DUKSUM URBAN DEVELOPMENT PLAN 2012

Department of Human Settlement
Ministry of Works and Human Settlement
Thimphu

&

Dzongkhag Admninistraion
Trashiyangtse

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Do-Sum: The Legend of Three Boulders

Duksum, the name is a distorted version of the original term ‘Do-Sum’ which literally translates as ‘three boulders’. Popular legend has it that a superman, referred to as ‘mansang’ in the local dialect, had set out to construct a bridge over the mighty Gong Ri. He planned to accomplish the task by rolling down three huge boulders and placing them in the river. The catch was that he had to complete the task under the cover of darkness. However, when the first cries of the rooster were heard, generally accepted as the start of daybreak, he had managed to place only one of the boulders in the river. The other two were stranded on the way and the superman could not complete his task. Local elders point to the presence of huge boulders at the site as the proof of the legend. Interestingly, there is also a rock in the shape of a rooster, referred to as ‘japo duwa’ or the ‘rooster rock’. The locals believe this is the same rooster whose cries deprived them of the legendary bridge. Another version states that ‘Do-Sum’ referred to a cluster of three boulders further down the valley, though the exact location of the boulders could not be established. Despite the variations in the story, there is no question that Duksum is a derivative of the original name ‘Do-Sum’. The presence of many rocks and boulders at site bear more than ample testimony to the popular folklore!

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ROYAL GOVERNMENT OF BHUTAN
MINISTRY OF WORKS & HUMAN SETTLEMENT
THIMPHU: BHUTAN

FOREWORD

A decade ago Duksum was a small town with big development prospects. These prospects were nearly crushed by the risks of falling boulders and flash floods. However, with its strategic location and its proximity to sacred sites both within Duksum and in the region, it is still a significant settlement. The up-coming Kholongchhu Hydro-power Project will also bring socio-economic benefits both to Dukum area and the region. Further, the establishment of the institutional and service centres in Duksum will add to the vitality of the town.

Given Duksum town's safety concerns and the limited scope for physical expansion, a new site has been identified in the extended area for Duksum town development. The new area's difficult topography and natural landforms posed serious challenges for plan preparation. In this regards I am happy to note that a plan that not only respects the existing ground features but also meets the expectations of the stakeholders has been prepared and adopted.

Duksum Plan is a product of the collaborative efforts of the agencies at the central, the Dzongkhag and the local levels and has been prepared through a consultative and participatory approach. In terms of the planning process, Duksum presented an interesting case. The plan was for relocation of the existing town residents while the land in the new area belonged to a different group of landowners. I commend the innovative approach designed by the Ministry, the National Land Commission and the Dzongkhag Administration together with local people to address this unique challenge.

Duksum Plan consists of three parts. The first part which is the main part analyzes the existing and emerging scenarios and proposes development interventions for the township. Part two contains the development control regulations which both sets out the procedures for development and specifies the requirements to ensure a planned development. Part three is a set of urban design guidelines to help achieve the visions and goals of the Plan. The three parts together strive to promote a sustainable development of the town while also articulating many of the green concepts.

The Plan outlines a number of strategies to help realize the development goals and objectives. These strategies may be good and their effective implementation may bring some success. But that will not be enough. The real success of the town will depend on the sincerity, integrity and ingenuity of the stakeholders in taking the Plan forward. Therefore, I urge all stakeholders to interpret and implement the plan in its true spirit and intention.

The Plan has been approved by the National Consultative Committee on Human Settlements in its 10th Meeting convened on 18th May 2012. Periodic review of the Plan shall be carried out every five years. If any revision or amendment to the plan is deemed necessary before the scheduled review, the request should be submitted through the Ministry.

Tashi Delek.

(Yeshey Zimba)
Zhabtog Lyonpo

5 August 2012

Acknowledgements

We would like to express our humble gratitude to Hon'ble Zhabtog Lyonpo Yeshey Zimba for his vision, direction and invaluable guidance in the preparation of the Duksum Development Plan 2012.

The Hon'ble Secretary of MoWHS, Dasho (Dr) Sonam Tenzin provided constant and valuable advice. We are also indebted for his efforts to ensure that the planning benefits accrue to all stakeholders equitably.

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We greatly appreciate the patience, commitment and support of the residents of Duksum Town and the landowners in Khitsang area and the Town Representative Mr. Ugyen Dorji. Their local knowledge and review of the proposals helped improve the plan immensely.

The Director of DHS, Mr. Kinzang Norbu and the Director of DES, Mr. Rinchen Dorji who as the Director of DUDES initiated the planning process, provided constant guidance and direction. We are also grateful to Mr. Meghraj Adhikari, the Urban Specialist, Ms Latha Chhetri, the Chief Urban Planner and the DHS officials for their contribution and critical review of the proposals. Further, we would like to thank Mr. Sonam Phuntsho and the Survey Team, particularly J B Gurung who carried out the initial topographic survey works.

We would like to record our gratitude to the Hon'ble Members of the National Consultative Committee for Human Settlement for the final review of the plan and their valuable suggestions for betterment of the plan and its implementation mechanisms.

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Abbreviations

BDFC	Bhutan Development Finance Corporation
BHU	Basic Health Unit
BNUS	Bhutan National Urbanization Strategy
BPC	Bhutan Power Corporation
DCPS	Duksum Community Primary School
DES	Department of Engineering Services
DFS	Department of Forestry Services
DHS	Department of Human Settlement
DoR	Department of Roads
DUDES	Department of Urban Development and Engineering Services
FAR	Floor Area Ratio
GIS	Geographic information System
Km	Kilometer
LPG	Liquefied Petroleum Gas
MLD	Million Litres Per Day
MM	Millimetre
MoE	Ministry of Education
MoH	Ministry of Health
MoWHS	Ministry of Works and Human Settlement
NCCHS	National Consultative Committee for Human Settlement
NLCS	National Land Commission Secretariat
O&M	Operation and Maintenance
PHCB	Population and Housing Census of Bhutan
PPH	Persons Per Hectare
RBP	Royal Bhutan Police
RGoB	Royal Government of Bhutan
RoW	Right of Way
SWOT	Strengths, Weaknesses, Opportunities and Threats
UISD	Urban Infrastructure Services Division
UPDD	Urban Planning and Development Division

PART 1

Duksum Urban Development Plan 2012

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SECTION 1

INTRODUCTION

1.1 Vision for Duksum – The Three Boulders Town

Duksum, with its strategic location, is a compact and a high impact town. Its 283 residents (PHCB 20025) and the businesses they run, contained in an area of just over 4 acres, cater to the commercial and service needs of the 10,000 people of the five Gewogs of lower Trashiyangtse. It is also probably the only interior town with influence across the international boundary. The people of the Indian state of Arunachal Pradesh continue to visit Duksum and Trashiyangtse both for pilgrimage and trade. While its growth has been stalled for a few years in the last decade, it is on track again. The proposed Kholong Chhu Hydro-Power Project is poised to bring unprecedented growth and development both to Duksum and the region. The development of Duksum Town needs to be promoted not only in preparation of the progress that is on its way but also to expand its scope of growth, constrained by the small area and threat of natural disasters the existing town area faces. Therefore, the Structure Plan for Duksum aims to develop Duksum as a vibrant service centre that caters to both the locals and tourists, taking full advantage of its strategic location. The Plan also strives to promote a settlement that is responsive to the site setting and its environment and one that is respectful of the essence of the traditional settlement patterns.

1.2 Aims and Objectives

The Structure Plan for Duksum is prepared to build and capitalize on its strengths and opportunities on the one hand and to minimize and mitigate its weaknesses and threats on the other. Broadly, the plan attempts to achieve the following objectives:

- To facilitate the development of the town in a balanced and sustainable manner;
- To facilitate a pattern of development that is suitable and appropriate for Duksum's topography and setting;
- To develop a layout plan which addresses and respects the existing topography and natural features of the area;
- To facilitate provision of necessary infrastructure required for efficient urban system;
- To provide for the required amenities within walking distance from all parts of the proposed urban area;
- To rationalize the land subdivision within the local area in a manner which allows for the efficient introduction of urban infrastructure and services;
- To provide for a development option for the area which exists in balance with nature, respects the unique traditional values and guides future growth in a manner sensitive to the ecology of the town and its surroundings;
- To assure that access to all the plots of the area are facilitated through an efficient network of roads and footpaths; and
- To promote a building typology that minimizes the scaring of the landforms and preserves the essence of the architecture and traditional settlements of Bhutan.

1.3 Plan Preparation Process

The preparation of the Structure Plan involved critical analysis of the existing site features and other relevant data including identification of an efficient land use system and rationalization of the land parcels within the area. Duksum presented a unique challenge as the plan was prepared primarily to relocate the shops and residents from the existing town because of the threats of falling boulders on one side and flash floods from the Kholong Chhu on the other. This has serious implications for the choice of methodology for mobilization of land for urban development. The practicality of relocating the existing town calls for acquisition and allotment of the proposed town area. On the other hand 'land pooling' is a fair and equitable method that is generally acceptable to the original landowners. These are the issues that can best be resolved through continued consultation with the local government and active participation of all stakeholders, primarily those of the landowners, thereby ensuring a participatory planning process.

1.4 Growth and Slowdown of Duksum Town

Owing to its strategic location, Duksum was once a thriving town. It is located at the physical confluence of the four Gewogs of Tongzhang, Khamdang, Yalang and Ramjar. Further, it has continued to be an important centre for trade and pilgrimage, to Choeten Kora and Gomphu Kora, for the people of the neighbouring Indian state of Arunachal Pradesh. A 1999 study that reviewed growth potential of Duksum recommended its development for its strategic location. Consequently, a number of urban services and amenities were developed under a project financed through the World Bank.

However, Duksum went through a period of gradual slowdown in the last few years which could be attributed to a number of factors, often not directly related to Duksum itself. In an ironic sense, Duksum was a casualty of the overall socio-economic development in the region. For example, all Gewogs which form the catchment area for Duksum have now been connected with farm roads. This has had a twin effect of not only by-passing Duksum in the people's movement in the region but also in the people's commercial needs. The feeder roads and the farm roads provided direct access to the Gewogs and along with the roads the shops that cater to the basic needs of the people also reached the Gewogs. People no longer have to walk down to Duksum, which was the nearest road head for many Gewogs till then.

These new developments together with the lack of space for the physical expansion of the town had constrained its growth. In fact there had been a gradual slowdown. But to its credit, Duksum had established itself as a critical link in the economy and development of the region. The highway traffic and the establishment of some institutional and corporate offices at Duksum provided the economic base of the town. While there was not much growth, it seemed to have achieved equilibrium for its sustenance. However, an unfortunate incident in September of 2004 disturbed this equilibrium.

1.5 Reasons for Relocation

One night in September 2004 a large boulder fell right into the town from the cliff above. The errant boulder destroyed a number of houses, crushing one completely whose tenants narrowly escaped. Though there was no human casualty, the confidence of the residents was severely shaken. While it was possible that the rock fall was triggered by the rains of the past summer, there was no guarantee that there would not be repetition of such accidents. Considering that Duksum Town was also located on a narrow strip of land along the Kholung Chhu, with possible threat from flood and rock fall from the cliff on the opposite site, the government decided to relocate the town to a safer place.

Therefore, the residents were immediately moved to safer location about half a kilometer from Duksum Town. They were instructed not to move into the houses and to operate their business from makeshift huts at the new location. Meanwhile efforts were on to identify a new site for relocation of the township. An area above the Royal Bhutan Police establishment, with relatively gentle slope, was earmarked for the town. With the hope of relocating the town, neither new construction nor renovation of the houses in the existing town area was allowed.

Temporary Settlements at Khitsang

As would be expected with any proposal for relocation of such an established settlement, the plan took some time to take off. In the meantime, the government's plan for construction of a hydro-power project came through and the need for an urban area was reinforced. The hydro-power project and the highway widening project would affect the lower part of the existing town where the current Bailey bridge has to be replaced by a permanent bridge. As if to remind the residents of the eminent danger, there have been reportedly at least two instances of smaller rock falls since 2004. Therefore, it was imperative that the Duksum Town is relocated to a better site not only for public safety but also in preparation for the mega projects that are envisioned for the socio-economic development of the region.

1.6 The Proposed Site

The local community with Trashiyangtse Dzongkhag Administration has identified a site for the proposed relocation of Duksum Town. It is located on the hill spur. While the municipal boundary covers a large area including the existing Duksum Town area and the Royal Bhutan Police area, the actual site proposed for commercial area is a relatively flat terrain located

immediately after the DCPS. Considering that there are not many shop owners at Duksum and that the town itself cannot be very large, it appears that the area would be adequate for the proposed relocation of the township.

View of the proposed Town Site with part of the Existing Town in the foreground.

SECTION 2

EXISITNG SCENARIO

2.1 The Existing Duksum Town

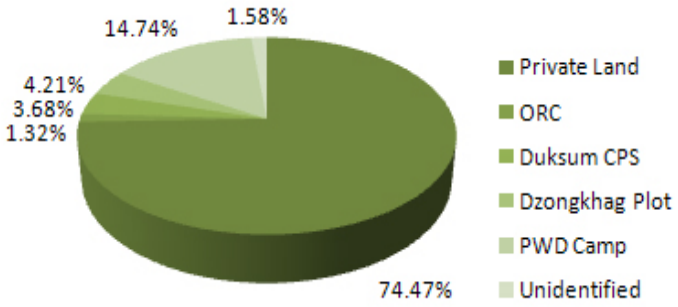
While the residents of the existing Duksum Town have not been allowed to either erect new constructions or renovate their existing houses in anticipation for town relocation, people have gradually moved back to their houses. For one, they had moved into temporary huts with the hope of moving into a more permanent town and houses soon after. However, this had taken longer than expected during which time the temporary huts had worn out. Further, while it is not the only factor, Duksum town, to a large extent also depends on the highway traffic. But the new, temporary settlements were located off the national highway. This was often seen to be the reason for most businesses not doing well.

Today, the core area of Duksum Town presents two different faces. The lower part, which is located along the highway and also next to the junction to Yalang and Ramjar farm road, is a busy and vibrant area in terms of vehicular traffic and commercial activities. Even the houses bear a cleaner and more robust appearance. On the other hand, the upper part of the town, which is upstream of the Kholung Chhu, bears a very deserted look. There is no activity in this part and many houses are in various stages of ruin and decay. Incidentally, this was the part of the town that bore the major brunt of the rock fall incident of 2004.

Two faces of the existing Duksum Town

Despite its small size and the hardships it went through, overall the town looks quite vibrant. In addition to the normal grocery and general shops, hotels and bars, it also has an electronics shop, an automobile workshop, a beauty salon and even a bakery. The town's activity could be attributed not only to the highway traffic but also to the existence of a number of institutional establishments in the area. They include RBP, BPC, Department of Forestry Services, Bhutan Post, DoR, DCPS, BDFC and Health Outreach Clinic.

Duksum Town has a curious case of land ownership, at least by the normal practices, though not entirely unheard of. The area falls under Khamdang Gewog but almost 90 percent of the plots are owned by people of Tongzhang, a Gewog across the river and high up on the mountain slope. But given Duksum's limited area, the plots could not be large enough. The total area within the existing town area is only 3.8 acres of which five plots with a combined area of 91decimals are government owned. The rest are privately owned, registered under 39 Thrams with areas ranging from 1 to 12 decimals. Only two thrams have fairly large plots with areas of 31 decimals and 56 decimals each.



	Type of Land	Area (acres)
1	Private Land	2.83
2	ORC	0.05
3	Duksum CPS	0.14
4	Dzongkhag Plot	0.16
5	PWD Camp	0.56
6	Unidentified	0.06
	Total	**3.80**

Details on Land Ownership in the Existing Town

In terms of infrastructure, the basic services like the roads, water supply, electricity, telephone and cable TV services are available. Street lighting, a vegetable market and a solid waste disposal site were developed as a part of the urban development project. However, most of these services cater to only part of the existing town area. The major part of the proposed urban area, being barren and undeveloped, is not provided with the required infrastructural services and amenities.

2.2 Constraints and Threats in the Existing Duksum Town

The small town of Duksum which enjoyed impressive growth and development for a number of years has been constrained by many factors in the last decade. Firstly, it is located on a narrow strip of land sandwiched between the fast flowing Kholong Chhu and the Trashiyangtse – Chazam highway, which in turn is constrained by a vertical cliff. Part of the area is also shared by the Field Office of the Department of Roads. This limited availability of space constrains any opportunity for the physical expansion of the town in future. The fact that it is located right next to the highway and at a tri-junction of Trashiyangtse - Chazam road and the farm roads to Yalang and Ramjar Gewogs further congest the town area. The Bailey bridge which is located at the lower of the town is also proposed to be replaced and widened which would again require more area.

But more significantly, the current commercial area at Duksum is faced with threat of rock fall as evidenced in September 2004 when a huge boulder fell in to the town. While no major incident has been reported since then, there have been cases of smaller rock falls. On the other hand, there are flood risks from the Kholong Chhu. Though there have been no reports

so far, it is a threat that cannot be ruled out completely, given its proximity to the river, narrow valley and unpredictable weather and climate patterns.


The existing town sandwiched between the cliff & the river

2.3 The Extended Duksum Town Area

The greater Duksum area which is proposed for relocation of the Duksum Town covers an area of 86.5 acres. The proposed urban area is bounded by Gong Ri to its south. To its west the area includes the existing town area with the boundary line running north along the top of the cliff which also coincides with the traditional foot trail to Khamdang Gewog. The boundary line terminates at the huge boulder at the upper end of the site from where it turns east till the second range of cliff (natural drop). From there the boundary runs south till it meets the Gong Ri near the existing suspension bridge across it.

2.3.1 Climate and Vegetation

Though Duksum falls in temperate region, the area itself has vastly ranging climatic conditions. Because of its lower altitude, it has very hot summers. During rainy season it also receives heavy downpours and the weather after rains can be both hot and humid. Winters are much more pleasant with warm weather but it can be quite chilly at night and in mornings. In terms of vegetation, though the current site does not have much vegetation cover, chir pine and lemon grass are indigenous to the area. Other trees like the eucalyptus and the China bead trees (locally known as ***tobda shing***) also grow in the area.

2.3.2 Topography and Land Features

Duksum is located at the base of a narrow valley. Consequently, the terrain is generally steep and it is difficult to find a continuous stretch of land with good terrain. However, there are pockets and terraces of land which can be developed. The existing settlements and developments are also located on such pockets and terraces. Since most developments are of low rise type and the overall density is quite low, there are no major issues.

Parts of the site are marked by presence of boulders and large rock outcrops. They do not seem to be parts of a continuous rock body but could be independent rocks either resting on the soil surface or partially buried in the ground. Such rock characteristics coupled with the sloping terrain and lack of any substantial vegetation cover pose serious threat of falling rocks. These features need careful consideration during site planning of the area and the structure plan preparation.

Existing Site Features

But these land features, hill spurs and rock outcrops, also provide strategic view points. The proposed site being at the higher ground can capitalize on the scenic views of the Kholong Chhu and the mighty Gong Ri below. There are views of the fields and the far mountains across the valley.

Significant Views and Sight Lines

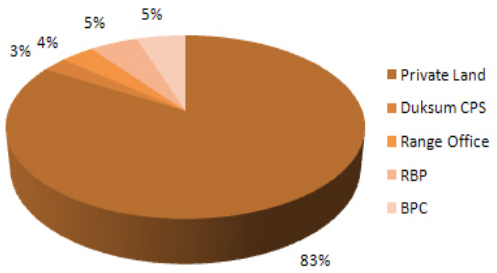
2.3.3 Existing Land Use Pattern

Most parts of the proposed site are expanses of fallow land overgrown with bushes and shrubs. However, there are indications that the area was once used for agriculture, which the locals also corroborate. There are ruins of houses and remains of terraced fields and stone masonry that would have been part of farm boundary and fences. Lack of water has been cited as the main reason for the area's abandonment. The lower part of the proposed site has witnessed a number of developments in the last few years. In addition to the RBP, the BPC and the DoF colonies and the school located in the area, a number of private houses have come up.

2.3.4 Existing Land Ownership Pattern

In the extended town area there is a total registered land of 66.8 acres. Of these a total of 11.06 acres are owned by the institutions established there. The DCPS, registered as Duksum Midai Lobdra has a total registered area of 1.76 acres while the BPC, DoF and the RBP have registered areas of 3.48 acres, 2.38 acres and 3.44 acres respectively. The remaining 55.74 acres owned by private landowners have fairly reasonable plot sizes. This is significant in view of the fact that most of the proposed town area is on a slope and that plots may have to be larger than the standard urban plots. This is also critical if Land Pooling scheme is to be employed for detailed local area plan preparation. It is also observed that beside the

institutional plots only few of the private plots have structures on them. Further, it is observed that there are no Government owned land in the area. Most areas that are not under private ownership fall either on steep slopes or in gullies and along cliffs and traditional trails.



	Type of Land	Area (acres)
1	Private Land	55.74
2	Duksum CPS	1.76
3	Forest Range Office	2.38
4	Royal Bhutan Police	3.44
5	Bhutan Power Corporation	3.48
	Total	**66.8**

Land Ownership Details in the Extended Town Area

2.4 Existing Amenities and Facilities

Currently the proposed town area exists as a two-pocket settlement, the more established existing town core and later developments and settlements and institutional areas at Khitsang. Consequently, in terms of amenities too, the existing town has better facilities, though most of them are not of the desired standards.

2.4.1 Road and Circulation Network

The existing Duksum Town area has proper black topped road. However, the other roads including the one that provides access to the institutional areas and the extended town area at Khitsang are still dirt road. This access road also provides the diversion off the Trashiyangtse – Chazam highway to Ramjar-Yalang farm road. The BPC has constructed an access road to its compound as has the school. The road to the school also provides access to some private plots where there are visible signs of new developments.

The area lacks any established pedestrian walkways and footpath system. Between the existing Duksum Town and the settlement at Khitsang, people walk along the road but it has no designated footpath. At Khitsang too, there is no proper footpath system. But there are trails and short cuts that are regularly used, mostly by school children to reach the school located above the settlement areas and the institutional establishments at Khitsang.

The proposed site has a total of 1.5 kms of dirt road. However, a major part of the proposed town area has no road access. The local residents who will be stakeholders and beneficiary of the township have requested for a highway by-pass road. The Dzongkhag Administration has also identified the possible alignment for the by-pass road. This road is necessary not only to provide access to the area but for the commercial viability of the town which to a large extent also depends on the highway traffic. As there are no settlements in the area, there are also no footpaths though the traditional trails to Khamdang Toetsho Gewogs pass through the area.

2.4.2 Institutional Establishments and Offices

Owing to its strategic location, Duksum is found to be an ideal location for institutions and offices with regional interests. Though such interests are constrained by the limited space, a number of offices have already been established. These institutions include the RBP, the BPC, the DoFS, the BDFC and the Bhutan Post. There is also a community primary school. But the Local Government expressed the need and scope for at least a lower secondary school. Further, the area also has scope for location for a health centre, probably a BHU Grade I, considering its potential to cater to the referral cases from the surrounding Gewogs. The DoR with a field office and staff stationed there is looking for an alternate location.

2.4.3 Heritage & Religious Structures

Duksum is located in close proximity to the religious site of Gomphu Kora which has many ***nyes*** related to the visit of Guru Rinpoche. There is also a Lhakhang where a popular tshechu is performed annually. At Duksum proper there is a small chhoeten next to the area where a suspension bridge was located and one at the lower end of the existing town area. There is another chhoeten along the traditional route to Khamdang. Interestingly, some houses have small hand-turned prayer wheels which may reflect the need for a community place of worship. In terms of natural land features there is the legendary 'rooster rock' with a small chhoeten erected on top of it.

Lhakhang at Gomphu Kora and the Prayer-Wheels in the Shop Houses

Historic Structures and Land Features at Site

2.4.4 Existing Housing

The existing Duksum Town has a mix of one and two-storeyed traditional houses of stone and timber with mud mortar. While some houses are occupied and maintained well, many are in bad shape. This is because following the incident of 2004, the residents have been asked to

move and their houses have either been kept vacant or no renovations have been permitted. Residents who moved to temporary huts faced a greater problem. Most huts are made of bamboo mats and wooden planks. Over the years these structure have gradually begun to wear out. There has also been confusion over tenancy in the temporary settlements in the RBP area which has been required to be vacated.

Shop Houses in the Existing Duksum Town

There are also a number of structures in the institutional areas used both for administrative and residential purposes. Almost all structures in the institutional areas are of single storey. This is commendable as they are located on slopes and also because they can be easily constructed with the locally available materials.

Temporary settlements at Khitsang

2.4.5 Weekly Market Shed

As a part of the Duksum urban development project financed through the World Bank, vegetable market sheds were constructed. The sheds are located just below the road to Khitsang, immediately after the diversion from the Trashiyangtse – Chazam highway.

2.5 Existing Utility and Services

2.5.1 Drinking Water Supply and Distribution

The area has a drinking water system which is inadequate and erratic with constant disruptions. This is reported to be attributable both to the inadequacy of the source and distribution network. The quality of the water, especially in the summer, is also questionable. While most houses in the existing town have house to house connection, most residents at Khitsang have shared, community water taps.

2.5.2 Storm Water Drainage System

There is no proper storm water drainage system beyond the immediate vicinity of individual houses. Consequently, storm water often follow the nearest road or the natural depressions making its way down to the main rivers. This is undesirable and risky situation which is compounded by the area's topography and land forms.

2.5.3 Sewage and Solid Waste Disposal System

Duksum Town does not have a piped sewage disposal system. Some houses have plot level septic tank and soak pit arrangement while others use the more primitive pit latrine system. There are also others who have no toilets at all. Till date sewage disposal have not come out as a major issue, probably, owing to its low volume. However, with the extended urban boundary and increased population, it is going to be one of the major challenges to be addressed.

A solid waste disposal site had also been developed for Duksum. The site is located about half a kilometer from the existing Duksum Town, along the road going to DCPS. However, the area is now included within the urban boundary and it is located close to area that can be developed. While it was adequate for the earlier town, its capacity may be too low for the new town. Therefore, an alternative site has to be found and developed for solid waste disposal.

2.5.4 Electricity Supply and Telecom Services

Duksum Town and the Khitsang area already have electricity supply. The area proposed for relocation of the town also has electric supply lines running through it. However, the adequacy of both the supply and the distribution networks and the power capacity need to be ascertained in consultation with the electricity agency. The area also has telecommunication and mobile phones services, though like electricity, their ability to cater to the entire extended area need to be established.

SECTION 3

ANALYTICAL STUDY

3.1 Urban Development Project Preparation Study by the World Bank

In 1999, the erstwhile Ministry of Communications, predecessor to the MoWHS, carried out an 'Urban Development Project Preparation Study'. The study looked at 10 potential commercial centres in the country for urban development assistance by the World Bank. Duksum was one of the towns included.

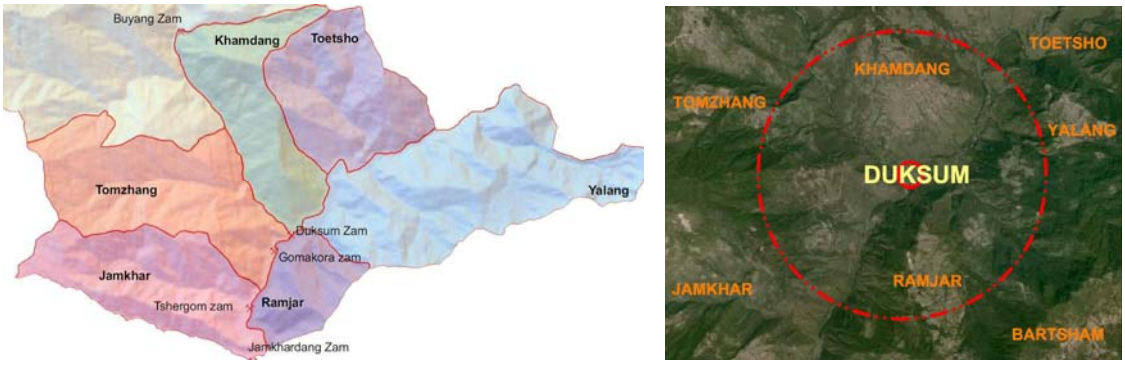
The study observed that Duksum had a strategic location and that it could one day compete with Trashiyangtse as an economic centre. The estimated population for 2000 was 362 persons which were projected to increase to 452 in 2005 and 693 by 2020. At an average household size of 5.15 and the population density of 81 persons per hectare, the additional land required for urban development at Duksum was calculated at 4 hectares. The report proposed two options for the development of Duksum. The first one proposed for relocation of the town to a flat area about 1 kilometer from the existing town and on the other side of the Gong Ri. This option was observed to be less favourable as it would require construction of a bridge over the Gong Ri. The second option proposed for rationalization of the existing town and expansion to Khitsang, about 500 metres from the town.

The rationalization plan proposed that the existing DoR compound be either shifted to Khitsang, next to the RBP, or be moved completely out of the town area. The area so vacated was to be developed as a town square including creation of car, taxi and bus parking, and landscaping and viewing areas. A total of 14 plots were also to be created in the area which were to be first to be allotted to those whose houses were affected by the proposal to create fire gaps in the town. The remaining plots were to be allotted to those who did not have land in the town. The report also proposed for improvement of roads and footpaths, landscaping of the main street, upgrade of school, creation of children's playground, modification of the WFP warehouse into a multi-purpose hall and a municipal office, construction of a public toilet and identification of a site for a Fuel Station.

The report proposed for rationalization of the existing town with possibility for expansion in future to Khitsang area. It also proposed a number of street improvement schemes and facilities which have brought great benefits to the local residents. However, with the benefit of retrospection, it is observed that the report did not really consider the risks posed by the steep cliff on one side and river on the other side. Community facilities like the school and the multi-purpose hall have been retained within the limited space of the existing town and the needs for issues like school expansion does not seem to have been considered. As a matter of fact the school has already been shifted to the upper part of the area that the report proposed as the expansion area. Further, the need to replace and upgrade the existing Bailey bridge which would encroach into the proposed town square is also seen to be a constraint.

3.2 Regional Context

Duksum has a very strategic location. It is located at the physical confluence point of the four Gewogs of Tongzhang, Khamdang, Yalang and Ramjar. Duksum catered to the service and commerce needs of the people living within its catch-ment area mentioned above. It was also a service centre for Toetsho Gewog, located further north. Owing to the physical proximity, people of Bartsham Gewog under Trashigang Dzongkhag also occasionally visit Duksum for some of the service needs. This may be reinforced in future because of the road construction from Duksum to Ramjar Gewog as the latter and Bartsham Geowg are already connected by road.



Location map of Duksum [image sources: NSB & Google Earth]

Despite the fact that most of the Gewogs that form the catchment area for Duksum are now connected by road and shops have reached these Gewogs, Duksum would continue to retain its importance in the regional context. While it is true that all Gewogs for which Duksum was the nearest road point for a long time have now been connected with roads, Duksum falls at the take off point for most of the roads. Further, there is no road connection among these Gewogs and anybody traveling from one Gewog to another or to the Dzongkhag Headquarter at Trashiyangtse or to the rest of the country has to pass through Duksum.

Visible progress and scope of development for Duksum

On the other hand Duksum has a number of cultural and historic sites within its vicinity. The Gomphu Kora Nye, a pilgrimage site associated with Guru Rinpoche is located just 2 kilometers from Duksum. The Gomphu Kora Tshechu a very popular annual festival is celebrated in the Lhakhang located very close to the Nye area. Further, it has continued to be

an important centre for trade and pilgrimage, to Choeten Kora and Gomphu Kora, for the people of the Indian state of Arunachal Pradesh.

Duksum area is poised for further activity and development. The Kholong Chu Hydro-Power Project is scheduled to begin very shortly. While the project development may last just 5 to 10 years, it is estimated that the Hydro-Power Plant will have a permanent O&M staff of around 200. Because of its strategic location, a number of public and corporate offices, for example the BPC, the DFS and RBP, are also established there.

3.3 Land Suitability for Development

Land suitability analysis is carried out to identify developable land available within the proposed town area. Such an analysis is very critical especially for places like Duksum where there is limited land suitable for urban development and most of that too fall on slopes. Land on steep slopes and cliffs, under forest cover, under river protection zones and environmentally fragile areas are identified and marked for protection. While such areas are not suitable for urban development, they can form part of the town's open space system that would ultimately help to improve the quality of urban life.

3.4 Slope Analysis

The slope analysis studies the surface of the land and groups land parcels under different slope categories. This is useful to identify areas that are suitable for various developments or more importantly to help designate appropriate land uses. The site slopes from its northern end towards the south. While the whole of the proposed town area falls on a hill spur, there are pockets of relatively flat areas that can be used for urban development.

In this analysis, land with slopes between 0 and 30% have been considered suitable for development while any land with slopes greater than 30% shall be considered only for restricted development, as is the practice in the country. The analysis found that 19% (16.25 acres) of the site has slopes greater than 30% which will mainly be maintained as protected areas and only restricted development would be permitted. Of the remaining 70.2 acres, 3.8 acres are in the existing town area which has been identified as unsuitable for human settlement because of risks of rock falls and flash floods. Therefore the net area available for effective development including those under institutional ownership is 66.4 acres.

3.5 Aspect Analysis

Aspect analysis identifies the direction of the inclination of the slope. Such a study is useful to determine the sun direction and therefore the layout of roads and streets which in turn determines the plot depth and the orientation of the buildings. Such orientations are done with the objective of maximizing or minimizing the impact of local weather and climate.

3.6 Contour Analysis

Contour analysis highlights such topographic features as cliffs, plateaus, hillocks and plain areas. Though the site has been identified such that the most prominent cliffs in the area have been left out of the site, there are still stretches of steep areas and rock features within the site. The analysis helps to identify areas for location of landmark buildings, view points and the most suitable alignment for storm water and drainage systems. There is a steep, almost

vertical cliff at the south west corner of the site. An area of steep and fragile area also adjoins this cliff area on its east. Further, from top to bottom of the site there are stretches of deep gullies and gorges along its eastern boundary. Apparently these areas are not suitable for development, but they provide great opportunity to enhance the quality of urban space through a network of open space systems.

3.7 Land for Development

The preceding analyses help to determine the areas that are suitable for development. These are the areas that are arrived at after identifying areas that fall either on steep sloes, environmentally sensitive areas or within flood protection areas along the rivers. Such studies are very critical, especially for places like Duksum, which have very steep slopes and cliffs, rock outcrops and rivers running along its boundaries. Further, parcels of land have to be maintained as either green areas or open spaces for public safety and convenience reasons.

Table 3.1: Areas under Different Land Use Types in Environmental Precinct

Land Use Types	Area in Sqm.	Area in Acres	% of Total (86.5 acres)
Green Corridor	20734.3	5.12	5.92
Steep Slopes	40345.9	9.97	11.53
Flood Protection Zone	23413.7	5.8	6.71
Green Cover	41225.9	10.19	11.78
Total	**125719.8**	**31.08**	**35.94**

3.8 SWOT Analysis

Table 3.2 below indicates the various strengths, weaknesses, opportunities and threats that confront the proposed development for Duksum. Such an analysis helps to arrive at a clear course of direction for future development and to take the precautions necessary to negate the perceived threats and shortfalls.

Table 3.2: Strengths, Weakness, Opportunities and Threats for Duksum Town

Strengths	Weaknesses
• Strategic, central location • Clear ground & few existing structures • Electricity and telecom infrastructure • Excellent views and sight lines	• Limited area with steep slopes • No/ limited access road at the site • Lack of diversity in economic base • High cost of construction
Opportunities	**Threats**
• To develop as a regional service centre • To develop as a vibrant transit point • To develop as a unique urban centre • To develop as a tourist attraction centre	• High cost of infrastructure development • Dependence on highway traffic • Stability of rock outcrops at site • Development of the catchment area

3.9 Mode of Land Mobilization

Given the limited land available for development, mobilization and assemblage of land for urban development has been a difficult task. On the other hand Bhutan is faced with a rapid rate of urbanization, a recognized global trend. Though the laws of the country provide for

acquisition of land for public purposes including urban development, the Government since the last decade has been promoting the concept of Land Pooling. In this scheme all landowners in an area contribute a certain agreed percentage of their land holdings towards provision of infrastructure and common amenities. However, in the case of Duksum it is observed that the implementation of the concept of land pooling may not be feasible.

The Land Pooling Rules 2009, adopted to streamline the land pooling process, stipulates a number of conditions for employment of the scheme among which are the suitability and feasibility studies and the ceiling on land pooling contribution ratio. For an area to be suitable for Land Pooling scheme it has to be in an urban area and the proportion of developed plots should not exceed 25%. The feasibility study requires consideration of the proportion of the plots which are vacant, the number of land owners, the size of the plots, topography, the likely environmental impact of a scheme, the need for environmental screening and the rise in property values. Further, implementation of a land pooling scheme requires that the contribution ratio does not exceed 30%.

Though the case of Duksum fulfills most features of the suitability and feasibility requirements, the contribution ratio would go much higher than the permissible 30% because of its terrain and topography. Higher percentage of contribution ratio also means that the rise in property value, the crux of a land pooling scheme, would not be meaningful in this case. Of the total area of 86.5 acres within the urban boundary, only about 25 acres are available for development. In such a scenario, the Land Pooling contribution ratio would be as high as 68%. This in turn means that a substantial area, about 38 acres, has to be acquired if the contribution ratio is to be maintained at 30%.

Table 3.3: Areas under different Precincts and their Specific Uses

	Land Use Precincts	**Area (acres)**	**Remarks (areas under different uses)**
1	Existing Institutions	9.13	RBP, DoFS & BPC
2	Proposed Institutions	6.25	School & BHU (School has a regstd. area of 1.76 acres)
3	Public Utility & Services	4.01	Water & sewage treatment plants, vegetable market, transit node, municipal office, fuel station.
4	Heritage Precincts	1.40	Lhakhang & Japo Duwa public open spaces
5	Env. & Open Spaces	28.73	Flood protection, steep slopes, rocky areas, etc
6	Circulation Networks	12.12	Roads & footpaths
7	Plotted Area	24.72	Commercial & residential areas

The Dzongkhag Administration and the stakeholders had extensive discussions on the mode of land mobilization for Duksum Town and subsequently settled for land acquisition. This decision has immense practical wisdom. Extension of Duksum town is being proposed, primarily, to relocate the existing town where the safety of residents and their landed properties are at risk. But the stakeholders and the land ownership in the existing and the extended town area are completely different. If land pooling scheme is adopted in the extended area it would be difficult to shift the town as the current shopkeepers would have to buy plots in the new area. Even if plot transactions occur, different individuals may buy plots from different locations. Consequently, Duksum Town may not have prominent urban core or a coherent urban system. Therefore, land acquisition would be the most effective means of Duksum urban development.

SECTION 4

DEMOGRAPHIC STUDIES AND PLANNING STANDARDS

4.1 Demographic Studies

Population projection is one of the most essential aspects of the preparation of a structure plan. The current and future population figures are used to determine the nature and level of infrastructure and services to be provided in a town. More importantly, reliable population estimation is also necessary to determine if some of the services that will be financed by user charges and fees would be viable. Therefore, a successful implementation and realization of the development goals envisaged in the plan would depend to a large extent on the accuracy of the projections which in turn would depend on the correctness of the assumptions made.

4.2 Existing Population Statistics

The 1999 World Bank study report on the potentials for urban development of Duksum Town estimated the 2000 population of the town to be 362 persons. The report estimated that the town's population would grow at an annual growth rate of 5% for the next five years and 3.1% thereafter. With these rates the 2005 population was projected at 452 persons which was expected to increase to 693 by 2020. However, the PHCB 2005 found that the population for Duksum had in fact decreased from estimated 2000 figure of 362 to 283. This was mainly attributable to the shift of population and business to other neighbouring towns following the rock fall incident on 2004. However, over the years there has been turnaround both in terms of business and population in the last few years. As a part of this structure plan preparation the Municipal Administration conducted a population count and found that the population of the town had increased to 534, almost doubling itself in 5 years.

4.3 Population Projection for Duksum

Ideally, it is necessary to consider all factors of population projections such as physical, social, cultural, economical, functional, political and historical including the fertility, mortality and migration. But for a small settlement like Duksum inclusion of all the factors may be neither possible nor necessary. Given its small size and unpredictable population growth patterns, it is not possible to derive a reliable rate of population growth. Further, the proposed Kholung Chhu hydro-power project proposed in Duksum area will have immense impact on the local population figures. However, this swell in population will be only for the project period and it would be misleading to base the infrastructure and service requirements entirely on this figure.

Therefore, in view of its long term relevance and practicality, the historic rates of national and urban population increase are used for the purpose of population projection for Duksum Town. It is safe to assume that Duksum will continue to play a critical role in the region and people will visit Duksum for various reasons:

- Duksum has a central and strategic location in relation to the surrounding Gewog. While these gewogs have motorable road connection and some commercial activities have moved into the villages along with the roads, Duksum will continue to cater to diverse commercial and service needs.

- Duksum is located at the physical junction of at least three Gewogs and the roads to these Gewogs branch off from Duksum. Therefore, it will be a transit point for people traveling from one Gewog to another, the Dzongkhag Head Office and those getting into or out of Trashiyangtse Dzongkhag.
- A number of institutions and public offices are already established in Duksum like the RBP, the BPC and the Forest Range Office. The people from Gewogs will have to visit these offices for various purposes. There are also proposals for upgrade of the school and construction of a health service centre which will further attract visitors.
- The O&M staff for the Kholong Chhu Hydro-Power Project is estimated to be around 200 who will form the major residents of the town and depend on it for their commercial and other services needs.

Given Duksum's unpredictable population growth pattern, it is difficult to derive a reliable growth rate. It is observed that the use of the national urban growth rate would be most logical. The PHCB 2005 found that 30.8% of Bhutan population lived in urban areas. The BNUS 2008 calculated the average annual urban population growth rate of 7.3% based on the BHCB 2005 and the urban population of 2000. At this rate, the report estimated Bhutan would be 73% urbanized by 2020 and stated that this would neither be desirable nor be realistic. Therefore, it referred to Bhutan's Vision 2020 document which estimates that the urban population by 2020 would be 50% of the total population of Bhutan for which the BNUS calculates annual growth rate of 4.6%. At this rate the population of Duksum by 2035 is estimated at 1650. Factoring in a floating population of about 20%, the total population would be 2000.

4.4 Population Projection Based on the Available Area

On the other hand, it is necessary to look at the total area available at the proposed town area. With a clear picture of the area available for residential development, it is possible to work out the population backwards. This is relevant and important especially in the case of Duksum for two main reasons. First, the population growth patterns for Duksum are unpredictable and therefore, it is not possible to derive a reliable average annual population growth rate. Second, the area available for development at Duksum is very limited with almost no opportunity for future expansion. It is, therefore, important to plan for only so much population that can physically be accommodated within the town area.

Table 4.1: Calculation of Population based on the Area Available for Development

Precinct	Area (acres)	No. of Plots	No. of DU	HH Size	Population
Urban Core	4.7	40	40	4	160
Urban Village 1	16.4	131	540	4	2160
Urban Village 2	3.7	20	40	4	160
Total	**24.8**	**191**	**620**	**-**	**2480**

Calculations from the table 4.1 above indicate that the total carrying capacity of the plots in Duksum is around 2500 persons.

Table 4.2: Planning Standards for Urban Settlements in Bhutan

	Facility/Amenities	Location/catchment area	Catchment Pop.	Site size	Min. level of site services
A	Open spaces				
1	Local Field Sport Facility	Within walking distance	Up to 5000	0.5 hec / 1000 people	Good access to public transport
2	Public Open Space	Equally distributed over urban area	2500-20,000	0.5 hec / 1000 people	Seating facilities, drinking water, information kiosk, public toilets
3	Central Plaza	Town Centre, Commercial Area	2500	0.2- 0. 5 hec	Seating, drinking water, lighting, garbage cans, public telephone
4	Children's Playground	Immediate vicinity max. 10 minutes walking distance from most houses	2500 - 4000	100sqm	Children's play equipments
B	Commercial Facilities				
1	Farmers' Market	Centrally located, close to public transport node	Upto 30,000	0.2 hectares	Water, electricity, storage, refuse disposal, public toilet
2	Neighborhood Shopping Center	Close to neighborhood facilities	2500 - 5000	250 sqm	Water, electricity, proximity to postal service, police post, public toilet
C	Health Facilities				
1	Basic Health Unit	30 minutes	2000 - 5000	500 – 800sqm	Water, electricity, telephone
D	Education Facilities				
1	Primary School 6 – 14 yrs age group 350 – 600 students	20 minutes walking distance	2500 - 6000	1 – 1.5 hec	Water, electricity, telephone Play Field 0.5 – 0.75 hec
E	Amenities & Services				
1	Fuel Station	Near major road, intersection of major roads	2500 - 15000	500 sqm	Electricity, firefighting equipments, telephone, LPG storage
2	Post Agency	Neighborhood	Upto 4500	25sqm	Could be part of multi-purpose building
3	Police Station	Centrally located within close proximity to postal agency and shops	2000 - 4500	200 sqm	Water, electricity, telephone
4	Bus Terminus	Whole Urban Area		500 sqm in smaller towns	Parking facilities for private vehicles
5	Taxi Stand	Neighborhood Centre	Neighborhood	10 Taxis	
6	Refuse Depot	Within 10 km radius of town	2500 - 30000	0.5 hec / 10000 pop	With good vehicular access to main road
7	Fire Fighting	Urban Area	Upto 15000	200 sqm	Water storage tanks where there is no regular water supply

Source: Planning Standards for Urban Settlements in Bhutan 1999

SECTION 5

PROPOSALS FOR ACTION

5.1 Concept of the Plan

The layout and design of the Duksum Structure Plan is based on the concept of the traditional village settlements of Bhutan. It pays careful attention to the existing site topography and landforms. Settlement plans and infrastructure are laid out around and with regard to the natural features like rock outcrops, hillocks, vegetation and steep slopes. On a hill top overlooking the entire site is the proposed location for a community lhakhang as is the general practice in Bhutanese villages. Further, the plan seeks to provide all facilities and amenities within walkable distances. It aims to create a vibrant and compact community with a prominent town centre with other land uses spread around it.

5.2 Planning Principles Adopted in Duksum Structure Plan

A number of specific planning principles were adopted both in preparation of the Structure Plan and drawing up the Development Control Regulations for Duksum.

- Regard for site topography and land features – Given Duksum's steep slopes and landforms with rock outcrops, it is important to propose a plan that is sensitive to these elements.
- Significant views and sight lines – Because of its topography the site offers a number of prominent points with scenic views which have been used as assets in the Plan.
- Traditional routes – The site has a couple of traditional routes which have been enhanced not only for their historical significance but also to improve the connectivity and circulation networks.
- Minimal site excavation – The Plan discourages excessive excavation of the site. Some measures adopted are restrictions on site excavation, shared parking spaces, alignment of urban roads and restrictions on plot coverage and building heights.
- Promotion of the traditional architecture of Bhutan – The shop-houses in the existing Duksum Town have interesting characteristics and traditional architectural features which are proposed to be promoted in the new urban core.
- Promotion of public open spaces – Open spaces are essential both to address the issue of Duksum's sensitive land forms and for the enhanced quality of urban environment.
- Preservation of the natural landforms – The significant site features including the legendary Japu Duwa will be preserved and enhanced to preserve the sanctity of the site and its surrounding areas.

5.3 Proposed Plot Configuration

Major part of the area proposed for development of the Duksum Town is a green field site, mostly abandoned farm lands. The existing cadastral map and land ownership data suggest that almost 70% of the land is under private ownership. However because of topography and the natural features of the site and the practicality of the relocation of the Duksum Town, land acquisition has been identified as the land mobilization technique. Such technique offers

opportunity for efficient plotting and development of land which is also governed by the existing terrain, standardization of plot areas and sizes, density and access to plots.

The site is characterized by a mix of stretches of gentle slopes, steep slopes and bodies of huge boulders and rock outcrops. While land is a scarce resource it is also important to recognize that sensitive areas are best preserved for the stability and aesthetics of the system. Ecologically fragile and environmentally sensitive areas have been marked for protection and enhancement. The proposed land use pattern was also influenced by the knowledge that the land earmarked for building construction would comfortably accommodate the population projected for Duksum area. Even on these plots, because of their proximity to steep slopes and fragile areas, restrictions are imposed on plot coverage and building height. As a principle, plot area increases with increase in slope while plot coverage and building height decreases.

5.4 Proposed Precinct Plan

The Precinct Plan of Duksum gives a clear indication of the organization of the various land uses in the town. The entire area is divided into following precinct categories: Urban Core, Urban Village 1, Urban Village 2, Institutional, Heritage, Services and Amenities, Environmental Conservation, Open Spaces and Neighbourhood Node. The precincts have been designated after a careful consideration of the existing scenario in terms of terrain and topography, physical infrastructure and scope for future development. One of the main factors considered in determining the land uses for different areas and their development control regulations was the impact on the environment. Therefore, the sanctioned precincts aim to preserve the environment and to promote a sustainable development. While the site is primarily vacant, there are few structures on some plots. Efforts have been made to retain these structures.

5.4.1 Urban Core

The town centre, designated as the Urban Core Precinct, is located towards the centre of the site. This location not only has a gentler slope amenable to intensive development but is also easily accessible from all parts of the town. This reinforces the prime objective of locating all urban amenities and facilities within walking distances. The town centre consists of rows of commercial buildings arranged around an urban corridor loop with a centrally located pedestrian mall. At one end, the mall starts from the proposed Neighbourhood Node and continues to an amphitheatre type public plaza, a central attraction of the town centre, at its top end. The mall extends beyond the town centre to the edge of the ridge that forms urban boundary where it meets the ridge-top footpath that has spectacular views of the rivers in the valleys below and the scenic views across the valleys. All commercial and retail activities are proposed to be confined within the town centre area.

5.4.2 Urban Village Precincts

The Urban Village Precincts are areas zoned for residential development. There are two categories of residential areas, UV-1 for medium and UV-2 for low density developments. The medium density residential precincts, where most of the dwelling units would be accommodated, are distributed equally above and below the proposed town centre. The low density residential precincts are located below the town centre on areas that either have steeper slopes or are located in close proximity to the huge drop in landforms or fragile and sensitive areas. UV-1 precinct is ideal for normal residential development while UV-2 precinct could provide ideal location for single family homes and resorts, if the standard sized plots are consolidated to create larger plots.

5.4.3 Institutional Precinct

The existing institutions, namely the RBP, the DoFS and the BPC, and their areas have been retained in their originality. This is because they are not only already established in their respective areas but also provide important public services. However, the boundary of the BPC area has been slightly altered, without affecting its existing establishments. This helps to promote a better and more efficient land use for the entire area. A section of the electrical lines that runs right across the site is also proposed to be realigned to release the prime urban land for development.

The existing school which is located in a slightly depressed area and which does not have a play ground is proposed to be relocated to a higher area. This relocation offers an opportunity to provide an increased area to accommodate the plan for school expansion and provision of sports field and playground for the students. For minimal cost, both financial and environmental, the flattest area in the site has been marked for sports fields. Next to the school, is the site proposed for development of a health service centre. The proposed locations are not only best suited in terms of their topography but they are also centrally located thereby making the facilities easily accessible from all parts of the town.

5.4.4 Heritage Precinct

While Duksum is located in close proximity to the sacred Gomphu Kora, the site itself does not seem to have much heritage sites or structures, except for the legendary Japo Duwa (rooster rock) and two Chhoetens – one along the traditional route from Duksum to Khamdang and another towards the lower end of the existing town. To protect their sanctity the areas around these sites have been marked for preservation and enhancement. Further, recognizing the lack of a community place of gathering and worship, an area at the top end of the site has been proposed for development of a community Lhakhang. Sitting atop a small mound overlooking the entire the settlement below, the setting reflects the essence of a traditional village settlement.

5.4.5 Services and Amenities Precinct

The essential public amenities, facilities and services have been grouped under the Services and Amenities Precinct. These services include the water treatment plant and supply networks, the sewage treatment plant, street lighting, storm water drainage system, fire

fighting facilities and fuel station. The solid waste disposal site, proposed to be a few kilometers outside the town, is to be identified.

Water Supply System

Water supply is one the major constraints for Duksum. There are two possible sources – pumping from the rivers below, Kholong Chhu or Gong Ri and from Buyang stream about 15 kilometres from Duksum. It is observed that for long term reliability and sustainability, it is better to tap the water from Buyang source. For this source, the water can be brought through gravity system to the top end of the site where the water treatment plant is proposed. The site of the water treatment plan is also so located that the distribution for the entire site and its vicinity can be made through gravity. However, the specifics of the treatment plant and the distribution networks will be detailed out in a separate water supply design for the town.

Sewage Treatment System

A common sewage treatment plant with a network of piped system that covers the entire site is proposed for Duksum Town. While the plot level septic tank and soak pit system is more economical, it is not recommended for clustered development like a town. Here the chances are that the bearing capacity of the ground would be reached very soon after which the risk of the waste flowing out to the surface is very high. The risks of unhygienic stench and the risks of disturbance of the ground stability are high for sloping areas like Duksum. Therefore, an area for the location of a sewage treatment plant has been marked at the lowest point of the site where either a common septic tanks or a more mechanized treatment plant could be installed and no provision has been kept for location of septic tank and soak-away pit at the plot level.

Street Lighting System

There is no existing street lighting system in the extended town area. Therefore, an adequate street lighting system is proposed along the road network. Appropriate and adequate lighting will also be provided along off-street footpaths.

Table 5.1: Details of the Proposed Street Lighting System

Road hierarchy	Location	C/C Distance	Type
Urban Corridor	Along median of the road.	30 metres	To be specified.
Primary & Secondary Roads	Along footpaths on either side of the roads in a staggered manner.	30 metres	To be specified.
Tertiary Roads	Along footpaths on one side of the roads.	20 metres	To be specified.
Footpaths & Parking Areas	Along the footpath on either sides in a staggered manner	20 metres	To be specified.

Storm Water Drainage System

The sloping topography of Duksum allows for a smooth drainage of storm water into the stream and river systems. However, there are concerns that the slopes together with increased

hard ground surfaces would lead to faster flow of the storm water. This poses risks to the stability of the slopes and the health of the river systems. Therefore, efforts are to be made to arrest the flow by appropriate devices like temporary pounding or passing the water through graded surfaces to reduce the speed and filter out litter and pollutants. The storm water drainage network proposed for the town runs both along the roads and the existing natural drainage paths.

Fuel Station

A fuel station is necessary within the Duksum area to cater to the local residents and to the people of the surrounding villages. Currently, vehicle owners have to go either to Trashigang or to Trashiyangtse, both over 25 kilometres away from Duksum, to refuel. Two possible locations were identified for this service, one at the lower end of the existing town area and another one along the by-pass link between the proposed town area and the Duksum - Trashiyangtse Highway. However, because of the fire risks in the latter location, an area for a fuel station has been earmarked in a safer part of the existing Town area.

Fire Fighting Facilities

Fire fighting facilities are essential in the area as the town is surrounded by pine forests and lemon grass growth both of which are prone to forest fires. There shall be a water reservoir of approximately 15% of the domestic water supply capacity for fire fighting. The reservoir for firefighting can be located in some of the service plots within the town. Additionally, an uninterrupted road access to one of the two rivers could be developed for fire engines.

5.4.6 Environmental Conservation Precinct

A network of protected spaces is proposed within the Duksum Structure Plan. This has been done, despite the fact that Duksum has very limited area for development, to ensure the natural environment and the terrain and topography of the area are preserved. Areas under these precincts include the river/ flood protection corridor along the river edges, steep drops and cliff areas, rock outcrops and sensitive and unstable areas. Low lying areas and gullies with history or indication of natural drainage systems have also been marked for storm water drainage along with buffer areas.

Adequate buffer spaces have also been maintained between the environmental conservation areas and those areas marked for development. Stringent regulations in terms of the type of development that would be permitted in such areas have also been drafted. While no access road or service infrastructure will be permitted in the flood protection zone, the existing electrical lines that runs right through the site is proposed to be realigned into the buffer area at the top edge of the cliff that forms the urban boundary to the south.

5.4.7 Open Spaces Precinct

Open Spaces Precinct is another land use related to the environmental conservation areas. The open space system, while helping to protect sensitive areas from the adverse effects of development, promotes and enhances the quality of urban life and living environment. The pedestrian mall and the amphitheatre type public plaza in the town centre is an important feature of the open space system. The open spaces also include playground, sports fields and

recreational areas and green corridors that provide linkages between different environmental precinct areas.

Certain areas with bodies of huge boulders and rock outcrops have been marked for protection as a part of open space system. These areas will not only add to the aesthetics of the town but also ensure its environmental stability by protecting the natural landforms. An additional feature of the Duksum Plan is that adequate areas at road bends have been maintained as open areas. Such measures help to ensure the safety of both drivers and pedestrians. The areas within the open space system will be maintained either as terraced gardens, landscaped parks or in their original state depending on the site conditions and design proposals. Vegetation and plantation of trees in these areas will also help to beautify the area and make the local climate more pleasant especially during the hot summer months.

5.4.8 Neighbourhood Node

An area close to the town centre is also marked as neighbourhood node where the essential urban services like the public transport node/ bus stop, taxi stand and vegetable markets will be located. Because of its small size a bus terminal is not necessary for the Duksum Town. However, it is expected that Duksum will be a critical transit point for public transport passengers and travelers. For the local residents this transit node can serve as an important stop for its public transport system.

An area has been proposed for municipal office. This will be an important service point for the local residents. Therefore besides the municipal administrative and management offices, a number of public facilities like public library, internet browsing centres and community halls would be located in this area. Other related and associated facilities like ATM services and cafes can also be encouraged in this precinct.

5.5 Circulation System and Road Networks

A network of hierarchical roads and pedestrian circulation system is proposed for Duksum Town. The system has been designed and proposed with the following primary objectives:

- Provide access to every plot with minimal impact on the environment
- Provide the most direct access to amenities and facilities
- Prevent vehicular-pedestrian conflicts
- Provide for easy and safe off-street pedestrian movement
- Provide access to emergency and maintenance vehicles.

Four categories of roads - primary, secondary, tertiary roads and urban corridor, are proposed. The RoWs of the roads have been kept at the minimum to reduce excavation of earth for roads. The primary road, with a RoW of 10 metres and footpaths on both sides, provides the main access to the town. It starts from the existing town area, runs through the proposed area and finally connects with the highway to Trashiyangtse. This road in fact provides a by-pass to the highway. The RoW of this primary road increases to 12 metres with footpaths on both sides and a central median in the Urban Core. The secondary and tertiary roads have a RoW of 8 metres and 6 metres respectively with footpath on one side only.

Besides the road side footpath, a system of off-street footpaths and pathways are also proposed. The footpaths are mostly aligned along the traditional routes that run through the site. Further, footpaths have been proposed along trails that are currently used as pathways. While fulfilling the connectivity and circulation needs, the footpaths also serve as significant view points and leisure tracks. A series of gazebos and seating arrangements are also proposed to be developed along these pathways.

5.6 Local Area Plans

Detailed Local Area Plans (LAPs) are prepared to effectively implement the Structure Plan and to help realize its objectives. In Duksum, the LAPs mostly manifest in the detailed plot subdivision and in the alignments of related circulation networks. While slight adjustments are expected, no major shift from the proposed Structure Plan are made. A set of guiding principles were adopted in plot subdivision for the Urban Core and Urban Villages Precincts. Some of these principles are to ensure that the shapes and sizes of the plots are amenable to development and that every plot has proper access. Such an arrangement also promotes other development aspects like access to winter sun and easement rights for drainage.

5.7 Strategies for Urban Development

Development aims envisioned in the Structure Plan are further detailed out in the Local Area Plans. However these plans require workable strategies to realize and to give form and shape to the planning objectives. Listed below are some of the strategies which are critical to the successful implementation of the Duksum Urban Development Plan.

5.7.1 Coordination with Kholong Chu Project

One of the main reasons for the development of Duksum Town is the up-coming Kholong Chu Hydropower Project. The Project, the first of its kind in eastern Bhutan, will not only bring unprecedented progress to the region but will have immense impact on Duksum Town. On the other hand, the Project will gain from the successful development of the Town. Therefore, the Project is considered an integral part of the town. All the basic infrastructure facilities and amenities have been planned to serve the requirements of both the Town and the Project. It is also proposed that the Project employees, especially the O&M staff rent accommodation within the town area. This will both create business for the building owners and help to reduce investment for the Project in terms of residential development costs. For its convenience, the Project could be allotted land for its administrative office and residences for its management team. But the majority of the Project employees could reside in the town.

5.7.2 By-Pass Road to the Highway

To a large extent vibrancy of the Duksum Town depends on the highway traffic and the transit travelers. There are genuine observations that locating the town off the highway, at a dead end, would virtually eliminate any opportunity for business. Therefore, a by-pass road that runs through the new town area is proposed. This by-pass road and the primary road for the town should be one of the first infrastructures to be developed in the town. Though the existing Chazam – Trashiyangtse is to be retained and kept open to traffic, the by-pass road should offer better option for travelers. The old road will be necessary in times of emergency and to divert unnecessary traffic from the town area.

5.7.3 Promotion of Duksum as a Unique Town

The shop houses in the existing town have beautiful architecture which is an adaptation of the traditional farm houses. The ground floor which is traditionally used for storage has been converted to shop with large shop windows. All the houses in the new town, especially in the Urban Core Precinct will be required to be constructed in the same old style. Further, the building exteriors are to be of locally available materials. These construction requirements together with prescribed regulations on plot coverage, building location and building height are aimed to ensure that Duksum is developed as a unique small town. Such a building architecture would not only help to preserve the hillside character of the Duksum Town but also help to promote the town as a tourist attraction.

5.7.4 Scope for Development as a Transit Point for Pilgrimage Sites

Proximity and access to pilgrimage sites also provides good development opportunity for Duksum Town. Gomphu Kora, a sacred site associated with Guru Rinpoche is located only a couple of kilometers from Duksum. There is also an annual Tshechu at Gomphu Kora that is very popular both locally and nationally that attracts thousands of devotees and spectators. Further, Duksum is a transit point for the annual pilgrimage of the people from the Indian State of Arunachal Pradesh to the Chhoeten Kora in Trashiyangtse. Duksum is also a transit point for visit to the sacred Ombha Nye. Therefore, Duksum has the unique opportunity to provide the transit facilities to both the national devotees and international tourists.

5.7.5 Scope for Development as a Regional Service Centre

Owing to its strategic location Duksum also has the scope to develop as regional service centre. Geographically, Duksum is located at the confluence of and transit to many villages and Gewogs around it. The overall socio-economic development in the country has brought drastic change in the life of the local people with access to numerous services and facilities. However, the market base in each of these Gewogs is too small to sustain service centres on their own. Therefore, Duksum Town has the unique opportunity to develop as a service centre to the settlements in its hinterland and promote a symbiotic relationship – the former offering services that the latter needs while creating a sustainable and viable market for itself.

Conclusion

Duksum Town and its surrounding region are poised for unprecedented socio-economic development and progress both because of the overall national development and the up-coming Kholong Chu Hydropower Project. At the threshold of such intense development, and often influenced by the priority of the Project, it is very likely that some development works are carried out at the cost of natural environment and ecology. In retrospective it is observed that often such works are necessitated by the urgent nature of the Projects and not really because of the disregard for environmental concerns. Therefore, the case of Duksum provides a unique opportunity to develop the town and its infrastructure before the Project intensifies its activities. For the sustainable development and vibrancy of the Duksum Town it is important to both implement the proposed plans and adopt the strategies proposed for its implementation. Further, the success of the Town will also depend on how effectively and efficiently the residents of the existing town are resettled in the extended town area.

PART 2

Duksum Development Control Regulations 2012

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INTRODUCTION

These Development Control Regulations have been formulated as part of the Duksum Urban Development Plan and its related Local Area Plans and Urban Design Proposals. They support the aims of the Plan through the introduction of regulations and procedures. The jurisdiction of these Regulations includes the area under the Duksum Urban Development Area and the Urban Control Zone which will includes areas within 5 kilometres of Duksum Town. While the Municipality shall be the Implementing Authority implementing these Regulations, the MoWHS shall be the Implementing Authority for areas outside the Duksum Town Area. The MoWHS may delegate its implementing authority to the Dzongkhag though it shall be the sole Competent Authority for all areas.

The Duksum Development Control Regulations have been divided into five major parts:

Section – 1: **Administration** - contains the applicability of these Regulations, the definitions of terms and expressions used in these Regulations and the provisions related to interpretation, discretionary powers, delegations of powers, etc.

Section – 2: **Procedure for Obtaining Development Permission** – contains the procedure for obtaining development permission including sections on documents and particulars to be furnished along with the applications, the fees to be paid, the validity of the approvals, liabilities and responsibilities of the applicant.

Section – 3: **Procedures during Development / Building Construction** - contains provisions for the issue of various certificates, service connections, documents to be kept on site, mandatory inspections, etc.

Section – 4: **Precinct Sanctions** – contains the permissibility of various uses and activities in the designated precincts and the permissible plot coverage, minimum plot sizes and building heights in the specified precincts. This section also contains sections relating to the special provisions regarding existing non-confirming uses.

Section – 5: **Building Regulations –** The provisions of the Bhutan Building Rules 2002 are to be adapted. Only those provisions that relate to the plot coverage, minimum plot sizes and the number of floors have been formulated specifically for Duksum.

The Municipality shall have an engineer and planner to implement the Plan, Development Control Regulations and the Local Area Plans. It is projected that once the plots are released for development construction will happen rapidly. This will require an engineer and a planner to work together as a team. The engineer will focus on the infrastructure priorities and the planner will focus on the overall layout aspects of the site. Both of them will need to work together to support the review of development and building permit applications. This project should not be left to just one individual as the engineer has expertise in the functional aspects and the planner has expertise in the development of the entire community and the specifics of the overall design requirements.

SECTION 1

ADMINISTRATION

1. Title, Commencement and Jurisdiction

These Regulations shall be called the Duksum Development Control Regulations 2012 (DDCR 2012). These Regulations shall come into force with effect from the date of their notification by the Royal Government of Bhutan. These Regulations shall apply to the Duksum Area including all areas within 5 kilometers radius of Duksum Town. The provision in the BBR 2002 shall supplement the DDCR 2012. This DCR shall supersede the BBR 2002 and all other local rules and regulations.

2. Applicability

i. These regulations shall be applicable from the date of their notification by the Royal Government of Bhutan. The regulations shall be applicable to all development in Duksum unless otherwise stated.

ii. Any action taken or developments permitted under the regulations or Building Rules, existing prior to these regulations coming into force, shall be deemed to be valid and continue to be so until alterations are made to such structures or sites.

iii. If there is a conflict between the requirements of these regulations and those of any other rules or byelaws, these regulations shall prevail.

3. Interpretation

Unless the context otherwise requires, the terms and expressions not defined herein shall have the same meaning as indicated in the following legislations:

i. The Local Government Act 2009

ii. The Land Act 2007

iii. Urban Area and Property Regulations 2003

iv. National Housing Policy 2002

v. Building Code of Bhutan 2003

vi. Bhutan Building Rules 2002

4. Delegation of Power

The Implementing Authority may delegate any of the powers, duties or functions conferred or implemented upon or vested in the Implementing Authority to its officers or designated committee of officers generally or specifically in writing and may impose certain conditions and limitations on the exercise of such powers as it may deem fit.

5. Discretionary Powers

The Implementing Authority may exercise its discretion in conformity with the intent and spirit of these Regulations, in order to mitigate any demonstrable hardship or to sub-serve public interest in the following ways:

i. Decide on matters where it is alleged that there is an error in any order, requirement, decision and determination, interpretation made by it under delegation of powers, while applying these regulations.
ii. Interpret these regulations in various contexts of or in situations where more clarity is required. Under such circumstances the Implementing Authority's decision shall be final and binding.
iii. Decide upon the nature and the extent of concessions in respect of marginal distances, room heights, etc. that can be granted in cases of proven hardship for reasons which are to be recorded in writing. However, such relaxation shall not affect the health, safely and hygiene of the inhabitants of the building and the neighborhood and the structural stability of the building. Provided further that while granting such relaxation, as above, the authority may impose conditions as may be necessary.
iv. No concessions shall ever be made in respect to lot coverage or additional floors.
v. Decide on the fine or compounding charges to be made applicable in cases of developments where non-adherence to these Regulations is detected.
vi. Authorize the erection of a building or the use of premises for a public services undertaking or a public utility purpose where such an authorization is reasonably necessary for the convenience and the welfare of the public, even if such erection or use is not permitted as per these regulations.
vii. Determine and establish the location of precinct boundaries in cases of doubts or controversies.

All matters stated above may be decided by a committee designated and authorized by the Implementing Authority. When issues arise that are not covered within these Regulations, the Implementing Authority shall refer the matter to the Competent Authority.

6. Definitions

Accessory Use - A structure that is not the main use on a plot. A garage is an accessory use to a house and a storage shed is an accessory use to a commercial building.

Attic - The space within the confines of the roof structure, above the ceiling or the top floor which is constructed and adopted for storage purposes, lift machine room, water tanks etc.

Basement - The story of a building below the ground floor whose construction was necessary to bring the ground floor level to the street level.

Building

Any structure for whatsoever purpose, and of whatsoever materials constructed and every part thereof, whether used as human habitation or not including foundations, plinths, walls, columns, floors, roofs, chimneys, plumbing and building services, fixed platforms, verandas, balconies, cornices or projections, part of a building or anything affixed thereto. However, structures of a temporary nature like tents, hutments, etc. erected for temporary purposes or for ceremonial occasions, with the permission of the Implementing Authority, shall not be considered to be "buildings".

Building Height - The permissible number of floors. This is inclusive of the ground floor and will be determined from the ground floor level. In addition to the precinct

regulations, the height of buildings shall be governed by the "Guidelines on Traditional Architecture of Bhutan" and by the overall allowable building heights.

Carpet Area - The covered area of the usable rooms of any floor, excluding the area of the walls. Also referred to as Net Internal Floor Area.

Commercial Building - A building or part thereof primarily used for commercial purposes such as shops, stores, departmental stores or markets, for display and sale of goods or merchandise, including office, storage and service facilities incidental thereto located in the same building.

Community - The people living in a particular place and usually linked by common interests.

Community Facilities/Services - Facilities/services used in common by a number of people, including schools, health, recreation, police, fire, public transportation, community center, etc.

Demarcation - The marking of the Site Plan at the actual location, on the ground, by the Implementing Authority in the presence of the owner and adjacent plot owners, if any.

Density - A measure of the intensity of occupants or use and measured in units per area. Units are commonly referenced in plots, dwellings, rooms or people per area.

Development - Carrying out of subdivision (division of land) or building construction on a plot of land. This also includes structural changes, demolition of buildings, excavation of land, and/or any change in use.

Dwelling Unit - A shelter consisting of residential accommodations for one household. Provided that the minimum accommodation in a dwelling unit shall be one habitable room of minimum carpet area of 9 square metres with a minimum side dimension of 2.5 m and a water closet. It may not have more than one kitchen or cooking space.

Erosion Prevention Treatment - The management of the graded areas in hillside areas by plantings and/or other devices which will serve to prevent the soil erosion of such graded areas.

Existing Use - Authorized use of a plot of land, a building, or a structure existing before the commencement of these Regulations.

Floor - The lower surface in a story on which one normally walks in a building. This does not include a mezzanine floor. The floor at ground level with direct access to a street or open ground/ land shall be called the ground floor. The ground floor shall also be counted as a floor in defining the number of floors and referred to as the ground floor. All additional floors shall be numbered sequentially starting with 1.

Floor Area - The built-up area including the area of walls.

Floor Area Ratio - The ratio of the dwelling area to the land area.

Front - The area of land or side of building facing the primary road.

Household - The socioeconomic unit which often coincides with the basic kinship unit of a society. Usually several related persons living together in a form of shelter and sharing food and other basic resources.

Implementing Authority - The government body responsible for governance, implementation and additions/corrections of these Regulations.

Infrastructure - The basic physical networks, including water supply, sewage disposal, electricity, circulation, street lighting, storm drainage, and telephone.

Plot Coverage - The percentage of building area to the total area of the plot. Also referred to as plot coverage. If half of the lot is covered by a building the lot coverage will be 50%.

Occupancy Certificate - An official document issued by the Implementing Authority certifying that the building is safe and fit for occupancy.

Open Space - A parcel of public land set aside to retain land, water, flora, fauna, historic or aesthetic features in their natural state; scenic or open condition; parcel size to be based on the surface area necessary to maintain the integrity of the unique site characteristics. Public use to be based on the preservation of the unique site characteristics and the scope of facility development to be based on the evaluated carrying capacity of the site.

Parking Space - An area, enclosed or unenclosed, covered or uncovered, sufficient in size to park vehicles with space for their movement. Parking spaces may be served by a driveway connecting them with a street, or alley, and permitting ingress or egress of vehicles.

Permission - A valid authorization in writing by the Implementing Authority to carry out development or a work regulated by the Regulations.

Precinct Plan - A geographical area designated in the approved Urban Development Plan/Structure Plan for the purpose of regulating land uses within the approved municipal boundary.

Right of Way - An area reserved for road carriageway, central verge, footpath, roadside drains, avenue plantations and utilities.

Road/Street - Any expressway, highway, boulevard, street, lane, pathway, alley, stairway, passageway, carriageway, footway or bridge, whether a thoroughfare or not, over which the public has the right of passage or access or have passed and had access uninterruptedly for a specified period, whether existing or proposed in any scheme.

Setbacks - The distance between the plot boundary and the building outer edge, or the distance between buildings within a plot.

Significant Vegetation - Vegetation that is indigenous and that, through its location on the plot and/or size and maturity, will preserve the hillside character.

Site Plan - The up-to-date legal plan of the plot showing all boundaries, their dimensions, the total plot area, angles in degrees of corners, abutting legal roads and required set-backs issued by the competent authority.

SECTION 2

PROCEDURES FOR OBTAINING DEVELOPMENT PERMISSION

7. Development Permission

No person shall change the use of a land or carry out development or erect a building or carry out additions and alterations or carry out civil construction activity without obtaining a written permission from the Implementing Authority. Development permission shall be issued only to the legal owner of the land/plot. Provided that no such development permission shall be necessary for the following:

i. Carrying out works for the maintenance, improvement or alteration of a building, being works which affect only the interior of the building without altering the structural members of the building or which do not materially affect the external appearance thereof – such as providing or closing of a window or a door or ventilator not opening towards other's property, providing intercommunication door, white washing / painting, retiling, plastering and patch work, re-flooring and replacement of flooring. Provided further that no built up area shall be added to the existing work without seeking the Implementing Authority's permission. Provided however that no such exemption shall be available in the case of heritage buildings / structures in heritage precincts.

ii. Carrying out the following works by / in compliance with an order or direction made by an authority under a law for the time being in force:

   a. Required for the maintenance or improvement of highway, road or public street, being works carried out on land within the boundaries of such highway, road or public street including repairs, extensions, modifications to existing service installations, culverts, bridges, tunnels, drains, foot over bridges, subways, pavements, pedestrian railings along pavements, medians, etc.,
   b. For the purpose of constructing, laying, inspecting, repairing or renewing drains, sewers, mains, pipes, cable, telephone or other apparatus including breaking open of a street or other land for that purpose,
   c. Falling in the purview of the operational constructions by Government departments/ bodies, such as water tanks–over head or underground, pumping stations, sub stations, traffic signals, bus stop shelters, overhead electrical equipment for electrification, etc.

8. Procedure for Obtaining Development Permission

A person or body intending to carry out layout development as defined in these Regulations in or over a land and/or subdivide land or to erect a building or carry out additions and alterations to a building or to carry out development within the limits of the Duksum Town shall obtain prior permission for the same from the Implementing Authority by applying on the prescribed form and furnishing all information in forms, formats and plans prescribed under these regulations and as may be amended from time to time by the Implementing Authority.

The application shall be signed by the legal owner of the plot or authorized signatory. The applicant shall submit signed plans and drawings along with the application and pay the requisite scrutiny fees, development charges, betterment charges, and other charges and dues if any to be levied under these Regulations.

9. Documents and Particulars to be furnished with the Application

The following particulars and documents shall be submitted along with the application.

Table 1: List of Documents and Particulars to be furnished with the Application.

	Land Development	**Building Development**
1	Copy of the Land Ownership Certificate.	Copy of the Land Ownership Certificate.
2	Copy of the Site Plan certified / issued by the Implementing Authority.	Copy of the Site Plan certified / issued by the Implementing Authority.
3	Copy of Precinct Certificate substantiating "Use Conformity".	Copy of Precinct Certificate substantiating "Use Conformity".
4	Three copies of proposed layout plan drawn to a readable scale showing all the details of the development.	Three copies of proposed layout plan drawn to a readable scale showing all the details of the development. Three copies of the detailed drawings showing the plans, sections and elevations of the proposed building to a scale of 1:100 showing all the details.
5	Certificate of Architect or Planner who prepared the plans and drawings.	Certificates of Architect and Engineers who prepared the plans and drawings.
6	Copy of No Objection Clearance from relevant Authority wherever applicable.	Copy of No Objection Clearance from relevant Authority wherever applicable.

Notes:

1. All the drawings shall be prepared in metric system only.
2. The applicant shall sign all forms, plans, sections or written particulars or cause them to be signed by his authorized signatory and registered Architect and Engineers.
3. One copy each of plans and documents shall be returned, on approval, to the applicant duly signed by the Implementing Authority or authorized officer.

It shall be incumbent on the person/body whose plans have been approved, to submit amended plans, if any, for deviation leading to increase in built-up area, building height or change in plans, he proposes to make during the course of construction of his building work, and the procedure laid down for plans or other documents hereto before, shall be applicable to all such amended plans.

10. Scrutiny, Services and Amenity Fees

Permission for carrying out development shall be granted by the Implementing Authority only on payment of Scrutiny Fees for processing the submitted application, service and amenities fees for execution of works as decided by the Implementing Authority. These fees and maintenance charges may be revised by Implementing Authority from time to time.

11. Grant of Development Permission

On receipt of the application for Development Permission, the Implementing Authority after making such inquiry as it thinks fit may communicate its decisions granting or refusing permission to the applicant as per the provisions of the regulations. The permission may be granted with or without conditions or subject to general or special orders. The Development permission shall be in the prescribed form and it should be issued by an officer authorized by the Implementing Authority. Every order granting permission subject to conditions or refusing permission shall state the grounds for imposing such conditions or for such refusal.

Grant of Development Permission shall mean acceptance by the Implementing Authority of all the requirements of these Regulations excluding the following:

i. Easement rights.
ii. Variation in area from recorded areas of a plot or a building.
iii. Structural reports and structural drawings.
iv. Soundness of material specifications used in construction of the building.

12. Rejection of Application

If the plans and information given do not contain all the particulars necessary to deal satisfactorily with the development permission application, the application shall be rejected.

13. Validity of Approval

The validity of the approved plan shall be for one year from the date of approval. The development should start within 365 Gregorian calendar days from issue of development permit.

14. Revalidation/ Renewal

Development permission granted under these Regulations shall be deemed to have lapsed, if such development work has not commenced till the expiry, of 365 Gregorian calendar days from the date of development permission, provided that, the Implementing Authority may on application made to it before the expiry of above period extend such period by a further period of 365 Gregorian calendar days at a time, on the payment of revalidation/renewal charges as decided by the Implementing Authority.

15. Cancellation / Revocation of Approval

The development permission if secured by a person/body by a misrepresentation or by producing false documents is not valid and such development permission will be treated as canceled/revoked.

16. Suspended/Cancelled/Revoked due to Change of Ownership

Development permission granted under these Regulations shall be deemed to be suspended/cancelled/ revoked, in cases of change of ownership, unless the 'original' owner who applied for, and obtained the development approval submits a letter to the Implementing Authority about the change in ownership giving details of the transaction and the new owner submits an application duly attaching copies of all the official records of such a transaction and an undertaking that he accepts the transfer to himself, of all the responsibilities and liabilities of the previous owner that relate to the development on the site.

17. Liabilities and Responsibility of the Applicant

Notwithstanding the development permission granted under these Regulations, a person/body undertaking any development work shall continue to be wholly and solely liable for any injury or damage (direct or indirect) or loss whatsoever that may be caused to anyone in or around the area during such construction and no liability whatsoever in this regard shall be cast on the Implementing Authority. Neither the grant of development permission nor the approval of the plans, drawings and specifications shall in any way absolve the applicant of the responsibility for carrying out the development in accordance with requirement of these regulations.

18. Demolition / Reconstruction of Dangerous/ Unsafe/ Dilapidated Buildings

Wherever it is necessary to demolish a dilapidated/unsafe structure in the interest of public safety, such demolition shall be carried out by the applicant wherever so directed by the Implementing Authority. However, if the same is to be reconstructed, it shall be done in conformity with these Regulations with due approval from the Implementing Authority.

19. Temporary Permission

Applications for temporary permissions need not be submitted through the registered professional. A scrutiny fee shall be paid as decided by the Implementing Authority. These temporary permissions shall be permitted only for:

i. In the case of private premises - temporary sheds to be used for storing construction material / as watchmen's cabin during construction phase,
ii. On public premises – public call booths, milk supply booths, newspaper kiosks.
iii. On public roads, highways - temporary sheds to be used for storing construction material/as watchmen's cabin/ workmen's shelter during construction/ repairs/ maintenance of public roads.

20. No Objection Clearance from Referral Authorities

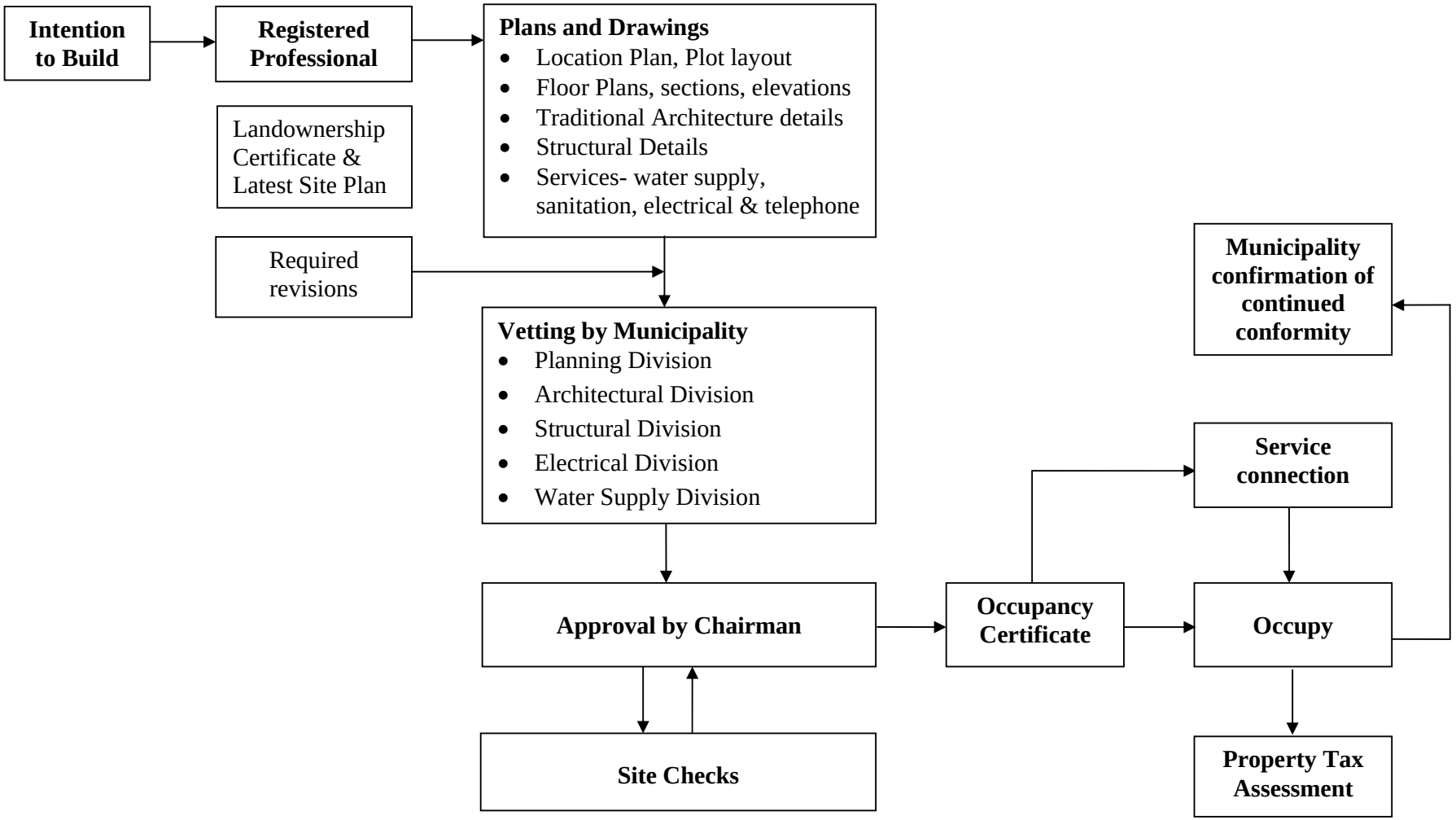
The proposal submitted shall be in conformity with other Acts/Regulations and shall, wherever applicable submit the NOC, from the respective authorities for conformity with their regulation and standards.

21. Development Undertaken on Behalf of the Government

The Office-in-Charge of a Government Department shall inform in writing to the Implementing Authority of the intention to carry out development for its purpose along with the plans of proposed development or construction.

i. All the development undertaken on behalf of the Government shall strictly conform to these Regulations.
ii. Any Government proposal which is not in conformity with the Duksum Structure Plan and these Regulations should have prior approval from the Competent Authority.

Chart 1: Chart showing Procedure for Obtaining Building Permission and Completion of Building Construction



SECTION 3

PROCEDURE DURING DEVELOPMENT/ BUILDING CONSTRUCTION

22. Temporary Service Connections

An applicant with a certified copy of development permission may apply to the respective agencies for temporary connection of services like electricity, water and sewerage. The use of a public street/road or a public place for loading and unloading and stacking of materials of construction and construction equipment shall not be allowed.

23. Documents at Site

The applicant shall, during construction, keep posted in a visible place, on the site for which permission has been issued, a copy of the development permission and a copy of the approved drawings and specification on the site for which the permit was issued.

24. Commencement Certificate

No applicant shall carry out any further work after any of the inspection stages without an inspection and clearance by the Implementing Authority. On receipt of the progress report certifying that the work has been executed as per the approved plan, it shall be the duty of the Implementing Authority to inspect, verify and endorse the report.

25. Inspections

Developments shall be subject to routine/periodic inspections by the Implementing Authority or persons/bodies authorized by the Implementing Authority. The Implementing Authority may, at any time during erection of a building or the execution of work or development, make an inspection without giving prior notice of its intention to do so. In the event of deviation(s) from the approved plan, including quality control or any of the conditions noted in this section, the Implementing Authority shall have the full authority to stop construction.

26. Inspections at Various Stages

The following shall be the recognized stages for progress verification in the erection of a building or the execution of a work which shall be verified and approved by the authorized Engineer/ Building Inspector from the Implementing Authority for carrying out further construction work as per the sanctioned plan.

i. Site layout
ii. Foundation
iii. Plinth
iv. Ground story
v. First story
vi. Before roofing

An applicant or his authorized representative shall give to the designated officer of the Implementing Authority at least four working day’s notice in writing of the time at which the work will be ready for inspection. This shall be called the progress certificate which shall be

duly filled-in and kept with the owner/architect and produced at the time of each inspection to be scrutinized and signed/endorsed by the building inspector, before the commencement of the next stage of construction.

27. Deviations during Construction

Alteration in the approved development and/or building plan shall require prior approval from the Implementing Authority. Notwithstanding anything stated in the above regulations it shall be incumbent on the person whose plans have been approved to submit revised plans for deviations he/she proposes to make during the course of construction of his/her building work and the procedure laid down for plans or other documents here to before shall apply to all such revised plans.

28. Occupancy Certificate for Buildings

The applicant shall obtain occupancy certificate from the Implementing Authority prior to occupancy or use of the completed development/building.

The application for the Occupancy Certificate shall include:

i. In case of any change from the approved plans, (which is permissible within these Regulations), a completion report in the prescribed form along with three copies of the ‘as built’ drawings endorsed by the Registered Architect/Engineer. It shall also be incumbent on every person who is engaged under these Development Control Regulations to supervise the erection or re-erection of the building, to endorse this completion report. One copy of the ‘as built’ drawings shall be stamped and returned to the applicant after inspection and approval by the Implementing Authority.

ii. A copy of the progress certificate containing all the comments and endorsements of the building inspector at every stage of inspection. On receipt of the application, the building and its premises shall be inspected by the Implementing Authority to verify that the work has been completed as per the approved drawings, or if there is a change, permissible within the Regulations, approve and endorse the ‘as built’ drawings submitted along with the completion report. The inspection team shall consist of authorized Architect and Engineer from the Implementing Authority. Based on this inspection report the Occupancy Certificate shall be issued.

29. Issue of Occupancy Certificate

The Authority issuing occupancy certificate shall ensure that:

i. Proper hygienic and sanitation facilities have been provided as per standards and are located as per approved plan.
ii. Domestic drains (to collect the rainwater) have been constructed as per standards and as per the design directions approved.
iii. The completed portion of the building/dwelling unit applied for occupancy is fit and safe for such.
iv. Construction debris around the building, and/or on the abutting road, and/or adjoining property is cleared by the applicant.

v. The applicant has permanently displayed the full postal address (house number, street name and zone) outside the main entrance to the building and each unit has been given an individual number or letter.
vi. The trees as per the design are planted on site or a suitable deposit has been collected by the Implementing Authority.
vii. The parking spaces are properly developed and the layout of parking is provided as per the approved plans. Signboards indicating the entrance, exit and location of parking spaces for different types of vehicles is permanently erected and maintained at an appropriate prominent location.
viii. The completion report endorsed by the Implementing Authority and submitted by the owner.

30. Permanent Service Connections

Permanent connections will only be given to services like water, sewerage, electricity and telephone by the respective agencies after issuing of the occupancy certificate.

31. Change of Building or Premises Uses

The applicant shall apply in writing to the Implementing Authority for conversion of approved building or premises uses to other uses or activity. Permission for change of use shall be given only if the building use conforms to the precinct use schedule, structural safety of the building and other relevant clauses of these Regulations.

32. Confirmation Inspections by Referral Authorities

Developments sanctioned through special conditions/appeals shall be liable for inspections by the Special Authorities or the Implementing Authority for revalidation of the development permission.

33. Safety on Site

All construction sites must be organized in a manner that the safety of all persons, on the site, at all times is assured. Special care must be taken that no person is electrocuted, that no one falls, or that no one is burnt, or that no material falls on a person.

34. Child Labour

It is incumbent that the applicant or his site in-charge sees that no underage workers, or children, are present on the construction site, either as employees, guests, or as dependents of legal employees.

35. Protection of Adjoining Public Properties

No construction activity in any site shall damage any of the public properties located adjoining the site, or use these properties for activities like storing of construction materials.

36. Development without Prior Approval

If a development requiring the written permission of the Implementing Authority under the provision of these Regulations or other rule, regulation or by-law is done by a person without obtaining written permission, it shall be deemed to be unauthorized. The Implementing Authority shall at any time, by written notice, order the same to be removed, pulled down, undone or altered.

If the requisitions contained in the order are not carried out by the person or owner within the given period, the Implementing Authority shall remove or alter such work and the expenses thereof shall be paid by the person or owner as the case may be.

In cases where development has already started/commenced on site for which development permission in writing is not obtained from the Implementing Authority, but where this development on site is in accordance with the provisions of these Regulations, the development permission for such work on site without the prior permission may be granted by the Implementing Authority on the merits of each individual case. For such development works, an additional amount shall be charged on the entire land area or total built up area as per the following rates, over and above the regular charges / fees.

Table 2: Regularization Fees for Developments without Prior Approval

Nature of unauthorized Development	**Whether Development would have been Approved**	**Rate of Regularization and/ or Penalty**
Application for development not made	Yes	20 times the regular fess */ charges #
	No	10 times the regular fess & removal of the deviations at the owner's cost
Application made but development commenced before grant of permission	Yes	10 times the regular fess/ charges
	No	Removal of the deviations at the owner's cost

***** **Regular fees** refer to the fees that the Implementing Authority charges for scrutiny and approval of development applications.

**Charges** refer to the charges and levies that the Implementing Authority may impose for its services and facilities.

SECTION 4

PRECINCT SANCTITY

37. Precinct Sanctity

The Duksum Structure Plan has 9 precincts with different land uses. These precincts have been designated in response to the topographic features of Duksum area and to ensure the different land uses and activities within the urban area are compatible with one another.

UC **Urban Core**
The Duksum Town Centre, a precinct of trade and commerce

UV-1 **Urban Village 1**
Medium density residential precinct

UV-2 **Urban Village 2**
Low density residential precinct

I **Institutional Precinct**
Local, National and International Institutions

H **Heritage Precinct**
Precincts for sacred activities and places of historical importance

SP **Services & Amenities Precinct**
Water & sewage treatment plants, electric substations, incineration plant, fuel station

E **Environmental Conservation Precinct**
Enhancement and protection of Duksum's ecology and steep slopes

OS **Open Spaces**
Precincts of public assets like parks, gardens, sport facilities, recreation areas

NN **Neighbourhood Node**
Basic services and amenities for urban villages

38. Pre-existing Non-Conforming Use Types

A lawful use of land existing prior to the adoption of the Duksum Structure Plan which do not conform to these Regulations, shall be permitted to continue, subject to the condition that no extension, modification of the buildings, or intensification of the non-confirming use shall be permitted. A change proposed in the existing building shall be permitted only if it is intended for changing the use to one that is permitted as per these Regulations. Non-conforming uses that are incompatible to the surrounding uses or activity shall be allowed to continue operations for a maximum of five calendar years from the date these Precinct Sanctions become operational. A maximum of one, three-year extension, based on hardship

can be made by the Implementing Authority. After that period no Non-Conforming use that is incompatible to the surrounding uses or activity shall be allowed.

Table 3: Precinct Schedule showing Uses Permissible in Designated Precincts

Sl. No.	Designated Precinct	Uses Permissible	Special Conditions and Restrictions
1	**UC** Urban Core	**Town Centre** Shopping centers, food courts, cinema halls, pool and billiard halls, hostels, lodging and boarding house, hotels, tourism and recreation based facilities, commercial centers, public buildings, auditorium, office building, public utilities and facilities, banks, art galleries, exhibition hall, bars, parks, gardens, playgrounds.	Minimum plot size - 400 sq. m. Small printing press, residential uses
2	**UV -1** Urban Village 1	**Medium Density Residential Precinct** Apartments, group housing, residential units, single dwelling units. Any commercial use including retail outlets, shops, ware house and recreational centres shall not be permitted.	Minimum plot size - 485 sq. m. Institutional uses in a minimum of 1000 sq. m plot may be permitted.
3	**UV-2** Urban Village 2	**Low Density Residential Precinct** Only residential uses, resorts, professional services, office spaces shall be permitted. Any commercial use including retail outlets, shops, ware house and recreational centres shall not be permitted.	Minimum plot size - 600 sq. m. Maximum plot coverage -30%. Recommended for resort for plots with minimum area of 1000 sq. m.
4	**I** Institutional Precinct	**Local, National & International** Educational, training, cultural and government institutions, public libraries, museums, art galleries, government offices, corporate offices	Residential & other activities incidental to the main use, provided not more than 10% of the site shall be used for such activities.
5	**H** Heritage Precinct	**Cultural & Religious** Spiritual and religious artifacts and places, Chhoetens, Mani walls, Lhakhangs, prayer wheels, statues, monasteries,	
6	**S** Service & Amenities Precinct	**Public Utility & Service Uses** Water treatment plant, sewage treatment plants, electric substations, incineration plants, fuel station	

7	**E** Environmental Conservation Precinct	**Natural reserve, river basin, streams, rivulets, bio-mass preserves, steep slopes** Activities related to environmental enhancement, protection and permitted/ undertaken by or on behalf of environmental agency. Existing structures with approval may be retained but new development and extension to the old structure is not permissible. Footpaths and cycle tracks, footbridges, vegetable and flower gardens, nurseries, landscape elements like lamp posts, benches, gazebos, children's play equipments and litter bins shall be permitted only 15 metres of the edge of rivers.	1. No access road or any service installations to be permitted through this zone. 2. No development or construction shall be permitted within thirty metres of the edge of rivers. 3. Natural landscape features of the rivers which includes the natural course of the water feature, banks, edges, soil, vegetation, rocky outcrops, boulders and any feature or element which is part of the ecosystem or which is considered to be of scenic value should not be damaged or disturbed from its natural state of being. 4. Dumping of solid wastes, sewage disposal, washing of vehicles or any action considered as polluting this zone shall not be permitted.
8	**OS** Open Space Precinct	**Public assets** Open space precincts of public assets like parks, gardens, recreational and sports facilities.	
9	**NN** Neighbourhood Node	**Basic amenities** Public transportation stops, gardens, bakeries, local libraries, community halls, taxi stands, vegetable vendors, outdoor cafes, ATMs	

Table 4: Precinct Schedule showing Minimum Plot Sizes, Maximum Plot Coverage, Maximum Building Heights

	Designated Precinct	Minimum Plot Area	Max. Plot Coverage	Minimum Set Backs	Maximum Height
		(Sq. m)	(%)	Metre	No. of Floors
1	UC Urban Core	400	50	2 m on three side including front & and 3m m on one side	2
2	UV-1 Urban Village 1	485	45	3 m on all sides	2
3	UV-2 Urban Village	600	35	3 m on all sides	1
4	I Institutional Precinct	-	35	3 m on all sides	2
5	H Heritage Precinct				
6	S Service & Amenities			3 m on all sides	2
7	E Environmental Precinct	-	-	-	-
8	OS Open Space		10	3 m on all sides	
9	NN Neighbourhood Node	N/A	50	3 m on all sides	2

Note 1: Plot Coverage
The maximum permissible plot coverage shall be within set back rules as prescribed in these Regulations.

Note 2: Projected Balconies
Cantilevered balconies (not enclosed) projecting up to 1.2 m in to the setback area from the ground floor external wall face shall be permitted. Projections beyond 1.2 m may be permitted provided they do not extend in to the setback areas and they are structurally safe. Such projections/ structures shall not cover the septic tanks. In case of commercial buildings cantilevered balconies shall be allowed only at the rear.

Note 3: Parking Areas
All permitted proposals within the respective precincts shall provide plot level parking spaces as per the parking standard mentioned in Table No. 5.12. Proposals in Urban Core shall be exempt from plot level parking provided the total clear retail floor area is than less 450 sqm beyond which provision shall be made for 1 car parking space for every 30 sqm of clear retail space or part thereof.

SECTION 5

BUILDING REGULATIONS

39. Setbacks and Plot Coverage

The minimum setback to be maintained and the maximum plot coverage permissible shall be as specified in the Precinct schedule in Table No. 4 provided both the conditions are fulfilled.

40. Maximum Building Height

The maximum building height, expressed in terms of the number of floors permissible shall be as specified in Table No. 4

41. Attic

Human occupancy of the attic spaces shall not be permitted.

42. Basement

Excavation of ground for construction of basement shall not be permitted, provided, partial basements which become necessary to bring the building plinth level to the street level may be permitted.

43. Architectural Control

Same as BBR 2002

Minimum Floor Space of Rooms in Residential Buildings
Same as BBR 2002
Circulations Space Requirements
Same as BBR 2002
Light and Ventilations Requirements
Same as BBR 2002
Artificial Lighting and Mechanical Ventilation
Same as BBR 2002
Ventilation Shaft
Same as BBR 2002
Fire Safety
Same as BBR 2002
Garage cum Servants Quarters
Same as BBR 2002
Porch
Same as BBR 2002
Roof and Site Drainage
Same as BBR 2002

44. Structural Control

Same as BBR 2002

45. Electrical Installations Control
Same as BBR 2002

46. Water Supply and Sanitation Control
Same as BBR 2002

47. Telephone
Same as BBR 2002

48. Painting
Same as BBR 2002

49. Access for the Disabled
Same as BBR 2002

50. Parking Requirements

Table 5: Parking Requirements

Description	**Number of Vehicle Parking Space Required**
Residential Buildings	1. Residential unit with total area equal to or more than 100sqm: 1 car for every 100 sqm. 2. Residential unit with total area between 60 – 100 sqm: 50% cars & 50% 2-wheelers. 3. Residential unit with total area less than 60 sqm: 25% cars & 75% 2-wheelers.
Public halls, community centres, non-residential clubs	1 car for every 30 sqm of public floor space or part thereof.
Restaurants, bars and cafes	1 car for every 15 sqm of public space or part thereof.
Shopping Centre (over 450 sqm clear retail floor space)	1 car for every 30 sqm of clear retail floor space.
Offices (outside Urban Core)	1 car for each 30 sqm net usable office floor area
Theatres and cinemas	1 car for every 10 fixed seats of public accommodation or part thereof.
Hotels and guest Houses	1 car for every 30 sqm clear retail floor space.
Warehouses	1 car for each 100 sqm of usable floor space
Vehicle services and repair workshop	5 cars for every service/ repair bay

51. Compound Wall & Fencing

Compound walls/plot fencing shall not be permitted in the Urban Core. The construction of all compound walls/fences in Urban Villages shall be transparent or opaque from the ground to 1 meter high and transparent from 1 meter to 2 meters high.

Form F-1: APPLICATION FOR CONSTRUCTION OF BUILDING
(Please type or write in clear block letters, use additional sheet if necessary)

To

The Chairperson
Duksum Municipality
Trashiyangtse

1.Name of applicant: .....…….. Passport Size Photo
2. Sex: Male ( ) Female ( )
3. Date of Birth: ……(dd/dd/yyyy)
4. Citizenship Identity Card No. .....…….
5. Permanent Address: .....
6. Present Address: .....
7. Postal Address:……
8. Contact details: Telephone No. (residence):…….....
Telephone No. (office):……..
Fax No.:……..
E-mail address:……..

9. Land ownership:
- Government Allotment (Allotment order no & date) ……
- Purchased from the openmarket (Registration no & date) ……
- Allotted under Kasho (Copy of Kasho to be attached) …….
- Inherited/exchanged/gifted (Details of previous owner to be attached)
- Subdivided (Approval letter no & date) ……..

10. Plot details: Plot No.:....…… Area:.....…….sqm Dimensions:.....

Declaration: The information supplied in this application form is correct to the best of my knowledge and if there are any discrepancies, I shall be personally responsible for the same and I am prepared to face any disciplinary or legal action against me.

Date: ..... Place: .....…….

Signature:

For official use only
Noting of the dealing officer with regard to land holdings, building construction, etc.
Recommended ( ) Not recommended ( )

Name & Signature of the Dealing Officer: .....

Signature of Chairman: .....

Remarks (if any):

Form F – 2: APPLICATION FOR OCCUPANCY CERTIFICATE

To

The Chairperson,
Duksum Municipality,
Trashiyangtse.

Sir,

I hereby certify that the addition/ alteration/ construction of building on Plot/Thram No. .....on.....Lam in…..….....town has been completed on ....., according to the approved building plan/ drawings, vide permit no. ..... dated.....

The work has been completed to our best satisfaction. Workmanship and all the materials have been used strictly in accordance with the approved documents/ drawings and relevant standards, codes of practice and specifications. Provisions of the DDCR 2012 and BBR 2002, conditions or orders issued thereunder have not been transgressed/ violated in the course of the work.

The building is fit for use for which it has been added /altered/ constructed. The necessary 'Occupancy Certificate' may be issued.

Signature of the Owner: .....
Name & Address:.....
Telephone No. (residence): .....
Telephone No. (office): .....
Fax No.: .....
E-mail address: .....
Dated: .....

Form F – 3: OCCUPANCY CERTIFICATE

To

……
……
……
……

Sir/Madam,

With reference to the application dated…..., regarding the addition/ alteration/ construction of building on plot/Thram no…….....…… on……..……Lam, in .....town has been inspected on ……..... and found that the building is **fit / not fit** for occupation.

Instruction / Remarks (if any):

Chairman

Dated:

PART 3

Urban Design Guidelines

Table of Contents

INTRODUCTION

What is Urban Design Guidelines?

The Urban Design Guidelines for Duksum Town is a set of broad guidelines drafted to help achieve the visions and goals of the Duksum Structure Plan. The document consists of explanatory notes on the objectives and the planning and design principles to be adopted along with relevant images and diagrams.

Objectives of the Urban Design Guidelines

The Guidelines aim to help realize the development objectives envisioned for Duksum Town in a manner that is environmentally sustainable, socially and culturally responsible and practically achievable. Specifically, the guidelines aim to minimize excessive site excavation, preserve the natural site features and the natural environment, enhance the scenic views and vistas, respect the local building scale and architecture and promote a livable settlement.

Who is this document for?

This document is primarily for planners, engineers and architects of the local government and the implementing agencies. It can also be a useful resource for developers, contractors and the landowners and the residents of Duksum Town.

What does this document contain?

This document has five sections.

Section one deals with the circulation network that comprises of the commercial street, the Pedestrian Mall, the residential streets and the off-street footpaths.

Section two provides guidelines for the built-form for both commercial and residential areas.

The third section deals with the public open spaces that include sports fields, river corridors, viewing decks and rest areas, historically significant sites and the amphitheatre in the town centre.

Section four covers the landscape design guidelines.

Last section, fifth, deals with the water sensitive urban design aspects.

SECTION 1

CIRCULATION

Roads, streets and footpaths are the main elements of circulation. They ensure efficient connectivity and ease of accessibility within the town. Specifically for Duksum, the circulation network is categorized into four categories of the commercial street, the pedestrian mall, the residential street and the off-street footpaths.

1. Commercial Street

This is also called as the Urban Corridor. It is the main street that provides access to the commercial plots and shops, and connects the commercial area with rest of the precincts of the Duksum Town. The commercial street has the following defining elements:

i. Carriageway: The area of street between two kerbs at the edges reserved for movement and parking of vehicles.

ii. Median: The area in the center that divides the street and it is used for plantation and street light poles.

iii. Travel-way: The part of the carriageway used for vehicle travel (and does not include the area used for parking)

iv. Verge: The part of the street between the carriageway and the boundary of the plots. It accommodates footpaths and storm water drains.

It is essential that these elements are incorporated in the urban corridor to ensure that commercial area is well connected, safe and comfortably walk-able and shops and public amenities are easily accessible.

Objective

i. To allow a barrier free and comfortable access to the buildings and public amenities.

ii. To eliminate or at least reduce the conflict between pedestrian and vehicular traffic.

iii. To encourage a development that is responsive to topography, natural elements and climatic condition.

iv. To enhance a sense of place through visual containment and continuity.

Issues to be considered: Topography and site conditions.

Design Principles

i. Ensure that there is proper signage with no or very minimal obstruction along and across the street to enable the people of all ages and the people with special needs to use it safely and comfortably.

ii. Ensure that the streets have footpaths, parking areas and travel ways clearly marked with legible lines, upright kerb and pavements (colored and textured wherever possible) to ensure the safe passage of pedestrians and vehicles.

iii. Design the street in response to topographical features of the site. There should be minimum excavation with minimum level differences (to enable appropriate gradient) between street and the building. This would ensure comfortable movement of people between street and building.

iv. The landscape elements such as street benches, trees and street lights to be oriented and located considering the ‘scenic views’, ‘light and shade based on the climatic condition’, ‘ visual continuity of the street and buildings’ and ‘the safety and comfort of the pedestrians’.

v. The buildings defining the street should off-set or setback uniformly to enhance visual containment of the street.

vi. The facades of buildings defining the street should have a high quality of architecture reflecting the local character and also contributing towards the aesthetics of the street. To enhance passive surveillance, the openings of the active spaces and habitable rooms should front the street.

vii. In order to encourage walking there should be speed deterrents and control mechanisms in place to reduce vehicular speed.

Plan of the Commercial Area and Urban Corridor

2. Pedestrian Mall

It is a vehicle-free street defined by shops on both sides. It has public open spaces on either ends and it connects to the commercial streets. Given its location, it is appropriate that this street is developed to enable activities which are convivial, interactive and facilitate the trade of regional or local arts and artifacts.

Objective

i. To have a barrier free space for people of all ages and needs.

ii. To create a space that is dynamic for everyday uses as well as special events.

iii. To develop a street that is responsive to topography, natural elements and climatic condition.

iv. To create a space that is attractive, safe and enables public interaction.

Issues to be considered: Topography, site conditions and architecture.

Design Principles

i. Ensure that there is no or very minimal obstruction to enable the people of all ages and the people with special needs to use it safely and comfortably.

ii. Ensure provision for the fire and service vehicles to access the mall during emergencies and also to transport heavy equipments during special events.

iii. Consider the topographical features of the site. The transition of spaces between the pedestrian mall and shops should be smooth and comfortable. The gradient should also consider the drainage.

iv. The landscape elements such as street benches, trees and street lights to be placed in response to scenic views, light and shade from sun and rain, and visual continuity of the street and buildings.

v. The architecture of buildings defining the pedestrian mall should be of high quality to contribute towards streetscape and the activities of the pedestrian mall.

vi. The surface of the pedestrian mall should have a mix of soft and hard landscape and should be pervious to water.

3. Residential Street

It provides access to the residential plots of the Duksum Town. There are three types of residential street namely Primary Road, Secondary Road and Tertiary Road and they have the following defining elements:

i. Carriageway: The area of street between two kerbs at the edges reserved for movement and parking of vehicles.

ii. Verge: The part of the street between the carriageway and the boundary of the plots. It accommodates footpaths and storm water drains.

These streets connect residential areas to commercial areas and public open spaces. They also connect the town to the road leading to Trashi Yangtse.

Objective

i. To ensure a proper access to the buildings and public amenities.

ii. To have a good connectivity between the public open spaces and the different precincts of the Duksum town for both pedestrians and vehicles.

iii. To facilitate safe and comfortable walking for the people of all ages and needs.

iv. To eliminate or at least reduce the conflict between pedestrian and vehicular traffic.

v. To allow development that is responsive to topography, natural elements and climatic condition.

Issues to be considered: Topography and site conditions.

Design Principles

i. The level difference between the plots and street should be considered carefully to enable access for both pedestrians and vehicles.

ii. The footpaths should be continuous and smooth to enable people of all ages and people with special needs to use it safely and comfortably.

iii. The access, footpath, parking and travel way should be clearly marked and highlighted with legible lines, kerbs and pavements to enable safe passage of pedestrians and vehicles.

iv. The street design should take into account the topography of the site. There should be as minimum excavation as possible.

v. The landscape elements such as street benches, trees and street lights to be oriented and located considering the ‘scenic views’, ‘light and shade based on the climatic condition’, and ‘ visual continuity of the street and buildings’ and ‘the safety and comfort of the pedestrians’.

vi. The facades of buildings defining the street should have a high quality of architecture reflecting the local character and also contributing towards the aesthetics of the street. The openings of the habitable rooms should face the street to enhance passive surveillance.

4. Off-Street Footpaths:

These are paths for pedestrians which connect various precincts of the Duksum town. Some of them are enhancement of trails used by the people in the past for travelling between the settlements and some are planned to shorten the walking distances between commercial area, residential areas and the public open spaces.

Objective

i. To enhance visual as well as physical connectivity.

ii. To preserve the traditional trails as important local historical elements.

iii. To ensure that the paths are safe and walk-able.

iv. To encourage walking.

Issues to be considered: Topography, site conditions and vegetation.

Design Principles

i. The visual qualities and the historical essence of the traditional trails should be preserved to promote a sense of place and local character of the Duksum Town.

ii. The obstructions that would disrupt the vista and visual connectivity between the settlements across the valley should be avoided to preserve the visual qualities of the footpaths and the town.

iii. The footpaths should have appropriate gradient, surface finishes, safety and visibility facilities to ensure that footpaths are safe and walk-able.

iv. Facilities such as resting benches, gazebos or shades, lights etc should be constructed at appropriate locations to encourage and entice people to walk for health and leisure.

v. The materials used for construction of new footpaths and enhancement of the traditional trails should be environment friendly, sustainable and should enhance the local character.

Walking trail with clear delineation and comfortable gradient. (http://www.travelinginspain.com/visits/walks_mozarabic.ht)

Walking trail with proper signage and scenic views. (http://www.chamonixbreaks.com/userimages/P1020682%281%29

Walking trail/Footpath with sitting bench and shade. (http://www.google.com/imgres?q=walking+trails)

Footpath with railing and scenic views http://www.google.com/imgres?q=walking+trails

Footpath paved and adorned with locally available materials. http://landscapeindenver.com/wp-ontent/uploads/2010/07/Multi-)

SECTION 2

BUILT-FORM

5. Commercial Built-form

The built-form should reflect the local architecture, topography of the site, prevailing climatic condition and any features which are characteristic of the locality within the purview of the Building Codes of Bhutan. It should also reflect the potential vibrancy and attractiveness of the town.

Objective

i. To allow a barrier free and comfortable access to the active part of the buildings.

ii. To reflect and promote the scale and essence of the local architecture.

iii. To integrate functions of the streets with the building.

iv. To ensure that the building defines and enhances the desired character of the street with a high quality of architecture.

v. To develop in response to topography, natural elements and climatic condition.

vi. To enhance a sense of place through visual containment and continuity.

Issues to be considered: Topography, site conditions, local building scale and architecture.

Design Principles

i. The level difference between the street and the shops on the ground floor should be minimal to provide a comfortable access to users and the people with special needs.

ii. The buildings should not be more than two floors to promote and respect local scale of building and architecture.

iii. The fenestrations and balconies should be oriented to allow daylight access, capture the scenic views of the surrounding areas and provide shade to the public spaces.

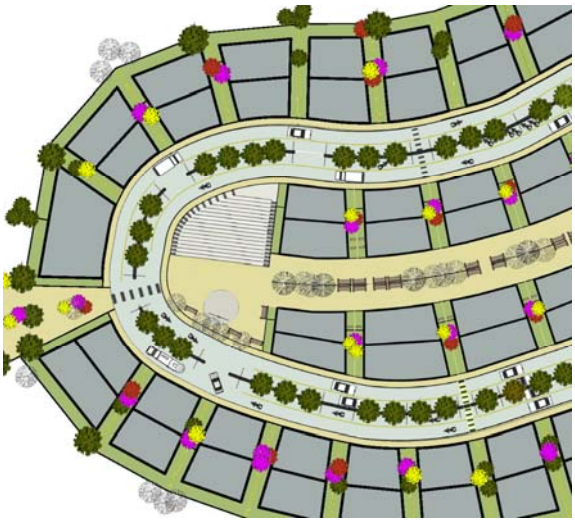
iv. The roof and its projection should be adequate to protect the pedestrians from the rain. The rain water gutters should be provided wherever necessary.

v. The building materials and method used for the construction should promote local building character, green architecture and sustainability.

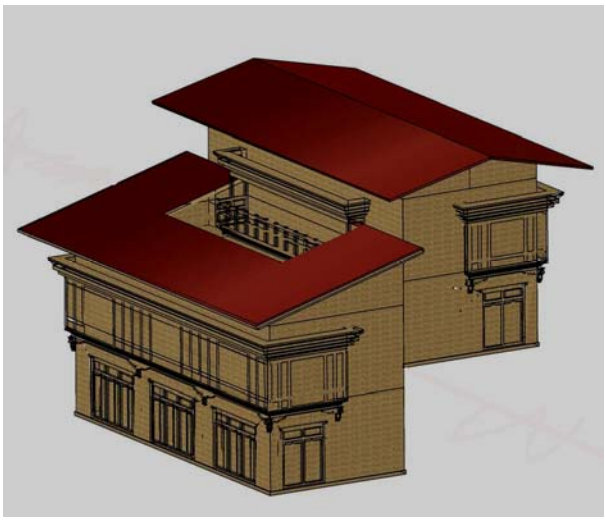
vi. The buildings should be designed in response to the topographical condition. The split type of design and construction should be carried out to avoid excessive excavation.

vii. The buildings should define the street with uniform setback to contribute towards desired urban form and enhance visual containment of the street.

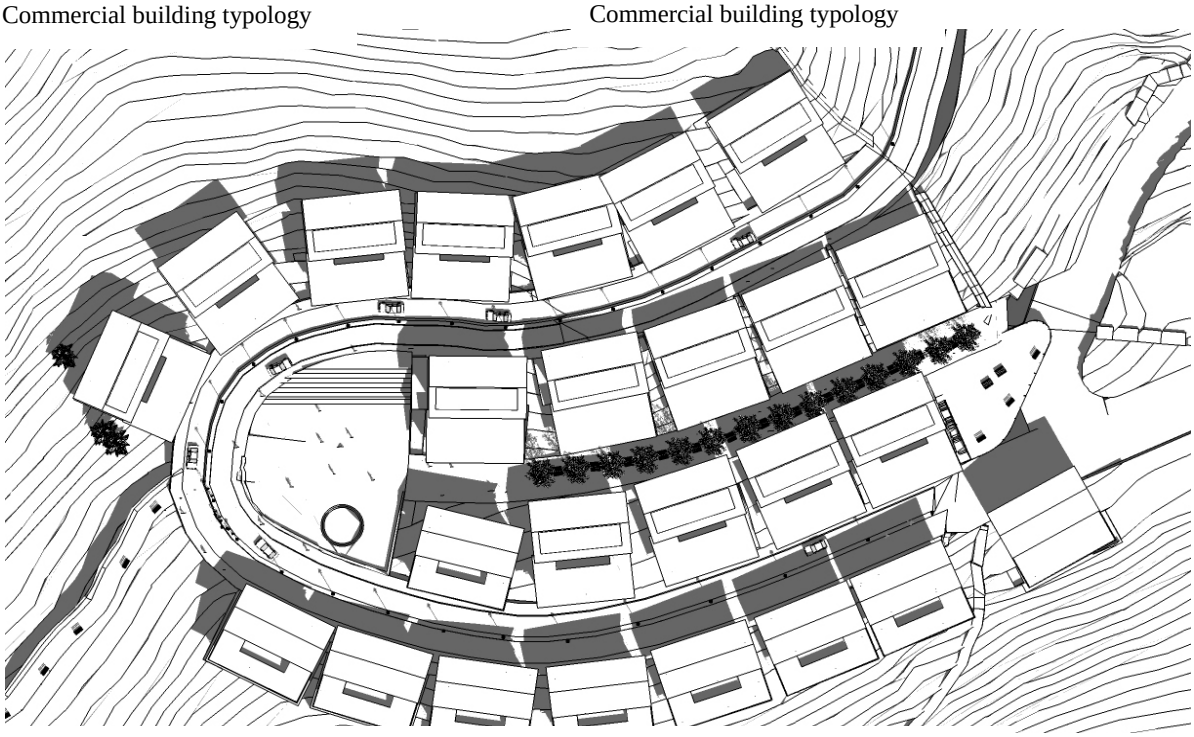
viii. The facades of buildings should define streets with high quality of architecture reflecting the Bhutanese architecture, local character and also contribute towards the aesthetics of the street. The openings of the active spaces and habitable rooms should face the street to enhance passive surveillance.



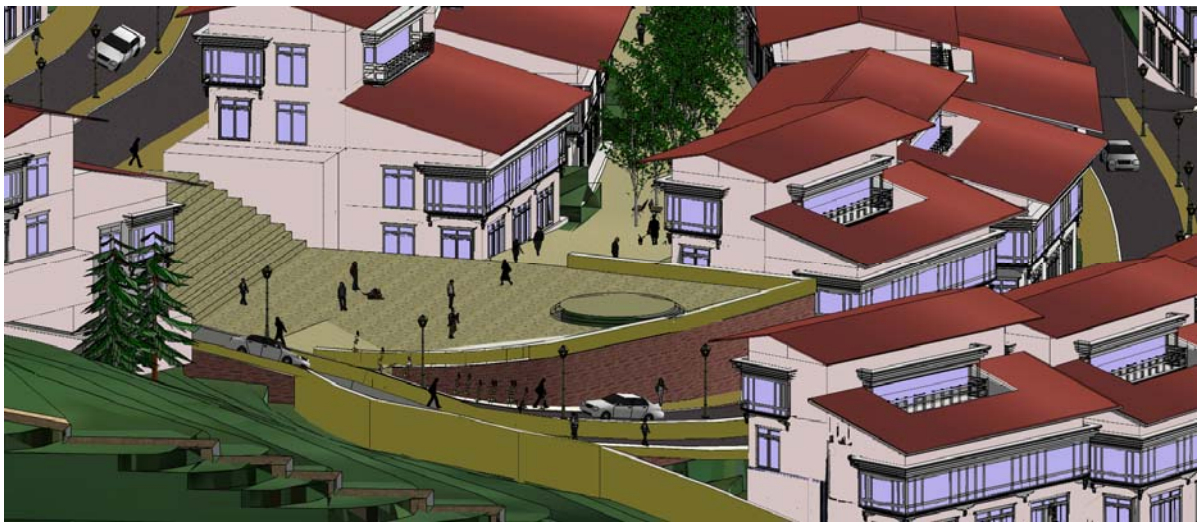
Commercial building typology



Commercial building typology



Shadow effect of buildings in the commercial area in the month of December (9-11am)



View of the commercial area (from West)

6. **Residential Built-form**

The built-form should reflect the local building character and various prevailing conditions such as topography, climate, scope for scenic views, and Building Codes of Bhutan.

Objective

i. To allow a barrier free and comfortable access to the buildings.

ii. To reflect and promote the local scale of buildings and architecture.

iii. To integrate streets with the buildings.

iv. To ensure that the building defines and enhances the desired character of the street with a high quality of architecture.

v. To develop buildings in response to the topography, natural elements and climatic condition.

vi. To promote green architecture and sustainability.

Issues to be considered: Topography, site conditions and local building scale and architecture.

Design Principles

i. The level difference between the street and the ground floor should be appropriate to allow a comfortable access to the people of all ages, the people with special needs and service vehicles.

ii. The buildings should not be more than two floors to promote and respect local scale of building and architecture.

iii. The building size, orientation, and zoning of spaces should be considered to integrate sun path, views of the surrounding natural features and settlements and topographical conditions of the site.

iv. The building materials and method of construction should promote local character, green architecture and sustainability.

v. The buildings should be designed in response to the topography of the site. The split type of design and construction should be carried out to avoid excessive excavation.

vi. The facades of buildings should define streets with high quality of architecture reflecting the local character and help to enhance the streetscape.

vii. There should be adequate openings facing the street to enhance passive surveillance.

viii. The buildings should incorporate the safety requirements as per the prevailing Building Codes of Bhutan.

SECTION 3

PUBLIC OPEN SPACES

7. Open Spaces

The open spaces in the Duksum Town form an important and integral part of the public domain. They are the essential components of the public spaces which has the potential to enhance the quality of the lives of the residents and the visitors to Town. There are both passive and active public open spaces in the Town. They are connected through a network of streets and footpaths. The following are types of open spaces in Duksum Town:

i. Amphitheatre

ii. Viewing decks

iii. Recess (small rest areas) along the footpaths

iv. Sports fields and green areas including the river corridors

v. Japoduwa (historical site)

Objective

i. To have a barrier free and comfortable spaces accessible to people of all ages.

ii. To ensure safety and usability for the people of all ages.

iii. To promote green practices and sustainability.

iv. To integrate the spaces with the network of streets and footpaths.

v. To enhance the natural qualities of the Duksum town.

Issues to be considered: Topography and site conditions.

Design Principles

i. The parks and amphitheatre should be made as accessible as possible to the people of all ages and the people with special needs with the provision of comfortable ramps wherever necessary.

ii. The public open spaces should be made attractive with the provision of benches, shades, proper lighting, toilets and drinking water taps.

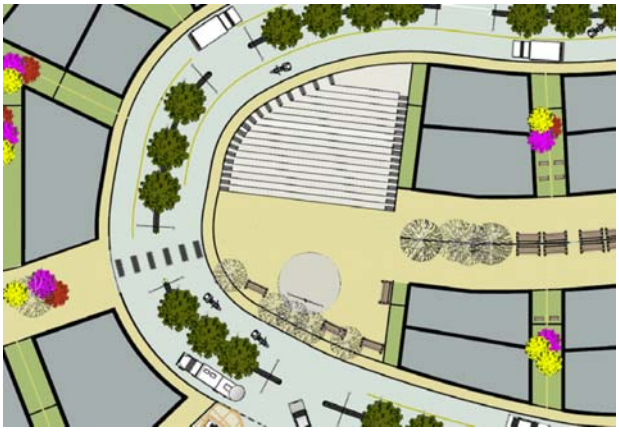
iii. Green practices such as waste segregation at source and waste collection should be encouraged by providing waste collection bins

iv. Locally available materials should be used for construction of parks and their associated facilities and the materials should require low maintenance cost.

v. The open spaces should be socially conducive. They should be the place for community gathering and interaction. Design should consider discouraging vagrancy and crime.

vi. The open spaces should integrate with the streets and footpaths and should be accessible from as many points as possible.

vii. The open spaces should be greened with vegetations of all seasons. There should be a mix of flowering and non-flowering plants. The locally grown plants should be used not only for viability but also to attract birds and animals of the locality.



Plan of an amphitheatre in Duksum Town

Plan of a viewing area in Duksum Town

Amphitheatre with grass cover and trees for shade
(http://www.google.com/imgres?q=amphitheatre)

Viewing Deck
(http://www.google.com/imgres?q=viewing+decks)

Bench for resting along the footpath and walking trail
(http://www.google.com/imgres?q=bench+forest+resting+place)

River side footpath or walking trial with sitting facility
(Image composed using images from Google)

SECTION 4

LANDSCAPE DESIGN

Landscaping is an integral part of the urban design. It includes the natural, cultural, and all the utilities proposed to enhance the spatial quality, usability, privacy, social opportunity and equitable access.

8. Landscape Design

The landscape design builds on existing natural and cultural features of the site. It includes planning, design, construction and maintenance of all open spaces and utilities. It optimizes privacy, opportunity, usability, and enhances the local character. Landscape design should integrate landscape elements and buildings to function sustainably and contribute to the aesthetic quality and amenity for occupants and the adjoining public domain.

The following are the landscape elements:

i. Vegetation
ii. Boulders and gorges
iii. Traditional trails
iv. Historical elements

Objective

i. To enhance the local character of Duksum town.
ii. To add value to the quality of life by ensuring privacy, shade, outlook and views.
iii. To integrate buildings with streets.
iv. To ensure usability with the provision of necessary infrastructure.
v. To improve storm water quality.
vi. To improve air quality.
vii. To develop in response to topography, natural elements and climatic condition.

Issues to be considered: Topography, scenic views, natural and historical elements.

Design Principles

i. The trees and landscape elements should provide appropriate shade and necessary visual screens to improve the amenity of the open spaces.
ii. The local characteristic of the site should be enhanced by retaining trees, shrubs and ground covers endemic to the site; considering the topography of the site; and retaining views and significant elements such as boulders, historical trails and monuments.
iii. The landscape elements should be planned and spaced appropriately to avoid conflicts such as trees blocking street lights; tree trunks encroaching on parking spaces; tree

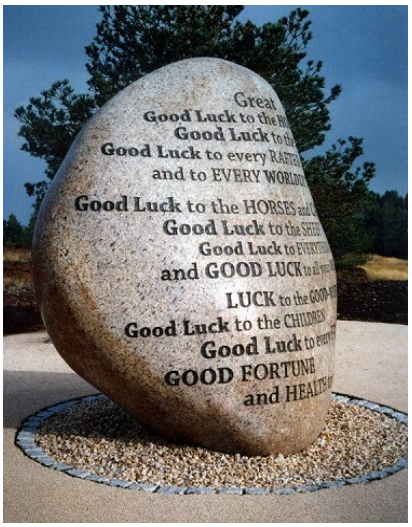
branches, fruits & saps falling on pedestrians and cars; and trees blocking the scenic views.

iv. The landscape design should improve solar efficiency of dwellings and the microclimate of open spaces. This could be done by planning trees to shade low-angle sun on the eastern and western sides of a dwelling; by planting deciduous and evergreen trees in the right places to avoid summer sun and allow winter sun to filter in; and plant trees of different heights to solar shade the walls and open spaces.

v. The landscape design should contribute to water and storm water efficiency by using plants which require less water; by growing plants with high water demand in the appropriate places to reduce storm water runoff; incorporating wetland filter systems; and utilizing permeable surfaces.

vi. The elements used for landscaping should be environment friendly and robust requiring less maintenance and costing less for maintenance.

Boulders as a part of house
(http://www.google.com/imgres?q=house+with+boulders



Boulders used for inscribing social messages.
http://www.google.com/imgres?q=gleneagles+boulders

Trees as landscape elements and also for proving shade. Grass cover is aesthetically pleasing and it is pervious storm water.
http://upload.wikimedia.org/wikipedia/commons/3/34/English_garden_amp

Boulders as a landmark along the walking trail/ footpath.
http://www.google.com/imgres?q=amphitheatre

SECTION 5

WATER SENSITIVE URBAN DESIGN

9. Water Sensitive Urban Design

Water sensitive urban design seeks to minimize impacts on the total water cycle, enhance effective storm water management and minimize impact on stability of water table. This is done mainly by reducing storm water runoff and improving the storm water quality.The streets, buildings and other hard surfaces of urban development account for a significant amount of impervious area causing increased storm water flows. They also account for the source of water borne pollutants such as sediments, metals and hydrocarbons affecting the quality of water.

Objective

i. To minimize the storm water runoff.

ii. To reduce discharge of sediments and other pollutants to the storm water drainage system.

iii. To minimize the impacts of urban development in Duksum town on the health of natural waterways.

iv. To preserve existing natural features and topography to protect the natural water course and natural system of storm water drainage.

Design Principles

i. The materials used for pavements should be pervious to reduce the storm water runoff.

ii. There should be optimum amount of deep soil. Deep soil is pervious to storm water and would facilitate growth of vegetation and infiltration of storm water. For the open spaces, there should be more than 25% of deep soil.

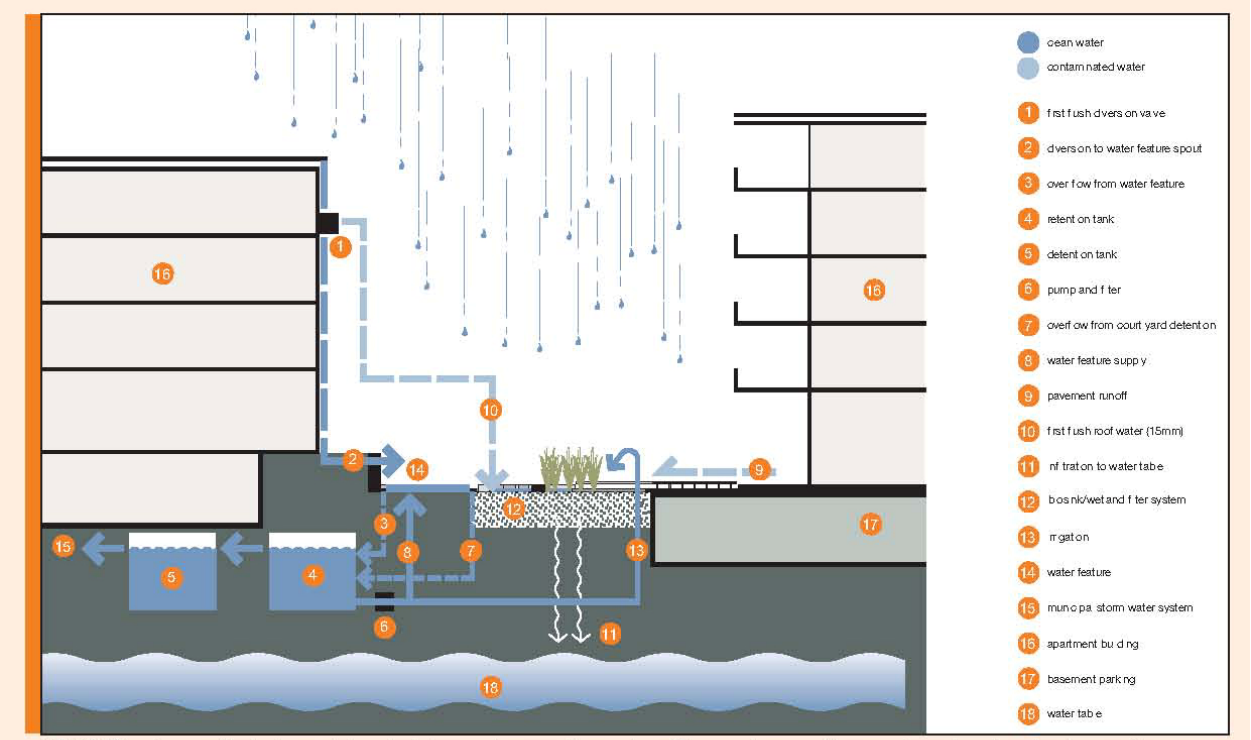
iii. The formal drainage system should be minimized. If constructed, it should be vegetated and it should have bio-filtration trenches and subsoil collection systems.

iv. Construction of wetlands or water pollution control ponds should be initiated wherever possible.

v. The landscape design should be integrated with the water sensitive urban design.

vi. Water Sensitive Urban Design is most effective on slopes of 1- 4 %. For the slopes exceeding 4%, bio retention street planter or flow controls such as check dams with swales and bio retention systems could be used.

vii. Bio retentions swales should be used wherever possible.



02.36. This diagram illustrates an integrated stormwater recycling system. Stormwater quantities can be reduced and water quality increased, by circulating rainwater through a connected water feature and wetland system.

Storm Water Recycling System. Source: Residential Flat Development Design Code, NSW Planning Department

Swales with grass. Source: Street Design Guidelines, Landcom

References

North Coast Urban Design Guidelines, Department of Planning, New South Wales, Australia.

Residential Flat Design Code, Tool for improving the design of residential buildings, Department of Infrastructure Planning and natural Resources, New South Wales, Australia.

Street Design Guidelines, LANDCOM.