

## **SHERABLING LOCAL AREA PLAN 2015-2030**

**Trongsa Thromde**



Urban Planning and Development Division

Department of Human Settlement

Ministry of Works and Human Settlement

July 2017

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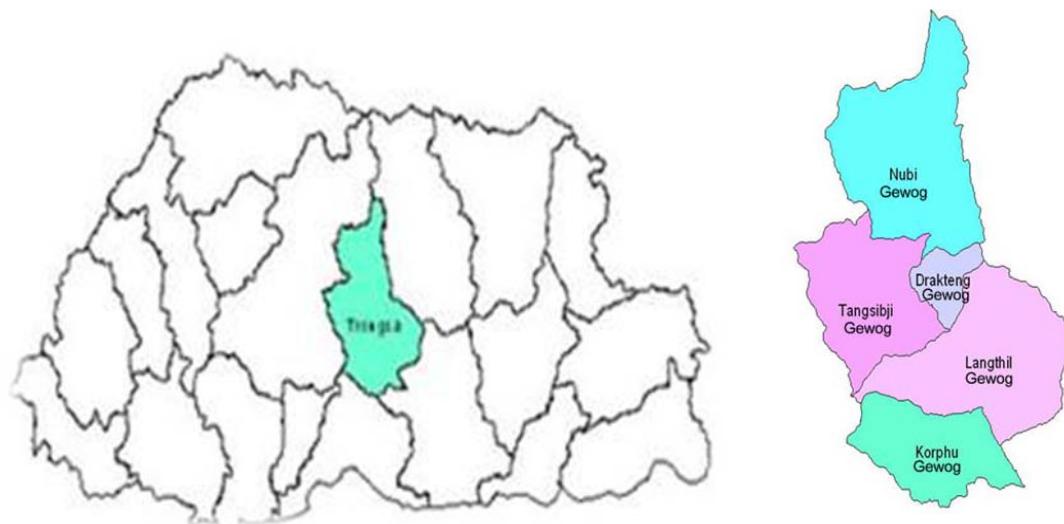
Sherabling, Trongsa.....

## 1. Trongsa Dzongkhag -Location and climate

Trongsa Dzongkhag is located in the centre of Bhutan and is bordered by Wangduephodrang to the west, Bumthang to the east and Tsirang, Sarpang and Zhemgang Dzongkhags in the south. The Mangdechhu River divides the District into almost two halves. Trongsa has 5 gewogs i.e. *Nubi, Tangsibji, Dragteng, Langthil and Korphu*. Most portion of the Dzongkhag is environmentally protected as there are Wangchuck Centennial Park in the north (*Nubi gewog*) and Jigme Singye Wangchuck National Park in the centre, west and southern Trongsa (*Langthil and Tangsibji*).

## 2. Trongsa Dzongkhag Thromde

The Trongsa Thromde is located in Nubi Gewog and has an area of 506.5 acres or 2.05sq.km. It has about 2000 people (as per the Approved Thromde and Yenlag report) in 2015. It is about 8 hours travelling distance from Thimphu and 5 hours from Wangduephodrang Thromde. The two hydroprojects - 720 MW Mangdechhu Hydroelectric Project Authority (MHPA) and 118 Nikachhu Hydropower Project are located in the vicinity of the Thromde. The projects are expected to complete in few years time.



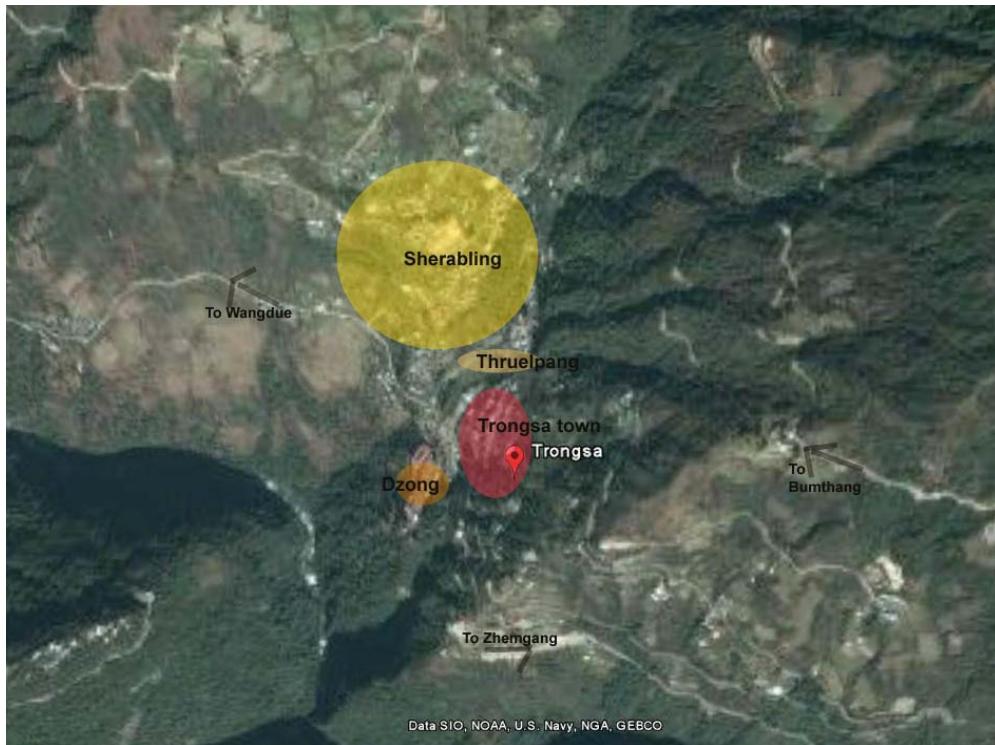
1. Figure 1 Trongsa located in the centre of Bhutan (L) and 5 gewogs of Trongsa (R)

## Sherabling, Trongsa.....

The Thromde is centrally located and has access to Wangduephodrang , which is about 129 km, 68 km to Jakar and 111km to Zhemgang .The Mangdechhu Hydroelectric Project Authority is located on the way to Zhemgang and Nikachhu Hyrdopower project on the way to Wangduephodrang.



2. Centrally located with access to Wangdue, Zhemgang and Jakar





(Images of Trongsa town)



Town Centre (view from the Dzongkhag Hospital)

The Trongsa town core and the Dzong are visible from very far and it almost takes 30 minutes by car to reach the town after the first view. The Trongsa Dzong is located on a ridge at a level lower level than Trongsa town and Sherabling. Sherabling is located a higher ground than the town and the Dzong.

### **3. Urban Development Plan for Trongsa, 2003**

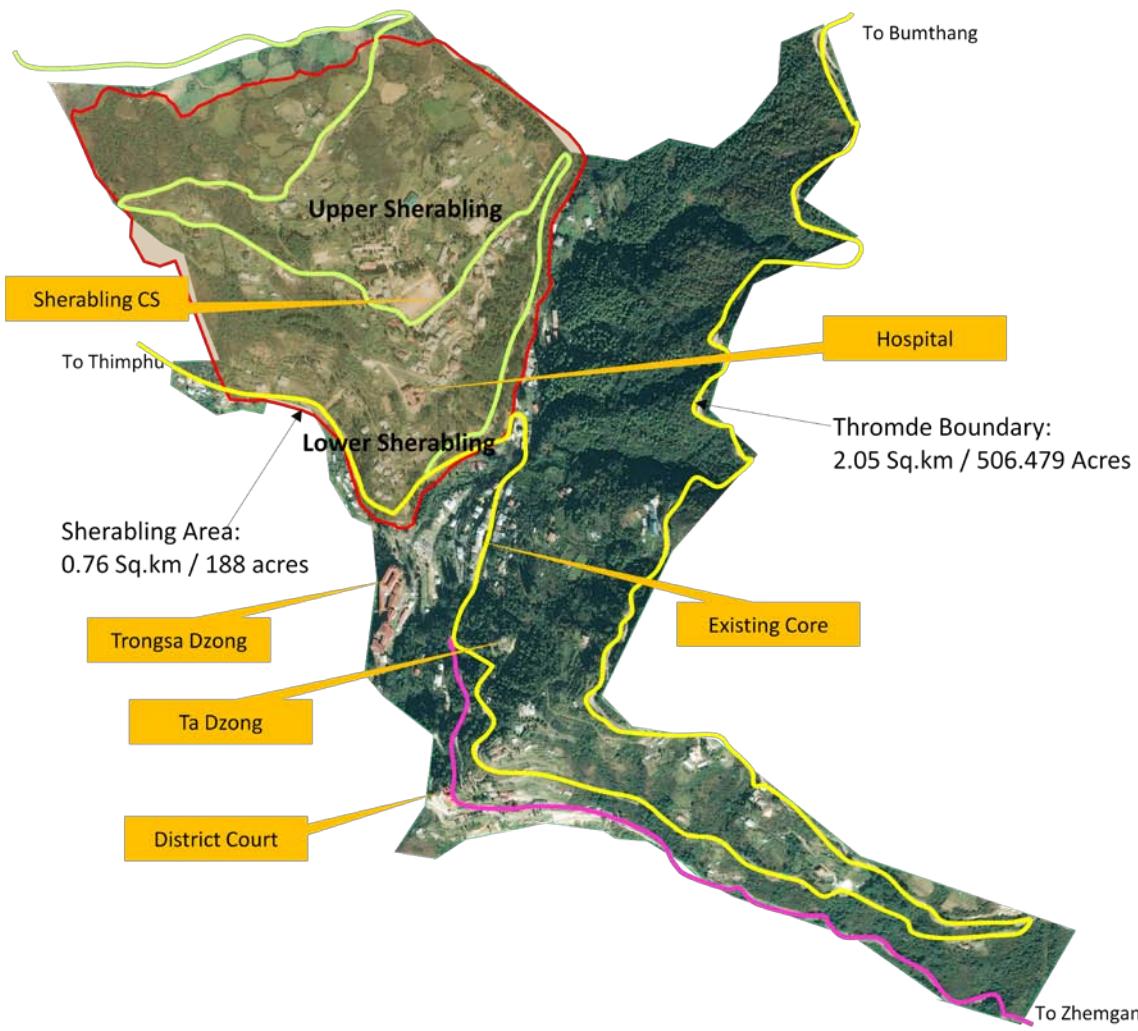
The urban development plan for Trongsa was prepared in 2003 under the Bhutan Urban Development Project, World Bank. Trongsa Municipal boundary has an area of 461 acres or 184.4 hectares as per the Trongsa UDP report. The proposals are designation of land uses, provision of arterial road, access road, amenities and services. The plan also designates environmentally sensitive areas especially the steep, forest and marshy area for conservation. The Structure Plan lays strong emphasis on provision of footpath and many of the footpath proposals are already implemented. The Municipal area can be roughly divided into three planning units for local area plan preparation i.e. The Department of Roads (DoR) & Industrial Areas to the south, town area in the centre and Sherabling area to the north. The Trongsa town has one of the steepest terrains in comparison to other towns in Bhutan and the town has made the optimum use of it. As a result the roads have hair-pin turnings and the buildings are built in line with the road. The town is overall very lively and has all the amenities and services that are required in the town. The East-West Highway and the Trongsa-Zhemgang highway passes through the centre of the town area.

### **4. Existing Scenario**

#### **1.1 Sherabling**

The Dzongkhag Thromde boundary of Trongsa extends from farm to *Nubi Gewog* Centre in the North, Trongsa-Bumthang Highway in the east, Trongsa- Zhemgang Highway in the south and steep slope in the west. The Thromde has an area of 506.5acres (2.05 sq.km) and falls under *Nubi gewog*. Sherabling area, for which the local area plan is to be prepared, is located at the northern part of the Thromde and above the Trongsa- Wangduephodrang Highway. It has an area of 0.76sqkm or 188 acres. Sherabling is visible prominently from the town and also from very far. Therefore, the development proposal has to be such that it harmonizes with the site and topography. In addition, since it is at a higher level than the Trongsa Dzong, the proposal has to

be such that it does not overshadow the Dzong. It has generally steeper terrain with small pockets of flat land available for development. The major portion of Sherabling is occupied by institutions like Sherabling Central School and Dzongkhag Hospital. In terms of the existing built up, the Sherabling area has three distinct areas. The lower most and just above the Trongsa-Wangduephodrang Highway is already built up with maximum of 4 storeys and uses are residential or mixed use. The middle portion comprises of institutional (School and Hospital) and the top most part is sparsely built and comprises of mostly traditional houses.



For the convenience of understanding and explanation, the area above the School and below the Yulling Lhakang will be called as upper Sherabling and area above the Highway and below the Hospital will be called as lower Sherabling.

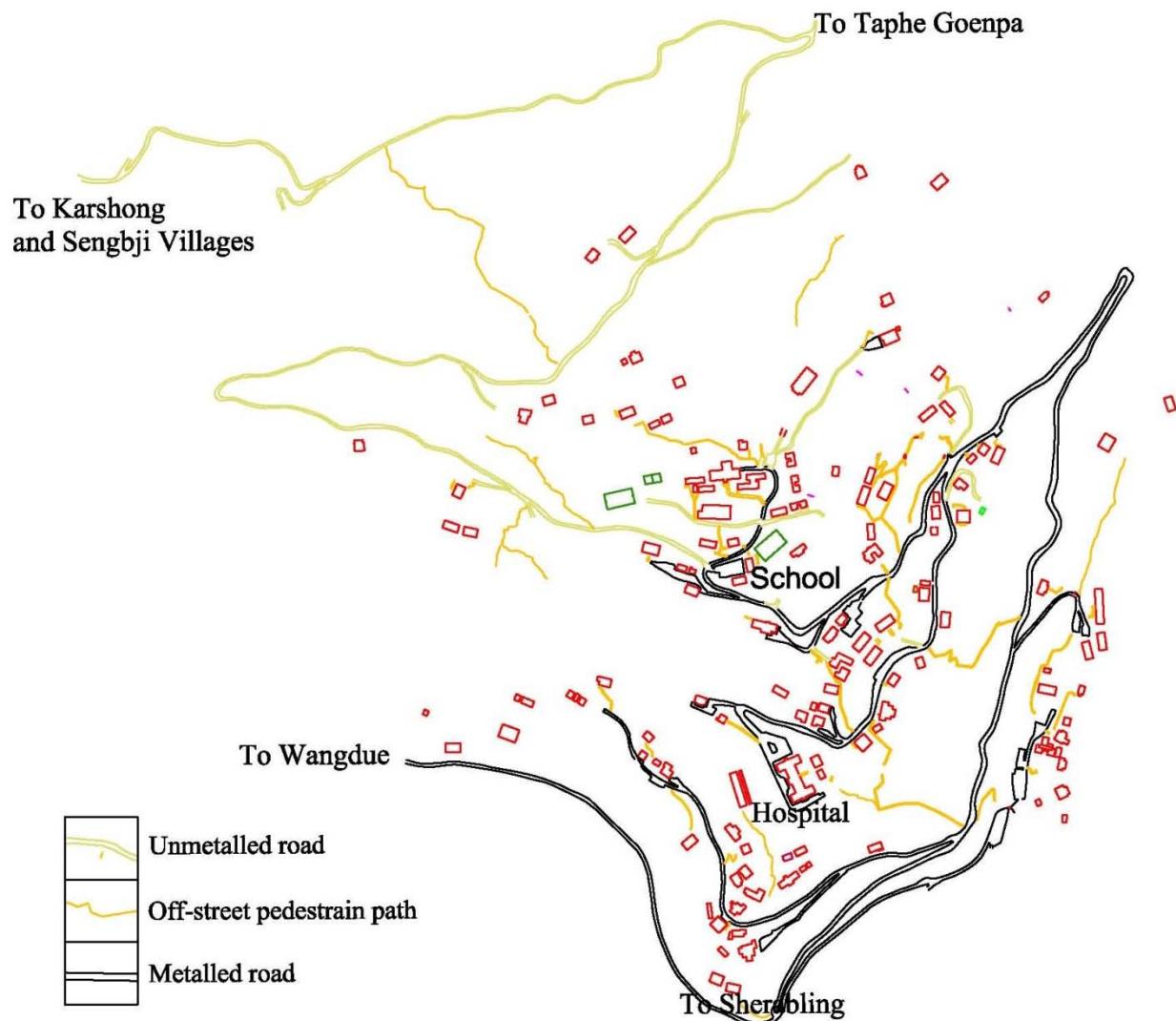


*Sherabling as seen from the E-W Highway towards Bumthang*

### **2.1 Road and Pedestrian access**

The road for Sherabling originates from Trongsa-Wangduephodrang Highway, which runs below the Sherabling. The road is metalled till the School and it is wider in comparison to unmetalled road, which follows after the School. The roads divides in last turn to provide access to Taphe Goemba in the east and following the route to Karshong and Sengbji villages in the west. Since Sherabling has a steep topography there are pedestrian access connecting different areas.



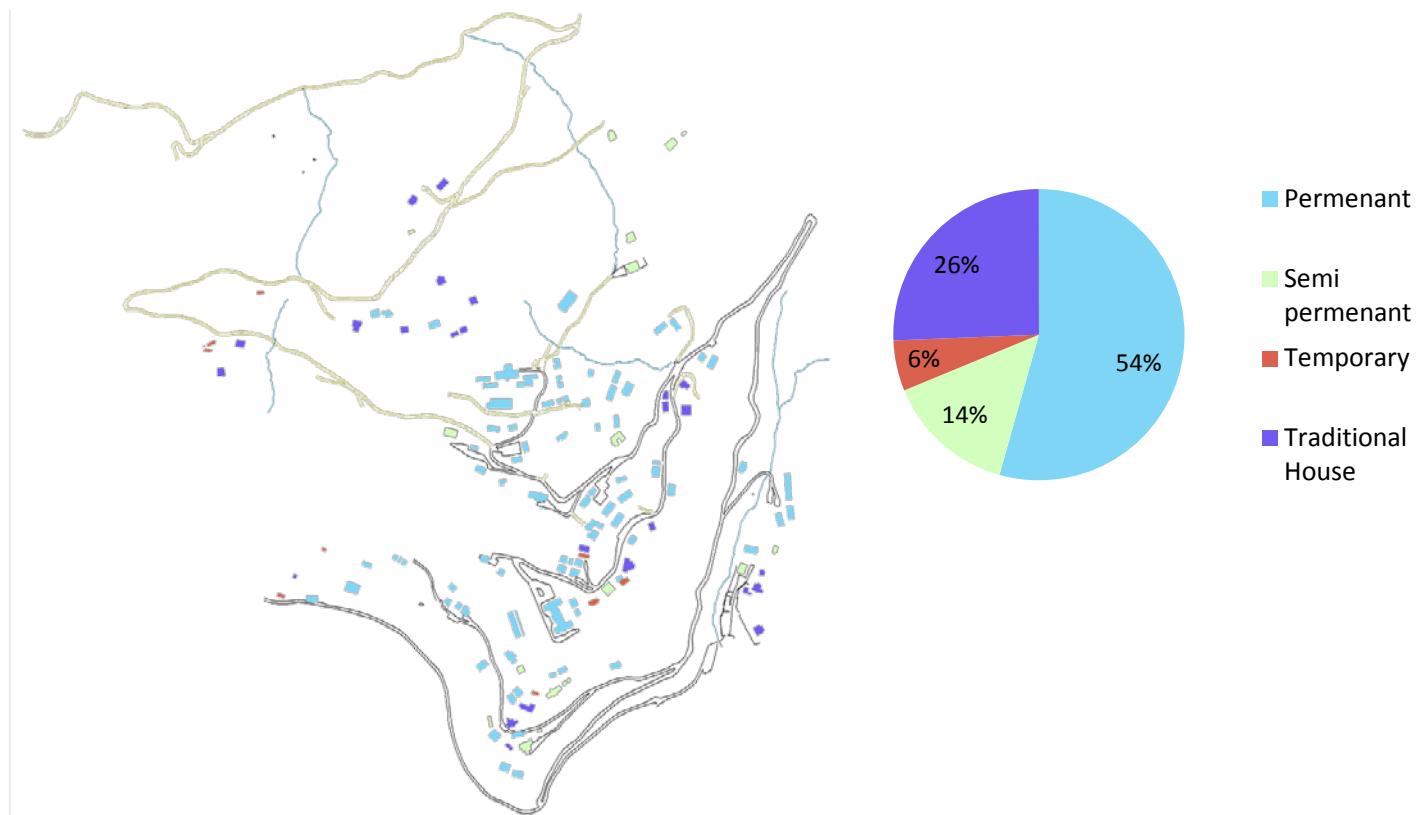


### 3.1 Housing typology

The structures in Sherabling area is categorized into various typologies as per the building materials used and nature of the structure. For the ease of study, the buildings are categorized into mainly four types - permanent (concrete), semi-permanent (full *ekra* walls), temporary (sheds) and Bhutanese traditional houses.



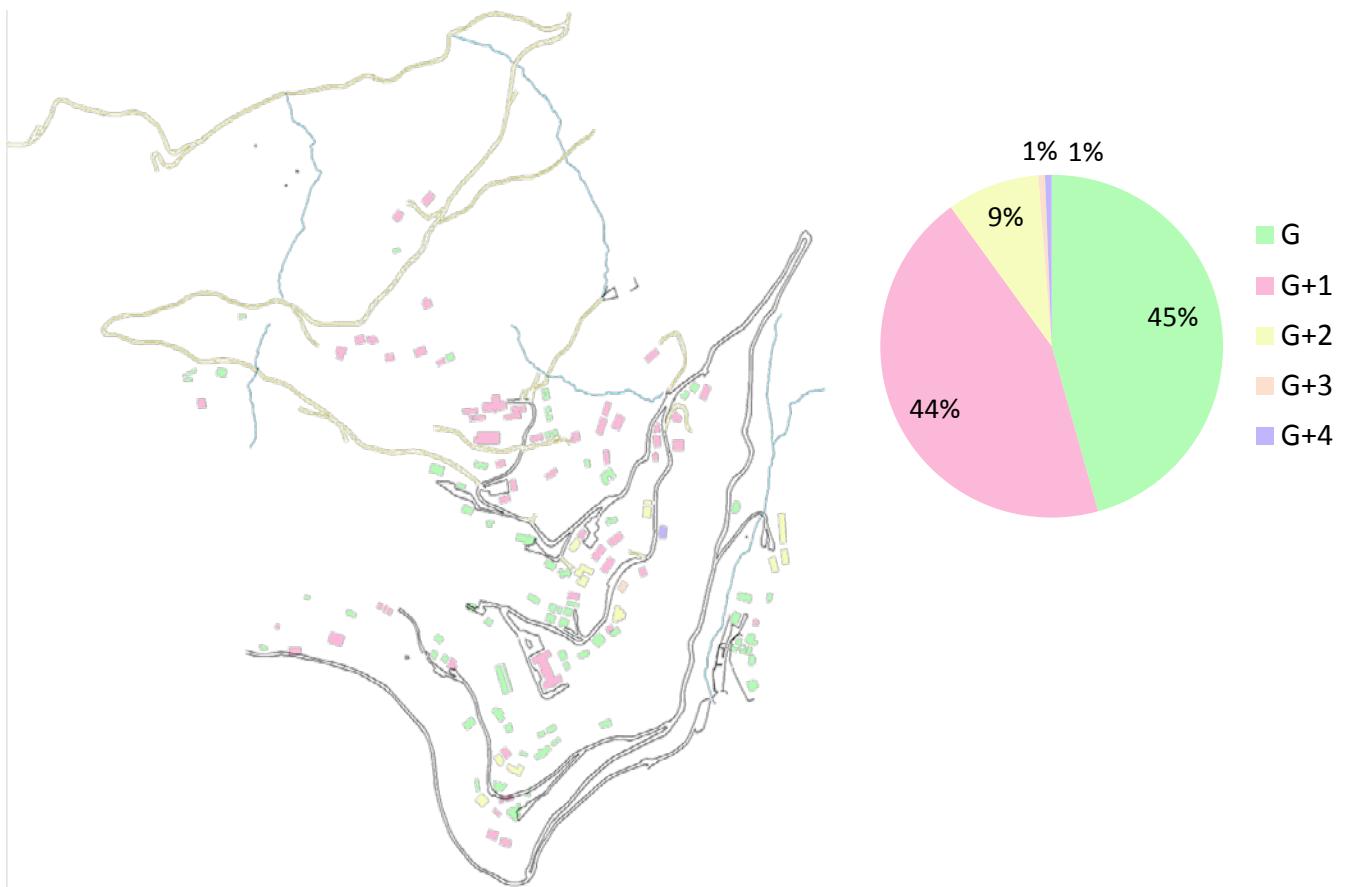
As per the analysis, there are about 54 % permanent/concrete structures and about 26 % traditional structures. Majority of permanent structures are within the school or hospital campus. The traditional houses are scattered either in upper or in lower Sherabling area. The rest are semi-permanent (14%) and only 6% temporary structures.



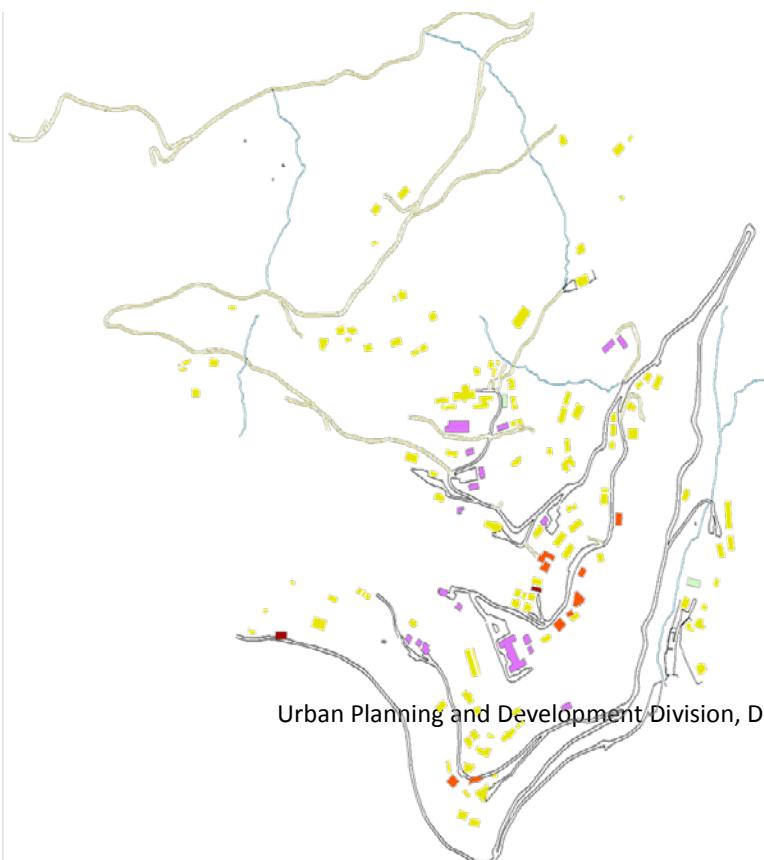
#### 4.1 Building heights and uses

The building height ranges from ground floor to G+4 structures. Almost 90% of the buildings in Sherabling are either ground floor or G+1. About 9% are G+2 structures and only 1% each of G+3 and G+4. The upper Sherabling area consists of mostly G+ 1 structures ,which are mostly traditional houses.

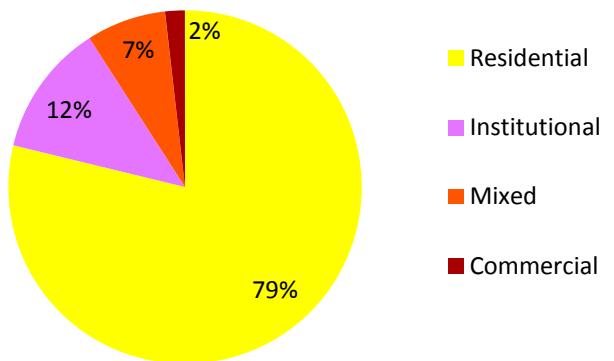
### Sherabling, Trongsa.....



The area has about 80% residential buildings and about 12% institutional, which are Sherabling Central School and the Dzongkhag Hospital. About 7 % comprises of mixed use buildings and about 2% commercial.



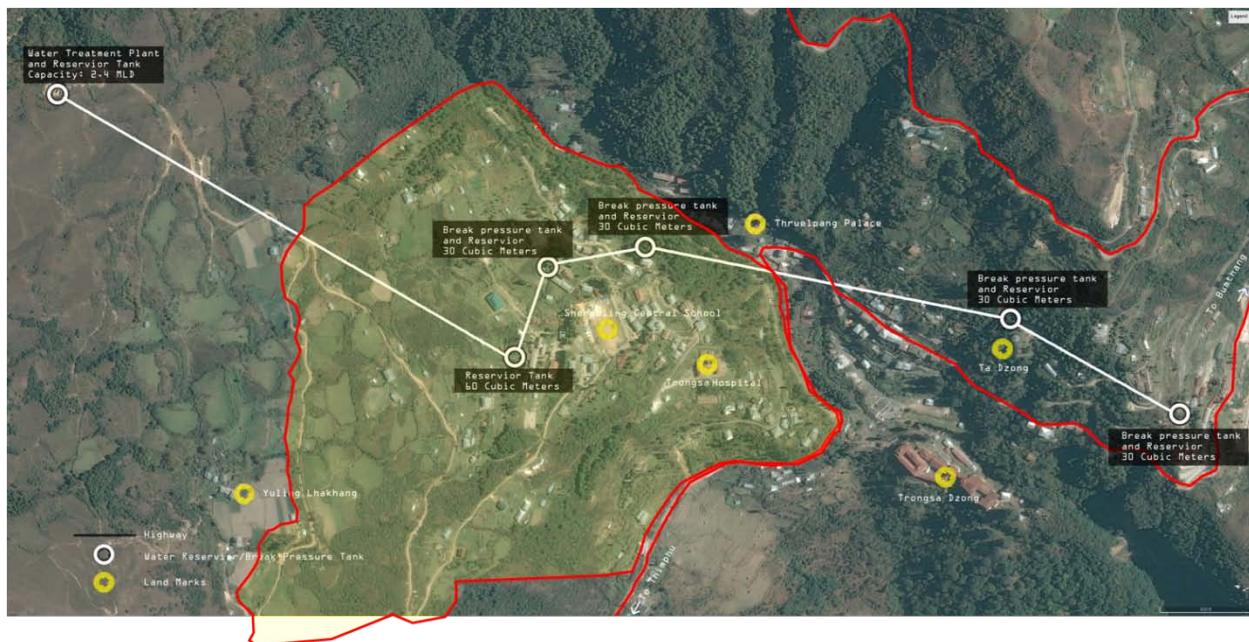
Sherabling, Trongsa.....



### 5.1 Water Supply

The water supply in Sherabling is headed by one treatment plant located at Jalipang with the Thruelpang Stream as the source. The water is supplied to whole of Trongsa town including School and Hospital. The capacity of the Euro-water treatment plant is 2.4 MLD where currently about 1.2 MLD is being used. The distribution network comprises of DI (110 mm), GI (50mm) and HDPE (90mm) pipes. By looking at the capacity and current usage of water, they have sufficient water supply, however they face acute shortage of water supply during monsoon season due to blockage of pipes and in winter due to drying up of the water source. Each household have water meters installed in their premises and monthly water tariff is commensurate with the amount of water consumed.

For the future supply to upper Sherabling area, a reservoir has to be installed at the level higher to supply to this area. However, for the rest there are reservoirs located at different points from where the distribution networks can be taken for the supply.



Schematic diagram showing water supply of Trongsa Town



### 6.1 Solid Waste Disposal

The disposal pit for solid waste is under construction at Khoyul also known as Chuzhipang located 4.5 kms away from the town towards Trongsa-Zhemgang Highway. One disposal pit is already filled and it's covered and today two new pits are under construction and it is scheduled to be completed by December, 2016. The municipal collects the waste twice in a week by compactor truck and the waste segregation is not practiced.

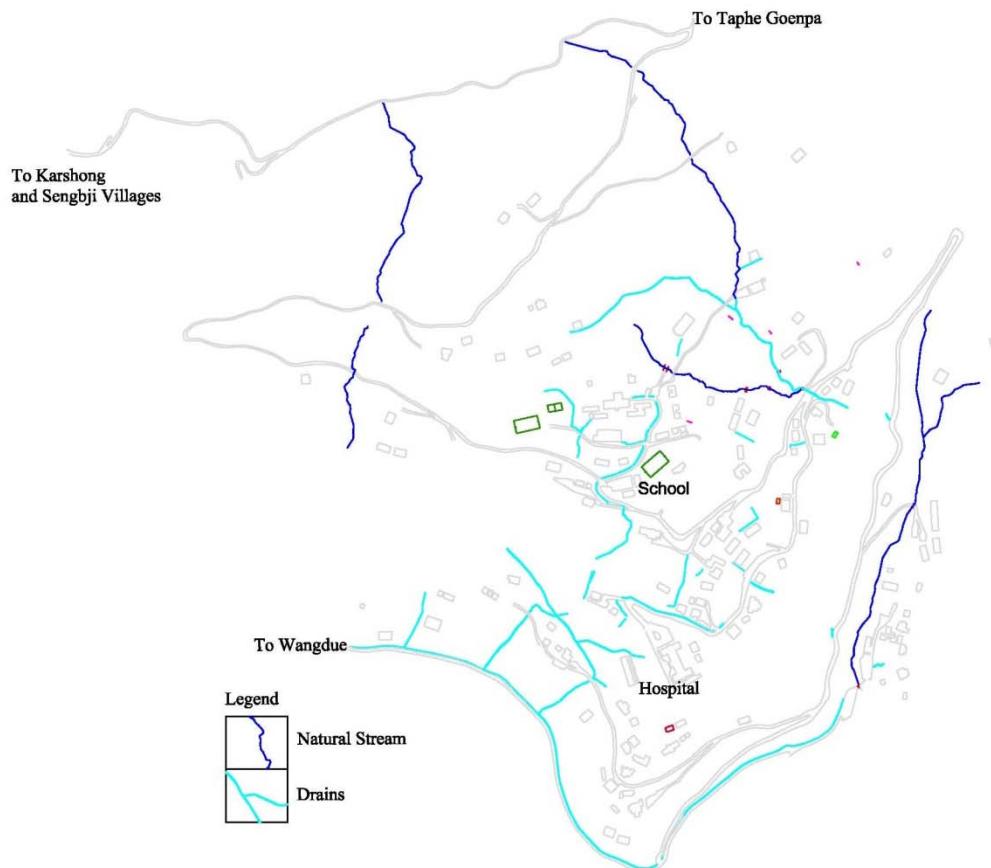


### 7.1 Sewerage System

The newly constructed houses are having inbuilt toilets and houses built on farm lands have separate toilets. Each building has an adjoining septic tank, which is again connected to soak pit. The Municipality doesn't have any plan for common sewerage treatment plant due to the space constraint.

### 8.1 Drainage System

The drainage system consists of both natural drainages and man-made drainages (storm water drains). There are two main streams in Sherabling area, one from the right side of Sherabling Central School and the other from the left side. And some minor natural drains formed due to contoured sites join these two streams. There is some storm water drains constructed but all the storm water falls ultimately into the natural streams.



### 9.1 Tourist Potential

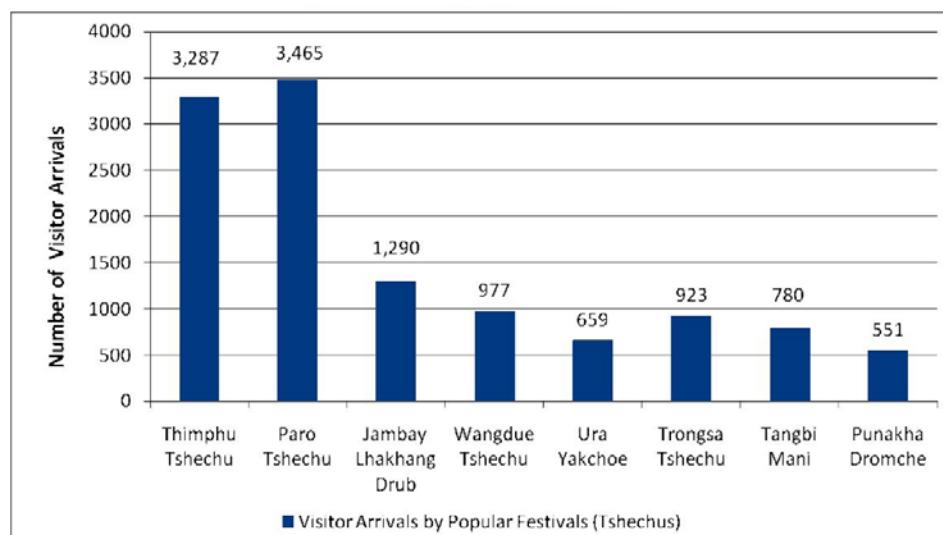
The Trongsa town has potential for tourism due to significant structures such as Trongsa Dzong, Ta Dzong, Thruelpang Palace, Chendibji Chorten and Kuenga Rabten Palace in the vicinity of the town. In addition Trongsa Tshechu is also almost popular amongst the international tourist like Paro, Wangdue and Thimphu Tshechus. As per the tourist arrival data from Bhutan Tourism Monitor Report from 2010-15, the number of tourist arrival has generally increased over the years. However, the halt in Trongsa is for a night and at max 2 nights. This can be attributed to the fact that the cultural sites in Trongsa can be visited within a day.



Due to its location along the National West-East Highway and located in the circuit of the tourism potential towns such as Paro, Thimphu, Punakha, Bumthang and Wangduephodrang, the potential for tourism can be enhanced further with provision of more resorts/hotels in the town. There are two international standard hotels in the towns. As per the data collected, one of the hotels has about 3570 bed nights in a year and with an occupancy rate of 47 % in 2015. This indicates that hotels are faring well and there are scopes for more hotels in the near future.

<b>Year</b>	<b>Tourist Arrivals</b>	<b>No of bed nights</b>
<b>2010</b>	5424	6462
<b>2011</b>	6454	7397
<b>2012</b>	7435	8537
<b>2013</b>	6913	7610
<b>2014</b>	6957	7850
<b>2015</b>	6399	7435

*Tourist Arrival data from 2010-2015 (source BTM reports)*



*Trongsa Tshechu arrival (source BTM report)*

As Sherabling area is located on a higher level overlooking the town and the Dzong, it has the potential for development of resorts. From the top of the Sherabling and below the Yulling Lhakhang one can get a picturesque view of the town and its surrounding mountains.

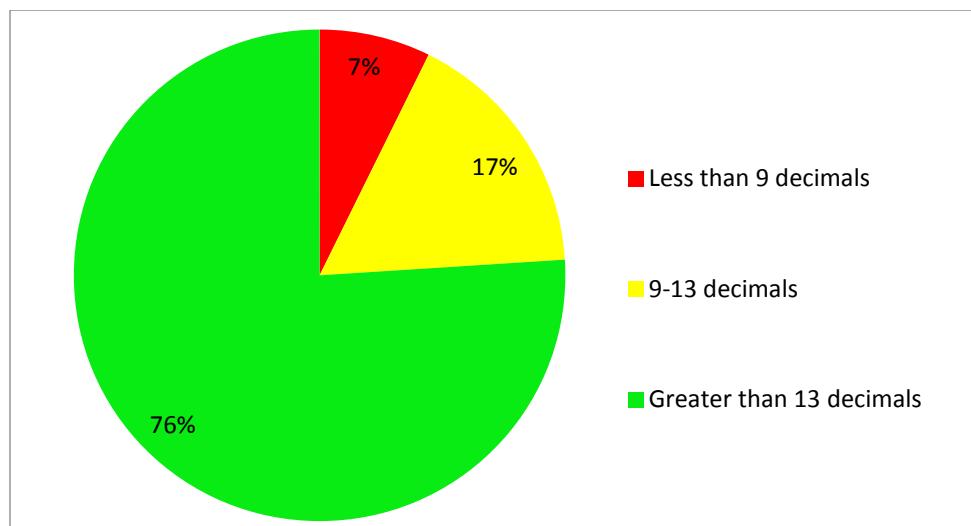
There are other community Lhakhangs such as Yulling and Lhowshing Lhakhang in Sherabling.



*View towards core and Dzong from Sherabling (below Yulling Lhakhang)*

#### 10.1 Plot size classification

Upon the analysis of plot size it was found that 7% of the total number of plots in Sherabling area is below 10 decimal and 17% in the 10 to 13 decimal range. The rest 76% of the total plots are more than 13 decimals.



Sherabling, Trongsa.....



Existing plots in Sherabling area.

## 5. Analysis

The analysis is carried out to understand the existing situation of Sherabling and proposed for the future. The Sherabling Local Area Plan 2015-2030 is for 15 years plan period and the analysis/projection is also based on the plan period. Different types of analysis that is slope, SWOT analysis, population projection, housing demand due to natural increase in population, implication of Hydroprojects -MHPA and Nikachhu on the town is also carried out. The geotechnical study map has been also incorporated in our plan to create safe and environmentally sustainable area for development.

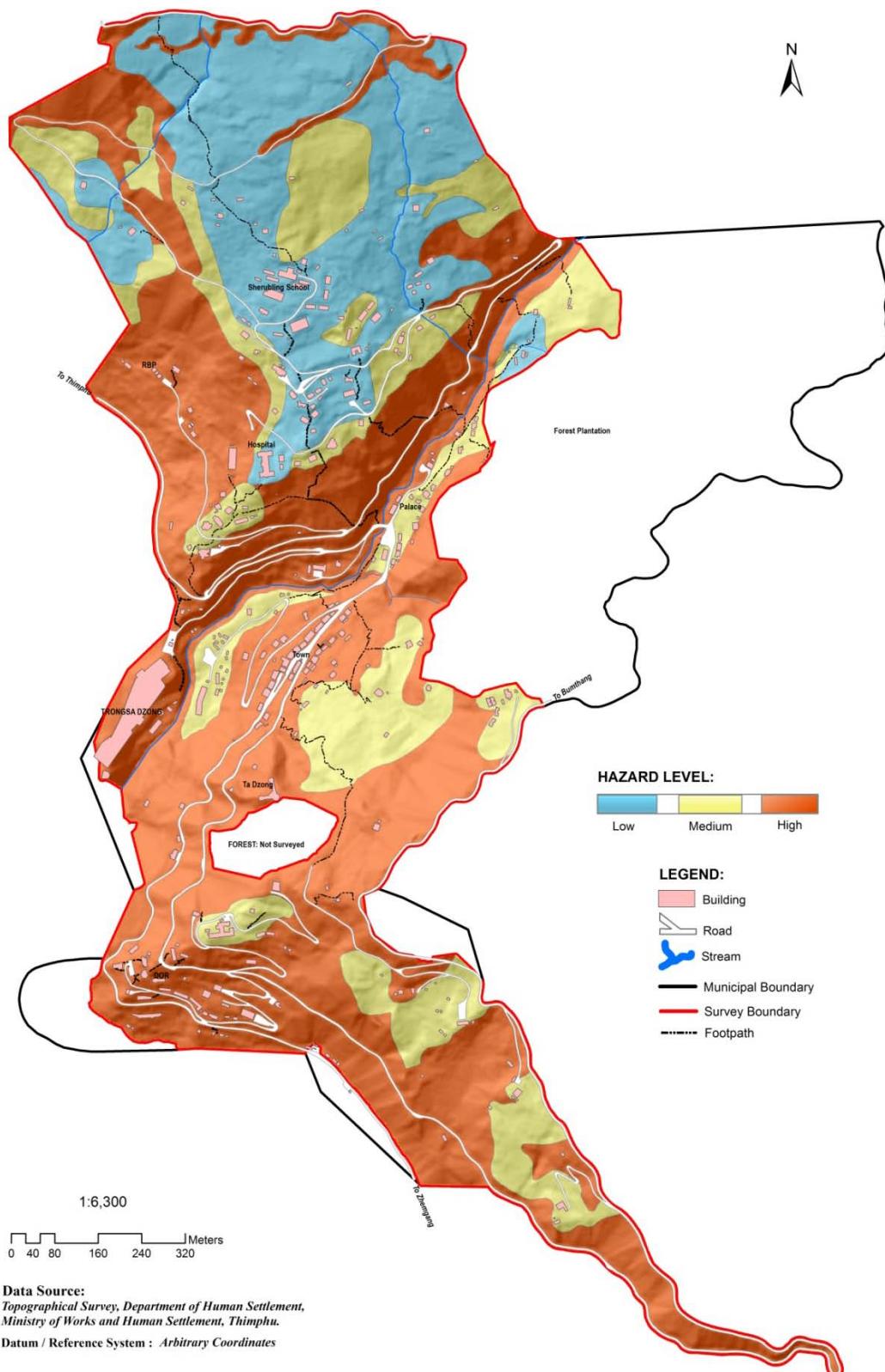
### 1.1 Geotechnical Study

The geotechnical study for Trongsa was carried out in 2014. The geotechnical was carried out to study stability of soil and to detect the various possible hazards at the place. According to geotechnical study, colluvium deposit is usually seen at the base of the slopes and is wide spread. It is seen as narrow but long extensions on the slopes and at the slope bases. The materials are poorly sorted and the rock types are the parent rocks of granitic gneiss and gneiss.

For Sherabling area, extensive surveys were carried out to map the instabilities in the valley. The whole of Royal Bhutan Police area lies in a subsided slide block compounded by broken and unmaintained drains along with few water seepages. Other areas with minor instability includes high school area and along the road on the way to hospital. Hazard study was carried based on observation of slope, slides, marshy land, flooding etc.

The Trongsa valley is divided into 3 hazard zones. The three hazard zones are high hazard zones marked by red colour, medium hazard marked by yellow colour and low hazard zones marked by blue colour. According to geotechnical study recommendations there should not be any construction in high hazard zone and is suggested to be maintained as green zone. In medium hazard zone construction can be allowed but mitigation measure proposed should be thoroughly implemented. In comparison to other areas in Trongsa, Sherabling is stable for development has it falls in the low hazard zone (indicated by blue color)

In general it recommends to have proper storm water drainage system channelized to prevent flooding, proper breast/retaining wall has to be constructed to have stability of soil, proper building foundation(at least 2 meters deep) is needed, rock fall risk needs to be viewed before constructing any infrastructure.



Hazard Zonation map from geotechnical study conducted in 2014

## 2.1 Slope Analysis:

The slope analysis is very much essential to understand feasibility of an area for development. It provides the slope ranges available in the region using the contour data thus determining the compatible and incompatible slopes for the urban development. Slope analysis would determine the most appropriate area for various land uses.

The slope angle is determined by the percentage of the ground slope by the formula

$$\text{Slope in \%} = (\text{rise} / \text{run}) \times 100.$$

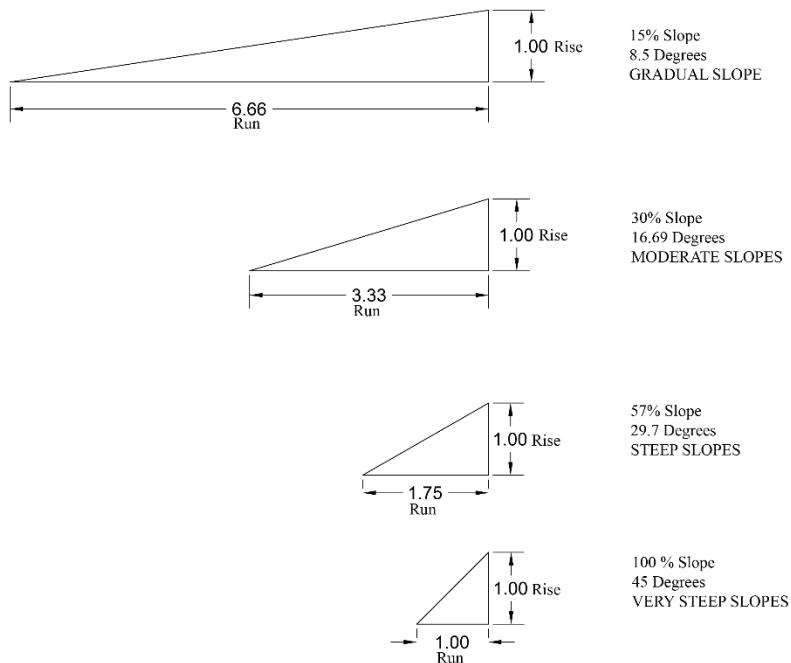
For the planning purposes the slopes are classified into four categories based on the steepness of the slope.

Gradual slopes (< 15%)

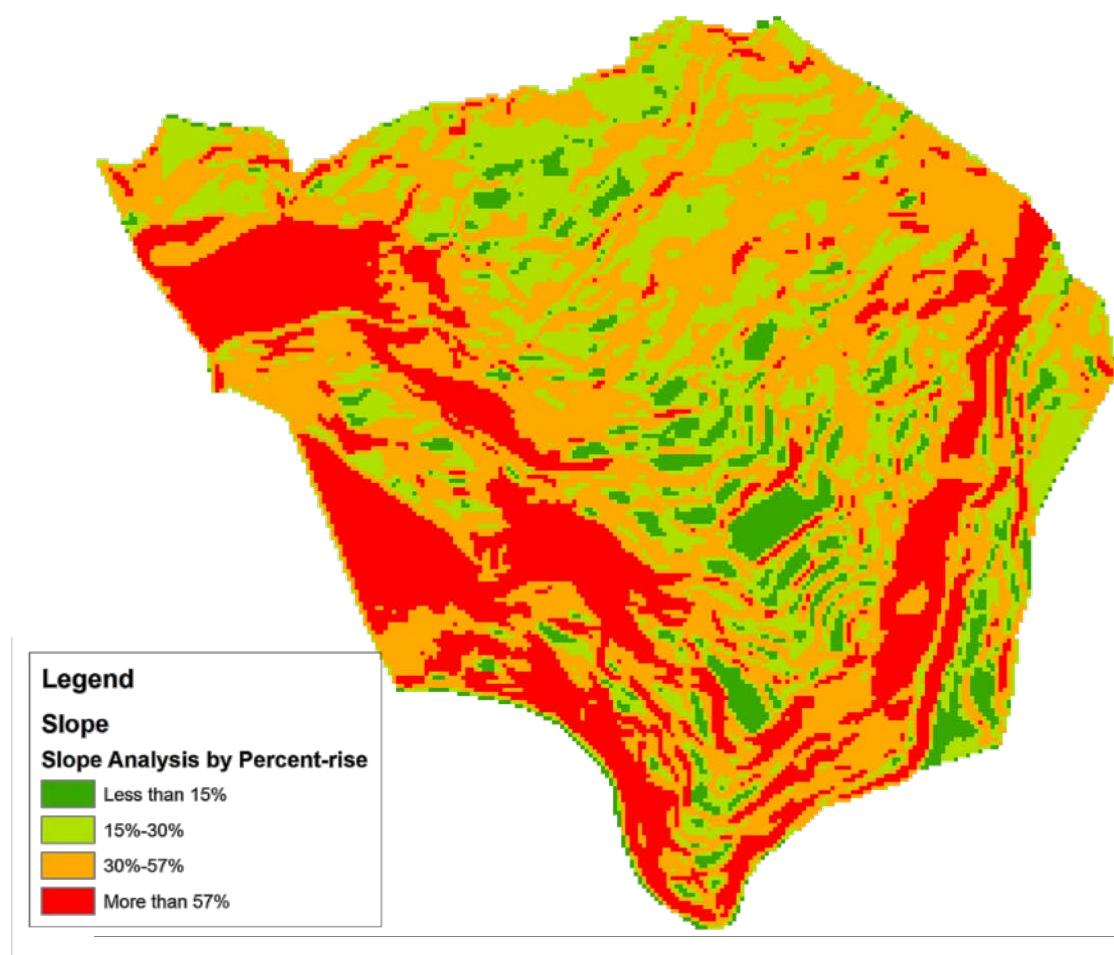
Moderate slopes (15 - 30 %)

Steep slopes (30 - 57%)

Very steep slopes (> 57%)

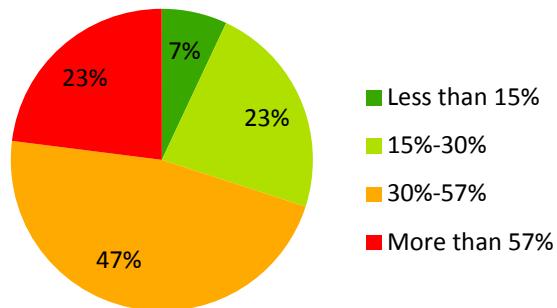


The following is the slope analysis map of Sherabling Local Area Plan (LAP)



The colors ranging from green to lighter shade of green represent gradual slopes and the moderate slopes, whereas the yellow and the red represents steep and the very steep areas.

#### Slope area coverage



The analysis determines that most of the area falls under the steep slope and only 30% of the identified area for the LAP are under the gradual slope and the moderate slope area (0-30%)

which are suitable for the development. The areas with slope range 30%-57% are normally proposed for restricted development as per the planning norms/guidelines. Even for Sherabling LAP, these steep areas are proposed for low density development.

### **3.1 Sherabling and Future Housing Scenario**

Trongsa town is located in vicinity of major hydro projects such as 720 MW Mangdechhu Hydroelectric Project Authority (MHPA) and 118 Nikachhu Hydropower Project. The hydro projects have supported the town's growth through financial support and also in terms of services. The town has provided housing and services such as hospital, school, fuelling, and banking to the project employees.

MHPA is a massive hydro project started in 2012 and expected to be completed by April 2018 and it is almost like a self contained project providing houses to its employees and also some services like banks, clinic in its colony. With approximately 500 employees in the project, there are about only 265 project housing units in Dangdung, Khamey and near the project dam areas. The rest of the employees are living in the town nearby and about 30 employees in the Trongsa town. The MHPA will not have much implication over the town in terms of housing and more so after the project completion as the project housing units are sufficient to cater to the employees. However, in terms of services , it has much implication as the project has provided financial support for construction of waste disposal site at Langthel and Dragteng, purchase of cesspool vehicle, construction of Euro eco-friendly water treatment plant, Trongsa Dzong renovation work etc. The project employees visit the town for shopping, fuelling, banking, hospital services etc. as the housing colonies are located 20 minutes to 2 hours drive from town towards Trongsa-Zhemgang Highway.

The 118 MW Nikachhu Hydropower Project (Tangsibji Hydro Energy Ltd) is another hydro project ,which is also under construction and is expected to be completed by 2019. There is proposal to shift its head office to Sherabling in a month or two and avail the housing of the town. This will have housing pressure on the town as there are about 100 project employees and only about 17 project temporary housing units in Chendibji and Tshangkha. Even after the

project completion, roughly about 50% of the present number of employees will be left behind for operation and maintenance, which will require about 50 additional houses.

Sherabling Higher Secondary School has been upgraded to Sherabling Central School with two campuses. The campus I have about 500 students and about 50 % availing the boarding facilities and campus II also has about 500 students with boarding facilities. There are about 60 staffs in total and about 13 staff quarters in campus I. As per the “Operational Guideline for Central School”, the central school is expected to have 800 plus students from PP-X/XII with residential facility for 80% of the students. Similarly, the Dzongkhag Hospital has about 35 staff and housing provision for 1/4<sup>th</sup> of its staff within the hospital campus. With the proposal to expand further, it will require supply of new houses for the additional staff. Though these institution are in the process of providing houses for its staff, it was observed that it will not be able to cater to all which implies that there is future prospect for developing Sherabling as a residential hub to meet the housing needs.

#### **4.1 Demography**

Population projection is one of the most essential aspects for the preparation of a comprehensive urban plan. The current and projected population is used to determine the nature and level of infrastructure and services to be provided in a town.

The current population of Sherabling area is 582 as per the inventory survey conducted by municipal staff in 2015. The school population of the school is as follows:

- Campus 1- Primary school- 499 students
- Campus 2- Higher secondary -504 students

<b>Year</b>	<b>Population</b>	<b>Year</b>	<b>Population</b>
<b>2015</b>	582	<b>2023</b>	809
<b>2016</b>	606	<b>2024</b>	843
<b>2017</b>	632	<b>2025</b>	878
<b>2018</b>	658	<b>2026</b>	915
<b>2019</b>	686	<b>2027</b>	954
<b>2020</b>	715	<b>2028</b>	994

Sherabling, Trongsa.....

<b>2021</b>	745	<b>2029</b>	1035
<b>2022</b>	776	<b>2030</b>	<b>1078</b>

<b>Year</b>	<b>Population</b>	<b>Year</b>	<b>Population</b>
<b>2015</b>	1003	<b>2023</b>	1394
<b>2016</b>	1045	<b>2024</b>	1452
<b>2017</b>	1089	<b>2025</b>	1513
<b>2018</b>	1135	<b>2026</b>	1577
<b>2019</b>	1182	<b>2027</b>	1643
<b>2020</b>	1232	<b>2028</b>	1712
<b>2021</b>	1284	<b>2029</b>	1784
<b>2022</b>	1338	<b>2030</b>	1861

So the total school population accounts to be 1003 students. It is important to include students as services and amenities are required for them as well. However they will not be included in requirement of housing units.

Sherabling, Trongsa.....

Average urban population growth rate according to PHCB 2005 is 4.2% in Bhutan. So taking this as % annual growth in Sherabling area

Taking same percentage for students projection

The total number of students in the Sherabling Central School by 2030 will be about 1860 when we project by urban growth rate percentage. The total population of Sherabling will be approximately 2940 by 2030. The housing requirement analysis will be done for the population roughly of 1080 according to first table.

Average house hold population of Trongsa town according to PHCB 2005 is 4.3. The number of houses required will be 251 flats, if we divide the population of 1080 by average house hold population. An additional of 50 flats would be required for the project employees. Further, if a person constructs two storied building with two units in each floor approximately about 76 buildings will be required.

### **5.1 Assessment of the requirements of amenities**

Trongsa including Sherabling has all the amenities/services to cater to future growth in the population. There is a Central School, Dzongkhag Hospital, vegetable market, play ground, basketball court, fuel station etc. The infrastructures such as water supply and waste disposal site also have the capacity to cater to new development in Sherabling.

Following are the proposed amenities that would be required for the Sherabling population which would be at an accessible location in the locality. As per the assessment following are the basic requirement for the projected population in line with the Spatial Planning Standards 2015:

<b>Sl. No</b>	<b>Amenities</b>	<b>Maximum Catchment population required</b>	<b>Connectivity</b>	<b>Location</b>	<b>Area</b>	<b>Maximum distance</b>
1	<b>Children Play Area</b>	5000	Secondary road	Neighborhood nodal point	200-500 Sq. m	10 minutes walk
2	<b>Kindergarten/ Nursery</b>	5000	Secondary road	Neighborhood nodal point	1000 Sq. m	10 minutes walk

### 6.1 Socio-economic analysis

The socio-economic analysis is carried out to understand the socio-economic context of Sherabling. Random survey was carried out covering temporary, traditional house and concrete structures. Only about 7 household surveys were carried, out of roughly about 45 buildings in Sherabling, which accounts for less than 1/4<sup>th</sup> of the sample survey required. It would not be appropriate to say that the survey of 7 household can provide complete picture of the other households in Sherabling but it does give an idea about the people residing in Sherabling. From the survey it is clear that people living in Sherabling are farmers, civil servants or business people and they have their children in school. The level of basic infrastructure is also good as they have good access to drinking water, electricity and sanitation.

### 7.1 SWOT analysis

The SWOT analysis is carried out to understand the strengths, weaknesses, opportunities and threats of the Sherabling. The strategies for developments are derived from the analysis.

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>• Proximity to Dzong, Ta Dzong, Chendibji Chorten, Thruelpang palace.</li> <li>• There are existing amenities such as School, hospital, vegetable market etc.</li> <li>• There is existing infrastructure such as water supply, road network, foot path, solid waste disposal site etc.</li> <li>• Picturesque view of the Dzong and town below from Sherabling area.</li> </ul>	<ul style="list-style-type: none"> <li>• Generally steep terrain</li> <li>• Lower part of Sherabling is already built up</li> </ul>
Opportunities	Threats
<ul style="list-style-type: none"> <li>• There is potential for tourism in</li> </ul>	<ul style="list-style-type: none"> <li>• Threats of huge structures developing</li> </ul>

<p>Trongsa</p> <ul style="list-style-type: none"> <li>• Potential for Sherabling area to be developed into residential hub to cater to future housing needs as it is in the vicinity of hydro projects such as MHPA and Nikachhu.</li> </ul>	<p>in Sherabling</p> <ul style="list-style-type: none"> <li>• Risk of inundation in Sherabling, if proper drainage facilities are not installed</li> </ul>
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## 6. Proposal

It was observed that Sherabling has the potential to be developed into a residential development with potential for resorts. The following vision and strategies are developed from the analysis/observation/study:

### Vision

*Sherabling will be lively and a happy place to live, work, learn and play*

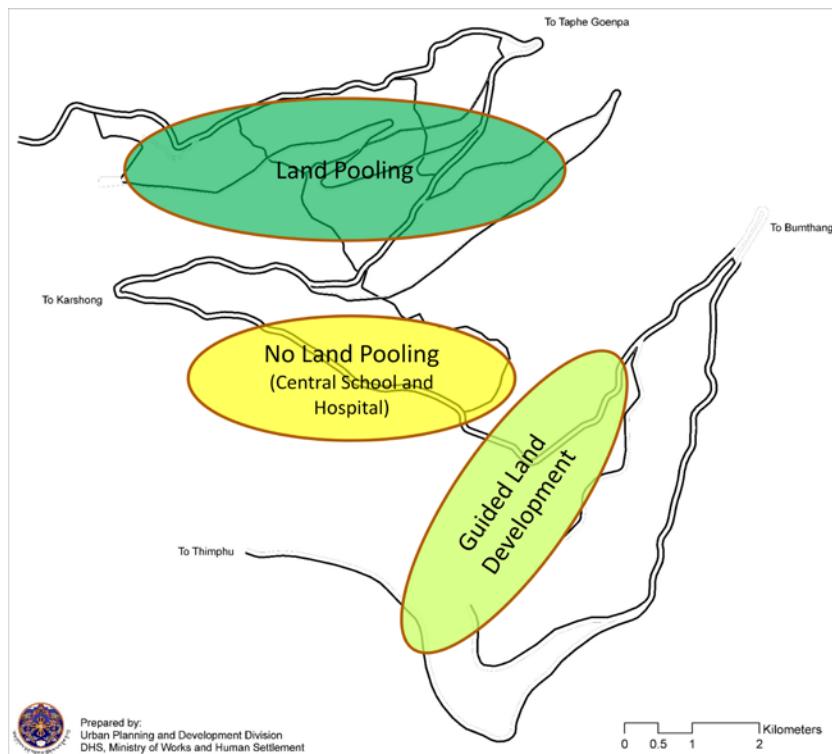
### Strategies

1. Developing Sherabling into medium to low residential development
2. Development that harmonizes with the topography of Sherabling.
3. Enhancing tourism potential with provision of more infrastructures such as resorts.
4. Development of network of on-street and off-street pedestrian paths connecting the main activity centers such as neighborhood node, kindergarten, children play area etc.
5. Provision of proper drainage to prevent risk of flooding due to run off water especially during the monsoon months

Since Sherabling has three distinct areas in terms of built up, different planning tools are used. Land pooling is applied for the upper most part of Sherabling above the Sherabling Central School and below the Yulling Lhakang as it is vacant area with few houses (herein called as *upper Sherabling*). For the area below the School and above the east-west highway (herein called as *lower Sherabling*), guided land development is used as a tool for planning intervention as it is already developed. The details of this are explained in a separate section. The Sherabling

Central School and the Dzongkhag Hospital is located in between the two areas mentioned above. Since these institutions are an integral part of Trongsa town and the Dzongkhag as a whole, it has been proposed not to pool or reconfigured the area as it has proposal to future expansion. Moreover the available flat areas in these institutions are mostly built up.

As per the urban planning norms/guidelines, slopes with existing slope of 30% or greater are recommended not to be included for development purposes. However for Sherabling due to its steep topography, areas with slope range greater than 30% but less than 58% are included for restricted development with necessary mitigation measures in place. The development allowed will be low density development which harmonizes with the site.



### 1.1 Upper Sherabling- Land Pooling

Upper Sherabling area is less built up and has a rural character with 10 traditional houses and about 3 concrete buildings. It is at a higher elevation and gives a good view of the area below. As per the population projection and analysis of amenities/services requirement, there is proposal for a kindergarten and children play area.



The existing main road which divides from the east-west highway and connects further up to Karshong and Sengbji villages forms the primary road of Sherabling.

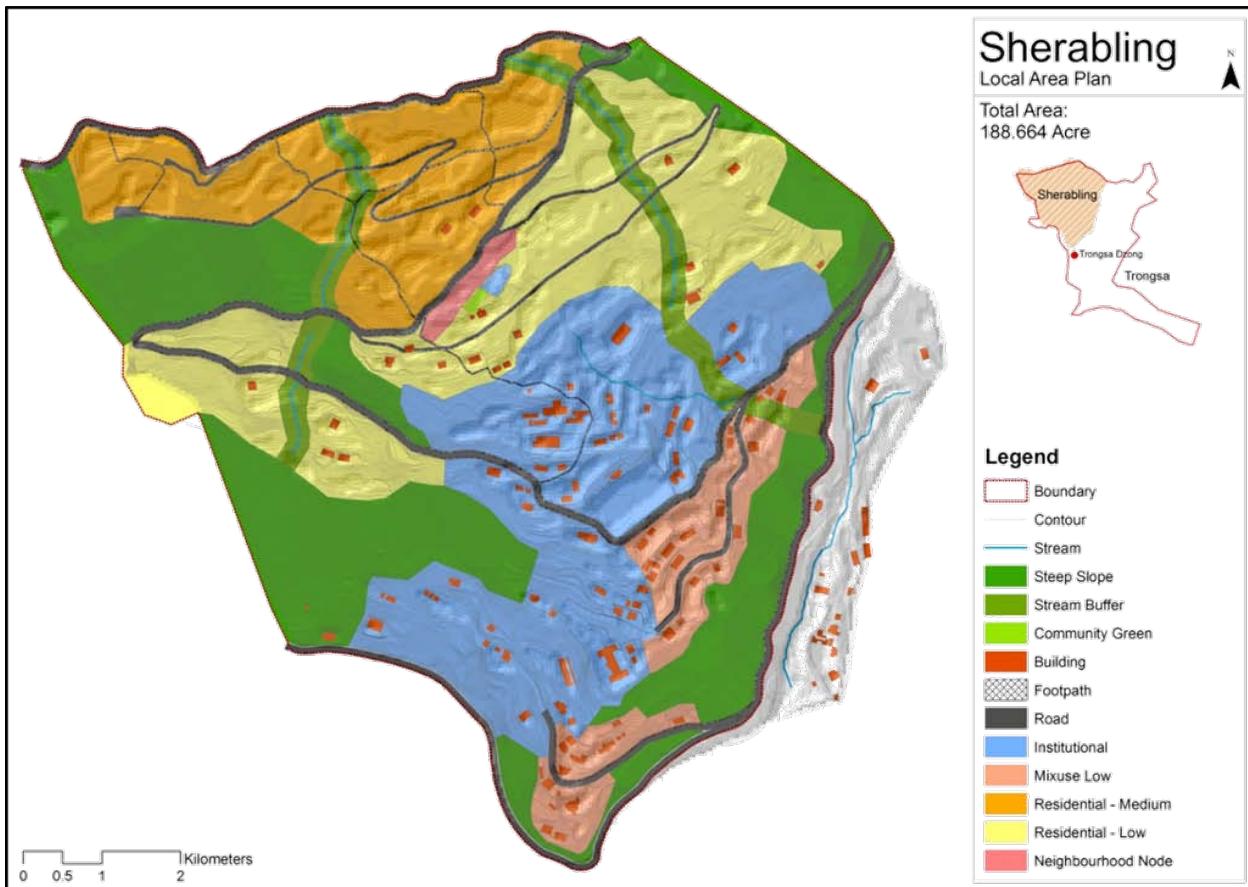
Due its steep nature of topography, the proposal for development is kept to minimum so that there is not much cut and fills leading to undesirable consequence. The road proposal are provided for area where there is possibility of road provision and where it is not possible, pedestrian access are provided. It has to be noted here that though for some plots there is access to road, however due to its terrain, footpaths connectivity has to be provided to gain access to the roads.

## 2.1 Precinct designation

The precinct has been designated based on the slope analysis, hazard map and potential use. In the upper Sherabling area, the area above the road leading to Taphe Goemba has lesser area with slope range of 30 -57% than the area below the road, therefore this area has been designated as medium density residential and area below the road as the low density residential. As per the hazard map, the lower area shows medium hazard zone whereas the upper area has only low hazard zone.

## Sherabling, Trongsa.....

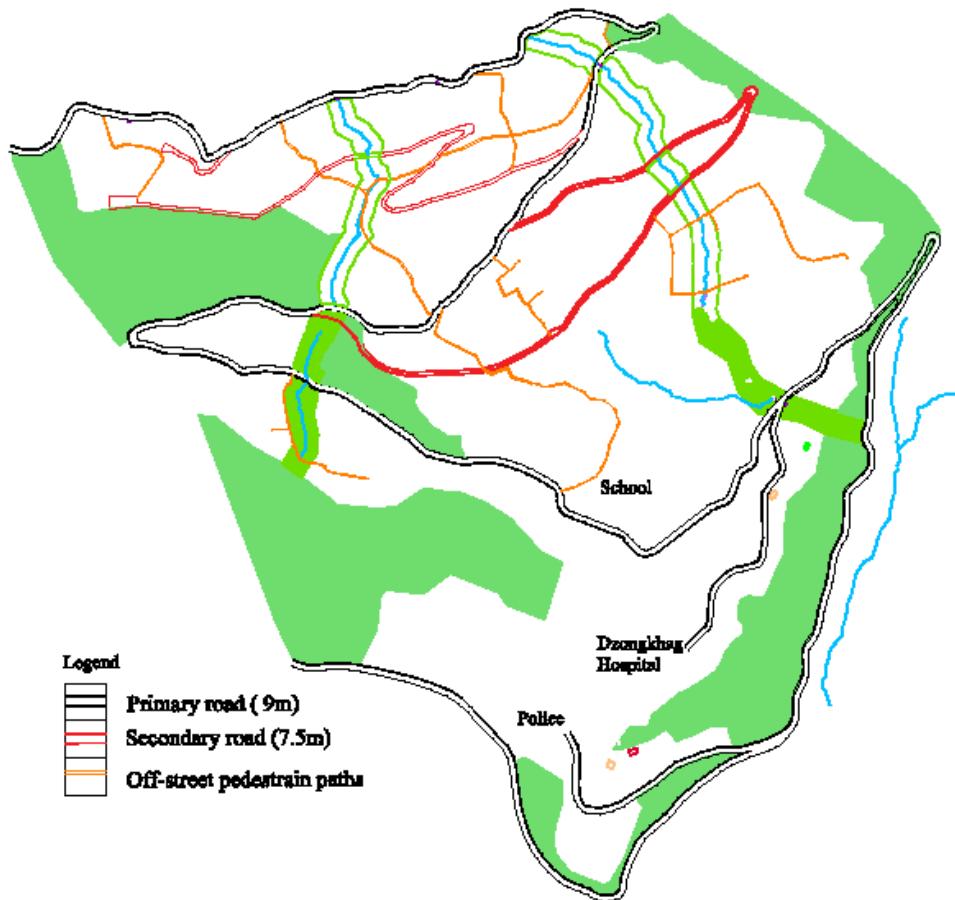
The lower Sherabling area is designated as low density mixed use due to its major portion of its area falling under steep or hazard.



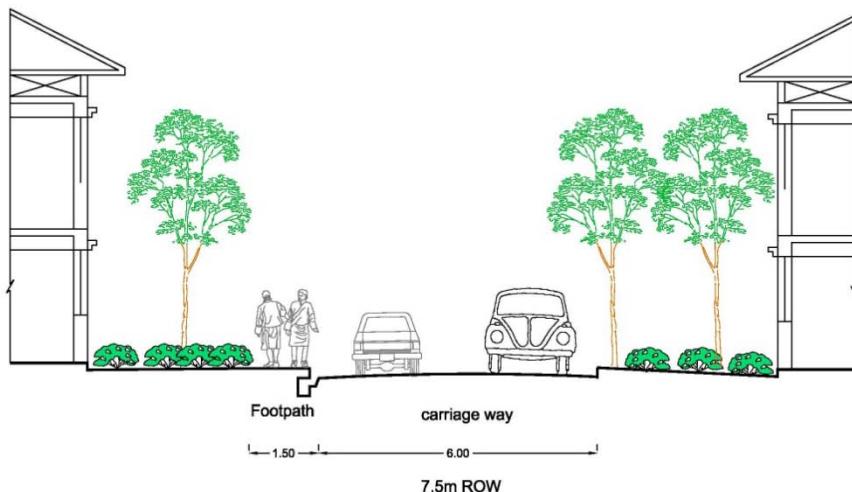


### 3.1 Road and pedestrian access

The existing winding road has been proposed for



widening to 9 m ROW which will serve as primary road. The secondary roads of 7.5m ROW are proposed to provide access to the plots. Due to the steep nature of topography, it is not possible to provide access to all the plots, for those plots pedestrian access width of 2 or 2.5m are provided.



#### **4.1 Land pooling and provision of infrastructures/amenities**

As per the Land Pooling Rules of Kingdom of Bhutan 2009, the area is feasible to adopt land pooling tool if the built up area is less than 25% of the total area. In the upper Sherabling, there are very few structures mostly traditional houses due to which the land pooling is adopted.

Through the land contribution from the land owners, provision of amenities such as children play area and kindergarten has been proposed. In terms of road infrastructure, the existing road is proposed for widening along with secondary road of 7.5 m. The pedestrian access is provided to plots where road access provision was not possible due to the topography. The land pooling contribution was calculated to be 8.3 %. However to counter the additional provision of pedestrian a land pooling percentage of 10% was taken for the local area plan preparation.

Calculations for Land Pooling Percentages (Upper Area) Area 1				
		Sq.m	acre	Remarks
<b>1</b>	Total Project Area	317797.225	<b>78.53</b>	
<b>2</b>	Total Registered Land	191792.7	<b>47.39</b>	
	<b>Total (Registered Land + Road)</b>	<b>191792.700</b>	<b>47.39</b>	
<b>3</b>	Total State Land	126004.525	31.14	
Land Excluded from Land Pooling				
<b>4</b>	Under Steep Slope	84307.2165	<b>20.83</b>	
<b>5</b>	Stream Buffer	23128.9654	<b>5.72</b>	
<b>6</b>	Drop Areas	0	<b>0.00</b>	
	<b>Total</b>	<b>107436.182</b>	<b>26.55</b>	
	Total Area Under Land Pooling	<b>210361.043</b>	51.98	
Proposals Considered for Land Pooling				
<b>7</b>	Proposed Road	6177.9725	<b>1.53</b>	
<b>8</b>	On-street Footpath	5999.559	<b>1.48</b>	
<b>9</b>	Off-Street Footpath	1729.8504	<b>0.43</b>	
<b>11</b>	Kindergarten	1000.000	<b>0.25</b>	
<b>12</b>	Community Space / Children Play Area	1000.000	<b>0.25</b>	
<b>13</b>	Parking	1225	<b>0.30</b>	70 Cars (2.5*7m)
<b>14</b>	Lay-by	300	<b>0.07</b>	10 Lay-by (3*10m)
<b>15</b>	Service Plots	100	<b>0.02</b>	
	<b>Total</b>	<b>17532.382</b>	<b>4.33</b>	
	<b>Area to be returned to the landowner</b>	<b>192828.661</b>	<b>47.65</b>	
	<b>Land pooling Percentage</b>	<b>0.083344243</b>		
			<b>8</b>	

## 7. Guided Land Development for Sherabling

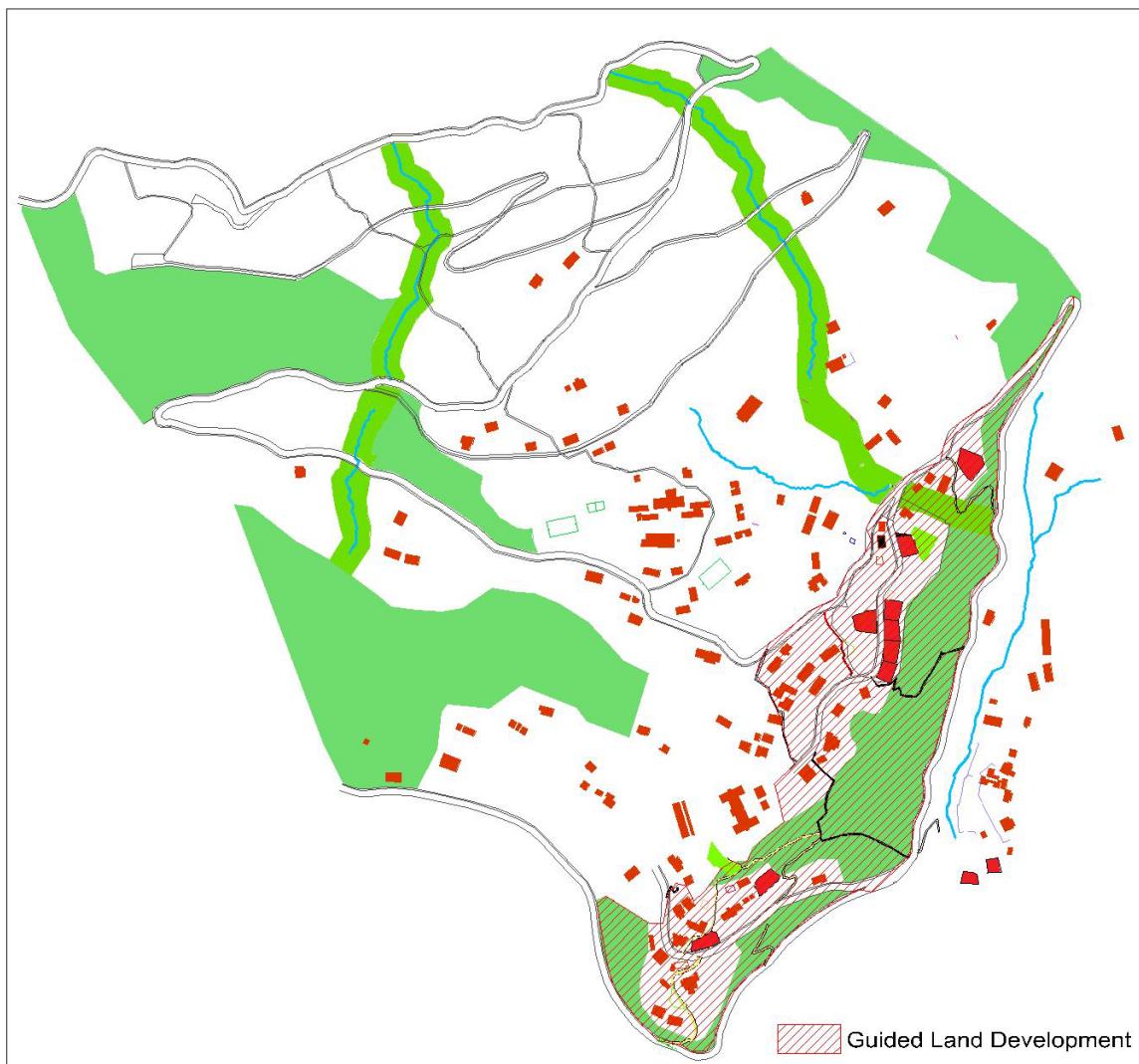
The development modality for the Sherabling Local Area Plan in Trongsa has been proposed in two different forms. The upper portion of the Local Area Plan above the school is sparsely developed with only a few structures. This makes the area viable for development using land pooling techniques.

The lower portion of the local area plan however is already built up and with very few areas to implement any form of interventions. And owing to the very steep terrain in the area, most of the development activities have been limited.



Structures in lower part of Sherabling

As mentioned earlier the guided land development modality is to be used for this area. In other words, the planning intervention is in form of provision of pedestrian paths, open green spaces for social interaction or recreation. The widening of roads wherever possible has been proposed for improved accessibility. In certain pockets where there are government owned lands, community green areas have been proposed. Also in areas where it is possible, the vacant plots have been reconfigured into regular shapes.



Lower Sherabling area –Guided Land Development modality

## Proposed Foot Paths and Community Green

The footpaths have been proposed as a means to improve connectivity and pedestrian movement in the area. There are existing footpaths in the area but it has been proposed that these footpaths be improved and widened for better access.



Proposed pedestrian paths and green

Two community green areas of approximately 500 square meters have also been proposed. This will serve as an area for the people in the neighborhood to spend time relaxing and socializing. What the Sherabling area lacks right now is a designated area for recreation and leisure. Thus these two areas are proposed to serve that need. No playgrounds have been proposed as there is limited amount of space available and the playground in the school is already in use by the community so there was no need.

The footpaths were proposed with a width of 1.5 to 2 meters. This would be a comfortable size for pedestrian flow and is the standard size most commonly adopted. The footpaths can also be paved with stones and other locally available materials. This kind of pavement is also seen in other parts of Trongsa, especially near the Ta Dzong area and could be also implemented in this area.



Visualization of proposed pavement of footpaths and community green

### 5.1 Proposed Plot Reconfiguration

One of the plots in the lower area in Sherabling was reconfigured to include the structure that was already present on the ground. This structure was previously shown as being slightly outside the boundaries of its plot. Hence the proposal to reconfigure it and include the whole structure whilst keeping the plot area same.



This also helps in making space for the proposed community green area in vicinity. Since the area abutting the road has a relatively gentle slope and is more accessible this makes for a good location for the community space. For the green space there also is a need to dismantle a structure. This is an old structure in the area but there are no details of ownership and it stands on government land. It was used as a bakery but is now an abandoned house.



**Figure 2: The structure on the reconfigured plot**



**Figure 3: Abandoned house**

## 8. Drainage

In hilly terrain there is higher probability of erosion when the vegetation cover is damaged or when the intensive land uses bares the soil. Therefore it is important to control the flow of water down the hill.

Not all the water falling can be removed by drainage, some will infiltrate in the ground and some will form puddles or fall into depression and eventually evaporate away.