[12]
Getting weaker	53.08	35.08
Stayed same	15.05	14.53
Getting stronger	31.87	50.40
Total	100.00	100.00

Figures 7.4.3 and 7.4.4 show the perceptions of changes in Driglam Namzha over age groups (from 10s to over 60s) for urban and rural areas. The percentages of those who consider Driglam Namzha getting stronger increase as respondents are older, and those who consider it getting weaker decreases as they are older. The percentages of those who consider it getting stronger are higher in rural areas than urban areas for all age groups. Conversely, the percentages of those who consider it getting weaker is less in rural areas than urban areas for all groups. These differences between urban and rural areas are consistent with the interviews mentioned above.

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[10] Hirama, Shuichi. 60 Chapters to know contemporary Bhutan. Akashi shoten. Tokyo. p.249.
[11] N is different from Figure 7.4.2 due to some missing data.
[12] Same as above.

N=1,980[13]

Figure 7.4.2   Perception of change in Driglam Namzha in Urban Areas

N=4,925[14]

Figure 7.4.3   Perception of Change in Driglam Namzha in Rural Areas
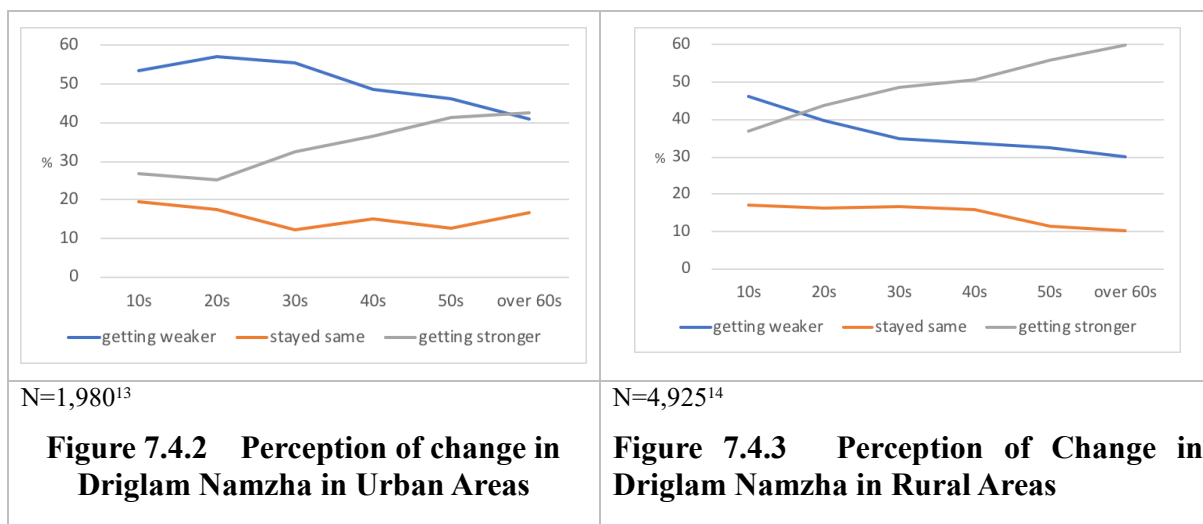
(6) Good Governance

The domain indicator is perception of government performance from 5 (very good) to 1(very poor) in creating jobs, reducing gap between rich & poor, providing educational facilities/services, providing health facilities/services, fighting corruption, protecting natural environment, and preserving culture and tradition. The results of the regression analysis are interpreted in the changes of this scale of perception of government performance as influenced by each variable.

A male tends to perceive government performance less positively by 0.034 ($p<0.05$). A married person tends to perceive less positively by 0.066 ($p<0.01$). A farmer tends to perceive less positively by 0.041 ($p<0.05$) than those of other occupation. With one-year increase at formal school, a person tends to perceive less positively by 0.009 ($p<0.01$).

With one unit increase in positive emotion (from 1=never to 7=few times a day), a person tends to perceive more positively by 0.030 ($p<0.01$). With one unit increase in the frequency reciting prayers (from 1=never to 5=several times a day), a person perceives less positive by 0.024 ($p<0.01$). With one unit increase in satisfaction with health (from 1=very dissatisfied to 5=very satisfied), a person tends to perceive more positively by 0.028 ($p<0.01$). With one unit increase in knowledgeability on HIV/AIDS (from 1=no knowledge to 4=clear understanding), a person perceives less positively by 0.017 ($p<0.01$). With one unit increase in communal vitality (from 1=not at all to 4=very much), a person perceives positively by 0.064 ($p<0.01$). With one unit increase in the perception of importance of Bhutanese code of etiquette and conduct (Driglam Namzha) (from 1=not important to 3=very important), a person tends to perceive more positively by 0.091 ($p<0.01$). With one unit increase in believing nature as the domain of spirit of deities (from 1=strongly disagree to 5=strongly agree), a person tends to perceive more positively by 0.051 ($p<0.01$). With one unit increase in satisfaction with major occupation (from 1=very dissatisfied to 5=very satisfied), a person tends to perceive more positively by 0.075 ($p<0.01$). With one unit increase in financial security (from 1=very difficult to 5=very easy), a person tends to perceive positively by 0.028 ($p<0.01$).

In following Dzongkhags, Government performance is perceived better than Thimphu: Chukha by 0.115 ($p<0.01$), Dagana by 0.247 ($p<0.01$), Lhuentse by 0.089 ($p<0.05$), Mongar by 0.157 ($p<0.01$), Punakha by 0.092 ($p<0.05$), Sarpang by 0.090 ($p<0.05$), Yangtse by 0.247 ($p<0.01$), Tsirang by 0.441 ($p<0.01$), and Wangduephodrang by 0.144 ($p<0.01$). In Trongsa, it is perceived

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[13] Same as above.
[14] Same as above.

worse than Thimphu by 0.175 (p<0.01).

1) Planning

According to the interviews conducted in communities, people mentioned that they are not aware of their area's planning and they want to know it, and it should be implemented (Kabesa, Thimphu). People in Sarpang mentioned that local area planning is done and ready and it should be implemented. Road planning was done 3 years ago. Road construction should be implemented. As infrastructure is not adequate, local business is not good. People go to India to purchase daily necessities (Shechamthang town, Sarpang).

2) Health

People mentioned that there should be more hours of consultation by doctor. They also go to National Referral Hospital, but they prefer having a hospital nearby (Kabesa, Thimphu). At hospital in a community in Sarpang, they have only one doctor, staffing is not sufficient. They also said there should be more consultation hours (Shechamthang town, Sarpang). People in Punakha mentioned that medical services are generally good, but emergency situation is a problem as a good hospital is far and transportation means is limited (Zomi village, Punakha Dzongkhag).

3) Water supply

In Punakha, people mentioned that their biggest issue is water. Its quality is poor as the treatment is not sufficient. As the population is growing, its quantity is also not sufficient (Khuruthang, Punakha Dzongkhag). In Punakha, people mentioned that drinking water is a problem both in terms of quality and quantity (Zomi village, Punakha). People in Wangduephodrang mentioned that availability of safe water is limited. Because of lack of safe water, people are moving out. Proper drainage system is also lacking. There is also a problem of hygiene (Bajothang, Wangduephodrang). People in Trongsa said that water quality is good as it is adequately treated. In summer, quantity of drinking water is a problem (Trongsa town, Trongsa).

Table 7.4.9 Regression Analysis of Communal Vitality

Factor	Coefficient
Age	0.000
Male	0.063***
Married	0.033**
farmer	0.046**
Formal Education	-0.010***
Rural	0.143***
Happiness	0.019***
Spirituality	0.036***
Frequency of reciting prayers	0.011**
Frequency of practicing meditation	0.000
Frequency of visiting temples	-0.004
Frequency of considering karma	0.031***
positive emotion	-0.023***
Negative emotion	-0.047***
Satisfaction in health	0.024***
mhdays	-0.001
Knowledge about HIV/AIDS	-0.014***
Satisfaction in work-life balance	0.008
Importance of Driglam Namzha	-0.029
Change in Driglam Namzha	0.014***
Cultural knowledgeability	0.056***
Government performance	0.058***
Satisfaction in family relationship	0.006
Environment issues	-0.005
Agreeing nature is domain of spirits	0.008
Feeling responsible for conserving environment	0.085***
Satisfaction in standard of living	0.072***
Satisfaction in major occupation	0.025**
Financial security	-0.022**
In-house piped-water	-0.004
house owned	0.012
Bumthang	0.230***
Chukha	0.150***
Dagana	0.209***
Gasa	0.122*
Haa	0.167***
Lhuentse	0.038
Mongar	0.233***
Paro	0.063*
Pemagatshel	0.142***
Punakha	0.047
Samdrupjongkhar	0.204***
Samtse	0.085***
Sarpang	0.306***
Trashigang	0.085*
Yangtse	0.275***
Trongsa	0.288***
Tsirang	0.020
Wangduephodrang	0.015
Zhemgang	0.367***
Intercept	1.485***
Adjusted R2	0.143
N	7,089

*** p<0.01 **p<0.05 *p<0.1

Table 7.4.10 Regression Analysis of Ecological Diversity and Resilience

Factor	Coefficient
Age	0.000
Male	0.049***
Married	-0.014
farmer	0.060***
Formal Education	-0.007***
Rural	0.346***
Happiness	0.004
positive emotion	-0.037***
Negative emotion	-0.004
Spirituality	-0.019
Frequency of reciting prayers	0.006
Frequency of practicing meditation	0.022***
Frequency of visiting temples	0.012
Frequency of considering karma	-0.033***
Satisfaction in health	-0.011
Satisfaction in work-life balance	0.034***
Satisfaction in family relationship	0.036***
Communal vitality	-0.004
Cultural knowledgeability	-0.028***
Importance of Driglam Namzha	0.038
Change in Driglam Namzha	0.022***
Government performance	0.050***
Agreeing nature is domain of spirits	0.030***
Feeling responsible for conserving environment	0.042***
Satisfaction in standard of living	-0.024*
Satisfaction in major occupation	0.039***
Financial security	0.055***
In-house piped-water	-0.102***
house owned	0.044*
Bumthang	-0.012
Chukha	-0.219***
Dagana	0.089*
Gasa	0.257***
Haa	0.000
Lhuentse	-0.105**
Mongar	0.262***
Paro	-0.179***
Pemagatshel	-0.219***
Punakha	0.067
Samdrupjongkhar	0.104**
Samtse	-0.154***
Sarpang	-0.189***
Trashigang	0.070**
Yangtse	0.100**
Trongsa	-0.381***
Tsirang	0.054
Wangduephodrang	-0.246***
Zhemgang	-0.119***
Intercept	3.026***
Adjusted R2	0.238
N	7,089

*** p<0.01 **p<0.05 *p<0.1

(7) Community Vitality

The domain indicator is the degree of how much people help and trust one another in the scale from 1 (not at all) to 4 (very much). This is captured by the degrees of neighbours helping one another, trusting neighbours, trusting Bhutanese people in general. The results of regression analysis are interpreted by the changes in this scale as influenced by each variable.

A male tends to perceive more communal vitality by 0.063 ($p<0.01$) than a female. A married person tends to perceive more communal vitality by 0.033 ($p<0.05$) than an unmarried person. A farmer tends to perceive more communal vitality by 0.046 ($p<0.05$) than those with other occupation. With one-year increase in formal school, a person tends to perceive less communal vitality by 0.010 ($p<0.01$). Rural residents tend to perceive more communal vitality by .0.143 ($p<0.01$).

With one unit increase in happiness (from 0=not at all to 10= very happy), a person tends to perceive more communal vitality by 0.019 ($p<0.01$). With one unit increase in spirituality (1=not at all to 4=very spiritual), a person tends to perceive more communal vitality by 0.036 ($p<0.01$). With one unit increase in frequency of reciting prayers (from 1=never to 5=several times a day), a person tends to perceive more communal vitality by 0.011 ($p<0.05$). With one unit increase in frequency of considering karma in the daily course of daily lives (from 1=not at all to 4=regularly), a person tends to perceive more communal vitality by 0.031 ($p<0.01$). With one unit increase in positive emotion (from 1=never to 7=few times a day), one tends to perceive less communal vitality by 0.023 ($p<0.01$). With one unit increase in negative emotion (from 1=never to 7=few times a day), a person perceives less communal vitality by 0.047 ($p<0.01$). With one unit increase in satisfaction with health (from 1=very dissatisfied to 5=very satisfied), a person tends to perceive more communal vitality by 0.024 ($p<0.01$). With one unit increase in knowledgeability on HIV/AIDS (from 1=no knowledge to 4=clear understanding), a person tends to perceive less communal vitality by 0.014 ($p<0.01$). With one unit increase in the perception of Driglam Namzha getting stronger (1= getting weaker to 3=getting stronger), a person tends to perceive more communal vitality by 0.014 ($p<0.01$). With one unit increase in cultural knowledgeability (from 1=very poor to 5=very good), a person tends to perceive more communal vitality by 0.056 ($p<0.01$). With one unit increase in positive perception of government performance (from 1=very poor to 5=very good), a person tends to perceive more communal vitality by 0.058 ($p<0.01$). With one unit increase in having sense of responsibility for conserving the natural environment (from 1=not at all to 4=highly responsible), a person tends to perceive more communal vitality by 0.085 ($p<0.01$). With one unit increase in satisfaction in living standard (from 1=very dissatisfied to 5=very satisfied), a person tends to perceive more communal vitality by 0.072 ($p<0.01$). With one unit increase in satisfaction with major occupation (from 1=very dissatisfied to 5=very satisfied), a person tends to perceive more communal vitality by 0.025 ($p<0.05$). With one unit increase in financial security, a person tends to perceive less communal vitality by 0.022 ($p<0.05$).

In following dzongkhags, community are more vital than Thimphu: Bumthang by 0.230 ($p<0.01$), Chhukha vital by 0.150 ($p<0.01$), Dagana by 0.209 ($p<0.01$), Gasa by 0.122 ($p<0.05$), Haa by 0.167 ($p<0.01$), Monggar by 0.233 ($p<0.01$), Paro by 0.063 ($p<0.1$), Pemagatshel by 0.142 ($p<0.01$), Samdrupjongkhar by 0.204 ($p<0.01$), Samtse by 0.085 ($p<0.01$), Sarpang by 0.306 ($p<0.01$), Trashigang by 0.085 ($p<0.05$), Yangtse by 0.275 ($p<0.01$), Trongsa by 0.288 ($p<0.01$), and Zhemgang by 0.367 ($p<0.01$).

(8) Ecological Diversity and Resilience

The domain indicator is the degree of how much people are contented of environmental issues in the scale from 1 (very discontented) to 5 (very contented). Such issues include noise, air

pollution, river and stream pollution, crime and violence, litter, pedestrian footpaths, and street lights. The results of regression analysis are interpreted in terms of changes in this scale as influenced by each variable.

A male is more contented with environment issues by 0.049 (p<0.01). A farmer tends to be more contented by 0.060 (p<0.01). With one-year increase in attending formal school, a person tends to be less contented by 0.007 (p<0.01). Rural residents are more contented by 0.346 (p<0.01). With one unit increase in positive emotion, a person is less contented by 0.037 (p<0.01).

With one unit increase in frequency of practicing meditation (from 1=never to 5=several times a day), a person is more contented by 0.022 (p<0.01). With one unit increase in frequency of considering karma in the course of daily lives (from 1=not at all to 4=regularly), a person is less contented by 0.033 (p<0.01). With one unit increase of satisfaction with work-life balance (from 1=very dissatisfied to 5=very satisfied), a person is more contented by 0.034 (p<0.01). With one unit increase of satisfaction with relationship in family (from 1=very dissatisfied to 5=very satisfied), a person is more contented by 0.036 (p<0.01). With one unit increase of cultural knowledgeability (from 1=very poor to 5=very good), a person is less contented by 0.028 (p<0.01). With one unit increase in the perception of Driglam Namzha getting stronger (1= getting weaker to 3=getting stronger), a person is more contented by 0.022 (p<0.01). With one unit increase in the positive perception of government performance (from 5=very good to 1=very poor), a person is more contented by 0.050 (p<0.01). With one unit increase in believing that the nature is the domain of spirits and deities (from 1=strongly disagree to 5=strongly agree), a person is more contented by 0.030 (p<0.01). With one unit increase in having sense of responsibility for conserving the natural environment (from 1=not at all to 4=highly responsible), a person tends to be more contented by 0.042 (p<0.01). With one unit increase of satisfaction with living standard (from 1=very dissatisfied to 5=very satisfied), a person is less contented by 0.024 (p<0.1). With one unit increase of satisfaction with major occupation (from 1=very dissatisfied to 5=very satisfied), a person is more contented by 0.039 (p<0.01). With one unit increase of financial security (from 1=very difficult to 5=very easy), a person is more contented by 0.055 (p<0.01).

When a person has tap water in-house, a person is less contented by 0.102 (p<0.01). When a person owns a house, he/she is more contented by 0.044 (p<0.1).

In the following dzongkhags, people are more contented with environment issues than those in Thimphu: Dagana are more contented by 0.089 (p<0.1), Gasa by 0.257 (p<0.01), Monggar by 0.262 (p<0.01), Samdrupjongkhar are more contented by 0.104 (p<0.05), Trashigang by 0.070 (p<0.05), and Yangtse by 0.100 (p<0.05). In the following dzongkhags, people are less contented with environment issues than those in Thimphu: Chhukha by 0.219 (p<0.01), Lhuentse by 0.105 (p<0.05), Paro by 0.179 (p<0.01), Pemagatshel by 0.219 (p<0.01), Samtse by 0.154 (p<0.01), Sarpang by 0.189 (p<0.01), Trongsa by 0.381 (p<0.01), Wangduephodrang by 0.246 (p<0.01), and Zhemgang by 0.119 (p<0.01).

In the interviews in communities, some people mentioned that waste management is issue. More waste bins are needed (Khuruthang, Punakha). Waste management is a problem as it is located between Bumthang and Trongsa and travellers' litter on their way (Nangar village, Bumthang).

Other people mentioned wildlife damage to crop is an issue. Electric fencing is not effective as electricity is not strong enough (Zomi village, Punakha).Crops are eaten by animals. They started installing electric fences. They hope they will help (Yuling village, Trongsa). Other people also mentioned human wildlife conflict as they eat crops. But fencing is effective and helping (Nangar village, Bumthang).

(9) Living Standard

This domain indicator is the degree of satisfaction in living standard from 1 (very dissatisfied) to 5 (very satisfied). The results of regression analysis are interpreted in terms of changes in this scale as influenced by each variable.

A male is less satisfied with living standard than a female by 0.025 (p<0.1). Rural residents are less satisfied with living standard by 0.066 (p<0.01) than urban residents.

With one unit increase in happiness (from 0=not at all to 10=very happy), a person is more satisfied with living standard by 0.016 (p<0.01). With one unit increase in overall satisfaction (from 0=not at all to 10=very satisfied), a person tends to be more satisfied with living standard by 0.054 (p<0.01). With one unit in negative emotion (from 1=never to 7=few times a day), a person is less satisfied with living standard by 0.029 (p<0.01). With one unit increase in satisfaction with health (from 1=very dissatisfied to 5=very satisfied), a person is more satisfied with living standard by 0.075 (p<0.01). With one unit increase in satisfaction with work-life balance (from 1=very dissatisfied to 5=very satisfied), a person is more satisfied with living standard by 0.123 (p<0.01). With one unit increase in the scale of believing the practice of Bhutanese code of etiquette and conduct (Driglam Namzha) getting stronger (1=getting weaker to 3=getting stronger), a person is less satisfied with living standard by 0.012 (p<0.05). With one unit increase in the positive perception of government performance (from 5=very good to 1=very poor), a person is less satisfied with living standard by 0.025 (p<0.05). With one unit increase in community vitality (from 1=not at all to 4=very much), a person is more satisfied with living standard by 0.068 (p<0.01). With one unit increase in satisfaction

Table 7.4.11   Regression Analysis of Living standard

Factor	Coefficient
Age	0.000
Male	-0.025*
Married	-0.023
farmer	-0.027
Formal Education	0.001
Rural	-0.066***
Happiness	0.016***
Overall satisfaction	0.054***
positive emotion	0.005
Negative emotion	-0.029***
Satisfaction in health	0.075***
Satisfaction in work-life balance	0.123***
Cultural knowledgeability	-0.004
Importance of Driglam Namzha	0.023
Change in Driglam Namzha	-0.012**
Government performance	-0.025**
Communal vitality	0.068***
Satisfaction in family relationship	0.092***
Satisfaction in major occupation	0.194***
Financial security	0.152***
In-house piped-water	0.078***
house owned	0.086***
Bumthang	0.035
Chhukha	-0.051*
Dagana	0.033
Gasa	0.071
Haa	0.091**
Lhuentse	-0.078*
Monggar	0.075**
Paro	0.113***
Pemagatshel	-0.071*
Punakha	0.029
Samdrupjongkhar	-0.030
Samtse	-0.091***
Sarpang	-0.074**
Trashigang	0.013
Yangtse	-0.013
Trongsa	-0.068*
Tsirang	0.141***
Wangduephodrang	-0.039
Zhemgang	-0.120***
Intercept	1.017***
Adjusted R2	0.336
N	7,094

*** p<0.01 **p<0.05 *p<0.1

with relationship with family (from 1=very dissatisfied to 5=very satisfied), a person is more satisfied with living standard by 0.092 (p<0.01). With one unit increase in satisfaction with major occupation (from 1=very dissatisfied to 5=very satisfied), a person is more satisfied with living standard by 0.194 (p<0.01). With one unit increase in financial security (from 1=very difficult to 5=very easy), a person is more satisfied with living standard by 0.152 (p<0.01). If a person has a tap water in-house water, a person is more satisfied with living standard by 0.078

(p<0.01).

If a person owns a house, a person is more satisfied with living standard by 0.086 (p<0.01).

In following Dzongkhags, they are more satisfied with living standard than Thimphu; Haa by 0.091 (p<0.05), Monggar by 0.075 (p<0.1), Paro by 0.113 (p<0.01), and Tsirang by 0.141 (p<0.01). In following Dzongkhags, they are less satisfied with living standard than Thimphu; Chhukha by 0.051 (p<0.1), Lhuentse by 0.078 (p<0.1), Pemagatshel by 0.071 (p<0.1), Samtse by 0.091 (p<0.01), Sarpang by 0.074 (p<0.05), Trongsa by 0.068 (p<0.1), and Zhemgang by 0.120 (p<0.01).

1) Basic needs

In the interviews in most communities, people mentioned that Basic needs in the community are reasonably met. Food needs are generally met (Phobjikha village, Wangduephodrang, and others). Others mentioned that income level reasonable in general and can be earned by selling vegetable. They said they prefer local products to imports from India as the imports contain much chemicals (Zomi village, Punakha).

2) Housing issue

In urban areas, some people mentioned housing issues. In Thimphu, they mentioned that the biggest problem is that many people don't have their own houses and they have to continue to pay for the rent. Once they lose their employment, they have no means of living and they would lose their places to live (Thimphu Thromde, Thimphu). In Trongsa, they mentioned that population has increased because of hydro power project implemented nearby and housing is in short supply (Trongsa town, Trongsa). Others mentioned that old people cannot maintain their houses. Their children live somewhere else and cannot help them. In rainy seasons, some houses are washed away. (Yuling village, Trongsa). Some also mentioned that housing is expensive and not affordable (Bajothang, Wangduephodrang).

3) Land issue

Some mentioned that land shortage is a problem as much of it in the community is designated as marsh land and cultivation is not allowed. In addition, because of increased population and inheritance of land, land is increasingly fragmented (Phobjikha village, Wangduephodrang). Other mentioned that due to urbanization, agriculture land is s lost and additional land is needed. Forest should be cleared for agricultural activities (Dhamkhar town, Bumthang). In Sarpang, they mentioned that they have more wetland and less dry land. They cannot construct on wet land. They need more dry land (Drjithang village, Sarpang). Some mentioned disputes over land boundaries and it is affecting relationships in communities (Bajothang, Wangduephodrang).

4) Employment issues

Many people in communities mentioned problems of unemployment problem among youth. After they complete 10th grade, they are not willing to do farming. There is not enough employment for them. Before, they had only 5th-6th grade education, and they had government job, and now with 10th or 12th grade, they don't have employment. Youth (15-25 years old) unemployment is a major problem (Yuling village, Trongsa). Employment in private sector is limited. Young people do farming as the last option when they have no other work (Dhamkhar town, Bumthang). Youth unemployment is a problem. More youth go out of village. Female youth stay in village. They do traditional weaving and it should be promoted. Its marketing and skill development are fine. They are sold to fashion designer to make bags, mats table clothes etc. But its raw material is in shortage and should be assisted (Nangar village, Bumthang).

7.4.3 Priorities Areas, Priority Social Categories and Promoting Factors for Improving GNH

In order to promote each domain, the results of the analyses are summarized in the order of priority areas in dzongkhag with distinction of rural and urban areas, and priority social categories for which more attention can be given by promoting factors that are subsequently discussed.

In implementing a development alternative, the priority areas, priority social categories and promoting factors should be taking into account in designing and implementing concrete measures to promote each GNH domain in the selected development model.

(1) Psychological Wellbeing

In this domain, the priority rural areas are in Chhukha, Samtse, Zhemgang, Trashigang and Wangduephodrang. The priority urban area is in Punakha.

The priority social categories are males, farmers, those with less formal education and non-married persons.

The promoting factors are more community vitality, more satisfying living standard, more satisfying family relationships, more satisfying major occupation and more formal education.

(2) Health

In this domain, the priority rural areas are in Zhemgang, Trongsa, Lhuentse, Pemagatshel, Samtse, and Sarpang. There is no priority urban area for this domain.

The priority social categories are older people, females, and those with more formal education

The promoting factors are more communal vitality, more satisfying major occupation and more spirituality.

(3) Time Use

In this domain, the priority rural areas are in Thimphu, Dagana, and Trashigang. The priority urban areas are in Punakha, Dagana, Monggar, Paro, Wangduephodrang, Trongsa, and Sarpang.

Priority social categories are younger people, males, those with more formal education, and rural residents

The promoting factors are more satisfying living standard, more satisfying occupation, more satisfying health, and more satisfying family relationship.

(4) Education

In this domain, the priority rural areas are in Monggar, Trashigang, Wangduephodrang, Punakha, Trongsa, Lhuentse, Yangtse, Haa, Gasa, Zhemgang, Pemagatshel, Samdrupjongkhar, and Bumthang. There is no priority urban areas for this domain.

The priority social categories are farmers, rural residents, and females.

The promoting factors are more formal education, more satisfying health condition, more satisfying family relationships, more satisfying living standard, and better financial security,

(5) Culture

In this domain, the priority rural areas are in Paro, Chhukha, Wangduephodrang, and Dagana. The priority urban areas are in Paro, Punakha, Trongsa, Pemagatshel, Chhukha,

Wangduephodrang, Sarpang, Haa, Samtse, Thimphu, and Monggar.

The priority social category are females, farmers, and those with less formal education.

The promoting factor is better government performance, more community vitality, and higher spirituality.

(6) Governance

In this domain, the priority rural areas are in Samdrupjongkhar, Haa, Gasa, Paro, Thimphu, and Chhukha. The priority urban areas are in Samdrupjongkhar, Thimphu, Samtse, Chhukha, and Wangduephodrang.

The priority social categories are males, married persons, farmers, and those with more formal education

The promoting factors are more satisfying health condition, more community vitality, more satisfying major occupation, and better financial security.

(7) Community Vitality

In this domain, the priority rural areas are in Thimphu and Chhukha. The priority urban areas are in Chhukha, Thimphu, Punakha, Bumthang, Samdrupjongkhar, Sarpang, and Mongar.

The priority social categories are females, non-married persons, urban residents, non-farmers, and those with more formal education

The promoting factors are higher spirituality, more cultural knowledge, better government performance, feeling more responsible for conserving environment, more satisfying standard of living, more satisfaction with major occupation.

(8) Ecology

In this domain, the priority rural areas are in Trongsa, Zhemgang, Yangtse, Sarpang, Lhuentse, Monggar, Pemagatshel, Bumthang, Wangduephodrang, Paro, and Tsirang. There is no priority urban area for this domain.

The priority social categories are females, non-farmers, those with more formal education, and urban residents.

The promoting factors are better government performance, agreeing that nature is domain of spirits, feeling more responsible for conserving environment.

(9) Living Standard

In this domain, the priority rural areas are in Trashiyangtse, Trashigang, Samdrupjongkhar, Zhemgang, Pemagatshel, Monggar, Trongsa, Dagana, Wangduephodrang, Lhuentse, Punakha, Tsirang, and Samtse. There is no priority urban area for this domain.

Priority social categories are males, and rural residents.

The promoting factors are more satisfying with work-life balance, more satisfying major occupation, better financial security.

CHAPTER 8   CHARACTERISTICS OF THE DZONGKHAGS

8.1   Overview of the 20 Dzongkhags

The Local Government Act 2009 stipulated the political structure of Dzongkhags and their mandates. Current, Bhutan's local administration structure consists of 20 Dzongkhags (districts), 15 Dungkhags (counties) and 205 Gewogs (village blocks). Each Dzongkhag has a dzong, which is a central facility for local government, administration, judiciary services and religion.
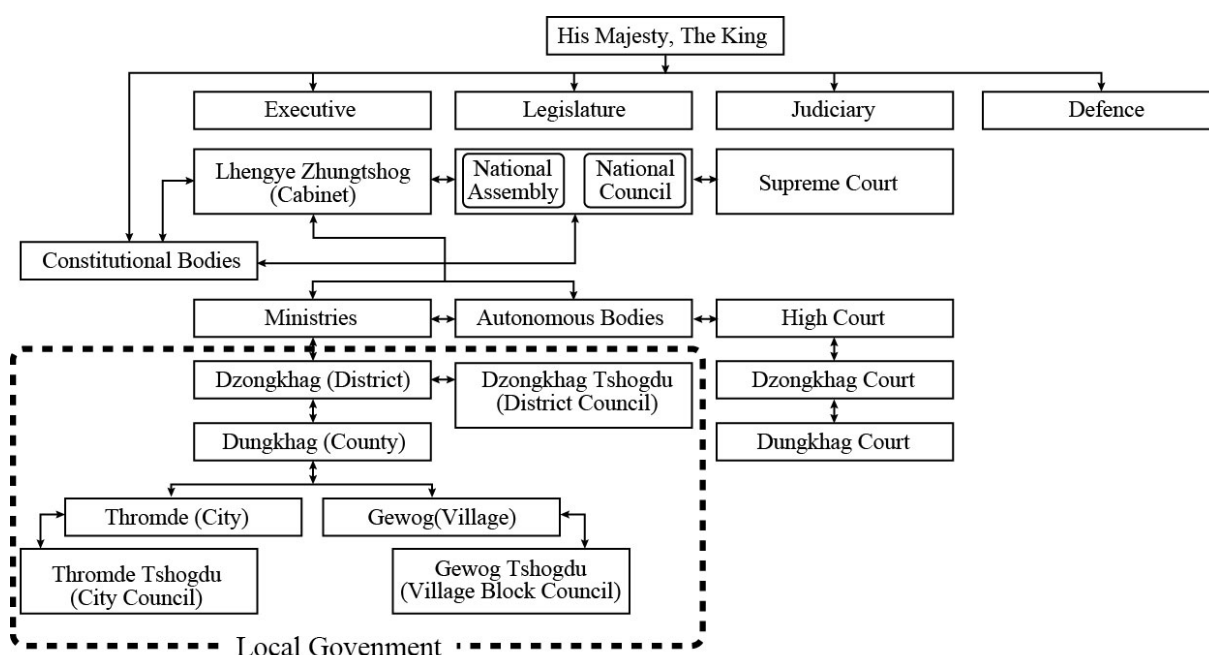
Source: Statistical Yearbook of Bhutan 2016

Figure 8.1.1   Organogram of the Royal Government of Bhutan

The roles and functions of local government are shown in Table 8.1.1. The Tshogdu of a Dzongkhag, Gewog or thromde has the right to prepare regulations and plans. A Tshogdu is also authorized to implement the proposed plans. In this sense, the local government of the Dzongkhag, Dungkhag, gewog and thromde is an organization for planning and implementation. Specifically, a thromde is responsible for town planning, permits for urban development and public services, including the water supply and solid waste management.

Table 8.1.1 Roles and Functions of Local Government

Organization	Roles and Functions
Dzongkhag	➢ Implement policies, plans and programmes of national government, the Dzongkhag and decisions of Dzongkhag Tshogdu ➢ Manage human resource of Dzongkhag (preparation of human resource development Plan, nomination of Staffs for conferences, etc.) ➢ Coordinate between Dzongkhag, national agencies, regional offices, Dzongkhag Tshogdu, Gewog Tshogde, and Thromde Tshogde, including provision of technical backstopping to Gewog
Dzongkhag Tshogdu	➢ Regulate the pollution and environmental degradation ➢ Protection of cityscape (Regulation of advertisements) ➢ Regulate content of broadcasting and telecasting within the Dzongkhag ➢ Regulate harmful substances (Distillery products, drugs, gambling activities, etc.) ➢ Review and endorse Dzongkhag five-year plans for submission to the Royal Government ➢ Approve Dzongkhag annual plans, and monitor, evaluate and ensure implementation of plan activities in the Dzongkhag ➢ Review, re-appropriate and approve Dzongkhag's annual budget proposal prepared by the Dzongkhag Administration ➢ Review accounts of Dzongkhag Administration ➢ Issue clearance for the establishment of mines and quarries
Dungkhag	➢ Support their constituent Gewog Administrations ➢ *Although Dungkhag is no longer legal administrative division, because of the repeal of the Local Government Act of 2007, it remains judicial and law enforcement jurisdictions under the Constitution.*
Thromde	➢ Provide services such as water supply, sewerage services, solid waste management, drains, animal control, plantation, and other services including the disposal of unclaimed bodies and protect such properties ➢ Conduct urban planning (Preparation of structure plans and local area plan including land pooling scheme, promotion of planned development and land use, control/regulation of unplanned development, etc.) ➢ Approve building permit and land transactions (Registration of property, issue and renew occupancy certificate) ➢ Protect city's environment (prevention of pollution and regulation/protection of parks, trees and plantations, etc.) ➢ Levy and collect taxes duties, tolls, and fees ➢ Organize relief measures for natural disasters and emergencies ➢ Prepare annual budget for its operations and manage its finances ➢ Manage affairs of the Dzongkhag Thromde and interact on matters concerning the development and overall governance of the Dzongkhag Thromde with the relevant agencies
Thromde Tshogdu	➢ Regulate advertisements ➢ Regulate and enforce land use and building activity in the Dzongkhag Thromde in accordance with the approved plans ➢ Formulate guidelines for entertainment and recreational activities and venue ➢ Regulate and enforce appropriate land uses (Nonconforming land uses, vehicle repair workshops, squatter/illegal settlements and building and commercial activities) ➢ Review and approve the annual budget, and use its budget, grants, local fees, service charges, fines and taxes ➢ Levy and collect taxes (Land tax, property tax, property transfer tax, vacant land and underdevelopment tax, etc.)
Gewog	➢ Implement the annual plans and programmes approved by the Gewog Tshogde

	and the Government, and the resolutions of the Gewog Tshogde ➤ Provide necessary administrative, technical, managerial capacities and support to the Gewog Tshogde, including planning of five-year and annual plans
Gewog Tshogdu	➤ Formulate five-year plans of the Gewog and approve Gewog annual plans ➤ Promote area-based development planning and monitor, evaluate and ensure the implementation of the planned activities ➤ Regulate the local recreational areas, protection and harvesting of edible forest products in the community forest ➤ Regulate the construction (Maintenance of traditional architectural designs, structures within road right of way, illegal house in community/government land and forest) ➤ Manage community land, community forests, and protect historical site which are not part of custody of monastic body or central agencies ➤ Conserve and protect water sources and allocate safe and clean drinking water and irrigation water ➤ Prevent the depredation of crops by livestock and wildlife ➤ Monitor establishment and operation of mines and quarries ➤ Ensure collection and deposit of premiums for rural insurance and such schemes. ➤ Encourage setting up of economic enterprises within the Gewog ➤ Review and approve Gewog's annual budget and carry out re-appropriations within the Gewog budget ➤ Review accounts of all expenditures of Gewog and ratify; and approve the maintenance of development infrastructures ➤ Levy and collect taxes (Land tax, building tax, cattle tax, grazing tax, entertainment tax, advertisement tax other than advertisement in newspapers, print, radio and internet, etc.)

Source: The Local Government Act 2009

Table 8.1.2   Basic Information on the 20 Dzongkhags (2015)

ID	Dzongkhag	District Capital	Population	Area (km²)	No. of Dungkhags	No. of Gewogs	Region
1	Bumthang	Jakar	17,820	2,667.76	0	4	Central-Eastern
2	Chhukha	Phuentsholing	68,966	1,879.32	1	11	Western
3	Dagana	Dagana	24,965	1,722.57	1	14	Central-Western
4	Gasa	Gasa	3,952	3,075.08	0	4	Central-Western
5	Haa	Haa	13,655	1,864.75	1	6	Western
6	Lhuentse	Lhuentse	14,437	2,808.53	0	8	Eastern
7	Monggar	Monggar	37,150	1,944.95	1	17	Eastern
8	Paro	Paro	46,316	1,250.71	0	10	Western
9	Pemagatshel	Pemagatshel	23,632	1,022.14	1	11	Eastern
10	Punakha	Punakha	28,740	1,109.81	0	11	Central-Western
11	Samdrupjongkhar	Samdrupjongkhar	35,079	1,877.93	2	11	Eastern
12	Samtse	Samtse	62,590	1,305.18	2	15	Western
13	Sarpang	Gelephu	46,004	1,666.15	1	12	Central-Eastern
14	Thimphu	Thimphu	138,736	1,748.58	1	8	Western
15	Trashigang	Trashigang	45,518	2,204.21	3	15	Eastern
16	Yangtse	Yangtse	17,300	1,449.26	0	8	Eastern
17	Trongsa	Trongsa	19,960	1,822.13	0	5	Central-Eastern
18	Tsirang	Damphu	22,376	638.29	0	12	Central-Western
19	Wangduephodrang	Wangdue	42,186	3,920.33	0	15	Central-Western
20	Zhemgang	Zhemgang	17,763	2,416.20	1	8	Central-Eastern
	Total		727,145	38,393.88	15	205	-

Source: Population: Annual Dzongkhag Statistics 2016, Area: Statistical Year Book 2016, Dungkhags/Gewogs: Dzongkhags at a Glance 2016

8.2   Problems, Potential and Constraints of the 20 Dzongkhags

For the purpose of analysing the Dzongkhags, the Ministry of Economic Affairs (MoEA) developed a SWOT analysis model in the "Dzongkhag-Wise Inventory of Resources – Bhutan". This SWOT analysis model aims to clarify the resource inventories of each Dzongkhag and to eliminate regional distortions in the national analysis. Table 8.2.1 shows the criteria for Strengths, Weaknesses, Opportunities and Threats. Since this analysis was based not only on regional resource inventories and statistical data, but also on interviews with relevant authorities, it is not only quantitative but also qualitative. From that reason, it would appear useful to apply this SWOT analysis to considering the characteristics of Dzongkhags, including their problems, potential and constraints, for the Comprehensive National Development Plan 2030. In order to update the analysis, the 11th Five-Year Plan will be reviewed and updated inventories of each Dzongkhag's Strengths and Weaknesses will be categorized according to the nine GNH domains to characterize the Dzongkhags in each section of this report. Descriptions from the 11th Five-Year Plan will be italicized in Tables 8.2.2 to 8.2.21. Although the inventories often involve several domains, they will be categorized into one representative domain for the purpose of characterizing the Dzongkhags.

Table 8.2.1   SWOT Analysis Model of the "Dzongkhag-Wise Inventory of Resources – Bhutan"

Strengths	Weaknesses
➢ Competitive advantages ➢ USPs (unique selling points) ➢ Resources, infrastructure and people ➢ Marketing - reach, distribution and awareness ➢ Innovative aspects ➢ Location and geography ➢ *Land Availability* ➢ *Transportation network* ➢ *Natural resources (forest, agriculture, animals and plants, mineral, water, etc.)* ➢ Processes, systems, IT and communications ➢ Culture, attitudes, behaviours	➢ Competitive disadvantages ➢ Lack of competitive strength ➢ Own known vulnerabilities ➢ Lack of infrastructure and research ➢ Lack of continuity and supply chain robustness ➢ Effect on core activities and distractions
Opportunities	**Threats**
➢ Market development ➢ Competitors' vulnerabilities ➢ Industry or lifestyle trends ➢ Technological development and innovation ➢ Global influences ➢ New markets (vertical/horizontal) ➢ Niche target markets ➢ Geographical location for imports and exports ➢ New USPs ➢ Business and product development ➢ Information and research ➢ Partnerships, agencies and distribution ➢ Volumes, production and economies ➢ Seasonal climate, weather, fashion influences	➢ Political effects ➢ Environmental effects ➢ IT developments ➢ Geographical competitors ➢ Market demand ➢ New technologies, services and ideas ➢ Sustaining internal capabilities ➢ Obstacles faced ➢ Sustainable financial backing ➢ Seasonality, effects of weather

Source: Dzongkhag-Wise Inventory of Resources - Bhutan

Table 8.2.2   SWOT Analysis of Bumthang

Strengths		Weaknesses
Education	➢ Excellent education infrastructure	➢ Lack of vocational training institutes
Health	➢ Excellent health infrastructure ➢ Adequate water supply	
Living Standards	➢ Good social infrastructure ➢ Existing industrial base ➢ Availability of plain land	➢ Lack of developed industrial area ➢ Lack of microfinance ➢ Inconsistent power supply ➢ Lack of internet connectivity ➢ High transportation costs ➢ Lack of skilled manpower ➢ *Lack of storage and marketing facilities for agricultural products*
Ecological Diversity and Resilience	➢ Excellent weather (called the Switzerland of Bhutan)	
Time Use	➢ Good road connectivity	
Cultural Diversity	➢ Spiritual heartland of Bhutan	
Psychological Wellbeing		
Community Vitality	➢ Strong cooperative base	
Good Governance		➢ Lack of institutional support for new entrepreneurs
Opportunities		**Threats**
➢ Development of cultural and spiritual tourism ➢ Local handloom and textile industry ➢ Agro-processing and organic produce ➢ Entrepreneurial zeal in the local population ➢ Business Process Outsourcing (BPO) and IT industries ➢ Cyber cafes ➢ Provision of institutional and service support to local industries and enterprises like insurance, banking, international trade, etc. ➢ Natural healing and meditation centre ➢ Starred hotels and tourist facilities		➢ Industrial development may disturb the strong agricultural base and natural ambience ➢ Sensitive balance required between development and available resources ➢ *Loss of crops to wildlife* ➢ *Very cold winters and snowfalls*

Source: Dzongkhag-Wise Inventory of Resources - Bhutan, 11th Five-Year Plan

Table 8.2.3   SWOT Analysis of Chhukha

	Strengths	Weaknesses
Education	➢ Well-established education infrastructure	
Health	➢ Well-established health infrastructure ➢ Adequate power and water supply	➢ Lack of waste/effluent disposal facilities
Living Standards	➢ Economically well-developed *(high mean annual household income and low unemployment rates)* ➢ Main trade route with India ➢ Rich mineral deposits ➢ Hydropower generation *(Bunakha, Ammochhu, Wangchu)* ➢ Existing industrial estate with developed infrastructure that can support further growth *(dry port in Phuentsholing)* ➢ *Rich reserve of agricultural, livestock and horticultural products*	➢ Weak infrastructure to support the main trade route with India ➢ *Shortage of farm labour* ➢ *Lack of storage and marketing facilities for agricultural products*
Ecological Diversity and Resilience		➢ Big disparities in terrain altitude ➢ *Risk of earthquake, landslide and flood*
Time Use	➢ Excellent road connectivity	➢ Some Gewogs are remote and relatively poor
Cultural Diversity		
Psychological Wellbeing		➢ Lack of entrepreneurial spirit in the local population
Community Vitality		
Good Governance	➢ Agriculture Extension Centre ➢ Livestock Extension Centre ➢ RNR Extension Centre	
Opportunities		**Threats**
➢ Services to support heavy industrial activities ➢ Tourist circuits and innovative tourist products ➢ Hydropower generation and maintenance services ➢ International education and BPO hub ➢ Non-wood resources to support the production of fragrant and aromatic products ➢ Availability of wood can sustain wood-based industries ➢ Rich mineral base ➢ IT and BPO services ➢ *Formation of farmers' groups/cooperatives*		➢ Cheap products and services from India ➢ Marginal forest cover may be threatened by further land development ➢ *Human-wildlife conflicts*

Source: Dzongkhag-Wise Inventory of Resources - Bhutan, 11th Five-Year Plan

Table 8.2.4   SWOT Analysis of Dagana

	Strengths	Weaknesses
Education		➢ Lack of vocational training institutes ➢ *Low general literacy rate*
Health	➢ Availability of water	
Living Standards	➢ Good area for growing cash crops *(e.g., rice, vegetables, mandarins, cardamom, etc.)* ➢ Livestock population *(dairy and meat)* ➢ Availability of land for industrial areas ➢ *Hydropower generation (Dagachhu, Sankosh)*	➢ Lack of skilled manpower ➢ Poor internet connectivity ➢ *Lack of storage and marketing facilities for agricultural products*
Ecological Diversity and Resilience		
Time Use		➢ Remote human settlements ➢ Connectivity with other Dzongkhags through Tsirang *(the Dagana-Tsirang highway is often closed during monsoon season)*
Cultural Diversity		
Psychological Wellbeing		➢ *Mismatch between supply and demand in terms of employment (high levels of unemployment and shortages in farm labour)*
Community Vitality		
Good Governance	➢ RNR extension centre	
Opportunities		**Threats**
➢ Plenty of non-wood resources *(e.g., pipla, thysolinia and cinnamon)* ➢ Adventure tourism *(birdwatching, trekking, farm stays, etc.)* ➢ Availability of wood logs ➢ Abundance of maize ➢ Surplus of milk and milk products ➢ Abundance of horticultural produce ➢ Minerals – potential for limestone and dolomite ➢ *Reliability of electricity supply as a result of the 126 MW Dagachhu Hydroelectric Project and the 2,560 MW Sankosh Hydroelectric Project*		➢ Natural calamities and landslides ➢ Migration of the young population ➢ *Human-wildlife conflicts*

Source: Dzongkhag-Wise Inventory of Resources - Bhutan, 11th Five-Year Plan

Table 8.2.5   SWOT Analysis of Gasa

	Strengths		Weaknesses
Education			➢ Poor primary school network
Health			➢ *Lack of access to health facilities*
Living Standards	➢ *High household income from non-agricultural products (cordyceps)*		➢ Shifting human settlements ➢ Wholesale trade from Thimphu ➢ Industrial activities non-existent ➢ *Poor access to grid electricity supply*
Ecological Diversity and Resilience	➢ Unique unspoiled environment ➢ Virgin territory ➢ *Rich flora and fauna found in Jigme Dorji Wangchuck National Park*		➢ Very cold climatic conditions
Time Use			➢ *Poor road network* ➢ Smaller and remotely scattered population
Cultural Diversity	➢ Unique local tradition and culture		
Psychological Wellbeing			➢ Year-round work not possible
Community Vitality			
Good Governance	➢ Agricultural Extension Centre ➢ Livestock Extension Centre ➢ RNR Extension Centre		
	Opportunities		Threats
➢ Unexplored tourism potential (hot mineral water springs) ➢ Tourism accommodation, trekking and camping facilities on the way to Gasa ➢ Good scope for the commercial cultivation of medicinal plants ➢ Handicraft souvenir items ➢ Spiritual and healing tourism clusters ➢ Availability of non-wood resources for the fabrication of spiritual fragrance and aromatic products			➢ Ethnic heritage may be lost with indiscriminate development ➢ Lack of primary education may limit the development of the Dzongkhag

Source: Dzongkhag-Wise Inventory of Resources - Bhutan, 11th Five-Year Plan

Table 8.2.6   SWOT Analysis of Haa

	Strengths	Weaknesses
Education	➢ *Good education coverage, with secondary, primary and community schools*	
Health		
Living Standards	➢ Reasonably good infrastructure	➢ Wholesale trade is managed from Paro ➢ Economic activity restricted to sawmilling and a small retail trade ➢ Low population to support development ➢ *Lack of storage and marketing facilities for agricultural products*
Ecological Diversity and Resilience	➢ Unexplored and virgin area recently opened up to visitors in 2002 ➢ Beautiful natural surroundings and dense forest area ➢ Access to China through Tibet	➢ *Cultivable agricultural land only makes up around 2% of the total area of the Dzongkhag*
Time Use	➢ Reasonably good road connectivity	
Cultural Diversity		
Psychological Wellbeing		
Community Vitality		➢ Small population
Good Governance	➢ RNR Extension Centre	➢ Non-existent institutional support and financing for microenterprises
	Opportunities	**Threats**
➢ Excellent potential for organic cultivation ➢ Good potential for milk processing ➢ Potential for a higher education centre ➢ Ideal for biotechnology and IT centres ➢ Potential to exploit mineral/spring water ➢ *Potential for community-based tourism with nature, outdoor sports, religious and cultural sites, etc.*		➢ Cheap products from China could discourage local production ➢ *Human-wildlife conflicts*

Source: Dzongkhag-Wise Inventory of Resources - Bhutan, 11th Five-Year Plan

Table 8.2.7   SWOT Analysis of Lhuentse

Strengths		Weaknesses
Education		
Health	➢ Adequate water supply	
Living Standards	➢ Power supply infrastructure in place	➢ Limited agricultural activity ➢ Lack of hotels and tourism facilities ➢ Skilled manpower unavailable ➢ *Shortage of farm labour* ➢ *Limited economic opportunities and infrastructure facilities*
Ecological Diversity and Resilience	➢ Extremely good climatic conditions ➢ Rich flora and fauna in *National Parks (Wangchuck Centennial Park, Thrumshingla National Park)*	➢ Limited agricultural land
Time Use		➢ One of the most remote and inaccessible Dzongkhags
Cultural Diversity	➢ Ancestral home of the Wangchuck dynasty ➢ *Host of important religious sites and a reputation for Kishuthara textile weaving*	
Psychological Wellbeing		
Community Vitality		➢ Dispersed and remote human settlements
Good Governance		
Opportunities		Threats
➢ Mineral/spring water ➢ Tourism development ➢ Floriculture ➢ Hotel and tourism facilities ➢ Minerals like gold and hematite ➢ Limestone and marble exploration		➢ Migration of young people seeking jobs in other Dzongkhags ➢ Human-wildlife conflicts ➢ Forest fires

Source: Dzongkhag-Wise Inventory of Resources - Bhutan, 11th Five-Year Plan

Table 8.2.8   SWOT Analysis of Monggar

	Strengths		Weaknesses
Education	➢ Adequate education facilities		➢ *Lower general literacy rate than the national average*
Health	➢ Adequate health facilities *(regional referral hospitals)*		➢ Lack of waste disposal facilities ➢ *Water sources are drying up due to population growth and lack of irrigation*
Living Standards	➢ Good agricultural and horticultural base ➢ Power and water supply available in townships *(Kurichhu, Dorjilung)* ➢ Adequate tourism infrastructure, e.g., hotels ➢ Land identified as industrial area		➢ Skilled manpower unavailable ➢ Lack of internet connectivity ➢ *Small and fragmented landholdings* ➢ *Shortage of farm labour* ➢ *Lack of storage, distribution and marketing facilities for agricultural products*
Ecological Diversity and Resilience			
Time Use			
Cultural Diversity	➢ *Existence of many unique, age-old and traditional cultural festivals and practices*		
Psychological Wellbeing			
Community Vitality			➢ Villages are scattered and remotely located
Good Governance	➢ RNR Extension entre ➢ Good livestock support centre		➢ *Access to rural credit*
	Opportunities		Threats
➢ Herbal and cosmetic processing ➢ Agro-based industries *at Bondeyma* ➢ Fragrance and aromatic industries ➢ IT service units ➢ Wholesale warehouse and distributions network for Lhuentse and Bumthang ➢ Non-wood resources (lemongrass, honey etc.) ➢ Higher education ➢ Biodiesel ➢ *Development of Gyalpozhing-Nganglam highway and farm roads* ➢ *Development of 2,640 MW Kuri-Gongri Hydroelectric Project*			➢ Managing ecological balance due to increase in economic activities ➢ Migration of human resources ➢ *Human wildlife conflict*

Source: Dzongkhag-Wise Inventory of Resources - Bhutan, 11th Five-Year Plan

Table 8.2.9   SWOT Analysis of Paro

	Strengths	Weaknesses
Education	➢ Well-established education infrastructure	
Health	➢ Well-established health infrastructure ➢ Adequate water supply infrastructure	➢ *Shortage of water for drinking and irrigation purposes*
Living Standards	➢ Well-developed infrastructure ➢ International airport ➢ Proximity to the capital ➢ Good local market ➢ Availability of land ➢ Adequate power supply infrastructure ➢ *One of Bhutan's "food baskets" due to its fertile land and suitable terrain for growing cereals and vegetables*	➢ Low labour productivity ➢ Comparatively higher salary and wages ➢ Lack of infrastructure development ➢ *Shortage of farm labour* ➢ *Lack of storage, distribution and marketing facilities for agricultural products*
Ecological Diversity and Resilience	*Rich in Graphite, Marble*	
Time Use	➢ Well-connected to Thimphu and other adjoining Dzongkhags ➢ *Paro International Airport*	
Cultural Diversity	➢ *Many historical and cultural attractions (Dzongs, Taktshang Monastery, etc.)*	
Psychological Wellbeing		
Community Vitality		
Good Governance	➢ RNR Extension Centre	➢ Lack of institutional support for microenterprises
	Opportunities	Threats
	➢ As Thimphu market is not very far away, there are good opportunities for agricultural production and post-harvest processing ➢ Potential for produce/products to be exported by air ➢ Number of tourists to Bhutan is increasing annually, and all tourists coming to Bhutan touch down in Paro first without exception, creating tremendous opportunities for tourism-related services and trade ➢ Good scope for the holding of world conferences or seminars, Indian corporate meetings/annual conferences, etc. ➢ Wholesale trade centres in nearby Haa Dzongkhag ➢ *Increasing urban growth*	➢ Increasing municipal waste and lack of disposal methods ➢ Shortage of semi-skilled and skilled workers ➢ Sensitive balance required between development and natural resources ➢ *Pollution and congestion* ➢ *Human-wildlife conflicts*

Source: Dzongkhag-Wise Inventory of Resources - Bhutan, 11th Five-Year Plan

Table 8.2.10   SWOT Analysis of Pemagatshel

	Strengths	Weaknesses
Education		
Health		➢ Inadequate water supply
Living Standards	➢ Major, high-quality gypsum deposits ➢ Availability of flat land for industrial use ➢ Availability of power infrastructure	➢ Negligible wetland farming *(land fragmentation, poor land quality)* ➢ Wholesale trade is controlled from Samdrupjongkhar ➢ Lack of internet facilities ➢ *Shortage of farm labour* ➢ *Lack of storage and marketing facilities for agricultural products*
Ecological Diversity and Resilience		➢ *Steep and unstable terrain*
Time Use		➢ *One of the least developed and most remote Dzongkhags*
Cultural Diversity		
Psychological Wellbeing		
Community Vitality		
Good Governance		➢ Lack of institutional support like an RNR Extension Centre
	Opportunities	Threats
	➢ Gypsum- and limestone-based industries *(Dungsam Cement Project)* ➢ Possibilities for the cultivation and processing of value-added cash crops like cardamom, ginger, oranges and kadamb (a non-edible oil) ➢ Potential for eco-tourism, tourist routes and good quality tourist accommodation ➢ Biodiesel ➢ Horticultural units ➢ *Development of the Gyalpozhing–Nganglam highway and the Tsebar-Mikuri–Durungri feeder road* ➢ *Establishment of a regional hub at Nganglam* ➢ *Development of a new township at Rinchenthang*	➢ Migration of young and educated people to other Dzongkhags for jobs ➢ Sensitive balance required between development and available resources ➢ *Human-wildlife conflicts*

Source: Dzongkhag-Wise Inventory of Resources - Bhutan, 11th Five-Year Plan

Table 8.2.11   SWOT Analysis of Punakha

Strengths		Weaknesses
Education		
Health	➢ Availability of water	➢ *Shortage of water for both drinking and irrigation purposes*
Living Standards	➢ Availability of electricity	➢ Lack of skilled manpower and farm labour ➢ Wholesale trade is controlled from Wangduephodrang ➢ Lack of industry to support the development infrastructure ➢ Lack of internet connectivity ➢ *Lack of storage and marketing facilities for agricultural products*
Ecological Diversity and Resilience	➢ *Favourable location, soil and climatic conditions for agriculture*	
Time Use	➢ Well-connected with the capital, Thimphu, and Wangduephodrang	➢ Lack of internal service roads
Cultural Diversity	➢ Ancient capital of the country *(served as the winter capital until 1955)* ➢ *Winter residence for the Central Monastic Body* ➢ *Popular tourist destination with a dzong, hot springs, etc.*	
Psychological Wellbeing		
Community Vitality		
Good Governance	➢ Livestock Extension Centre ➢ RNR Extension Centre	
Opportunities		Threats
➢ Tremendous scope for greenhouse construction and high-value crop cultivation ➢ International educational hub ➢ Vocational training institute to support the availability of technically trained manpower ➢ Rural tourism route ➢ *Development of Punatsangchhu Hydroelectric Projects I and II*		➢ Industrial development may disturb the strong agricultural base ➢ *Human-wildlife conflicts* ➢ *Disaster preparedness and management*

Source: Dzongkhag-Wise Inventory of Resources - Bhutan, 11th Five-Year Plan

Table 8.2.12   SWOT Analysis of Samdrupjongkhar

	Strengths	Weaknesses
Education		
Health		
Living Standards	➢ One of the most economically developed eastern Dzongkhags ➢ Good mineral base ➢ Existing industrial and economic estates and activities ➢ Modern telecoms facility ➢ Warehouse and auction yards of the Food Corporation of Bhutan ➢ *Proximity to the Indian market* ➢ *Different crop varieties (cereal and vegetable production)*	➢ Lack of skilled manpower ➢ *Shortage of farm labour* ➢ *Lack of irrigation, storage, distribution and marketing facilities for agricultural products*
Ecological Diversity and Resilience	➢ Border route with India ➢ *Favourable climatic conditions and plain arable land* ➢ *Rich in Coal, Limestone*	➢ Rugged terrain and scattered settlements
Time Use	➢ Well-connected to other eastern Dzongkhags by road	➢ No direct access to Thimphu
Cultural Diversity		
Psychological Wellbeing		
Community Vitality		
Good Governance		➢ Lack of institutional support for microenterprises
Opportunities		**Threats**
➢ Agri-processing *(Motanga Industrial Estate)* ➢ Mineral-based industries ➢ Vocational training institutes ➢ Greenhouses and plastic sheds for the production of exotic vegetables for the Indian market ➢ Processing, packaging and export of organic produce ➢ IT parks, biotechnology, education, research and development in pharmaceuticals (medicinal plants) ➢ Wholesale trade ➢ Entertainment ➢ Cement and ready mixed concrete ➢ Eco-tourism ➢ *Construction of the Dewathang-Nganglam, Samdrup Choling-Samrang and Samrang-Jomotshangkha highways and the upgrading of the Samdrupjongkhar-Trashigang highway*		➢ Cheap products from across the border ➢ Sensitive balance required between demand and the available resources ➢ Long Indian border road used to access other Dzongkhags ➢ *Human-wildlife conflicts*

Source: Dzongkhag-Wise Inventory of Resources - Bhutan, 11th Five-Year Plan

Table 8.2.13   SWOT Analysis of Samtse

Strengths		Weaknesses
Education		➤ *Second lowest literacy rate in Bhutan*
Health	➤ *Good degree of health coverage, with most households having access to health facilities*	➤ *Shortage of drinking water*
Living Standards	➤ Close proximity to the Indian market ➤ Value-added agricultural and horticultural products (cash crops) ➤ Rich mineral deposits with major mineral-based industries *(limestone and dolomite)* ➤ Availability of power and water supplies ➤ Availability of industrial land ➤ *Opportunities for double cropping*	➤ *Shortage of farm labour* ➤ *Lack of storage, distribution and marketing facilities for agricultural products*
Ecological Diversity and Resilience	➤ *Warm climate and rich fertile land*	➤ Settlements in difficult terrains
Time Use		➤ The rest of the Dzongkhag can only be accessed through India
Cultural Diversity		
Psychological Wellbeing		➤ Relatively poor and underdeveloped Gewogs
Community Vitality		
Good Governance	➤ Livestock Extension Centre	➤ Non-existent institutional support for the development of microenterprises
Opportunities		Threats
➤ Greenhouse and plastic sheds for the production of off-season vegetables for the Indian market ➤ Bamboo and cane furniture and artefacts ➤ Availability of limestone and dolomite minerals ➤ Potential for the manufacture of fragrance and aromatic products (abundance of non-wood resources) ➤ *Development of the Dhamdhum Industrial Estate* ➤ Maize and rice are the main crops, offering scope for the development of processing industries ➤ Ginger and cardamom production offer scope for the processing of spice oleoresins ➤ *Construction of a new 40-bed hospital* ➤ *Completion of the Samtse-Phuentsholing highway*		➤ Cheap goods from India ➤ Access to the rest of Bhutan through India only ➤ Ecological balance between available resources and development ➤ *Human-wildlife conflicts*

Source: Dzongkhag-Wise Inventory of Resources - Bhutan, 11th Five-Year Plan

Table 8.2.14   SWOT Analysis of Sarpang

Strengths		Weaknesses
Education		➢ Lack of a vocational training institute
Health		
Living Standard	➢ Availability of industrial land (two existing industrial areas) ➢ Availability of human resources ➢ Adequate water and power supplies *(Tsirang- Jigmeling electricity transmission line)* ➢ Wholesale trade centre for supplying Dagana, Tsirang and Zhemgang ➢ *Road access to the Indian market* ➢ *Domestic airport in Gelephu* ➢ *Potential for the timber- and mineral-based industries* ➢ *Fertile agricultural land*	➢ Small-scale industrial activities ➢ Low-volume domestic market ➢ Lack of internet facilities ➢ *Lack of irrigation, storage and marketing facilities for agricultural products*
Ecological Diversity and Resilience	➢ Pleasant climate ➢ *Favourable terrain* ➢ *Rich in Tungsten and Limestone*	
Time Use	➢ *Domestic airport in Gelephu*	
Cultural Diversity	➢ Unique destination with unexplored resources ➢ Gateway to Manas National Park	
Psychological Wellbeing		
Community Vitality		
Good Governance	➢ RNR Extension Centre	
Opportunities		Threats
➢ Educational centres ➢ Agro-based industries *(Jigmeling Industrial Estate)* ➢ Value-added horticultural products through tissue culture and greenhouses for the Indian market ➢ Plenty of non-wood forest products for the aromatic and incense industries ➢ Abundance of livestock products ➢ Eco-tourism ➢ *Development of a new 150-bed hospital* ➢ *Development of dry port in Gelephu* ➢ *Upgrading of the domestic airport to international standard* ➢ *Completion of the Lamoizingkha-Sarpang and Gelephu-Panbang highways*		➢ Cheap products and services from India ➢ Security issues ➢ Sensitive balance required between development and rich biodiversity ➢ *Human-wildlife conflicts*

Source: Dzongkhag-Wise Inventory of Resources - Bhutan, 11th Five-Year Plan

Table 8.2.15   SWOT Analysis of Thimphu

	Strengths	Weaknesses
Education	➢ Higher education and vocational training institutes	
Health	➢ *Adequate health facilities (national referral hospitals)*	➢ Inadequate waste disposal systems ➢ *Water shortages*
Living Standards	➢ Well-developed infrastructure ➢ Good local market ➢ Good availability of land ➢ Relatively easy access to cheap skilled labour from India ➢ Affluent people with purchasing power ➢ Good IT infrastructure ➢ Capital city ➢ *Various opportunities for commercial agricultural production* ➢ *Potential for non-wood forest products (cordyceps, medicinal plants, matsutake, etc.)*	➢ Overcrowding of facilities and institutions ➢ Low labour productivity ➢ Comparatively higher salary and wages ➢ Expensive telecommunications services ➢ Slow and expensive courier services ➢ *Housing issues* ➢ *Lack of storage and marketing facilities for agricultural products*
Ecological Diversity and Resilience	➢ *Rich in Zinc and Marble*	➢ *Risk of earthquake, landslide and forest fire*
Time Use	➢ Well-connected with all other Dzongkhags	
Cultural Diversity		
Psychological Wellbeing		➢ *High unemployment rate* (young people disinclined to undertake physical labour)
Community Vitality		
Good Governance	➢ All government support offices ➢ Agricultural Extension Centres ➢ RNR Extension Centres ➢ Livestock Extension Centres	
Opportunities		**Threats**
➢ Huge local markets for agricultural produce, creating great opportunities for post-harvest processing ➢ Preference for non-vegetable food items ➢ Creation of tourism-related services and trade due to the increase of tourists to Bhutan ➢ IT and outsourcing services ➢ Main trade centre and a centre for wholesale trade distribution to other Dzongkhags ➢ *Construction of a new 40-bed district hospital, a Public Health Laboratory, a National Rehabilitation Resource Centre, permanent craft bazaar, etc.*		➢ Shortage of skilled and unskilled manpower ➢ High level of labour mobility ➢ Environmental degradation due to rapid urbanization ➢ Young people's job aspirations do not match their commensurate qualifications ➢ Expatriate labour population ➢ *Human-wildlife conflicts*

Source: Dzongkhag-Wise Inventory of Resources - Bhutan, 11th Five-Year Plan

Table 8.2.16   SWOT Analysis of Trashigang

	Strengths	Weaknesses
Education	➢ Educational and vocational training institutions	
Health		➢ Lack of waste disposal facilities ➢ *Shortage of water for both drinking and irrigation purposes*
Living Standards	➢ Largest Dzongkhag in the country ➢ Potential for industrial growth/development ➢ Power supply infrastructure in place ➢ *Domestic airport in Yonphula*	➢ Inadequate hotel and tourism facilities ➢ Lack of developed industrial areas ➢ *Shortage of farm labour* ➢ *Land fragmentation* ➢ *Lack of storage and marketing facilities for agricultural products*
Ecological Diversity and Resilience	➢ *Many natural reserves with rich and varied flora and fauna*	
Time Use	➢ Good road connectivity with other Dzongkhags ➢ *Domestic airport in Yonphula*	
Cultural Diversity	➢ *Number of cultural and religious attractions* ➢ *Known for the traditional skills of weaving and dyeing*	
Psychological Wellbeing		
Community Vitality		➢ Dispersed and remote human settlements
Good Governance		
	Opportunities	Threats
	➢ Tourism-related infrastructure ➢ Limestone-based industries ➢ Educational institutions (*development of a regional hub in Kanglung)* ➢ IT-enabling service industry ➢ Wholesale trade centre (warehouse) ➢ Entrepreneurial zeal among the local population ➢ *Widening of the Trashigang and Samdrupjongkhar highways and the development of a road to connect Gewogs at Merak and Sakteng* ➢ *Establishment of farmers' groups/cooperatives*	➢ Migration of young educated population ➢ Environmental degradation due to the dense population ➢ *Human-wildlife conflicts*

Source: Dzongkhag-Wise Inventory of Resources - Bhutan, 11th Five-Year Plan

Table 8.2.17   SWOT Analysis of Yangtse

	Strengths	Weaknesses
Education		
Health		
Living Standards	➢ Adequate availability of water ➢ *Abundance of cordyceps* ➢ *Hydropower generation (Kholongchhu)*	➢ Lack of tourism facilities and amenities ➢ Virtually non-existent industrial climate/culture ➢ Limited cultivable land *(land fragmentation)* ➢ Higher transportation costs ➢ Frequent power cuts ➢ *Shortage of farm labour* ➢ *Lack of irrigation, storage and marketing facilities for agricultural products*
Ecological Diversity and Resilience	➢ Wildlife Sanctuary ➢ Excellent climate	
Time Use	➢ Most Gewogs are connected via feeder roads	➢ Difficult connectivity with other parts of the country
Cultural Diversity	➢ Numerous tourism attractions like religious monuments, monasteries, etc. ➢ *Known for the production of traditional handicrafts (Dapa and Desho)*	
Psychological Wellbeing		
Community Vitality		
Good Governance		➢ Lack of institutional support
	Opportunities	**Threats**
	➢ Cooperative-based market for agricultural produce ➢ Skilled craftsmen to make wooden artefacts ➢ Bamboo and cane resources ➢ Untapped cultural and natural tourism ➢ Creativity, design and souvenir cottage industry ➢ Bamboo, cane, mask-making, souvenir items ➢ Eco-tourism and tourism circuits ➢ Potential for the international festival of Chorten Kora ➢ *Development of tourist accommodation and facilities* ➢ *The 600 MW Kholongchhu Hydroelectric Project*	➢ Sensitive balance required between development and the preservation of cultural heritage ➢ Wildlife Sanctuary at Bumdeling, which attracts black-necked cranes, must be balanced with industrial development ➢ Migration of young people due to the lack of availability of local job opportunities ➢ *Human-wildlife conflicts*

Source: Dzongkhag-Wise Inventory of Resources - Bhutan, 11th Five-Year Plan

Table 8.2.18　SWOT Analysis of Trongsa

	Strengths	Weaknesses
Education	➢ Adequate education coverage	
Health	➢ Adequate health coverage	➢ *Water shortages*
Living Standards	➢ Horticulture and floriculture ➢ *Hydropower generation (Nikachhu, Mangdechhu)*	➢ Higher transportation costs ➢ Inadequate and unreliable power supply ➢ Lack of skilled manpower ➢ Lack of internet facilities ➢ Lack of developed industrial areas ➢ *Shortage of hospitality and other tourist facilities and services* ➢ *Small and fragmented landholdings* ➢ *Shortage of farm labour* ➢ *Lack of irrigation, storage and marketing facilities for agricultural products*
Ecological Diversity and Resilience	➢ Suitable climatic conditions for agriculture and livestock ➢ Located in central Bhutan	➢ Rugged terrain
Time Use		➢ Lack of internal roads
Cultural Diversity	➢ The formal investiture of the Crown Prince of Bhutan as the Trongsa Penlop ➢ *Numerous cultural and religious heritage structures and sites*	
Psychological Wellbeing		
Community Vitality		➢ Remote settlements
Good Governance	➢ RNR Extension Centre	
Opportunities		**Threats**
➢ Activated carbon ➢ Tissue culture ➢ Research and development in pharmaceuticals (medicinal plants) ➢ Wholesale trade warehouse facility for supplying neighbouring Dzongkhags ➢ Central point of Bhutan, excellent opportunity for growth in eco-tourism and tourism circuits ➢ International education institutions ➢ Agro-processing industries ➢ Cyber cafes ➢ *Development of hotel and tourist facilities* ➢ *The 720 MW Mangdechhu Hydroelectric Project*		➢ Sensitive balance required between demand and available resources ➢ Waste disposal facilities ➢ *Human-wildlife conflicts*

Source: Dzongkhag-Wise Inventory of Resources - Bhutan, 11th Five-Year Plan

Table 8.2.19   SWOT Analysis of Tsirang

Strengths		Weaknesses
Education		➢ Lack of vocational training institutes
Health	➢ Availability of water supply (There exists 103 schemes for water supply)	➢ *Shortage of water for both drinking and irrigation purposes in dry season* ➢ *Lack of solid waste management*
Living Standards	➢ Local marketable skills ➢ Area for growth of cash crops *(oranges, cardamom and vegetables)* ➢ Good livestock population *(poultry, pigs and fish)*	➢ Power supply only available in the town of Damphu ➢ Lack of internet facilities ➢ *Lack of infrastructure (farm roads, market sheds, etc.)*
Ecological Diversity and Resilience		
Time Use	➢ Good internal road network ➢ Existing transportation network between Thimphu, Phuentsholing and Dagana	
Cultural Diversity		
Psychological Wellbeing		
Community Vitality	➢ Strong cooperative base (several cooperatives operational in various economic sectors) ➢ Entrepreneurial zeal in the local population	➢ Dispersed and remote human settlements
Good Governance		
Opportunities		**Threats**
➢ Tremendous scope for low-volume, high-value projects like IT, education, research and development in pharmaceuticals (medicinal plants), creativity and the design industry ➢ Warehouse for wholesale trade to Dagana and Wangduephodrang ➢ IT hub with broadband internet facilities ➢ Floricultural and horticultural commercial development ➢ Tourist accommodation and services ➢ *Development of new tourism products* ➢ *Completion of an electricity transmission line between Basochhu and Tsirang and the commissioning of the Dagachhu Hydroelectric Project*		➢ Marginal forest cover; large-scale industrial activity can affect forest cover and lead to the degradation of land ➢ *Human-wildlife conflicts*

Source: Dzongkhag-Wise Inventory of Resources - Bhutan, 11th Five-Year Plan

Table 8.2.20 SWOT Analysis of Wangduephodrang

	Strengths	**Weaknesses**
Education	➢ Good education facilities	➢ Lack of professional/technical training institutions
Health	➢ Good health facilities	➢ *Water shortages*
Living Standards	➢ Agricultural practice of double cropping ➢ Existing industrial and manufacturing activities ➢ Mineral deposits	➢ Lack of skilled manpower ➢ Poor local market ➢ Poor internet connectivity ➢ *Small and fragmented landholdings* ➢ *Shortage of farm labour* ➢ *Lack of storage and marketing facilities for agricultural products*
Ecological Diversity and Resilience	➢ National Parks and biodiversity *(Jigme Dorji Wangchuck National Park, winter roosting place for black-necked cranes, etc.)* ➢ Rich pasture land ➢ *Pleasant climate in the spring, autumn and winter* ➢ *Rich in Marble and Slate*	➢ *Risk of earthquake, GLOF and forest fire*
Time Use	➢ Good internal road network	
Cultural Diversity	➢ *Many historical monuments, heritage structures and local events*	
Psychological Wellbeing		
Community Vitality		➢ Villages are scattered
Good Governance	➢ Agricultural Extension Centre ➢ Livestock Extension Centre ➢ RNR Extension Centre	
Opportunities		**Threats**
➢ Ideal for tissue culture and biotechnology projects ➢ Ideal for food crafts and the mechanization of agriculture ➢ Untapped tourism potential; tremendous scope for low-volume, high-value projects like IT, education, research and development in pharmaceuticals (medicinal plants), creativity and the design industry ➢ Tourist accommodation and facilities ➢ Potential for new tourism products like ballooning, cycling and windsurfing ➢ *Reconstruction of the old Dzong* ➢ *Construction of Punatsangchhu Hydroelectricity Projects I/II*		➢ Any industrial development based on mineral deposits or other natural resources may affect the ecological balance ➢ *Human-wildlife conflicts* ➢ *Loss of agricultural land to urbanization*

Source: Dzongkhag-Wise Inventory of Resources - Bhutan, 11th Five-Year Plan

Table 8.2.21   SWOT Analysis of Zhemgang

	Strengths	Weaknesses
Education	➢ Education infrastructure supported by the ISDP programme	
Health	➢ Health infrastructure supported by the ISDP programme	➢ *Water shortages*
Living Standards	➢ Strong agricultural and forest base ➢ Abundance of bamboo and cane ➢ Hydropower generation *(Chamkharchhu)* ➢ Existence of cottage industries	➢ Wholesale trade is controlled by other Dzongkhags ➢ Poor physical infrastructure ➢ Virtually non-existent industrial climate/culture ➢ Shortage of skilled or unskilled manpower ➢ Lack of hotels and tourist facilities ➢ *One of the most vulnerable Dzongkhags in terms of food security* ➢ *Lack of irrigation, storage and marketing facilities for agricultural products*
Ecological Diversity and Resilience	➢ Wildlife corridor made up of Royal Manas National Park, Jigme Singye Wangchuck National Park and Thrumshingla National Park	
Time Use		➢ Weak road access
Cultural Diversity		
Psychological Wellbeing		
Community Vitality		➢ Dispersed and remote human settlements
Good Governance	➢ RNR Extension Centre	➢ Lack of institutional support
	Opportunities	**Threats**
	➢ Bamboo and cane products ➢ Potential for wood-based industries ➢ Agro-processing ➢ Potential for handicraft tourism ➢ *Development of tourism products (community-based tourism, adventure sports and bird-watching)* ➢ Horticulture, floriculture and tissue culture ➢ *Construction of the Panbang-Nganglam highway, the Gomphu–Panbang highway, the Manmung–Digala highway and the improvement of the Tingtibi-Praling highway* ➢ *Development of the 770 MW Chamkharchhu Hydroelectric Project*	➢ Wild animals *(human-wildlife conflicts)* ➢ Lack of opportunities for young educated people to earn their livelihoods, leading to migration ➢ Limited available land ➢ Limited market access

Source: Dzongkhag-Wise Inventory of Resources - Bhutan, 11th Five-Year Plan

8.3 Categorization of the 20 Dzongkhags

In order to accurately clarify the current status of each Dzongkhag, it is assumed that the Dzongkhags should be compared in order to list their comparative advantages/disadvantages. This comparison will contribute to the formulation of categories based on the characteristics of the Dzongkhags. In order to make this comparison, the inventories described in the SWOT analyses in Tables 8.2.1 to 8.2.21 will be counted according to the following rules and shown in radar charts.

- The basic status of each domain will start at 2.5 points
- Each Strength is counted as + 0.5 points
- Each Weakness is counted as – 0.5 points
- If the score adds up to more than five points, it will simply be counted as five; less than 0 points will also simply be counted as 0 points.

The score calculated for each of the GNH domains is shown in Table 8.3.1 and the Dzongkhags can be mainly placed into three categories as a result

Table 8.3.1   Score Calculated for each GNH Domain

	Bumthang	Chhukha	Dagana	Gasa	Haa	Lhuentse	Monggar	Paro	Pemagatsh	Punakha	Samdrupjo	Samtse	Sarpang	Thimphu	Trashigang	Yangtse	Trongsa	Tsirang	Wangduep	Zhemgang
Education	2.5	3.0	1.5	2.0	3.0	2.5	2.5	3.0	2.5	2.5	2.5	2.0	2.0	3.0	3.0	2.5	3.0	2.0	2.5	3.0
Health	3.5	3.0	3.0	2.0	2.5	3.0	2.0	3.0	2.0	2.5	2.5	2.5	2.5	2.0	1.5	2.5	2.5	2.0	2.5	3.0
Living Standards	0.5	4.0	3.0	1.0	1.0	0.5	2.0	3.0	1.5	0.5	4.5	4.5	4.0	3.5	1.5	0.5	1.0	2.5	1.0	1.0
Ecological Diversity and Resilience	3.0	1.5	2.5	3.5	3.5	3.0	2.5	3.0	2.0	3.0	3.5	2.5	4.0	2.5	3.0	3.5	3.0	2.5	4.0	3.0
Time Use	3.0	2.5	1.5	1.5	3.0	2.0	2.5	3.5	2.0	2.5	2.5	2.0	3.0	3.0	3.5	2.5	2.0	3.5	3.0	2.0
Cultural Diversity	3.0	2.5	2.5	3.0	2.5	3.5	3.0	3.0	2.5	4.0	2.5	2.5	3.5	2.5	3.5	3.5	3.5	2.5	3.0	2.5
Psychological Wellbeing	2.5	2.0	2.0	2.0	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.0	2.5	2.0	2.5	2.5	2.5	2.5	2.5	2.5
Community Vitality	3.0	2.5	2.5	2.5	2.0	2.0	2.0	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.0	2.5	2.0	3.0	2.0	2.0
Good Governance	2.0	4.0	3.0	4.0	2.5	2.5	3.0	2.5	2.0	3.5	2.0	2.5	3.0	4.5	2.5	2.0	3.0	2.5	4.0	2.5

(1) Category A: Low Living Standards and Other Average Domains

Bumthang, Haa, Lhuentse, Yangtse, Trongsa and Zhemgang have similarly shaped radar charts, which indicate a low score in living standards and approximately average scores in the other domains.

(2) Category B: High Living Standards and Other Average Domains

Chhukha, Samdrupjongkhar, Samtse and Sarpang have similarly shaped radar charts, which indicate a high score in living standards and an approximately average score in the other domains. These four Dzongkhags are all located in southern Bhutan, a relatively well-developed area.

(3) Category C: All Domains Well-Balanced

Monggar, Paro, Pemagatshel and Tsirang have similarly shaped radar charts, which indicate a

well-balanced score among all of the domains.

(4) Others

Other Dzongkhags, which do not fit into any of Categories A, B or C, are Dagana, Gasa, Punakha, Thimphu, Trashigang and Wangduephodrang. The existence of governmental organization Extension Centres means that Gasa, Punakha, Thimphu and Wangduephodrang scored relatively highly in good governance, but there are no similarities in the scores for other domains.
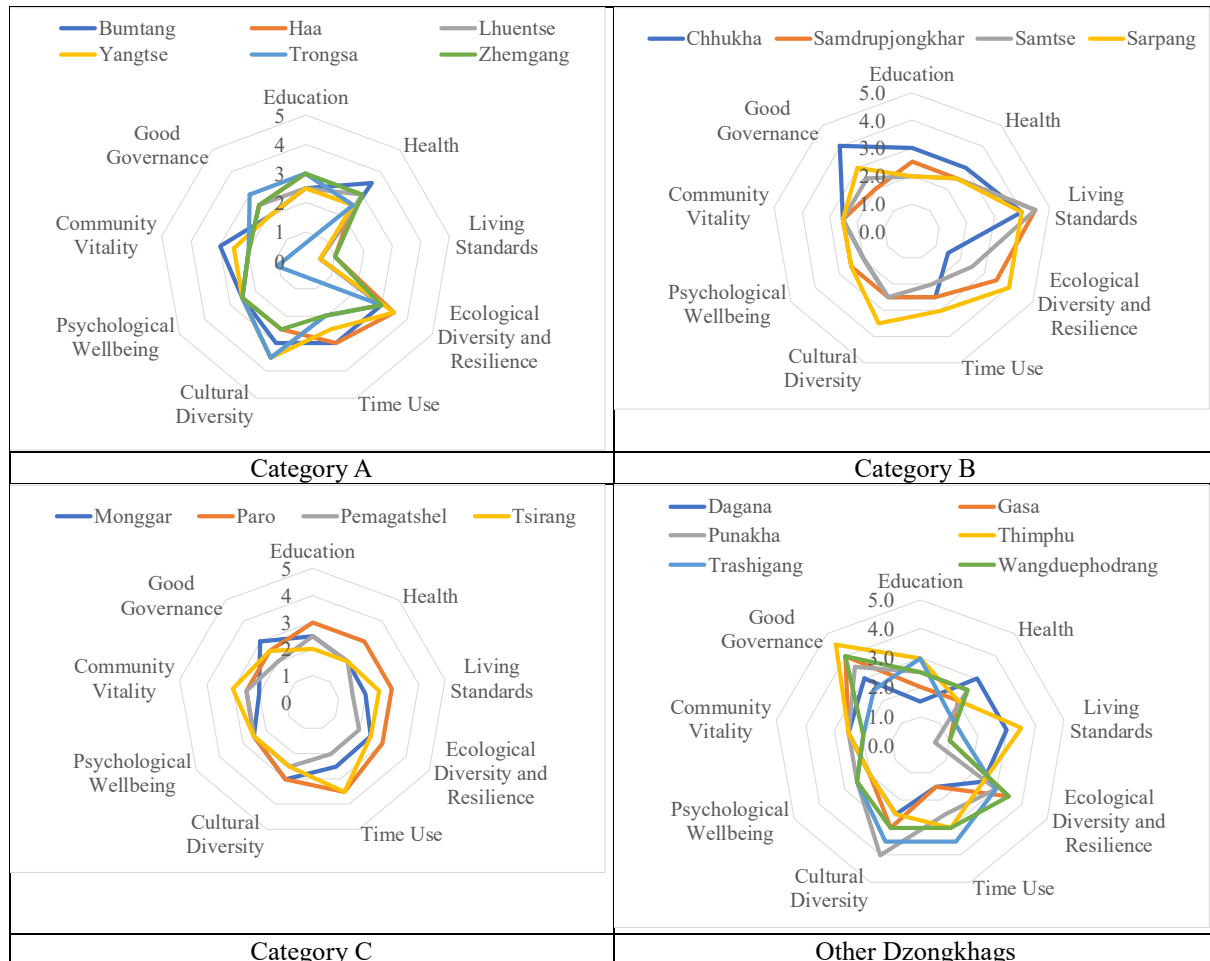
Figure 8.3.1   Radar Chart of Estimated Inventory Score

CHAPTER 9   DEVELOPMENT ISSUES IN BHUTAN

9.1   Development Issues by Sector

9.1.1   Projected Population of Bhutan and Dzongkhags by NSB

The NSB has estimated the population of the whole country every single year until 2047 and the population of each Dzongkhag every year until 2027 and every five years thereafter until 2047, based on the results of the PHCB 2017. According to the NSB's projections, the population of Bhutan is around 727,000 as of 2017 and will be 816,000 in 2030 and 884,000 in 2047, respectively (Table 9.1.1). Bhutan's average population growth rate between 2005 and 2017, between 2017 and 2030, and between 2032 and 2047, is decreased from 1.14% to 0.89% and 0.47%, respectively. This gradual decline of the growth rates is due to the low total fertility rate which is estimated at 1.9 children per woman in 2017, 1.7 in 2032, and 1.7 in 2047. These estimated total fertility rates are less than the minimum total fertility rate of 2.1 children per woman which is required to remain the population stable. The decreasing total fertility rate together with the life expectancy increasing from 69.1 years old in 2017 to 76.8 years old in 2047, the aged population group more than 65 years old enlarges its share to the total population from 5.9% to 13.4% until 2047. Yet, the projected population pyramid is deformed with the narrowed base of the population group below 44 years old (Figure 9.1.1).

Table 9.1.1   Projected Population of Bhutan (2017-2047)

Year	Population			Percent		
	Total	Male	Female	Total	Male	Female
2017	727,145	380,453	346,692	100.0	52.3	47.7
2023	770,276	401,092	369,184	100.0	52.1	47.9
2030	815,755	422,679	393,076	100.0	51.8	48.2
2047	883,866	452,779	431,087	100.0	51.2	48.8

Source: NSB, Population Projections Bhutan 2017-2047
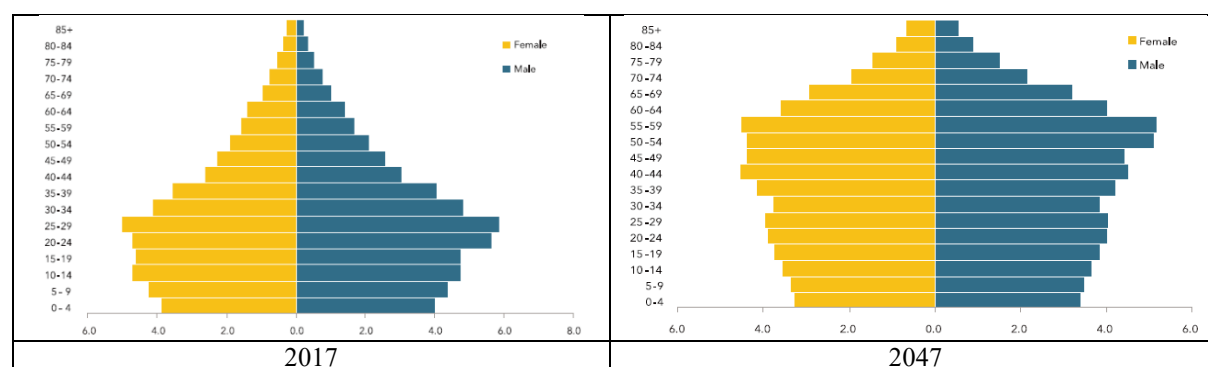
Source: NSB, Population Projections Bhutan 2017-2047

Figure 9.1.1   Age-Sex Population Pyramid of Bhutan in 2017 and 2047

According to the projected population, the urban population exceeds a half of the total population until 2037 (Table 9.1.2) and increased it share to the total population to 56.8% in 2047. Urban population will be more than a half million. Rural population, in contrast, continuously decreases from 452,000 to 382,000 in the next 30 years until 2047.

Table 9.1.2   Projected Population in Urban Areas and Rural Areas (2017-2047)

Year	Urban Population			Rural Population			Percent		
	Total	Male	Female	Total	Male	Female	Urban	Rural	Total
2017	274,967	143,855	131,112	452,178	236,598	215,580	37.8	62.2	100.0
2022	311,994	162,568	149,426	451,255	235,163	216,092	40.9	59.1	100.0
2027	350,892	182,174	168,718	446,372	231,776	214,596	44.0	56.0	100.0
2032	390,286	201,940	188,346	436,671	225,971	210,700	47.2	52.8	100.0
2037	429,009	221,249	207,760	422,167	217,750	204,417	50.4	49.6	100.0
2042	466,310	239,696	226,614	403,590	207,484	196,106	53.6	46.4	100.0
2047	501,848	257,067	244,781	382,018	195,712	186,306	56.8	43.2	100.0

Source: NSB, Population Projections Bhutan 2017-2047

Among the 20 Dzongkhags, the population of Thimphu amounts to 201,000 in 2032 and 263,000 in 2047 (Table 9.1.3). The share of this Dzongkhag to the total population becomes almost one-quarter of total population in 2032 and almost reaches to 30% in 2047. Thimphu (2.51%), Paro (1.83%) and Trongsa (1.66%) have the highest annual growth rate of all the Dzongkhags between 2017 and 2032, as compared to the national average of 0.86%. On the other hand, Lhuentse, Monggar, Samdrupjongkhar, Trashigang, Trashiyangtse and Zhemgang, have annual population growth rates below zero percent over the same period. Those Dzongkhags are located in Central-Eastern and Eastern Regions. The differences of growth rates are mainly caused by continued migration between the Dzongkhags. Figure 9.1.2 shows the projected population and annual growth rates of Dzongkhags in 2017 and 2032.

Table 9.1.3   Projected Population of Dzongkhag (2017-2047)

Dzongkhag	Projected Population			Annual Growth Rate (%/year)		Share to Total Population (%)		
	2017	2032	2047	2017~2032	2017~2032	2017	2032	2047
Bumthang	17,820	19,138	19,353	0.48	0.07	2.5	2.3	2.2
Chhukha	68,966	70,884	68,025	0.18	-0.27	9.5	8.6	7.7
Dagana	24,965	27,150	27,827	0.56	0.16	3.4	3.3	3.1
Gasa	3,952	5,006	5,932	1.59	1.14	0.5	0.6	0.7
Haa	13,655	14,001	13,399	0.17	-0.29	1.9	1.7	1.5
Lhuentse	14,437	11,616	7,288	-1.44	-3.06	2.0	1.4	0.8
Monggar	37,150	34,144	27,923	-0.56	-1.33	5.1	4.1	3.2
Paro	46,316	60,777	74,067	1.83	1.33	6.4	7.3	8.4
Pemagatshel	23,632	23,865	22,383	0.07	-0.43	3.2	2.9	2.5
Punakha	28,740	35,073	40,264	1.34	0.92	4.0	4.2	4.6
Samdrupjongkhar	35,079	34,072	30,320	-0.19	-0.77	4.8	4.1	3.4
Samtse	62,590	63,245	59,388	0.07	-0.42	8.6	7.6	6.7
Sarpang	46,004	56,753	65,774	1.41	0.99	6.3	6.9	7.4
Thimphu	138,736	201,203	263,152	2.51	1.81	19.1	24.3	29.8
Trashigang	45,518	36,216	22,110	-1.51	-3.24	6.3	4.4	2.5
Trashiyangtse	17,300	15,100	11,278	-0.90	-1.93	2.4	1.8	1.3
Trongsa	19,960	25,545	28,555	1.66	0.75	2.7	3.1	3.2
Tsirang	22,376	26,645	29,923	1.17	0.78	3.1	3.2	3.4
Wangduephodrang	42,186	51,724	56,840	1.37	0.63	5.8	6.3	6.4
Zhemgang	17,763	14,799	10,063	-1.21	-2.54	2.4	1.8	1.1
Bhutan	727,145	826,957	883,866	0.86	0.44	100.0	100.0	100.0

Source: NSB, Population Projections Bhutan 2017-2047
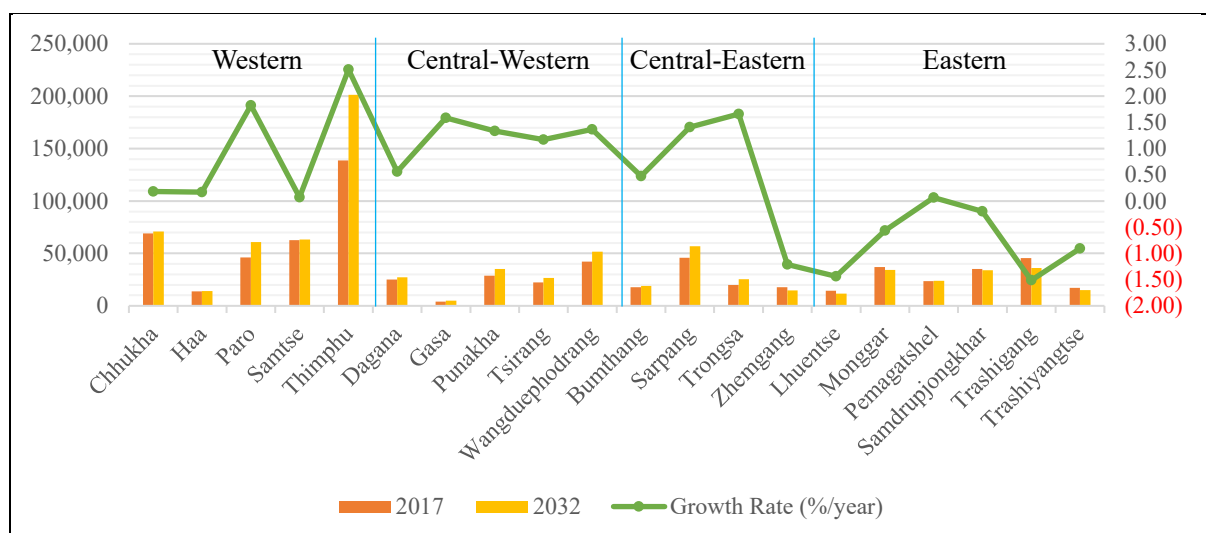
Source: NSB, Population Projections Bhutan 2017-2047

Figure 9.1.2   Projected Population and Annual Growth Rate of Dzongkhags (2017~2047)

9.1.2   Out-Migration and Possible Subsequent Changes in Rural Areas

Currently, out-migration from rural areas seems to be a serious phenomenon in many Dzongkhags. According to the population projection by the NSB, the age group over 65 years old has a large share of 18.1% in rural areas, higher than the national average (13.4%) for 2047, due to the out-migration of the productive population and youth population from rural areas. The share of the 0-14 years age group, in contrast, will decline to 15.8% in 2047. Figure 9.1.3 shows the estimated proportion by age group in rural areas and urban areas.
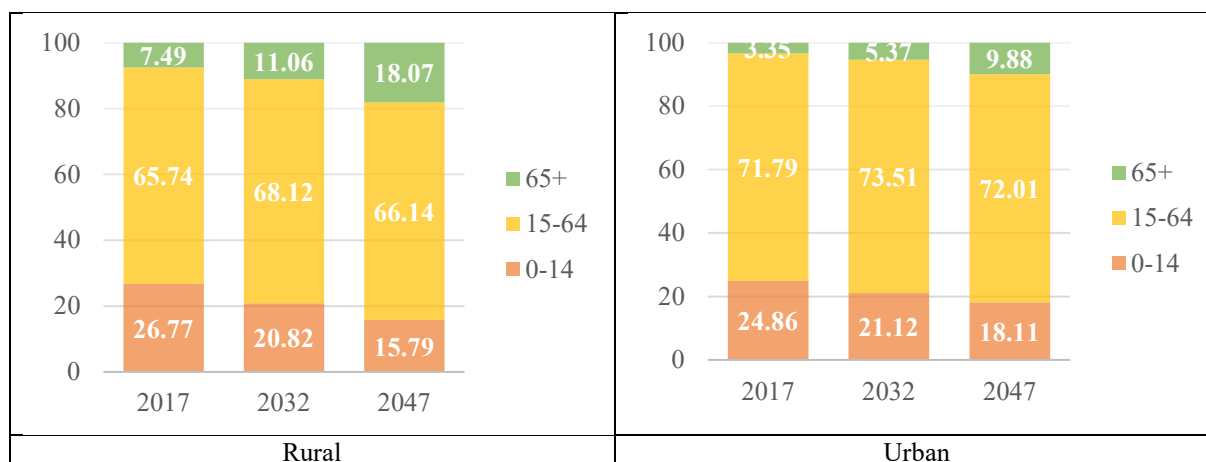
Source: NSB, Population Projections Bhutan 2017-2047

Figure 9.1.3   Broad Age-Group of Rural Population and Urban Population (2017~2047)

A continuous population decrease in rural areas may have a negative effect in several areas. Below are listed some of the possible consequences.

- Decrease in food production: With less farmers in rural areas, there is more uncultivated land. This means that less crops are produced, which in turn reduces food production. This may lead to a decline in food self-sufficiency.

- Less economic activity: In Bhutan, many people in rural areas are engaged in the primary industries (agriculture, forestry and livestock) and rural economies rely to a certain extent upon these productive activities. When the productive population decreases in rural areas, the economic activities that they perform also decrease.

- Severe living conditions: As the number of people living in rural areas decreases, those areas with a high level of human activity become smaller. As a result, the habitats of wild animals become larger and the current wildlife conflict increases in severity. In addition, with the increase of out-migration, there is less demand for commodities. This may result in the closure of some commercial businesses, which in turn means fewer shops to provide rural people with their various daily necessities.

- Deterioration of the local community: As people in rural areas out-migrate, human relationships in these areas become weaker. Because rural people are the main actors in many local events (such as festivals), it may be impossible to hold some of these events due to the shortage of human resources. Another result may be that local communal activities are reduced or cancelled due to the lessened population. These factors may accelerate the breakdown of local communities. Moreover, these negative effects on local communities may lead to the loss of traditionally inherited, specific local cultures.

- Consolidation of schools: As children in rural areas decrease, some schools may need to be consolidated with others. This may inconvenience some schoolchildren as they will have to travel further to go to school.

Box 9.1.1   Features of In-Migration in Bhutan

One of the features of out-migration in Bhutan is that out-migration from rural areas is happening in many Dzongkhags, while those Dzongkhags into which in-migrants are moving are relatively few. According to the government report Migration in Bhutan (Its Extent, Causes and Effects) 2013, MoAF, RGoB, Thimphu received one third (33.3%) of all in-migrants, followed by Chhukha (15.1%), Samtse (9.9%) and Sarpang (8.9%). Hence, two thirds of all in-migrants in Bhutan moved to the capital and three other Dzongkhags. This means that many out-migrants did not move into urban areas within their own Dzongkhag, but into urban areas in these four Dzongkhags. If this continues in the future, the population of many Dzongkhags will decrease considerably, which, in turn, will lead to less economic activity in each Dzongkhag.

9.1.3   Narrow Diversification in Economic Structure

(1) Limited Linkages among Economic Activities

According to the 11th Five-Year Plan (2013-2018), economic growth continues to be driven largely by government spending and investment. The industrial sector continues to be dominated by a few large state-owned enterprises, mostly under the umbrella of Druk Holding Investments (DHI), with the hydropower subsector constituting almost 20% of GDP. The manufacturing subsector accounts for only 20% of industrial output, and is narrowly concentrated in the food processing, mineral and metal industries. This lack of economic diversification has resulted in a situation where high growth rates are being driven by the hydropower sector without a commensurate increase in gainful employment for a rapidly growing and educated labour force, which poses significant macroeconomic challenges.

The 11th Plan focuses on creating an enabling, inclusive and sustainable environment for growth that will lead to self-reliance. In this regard, conditions and strategies will be explored that aim to facilitate the diversification of the economy into employment-intensive sectors with enormous potential for backward and forward linkage in the industrial sector.

The current situation of industry linkages in Bhutan is analysed through the use of an input-output table.

Figure 9.1.4 shows the current level of interindustry linkages or interindustry interdependence by the index of the power of dispersion (backward linkage) and the index of sensitivity (forward linkage), considering 15 sectors such as (1) agriculture, forestry and fishery products, (2) mining, (3) food and beverages, (4) clothing, (5) wood and paper products, (6) basic metals, fabricated metals and machinery, (7) other manufacturing, (8) electricity and Gas, (9) water, (10) construction services, (11) wholesale and retail trade, (12) transportation and communication, (13) finance and insurance, (14) real estate and other business services and (15) other services.

Backward and forward linkages are descriptive measures of the economic interdependence of industries in terms of the magnitude of their transactions. Linkages provide an estimate of the direct and indirect increase in output following an increase in final demand. An index of 1.0 or more indicates that the sector's transactions are higher than average.

All manufacturing sectors show strong backward linkages with other sectors, with an index of more than 1.0. In other words, these sectors have the potential to boost other sectors. Of these, the food and beverages and the basic metals, fabricated metals and machinery sectors have the highest index value, at 1.33. Other manufacturing sectors, which are mainly composed of ferrosilicon, cement and other mineral products, all have an index value of more than 1.0.

On the other hand, it should be noted that the backward linkages in the electricity, mining, trade and agricultural sectors are currently weak.

Sector	Backward Linkage Index	Forward Linkage Index
Agriculture and Forestry	0.69	0.76
Mining	0.93	1.26
Food and Beverages	1.33	0.64
Clothing	1.10	1.00
Wood and Paper Products	1.30	1.01
Basic Metals, Fabricated Metals and Machinery	1.33	1.00
Other Manufacturing	1.24	1.86
Electricity and Gas	0.76	1.22
Water	0.85	0.59
Construction Services	1.24	0.61
Wholesale and Retail Trade	0.80	0.78
Transportation and Communication	1.09	1.79
Finance and Insurance	0.66	0.92
Real Estate and Other Business Services	0.64	0.79
Other Services	1.03	0.75

Source: Based on the Bhutan Input-Output Tables 2007 by the Asian Development Bank

Figure 9.1.4   Interindustry Interdependence in Bhutan

(2) Constraints on Industrial Development

Bhutan does not have enough potential for large-scale industrial development due to several limitations and obstacles, such as its geographical conditions and landlocked environment, a small domestic market, deficient infrastructure (especially in transportation), high transportation costs, the lack of raw materials, the lack of technology, limited access to workers with the necessary skills and a mismatch between the demand for and supply of skills in the labour market. Compared to advanced neighbouring countries, Bhutan is not sufficiently competitive in the industrial sector.

The development potential of the mining sector is limited because the availability of precious minerals such as tungsten, copper, zinc and others is not yet clear. Areas in which the mineral industry could be developed are limited, since Bhutan has many natural Protected Areas. If precious minerals were available in sufficient quantities, it would take time to develop the sector and would require advanced excavation and processing technology. In addition, the price of the mineral resources depends highly on international market demand.

The development prospects of industrial estates might be limited because the neighbouring country of India could produce better products in terms of quality and quantity. Additionally, industrial estates are capable of producing commodities, but could not currently create differentiated products such as branded and high value-added products.

- At present, mineral development would only benefit a few people, and not local people. Minerals belong to the country and their benefits should be shared with the country, especially with local communities and people.
- It is difficult to produce value-added products in the mining sector at sufficiently competitive prices, mainly due to the limited availability of precious minerals, land suited to mining, transportation and technology.
- The problems of Cottage and Small Industries (CSI) are categorized into five aspects, namely limited access to finance, inadequate human resources, limited access to markets, limitations of land and infrastructure and inadequate enterprise support services.
- Each industrial estate produces similar products, which are not high value-added or sufficiently differentiated from the products made by other countries.

(3) Constraints on Tourism Development

The tourism sector has issues such as seasonality, the spread of tourism and tourists from specific countries. This clearly means that the tourism sector still has great development potential. However, tourist overconcentration would increase because there is only one international airport and low access from western areas. Additionally, the number of regional tourists would also increase, which would exceed the carrying capacity of Bhutan.

- According to 2015 statistics, tourist destinations are mostly concentrated in western Dzongkhags such as Paro, Thimphu, Punakha and Wangduephodrang, while northern and eastern Dzongkhags receive very few tourists. There is huge gap in terms of tourist destinations among the Dzongkhags.
- One of the most important issues is the seasonal variation in tourist numbers. Tourists prefer to visit in March, April, October and November. However, Bhutan only receives a few tourists in January, June, July and August.
- Eastern and northern Dzongkhags, visited by less tourists, have many attractive tourist spots such as rich nature and traditional experiences. This is due partly to inadequate promotional activities and the limited capacity of the transportation infrastructure to receive tourists.
- The number of regional tourists, especially from India, is much larger than the number of other international tourists and is increasing year on year. Regional tourists are exempt from royalties. Thus, the increased number of regional tourists may be negative in terms of the carrying capacity of Bhutan's society and environment; furthermore, Bhutan cannot receive royalty payments from them.
- One of the major issues facing the service sector is the shortage of the skilled workers. That is, there are not enough trained workers, such as trained guides or experienced professionals in tourism product development, promotion, and destination marketing. Tour operators largely rely on international tour operators for attracting international tourists.

(4) Constraints of ICT Development

The ICT sector, comprising business processing outsourcing, knowledge processing outsourcing, green data centres, software development and animation, is recognized as the priority sector in the EDP. Symbolically, the IT park in Thimphu has finally taken firm root. However, the lack of skilled workers and any ICT training institute, as well as the stability of

the Internet environment, is a crucial area to address. In addition, work in the IT park involves typical sub-contract tasks on behalf of other countries. It is necessary to create Bhutanese ICT services in the park.

(5) Limited International Market for Agriproducts, Industrial Products and Tourism

1) The Renewable Natural Resources Sector

India is Bhutan's largest trading partner in agriproducts. Bhutan imports about 93% of its total agriproducts from India in terms of value. Exports to India account for 61% of the total value of agriproducts exported, followed by Bangladesh (32%). The major agriproducts exported to Bangladesh are cardamom, oranges and apples; their export value accounts for 52%, 41% and 6% of the total value of these agriproducts exported to Bangladesh, respectively. There are certain site-specific export agriproducts, such as exports of oranges to Bangladesh, matsutake mushrooms to Japan and cordyceps to Asian countries. These agriproducts provide more than 90% of the income from site-specific export counties. As demand for agriproducts varies depending on the overseas market, a market-oriented approach that emphasizes the market-access-production (MAP) approach over the PAM approach, is an alternative for the promotion of agriculture.

Box 9.1.2   Import Ban on Chilli from India

As can be seen above, Bhutan imports many agriproducts, including cereal and meat, from India to meet domestic demand. They account for 93% of the total value of agriproducts imported. This high a concentration can cause prices to rise sharply in some cases. In July 2016, the Bhutan Agriculture and Food Regulatory Authority (BAFRA) banned the import of chilli from India due to residual pesticides. After this, local organic chillies, which had normally been sold for up to INR 900–1,500/kg, were being sold at INR 2,900/kg. Imported chillies, which used to cost INR 25–50/kg before the ban, were now being sold for INR 500/kg[1]. Hence, it will be necessary secure alternative food sources other than India, as well as to prepare a well-formulated stockpiling policy, in order to ensure food security.

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2) Electricity Sales

Hydropower still has huge sales potential, to not only India but also to Bangladesh in the future. These two countries currently have huge populations and this will only increase in the future. Thus, both countries will have increased electricity demand.

Hydropower production highly depends on hydrological flows, the continued operation of hydropower plants and the daily climate. In addition, the unit price would also be a matter of negotiation with the Indian government. Thus, revenue from hydropower is vulnerable and influenced by external factors.

3) Industrial Products

Commodities and mineral products do not have huge further development potential. The quantity of available precious raw materials, including mineral resources, is limited. Furthermore, the volume of deposits and the feasibility of using these sparse mineral resources are not yet clear. In addition, high transportation costs are a huge obstacle to exporting to other

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[1] https://qz.com/879677/after-a-bland-new-year-bhutan-is-reversing-an-import-ban-on-indias-toxic-chillies/ accessed on 1 May 2017

countries.

The share of exports to India in 2015 is 85.2%, followed by Bangladesh (7.9%) and other countries. It is quite difficult to export to other countries other than India and Bangladesh due to Bhutan's geographical conditions.

One of the comparative advantages of mineral-based products is that they are price competitive because of cheap electricity costs, not because they are high value-added or due to technological advantages. In addition, mineral-based products are produced using not only domestic raw materials, but also those from India. The import costs of base metals and mineral products account for quite a high share of the total import value.

A focus on mineral products for export raises environmental concerns and concerns for future generations. Minerals resources are finite and belong to the public. Concrete activities to ensure value addition and sustainability should be considered.

4) Tourism

Purpose of visit and activities

There is some potential in activities to widen Bhutan's range of tourism products. Most visitors came to see and experience Bhutanese culture, travelling to Bhutan just once and visiting only a limited number of Dzongkhags such as Thimphu, Paro and Punakha. Central and eastern areas have a unique culture and different attractions, such as Tshechus and festivals, nature and wellness activities and spas. If there was a good means of inviting tourists to several Dzongkhags, then tourists would be able to enjoy different cultural attractions and activities.

Most visitors come to Bhutan for cultural sightseeing. They engage in general sightseeing and visits to dzongs and temples. Considering the principle of "high value low volume", Bhutan is going in the right direction in terms of travel products. However, there is much room for improvement, for example, the extension and diversification of cultural sightseeing to include wellness and spas, eco-tourism and community-based tourism. In particular, the activation of community-based tourism would lead to community development and job creation in rural areas.

According to the International Visitors Exit Survey 2015, 90.1% of the respondents answered that they had never visited Bhutan before. Less than 10% were repeat visitors. In that sense, tourism products should be improved and diversified to encourage tourists to visit Bhutan again.

Tourists by country and region

Of around 176,000 tourist visits in 2016, Bhutan only received visitors from certain countries, especially from India. The share of total tourists from India was 64.7%. Thus, there is enormous room to attract tourists from other countries, if the right promotional activities are undertaken. Tourists spent on average 6.93 nights in Bhutan. Visitors from 52 countries spent between one and five nights; those from 34 countries spent between six and seven nights; those from 21 countries spent between eight and nine nights; and those from 12 countries spent more than 10 nights, according to the 2015 statistics.

Of Bhutan's total tourists, the majority come from India (64.7%), followed by China (5.2%), Bangladesh (4.4%), the USA (4.1%), Japan (2.7%), Thailand (2.4%), the UK (1.8%), Singapore (1.7%), Germany (1.3%) and Malaysia (1.1%). There are very few tourists from Africa, the Middle East and South America.

Except for regional visitors, especially those from India, travellers from other countries are limited. Promotional activities for other countries, such as Australia, Korea, Switzerland and

France, are being planned and implemented by the TCB and the RGoB.

The length of stay of most Asian tourists is quite short, except for Malaysians who spent an average of 6.21 nights. Japanese and Thai visitors spent on average four nights in Bhutan. Taking into account each visiting country's preferred length of stay, appropriate tourism plans will be developed and promoted in each country.

(6) Constrains on Trade Balance

It is essential to raise the national value through environmental management and strengthening economic vitality in order to realize the sustainable development of Bhutan. The country is experiencing a large deficit in term of its trade balance. Economic vitality requires intensification of export power by electricity and other products, while Bhutan attempts to import substitution to achieve a better trade balance. As for import substitution, using renewable energy to replace fossil fuel, which accounts for 11.2% of the import amount, can be a considerable means in addition to costs associated with imported food products and domestic products (Table 9.1.4). As the number of cars increases, the amount of imported fossil fuels will increase. The effective use of renewable energies, such as electricity, is necessary to mitigate trade balance deficits.

Table 9.1.4   Top 10 Import Items and Main Imported Food Items

Item	million BTN
(Top 10)	
Other light oils and preparations (Diesel)	5,776.50
Parts, including regulators (Hydraulic Turbine and water wheels)	4,012.10
Parts (Electric Motors, generators and rotary converters)	2,351.80
Ferrous products obtained by direct reduction of iron ore	1,840.40
Motor spirit including aviation spirit (petrol)	1,755.30
Semi-milled or wholly milled rice	1,536.80
Motor vehicle for transport of goods (g.v.w. not exceeding 5 tonnes)	1,113.30
For a voltage exceeding 1,000 V	1,057.90
Dumpers designed for off-highway use	1,029.40
Machinery with a 360 degree revolving superstructure	972.2
(Main imported food items and firewood)	
Dairy produce	1,505.00
Firewood and charcoal	953.2
Meat and edible meat offal	998.7
Fish and other aquatic invertebrates	291.4
Total	67,186.90
Electricity	173
Grand total	67,359.90

Source: Bhutan Trade Statistics 2016, MoF
Legend: Oil product (beige), Food and Firewood (yellow), Electricity (green)

9.1.4   Diclination in Bhutanese Culture and Tradition

Bhutanese culture, both tangible and intangible, may gradually be eroded due to the drastic changes that Bhutan has experienced in the form of rural-urban migration, urbanization, population overconcentration in Thimphu and the shift to a western and modernized lifestyle. As indicated in the previous chapter, Bhutanese culture has several aspects, which are both tangible and intangible in nature. Bhutan is currently working on the conservation of its tangible heritage. Intangible culture will be the next goal, to be studied in the 12th Five-Year plan. Bhutanese culture is in danger for several reasons, such as the transition to a modern lifestyle, rural-urban migration and a disregard for traditional values. These factors have negatively affected Bhutan's original culture and traditions. The issues facing culture and tradition are as follows.

- The comprehensive policy is in preparation, encompassing all the various aspects of the conservation of culture and tradition. To obtain the necessary support and to coordinate successfully with the various stakeholders, it is essential to develop a comprehensive plan for the conservation of culture and tradition.

- In terms of tangible culture, many historical sites are exposed to the threat of both natural and human-induced disasters, such as landslides, earthquakes, windstorms, critical damage and fires. These sites should be strengthened through reconstruction, renovation and regular maintenance so as to be able to endure those threats.

- One important factor of Bhutanese identity is the original landscape in rural areas. Due to a variety of factors, such as the improvement of transportation, the lack of jobs in rural areas and rural-urban migration, it is becoming more difficult to maintain rural communities and lifestyles. This results in the loss of the original landscape in rural areas.

- Some local dialects, songs, dances, festivals and rituals are being lost, since only a few people are involved in the upkeep of these traditions. These few people are small groups of elderly people and these traditions may also disappear. The conservation of endangered traditions and culture is extremely important.

- Related to the above intangible culture, traditional and skilled forms of labour are also in danger. Previously, traditional and skilled labour resulted in the construction of traditional architecture, such as dzongs and houses. However, demand for this traditional form of architecture has decreased due to the shift to modern development and a disregard for traditional houses. In accordance with the decrease in traditional architecture, the number of traditional and skilled labourers has also decreased.

9.1.5   Preliminary Land Suitability Analysis

Land suitability was preliminarily analysed to roughly identify the quantity of suitable land for urbanization using the existing land cover map produced by Ministry of Agriculture and Forests from 2016 and data from the digital elevation model. Since a new land cover map using satellite imageries from 2017 does not include the land use category of Chhuzhing and Kamzhing, the MoAF's land cover is used for this analysis. More than 92% of the built-up area is located at places lower than 3,000 m in elevation (Table 9.1.5). The built-up area in a flat and gentle slope areas less than 5% gradient is very limited to 5.8%, though 56.8% of the built-up area is spread over moderate to steep slope areas of 5%~30% gradient. Very steep area higher than 50% gradient occupies a large share of 15.1%.

Table 9.1.5   Built-up Area by Slope and Elevation in 2016

Item		<5%	<15%	<30%	<50%	>50%	Total
Area (ha)	<3000m	432	1,831	2,238	1,515	979	6,995
	>3000m	8	65	152	169	160	553
	Total	440	1,896	2,390	1,684	1,139	7,549
%	<3000m	5.7	24.3	29.7	20.1	13.0	92.7
	>3000m	0.1	0.9	2.0	2.2	2.1	7.3
	Total	5.8	25.1	31.7	22.3	15.1	100.0

Source: Land cover map using satellite imaries from 2016, MoAF

The average population density in the built-up area was estimated at 96 persons per ha. If the population increases as projected by NSB, the population will be 815,755 people in 2030. The land demand for new built-up area accounts for 920 ha as shown in Table 9.1.6.

Table 9.1.6   Land Demand in 2030

Item	Unit	Value
Built-up in 2016[1]	ha	7,549
Population in 2017[2]	persons	727,145
Population in 2030[3]	persons	815,755
Density	persons/ha	96
Required Built-up in 2030	ha	8,469
Land demand	ha	920

Source: 1) Land cover map using satellite imaries from 2016, MoAF
2) Population and Housing Census, NSB
3) Population Projection, NSB

Criteria for suitable land were established to include land cover and topography, as listed below.

- Altitude of less than 3,000 m
- Slope of less than 50%
- Areas outside of Protected Areas and Biological Corridors
- Range of land cover types, including built-up areas, non built-up areas, alpine scrubs, rocky outcrops, morains, landslides, snow and glacier, and water bodies

It is essential to raise the national value through environmental management and strengthening economic vitality in order to realize the sustainable development of Bhutan. The country is experiencing a large deficit in term of its trade balance. Economic vitality requires intensification of export power by electricity and other products, while Bhutan attempts to import substitution to achieve a better trade balance. As for import substitution, using renewable energy to replace fossil fuel, which accounts for 11.2% of the import amount, can be a considerable means in addition to costs associated with imported food products and domestic products (Table 9.1.4). As the number of cars increases, the amount of imported fossil fuels will increase. The effective use of renewable energies, such as electricity, is necessary to mitigate trade balance deficits.

Table 9.1.7   Land Area lower than 3,000m in Elevation by Land Cover and Slope within 1km from Built-up Area and Bhutan

Land Cover	Within 1km from Built-up Area				Whole Country				
	<5%	<15%	<30%	<50%	<5%	<15%	<30%	<50%	>50%
Meadows	65	439	934	1,312	146	1,059	2,658	3,816	4,908
Shrubs	930	3,986	7,674	12,568	2,108	9,049	17,236	30,135	40,619
Forests	1,087	7,426	26,816	62,393	8,146	60,173	218,964	534,254	1,143,546
Chhuzhing	883	3,849	5,690	5,438	1,549	6,697	10,247	10,553	3,136
Kamzhing	732	3,625	7,677	10,498	1,452	7,262	16,882	26,929	14,904
Orchards	73	415	863	928	137	747	1,548	2,013	1,112

Source: ASTER GDEM and Land cover map prepared by MoAF using the stallite imageries from 2016
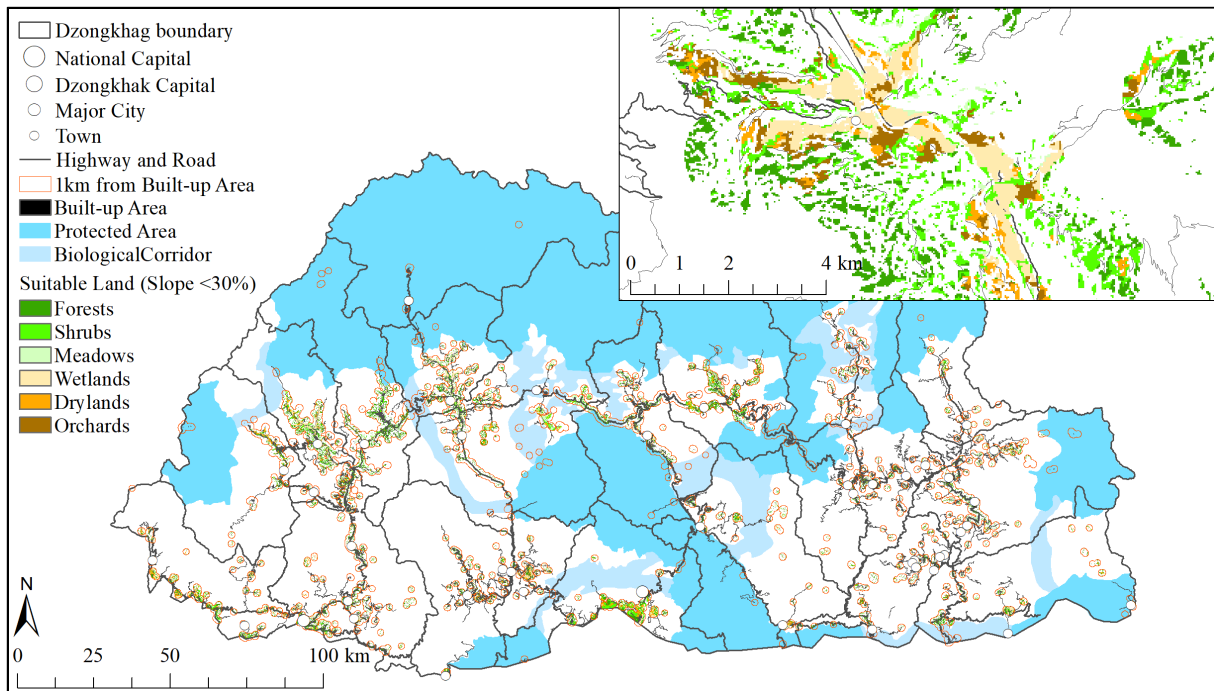
Source: ASTER GDEM and Land cover map prepared by MoAF using the stallite imageries from 2016

Figure 9.1.5 Identification of Suitable Land for Urbanization in Bhutan and Thimphu (right top)

9.1.6 Prelimianry Assessment of Road Transport

A preliminary assessment to verify the accessibility, capacity and quality of the present road infrastructure has been carried out through a demand-supply gap analysis an interview survey.

(1) Accessibility of the road network

The road network has been well developed due to the remarkable efforts of the Royal Government of Bhutan despite the mountainous terrain. Of Bhutan's 64 towns, 62 are accessible via the existing road network. Of the 203 Gewog Centres, 191 are also accessible. When the roads currently under construction and the roads proposed by the Department of Roads are complete, 62 towns will be accessible too. The number of accessible Gewog Centres will rise to 198.

The remaining inaccessible towns and Gewog Centres are located in remote, high-altitude areas over 4,000 m. The complete road network necessary to make all towns and Gewog Centres accessible will require substantial investments that are not economically feasible. The necessity of a completed road network should be considered carefully. Figure 9.1.6 shows towns, Gewog Centres and the road network. Table 9.1.8 shows the number of towns and Gewog Centres currently accessible via the existing road network, as well as the planned roads.
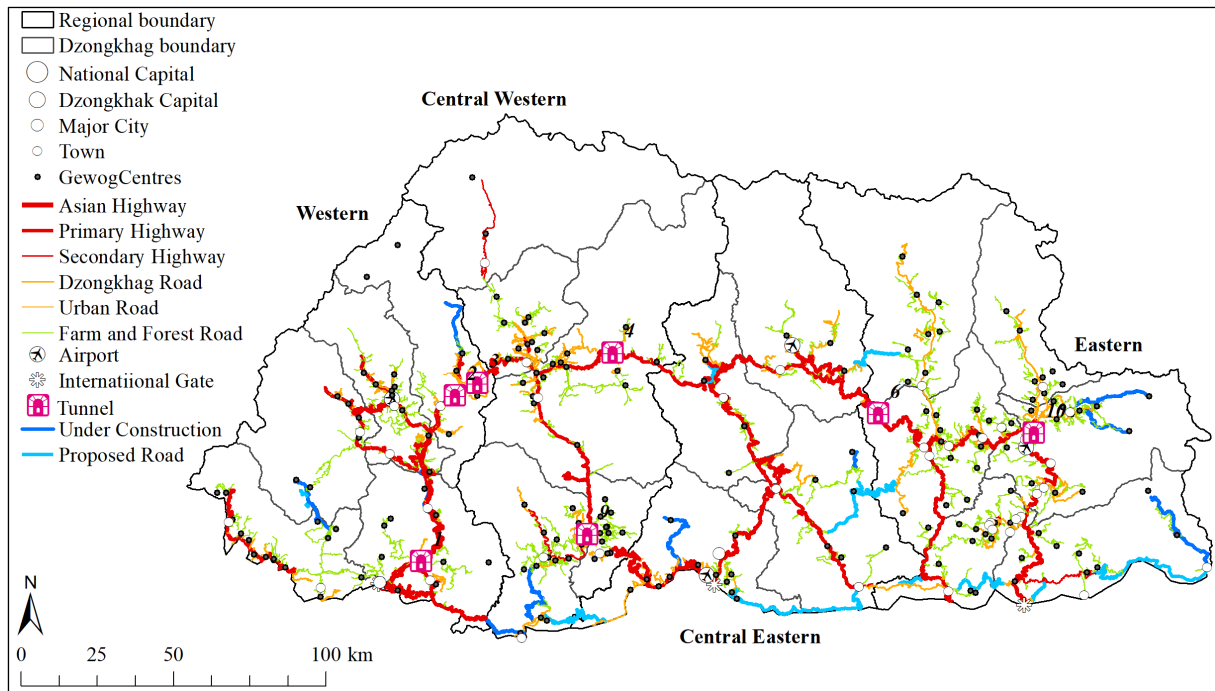
Figure 9.1.6   Existing and Planned Road Network

Table 9.1.8   Number of Towns and Gewog Centres Accessible via Existing and Planned Roads

Road Type		National Capital	Dzongkhag Capital	Major Town	Town	Gewog Centre
Number of Towns and Gewog Centres		1	19	2	35	203
Existing	Asian Highway, Primary Highways, Secondary Highways and Urban Roads	1	11	1	28	78
	All Existing Roads	1	17	2	42	191
Planned	All Existing and Planned Roads	1	17	2	42	198

The travel time between towns has been estimated for the 64 towns. The estimate reveals that only two Dzongkhag headquarters within an hour's travel from another Dzongkhag headquarter. Only 19 towns of the 42 are accessible from a Dzongkhag headquarter. The number of Dzongkhag headquarters and towns accessible within three hours' travel increased to 16 and 37, respectively.

This implies that there is difficulty in creating settlement areas within one hour's travel or three hours' travel from those Dzongkhag headquarters that interlink all of the towns, even though Dzongkhag headquarters and towns are connected by the road network. The location of settlement areas should be defined in a manner that suits the mountainous topography of Bhutan. A travel time of one week and seasonal movement may be timeframe options in terms of establishing the range of settlement areas.

Table 9.1.9 shows the number of towns and Gewog Centres that are accessible within an hour's travel and within three hours' travel from a Dzongkhag headquarter via the existing road network and planned roads. The area that is accessible from Dzongkhag headquarters within one hour's travel and within three hours' travel via the existing road network and planned roads is shown in Figures 9.1.7 and 9.1.8, respectively.

Table 9.1.9   Number of Towns and Gewog Centres Accessible within One Hour's Travel and Three Hours' Travel by Existing and Planned Roads

Category	Road Network	Travel Time	City	Town	GC
Accessible Towns and Gewog Centres	Existing Road Network	One Hour	15	19	89
		Three Hours	18	37	175
	Planned Road Network	One Hour	15	19	91
		Three Hours	18	39	187
Number of Towns and Gewog Centres			22	42	203

Note: GC=Gewog Centre
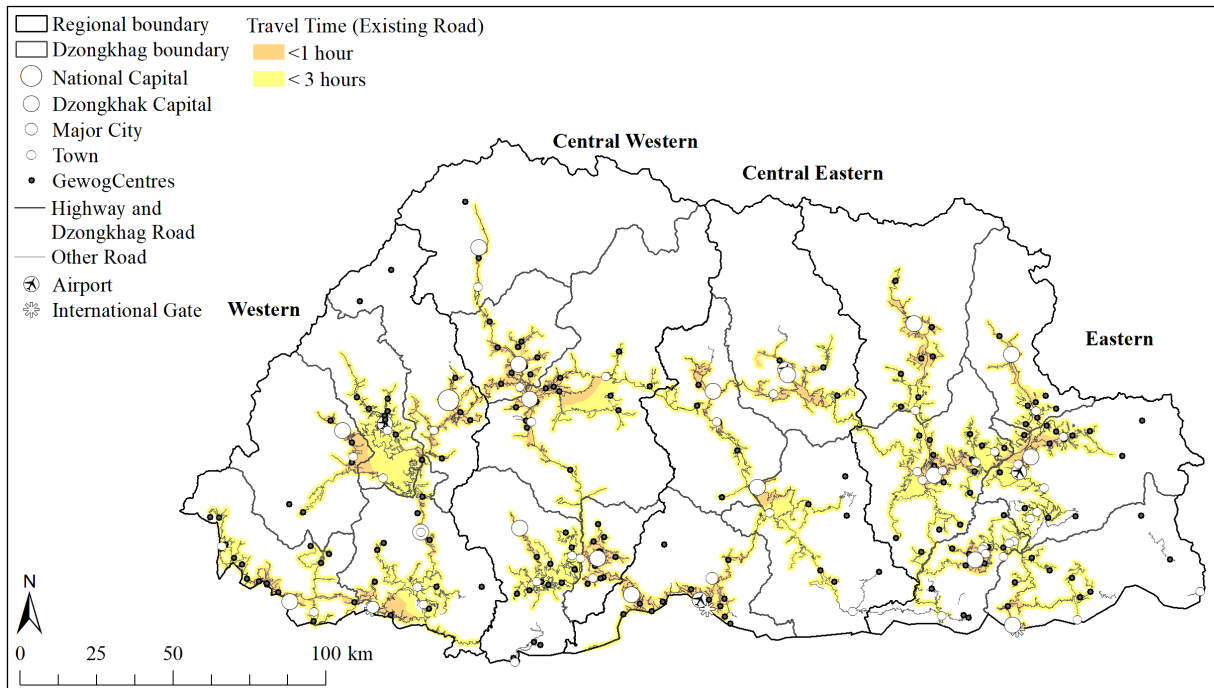
Figure 9.1.7   Area Accessible from Towns within Three Hours's Travel via the Existing Road Network
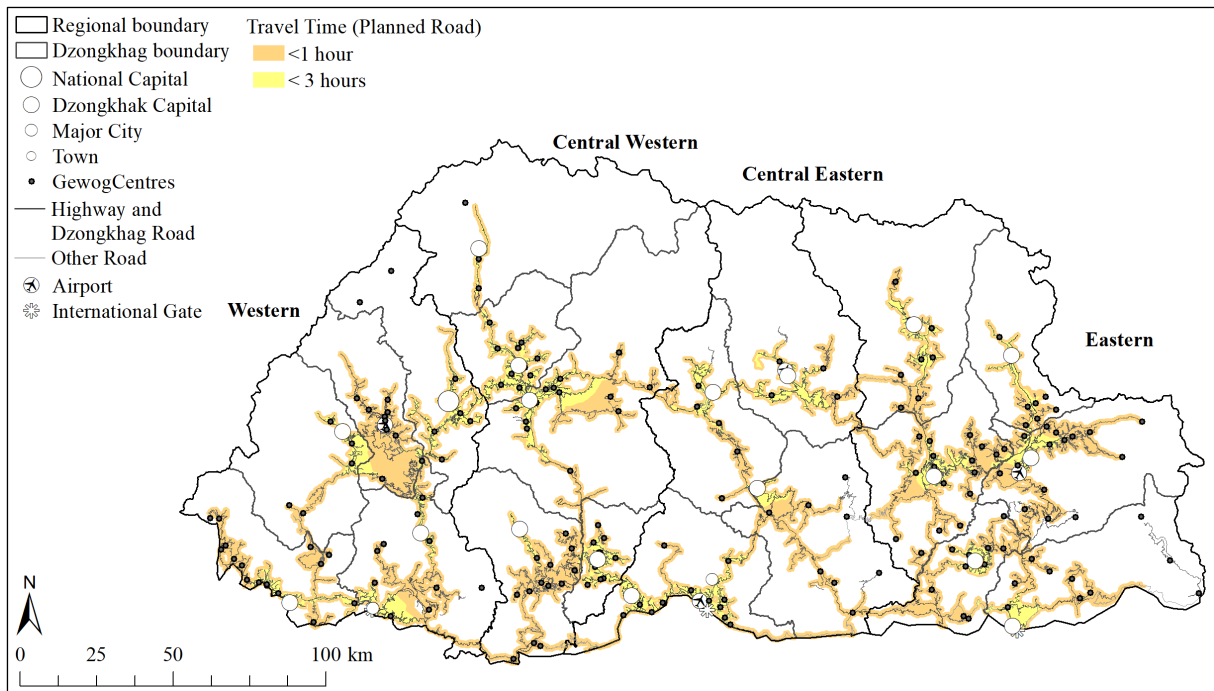
Figure 9.1.8   Areas Accessible from Towns within Three Hours' Travel via the Planned Road Network

(2) Demand-supply gap analysis (present condition of the road network)

The demand-supply gap analysis examines 26 sections of road, as shown in Table 9.1.9 and Figure 9.1.9, based on a traffic volume survey conducted in February 2017 by the DoR, and presents the road capacity of these sections. These sections are located along highways and the Dzongkhag roads interconnecting Dzongkhag headquarters. The analysis applies the road capacities of 1,600 PCU for a one-lane road, 7,000 PCU for a two-lane road and 35,000 PCU for a four-lane road, based on the IRC-064 (Indian Road Congress) standard.

As a result of the analysis, two saturated sections (6 and 7) have been identified on east-west sections near Phuentsholing. There are seven high traffic sections, or sections on which the capacity of one lane is exceeded, as shown in Table 9.1.9. These sections, with the exception of the two saturated sections, have two lanes, as shown in Table 9.1.10.

Table 9.1.10   Results of the Demand–Supply Gap Analysis Based on Present Conditions

ID	Section	Traffic Volume		Number of Lanes	Congestion Ratio
		(Veh/Day)	(PCU/Day)		
1	Wangdue-Wakleytar PNH (Rurichu Bridge)	907	1,316	2	0.19
2	Wangdue-Trongsa PNH (Khelekha)	458	845	1	0.53
3	Metsina-Douchula Highway (Dochula)	2,751	5,290	2	0.76
4	Metsina-Punakha (Metsina)	1,054	1,245	2	0.18
5	Rinchending-Gedu PNH (Rinchending Check Point)	1,173	1,509	2	0.22
6	Pasakha-Manitar (Damdara Check Point)	1,515	2,173	1	1.36
7	Rinchending-Pasakha (Rinchending Check Point)	1,390	2,128	1	1.33
8	Phuentsholing-Rinchending (Rinchending Check Point)	2,560	3,634	2	0.52
9	Samtse-Sipsu PNH (Yosertse)	250	270	1	0.17
10	Damphu-Sunkosh PNH (Changchey Junction)	58	80	1	0.05
11	Sunkosh-Dagana PNH (Yongseb and tshendengang)	93	109	1	0.07
12	Gelephu-Sarpang (Jigmeling Bus Stop)	1,577	2,021	2	0.29
13	Sarpang-Darachu (Hilley Check Post)	841	1,139	2	0.16
14	Dewathang-Samdrupjongkhar (Pinchinari Check Post)	548	937	2	0.13
15	Dewathang-Samdrup Choling SNH (Dewathang)	106	152	1	0.09
16	Panbang-Nganglam (Nishingbora)	491	789	1	0.49
17	Thimphu-Pling Highway (Babesa)	7,181	9,010	4	0.26
18	Simtokha-Dochula PNH (Semtokha)	2,203	2,911	2	0.42
19	Gelephu-Trongsa Highway (at ch.84.80km)	122	190	1	0.12
20	Tingti-Praling PNH (Goling Camp)	111	210	1	0.13
21	Tingtibi-Zhemgang-Wangdigang PNH (at ch. 35km)	84	140	1	0.09
22	Trashigang-Monggar PNH (Chazam)	316	563	1	0.35
23	Chazam-Trashiyangtse SNH (Chazam)	259	396	1	0.25
24	Trashigang-Thimphu (Chazam)	103	146	1	0.09
25	Trongsa-Bumthang (Gaytsa)	377	469	1	0.29
26	Trongsa-Chuserbu (Tshangkha)	397	514	1	0.32

Note: PCU Conversion Factors (Heavy Vehicle 3.0, Medium Vehicle 1.5, Light Vehicle 1.0, Two-Wheeled Vehicle 0.5, Others 1.0)

Source: Traffic Date: Feb 2017, DoR
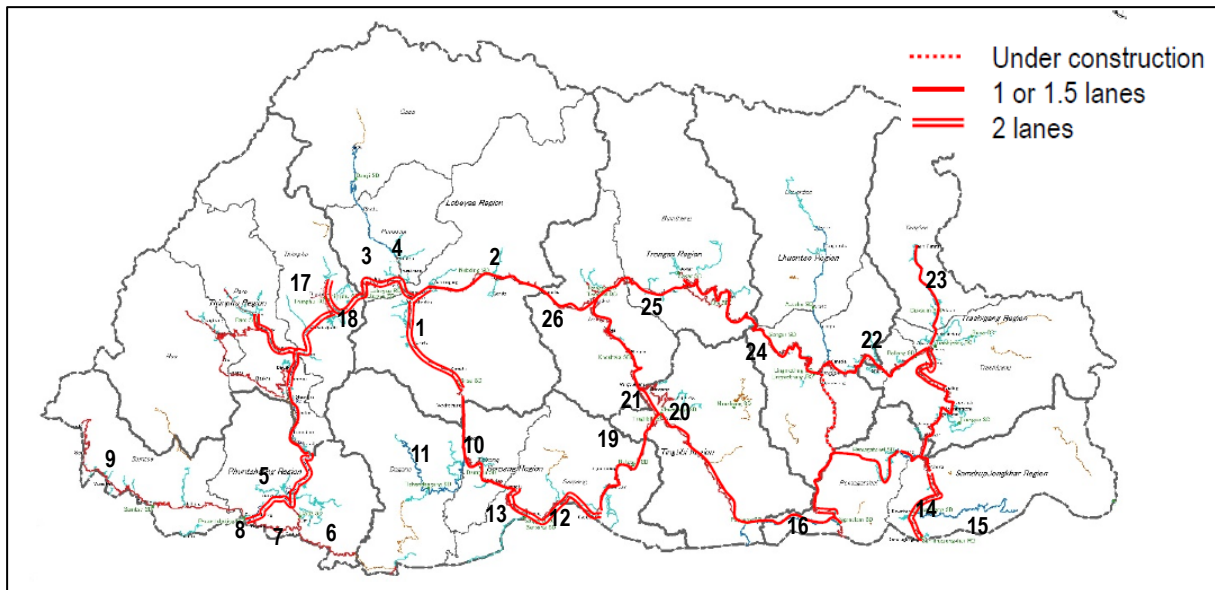
Figure 9.1.9   Traffic Volume Survey

(3) Demand-supply gap analysis for 2030

A traffic demand analysis using a traffic model will not be carried out as part of the Project and thus a quantitative demand-supply gap analysis cannot be performed. However, a preliminary analysis can be performed using the simple method of calculating the growth of vehicle registration numbers, as shown in Figure 9.1.10. The growth of vehicle registration numbers is one of practical parameter which can be applied to predict traffic demand; around a 6% growth was recorded in 2016. The 2030 congestion ratio, calculated using future traffic volume, has been preliminarily estimated using the figure of 6% annual growth. As a result, it has been proposed to widen six road sections, as shown in Table 9.1.11.

Two sections of the Metsina-Douchula Highway (ID-3) and the Phuntshoing-Rinchending (ID-8) are proposed in order to widen them from double lanes to four lanes. However, this is not economically and technically feasible since these sections are located on a steep terrain. Moreover, the construction and study of an alternative route for these sections has been initiated. Therefore, it is recommended that additional road capacity in these sections, in order to meet future demand, will be supplied by alternative road development.
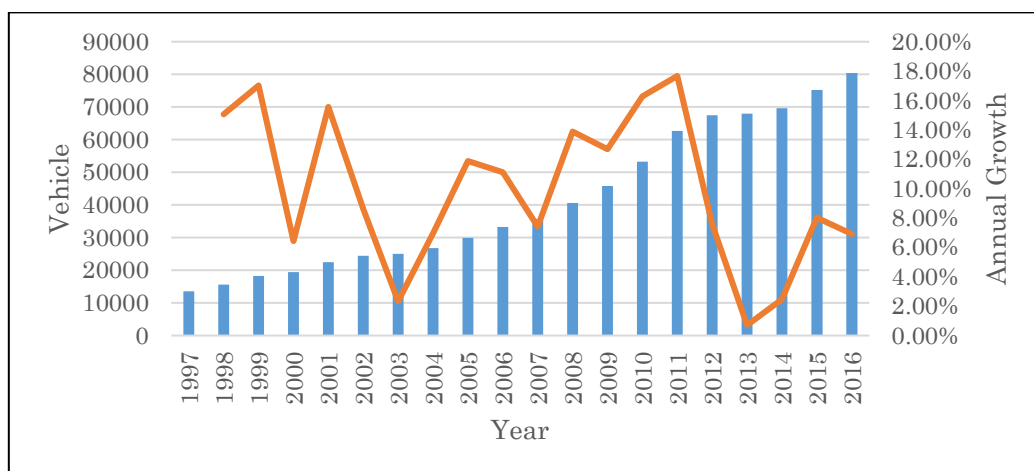
Source: Annual Report for 2015-16, Road Safety and Transport Authority

Figure 9.1.10   Growth in the Number of Registered Vehicles

Table 9.1.11   Result of the Preliminary Demand-Supply Gap Analysis Based on the Predicted Traffic Volume in 2030

ID	Section	Traffic Volume (PCU/Day) 2017	Predicted Traffic Volume (PCU/Day) 2030	Number of Lanes (Present)	Congestion Ratio	Number of Lanes (Proposed)
1	Wangdue-Wakleytar PNH (Rurichu Bridge)	1,316	2,807	2	0.40	2
2	Wangdue-Trongsa PNH (Khelekha)	845	1,802	1	1.13	1→2*
3	Metsina-Douchula Highway (Dochula)	5,290	11,283	2	1.61	2→4
4	Metsina-Punakha (Metsina)	1,245	2,656	2	0.38	2
5	Rinchending-Gedu PNH (Rinchending Check Point)	1,509	3,218	2	0.46	2
6	Pasakha-Manitar (Damdara Check Point)	2,173	4,636	1	2.90	1→2*
7	Rinchending-Pasakha (Rinchending Check Point)	2,128	4,540	1	2.84	1→2*
8	Phuentsholing-Rinchending (Rinchending Check Point)	3,634	7,751	2	1.11	2→4
9	Samtse-Sipsu PNH (Yosertse)	270	577	1	0.36	1
10	Damphu-Sunkosh PNH (Changchey Junction)	80	171	1	0.11	1
11	Sunkosh-Dagana PNH (Yongseb and tshendengang)	109	232	1	0.14	1
12	Gelephu-Sarpang (Jigmeling Bus Stop)	2,021	4,310	2	0.62	2
13	Sarpang-Darachu (Hilley Check Post)	1,139	2,430	2	0.35	2
14	Dewathang-Samdrupjongkhar (Pinchinari Check Post)	937	1,999	2	0.29	2
15	Dewathang-Samdrup Choling SNH (Dewathang)	152	323	1	0.20	1
16	Panbang-Nganglam (Nishingbora)	789	1,683	1	1.05	1→2*
17	Thimphu-Pling Highway (Babesa)	9,010	19,217	4	0.55	4
18	Simtokha-Dochula PNH (Semtokha)	2,911	6,210	2	0.89	2
19	Gelephu-Trongsa Highway (at ch.84.80km)	190	406	1	0.25	1
20	Tingti-Praling PNH (Goling Camp)	210	447	1	0.28	1
21	Tingtibi-Zhemgang-Wangdigang PNH (at ch. 35km)	140	298	1	0.19	1
22	Trashigang-Monggar PNH (Chazam)	563	1,200	1	0.75	1
23	Chazam-Trashiyangtse SNH (Chazam)	396	845	1	0.53	1
24	Trashigang-Thimphu (Chazam)	146	311	1	0.19	1
25	Trongsa-Bumthang (Gaytsa)	469	999	1	0.62	1
26	Trongsa-Chuserbu (Tshangkha)	514	1,096	1	0.68	1

Note: PCU Conversion Factors (Heavy Vehicle 3.0, Medium Vehicle 1.5, Light Vehicle 1.0, Two Wheeler 0.5, Others 1.0)   *improvement project planned by the RGoB
Source: Traffic Date: Feb 2017, DoR

(4) Road conditions

The major problems of the road infrastructure and the direction that problem solving should take were discussed with several of the DoR's regional offices as well as Dzongkhag Administrations. Through the above discussion, the magnitude of the necessity of each measure is summarized in Table 9.1.12 and sorted by road category. This result will be taken into account in the formulation of a road sector development plan. A road network has been developed and almost all administrative centres are linked by it. However, certain road standards, such as carriageway width, pavement, geometric design and ability to withstand natural disasters, are still insufficient to meet the requirements of the socioeconomic activities of road users. Therefore, further improvement of the above aspects, including the introduction of radical facilities such as tunnels, long bridges and slope protection, are important.

Table 9.1.12   Magnitude of the Necessity of Problem-Solving by Road Category

Road Development Strategies	Major Problems of the Road Infrastructure	Issues of Road Development	Direction of Problem-Solving	Magnitude of Necessity by Road Category			
				P	S	D	GC
Road development to accelerate trade and transportation	a) Poor arterial road network for trade and freight transportation b) No alternative east-west arterial roads	Ensuring alternative means	Establishment of major intercity roads	L	L	-	-
			Construction of city bypasses	L	L	-	-
			Construction of bypasses in steep sections (bridges, tunnels, etc.)	H	H	-	-
			Construction of access roads to the air route network	-	-	-	-
Road development, aimed at reducing high transportation costs due to the mountainous terrain	a) Slope failures and landslides b) Heavy rain and snow	Securing transportation throughout the year	Elimination of road closures due to landslides and slope failures	H	H	L	H
			Elimination of road closures due to snow damage	L	-	-	-
			Elimination of road closures due to rain	-	-	-	-
			Securing road surface properties to ensure travel ability (blacktopping)	M	M	M	H
Road maintenance to provide socioeconomic services to remote rural areas	a) Poor road specifications, network and maintenance, especially on roads in rural areas b) Old and damaged bridges c) Overloaded vehicles	Road standards according to road function and road safety	Road structure based on appropriate geometric design standards	M	M	M	H
			Eliminate bottleneck points and sections (narrow sections, old bridges, etc.)	M	M	H	H
			Securing road surface properties to ensure ability to travel (enforcement of overloaded vehicle prevention measures)	M	L	-	-
Improvement of traffic safety	a) Unpaved and damaged roads causing road accidents		Securing road surface properties to ensure travel ability (blacktopping)	M	M	M	H

Note: Road Categories (P: PNH, S: SNH, D: Dzongkhag Road, GC: Part of a Farm Road), H: High, M: Moderate, L: Low

9.1.7   Prelinary Assessment of Air Transport

A traffic demand-supply analysis of Paro International Airport was carried out in the Air Transport Connectivity Enhancement Project 2012, financed by the ADB. In this analysis, "number of aircraft" and "aircraft movements per hour" are used as important parameters. Currently, aircraft movements per hour are limited to four, and thus the improvement of this value would expand the airport's capacity.

As shown in Figures 9.1.11 and 9.1.12, Paro International Airport will be saturated by 2022 if the number of aircraft movements per hour is not improved. It will reach saturation by 2027 if aircraft movements per hour increase from four to five. The actual number of aircraft in 2015 is shown in Figure 9.1.12 and the number of aircraft forecast for 2015 is almost the same as the actual number.
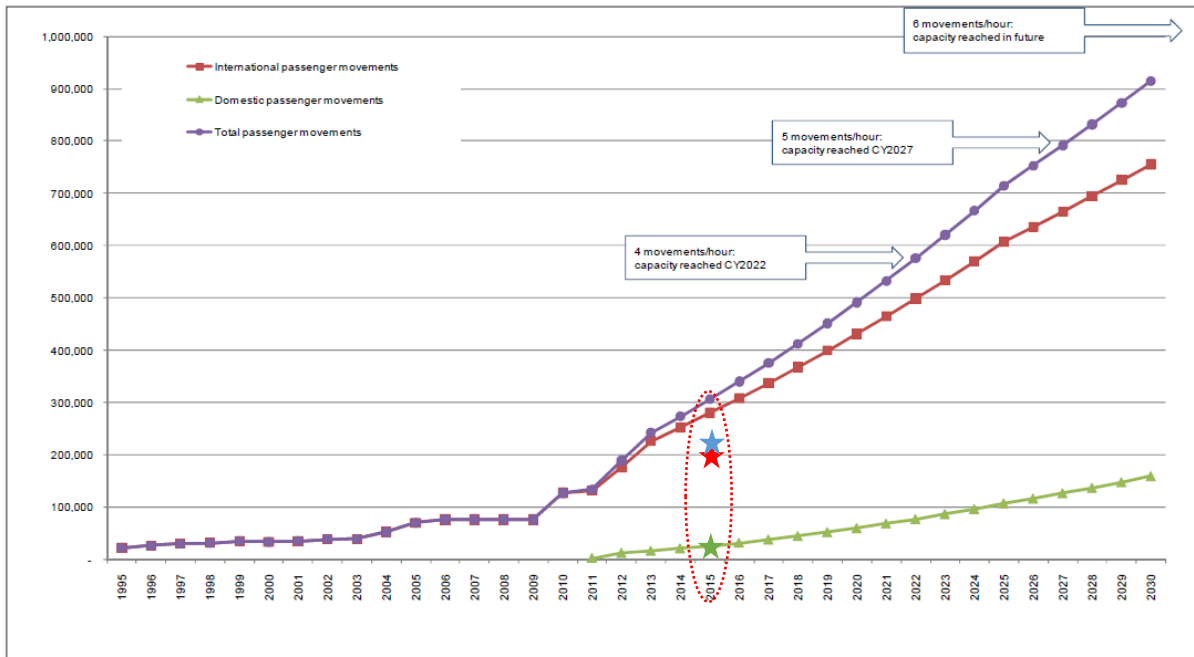
Source: Base Figure: the Air Transport Connectivity Enhancement Project, 2012, ADB

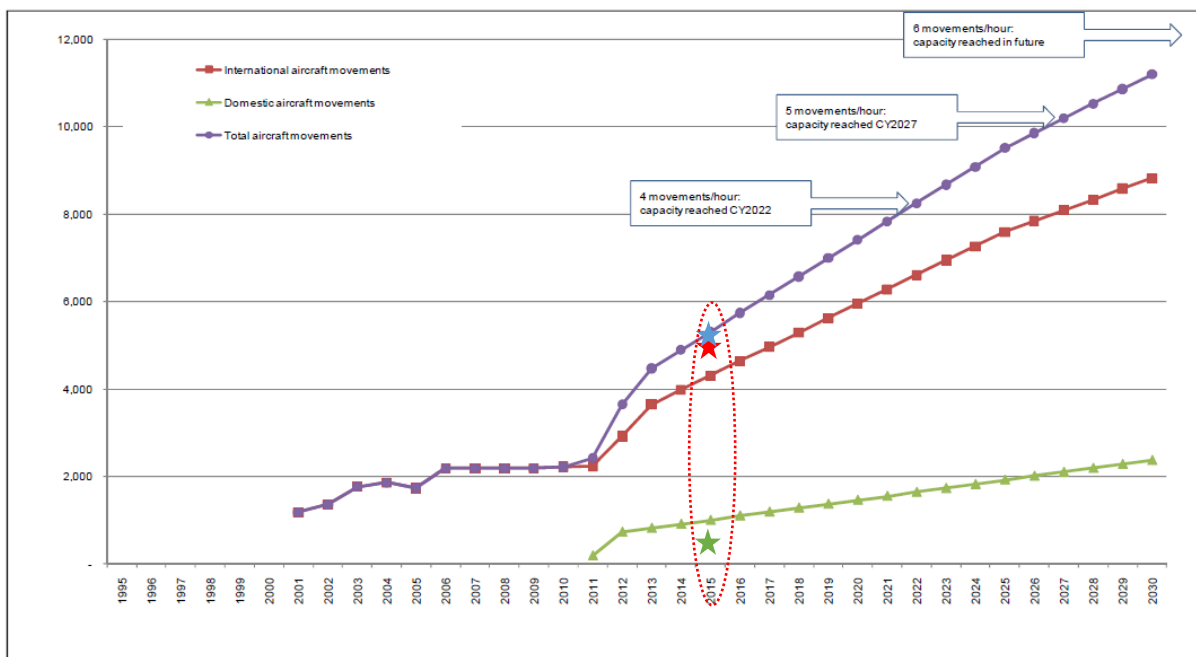**Figure 9.1.11   Historical and Forecast Passenger Movements: Unconstrained by Paro
or Domestic Airport Runway Capacity**

Source: Base Figure: the Air Transport Connectivity Enhancement Project, 2012, ADB

**Figure 9.1.12   Historical and Forecast Aircraft Movements: Unconstrained by Paro or
Domestic Airport Runway Capacity**

The traffic demands of Bhutan's three domestic airports have also been estimated, as shown in
Table 9.1.13. The estimate predicts that daily aircraft movements in 2030 will be 2.0 at
Bumthang, 5.9 at Yonphula and 2.0 at Gelephu. Considering the airport capacity of these
airports, they will not reach saturation until 2030. It is necessary to promote domestic air
transport in order to provide a more simplistic ticket purchase system, reasonable travel costs,
compared with land transport, and stable operations under harsh weather conditions.

Table 9.1.13   Forecasted Passengers and Aircraft at the Three Domestic Airports

	Forecasted Values					
	Bumthang		Yonphula		Gelephu	
	2020	2030	2020	2030	2020	2030
Passenger Movements (Two-Way)						
-Domestic Passenger Movements	17,960	47,870	53,870	143,600	17,960	47,870
Aircraft Movement (Two-Way)						
-Domestic Aircraft Movements	570	710	1,720	2,140	570	710
Aircraft Movement Per Day (Average)						
-Domestic Aircraft Movements	1.6	2.0	4.7	5.9	1.6	2.0

Source: the Air Transport Connectivity Enhancement Project, 2012, ADB

9.1.8   Disaster Vulnerabitiy

The issues and challenges associated with disaster vulnerability and disaster management include the following:

- Bhutan faces the risk of earthquakes on a nationwide basis, but especially in the South-western, South-eastern and Eastern Regions.
- Bhutan has a high landslide risk, especially in the Southern and Eastern Regions. There are many landslide areas along the national highways.
- Bhutan has a high flood risk at a nationwide level, but especially in the Southern Region. Rivers in this region are wide; thus, the flood risk in the rainy season is enormously high. With its flat topography, wider areas are exposed to high flood risk in the Southern Region, compared to the Central and Northern Region.
- In terms of disaster response, the Eastern Region needs more independence in villages or at a regional level, due to the poor accessibility from other regions.
- Road disaster prevention is very important for Bhutan to tackle as a national problem. Since there are too many areas that need mitigation measures, prioritization in a road transportation plan is required.
- Flood risk from large rivers in the Southern Region may not be controlled and reduced by land use only; thus, structural flood control measures are essential.
- Basic disaster information and related data are lacking, especially on floods. Flood risk mapping, based on simulations, is not yet reliable due to limitations in available data and analysis methods. Besides, there is an insufficient stock of past disaster records with locational information. For an accurate understanding of flood prone areas, the following is need: development of a standard format for disaster records with locational information; sharing the format and records among related agencies; development of a disaster record framework; facilitation of understanding about the importance of accurate disaster record accumulation.
- In terms of flood control measures, the demarcation of responsibility between agencies (National Centre for Hydrology and Meteorology and Flood Engineering and Management Department in the MoWHS) is still unclear and partially overlapping. Thus, effective clarification and information-sharing between them are necessary.

9.1.9   Future Prospective Environmental Conditions in Urban and Industrial Areas

The environmental conditions in urban and rural areas have already been studied and summarized in Sections 5.7.1 and 5.7.2, respectively, outlining the current pressures on environmental quality. Based on results of the study, the table below outlines the future

prospective environmental conditions in urban and industrial areas, assuming that present trends continue. The factors examined to gauge these future prospects are the same as those studied in the Sections on urban and rural areas, namely land, water, air, biodiversity and waste management.

Table 9.1.14   Future Prospective Environmental Conditions in Bhutan

No.	Factor	Future Prospective Environmental Conditions
1	Land	・ Increasing demand for land for infrastructure development (hydroelectricity and roads), mining, business and commercial activities, as well as urbanization and the conversion of land from arable land and forests to other types of land. ・ Landslides and erosion due to infrastructure construction, such as roads, hydropower plants and transmission lines, in fragile mountainous geological conditions.
2	Water	・ Degradation of river water quality in urban areas due to an insufficient sewage management system, including untreated domestic drainage and inadequate treatment of water from auto workshops in urban areas. ・ Pressure on water quality due to increased levels of municipal solid waste with no or an insufficient segregation and recycling system.
3	Air	・ Air pollution due to gas emissions from an increasing number of vehicles, re-suspended road dust, industrial, construction, mining and quarrying activities, forest fires, fuel wood and kerosene for heating and cooking. ・ Increased smoke and suspended particulate matter (PM10) beyond the national permissible limits in urban areas, especially near industrial estates. ・ Concern over the potential negative impact on crop productivity (decreasing fruit and vegetable yields) of increasing concentrations of particulate matter in the local area due to mining and industrial activities. ・ Issue of transboundary air pollution in the South Asia affecting Bhutan, especially during the winter months.
4	Biodiversity	・ Loss of habitats and fragmentation due to development activities, including hydropower plants, roads and infrastructure facilities, human settlements (urbanization), mining and quarrying, etc., which has an impact on wildlife and aquatic life. ・ Concern over potential ecological imbalance due to invasive plant, animal, bird and fish species, such as the tree marigold, the whitetop weed, Spanish Flag (LAVA), the bark beetle, etc., including alien invasive species. ・ Loss of forests and the threat posed to wildlife habitats by forest fires, which often occur during the dry season, especially from November to February.
5	Waste Management	・ Increasing waste generation due to rapid urbanization, increasing affluence, population growth, etc., leading to littering, visual eyesores and the destruction of the image of "Brand Bhutan." ・ Increasing non-biodegradable and hazardous waste due to pre-packaged products, plastics, PET bottles and chemicals, which pose the threat of contamination to water bodies and aquatic life. ・ Improper waste management such as open burning, dumping in open landfills and insufficient waste segregation and recycling. ・ Difficulty in identifying waste management sites due to the country's steep terrain.

9.1.10   Climate Change and its Assumed Impact

Bhutan's greenhouse gas (GHG) emissions are largely negligible in terms of the global total and, in fact, Bhutan's vast forests absorb more CO_2 than the country emits, indicating that the country is a net greenhouse gas sink. Climate change, therefore, is viewed as being largely driven by activities on a global level; having said that, it is definitely having an impact on all sectors in Bhutan.

An analysis of Bhutan's mean air temperature in summer and winter from 2005 to 2014 indicates that the mean summer temperature of temperate and subtropical regions is steadily rising, while mean winter temperatures seem to be declining. However, annual mean temperatures in both temperate and subtropical regions are gradually rising. The same analysis

shows that the annual mean levels of rainfall are decreasing. However, rainfall fluctuations are largely random, with no systematic change detectable on either an annual or monthly scale.

The Department of Agriculture, under the MoAF, has reported that climate-induced hazards, such as excessive rainfall, flash floods, windstorms, hailstorms, droughts, etc., have caused massive losses and damage to farming households. There is also evidence of new pests and diseases affecting crops and livestock production (State of Climate Change Report for the RNR Sector, 2016).

Issues of concern due to global warming and climate change include the following:

- There will be a general northward/upward migration of forests due to rising average temperatures (NECS, 2011). The Montane cloud forests of Bhutan are vulnerable to increased incidences of moisture stress due to rising temperatures, leading to habitat loss and an increase in the intensity and incidences of pests and diseases, etc.
- The fifth Assessment Report of the IPCC indicates that glaciers are continuing to shrink, thus threatening the continued ability of hydropower as a clean energy source and increasing the risk of glacial lake outburst floods.
- The wet monsoon seasons are getting wetter and the dry winters are getting warmer and drier. As a result, there may be more water shortages, especially during the dry winter season. On the other hand, rainfall is expected to increase during the monsoon period when water is already abundant (NEC, 2016).
- High temperatures will lead to high ozone concentrations at ground level, which will have an adverse impact on public health and the eco-system. Higher temperatures, decreased soil moisture and extended periods of drought all enhance the risk of wildfires, leading to air pollution.
- Concern is rising over the exacerbation of soil erosion, which causes floods and landslides leading to the further reduction of biomass, as well as the disruption of the ecological and land use systems, which would have a negative impact of people's livelihoods and adaptive capacity (Bhutan State of the Environment Report (BSER), 2016).

9.1.11   Unreliable Water Supplies

(1) Water Rights

Bhutanese water rights are described as follows: "Water resources are the property of the State. The rights to water resources, including the beds and banks of watercourses, shall be vested in the State. […] Every individual shall have access to safe, affordable and sufficient water for their basic human needs" (Water Act of Bhutan 2011). The method of water abstraction and water use is, thereby, regulated by the Water Act of Bhutan 2011 and the Water Regulation of Bhutan 2014. Different organizations carry out various functions and powers of authority and are represented by the National Environment Commission (NEC). The Bhutanese Government does not allow people to freely extract or use water; accordingly, an authorization system is adopted, known as 'environmental clearance'. However, people can use water without permission for domestic use, small-scale drinking water supplies and irrigation schemes, as well as running small watermills, etc. In addition, exemption from environmental clearance can be applied on the grounds of public health, the environment and other limitations. For instance, the extraction of groundwater is permitted if other water resources are unavailable. Furthermore, customary water use is also exempt from environmental clearance.

In terms of international water resources, Bhutan's Water Policy 2007 states that the

"transboundary water issue shall be dealt in accordance with international laws and conventions to which Bhutan is a signatory". On the other hand, Bhutan is not a member of the treaty on the transboundary water issue at present. Hence, water use in Bhutan is not restricted by specific international agreements to date; meanwhile, the water policy prescribes the nature of information-sharing between India for the sake of disaster management, such as floods. In addition, Bhutan participates in environmental development discussions.

(2) Water Demand and Water Balance at National Level

Water demand varies according to water use. Water use is prioritized by the Water Act of Bhutan 2011 as follows; 1) for drinking and sanitation; 2) for agriculture 3) for energy; 4) for industry; 5) for tourism and recreation; and 6) for other uses. Water allocation is supposed to be determined by these priorities. According to the Bhutan Water Vision 2025, average water demand per capita in rural areas is estimated to be 45 l/day for domestic purposes while people in urban areas use 130 l of water per day.

Table 9.1.15 shows the water balance with water use in 2015 and 2030 at the nation level. The highest estimated proportion is for irrigation purposes (in other words, agricultural purposes). In contrast, the proportions of other purposes are very low. The proportion of water use for drinking is estimated to increase from 5% in 2015 to 9% in 2030, as the country's population will increase. Although some of the information on which the estimate is based is unclear, the estimate is competent enough to ensure that Bhutan has plenty of surplus water in its water balance at the nation level.

Table 9.1.15   Water Balance in 2015 and 2030

		2015 (million m^3/year)	2030 (million m^3/year)	Share in 2015 (%)	Share in 2030 (%)
Water demand	for drinking	32.0	79.9	5	9
	for irrigation	575.6	791.3	94	89
	for industrial and other purposes	6.3	18.3	1	2
Total water demand (a)		613.9	889.5	100	100
Total water availability (b)		69,263.6	69,263.6	-	-
Water balance [(b)-(a)]		68,649.7	68,374.1	-	-

Note: In this estimate, non-consumptive water demand, which is mainly needed for hydropower, is not considered. The estimate does not include groundwater.
Source: Bhutan Water Security Information Management System (Water Balance Calculator via Dzongkhag), National Environmental Committee.

On the contrary, this water balance calculation should not be simply transferred to water availability in Bhutan. The agglomeration/settlements are mostly located on the slopes of the mountain, while water resources usually exist at the bottom of the valley, which is difficult to intake. This fact implies that getting water from far places requires facilities and a workforce, involving tremendous costs and time. Nevertheless, the water availability is usually calculated by the run-off. Thus, there is a huge gap between water availability and water supply capacity.

(3) Water Supply System

1)   Water supply capacity and demand

Table 9.1.16 below shows the expected water demand and existing water supply capacity in each urban areas. In contrast with the abundant water balance at the macro level, the water demands in nine towns surpass their water supply capacity according to the scenario in 2030, due to the increased population and the variety of water use. Water supply capacities in Paro

and Monggar should ensure adequate water supply; however, the water supply facilities are assessed as inadequate and unreliable, thus renovation and rehabilitation are advisable in order to ensure future water demand. This calculation does not take account of rural areas.

Groundwater sources for drinking purposes are broadly utilized in five towns, namely, Thimphu, Phuentsholing, Gelephu, Samdrupjongkhar and Paro.

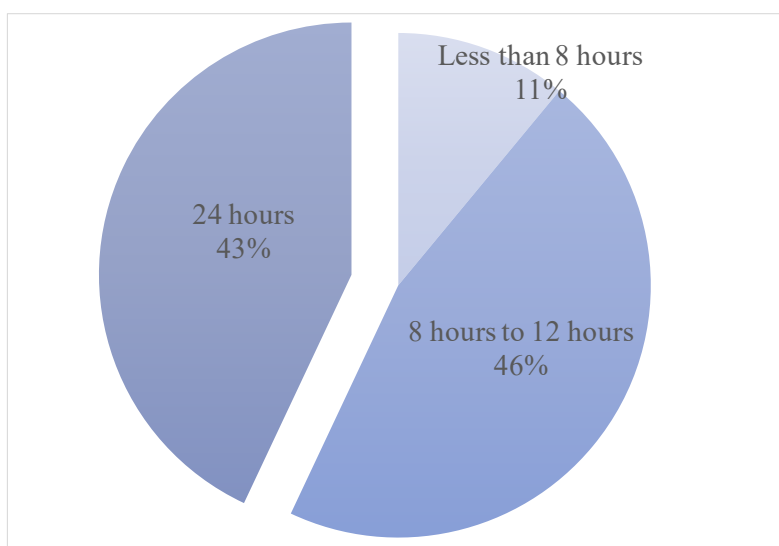**Table 9.1.16   Existing Water Supply and Water Demand in the Urban Area**

Thromde/Town	Dzongkhag	Existing Supply (mld)	Existing Demand in 2014 (mld)	Demand in 2030 (mld)
Chamkhar	Bumthang	1	0.2	0.43
Phuntsholing	Chhukha	10.93	5.9	9.65
Tsimasham and Tsimalakha		2	0.7	1.32
Dagana	Dagana	0.6	0.3	0.6
Gasa	Gasa	0.5	0.1	0.22
Haa	Haa	1.5	0.7	1.4
Phaling	Lhuentse	1	0.3	0.66
Monggar	Monggar	3	1	**1.96**
Paro	Paro	2	0.7	**1.32**
Pemagatshel and Denchi	Pemagatshel	1	0.3	0.6
Khuruthang	Punakha	2	0.7	1.28
Samdrupjongkhar	Samdrupjonghar	2.6	2.5	**4.81**
Samtse	Samtse	2.5	1.4	**2.79**
Gelephu	Sarpang	6.18	2.7	5.15
Sarpang		1	0.8	**1.47**
Tashigang	Tashigang	1.5	0.7	1.33
Tashiyangtse	Tashiyangtse	1.6	0.8	1.53
Thimphu	Thimphu	15.4	**22.9**	**37.22**
Trongsa	Trongsa	1	0.8	**1.51**
Damphu	Tsirang	1.9	0.5	0.93
Bajo	Wangduephodrang	2.4	1.9	**3.76**
Zhemgang	Zhemgang	1	0.7	**1.3**

Note: Gray scale identified the excessive water demand or existance of poor water supply system
Source: Urban Water Supply –Status and Plan, Department of Engineering Services, MoWHS October 2014

2)   Water supply for 24 hours and seven days a week

The current water supply system cannot provide 24-hour access to drinking water in many places. In urban areas in 2014, 43% of households had 24-hour access to drinking water, while 11% of the urban population had access to water for less than eight hours per day. The reasons are as follows: 1) poor demand management, 2) inadequate existing facilities to cover demand, and 3) inadequate and unreliable water resources.

Figure 9.1.13   Duration of Water Supply in Urban Area

3)   Water quality for drinking purpose

As stated in 6.2, most areas ensure access to improved water sources as follows: urban areas = 95.6%; Rural Areas = 95.5%. That said, the drinking water quality is unreliable. This is true for both Urban and Rural Areas, as reported by the Ministry of Health.

A water quality survey at the national level has been implemented and monitored by the RCDC, in collaboration with district hospitals and basic health units. However, the water testing and monitoring facilities need to be developed. Currently, there is no facility able to conduct chemical substance content examinations in Bhutan, even though the examination method is expected to meet global standards. Meanwhile, the lack of human resource capacity is also highlighted.

Figure 9.1.14 shows the ratio of drinking water safety by Dzongkhag in 2017, as implemented by the National Water Reference Laboratory of the RCDC. These safety criteria are based on the Bhutan Drinking Water Quality Standard for 2016. The percentage of average drinking water safety in urban and rural areas is approximately 43% and 51%, respectively. Additionally, the safety percentage is seasonally changed. In general, the water quality from June to August is reported as becoming comparatively worse.
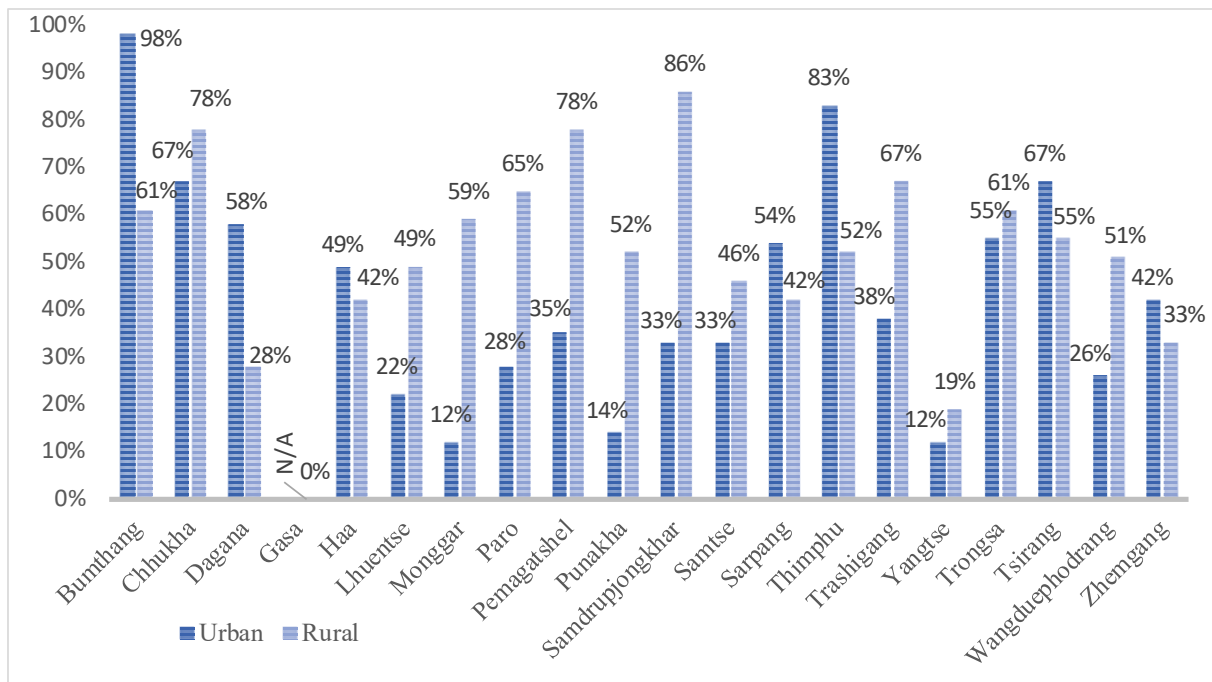
Source: National Water Reference Laboratory, Royal Centre for Disease Control, Ministry of Health, Year 2017 Status of Drinking Water Safety in Bhutan

Figure 9.1.14   Percentage of Safe Drinking Water in Rural and Urban Area in Bhutan 2017

In urban areas, the main cause of water contamination is improper waste management including sewage. The low sewer connection rate, which is only 15% in Thimphu City, is an example of the risk of overdischarged wastewater. The increasing number of automobile companies has been indicated as a new source of water contamination because most of their workshops are located on the riverside.

In rural areas, agro-chemical products could be a source of water contamination. Pesticide and herbicide use doubled between 1998/99 and 2004/05. Deforestation and land degradation have also led to sedimentation, which affects water quality.

The construction of a dam and the pollution emitted by it have severely affected life downstream, including the eco-system.

9.2   Problem Structure Analysis

(1) Analytical Procedure

The existing conditions of Bhutan have been analysed by sector, while site visits have also been undertaken as part of the study. The various problems facing Bhutan have been identified for different sectors and localities. Many of these problems are interrelated, therefore leading to the undesirable phenomena presently being observed. A problem structure analysis is a method to macroscopically clarify these interrelationships. The analysis, usually undertaken during the initial stage of development planning, would allow for a broad perspective without getting bogged down in detail, thus enabling the identification of the most essential factors and the major problems, which could then be alleviated through planned development efforts. The analysis is used to define Bhutan's development objectives and a basic development strategy.

(2) Problem Enumeration

The first step of the problem structure analysis is to enumerate the problems facing Bhutan. The early results from the fieldwork, which included interviews and discussions with Steering Committee members, Working Group members and Core Members, as well as field surveys from the Dzongkhags, were used to enumerate all of the problems perceived by the aforementioned stakeholders and observed. Some of these problems have been combined to define a broader problem more generically. Some relatively minor problems are excluded from the analysis. All of the problems listed for the purpose of the problem structure analysis are listed in Table 9.2.1. Those include the problems identified in section 9.1 of this report.

The problems comprise two inherent problems, 17 economic problems, 12 social problems, six environmental problems and two infrastructural problems. The number of problems identified in each category shows that Bhutan's current problems are mainly related to economic and social issues, while environmental and infrastructural problems are limited. This implies that the efforts of the Government of Bhutan to conserve the quality of environmental conditions have been successful, although rapid urbanization is leading to the threat of social changes. Continued high investment in infrastructure development has led to the creation of acceptable road, electricity supply, water supply and sanitation networks without serious problems, although the road network still requires improvement, for example, road paving and road widening for better travelling performance.

Table 9.2.1   Major Problems Facing Bhutan

Category	Major problems	Category	Major problems
Economic problems	1. Limited number of international tourists 2. High transport costs, including weak access to the international market 3. Low incentives to continue with agricultural production 4. Seasonal disparities in tourist numbers 5. Small area of agricultural land 6. Small market size 7. Small population size 8. Trade deficit 9. Inadequate informaiton about local resources 10. Low-value of available mining resources 11. Low access to finaincal resources 12. Undeveloped manufacturing industries and CSIs 13. Undeveloped mining resources 14. Undeveloped non-wood timber forest products 15. Undeveloped private sector 16. Unhealthy financial balance 17. Lack of mechanization in agriculture	Social problems	23. Low recognition of rural life 24. Increase of fallow land 25. Low GNH Index of farmers 26. Rapid migration to urban areas 27. Relatively high multi-dimensional poverty rate in rural areas 28. Shortage of affordable housing 29. Threat of diminishing tradition and culture
Social problems	18. Low rate of food self-sufficiency 19. Dependency on imported products 20. Unemployment especially for youth generation 21. Mismatch between human resources and market demand 22. Conflict of land use between urban, agricultural and forest areas	Environmental problems	30. Damage from wildlife 31. Excessive disposal of solid waste in urban areas 32. Natural disasters (forest fires, floods, landslides, GLOF) 33. Scarce water resources in towns 34. Threat of degrading environmental quality 35. Worsening air and water quality in urban areas
		Infrastructural problems	36. Insufficient air transport capacity 37. Vulnerability of roads to landslides and slope failures
		Inherent problems	38. Monsoon climate 39. Mountainous country

(3) Problem Structure

Having identified all of the major problems facing Bhutan, a problem structure has been constructed as shown in Figure 9.2.1. The figure shows the most important problem factors and phenomena, expressed in generic terms to imply many detailed or sector-specific problems. The figure also shows causal relationships between the identified problems, focusing only on the main interrelationships. Three broad problems can be identified, which should then be alleviated through planned development efforts. These problems consist of problems in rural area, urban area and national socioeconomic conditions. The observed problems are described below.

1) Problems in rural area

Two inherent problems at the root of many other problems are the country's mountainous terrain and its monsoon climate. The mountainous topography limits the land available for agricultural use. The small size of agricultural plots of land hinders the mechanization process and reduces productivity, in turn representing disadvantageous conditions for agriculture development. Furthermore, the household income of farmers is smaller than that of other economic actors. The farmers have to deal with imported products with a low price from India and protect their farmland from wildlife. It is difficult for famers to find incentives to continue farming. Further, young people have started to leave rural areas and migrate to urban areas to find better opportunities in terms of higher education and jobs, as well as better conditions of employment than farming. The out-migration from rural areas has diminished rural society through the loss of the younger generations who must succeed the older generations in rural jobs. This might mark the beginning of the loss of Bhutan's national identity, which was carefully conserved before the establishment of the monarchy and has continued. Out-migration will cause the negative cycle to diminish the rural society. Out-migration causes labour shortages in rural areass, leading to increased amounts of fallow land. This results in the greater occurrence of wildlife conflicts on farmlands. The population decrease also makes it difficult to sustain the service level of public services.

Parents expect their children to not succeed at farming nor receive a high enough education to find a good job in an urban areas. Parents also do not recognize the value of rural life. Consequently, their children do not want to stay at home, because their parents do not want their children to stay at home after they have completed higher education.

2) Problems in urban area

Rapid migration causes land conflicts due to the shortage of land at affordable price in the towns. Rapid migration demands sufficient job opportunities. Such a social problem may lead to a deterioration in social security, such as in the form of criminal offences.

Bhutan has not yet experienced any serious environmental degradation. The concern is that rapid urbanization will exceed the environmental capacity of urban areas. Excessive waste will deteriorate water and air quality. Water resources should be used effectively: wastewater must be treated using the correct procedures and solid waste must be properly managed. These subjects should be examined in the infrastructure development plans of those towns which will receive a considerable number of migrants. Otherwise, rapid migration will threaten the tradition and culture in urban areas. Bhutan's environmental problems are not currently serious in its urban areas, but advance preparation is necessary in order to avoid environmental deterioration.

3)   National socioeconomy problems

The creation of jobs is the most critical problem in both Urban and rural areas. The current national economy relies heavily on sales of electricity to India. Bhutan has considerable potential in terms of hydropower development due to its mountainous topography and high levels of precipitation. However, its landlocked situation and small population lower its economic competitiveness in the global economy.

Bhutan's mountainous topography reduces the travel speed of land transport in the country. Long travel times consequently increase the cost of travel, thus lowering the competitiveness of prices for economic development. Mining resources do not include high-price resources. It is difficult to find comparatively advantageous products in the country. Hydropower electricity has failed to create a large number of job opportunities. The stagnation of industrial development can particularly be observed in rural areas, from where people are leaving to seek employment opportunities in urban areas.

The monsoon climate brings heavy rain in the rainy season. Prolonged rainfall causes landslides in mountainous areas and blocks land transport. These road blockages impede people's daily lives and hinder communication in the country. The monsoon climate also causes seasonal disparities in tourist numbers. In combination with those problems, domestic industry has not been developed. Moreover, the undeveloped domestic industry is not able to compete with imported products including articles for daily use, fossil fuels and food. The nation's financial balance is consequently unhealthy and depends on financial support from international partners.
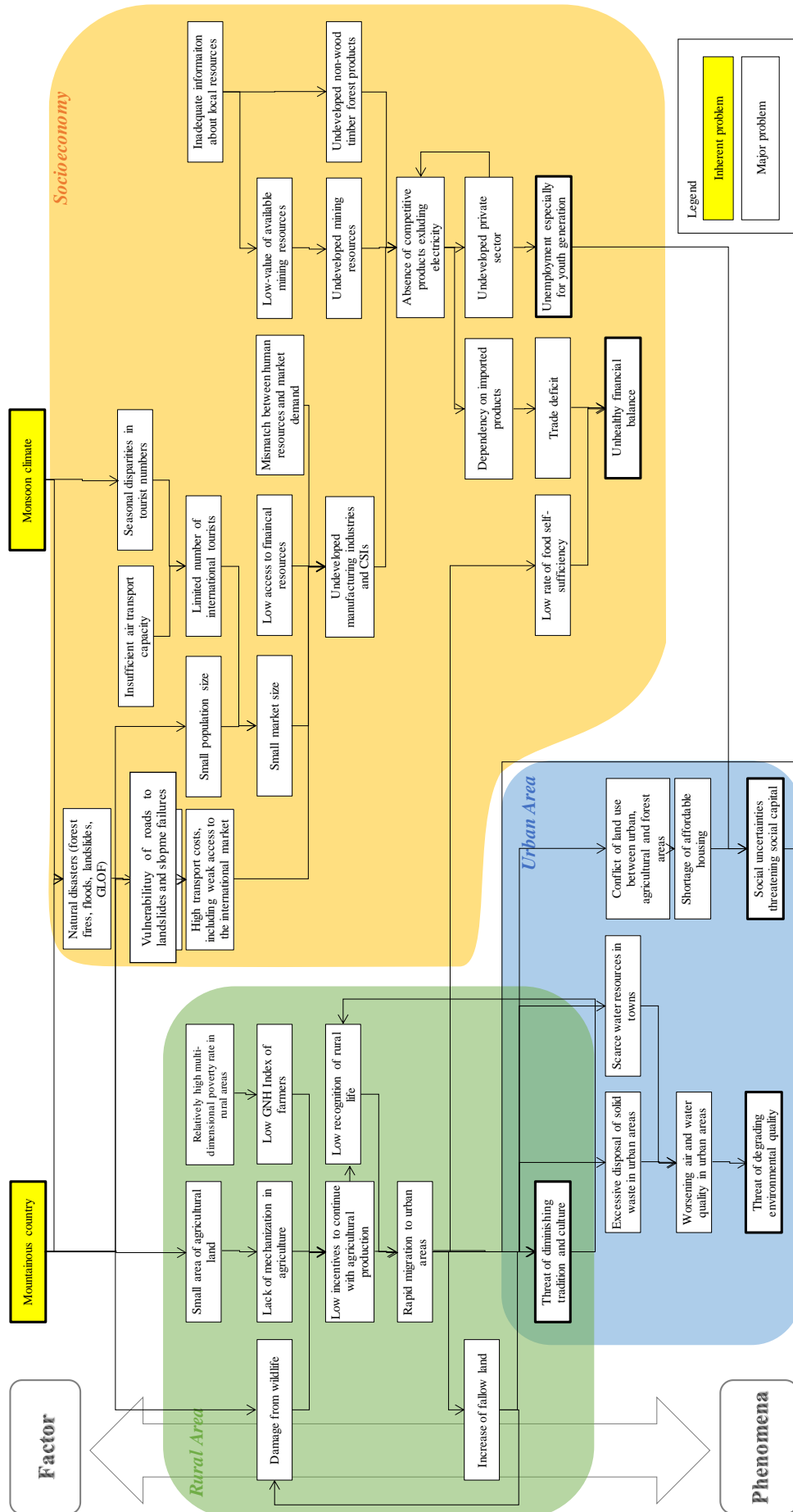
Figure 9.2.1   Problem Structure of Bhutan

9.3 Identification of Development Issues

The problem structure analysis identified Bhutan's major problem factors and problem phenomena. The future perspective of Bhutan predicts conditions that Bhutan will face in the future if the current situation continues. Development issues were identified in consideration of these analyses and assumptions.

Rural-urban migration is causing social tensions in many parts of the world. However, there are no specific countermeasures to stop migration to urban areas. Once migration has started, people will migrate into urban areas, even though this migration might not be economically efficient. Experiences in other countries suggest that countermeasures must be taken to prevent serious problems in both urban and rural areas, even as migration continues. Some of these countermeasures may include action that consequently mitigates rural-urban migration to a limited extent.

(1) Isssues to be addressed for rural area

Countermeasures in rural areas must be consisted of a comprehensive approach that cover the economic and social aspects. One of the necessary countermeasures must deal with the extent to which the local people will recognize the value of rural life in local areas and encourage it. Because the local people are the most important resources to vitalize the rural area. The expected human resources will be local residents and migrants who are willing to commit themselves to development in local areas. The local people are not sometimes able to find an unique value and advantage in their lives. It is useful that they receive the stimuration from the people on the outside. The in-migrants to the rural area and tourists can take this role. The people who were originally local people and left a village can be a good human resource, when they decide to be back to a rural area.

Another countermeasure is to provide the good living environment in the rural areas. The conditions of each village are different in location, population size and accessibility to public services. Although the public services will not be provided equally in all the villages, a holistic delivery service system should be established to meet the acceptable level for the local people.

The other conuntermeasure is to identify the economic activies other than agriculture in rural area. Tourism is believed to have the next highest potential after hydropower development. The tourism will be an economic activity to interlink the different types of economic activies in rural areas. Although tourism resources exist in the Dzongkhags, those are not recgonized by local people. Utilizing those recources, the tour routes should be identified to benefit people in rural areas. The creation of competitive products will be impotant in local area. There is a list of non-wood forest products (NWFPs), but their market potential has not been examined. The most strategic NWFPs should be identified in order to use Bhutan's rich biodiversity in a sustainable manner.

(2) Isssues to be addressed for urban area

Countermeasures in urban areas may be critical so that migrants can be received without serious environmental and social problems. These countermeasures encompass the following aspects with the aim of achieving sustainable development.

- The creation of jobs opportunities.
- Land use control to maintain good environmental quality, economic efficiency and cultural attractiveness.
- Efficient transport system and infrastructure.

● Affordable housing.

In urban areas, economic development, land use control, the transport system and infrastructure development should be examined in the structural plan of the municipality and the local area plans of the selected areas. The structural plan ensures the availability of sufficient lands for housing supply. However, the Comprehensive National Development Plan (CNDP) should also focus on the national spatial structure and a national land use plan to envision a desirable national situation with which the structure plan and local area plans can then be aligned. The local governments of Dzongkhag and Thromde are obliged to prepare the business environmenta and find the potential economic activities having comparative advantates in locality.

(3) Isssues to be addressed for national socioeconomy

In the social aspect, the rapid rural-urban migration is recently the upmost critiral issue in the country. Although this critical issued should be tackled, the CNDP msut be formulated to resolve the issues in the long-term perspective. In this line, the balanced development of rural and urban areas is the most impotant and challenging issue. The balanced devleopmet can be achieved only by effectively utilizing the local resources. The CNDP will contribute to formulate the software and hardware for achieving this up most challenging issue.

Like in Japan, the national territory is divided into regions in which the whole area can be accessed in a one-day trip and commuting is possible. The extent of these regions has expanded as the transport system has improved. Nowadays, the one-day trip region extends to most of the country in Japan following the establishment of regional airports, highways and bullet trains. However, Bhutan's situation is different as it has a small population scattered throughout remote areas and a mountainous topography. The development of highways will damage Bhutan's pristine environment and will result in the deterioration of national identity. Bullet trains and tunnels will require a large amount of cost. Therefore, a suitable regional scale should be carefully considered for Bhutan. This suitable scale may have a travel timeframe of several days or one week. A development model that avoids reliance on the transport network will be unique and challenging and will set a good example to other countries also faced with problems of difficult accessibility.

In order to pursue the most suitable national spatial structure and national land use plan, development alternatives will be established and examined as part of the strategic environmental assessment.

At the macro economy, the trade balance has been deficit due to economic dependency on the imported goods. The imported goods include daily goods, foods and fossil fuels. The sales of electricity is the largest export product and a sole means of acquisition of foreign currency in Bhutan. The Bhutanese economy has to encourage the tourism and other activities for means of obtaining foreign currency. On the other hand, improvement for self-sufficiency of energy and foods is another issue. Bhutan is rich with the electricity. The effective use of electricity needs to reduce the dependency on the imported fossil fuel. The supply of domestic agriculture produce also needs to be pursued. The improved self-sufficiency contributes the import substitution.

The CNDP will contemplate the countermeasures necessary to tackle these issues.

(4) Improvement of GNH in urban area and rural area

The degree of the GNH indices is analysed for Urban and rural areas in each Dzongkhag in the project. The degree of the three domains of education, living standards and ecology is lower

than the national average in the rural areas of more than 11 Dzongkhags as shown in Table 9.3.1. In contrast, the degree of cultural diversity and community vitality is below the national average in the urban areas of more than nine Dzongkhags. The factors with high relevance to these low-degree domains are analysed in order to find a way to improve GNH in Rural and urban areas. The details of the analysis are mentioned in Chapter 7 of this report. The factors include two kinds of social categories and promoting factors. The promoting factors correspond to GNH domains and their indicators.

In urban areas, the factors affecting two low-degree domains are spirituality, cultural knowledge, government performance, community vitality, environmental conservation, living standards and occupation. The first five factors imply that a living environment with a rich environment and social ties help to improve cultural diversity and community vitality as shown in Figure 9.3.1. The latter two factors mean that the creation of job opportunities for sufficient livelihood supports the improvement of two domains.

In rural areas, the factors that are highly relevant to the low-degree domains include family relationship, work-life balance, government performance, recognition of nature as domains of spirits, environmental conservation, health, formal education, occupation, and financial security. The first five factors reveal that cultural living conditions with a rich environment and community bonding are effective for improvement. The next two factors express the needs of good access to social services, such as education and health. In the last two factors, job creation, which is sufficient to support livelihood, is required to achieve a higher GNH index degree in rural areas. In preparation of the CNDP, the above-mentioned improvement should be considered to reach the utmost target necessary to raise the degree of GNH in the entire country.

Table 9.3.1   GNH Indexes by Domains for Each Dzongkhag with Urban and Rural Distinctions

To be improved for rural area   To be improved for urban area

Dzongkhag	Psychological wellbeing		Health		Time use		Education		Cultural diversity		Governance		Conummity vitality		Ecology		Living standard	
	0.58		0.85		0.59		0.47		0.6		0.52		0.68		0.76		0.65	
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
Bumthang	0.68	0.60	0.84	0.88	0.60	0.58	0.43	0.63	0.68	0.58	0.59	0.66	0.75	0.57	0.69	0.86	0.63	0.86
Chukha	0.48	0.57	0.86	0.87	0.64	0.67	0.48	0.65	0.53	0.51	0.50	0.45	0.65	0.57	0.81	0.78	0.66	0.84
Dagana	0.58	0.60	0.79	0.92	0.55	0.43	0.49	0.50	0.57	0.59	0.50	0.55	0.69	0.63	0.73	0.82	0.54	0.81
Gasa	0.65	0.74	0.88	0.95	0.71	0.72	0.39	0.59	0.68	0.60	0.45	0.54	0.78	0.63	0.91	0.86	0.67	0.72
Haa	0.63	0.66	0.87	0.88	0.59	0.56	0.39	0.56	0.67	0.55	0.45	0.57	0.67	0.68	0.76	0.86	0.66	0.82
Lhuentse	0.58	0.55	0.81	0.87	0.60	0.65	0.38	0.65	0.70	0.64	0.65	0.62	0.78	0.62	0.65	0.83	0.56	0.90
Mongar	0.56	0.61	0.88	0.90	0.49	0.43	0.33	0.56	0.65	0.55	0.64	0.51	0.71	0.65	0.66	0.84	0.51	0.81
Paro	0.67	0.60	0.86	0.93	0.64	0.45	0.46	0.64	0.52	0.48	0.46	0.75	0.69	0.59	0.73	0.92	0.78	0.88
Pemagatshel	0.57	0.57	0.81	0.90	0.58	0.65	0.41	0.74	0.71	0.49	0.65	0.59	0.80	0.70	0.66	0.80	0.50	0.85
Punakha	0.59	0.50	0.83	0.91	0.56	0.39	0.37	0.66	0.59	0.48	0.58	0.51	0.70	0.57	0.89	0.81	0.58	0.91
Samdrup Jongkhar	0.57	0.56	0.83	0.80	0.59	0.63	0.41	0.58	0.72	0.62	0.43	0.40	0.77	0.60	0.74	0.83	0.46	0.76
Samtse	0.51	0.58	0.82	0.84	0.59	0.68	0.46	0.65	0.59	0.55	0.52	0.44	0.67	0.60	0.82	0.83	0.61	0.81
Sarpang	0.59	0.59	0.82	0.83	0.51	0.51	0.45	0.63	0.58	0.53	0.56	0.51	0.73	0.62	0.63	0.79	0.65	0.83
Thimphu	0.60	0.59	0.83	0.88	0.54	0.62	0.45	0.59	0.66	0.55	0.46	0.42	0.62	0.57	0.91	0.87	0.70	0.82
Trashigang	0.54	0.63	0.86	0.91	0.56	0.58	0.34	0.61	0.72	0.62	0.51	0.58	0.68	0.65	0.78	0.84	0.44	0.77
Trashiyangtse	0.51	0.52	0.85	0.88	0.59	0.77	0.38	0.65	0.62	0.60	0.56	0.59	0.73	0.65	0.61	0.89	0.42	0.75
Trongsa	0.58	0.62	0.80	0.87	0.59	0.48	0.37	0.61	0.59	0.48	0.51	0.48	0.73	0.64	0.58	0.90	0.53	0.85
Tsirang	0.66	0.61	0.85	0.86	0.56	0.63	0.47	0.58	0.61	0.60	0.59	0.62	0.69	0.65	0.74	0.94	0.61	0.84
Wangdue Phodrang	0.55	0.62	0.86	0.89	0.57	0.48	0.35	0.55	0.55	0.51	0.59	0.47	0.70	0.66	0.70	0.87	0.56	0.81
Zhemgang	0.52	0.55	0.78	0.88	0.66	0.64	0.40	0.65	0.70	0.64	0.61	0.53	0.78	0.67	0.58	0.74	0.50	0.88
	6	1	7	0	4	7	13	0	4	11	6	5	2	9	11	0	13	0
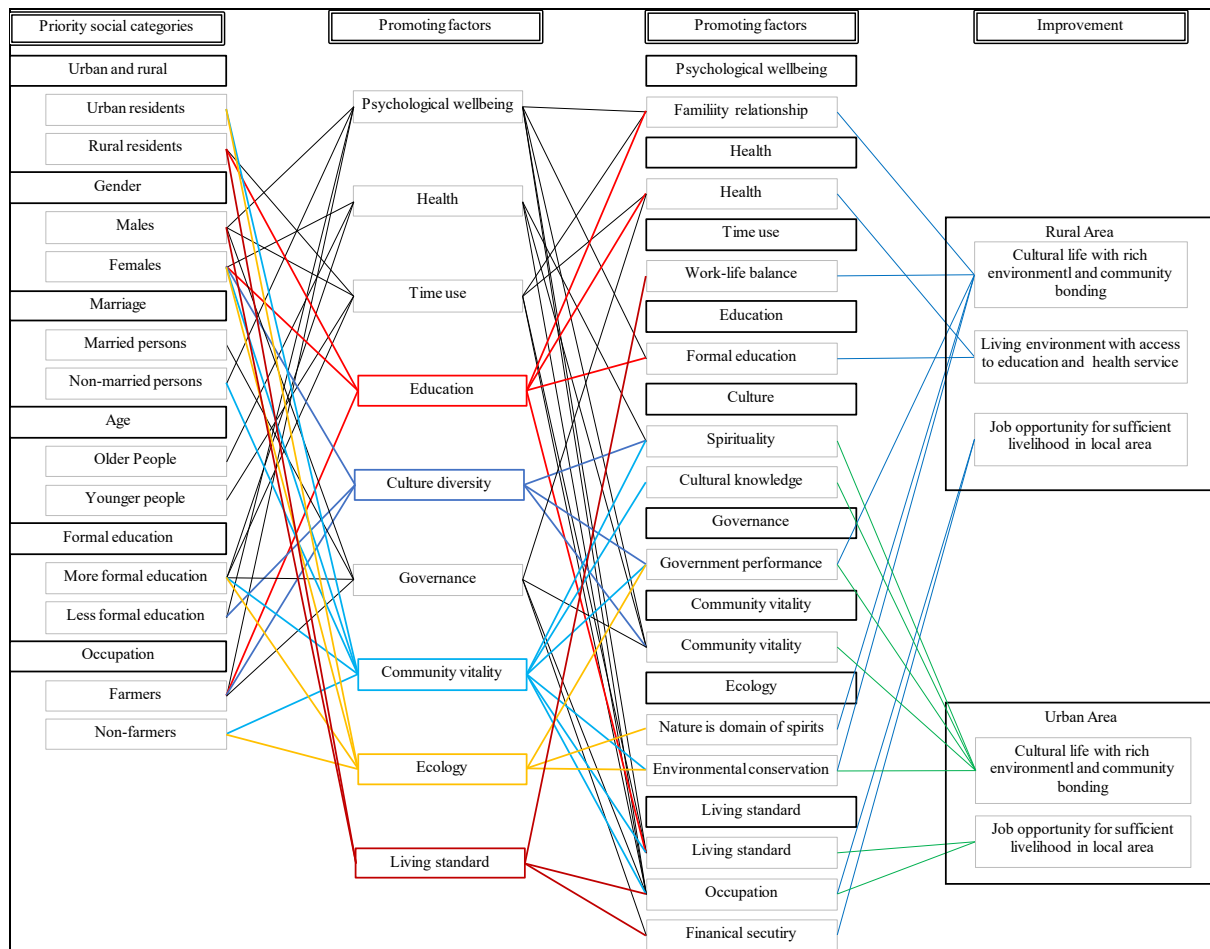
Figure 9.3.1 Necessary Improvement for GNH in Urban Area and Rural Area