

# Review of Road Sector Master Plan (2007-2027)

## 1. Introduction

Being a land-locked and mountainous nation, roads form the main mode of transport in the country besides air transport. As such, the Royal Government of Bhutan ever since it began the modern development process in 1961, has been consistently prioritizing road and highway construction in each of the five year plans so far. Major chunk of the country's overall financial outlay for development is allocated for road sector.

The Royal government realizes the fact that development of an efficient road transport infrastructure is very critical for Bhutan in terms of achieving international trade as well as to facilitate safe and efficient movement of people and goods. Bhutan 2020, a vision document mentions that all new roads constructed at dzongkhag and geog levels cannot be justified on economic criteria alone, and that our road building programme will need to take account of other considerations derived from the principles of social justice and equity. In addition, our physical infrastructure affects every individual and communities, integrates different parts of our nation, links the Kingdom with the outside world, and has a direct bearing on the maintenance of the sovereignty and security of our nation-state. The document outlines that development of efficient road network in the country that is essential to bring communities out of their isolation, expanding their access to essential services and markets, enlarging their opportunities and choices, and creating conditions required to promote rural industrialization.

Bhutan 2020 set the following numerical targets and strongly promotes road development as a major national project:

- Improve arterial roads by 2007 to allow for traffic of 30 trucks
- Develop a road network by 2012 that can be reached on foot in half a day by 75% of the country's population
- Complete the second east west (about 794km) by 2017

However, because large parts of the country consist of steep mountainous areas there are significant geological and topographic constraints to the construction of the majority of roads.

As such, the Ministry of Works and Human Settlement had prepared the Road Sector Master Plan (2007-2027) in 2006 in order to carry out carefully planned development and strengthening of the road network in the country. The Master Plan is a 20-year programme that focuses on some strategic road connectivity like the construction of South East-West Highway (SEWH), network expansion, road realignment, inter-dzongkhag connectivity, connectivity to potential economic growth centers, and tunneling. This document serves as a guide for planning, development and maintenance of highways/roads in the country in a phased manner.

The current review is being carried out as we have reached the halfway of the plan horizon, and also to assess the achievements made so far, and to plan ahead keeping in mind the changing needs and priorities of the country and people. In addition to the above outlined priorities, it has also become imperative with time, to consolidate and strengthen the built infrastructure through proper asset management approaches. The growing effects of climate change are also making road building and maintenance very challenging, which calls for better planning and building of our road infrastructure hereon. Climate resilient infrastructure should be the way forward when we plan our public infrastructure investment.

## **2. National Policies and Visions for Sector**

The Royal Government provides road transport policies from time to time in order to meet the changing and growing needs of the country and the people. Such policies also provide overall guidance in planning and implementation of road infrastructure programs and projects for sustainable and inclusive development of road transport in the country.

Current documents that provide vision and guidance in the development of road transport are as follows:

### **a. RSMP 2007-2027**

In 2006, the Ministry of Works and Human Settlement prepared the Road Sector Master Plan 2007-2027, a 20-year planning document to provide guidance to planners for development of road transport network in the country. The Master plan consists of road network expansion, road realignment, tunneling, roads for inter-dzongkhag connectivity and the Second East-West Highway.

## **b. Road Act 2013 & Road Rules and Regulation 2016**

The law and the subsequent regulations empowers the Department of Roads under Ministry of Works and Human Settlement to establish and maintain an efficient road network system to enable balanced socio-economic development. These also provide clear delineation of roles and responsibilities between various government bodies at various levels and road users to manage and administer the road network system efficiently.

## **c. Bhutan 2020**

A vision document prepared in 1999 that provides a comprehensive policy direction to pursue our development process with the over-arching goal of ‘Gross National Happiness’ for the country. Most of the salient targets outlined in this document for the road sector are achieved and some are still being pursued.

## **d. Bhutan Transport 2040**

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 Dzongkhag roads, to farm roads and access roads. The Road Network Development Strategy covers:

- National highways (PNH & SNH), which provide connections to border crossings and links to all Dzongkhag Centres
- Dzongkhag Roads, which provide access within each dzongkhag to all gewogs, and major villages
- Farm roads, which provide access to individual communities not otherwise served and
- Access roads, which provide access to hydro power plants, schools, health facilities, forestry land, among others.

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

- Double-Laning of North East-West Highway (NEWH) to be complete by December 2017.
- Widening of Thimphu - Phuentsholing highway (AH 48) completed and upgraded to Asian Highway standard Class II.
- Widening of Samdrup Jongkhar - Trashigang is in progress.

- Thicker road pavements are used to enhance durability and riding comfort and reduce life cycle cost.
- Manual road construction methods are being replaced by semi or fully mechanized methods. Conventional road construction methods are being replaced by more sustainable EFRC methods.

### **3. Classification of Roads**

The Guidelines on Road Classification System and Delineation of Construction and Maintenance Responsibilities (GRCS & DCMR) of 2009 stipulates the need of comprehensive road classification system delineating ownership and roles of various agencies involved in planning and budgeting, implementation and maintenance of road network. A proper road classification will establish:

- i) clear understanding and definition of various road categories;
- ii) clear understanding among stakeholders and agencies as regards to their role in road sector development; and
- iii) increased transparency in decision making.

As per the “**Road Act of Bhutan 2013, Chapter 2 Administration of Roads**”, the entire road network of the country is classified into 5 categories as follows:

#### **Category 1: National Highways, which are further sub-categorized as:-**

- i. Asian Highway (AH 48 Class II, Phuentsholing-Thimphu Highway)
- ii. Primary National Highway (PNH)
- iii. Secondary National Highway (SNH)

#### **Category 2: Dzongkhag Roads**

#### **Category 3: Thromde Roads**

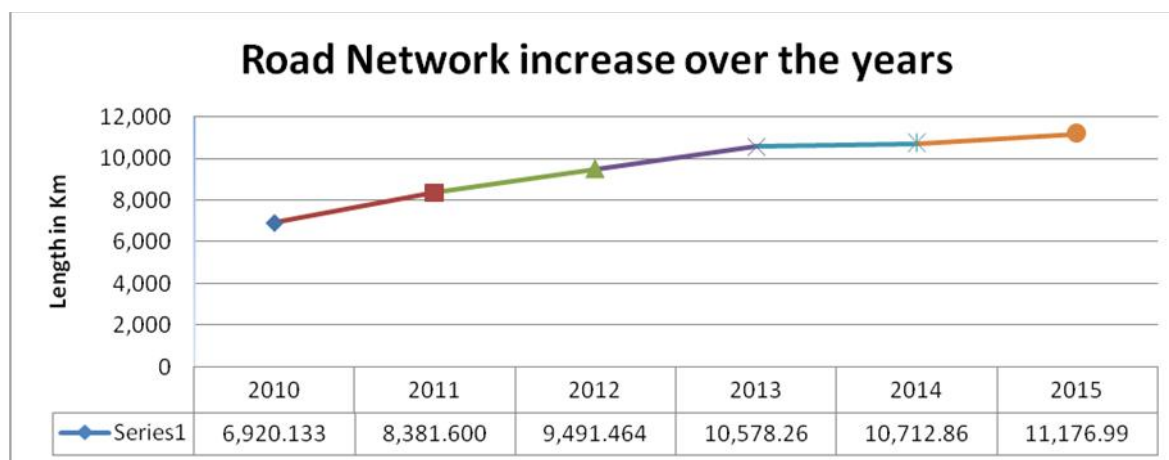
#### **Category 4: Farm Roads**

#### **Category 5: Access Roads**

The definition and technical standards of each category/sub-category of above roads and the responsibilities for these roads shall be as per the GRCS & DCMR 2009.

The road length has increased from 5,362 kms in 2008 to 11,177 kms by June 2016. The details are as follows:

SN	Road Type	As of 30 <sup>th</sup> June 2008	As of June 2016
1	Expressway	6.20	Nil
2	Asian Highway	Nil	174.00
3	Primary National Highway	1,621.10	1,800.64
4	Secondary National Highway	482.00	584.47
5	Dzongkhag Roads	820.70	1,504.32
6	Urban Road	163.00	402.98
7	Farm Road incl. PTT	1,186.40	5,351.42
8	Access road incl. Forest Road, etc.	1,083.10	1,359.16
<b>Total</b>		<b>5,362.50</b>	<b>11,176.99</b>



About 2,654.4 kms of Dzongkhag roads (Feeder roads) was planned in the RSMP 2007-2027 in 2007, and about 2,621.29 kms has been achieved as of June 2016, thus surpassing the planned coverage.

#### 4. Review of Road Sector Master Plan 2007-2027

As per the ‘**Road Act of Bhutan 2013**’, the Road Sector Master Plan is required to be reviewed every ten (10) years from the date of publication OR as and when needed by the Ministry. The RSMP 2007-2027 has focused mainly on the construction of feeder roads (Dzongkhag roads now as per the Road Act 2013) based on *cost per household (cphh)*. A unit cost of Nu. 5.21 million

per km, derived from the World Bank-assisted Rural Access Project, was adopted for computing the costs of feeder roads. Based on this criteria, four priority rankings of **A, B, C & D** developed as follows:

<b>Priority Ranking</b>	<b>Range of cphh (Nu.) in million</b>
A	< 0.5
B	0.6 - 0.9
C	1.0 - 1.5
D	> 1.5

Cphh range of less than 0.5 million for priority ranking A was based on the assumption that improved accessibility would accelerate economic activities of the beneficiary households and enhance cash incomes of up to Nu.0.5 million per annum towards the end of road life, which is estimated at 15-20 years. Roads for which priority ranking based on cphh could not be determined because of non-availability of information on beneficiary households, was assigned a priority ranking D.

### **I. Dzongkhag (Feeder) Roads**

About 132 new feeder roads with a total length of 2,654.4 km had been prioritized, which would benefit a total of 20,893 households excluding indirect beneficiary households. The Ministry in collaboration with Ministry of Agriculture and Forests and the 20 dzongkhags has successfully completed the construction of these feeder roads as of December 2016.

### **II. South East-West Highway (PNH-2)**

Out of about 794 kms of road that form the proposed South East-West highway, 506 kms were proposed new construction and the remaining 288 kms were up-gradation of existing roads. As of December 2016, 141 kms of new construction have been completed and 39 kms of up-gradation have been completed. Refer Annex 1 for details.

### **III. Inter-Dzongkhag Roads**

Out of the proposed 537 kms of road to provide inter-Dzongkhag connectivity (refer Annex 2), 12 kms (of Shingkhari-Gorgan) completed while the remaining are yet to start. Refer Annex 2 for details.

#### **IV. Major Realignment**

Out of the 62 kms of major road realignments identified, 16kms (Wangdigang-Tingtibi) have been completed; Reffe-Khosala (16 kms) and Damchu-Chukha (24 kms) will be completed by end of 2017, while the 6 kms stretch of Serpang-Sengor could not start. Refer Annex 3.

#### **V. Road Tunnels**

Ten (10) road tunnels have been identified along the various parts of the road network in order to reduce travel distances. These proposals require further feasibility studies. Refer Annex 4 for the details.

### **5. Implementation Plan**

With the RSMP 2007-2027 as the basis, the Ministry has carried out further surveys and studies so far in order to explore various possibilities to connect adjacent Dzongkhag headquarters and further reduce travel distances along various routes in addition to those already identified in RSMP.

As an outcome of these studies, few routes and bypasses are identified to improve inter-Dzongkhag connectivity. Further, few new routes are also identified for new inter-Dzongkhag connectivity which are proposed to be taken in a phased manner by the year 2027.

As the year 2016 ends, the Ministry is taking stock of the Road Sector Master Plan prepared in 2006 in order to set the target for the next 10 years of the Master plan horizon along with action plans.

The Ministry has set the following objectives over the next 10 years:

- a) Construct and complete the South East-West Highway up to PNH standard
- b) Construct new roads to provide inter-Dzongkhag connectivity
- c) Consolidate existing highways and roads infrastructure to make them climate-resilient
- d) Construct short tunnels where feasible
- e) Develop road asset management system to enable efficient highway operation and maintenance, thus creating value for money
- f) Promote mechanization in road construction and maintenance
- g) HR development to promote specialization in some special areas within the road sector





## **1. South East-West highway**

### **a) a) Pasakha-Gedu Road (Up-gradation-52km)**

The existing road will be upgraded to PNH standard. Up-gradation of this road will mainly provide an alternate reliable route along the Thimphu-Phuentsholing highway during road blockages in summer. About 38km of this proposed up-gradation will also benefit the connectivity to Lhamoizingkha dungkhag, thereby further strengthening the South East-West connectivity.

### **b) b) Lhamoizingkha-Karmaling (Up-gradation-12km)**

The existing farm road (?) will be upgraded to PNH standard. This road connects to Dagana dzongkhag and upgrading this stretch of road will further improve the connectivity between the dzongkhag and the dungkhag. Upgrading the road will also benefit the country's plan of building the Sunkosh hydroelectric project in future.

### **c) c) Gelephu-Gelezam-Umling (Up-gradation-21km)**

The existing road will be upgraded to PNH standard as this road falls along the South East-West highway. Upgrading this road will facilitate the smooth and efficient of people and goods including the Dungsam cement from Nganglam. This road also connects Gelephu to Umling geog center.

### **d) d) Umling-Panbang (New construction-70km)**

The new road from Umling toward Panbang will of PNH standard as this is part of the South East-West highway. The road will bring immense benefit to people of lower Kheng in terms of access to market, essential services etc. The road connection to Panbang will also provide alternate connectivity between Zhemgang dzongkhag and Gelephu. Panbang's tourism potential can be further boosted if this road can be upgraded.

### **e) e) Nganglam-Dewathang (New construction-74km)**

The new road Nganglam to Dewathang will be of PNH standard as this is also part of Lholam. This road will connect Nganglam to Samdrup Jongkhar dzongkhag center. Nganglam is poised to be the commercial hub in the east as it will be connected to Gyelposhing and Pemagtshe dzongkhag in the north and Panbang in the west. By connecting to Dewathang, it will be well-connected to all the three adjacent dzongkhags. The road will greatly benefit the smooth and efficient movement of people and goods including Dungsam cement from Nganglam to other parts of the country.

**f) f) Amochu embankment**

The construction of raised embankment (1.25km) and Chamkuna-Phuentsholing road (3.3km) along the Amochu river towards Phuentsholing will protect the road from flash floods in future. This road will connect Amochu bridge to Phuentsholing, thereby establishing the connectivity between Samtse to Phuentsholing.

**g) g) Maochu embankment**

The construction of river bank protection along the Maochu river is necessary to protect the road connecting Gelephu to Umling and onwards to Panbang. The river protection work will also help in protecting the agricultural rich land on both sides of Maochu river. Together with the embankment work, multi-span permanent bridge can be built to shorten the distance of SEWH.

**2. Inter-Dzongkhag connectivity**

**a) Shingkar-Gorgan road (New construction - 37.60 km and up-gradation – 32.0 km)**

The road will connect Bumthang and Lhuentse dzongkhags, and significantly reduce the travel time for the commuters between these two dzongkhags. The Lhuentse Dzongkhag in the country is the most remote dzongkhag and has highest population under poverty. The current connectivity to Lhuentse Dzongkhag from Bumthang is through the National Highway passing through Thrumshingla peak. This accessibility becomes very difficult during winter when there is heavy snowfall. The proposed project road from Shingkar to Pephu will provide connectivity shorter by 100 km between Shingkar and Lhuentse. The highway will also strengthen the old traditional bondage of people from two villages, shingkar and zhomey. The total road length is 69.60 km from Ura to Gorgan; around 37.60 km is the new construction from Shingkar to Pephu and 32.0 km is the up-gradation of existing farm roads.

**3. Construction of Tunnel**

**b) Thomangdrak Tunnel (850 m)**

The proposed tunnel at Thomangdrak will bypass the chronic slide area at the cliff through which the road currently passes. Through this proposal, the Department of Roads plans to build technical know-how in tunnel construction and build further from the experiences gained through this project. Involving the Department's engineers in this project through transfer of technology arrangements, the in-house capacity building will be done to enable the Department to pursue other tunnel projects in future.

## II. Action Plan 2022-2027

The table below shows the detail of road to be constructed/up-graded in the next five year of Road Master Plan.

<b>1. Proposed Second East-West Highway</b>					
SN	From	To	Length (Km)	Proposal	Remarks
1	Karmaling	Phibsoo	50.00	New construction	PNH
2	Phibsoo	Sarpang	24.00	Up-gradation	PNH
<b>2. Inter-Dzongkhag Connectivity</b>					
SN	From	To	Length (Km)	Proposal	Remarks
1	Tangmachu (Lhuentse)	Trashiyangtse	80.00	44km NC* + 36km UG**	Survey
2	Gedu (Chukha)	Geserling (Dagana)	119.00	40km NC + 79km UG	Survey
3	Dagana	Narichu (Wangdue)	54.00	39km NC + 15km UG	
4	Ura (Bumthang)	Dakpai zig (Zhemgang)	106.00	23km NC + 83km UG	Survey
5	Menchugang (Mongar)	Ringdibi (Zhemgang)	126.00	51km NC + 75km UG	
6	Sherichu	Gongri Zomsa	68	68 Km NC	Design Completed
NC*: New Construction                      UG***: Up-gradation Note: Length of the proposed new roads are based on desktop study.					
<b>3. Bypass Routes to Improve Existing Inter-Dzongkhag Roads</b>					
SN	From	To	Length (Km)	Proposal	Remarks
1	Tangsibji (Trongsa)	Bubja (Trongsa)	17.00	new construction	
2	Lower Orong (S/Jongkhar)	Dewathang (S/Jongkhar)	tbd*	Alternative to Dewathang-	
3	Lower Orong	Philuma	tbd*	Nganglam (new	

				construction)	
4	Namchukhola	Doyagaon (Tading gewog)	25.00	new construction	
5	Latongla	Menchugang	25.00	new construction	
<b>4. Construction of Tunnels</b>					
SN	From	To	Length (Km)	Proposal	Remarks
1	Gedu	Ganglakha	tbd*	New construction	
2	Thimphu	Wangdue	10.5	New construction	

## 1. South East-West highway

### a) Karmaling - Phibsoo (New construction-50 km)

The new road will connect Lhamoizingkha dungkhag to Sarpang dzongkhag, thus completing a portion of the proposed Lholam. The road will be constructed to PNH standard. With this road, Lhamoizingkha will be connected to Chukha, Dagana and Sarpang dzongkhags thereby benefitting the people of these three dzongkhags in terms of mobility and access to Indian markets.

### b) Phibsoo-Sarpang (Up-gradation-24 km)

The existing road will be upgraded to PNH standard. The up-gradation will be done simultaneously with the construction of Karmaling-Phibsoo segment.

## 2. Inter-Dzongkhag connectivity

### a) Tangmachu (Lhuentse) - Trashiyangtse (80 km)

The proposed road to connect Lhuentse and Trashiyangtse dzongkhags will greatly reduce the travel distance between the two dzongkhags when compared to the existing route through Mongar and Trashigang dzongkhags. It will significantly shorten the travel distance between Trashiyangtse and western part of country. About 44kms of new road construction and 36 kms of existing road up-gradation will be required.

**b) Gedu (Chukha) - Geserling (Dagana)- 119 km**

This road will connect Chukha and Dagana dzongkhags which will benefit the people of these two dzongkhags in terms of mobility and access to services and the Indian markets. About 40 kms of new road construction and 79kms of existing road up-gradation will be required.

**c) Dagana - Nyarachu (Wangduephodrang) – 54 km**

This proposed road will connect Dagana and Wangduephodrang dzongkhags, thus benefitting people of these two dzongkhags. The road will reduce the travel distance between the two dzongkhags when compared to the current route of about 167km. About 39kms of new road construction and 15kms of existing road up-gradation will be required.

**d) Ura (Bumthang) - Dagpai zig (Zhemgang) - 106 km**

The two dzongkhags of Bumthang and Zhemgang will be connected through this road. About 23 kms of new road construction from Ura to Shingkar and 83 kms of existing road up-gradation from Shingkar to Dagpai will be required.

**e) Wama (Mongar) - Khomsar (Zhemgang) – 32 km**

This road will connect Mongar and Zhemgang dzongkhags. People of Kheng can enjoy improved mobility to eastern parts of the country and vice versa. Once the road is completed the people from Mongar, Lhuentse, Trashigang & Trashiyangtse can easily reach Gelephu in one day. This highway can also be an alternative route to reach Nganglam.

**f) Sherichu – Gongri Zomsa**

This road will connect Trashigang with Mongar and Pemagatshel dzongkhag. The road was proposed as a hydro power road for the transportation of hydropower equipment for the Kholongchu Hydropower Project. The road will also serve as an alternative road for the people of Trashignag and Trashi Yangtse to travel to Nganglam.

**3. Bypass Routes to improve inter-Dzongkhag connectivity**

**a) Tangsibji – Bubja (17 km)**

This road under Trongsa dzongkhag will benefit travelers bound for Zhemgang from western part of the country in terms of reduction in travel distance.

**b) Dewathang - Lower Orong – Philuma**

This road under SamdrupJongkhar dzongkhag will provide an alternate route connecting Dewathang to Nganglam. It will benefit people of lower Orong, Philuma and Dewathang.

**c) Namchukhola - Doyagaon (Tading gewog)**

The bypass road under Samtse dzongkhag will reduce the distance between Haa dzongkhag to Phuentsholing. The proposed road alignment runs mostly parallel to the Namchukhola river. The proposed road measures about 25 kms based on Google Earth desktop study.

**d) Latongla – Menchugang (25 km)**

The bypass road under Mongar dzongkhag will reduce the distance of Northern East West Highway by about 22 km. The road will avoid Namlingbrak, one of the risky cliff on this highway. The proposed road measures about 25 kms based on Google Earth desktop study.

### **III. Road Asset Management**

Asset management is a coordinated approach that seeks to minimize the total cost of acquiring, operating, maintaining and upgrading/replacing the assets to consistently deliver desired customer satisfaction and regulators' requirement.

In highways context, asset management approach provides a structured approach to roads maintenance to enable highway authorities to operate, maintain and restore the highway assets to meet key performance requirements. It looks at all transport issues collectively with a long-term view, which allows highway authorities to consider what the alternative options are, set performance targets and assess the results. In this way, the highway authorities are able to support their funding requests with hard facts. This allows further improvement of the service to be targeted and the timing of maintenance to be planned such that further deterioration is minimized.

With changing socio-economic needs, there will be need for building new roads as well as the need to upgrade existing roads to higher standards. In order to meet such changing needs, asset management becomes even more necessary for investment planning in future road development programs.

As such, the Department of Roads shall gradually establish the asset management approach that will serve as a necessary tool for investment planning in the road sector. Initially, preparation of detailed inventory of the entire road assets shall be carried out. The capacity building in terms of asset management shall also be pursued as per the organization's needs. Investments are required to develop IT infrastructure like software tools for carrying out analysis of data in order to plan road investment programs.

#### **IV. Climate-resilient road construction**

With climate change effects occurring every year around the whole world in the form of floods, drought, hurricanes, wild fires, etc., significant amount of investments are being lost due to damages and destructions of infrastructure in times of natural disasters occurring due to these climate change effects.

In Bhutan, the road sector suffers huge infrastructure damages every monsoon season as bridges and roads are washed away because of excessive rainfall. Every monsoon, the Department incurs expenditures in millions of Ngultrums to keep the roads trafficable, as numerous landslides require to be cleared all around the country, damages roads and bridges have to be reinstated immediately, drainages need to be improved and reinstated. The rugged mountainous terrain with steep profile, loose unstable soil conditions along the country's southern belt, and the inadequately designed road infrastructure in terms climate-resilience, all make the road infrastructure even more vulnerable to the effects of climate change.

Thus entire road network within the country need to be strengthened and consolidated in terms of climate resilience and also to meet the growing traffic volume along the highways. Climate-resilient road infrastructure shall be the way forward in order to meet the desired performance levels even during severe natural events. Slope stabilization technologies and erosion control through adequate drainage provisions shall be incorporated in all road designs.

Environment friendly road construction shall be pursued in line with the principles of sustainable development and environment conservation.

#### **V. Road Maintenance Centers**

With the growing challenge of carrying out routine maintenance works of the highways through a labour-intensive approach, the Department felt the need to mechanize the maintenance operations of the road infrastructure. This will greatly reduce the need for labour and also improve the labour productivity as well as increase the effectiveness of maintenance work.

Thus, the Department plans to establish twelve (12) road maintenance centers (RMCs) along the Semtokha-Trashigang highway with an objective to provide an efficient and sustainable means to maintain our roads/highways.

#### **VI. Mechanization of road construction and maintenance**

In order to increase work efficiency and reduce labour use, mechanization of road construction and maintenance shall be promoted and made mandatory. Regular inspections shall be made to ensure the use of mechanization and automation.

## **VII. Disaster prevention and preparedness**

The Department of Roads is the government agency responsible for the construction, rehabilitation and maintenance of national road systems in the country. With climate-related disasters occurring every year resulting in damage of road infrastructure, these cause disruption in transport services that affects the movement of passenger, goods and services. In order to minimize damage to the various road infrastructure during disasters, disaster prevention measures will be undertaken along some of the critical highways in the form of river bank protection and river training works, slope protection works, etc. Development of alternative new and consolidation of existing roads which will serve as alternative routes will be undertaken on priority basis. For e.g. the Pasakha-Manitar-Gedu road will be strengthened and consolidated to ensure further reliability of Thimphu-Phuentsholing connectivity.

It will be helpful to develop a disaster preparedness plan for the department to maintain road connectivity all around the country during times of disasters.

## **VIII. Road Development Fund**

With the growing demand for better services in transport sector, it is becoming increasingly difficult for the Royal Government to mobilize resources to carry out various road development programmes in the country.

Establishing a Road Development Fund will ensure a sustainable funding for our road development programmes and activities in future. The Fund shall be used mainly to meet emergency needs that arise outside the scope of planned activities. Establishing the Fund will also serve as a disaster preparedness measure for the Department of Roads.

## **IX. HR Development**

The Department of Roads realizes that, in order to professionalize the road construction sector, there needs to be long-term planning for human resource development too. With so much road infrastructure built so far, these infrastructures require efficient operation and maintenance skills, and at the end of their service life, to be replaced. Building road infrastructure in future in a mountainous terrain like ours, can prove to be very challenging and complex with growing demand for better services and that too in face of increasing climate-related challenges. Proper investment planning should become part of all road development programmes in future. All these indicate that the human resource development within the Department needs to be pursued on a continuous basis as per the changing needs of the time.



For many of the specialized works like geotechnical investigations, bridge construction and maintenance, tunneling, slope protection and stabilization technologies, etc. the Department is currently dependent on external expertise whose quality of works are sometimes unsatisfactory resulting in construction and contractual problems at later stage.

It is extremely important to start building in-house capacity in many of the specialized fields as a long-term measure, so that delivery of quality infrastructure can be pursued consistently in the times to come. Developing institutional capacity can also significantly reduce many administrative burdens of tedious procedures of procurement, and more so in dealing with various complications/issues that arise during execution of works.

Continuous investment in HR development will also help in the succession planning process for the department too.

The Department will develop a 10-year (2017-2027) HR master plan that will provide a guidance in terms of pursuing continuous human resource development within the department focusing on building capacities in geotechnical investigations, bridge design and construction, slope protection technologies, river protection engineering, tunnel engineering, etc.

## **X. Institutional linkages**

In order to promote capacity building in the road construction sector, it is imperative for the road professionals to gain technical expertise and knowledge in the latest construction technologies being practiced in the region and beyond. Even to promote extensive mechanization, road professionals need to learn about the emerging road construction technologies in the international markets.

With the objective to foster continuous learning and to build professionalism within the Department and thereby improve delivery of high quality infrastructure, avenues for institutional linkages shall be continuously explored and established through MoUs at the regional and international levels. Through these linkages, exchange programs or study visits for our road engineers can be developed through which new emerging road construction technologies can be learned and shared among partner institutions. Joint researches on road construction subjects can also be pursued between partner institutions. Having such arrangements can serve to enhance the technical knowledge of our engineers through the much-needed exposure, thereby boosting their confidence in delivery of work.

## **XI. Quality Management**

In order to pursue the goal of delivering road infrastructure up to highest quality and standards, the Ministry will continuously work with relevant agencies like Construction Development Board, Public Procurement Policy Division (Ministry of Finance), etc. to further streamline and professionalize the construction industry.

Within the department, various Quality Assurance measures shall be developed and continuously reviewed in order to promote quality construction works. These may be gradually inculcated in our general construction norms through procurement policies, Standard bidding documents, Technical Standards and Specifications etc.