FOREWORD

Phuentsholing Structure Plan 2013-2028 (PSP: 2013-2028) is a blue print document that provides strategic framework & policy guidelines and vision for the future planning and development of the Commercial Capital Town of the Kingdom of Bhutan. This Structure Plan has been developed in consultation with the residents, public and other stakeholders of Phuentsholing Thromde. It is a facilitative document that fosters discussions amongst the people of Phuentsholing, as represented through various "stakeholders" in the urban community, regarding the quality of life and livability of the town in the future.

This Structure Plan has taken into consideration the concerns raised by the public and balanced them within national plans and policies. It is not a static legal document, but an organic plan, subject to regular review and revision in response to evolving circumstances. The implementation requires co-operation from all the stakeholders and Phuentsholing Thromde has to ensure that all the plans and programs are based on approved plans.

The plan lays down the basic structure and guidelines for the future development of the town. These guidelines need to be detailed out in the Local Area Plans for implementation. Any amendments to the Structure Plan should be properly done in consultation with National Consultative Committee for Human Settlement (NCCHS) or Ministry concerned and no other agency or person has the authority to alter or change the plan.

Our appreciation goes to all the individuals involved in the process of plan preparation including the consultant - Progressive Research and Consultancy Services (PRCS) who prepared the plan in consultation with Phuentsholing Thromde with support and guidance from Department of Human Settlement (DHS), MoWHS. Our special gratitude also goes to all the Hon'ble members of National Consultative Committee for Human Settlement for review and accord of approval.

(Dorji Choden)

Zhabtog Lyonpo

Minister

Ministry of Works & Human Settlement

Thimphu

EXECUTIVE SUMMARY

The Phuentsholing Structure Plan is a document that incorporates a report, structure plan map, additional technical supporting documents and plans, to provide a framework for the coordinated provision and arrangement of future land use (precincts), subdivision and development in new urban areas (greenfield sites) and in existing developed/redevelopment areas (brownfield sites) in the core and extended areas of the Phuentsholing Municipality. It coordinates the provision of transport networks, public open space (POS), utility and service networks, urban water management, development standards and community and other infrastructure investment and staging programs. The report is divided into three volumes:

1. Volume 01: The Vision, The Conceptual Plan, The Present Scenario, Population Projection and Planning Standards, Proposals for Action and Housing Strategy;
2. Volume 02: Development Management System, Development Control Regulations and The Investment Plan;
3. Volume 03: Drawings of Existing Scenario and Proposals

This Structure Plan lays down the precincts plan, road network, open space system and amenities system. This plan has been presented to the residents, general public and officials of Phuentsholing. The Structure Plan creates the potential for neighborhood land owners. This Structure Plan is a facilitative document that facilitates:

- Discussions amongst the people of Phuentsholing, as represented through various “stake holders” in the urban community, regarding the quality of life and livability of the town in the future
- Discussions at the highest level of government regarding the role of the town in the national development context, in projecting an image of the town and its role as the regional icon of Bhutanese culture and urbanity. It links urban planning with employment generation, growth in national productive capability and national wealth creation
- Discussions with the Ministries of Trade and Industries; Information and Communications; Education; Health; Works and Human Settlement; Agriculture; and Home and Cultural Affairs regarding future objectives for development, and the required infrastructure
- Discussions with senior policy makers about the broad shape which the town will take and its implications on land ownership, roads, infrastructure and precincts; all of which raise a number of policy issues regarding urban regulations, land acquisition, incentives for development and guiding investments
- Discussions within the DHS, MoW&HS regarding the structure, character and phasing of growth of the town
- Discussions within various technical agencies that will have to provide infrastructure, maintain infrastructure and manage the capital investments and recover funds through various budgets, levies, user charges and fees

This Structure Plan of Phuentsholing has taken into consideration the concerns raised and balanced them within national theories and techniques. The Structure Plan is not a static legal document, but a living plan. It is intended to be an organic plan, subject to regular review and revision in response to evolving circumstances. The plan lays down the basic structure and guidelines for the future development of the town. These guidelines need to be detailed out in the Local Area Plans. Whilst every reasonable endeavour has been made to ensure that the contents of the Structure Plan is represented accurately, the Consultant and Phuentsholing Thromde disclaim all liability for any injury, loss or damage whatsoever that may arise as a result of any inaccuracy, error or omission.

The Phuentsholing Structure Plan document is organized into nine parts. These are:

- The Vision
- The Concept Plan
- The Present Scenario
- Population Projection and Planning Standards
- Proposals for Action
- Shelter Strategy,
- Urban Development Management System
- Development Control Regulations and
- Investment Plan

Key benefits of structure plan

- Infrastructure coordination – structure plans identify and secure sites for future infrastructure development, reduce land use conflicts and enable better staging of infrastructure provision to support land development.
- Land supply monitoring – structure plans enable the tracking of prospective amounts and yields (dwellings, employment etc) of land to ensure the future supply and timely release of land for urban development.
- Efficient subdivision and development approvals – structure plans address and resolve broader, more strategic planning issues ahead of detailed planning in respect to subdivision and development, allowing for more efficient assessment and approval processes.
- Review and development of planning policy – use structure plans to measure the effectiveness of planning strategies and policies.
- Guidance – structure plans assist landowners, landowner's representatives, decision making authorities, advisory agencies and local government to identify the specific issues and actions required to progress the land through the required planning and development processes.

Table of Contents

List of Tables:

1.0 BACKGROUND

Bhutan is situated on the southern slopes of Eastern Himalaya and comprises an area of 38,394sq.kms (as per Statistical Yearbook of Bhutan, 2009). The country is surrounded by mountain ranges and is completely land locked with a very rough terrain to the North by the Tibetan region of China and with the Indian states of Sikkim, West Bengal, Assam and Arunachal Pradesh in the West, East and South.

The country is going through a rapid urbanization process due to opening up of the economy to outside. This has increased rural-urban migration and demand for urban land. Considering the limitations of natural settings and availability of suitable land, efforts are made to plan the services in a rational manner.

Chhukha is an important Dzongkhag in the south western region of Bhutan. It is strategically placed on the Indo-Bhutan border adjoining the Indian state of West Bengal. Phuentsholing, a vibrant city and an important Thromde of Chhukha Dzongkhag is a gateway to the country. Due to nearness to the Indian border it has created a strong economic base and attracts people from various parts of the country and from across the border for trading purpose. People from the surrounding villages are dependent on Phuentsholing for their daily needs and livelihood. With higher industrial growth in Pasakha, proposal for a hydro-power development on the Ammo Chhu and increasing level of commercial activities, Phuentsholing is considered as one the most important growth centers of Bhutan.

1.1 HISTORY

From a small hamlet or hardly any human settlement in 1950s, Phuentsholing, facilitated and accelerated by the launching of the first FYP in 1961 and simultaneous commencement of the construction of Phuentsholing-Thimphu National Highway, grew at an unprecedented rate leading to the preparation of first Development Plan in 1987 with horizon year as 2001. Being the first Development Plan, it is considered as the blue print for future development. A number of planning proposals were made in the plan, but their implementation did not take place as envisaged due to various reasons. The next urban development plan for Phuentsholing (2002-2017) proposed for a wider, regional perspective for the city and it is the most comprehensive document providing important base data for urban planning.

Limited land availability for future expansion and inadequate infrastructure growth are identified as critical issues by all the past planning proposals prepared for Phuentsholing.

1.2 POPULATION & ECONOMY

Phuentsholing which had a population of around 12,625 in the year 2000 had grown to reach 20,537 by the year 2005 (Source: Bhutan National Urbanization Strategy, 2008). Thus it had witnessed a population growth of almost 10.2% during these 5 years that resulted in the rapid urbanization, while the city was not prepared for the supportive infrastructure. With a higher rate of urbanization and increasing opportunities in Phuentsholing the population is projected to reach almost 30,000 by the year 2020.

Over the years it is noted that Phuentsholing has a larger number of migrants as compared to the local population. The main reason for migration is the job and business opportunities the city offers as the second largest urban center and the economic capital of the country. It is strategically located with the major industrial estate at Pasakha and mega projects like Chhukha and Tala Hydro Power projects in its immediate hinterland. Almost 82% of the total trade in the country is with India and Phuentsholing is the main export and entry point for these trades. The following table shows the importance of Phuentsholing in the international trades.

Table 1-1 Trades from Phuentsholing Region in 2010

Phuentsholing share in total imports in 2010			
	Imports from India	Imports from third countries	Total imports
Phuentsholing region	2,37,25,263	87,76,684	3,25,01,947
Overall for Bhutan	2,93,29,106	97,46,092	3,90,75,198
% share of Phuentsholing	81%	90%	83%
Phuentsholing share in total exports in 2010			
	Exports to India	Exports to third countries	Total Exports
Phuentsholing region	1,15,30,236	21,90,989	1,37,21,225
Overall for Bhutan	1,55,89,427	33,23, 499	1,89,12,926
% share of Phuentsholing	74%	66%	73%

Source: Dept of Revenue and Commerce

The strategic goods imports from India are Rice, Wheat, Edible oil, Petrol, Diesel, Aviation fuel, Kerosene besides vegetables. While agro products like orange, apple, potato and ginger are some of the goods exported from Bhutan.

1.3 ISSUES AND CONCERNS

Before moving on to the themes of the Structure Plan it is extremely important for us to identify the issues and concerns of the present Phuentsholing City.

- Phuentsholing city presently has variety of Land uses viz., Mixed/ Commercial Use, Residential Use, Institutional Use, Public Use, Industrial Use, Warehousing, Special Uses, Land Slide Prone Areas, Forest and other Open Space Uses. A mix of uses such as Residential, Light Industries and Warehousing in prime locations is felt inappropriate. While the city boundaries are extending and there is an acute shortage of space for residential densification, such industrial settlements should be relocated towards the peripheral zones.

- An acute shortage of housing supply and supportive infrastructure has led to residents opting for cross-country rental accommodations. This has resulted in fragmentation of families and economically benefiting the non-nationals that are staying across the border.

- Natural disaster in form of floods and relative environmental degradation in the form of soil erosion is a matter of concern.
- Underutilization of prime land along Ammo Chhu River.
- Tourism sector still untapped that could act as a major economy generator.
- Single access to the neighboring country through Phuentsholing city has led to traffic congestion and made traffic management difficult. It is a matter of concern for the safety of vehicular and pedestrian traffic. Segregation of heavy and light vehicles at the entry point is felt necessary.
- Nearness to the international boundary is leading to security issues.

1.4 AIM AND OBJECTIVES

This section of the report presents the aim and objective behind this exercise, the scope of work and various stages of work.

The Structure Plan would lay out the broad Land uses, designate various development zones, specify development control rules, assess existing proposals for the infrastructure and services requirements and lay out an appropriate road network. The plan will include a strong housing component and provide directives for community services and facilities. Keeping in mind the issues that need to be addressed, the Structure Plan aims to:

- **"Create Phuentsholing as a socially and culturally vibrant city with the emphasis on Sustainable Business and Tourism by applying the smart growth principles."**

To achieve these aims the following objectives have been set:

- Establishment of an alternative Commercial Zone in the eastern region of the municipal area.
- Designate a sizable land in appropriate location for dry port activities and supportive industrial development.
- The ongoing proposal for Ammo Chhu Land Reclamation Project will address the land shortage for future urban development. Channelization of the river and reclamation of about 865 acres of land is proposed.
- Promote tourism and trade by creating recreational and commercial facilities along Ammo Chhu River.
- Efforts will be made to meet the present housing gap and also create additional houses for the projected demands over the next two decades.
- Improvement of the existing infrastructure in order to cut down the total infrastructural development cost.
- Provide easy, safe and convenient movement for people and goods to all areas of the settlement by a road and pedestrian network.

- Enhance public amenities through series of public consultation.
- Create harmony between new development and traditional spaces by conservation and improvement of natural, religious or cultural features.
- Security should be a key concern as Phuentsholing is the border city and shares its international boundary with India. Its planning should be dealt in a special manner and buffer zone should be provided.
- Decongestion of existing core area
- Densification of the existing core

In order to achieve the above, it is essential to:

- Review the existing Phuentsholing Structure Plan in order to identify the lacunae's.
- Propose new structure plan that can bridge the lacunae's and provide a framework for physical planning and use of land within the Municipality /Plan Area for a period of two decades. It will also guide the detailed policies and proposals of local area plans.
- Create ownership of the structure plan in a participatory process with involvement of all relevant stakeholders.
- Ensure a well balanced distribution between the major activities by an adequate Landuse pattern, which locates the areas for agriculture, commerce, housing, public buildings and public open spaces.
- Guarantee a step by step procedure by phasing the building areas and infrastructure.

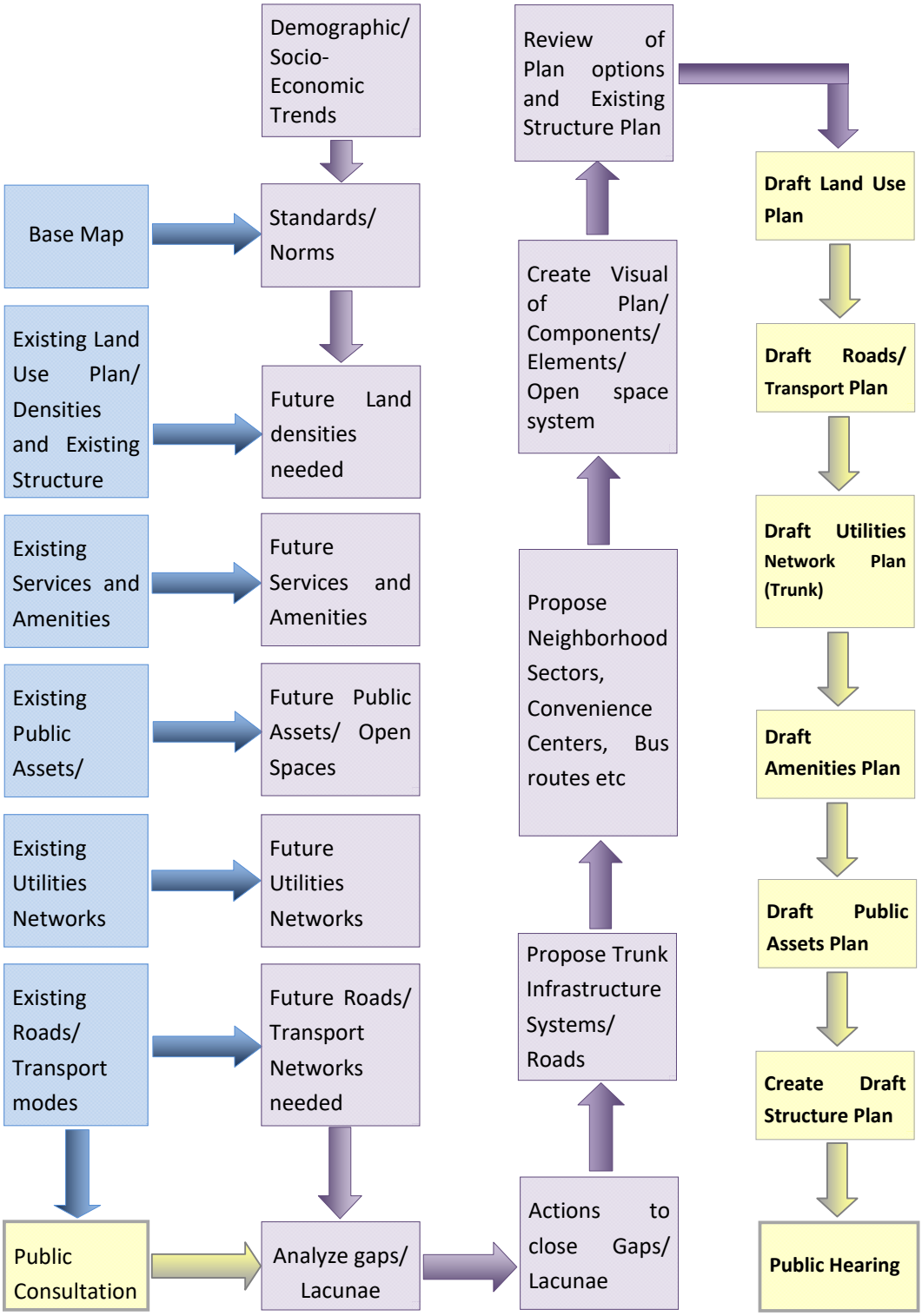
1.5 REPORT STRUCTURE

The following is covered in Draft Structure Plan report:

- Review of the past efforts and proposals
- Existing situation analysis
- Proposed Landuse map
- Detailed circulation Plan
- Proposed natural environment protection enhancement zones
- Proposed Infrastructure and amenities map
- Shelter Strategy
- Priority Investment/ Infrastructure Plan

The following diagram explains the efforts required to produce specific outputs. The idea is to bring a rational order of decision making into the planning process.

STRUCTURE PLAN- METHODOLOGY



2.0 REVIEW OF PREVIOUS STUDIES

2.1 PHUENTSHOLING URBAN DEVELOPMENT PLAN- 2002-2017

By DANIDA USPS, Component III

With Ministry of Works and Human Settlements, 2004

The Urban Development Plan recommends having a regional approach for the development of Phuentsholing Urban Area. This is due to the rapid urbanization that is taking place and a very limited area to accommodate the increasing population. The report has also identified the strengths and weaknesses that should be considered for the urban development. Following sectors are emphasized as economic growth potentials for Phuentsholing Urban Area:

- Trade and Commerce
- Industrial Development
- Warehousing
- Construction

Based on the available data and past trends, Phuentsholing urban area population is estimated at 47,200 people by the year 2017, considering an average annual growth rate of 3.0 %. The infrastructure and housing gaps are identified based on existing and projected population of the city. Transportation is considered important for the future growth and various schemes relating to parking, road widening, public transport, junction improvements and traffic management are proposed in the report.

In Phuentsholing, a severe shortage of land suitable for urban extension or development is identified and various measures like reclamation of river land, relocation of industries and warehouses, densification or redevelopment of government housing colonies and land restructuring are proposed. Providing sufficient affordable housing for all is considered as an important objective of the development plan and it is recommended that the City Corporation and other government bodies should play an active role in achieving this.

Overall, this report provides a lot of useful information and base data related to urban planning and infrastructure for Phuentsholing.

2.2 AMMO CHHU HYDROPOWER PROJECT

Ammo Chhu river hydro power project, proposed to be constructed on river Ammo Chhu near Phuentsholing and falling under the area of Samtse and Chhukha district of Bhutan, is being proposed to harness the hydro power potential of the River Ammo Chhu. The project envisages construction of 195 m high concrete gravity dam, proposed to be located near Barbotaygoan village about 2.8 km downstream of confluence of River Pachhu with River Ammo Chhu, with a total installed capacity of 4 x 135 MW. Other components of the project are Penstocks/ Pressure shaft and Tail race tunnel. About 276 families in nearby five gewogs (Dorokha, Tading, Denchukha, Lokchina and Phuentsholing) are likely to be affected by this 540MW Hydropower project. In a public consultation, the doubts and concerns related to land substitution and compensation were addressed by a group of senior government officials. All

families including the local leaders said that they sincerely supported the project in the area and are aware of the economic benefits.

The project shall have significant impact on Ammo Chhu land reclamation project and it is important that the planning for both the projects are integrated to ensure that there are no operational issues. The project shall also require township facilities and to our opinion the same should be made a part of the reclamation project. This shall not only benefit the viability of reclamation project but also reduce the capital cost of the power project. The total budget for developing this project is over Nu 4.5 billion.

2.3 AMMO CHHU LAND RECLAMATION PROJECT REPORT

IL&FS Infrastructure, 2013 – ongoing

The report identifies high monsoon flows in Ammo Chhu River as a major issue which are eroding the land along the western city limit and expose the city to the danger of flooding. In addition, the presence of river, hills and international boarder restricts the land availability for future expansion of the city. Reclamation of approx. 865 acres land on the banks of the Ammo Chhu River in Phuentsholing and development of a new city on the reclaimed land is envisaged as a holistic solution to these issues. It is proposed to fund this project on a public private partnership basis.

The report proposes to integrate the land reclamation project with Ammo Chhu reservoir hydropower project, which is another project in pipeline on Ammo Chhu River. Some of the main features of the proposed land reclamation projects are as follow:

- Green belt park and river front development
- Ring road and new bridges for a better connection with present Phuentsholing city
- A mass rapid transit system along the river
- Landuse plan on the reclaimed land (865 acres) will primarily comprise of residential, recreational, tourism linked facilities, commercial, institutional, open areas and infrastructure facilities.
- Additional facilities may include a large tourism resort, airport, golf club, medical hub and mini knowledge hub.
- It is suggested to develop the reclamation project in phases, considering the financial viability.

Since this is an ongoing project proposal linked to Phuentsholing Landuse development, its impacts are taken into consideration while proposing the draft structure plan.

2.4 REVIEW OF URBAN STUDIES ON PHUENTSHOLING & BHUTAN

When planning for the future, it is important to learn from the past efforts and plan one step further. There are various documents, planning proposals and guidelines prepared for Phuentsholing and Bhutan, which can provide a relevant reference or base for the structure plan. A brief summary with important points on each of the document is presented here with a purpose of understanding the past efforts and avoid any duplication.

2.4.1 Urbanization and Urban Planning in Bhutan

S. Ian D. McKee

United Nations Center for Human Settlements (Habitat)

This report provides guidelines for urban planning in the country of Bhutan. Due to adequacy of data zonal population surveys were conducted by the author for the towns of Thimphu and Paro. The report identifies major issues related to natural growth of towns:

- Topographical constraints on the physical growth limits of towns.
- Difficult, mountainous locations of many towns which grew in the vicinity of important Dzongs, the Dzongs been located in the remotest and most difficult terrains for natural defense for their scheduled meditation and administration;
- Limitations on induced industrial growth, which generally propels urban expansion, due to environmental considerations; and
- A conflict between the urban growth taking place on mountain slopes and the natural assets such as forests and religious centers.

The report comes out with the following suggestions for balanced and sustainable urban growth:

- Relocation of urban functions in a phased manner that is capable of expansion for a period of fifty years;
- Decentralization of existing industrial enterprises that will act as a catalyst for a balance population distribution in terms of townships; and
- Need for a national human settlements strategy defining the future role and functions of specific urban centers of Bhutan.

2.4.2 Planning Standards for Urban Settlements in Bhutan

Urban Development and Housing Division

Ministry of Communication, 1999

Planning Standards for Urban Settlement in Bhutan is a document stating basic standards for designing and locating public facilities, services and amenities including health, education and recreation facilities as well as commercial and industrial requirements and roads and pedestrian walkways, parking for public vehicles, housing, public sanitation, protective services like fire fighting, post and telecommunication etc. All standards are proportional to the population. This report also provides the definitions for sub-classification of Land uses and corresponding standards.

2.4.3 Housing Finance for Low Income Groups

Danish Ministry of Foreign Affairs/ Ministry of Communication

DANIDA, June 2000

This report attempts to access the need for a housing finance corporation and to explore the means of finance for the low income group housing in Bhutan. There is a critical shortage of

affordable housing due to the increase in the urban population mainly through rural-urban migration to the scale of 10% per year by the year of 1998. Thimphu alone requires around 350 housing units per year out of which most are dependent on finance from the government and private sectors. The private sector is reluctant to extend finance to this sector, as it is not profitable while the government has its own limitations in financing such schemes and in releasing land under its control. The report studies the existing finance systems available and the variety of schemes to handle financing low income group housing. It questions the concept of affordability" and proposes the concept of "willingness to pay," that is looking at rent propensities and loan eligibility, thus opening a potential investment in housing. The report suggests the system of a "savings and credits" society scheme for community housing. The report proposes the surplus liquidity in the banking institutions be used for housing finance rather than to setup a new institution. The government's inability to keep pace with the demand for low income group housing and lack of an active private sector in housing construction, as well as housing finance, has resulted in poor quality housing. The release of public land and incentives to private financial institutions are the two key aspects which would, when implemented, improve the current housing scenario, according to the report.

2.5 THIMPHU STRUCTURE PLAN- 2002 TO 2027

Christopher Charles Benninger Architects Pvt. Ltd. With Department of Urban Development and Housing, Thimphu, November 2002

- Issues related to the haphazard growth of Thimphu were identified.
- Studies were carried out in relation to the population growth over the years and projections made accordingly.
- Inferences were drawn through the reports and studies carried out in the past

Proposals include:

- Thimphu was divided into various Urban Villages each having a Neighborhood Node surrounded with high density housing.
- Neighborhood Node consists of commercial activities (convenience shopping), health facilities, crèches, transit nodes, open spaces and community halls.
- Other than the Thimphu Core two other important Urban Hubs were proposed, one in north and other in south. The purpose of these nodes was to reduce the load on the core commercial area.
- The Structure Plan based on the principals of Intelligent Urbanism adopted an eco-sensitive planning approach respecting the environment, culture and the unique setting of the city without compromising on the modern aspirations of the society.
- Green Buffer Zones along all the major stream and river were linked with all the other open spaces in the town thus forming an open space network.
- Detailed development control mechanism was proposed for the efficient implementation of the structure plan.

2.6 REVIEW OF STATUTORY MEASURES

2.6.1 Bhutan Municipal Act, 1999

Department of Urban Development and Housing

Ministry of Communications, Bhutan, July 1999

The Bhutan Municipal Act came into force with effect from 28th July 1999. The purpose of this act is to enable the establishment of Municipal Corporations as legal entities and to confer on them such powers as required to forge partnerships among the Municipal Corporation, business and Institution and the residents for effective and efficient governance of urban communities. This act spells out the procedures to create and to dissolve a Municipal Corporation and its structure. It states the functions of municipal communities with respect to the city administration. It includes procedures for election of people's representatives, their duties, constitutions of executive committees, meeting proceedings and the sanctioning the work. This act also elaborates on the functions, authorities and obligations of the municipal corporations. The functions include developmental works regarding infrastructure, roads and transportation, public health, recreation and Landuse planning amongst others. The act provides the guidelines regarding the fiscal issues and financial matters including budget, contracts and collection of revenues and tariffs. The respective municipal corporations are supposed to formulate their rules and regulations and development controls within the framework suggested in this act. This is a well drafted document stating the principles and guidelines for urban administration.

2.6.2 Bhutan Building Rules, 2002

Department of Urban Development and Housing

Ministry of Communications, Bhutan, 2002

Bhutan Building Rules fulfill the basic requirement of guiding building construction. There are no comprehensive guidelines regarding plotting and site development. The guidelines show little reference to the traditional site development mechanisms, even though the aim of the guidelines is to maintain and conserve traditional architecture. There are no guidelines regarding the view lines and sky lines. There is not mention of maximum slopes upon which one can build, nor of soil retention structures or of other rules relevant and related to Bhutan.

2.6.3 The Thromde Act of Bhutan

Royal Government of Bhutan, 2007

This Act repels the Bhutan Municipal Act of 1999, its rules, regulations and all directives and circulars that are inconsistent with this Act. Under this Act the government, from time to time, will establish a certain geographical, administrative or economical area of the country as a Thromde or Throm. The Act classifies the Thromde or Throm into four types and provides the guiding principles for the establishment of Thromde or Throm. Criteria's of establishing the four types of Thromde or Throm are also described in the document. These typologies are decided based on the population and densities the Urban and Rural areas have. This act spells out the procedures to create and to dissolve the Municipal Administration. The functions and

powers of the Thromde Tshogdu, Thromde Tshogde and Thromde Dagchong are clearly stated in the Act. The administrative structure under this Act is found to be complicated and hence a draft of the Local Government Act 2009 has been prepared and submitted for approval.

2.6.4 Draft Local Government Act, 2009

Royal Government of Bhutan

Ministry of Works and Human Settlements, 2009

The Local Government Act proposes to reduce down the number of classifications made under the Thromde. The towns will be classified under these categories mainly based on the population and population density. The election of the Local Government, qualification of its members, their functions and powers has been elaborately defined in this proposed draft Act. For larger urban areas that fall under Class A, there would be a body of decision makers while Class B Thromdes would function under the Dzongkhag or Gewog Administration. The powers and functions of the Local Government have been described and elevated as compared to the Municipal Act 1999 in this Act. These powers have been categorized into general, regulatory, administrative and financial powers. The role of the Chairperson of the Local Government and his/her powers and functions have been elaborated in this document. In this entire document organizes the structure of the Local Government and eases the process of decision making.

2.6.5 Bhutan National Urbanization Strategy, 2008

Royal Government of Bhutan

Ministry of Works and Human Settlements, March 2008

The uncontrolled rapid urbanization in the country and Bhutan entering into a democratic constitutional monarchy has led to the preparation of the Bhutan National Urbanization Strategy. Inferences were drawn from 'Bhutan 2020: A Vision for Peace, Prosperity and Happiness' as it provides a strategy for the country's development over the next decade up to year 2020. The two key urban sector issues as identified here are the rapid rate of urbanization and limited availability of serviced land. The report identifies the regional growth centers in order to achieve a balanced and equitable regional development. It has rated Phuentsholing one amongst the seven cities with national importance and has projected its population to be 30,000 by year 2020. The report indicates that Phuentsholing has the second highest rate of in-migration over the past decade. It has also identified Phuentsholing as a growth center with revenue generating activities of Tourism, Industrial Establishments, and Hydropower Plants. This in turn would generate employment and govern the majority economy of the Kingdom.

The information in this report is found very helpful and it is studied in depth for the planning of these two towns.

2.6.6 Statistical Yearbook of Bhutan, 2009

National Statistics Bureau

Royal Government of Bhutan, October 2009

This report provides official data that is helpful for future planning and comparison among Dzongkhags. Information in various Dzongkhags on population, health and education facilities, labor and employment, Land uses and distribution of agricultural lands, industrial setups, transport and communication facilities, tourism and banking and finance as of year 2009 are stated in this report.

2.6.7 Economic Development Policy of the Kingdom of Bhutan, 2010

Royal Government of Bhutan, 2010

The vision of Bhutan's Economic Development Policy is to promote a green and self reliant economy sustained by an IT enabled knowledge society guided by the philosophy of GNH. This Policy provides the basis for government intervention to enhance productivity of the economy as a whole. It shall be the apex policy for economic development of the country and shall be the guiding document for all ministries and agencies to stimulate the economy growth and more importantly, to ensure that growth takes place in consonance with the principles of GNH.

The main objectives of the policy are 1) to achieve economic self-reliance by the year 2020 & 2) Full employment (97.5%). The time line to achieve these goals shall be 2020 and will be subject to periodic review.

The areas having highest potential to generate wealth, employment and sustainable growth within the framework of GNH are as follow:

- High quality green services
- Agro and food based production
- Energy
- Information and Cultural Industry
- Natural resources
- Transportation and related services
- Construction
- Other Manufacturing

The policy also states that the southern region shall be promoted as the main economic hub for trade, transport, storage and manufacturing through creation of industrial estates, dry ports and SEZs. While in the interior areas, focus will be on the promotion of services, cultural and high value products.

3.0 THE VISION AND CONCEPT

The overall vision for Phuentsholing town, as accepted by the stakeholders during the public consultation meeting held as part of the structure plan is presented in this section along with relevant design principles, themes and planning components for implementation.

3.1 VISION FOR PHUENTSHOLING TOWN

"To Create Phuentsholing as a socially and culturally vibrant city with the emphasis on Sustainable Business and Tourism by applying smart growth principles".

3.2 SMART GROWTH DESIGN PRINCIPLES

Smart growth is an urban planning and transportation theory emerged in the early 1990's that concentrates growth in compact walkable urban centers to avoid sprawl. It accepts that growth and development will continue to occur, and so seeks to direct that growth in an intentional, comprehensive way. Its goals are to achieve a unique sense of community and place; expand the range of transportation, employment, and housing choices; equitably distribute the costs and benefits of development; preserve and enhance natural and cultural resources and promote public health. Smart Growth principles are directed at developing sustainable communities that are good places to live, to do business, to work, and to raise families. Smart growth is related to the principles of intelligent urbanism and more appropriate in case of Phuentsholing considering its present status. The following eight principles represent the basis of smart growth in case of Phuentsholing.

3.2.1 Principle One: Community and Stakeholders' Involvement

A key component of smart growth is to ensure early and frequent involvement of all stakehooders to identify and address specific needs and concerns. For the city vision to be effectively implented, it is important to have citizen participation, understanding, involvement and support in the planning process. Ensuring a high level of public awareness is one of the most fundamental strategies to guarantee that community needs and possible solutions are fully considered. This strategy can help local leaders better identify and support development that meets those needs.

This process can be time-consuming, frustrating, and expensive. In many cases, involving the public is a contentious and even messy process because of the diverse ideas and priorities among stakeholders. Citizens may find different components of smart growth particularly appealing and other principles of less interest. However, citizen involvement and commitment is necessary to garner the long-term support and speedy resolutions to development conflicts.

Every community should develop its own range of methods to reach as many individuals and segments of the community as possible. To reach the stakeholders, a local government might hold evening or weekend meetings on specific issues, conduct focused group discussions, host design charrettes, distribute radio public service announcements or work with local community groups. Often, lower-income communities feel less politically empowered to participate. To reach these audiences, localities can issue neighborhood notices or post notices in local newsletters and local gathering spots such as post offices, popular shops, or local farmers markets. In this way, residents will work with their governments to create more

livable, vibrant communities and any project will have a better chance of successful implentation. Creating a system of public spaces and green open places is a goal of the plan, which can bring about better community interaction.

3.2.2 Principle Two: Walk able neighborhood

Walk able communities are integral to achieving the goals of smart growth because they enhance mobility, reduce negative environmental consequences, strengthen economies, and support stronger communities through improved social interaction. Communities can be built so that walking to destinations is a viable alternative, thereby improving access to services for the one-third of the population that is too old, too young, or too poor to drive. Communities that enhance pedestrian access provide many benefits for the environment. For example, by reducing the need for people to drive cars to every destination, pedestrian design can improve air quality. Walk able, mixed use Landuse is encouraged, over single-functional blocks linked by motor ways and surrounded by parking lots. Creating such pedestrian friendly environments is a goal of the Phuentsholing Structure Plan.

3.2.3 Principle Three: Create Attractive Communities with Strong Sense of Place

Smart growth supports the idea that development should not only respond to basic commercial or housing needs, but should also help create communities that are distinctive and unique. Smart growth seeks to foster the types of physical environments that create a sense of civic pride, and therefore support a more cohesive community fabric. As a result, economic benefits accrue as well; high-quality communities with architectural and natural elements that reflect the interests of all residents are more likely to retain their economic vitality and value over time.

Conventional development pattern has helped to create a predominance of low rise and low density residents and neighborhood shopping centers that are, with the exception of small cosmetic variations, largely indistinguishable from one another. While such an approach may conserve costs initially and make development more profitable for some, it does little to stimulate civic pride or contribute to a strong sense of place with which community residents can identify. This can be achieved by respecting traditional building practices, retaining existing cultural assets and addressing local geo-climatic conditions when planning for the future. Giving the city a distinctive Bhutanese character is a goal of the plan.

3.2.4 Principle Four: Mix Land uses

Mixing Land uses like commercial, residential, recreational, institutional, and others in urban villages or places that are accessible by foot can create vibrant and diverse communities. A mix of uses attracts people to shop, meet friends, and live in urban villages like traditional Bhutanese small towns and villages. Mixed Land uses are critical to achieve the great places to live, work, and play that smart growth encourages.

While the separation of Land uses was originally intended to protect communities from polluting industries and such businesses, it can led to a land development pattern in which stores, housing and schools are often placed so far apart that they can be reached only by vehicles. Separate uses levy larger social costs by fundamentally changing the character of communities and undermining the viability of opportunities for people to walk to shops or work, and to meet and chat with their neighbors on the way.

A mix of Land uses provides a more diverse and sizable population and a wider commercial base to support public transit. Mixed Landuse can enhance the vitality and perceived security of an area by increasing the number of people on the street. Mixed Land uses also convey substantial fiscal and economic benefits. Commercial uses in close proximity to residential areas often have higher property values as there are more people in that area to shop. Furthermore, a mix of Land uses helps streets, public spaces and retail stores again become places where people meet, thus helping to revitalize community life. Planning for the most beneficial and healthy Landuse mix against the present mismatch is a goal of the plan.

3.2.5 Principle Five: Make Development Fair and Cost Effective

In order for smart growth principles to work, the various components must be cost effective. Efficiency promotes a balance between the consumption of resources like energy, time and finance, with planned achievements in comfort, safety, security, access, tenure, and hygiene. It encourages optimum sharing of land, roads, facilities, services and infrastructural networks reducing per household costs, while increasing affordability and civic viability. While Phuentsholing has limited land availability for future development, redevelopment and densification of present unutilized or poorly utilized land is a goal of the plan.

3.2.6 Principle Six: Preserve Open space, Natural Beauty and Critical Environmental Areas

Open space serves many purposes, such as green space, animal habitats, plant growth zones, production lands, recreation experiences and wet lands. Additionally, open space may be a part of the natural beauty of the community that supports quality of life experiences. Open space should be viewed as land that is worthy of protection, preservation or appropriate use and not just unused land. Networks of preserved open space and waterways can shape and direct urban form and at the same time prevent haphazard developments. These networks, known as "green infrastructure," help frame new growth by locating new development in the most cost-efficient places.

There are significant fiscal, environmental quality and health benefits associated with the protection of open space. Preservation of open spaces benefits the environment by combating air pollution, attenuating noise, controlling wind, providing erosion control, and moderating temperatures. Open space also protects surface and ground water resources by filtering trash, debris, and chemical pollutants before they enter the community's water system.

It emphasizes the distinction between utilizing resources and exploiting them. It focuses on a threshold beyond which deforestation, soil erosion; aquifer depletion, silting, and flooding reinforce one another in urban development, destroying life support systems. The principle promotes environmental assessments to identify fragile zones, threatened natural systems and habitats that can be enhanced through conservation, density control, precinct and open space planning. Creating a sustainable urban environment is a goal of the plan.

3.2.7 Principle Seven: Provide a variety of Transportation Options

Providing people with more choices in housing and transportation is a key aim of smart growth. With rapid urbanization and increased distances, communities are increasingly seeking for a wider range of transportation options that are time and cost efficient. This would also mean coordination between land use and public transportation as transit services would require supportive Landuse in order to be most cost effective. The provision of parking lots at convenient locations is also important as that will influences an individual's choice to drive, walk or take public transport.

There should be an integrated transport system comprising walkways, cycle paths, bus lanes and automobile channels. The modal split nodes between these become the public domains around which cluster high density, mixed-use urban villages. The city will grow in an ad-hoc manner unless the transport network is carefully conceptualized. Modes of transport such as air, bus, truck, taxi, automobile, cycle and pedestrian must all be integrated. Advocating a transit oriented development is a goal of the plan.

3.2.8 Principle Eight: Create a range of Housing Opportunity

By using smart growth approaches to create a wider range of housing choices, communities can begin to use their infrastructure resources more efficiently and better accommodate the housing needs of all residents. Housing is a critical part of the way communities grow, as it constitutes a significant share of new construction and development. More importantly, housing provides people with shelter and is a key factor in determining a household's access

to transportation, commuting patterns, access to services and consumption of energy and other natural resources. Providing quality housing for people of all income levels is an integral component in any smart growth strategy.

In summary, smart growth principles can help create a city that is a medium for personal, social, and economic development by providing a variety of opportunities for education, recreation, employment, business, mobility, shelter, health, safety and basic needs.

3.3 GROSS NATIONAL HAPPINESS

The term "gross national happiness" was coined in 1972 by His Majesty King Jigme Singye Wangchuk. He used this phrase to signal his commitment to building an economy that would serve Bhutan's unique culture based on Buddhist spiritual values. At first offered as a casual, offhand remark, the concept was taken seriously, as the Centre for Bhutan Studies, under the leadership of Karma Ura, developed a sophisticated survey instrument to measure the population's general level of well-being.

Gross National Happiness is not just an improvement in the living standards, nor is it the enhancement of the Physical Quality of Life. It is the creation of a system in which each individual gets an opportunity to explore their own potentials and develop them to the maximum extent possible.

As the society grows and matures and people get educated the economy becomes more broad based, his majesty the Fourth King's Gross National Happiness dream will become even more relevant. This new image and dream of a society that promotes happiness will be clearly shaped up in the form of the Bhutan's towns and cities.

3.4 THEMES OF THE STRUCTURE PLAN

There are various ways in which a town, a city, a region could be planned. Therefore it becomes our prime responsibility to identify the aspects that could govern the future of Phuentsholing. It is time to define the city vision based on smart growth principles. Following are some of the themes representing the structure plan for Phuentsholing:

3.4.1 Creating an Economic Base

Investment in the sectors of trading and industrial development would boost the country's economy in multi-folds. Geographical location and their connectivity to surrounding areas also play a vital role in governing the country's economy.

Phuentsholing is envisioned as a Growth Center for south-western Bhutan serving a series of smaller settlements, or Service Centers, like Samtse and Chhukha. Thus, next to Thimphu, the Growth Centers become apex focal points for financial institutions, social services, health care and education. There will eventually be up to five Growth Centers in Bhutan, energizing development in these areas, and creating wealth for the nation.

Growth Centers are also "out-reach" hubs from which professional services, training support, technical support, security force and development support communications emanate. An important function of the plan is to provide institutional space for these services and facilities.

Special Policies for Catalyzing Growth

The underpinning public policy required to support the economic growth of Bhutan will be focused on the following three areas:

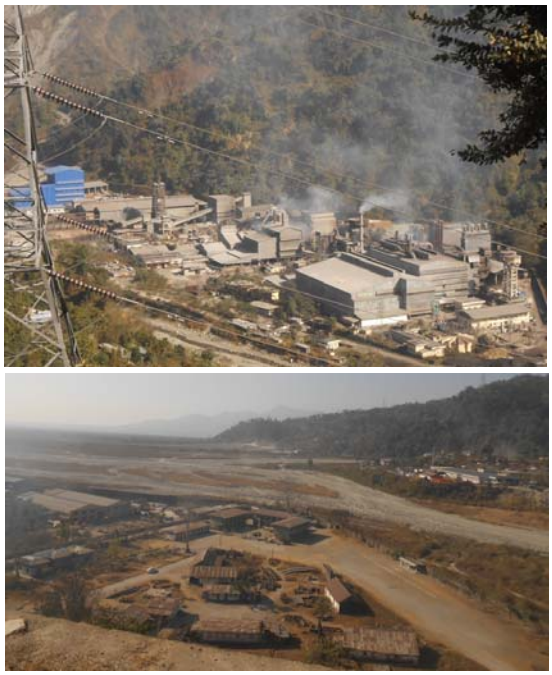
1. Infrastructure investment
2. Incentives
3. Facilitative Regulation

These policy initiatives will act as a convergence of "development fillips," which serve multidimensional goals like:

- Increasing exports to create a positive balance of trade,
- Creating attractive, well paying jobs for Bhutanese youth,
- Capitalizing on the “value added potential” of inexpensive energy, instead of exporting that potential to neighbors who use the energy as an investment input, and re-import the products of those investments into Bhutan. This strategy brings "value added" and profits from energy to the country itself!
- Increasing the yields of long term corporate income tax yields; and,
- Enhancing national financial institutions and building up surplus capital for reinvestment in new economic activities.

Economic Infrastructure and Industrial Estates

Phuentsholing holds good potential for employment, exports, import substitution, capital formation, revenue generation and maturing all sectors of the economy. A well planned industrial estate is established at Pasakha and is already in operation. The industrial estate has rationally laid out sites, access roads, electricity and water supply. This has attracted a big number of private investors. These investors are offered with all the services at subsidized rates in order to promote future industrial developments that will govern the economy of the country.



Existing Industrial Estate at Pasakha

Dry Port and Free Trade Zone

As the portal to south-western Bhutan, and the "staging center" for all major infrastructure development in the region, it is essential that sea borne and road borne shipping containers can be imported and exported from Bhutan directly, without the added costs of customs and clearances through neighboring ports. It is of utmost importance that a Dry Port is established in Phuentsholing and a Free Trade Zone is part of the Special Economic Zone. In this manner manufacturing units can import components into the Special Economic Zone, assemble them and re-export the complete products with the value addition. The capital assets, jobs and corporate taxes will remain within Bhutan.

New Phuentsholing-Samtse and Phuentsholing-Sarpang National Highways

The major bottleneck today is access via good road transport. Connecting the western and eastern regions of Bhutan through Phuentsholing will create new avenues. This will help set higher goals and achieve them. The eastern highway connectivity in between Phuentsholing and Samtse is already in progress. Also, extensive studies have been carried out to connect Phuentsholing to the Eastern Zone of Sarpang and Gelephu through an eastern highway. Connecting these two regions would help boost Bhutan's economy by filling in these strategic lacunas. It will open up the entire belt from east to west zones for development in stages, through strategies which are evolving in Phuentsholing and Samtse regions. An efficient transportation network can make the import and the export of products possible on a larger scale.

3.4.2 Gateway to the Kingdom

Paro international Airport acts as a prominent gateway to the kingdom for foreign visitors. Whereas, the Bhutan gate in Phuentsholing is the entry point for the road travelers. It is a good opportunity to plan the area thoughtfully and showcase traditional Bhutanese architecture and culture.

At present, traffic congestion is frequent on the entry road. For a smooth traffic flow there should be systematic traffic management and vehicle segregation should be made at the entry points:

1. One for passenger vehicles such as buses and automobiles; and,
2. Another for cargo vehicles.

There is also a potential to bring a rail head into the Pasakha industrial estate and/ or at Pekarshing (Toribari) where the Dry Port is proposed.

Passenger Entry

The passenger entry would be specifically meant for private cars and passenger vehicles such as buses and taxis. Upon crossing the immigration, security and custom check points these vehicles will be allowed to enter the Kingdom and have a smooth flow towards their destinations within the city and to the various parts of the country.

Cargo Entrance

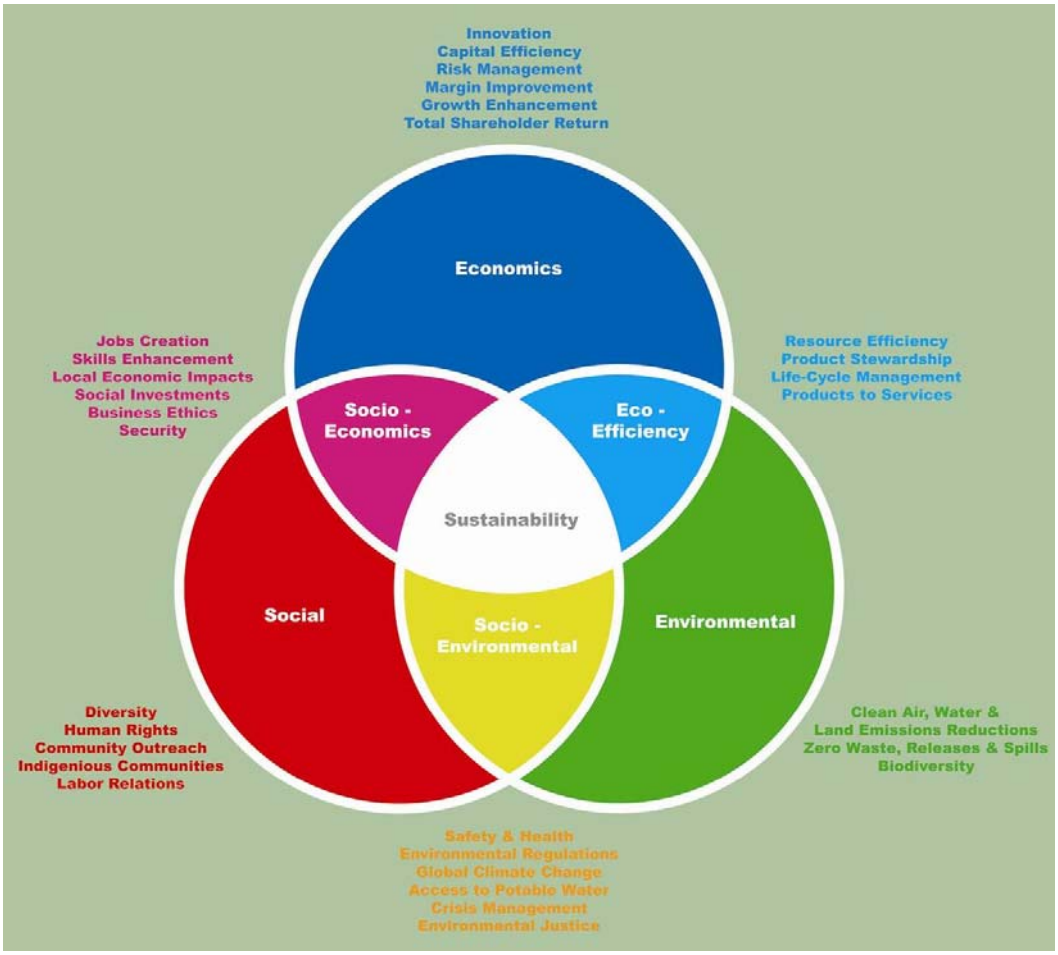
The Cargo Entrance shall specially cater to the heavy goods transport vehicles such as trucks and cargo trailers. This entrance shall have necessary immigration, security and customs facilities. The entrance shall be linked be linked through the proposed 4 lane by-bass to various destinations viz., the industrial estate, the dry port estate and other eastern, central and western regions of Bhutan. This entry will be more than just a "pass through" place. It will be a well organized, neat and clean transport center and will serve as major attraction for industries to invest in the area, as their exports can move directly from the Dry Port to the shipping ports of Dhaka, Kolkata and Haldia Ports for trans-shipment.

Thus, this Gateway to Bhutan not only facilitates the inward movement of tourists, citizens, businessmen and traders, but more important it creates a major Export Channel for produces within the country. These facilities shall be integrated with the Ministry of Trade and Industry's new industrial estate.

3.4.3 Sustainable Environment

With increase in population and increase in development activities, changes in present Landuse and consumption of natural resources are bound to happen. An excessive use of natural resources can outpace the ability of an eco-system to replenish itself and hence, result in to imbalanced ecology and natural calamities. Implementing precautionary policies to prevent environmental degradation and protect the fragile ecosystem will be a prime concern in the planning process.

The environment of the city with Ammo Chhu River and its surrounding streams is a major theme. Conservation of the riverfront by redefining its boundaries and making use of the land thus made available in abundance for the recreational purposes is an important theme of the plan. This will help create a new identity for Phuentsholing as a Tourist destination that would attract people from within the country and a high number of international tourists.



3.4.4 Integrity among Tradition and Technology

Every society has a dream of what it is and an ideal form of how it should be. In Bhutan, the villages have houses clustered together and a tradition of community and a tradition of sharing spaces. The Chortens are placed along the rivers as basic markers of urban space. Enclosed spaces are prominent in larger structures like the Dzongs and the Monasteries with arcades and porches. Other prominent features like the traditional gateways, mani walls, prayer wheels and pavilions are commonly seen in the Bhutanese villages and towns. Most importantly there is a spatial tradition of "community" which is rich in its history and in its diversity. It is focused on bringing people together, while respecting their individuality.

Religious Structure: Chorten

In olden days people used to walk to places,

meet passersby on the streets and greet them. Market used to be a meeting point for almost everyone. Traditional games of archery and khuru were a mean of entertainment where people from all levels used to come together and enjoy the tournaments as one. These were the binding factors for the communities in Bhutan.

Due to modernization, exposure to a mechanized world and westernized lifestyle people have moved to using cars, make a quick stop at a corner shop to make purchases and television became the sole mean of entertainment. Differences were sighted amongst the communities as the clustered settlements began to spread out and sports field had separate archery groups one using power bows and another the traditional ones. These are a few factors that lead to the fragmentation of the communities.

We need to take lessons from these findings and then lay our plans on paper that would be modern but will have traditional values within.

The Religious and Cultural meaning of the city must also be a major theme. The Urban Development Plan for Phuentsholing 2002-2017 had identified a few locations of religious importance and a few of such identified projects were prioritized and implemented. An emphasis on such religious structures of importance in the extended areas is a must.

We must realize that urban growth is unavoidable and sure. What is not sure is that we respond to this inevitable change in a positive and imaginative manner. Again, cities are both the means and the ends of development. They can be used to provide a comfortable urban living or they can be left on their own to create squalor and decline into decadence. Their security, social and economic opportunities, infrastructure, financial institutions and political expression lead to a successful system and satisfaction among the citizens. Thus, integrated city planning is at the core of a nation's survival and development.

3.4.5 Community, Conviviality and Human Scale

Well planned cities take care of the scale at which it is built, especially the public places, streets and the institutes. Neighborhoods and streets must have a human scale and pedestrian network. A balance between the open and built mass determines the quality of life an urban area offers to its residents.

Recreational Activities along the River

This Structure Plan for Phuentsholing is about:

1. Communities that are people oriented and of human scale;
2. Communities that provide the youth more opportunities for livelihood;
3. Communities that are more diverse in their economic bases and potentials for social contacts;
4. Communities that are secure and safe;
5. Communities that are integrated in their uses and in their functions;
6. Communities that sponsor health, hygiene and well being;

7. Communities enhance skills, knowledge, and awareness through education;

Opposed to these community-based concepts stand models of mechanization, fragmentation and isolation of the individuals. It is the stakeholders and future generations who have to decide how to shape up this man-made environment and conceptualize our communities. This is an opportunity to strive for something better and futuristic for our city.

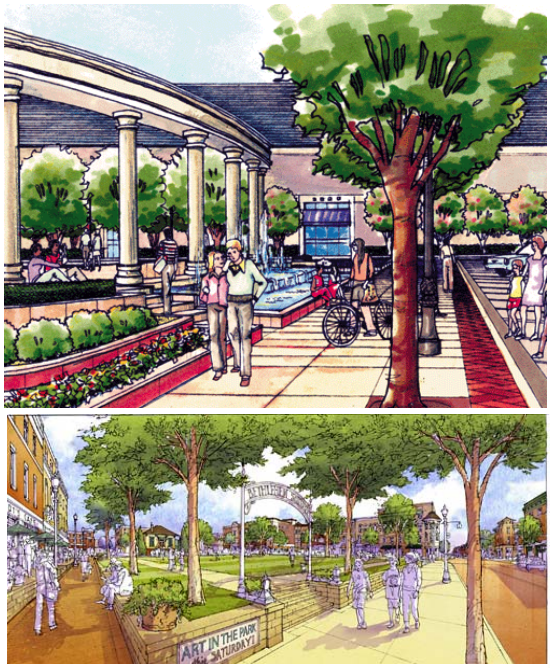
Creating an opportunity for the two generations to come together- grandfather and grandson

Our plan for Phuentsholing must respond to the needs of different ages and genders. Grandparents and older people would like to visit religious places and gardens with their grandchildren. They would like to meet their friends in a public park, or just sit in the sun and read. The city must be a city for elders as well as for the youth. Young people need sports complexes and they need a place where they can hang out. They need libraries, cyber cafes, discos and reading rooms. We have to plan for the youth who are the future of our country.

If the planning is sensitive, people will better associate with the city and they will become the advocates and guardians of all the public assets, be it roads, gardens or street furniture.

3.5 PLANNING COMPONENTS

The above themes shall be implemented through following planning components. Around each of these elements arise certain principles and guidelines. These principles and guidelines are the essence of the planning process. Through consultations with the people of Phuentsholing we would arrive at both physical representations of these principles as well as written rules and guidelines.



Segregation of the Vehicular and Pedestrian Movement in the Core Area

3.5.1 The City Core

The center of the city is what gives it life and character. It is essential that this zone of the city generate exuberance and a variety of activities. It must be dense, safe, clean and easy to move in.

The Urban Core for Phuentsholing can be defined as the zone from the existing commercial area down to the river. Presently, it is characterized by dense built

mass and a lack of open space. The buildings are placed so close to each other that it makes the environment claustrophobic. Pedestrians do not feel safe due to uneven surfacing of footpaths, abrupt discontinuation of roadside walkways and heavy vehicular traffic. Vehicular movement is mostly in the form of a single lane carriageway that is found to be unsafe and hazardous.

Decongestion and pedestrianization of the city core is felt to be on highest priority. Efforts are required to make the city core as a lively community gathering space that is pedestrian friendly and people oriented. Sufficient parking spaces for visitors and residents need to be allocated. An alternative location, which will act as an extension to the present city core, preferably towards the far eastern end of the municipal limits will help ease out the pressure on the present city core. It must be attractive to the visitors and citizen alike.

Spaces along the river and parks give a character to the public domain

3.5.2 The Public Domain and Community Participation

The Structure Plan emphasizes that our communities must be designed with mix Landuse to reinforce the public domain. The city form and identity must integrate historic context, unique ecologies and an integrated regional structure.

Settlement patterns are the physical foundations of a society. The settlements can fragment societies or integrate them. Isolated projects, Land uses, zoning and land markets can segregate income groups, ethnic groups and occupational groups. These haphazard planning techniques can isolate people and activities in an inefficient network of congestion and pollution rather than joining them in to diverse, healthy and human scaled communities.

Provision of benches along the walkways and places that brings parents and children together

The structure plan will lay out the main structure, the central themes and coherent ideas and necessary actions to promote a better future. It is time to define the Bhutanese Dream in terms of sustained

urban form and fabric. It is time to revive the public domain where the spirit of Bhutan dwells.

Public domains are areas, places and spaces that belong to everyone and provide an opportunity for community gatherings. Ay any scale, it is not the individual space itself, but its placement in a social background and often in a bunch linked with other such spaces, which shape up an urban fabric of community gathering places. Society is looked upon at a micro level about how people relate to each other and gather together. Finally, it is the citizens who make the place and the implementing body is not the only one responsible to make the city livable. It is equally important that citizens consider the city as their own and take up the initiative to inform the authorities and sort out any infrastructure issues like cleanliness or water logging in the neighborhood public places. At times, water is overflowing through the water tanks at night time, sewer pipes are leaking, the building surroundings are not kept clean due to any ownership from the inhabitants.

There are many types of public domains. The community owns most domains; others are held in trusteeship by institutions, or even privately owned and managed. The most elemental "public domain" is the footpath. Footpaths become more sophisticated when they turn into covered arcades. Shelter gives the footpath more flexibility and significance. Arcades become even richer when they expand into outdoor courtyards and there are festive activities like art exhibits and cafes.

This domain can be nurtured in a number of areas besides the city core. There are varieties of opportunities along the Ammo Chhu, in residential neighborhoods, in cusps of trees and in the form of a city gateway. Lighting, plantation and landscaping plays a vital role in reshaping the city and making the existence more lively and meaningful. There could be a number of public domains planned, which could give an identity to Phuentsholing city. For example,

1. The vegetable market
2. River front development would include:
    - Pedestrian and bicycle tracks
    - City level parks
    - Archery Ground
    - Indoor Sports Complex
    - Water Sports facilities
    - Drive in Theatre
    - Pedestrian bridges across the river
3. Open Spaces Networking

Proposals will be made to have an open space system in the entire municipal limits. The open spaces will be linked with the river front, streets, footpaths and bicycle tracks. All these large open spaces will be planned to have informal activities taking place resulting in creation of a lively atmosphere. For example, an extended open space system on Goeten Lam (Lam means a road) can be developed, where the road is to be pedestrianized with just a paved area for delivery vehicles to come and leave. It can act as an extension to the shops and restaurants related activities facing the road.

3.5.3 Open Space System

One of the most important elements of Phuentsholing Structure Plan will be the open space system. This will be in the form of an open green corridor that will run along both the sides of Ammo Chhu River. Placing sports facilities, gardens, and natural open areas along it will maintain this system.

Where possible the open space system would take in heritage sites. The religious structures like the Monasteries, Mani Walls and Chortens within the municipal limits can also become a part of the opens space system and enhance the public space.

Phuentsholing has a relatively warm and humid climate as compared to other regions. Green belts along the Am Mo Chu that will house recreational activities and water sports will be an attraction to the residents and visitors/ tourists. If investments are made in such kinds of developments they will act as a long term asset to the future city. These will be good revenue generators. Water sports training camps can be an attraction for children during their vacations.

A sports complex along the river will form a part of the open space system. The complex would have indoor sports facilities of badminton and basket ball courts, table tennis, gymnasium, yoga and meditation. The same complex could have lawn tennis, volleyball and swimming pool facilities in the outdoors. Sports tournaments for the various schools in Phuentsholing city and adjoining Gewogs could be held here.

Present Ammo Chhu

Possibilities of merging the mountain Kailashwar Drangra to the Phuentsholing Thromde, Chhukha Dzongkhag should be given a thought. It can be merged together with the development of the Ammo Chhu reclamation work and can form a very important tourist destination. Projects related to tourism can be a huge revenue generator and Phuentsholing being a growth center can take care of the necessary investment and maintenance in a long run. Discussions should be made at higher levels and decisions be made on a priority basis in order to take necessary steps while developing its surrounding areas.

There are many examples of cities in America, like Boston and Kansas City, which have been able to recapture their open spaces, by reclaiming river beds, old industrial areas and integrating them into their existing park and open space systems. It is important that we look at the open spaces in the city of Phuentsholing carefully and reclaim what we have.

3.5.4 Urban Corridor

Once a sequence of public domains is created, the present city area will act as a focal point and surrounding local areas will have neighborhood nodes. They will be then linked by various paths or the urban corridors, which will have their unique characteristics based on the adjoining activities.

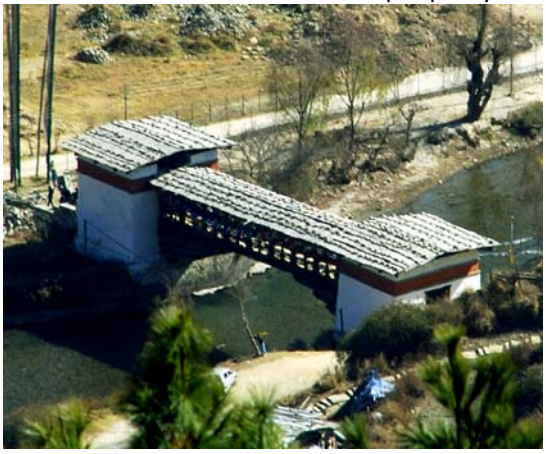
A series of neighborhoods are connected through the road link between the present Phuentsholing city and the extended areas in the Eastern Municipal limit. The urban corridors will be so designed that they provide strong linkages among the neighborhoods. The street infrastructure should be pedestrian friendly, which will allow interaction among various user groups.

Today, the increasing use of automobiles isolates the passengers from their fellow mates on the streets and creates a sense of differentiation. Vehicular traffic growth leads to huge amount of black topping and creation of hard paved areas with a high implementation and maintenance cost. As a result it leads to environmental degradation and reduces the willingness of people to walk. The alternative to the private automobile is clean, comfortable and reliable public transport. Public transport must be a key component of the plan, which can balance the pedestrian and the machine. Citizen friendly urban corridors and systematic traffic management can determine the spread and pattern of urban areas and its liveliness.

3.5.5 Footpath System

A pathways network will be established in the neighborhood areas, institutional areas and core area. The pathways will run along the streams along the buffer zones and will have to be extended to the Ammo Chhu. Traditional footbridges would be constructed over the Ammo Chhu at regular intervals. In case if two pockets on either side of the streams do not have road connectivity, pedestrian bridges can be helpful. This system of “off street” footpaths must be extended for the new planned areas so that people can conveniently walk down in the city core and all the adjoining neighborhoods. We must integrate pedestrian bridges into the footpath network to make the river a more vibrant place.

Phuentsholing does not have a specific institutional zone as they are located all over the city. Efforts should be made to create planned open spaces and pedestrian network system within the larger institutions and campuses. The vehicles should be restricted on the periphery and use of bicycles inside the campus should be made mandatory for regular visitors and users. Planning of footpaths should be given equal importance as the planning for vehicular movement.



Traditional Foot Bridge

Off street footpaths, merged into the open space system, along with watershed development in the rivulet gullies can create a lively street environment. There must be a boundary footpath which links picnic areas, viewpoints and religious places and there must be another loop around the

river. Both the paths can be joined by a system of stairs and ramps.

3.5.6 Urban Villages


Ura Village

The Structure Plan sees Phuentsholing as a system of communities. There are family communities, neighborhood communities, the city community, and specialized communities of interest groups within the city. All of these communities fit into an urban hierarchy and are linked to one another. The most essential community is the neighborhood community. There are various Neighborhoods identified in the present municipal limits that act as extensions to the city core. These will predominantly have a residential and supporting commercial development while The Phuentsholing core area will be a mix of residential, commercial and institutional development. These neighborhoods are coined as Urban Villages.

Each Urban Village would have a node, which would be like a traditional village center. It would have a small park with toddlers play area. It would have a taxi kiosk, with a newsstand, a clinic, provisions shop, barber, neighborhood pub, bakery, cyber café, laundry and other convenience shops. This would be a vibrant node where mothers can take some time off during the day and walk down to meet friends and do a little shopping. The park would be next to the transport station, so that alighting passengers could relax and do some shopping on the way home from work. The parking area would also be attached so that shopping can be more pedestrianized and the node and the transport station can use the facility together. There are ample Bhutanese examples (Ura Village above) of traditional communities and cozy, well designed neighborhoods.

3.5.7 Forest Boundary and Natural Landscape

The city is surrounded by hills, which reach up into the mountains. There are lush forests providing a magnificent backdrop. This forest carpet acts as an air filter and a breathing lung for the city.

There are already intrusions up into the forest in various parts of the country that ultimately result in soil erosion and landslides. Phuentsholing is a land slide prone region and soil erosion is taking place at an uncontrollable pace. It is important to conserve and enhance this natural asset of the city. A boundary can be defined in the form of a peripheral footpath. There can be picnic spots, small archery lanes, camping grounds and lookout viewpoints over the city. The path can follow a contour line, easing ones movement on foot. No development should be allowed above this facility which acts as a “boundary.”

Just as we are concerned about the forest areas, the green areas of the city should be also taken care of. There are local species of trees and plants, which have their own seasonal colors. The parks in the city can all have color and scent themes as per the seasons. Likewise the landscaping around the monuments and religious structures must be planted with thought and consideration. Greenery does not mean wild trees. It means well considered and articulated planting related to visual needs in terms of colors, shade, directing views, blocking and opening vistas and in terms of the other senses like smell and even touch.

3.5.8 Peripheral Zone Control

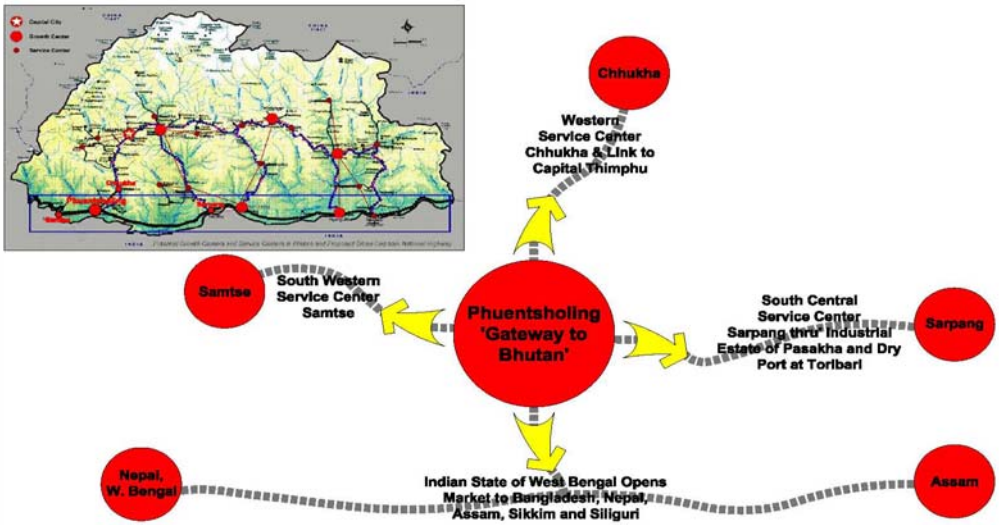
There is a great deal of slow, but continues "eating" of the hillsides above the city due to various activities. There should be a zone beyond the Forest Boundary where the development is regulated to protect the greenery and soil. The trees, soil and natural aquifer system protects the city from landslides, acting as a natural air filter and providing a beautiful urban backdrop. Where there are buildable flat lands available very low-density estates can be created with green activities. But, along the steep slopes above the city rim, no development should be allowed. View spots can be developed above Dhamdara, Kabreytar, Rinchending, Ahlay, Pekarshing (Toribari), Khogla and Malbase and a sky lift may be envisioned to take people to a high viewpoint over looking Phuentsholing city. But these matters need to be thought out very carefully and with the assistance of qualified environmentalists. The Ministry of Works and Human Settlements has established a special division that shall take care of all such peripheral zones that fall under rural areas.

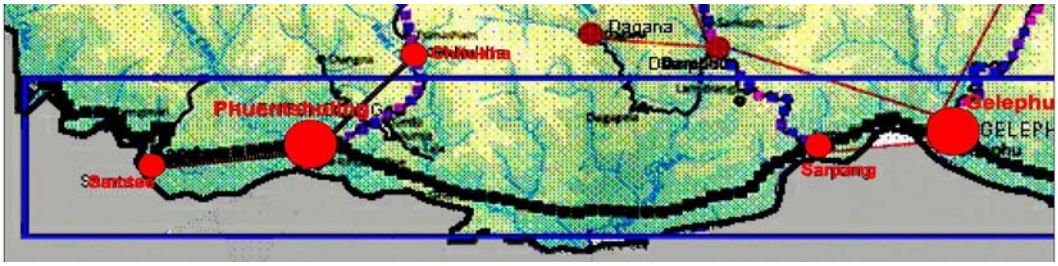
4.0 PHUENTSHOLING: PRESENT SCENARIO

4.1 REGIONAL SETTING

Phuentsholing is considered as "Gateway to Bhutan" due to its location on Indo-Bhutan boarder at its south-west. The city forms part of the urban settlement that includes the adjacent Indian city of Jaigaon. The international boundary is very porous. Although traffic movement across the boundary is controlled at Bhutan Gate there are numerous other places where pedestrians can freely walk from one country to another, indeed there is one street (Sang Lam) where buildings opposite each other are in different countries.

It is accessible by road from India and the nearest airport is located at Bagdogra in India, which is about 4 hour's road journey from the city. The city is about 175 Km away from Thimphu, the capital of Bhutan.





The following table gives its distance from the capital city and the major urban centers.

Table 4-1 Distance to Phuentsholing from important national/international cities

S. No.	Country	City	Distance (Km)	Approx. driving time (Hrs.)
1	Bhutan	Thimphu	176	5.0 – 5.5
2	Bhutan	Paro	149	5.0
3	India	Bagdogra	165	4.0
4	India	Siliguri	155	3.5
5	India	Darjeeling	200	5.5
6	India	Gangtok	220	6.5
7	India	Kolkata	746	12.0
8	Bangladesh	Dhaka	264	9.0 – 10.0

Source: Ammo Chhu Land Reclamation Project Report

4.2 CLIMATE

Phuentsholing enjoys a warm, sub-tropical to temperate climate with an average annual rainfall varying between 500-1000 mm. The average daily winter temperature varies between 5-18°C and the average daily temperature during summer varies between 20-38°C. It experiences all four seasons with a heavy monsoon rain for about three months starting from June. During the summer the weather is much warmer and wetter. The following climate data is based on long term weather and climate records. They are an average for Phuentsholing.

Table 4-2 Climate data for Phuentsholing

	Average maximum temperature (°C)	Average minimum temperature (°C)	Average hours of sunshine per day	Average days with precipitation per month	Average mm precipitation per month
January	19	8	8	1	0-5 mm
February	21	10	7	1	6-30 mm
March	25	14	8	3	31-60 mm
April	26	16	8	6	61-100 mm
May	27	19	7	12	101-200 mm
June	27	21	6	17	Over 200 mm
July	27	22	5	21	Over 200 mm
August	27	22	5	21	101-200 mm
September	27	21	5	15	101-200 mm
October	26	18	7	5	61-100 mm
November	24	15	8	2	6-30 mm
December	21	10	8	1	0-5 mm

Source: http://www.whatstheweatherlike.org

4.3 GEOGRAPHY

The entire area of Phuentsholing comes under Tertiary Himalayan geology. It is located in southern Bhutan at latitude 26° 51' N and 89° 23' E and the altitude of 160 m above mean sea level. Phuentsholing occupies the river terraces of the Om Chhu, which are defined by the steeply rising foothills of the Himalayas, to the North and East, and by the Ammo Chhu to the west. The urban center slopes gently (1-4% slope) towards the Om Chhu and Ammo Chhu rivers. The hill slopes are prone to slips and landslides in the relatively weak zone. The landslide-affected areas are Hatidunga, Rinchending, pockets along Thimphu Highway, Ammo Chhu bed, Dhamdara and Kabreytar. The main reason for landslides is slope failures i.e. inherent lack of strength of materials, which leads to the development of tension cracks on the hill slope. These cracks allow rainwater into hill slopes and thereby enhance the sliding activity. Landslide and slope failure caused by torrential stream is a peculiar feature which should be taken into account while proposing any development plans for Phuentsholing.

4.4 DEMOGRAPHY

Phuentsholing is one of the 11 Gewogs coming under Chhukha Dzongkhag. The latest Housing and Population Census was conducted in 2005, which is considered as the base to understand the demographic trend in the district as well as Phuentsholing Gewog. In addition, the socio-economic survey conducted in Phuentsholing, as part of this study, gives some important inputs. A sample size of 4.5 % (225 H/H's) of the total population was covered for studying the socio-economic profile and demographical trends. The key findings of the data collected in this survey are used as the base data for the planning process.

The total population in Chhukha Dzongkhag in 2005 was 74,387 and out of that 32,926 or 44.26% were residing in urban areas. The urban population data for Phuentsholing and Chhukha in 2005 suggests that about 62% of the total urban population lives in Phuentsholing Gewog. Phuentsholing is the major urban center in the Dzongkhag. Some of the important demographic indicators are for Phuentsholing vs. Chhukha are presented in the table followed on the next page.

The socio-economic survey results reveals that out of the total households surveyed, around 92% of the households are in-migrants to Phuentsholing and a very few households have Phuentsholing as their origin. Most of the households have migrated to Phuentsholing for livelihood purpose or for better education opportunities. More than 51% of the working population is engaged together in government jobs and other public organizations and 27.52% engaged in the Private sector. Business occupation comes next constituting to almost 14% leaving the agricultural activities to the lowest at just 7%. This is due the increasing rate of urbanization where agricultural lands are getting converted to either residential or

commercial uses and such activities are taken over by other small towns and villages in the Chhukha Dzongkhag. In total, almost 74% of the households surveyed earn more than Nu 10,000 per month, which is much above the poverty line. This gives an idea of the employment opportunities that Phuentsholing offers to its residents. As a result it attracts the in-migration and adds to the rapid urbanization.

Table 4-3 Demography

Indicator	Phuentsholing	Chhukha Dzongkhag
Population total (Persons)	20,537	74,387
Area (Sq km)	4.28	1,802
Gross density (Persons per Ha.)	48	0.41
Sex ratio (female per 1,000 male)	1059	759
Literacy rate (% of total population)	68	63
Average family size	4.2	4.8
Net immigration (% of total population)	92	20.80
Source: Bhutan Population Census 2005 & Annual Dzongkhag Statistic 2010		

The survey reveals that only 16% of the surveyed households have self owned houses, whereas more than 58% households are staying in rental housing. Almost 26% of the households (civil servants) reside in government provided housing.

4.5 URBAN SPRAWL AND EXISTING LAND USE

Phuentsholing became the commercial hub of Bhutan since 1960, but the physical growth of city remained haphazard without any development guidelines or land use until 1986. In 1986 Phuentsholing Urban Development Plan (1987-2001) was prepared by the National Urban Development Corporation & United Nations Centre for Human Settlements (HABITAT). However its implementation took place in patches and not in a holistic manner as per the plan.

Foreseeing the potentials and problems of Phuentsholing city, a comprehensive Phuentsholing Urban Development Plan (2002-2017) was prepared in 2004 by Phuentsholing City Corporation with financial support from DANIDA. The main component of this plan was an increase in the municipal area from 186 hectares to 1968 hectares (20.0 sq km) which includes the Ammo chu river bed upto the Kailashwar hill base. However, the actual Municipal Boundary as per the Thromde Boundaries approved by the Parliament dated 2nd July 2010 is only 15.6 SqKm.It outlined the need for preparation of local area plans for all the extended areas like Kabreytar, Dhamdara, Rinchending, Pekarshing (Toribari), Changmari, Pasakha, Gurungdangra, Malbase, Ammo Chhu land reclamation & Toorsatar. The local area plan for Kabreytar was prepared by previous Department of Urban Development & Engineering Services (DUDES) in 2002 and is under implementation. At present the Thromde is also preparing the Local Area Plans for Changmari, Dhamdara & Rinchending. The plan was approved by the government and is under implementation at the moment. The local area plan for the core area was prepared and approved and is under implementation. A number of planning proposals were made in the Plan, but their implementation did not take place as envisaged. The development control rules were missing in the plan and therefore the

construction permits are issued following the Bhutan Building Rules. The present situation indicates that the city has grown and developed without proper approach to planning and without adequate infrastructure. Phuentsholing existing land use break up is given in the following table:

Table 4-4 Existing Landuse (Extended Municipal Area)

Landuse	Area		%
	sq.m	Ha	
Unsurveyed *(Mostly forest and Open)*	772,475.97	77.25	4.60%
Agriculture	1,025,139.06	102.51	6.10%
Commercial	3,944.64	0.39	0.02%
Forest	4,083,489.35	408.35	24.30%
Industrial	840,368.71	84.04	5.00%
Institutional	57,265.71	5.73	0.34%
Mixed	162,451.28	16.25	0.97%
Open	2,649,468.80	264.95	15.77%
Recreational	10,972.68	1.10	0.07%
Religious	14,458.72	1.45	0.09%
Residential	493,768.81	49.38	2.94%
Utility	141,603.66	14.16	0.84%
Waterbody	6,279,913.28	627.99	37.37%
Roads	269,765.58	26.98	1.61%
Total Extended Municipal Area	**16,805,086.24**	**1,680.51**	**100.00%**

Source: Existing Land Use Map

The Development Plan has traditionally been used as a tool to guide the urban development process. But in Phuentsholing, the desired results have not been achieved. Even with the presence of a statutory plan document, the residential, commercial and other areas including the sub-city centers, transport terminus, road networks, public facilities etc. were not developed as per the plan. This all exacerbated the problems of the city, making the civic environment more unhygienic and unsafe for the citizens. The main issues for the slow, restrictive and indirect implementation of the plan and some mismatches in the existing land use are as follow:

Issues:

- Non-availability of land for development
- The ever-increasing population with uncounted migrated population has put tremendous pressure on land, infrastructure and the surrounding environment.

- Natural barrier to expansion created by steep and unstable slopes to the north and north-east, Ammo Chhu to the west and south-west and international boundary to the south-west.
- The forest areas surrounding the city should be conserved as a green belt and recreational uses.
- The core area is the most efficient in term of its Landuse and density of development. However, the warehousing activity has to be discouraged.
- The PWD, Drungkhag, Bhutan Telecomm, Bhutan Post, Forest, Education colonies were built many years ago and have outrun their useful life. Density of development is low, building conditions are poor and road width is narrow, which should be considered for redevelopment.
- With a heavy demand for warehousing, people have changed the Landuse of any particular areas. As a result, the city has as high as 10% of the total area under warehouses.
- Chhukha Hydro Power Authority (CHPA) compound is redundant since the project is completed. The buildings within are hardly used and much land is now vacant, which can be suitably redeveloped to residential complexes.
- Underutilization of the land in the vicinity of the Norgay cinema. Most of the site is vacant in spite of its central location. The value of this land will go higher after the implementation of Samtse Highway and it should be considered for redevelopment.
- Because it is a border town, security forces like Royal Bhutan Army, Royal Bhutan Police, GREF and IMTRAT occupies some area of buildable land.

Unless the existing city core and surrounding area is efficiently utilized, land and housing shortage will be a critical shortcoming for any future development proposal in Phuentsholing.

Building heights

The building height map represents the density of built up area in Phuentsholing municipal limits. Most of the buildings in Phuentsholing city core are two or more storied and on the periphery there are low rise isolated structures. Some of the areas are so dense due to minimal setbacks and multi-storied buildings that it creates a safety concern.

Open space

Open Spaces play a major role in controlling and managing the urban environment, health and climate. It acts like a breathing space for the dense urban fabric or a place for recreation and retreat for the urban population. Trekking, picnicking, camping, fishing and pleasure driving are amongst the most popular recreational activities in addition to regular sports. Providing the space needed for these activities in close proximity to urban communities is a necessity in all urban centers. The total number and area under recreation spaces should be governed by the planning standard and zoning guidelines.

4.6 HERITAGE

Heritage assets provide the inhabitants with both passive, as well as spiritual, forms of recreation. They are special as they offer peace and serene ambience. Every culture and every society has its iconography, its signs and symbols. Bhutan has a unique style of architecture, which is reflected in the various structures, may it be monumental or a simple residence. To study the Bhutanese culture and way of life, it becomes important to assess the present scenario of the heritage structures, which are an integral part of this religious and traditional society.

Zangtho Pelri Lhakhang is a temple located in the city centre representing the heaven of Guru Rimpoche. The multi-storied temple has a huge collection on the life of Buddha.

Kharbandi Gompa is a monastery, which is located a short distance above the city. It is located amongst garden of tropical plants and flowers. The monastery was built in 1967 by the Royal Grandmother, Ashi Phuntsho Choedron. The monastery garden provides great views of the Phuentsholing city and the plains of West Bengal.

4.7 ENVIRONMENTAL ASSETS

Nature functions in its own organized system. All development should be in harmony with nature. The ecological balance has to be maintained at all costs. Any step towards development which disturbs the balance and harmony of nature could lead to devastating consequences like landslides, soil erosion, pollution of natural water bodies and atmosphere, silting of rivers, floods and earthquakes. Environment should be understood as an asset to mankind rather than a mere element.

Topography, vegetation, geology, and hydrology are the primary determinants of the natural system and they are the prime factors for the healthy planning of a town. Apart from understanding the determinants and functioning of the natural systems, utilization and management of the natural resources is another factor to be addressed in planning a town. The uncontrolled utilization of natural resources like water and forests at a rate that the natural system cannot regenerate will lead to depletion of these resources, which would leave the future generations with little natural wealth and major crisis management problems.

Thus, understanding the determinants of the natural system and efficient management of these environmental assets are two essential components of the Structure Plan.

4.7.1 Flora and Fauna

The flora of a region is the vegetation typology of the region. The main vegetation types found in Phuentsholing and Chhukha region are paddy, wheat and other grains, a variety of fruits like apple and orange and vegetables. Due to land shortage for urban development, majority of the fertile agricultural land and farms are converted to non agricultural land use.

Animals like elephants, peacocks, wild boar and monkeys are commonly found in the entire region. Urbanization, conversion of forest lands for agricultural purposes and intense human interface has resulted in the expatriation of these animals from the towns and it's near vicinity.

4.7.2 Water bodies and surface hydrology

Rivers, streams, springs, aquifers, lakes, ponds and ground water are interlinked to each other and the hydrological network formed by them is the nerve of an eco-system. Understanding these links and the functioning of these hydrological units is an important factor in planning and resource management. Water is the prime resource for any habitable place and in case of Phuentsholing it is very critical due to the rapid urbanization and growing demand.

The Ammo Chhu River and its tributaries comprise of the hydrological network for the region. These major streams originate from natural springs, lakes and surface runoffs at higher altitudes and rivulets through the gullies running down the hill slopes. The river and streams support a variety of plant species within the ecosystem in the immediate surroundings of the watercourse. In turn, this eco-system protects the environment of streams and rivers.

There also exists a specific pattern of storm water drainage in the region based on the natural slopes. These are evident from the continuous strips of relief and the topographical character

of the city. The developmental activities like road or building construction would disturb this natural system and it can result into calamities like flood. The entire planning process for the city assumes that essential flood control measures would be adopted towards protecting the city in the future. As a planning principle, zones with potential high risk of flooding should not be considered for intense urbanization. No development but only recreation oriented activities shall be envisioned in these areas.

At present, the forest lands are cleared for urban development and the river beds are either garbage disposal sites or are taken up for urban activities. These are eco-fragile areas that are getting a severe threat from uncontrolled growth. Flood protection, controlling soil erosion, and conserving surface water drainage channels within the city are some of the steps needed to be taken with immediate effect. These zones are truly the functional centers of the natural system. Suitable land uses for these zones is to be identified toward the conservation of these zones in the municipal limit.

4.8 BASIC INFRASTRUCTURE SERVICES

Urban infrastructure like water supply, sewerage, storm water drainage, solid waste management and street lights are among the basic essential services that are operated and maintained by the local authority in a city. Phuentsholing has an average level of the basic services which should be upgraded further to support the economic growth.

4.8.1 Water Supply

The water supply system within Phuentsholing Corporation area is provided and maintained by PCC. 100% of the present population within the Corporation's boundaries and some of the sub-urban areas are connected to the city's water supply system. The outermost areas such as Dhamdara, Pipaldara are served through Rural Water Supply Schemes (RWSS).

The city's water supply comprises of surface water and ground water. Earlier, the Ammo Chhu infiltration gallery and the Om Chhu intake, which were used to guarantee continuous water supply to Phuentsholing was destroyed by the August 2000 flood. Ground water extraction was then initiated including rehabilitation of the surface water intakes to stabilize the water supply. Even though intermittent water supply has to be used, the water supply at present has been satisfactorily restored. The water supply system developed after the flood is provisional, hence a long-term solutions for improving the system was undertaken with DANIDA assistance. The average daily demand was assumed as 7000 m3 per day based on metered water consumption and a per capita consumption of 133 lpcd.

The existing water supply system comprises of operational bore wells, four raw water streams, three treatment plants, 10 water reservoirs, one break-pressure tank, one fire flow tank (nearby the main booster station), approx. 12.0 km of raw water transmission lines and approximately 27 km of distribution pipelines with more than 870 connections. Most of the existing water supply network was constructed in 1990´s. All the service area is under intermittent water supply.

The raw water from various surface water intakes is transmitted to the treatment plants and then supplied through the storage tanks to individual households after treatment. The groundwater from bore wells is treated at the booster station. The capacities of the plants and pumping wells are given in the table below. The North and South treatment plants are operated below the installed capacities because of the loss of main intake during the flood. One of the pumps at the CHPC well field is kept as stand by. The treatment plants are of conventional type and adapt the process of rapid and slow gravity filtration with chlorination.

The total operational storage capacity within the distribution system is 1900 m3. In total there are 12 storage tanks with a total storage capacity of 2750 m3 of which three are within raw water transmission system (break-pressure tanks) and 9 are in the distribution system.

Table 4-5 Capacity of the water treatment plants

No	Plant/ well field	Installed Capacity	Operating capacity
1.	North Treatment Plant (NTP)	2000 m3 / day	1500 – 1800 m3/ day
2.	South Treatment Plant (STP)	2000 m3 per day	1500 – 1800 m3/ day
3.	Rinchending Treatment Plant (RTP)	250 m3 per day	250 m3/day
4.	CHPC/ R&C well fields	4000 m3 per day	3150 m3/day
Source: Water Supply Cell, Phuentsholing Thromde			

There are four different hydraulic zones in the supply area. These hydraulic zones are: areas fed by North Treatment Plant, South Treatment Plant, Booster station and Rinchending Treatment Plant. Northern and Eastern parts of the city and Rinchending area are supplied only by gravity, where as the central and Western parts are supplied by pumping. Because of the water shortage and elevation differences within the service area, the system is divided into several pressure zones where water is supplied from any of the above treatment plants. The supply duration also varies between 4 hr/ day to 17 hr/day based on the elevation and distance from the source.

The house connections are given from the nearest distribution sub mains. The total number of existing house connections is 870. The distribution lines are galvanized iron pipe and their total length is about 12 Km. Connections are metered with one meter for one building and the bills are based on the master meters.

Issues:

- The inability of the current system to meet the present overall water demand of the city of Phuentsholing.
- As the water demand in the present system is larger than what can be supplied from treatment plants, water supply from the sources has to be closed several times during the day in order to refill the reservoirs.
- 60% of the total water supplied is pumped from underground and 40% is from surface water sources. If there is a power cut in the city, 60% of the city's water supply is affected as there are no generators to pump underground water.
- Serious water crisis is faced almost every year during the summer months.

- The unaccounted for water in the present system is very high at about 25% of the total supply.
- Lack of network monitoring systems (e.g. master meters for metering flows in all outlets are needed) and consequently poor control and predictability of the system. The main water source, bore wells at the CHPC colony, booster station and MSD tank are not equipped with master meter.
- Most of the service area is under intermittent water supply, which means the pipes are not pressurized and the risk of mixing of harmful ingredients from outside is high. Thus, intermittent water supply causes several health related and technical concerns.
- The raw water mains including the pipe bridges are prone to damage due to landslides and the raw water becomes turbid during monsoon.
- Low network pressure (0.2 – 1.5 bars) particularly in few zones
- With growing population and higher demands, the crisis would worsen and it may become necessary to ration water supply.

4.8.2 Storm Water Drainage

Phuentsholing has a hilly terrain which slopes gently towards Ammo Chhu and Om Chu rivers. The annual precipitation is in the range 500–1000 mm, predominantly in the monsoon between April and October. The urban area is divided by Om Chhu River, which connects to the Ammo Chhu.

Phuentsholing's drainage system was constructed in 1990's, which is a combined system with mostly open drains that conveys both storm water runoff and household wastewater. There was no comprehensive planning and engineering standards followed while implementation of the drainage system. Therefore, it lacks an overall plan and at times the sizes of main and collector drains do not match with the standards. These conditions have amplified the adverse effects related to disrepair and the requirement for maintenance.

In the year 2000, there was a devastating flood, which caused severe damage to the life and properties of residents in the lower market area. After that, huge investments were done by RGoB for construction of river protection works. Permanent protection works were carried out in Om Chhu and Ammo Chhu with the funding of both RGoB and ADB. The protection work is considered as a landmark by the Phuentsholing residents and the city has become much safer from flood than it was before.

A number of drainage constructions were taken up under the ADB funded project. A list of the new drains implemented during the period 2000 to 2004 is as follows:

- Drain from Truck Parking to Choden Engineering
- Drain from Choden Engineering to Water Supply Office
- Drain in the Lower Market area
- Drain in the Core Area

- Drain from PSA ground to Karma Steel
- Drain along the Archery field

Issues:

The following issues have been identified in the existing storm drainage system based on the field visits and information from PCC:

- There are no drawings available of the existing drainage system and the slope and dimensions of collector and main drains are not known, which is a hindrance.
- There should be 100% coverage within Phuentsholing urban area limit by the drainage system and the sizes of the pipes should be sufficient to carry expected waste generation.
- Disposal of solid waste into the drainage by the households results in to blockage of flow, local flooding, leaching of pollutants and transfer of the waste in river water.
- Disposal of building materials at construction sites resulting into filled up drains at access points to the plots.
- Observation of oil in some of the drains, in particular near workshops and garages which pollutes the drains and the river.
- Lack of screens at road crossing to facilitate the cleaning of the drain.
- Missing or broken slabs at covered drains.
- Siltation in the system, particularly at closed conduit road crossings that is probably caused by insufficient slope of the conduits
- The high precipitation in Phuentsholing also cause a problem for the drainage channels as they often get clogged due to mud and debris. Regular maintenance of the drains is required for efficient functioning.

4.8.3 Sewerage

Phuentsholing sewerage system is separate from the storm water drainage system which is directly discharged into the river without treatment. Till date, a total of 616 plots have been connected to sewerage system, which is 85% of the population in Phuentsholing.

The main sewer pipes ranging from 160 to 400mm diameter are of PVC and its total length is about 10km. The house connection pipes are high-density polythene pipes of 110 and 160mm diameter and approx. 25 km in total length. There are 180 manholes at intermediate distance of 50-60 meters, 5000 junction boxes and inspections chambers at various depths from 45 cm to 150cm. The diameters of these chambers are 30 cm, 60 cm, and 100 cm depending upon depth or gradient of sewer pipes whereas for manhole it is 1.25 meter.

The wastewater connected to sewerage system is almost entirely of domestic households, hotels restaurant, offices and schools. The hospital being very far and located at high altitude has not been connected. The workshops are not connected except their toilets and hence, the

lubricants, spill over grease engine oil, etc are discharged into storm water drains. The existing industrial area is also partly connected. A few years back sewer lines have been extended to CWC/ BPC areas, Pemaling colony, Norgay Area and RBP compound. The Treatment Plant (lagoon type) is located on the bank of Ammo Chhu occupying about 7.0 Ha of land area and designed for a period of 15 years. The daily discharge of sewerage is 2000 m^3.

One of the main objectives under the DANIDA funded USPS program was to provide sewerage facilities to all areas that are technically feasible in order to have 100% coverage. In addition, all septic tanks in the areas with sewerage lines were bypassed (demolished). PCC also received funds to construct Pay and Use Toilet for the general public. Public toilets are constructed at total 5 different locations in the city.

Issues:

- The sewerage system is more than 15 years old and it is not able to cope up with the additional load due to population growth. There are increasing complaints regarding overflow of manholes, pipes and inspection chambers day by day.
- At present, the entire PUA area is not connected to the sewerage system. Areas like Dhamdara, Kabreytar, Karma Steel, Dry Port area, Rinchending and Pasakha Industrial Estate are still using septic tanks.
- Quantity of sewage generated from city has to be established and demand for treated sewage has to be made with PCC for horticulture purposes.

4.8.4 Solid Waste Management

Municipal solid waste consists of household waste, construction and demolition debris, sanitation residue and waste from streets. This garbage is generated mainly from residential and commercial complexes. With rising urbanization and change in lifestyle and food habits, the quantity of municipal solid waste also increases.

Presently solid waste is collected from individual and community bins and transported through trucks to a landfill site near Pekarshing (Toribari), 7 km away from the city. Approximately 15-18 tons of garbage is generated per day and the coverage is about 80%. The wastes from the households are collected from individual swing bins. Two types of MS containers are placed at strategic locations all over the city. Masonry containers are also provided which serves as community solid waste bins. The MS containers are towed by tractor attached with container carrier with hydraulic system and placed back at the same locations after disposal. Dumper/Tripper trucks and low loading covered trailers are used for collecting the wastes from stationery container systems.

Phuentsholing City is divided in three zones for ease of solid waste operation. Zone 1 mainly comprises of core area where collection & transportation takes place every day including Sundays. In other two zones frequency is four times a week or once in two days. Some places are provided with block collection system with operator blowing horn and stopping the vehicle at specified locations for the waste generators to bring their waste to the vehicle. The waste collectors attached with the vehicle collect and unload the bin one by one and thereafter the vehicle moves for next stoppage and finally to the land fill site for final disposal.

Door to door collection was introduced in the NPPF colony and the residents' feedbacks suggest that the system was working very satisfactorily. This system should be implemented for the entire city for better waste collection.

The entire raw waste is presently dumped at Pekarshing (Toribari) disposal site, which is an inefficient and costly affair. Site is spread in a total area of about 1.75 Acre. In absence of any processing plant, entire waste in mixed form is brought at the site which sometime contains highly hazardous medical waste, toxic and polluted waste and construction debris. Although no plan and guidelines for management of the site is available, PCC tries to maintain the place by spreading, leveling and pressing of waste. For an efficient and long term solution to solid waste management, it is essential to segregate the waste and set up a compost plant for processing.

Issues:

- All the bins are open to sky, which invites rag pickers and stray animals, who scatter the waste in search of recyclable and eatable respectively.
- Littering is quite common at all those places where no bin is placed or proper emptying arrangement is not practiced.
- Community bins do not synchronize with primary collection equipment thus necessitating the need for multiple and manual handling.
- The vehicles have no compartments to collect different type of waste, and entire waste is collected in mixed form .Waste collectors who collect and sale recyclable products, have to sort out and put in different sacks before operating compaction system of the vehicle. In this process, substantial time is lost.
- In absence of a segregation system, the entire waste is taken to the landfill site which also contains highly hazardous medical waste, toxic and polluted waste and construction debris. A system for segregation of waste at source has to be properly implemented and separate bins for organic and non-organic have to be provided for different kind of wastes.
- Disposal of the industrial waste from Pasakha Industrial Estate and the hospital waste are the biggest challenges for PCC.
- Internal road leading to dumping place site is broken and not properly maintained. Being at sharp gradient, there is danger of loaded vehicles to meet with some accident.

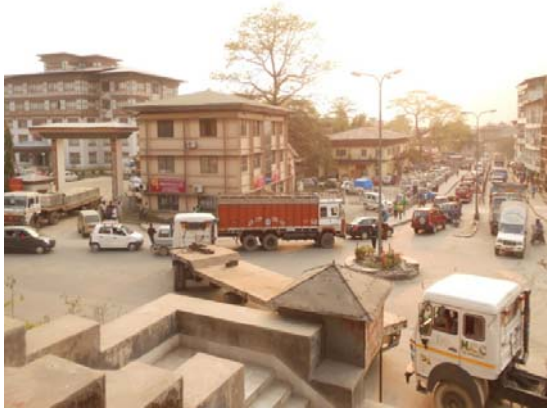
- There is no system of recording vehicle movement, trip number and attendance of staff at the landfill site. The site office is non-functional.
- The site is not protected; therefore entry of rag pickers and stray animals is not checked. Presence of stray animals is dangerous for safety and health of persons working/present at disposal place.
- PCC suffers with inadequate institutional and financial capacities. Adequate number of trained personnel to ensure effective solid waste management system is not available.

4.8.5 Road Network, Traffic Movement and Street Lights

Road network and linkages with surrounding region play a vital role in growth and development of a city. Existing roads and transport infrastructure in Phuentsholing has been studied to identify issues and propose future strategies.

Phuentsholing being the border city and entry point to Bhutan has very good regional connectivity within the country as well as with India. Thimphu – Phuentsholing Highway links it with some of the important cities like Thimphu, Gedu, Chhukha, Paro, etc. Due to poor road condition and difficult terrain, the journey becomes quite lengthy though. It connected to other parts of Bhutan like Samdrup Jhonkhar, Gelephu, and Samtse through the road networks of India. The biggest advantage is its connectivity with major commercial towns of India like Siliguri, Kolkata, Coochbehar, Guwahati etc. which allows for a smooth trade flow between India, Bhutan and Bangladesh. The National Highway connecting Siliguri (India) and Phuentsholing (Bhutan) is in excellent condition.

The nearest rail connections are in New Jalpaiguri (137 km) and Alipur Duar (85 kms) and airport at Bagdogra (130 kms.) in India. Studies suggest that a large number of residents/ businessmen of Phuentsholing use the air, rail and road networks of India for easy accessibility. With population and economic growth in Phuentsholing, it will become increasingly important and viable to plan for a domestic air service or chopper facilities to other parts of Bhutan and some cities of India. Similarly, a railway link to Pasakha can be planned for faster movement of goods and traffic to the industrial town. This will also help in diverting the traffic from the main city.



All the urban roads in Phuentsholing are managed by Bhutan Department of Roads,

with the exception of the part of National Highway from Phuentsholing to Thimphu, which is managed by Project DANTAK. The city has a total road length of 16.0 Km. (15.00 Ha), which constitutes 8.20% of total developed area. This is much less compared to urban planning standards of 15-20% provision for the area under roads. The following map shows the existing city road network.

The road networks mainly comprise of two lanes and single carriageway with footpath on one side. The traffic characteristics in Phuentsholing exhibit typical problems as seen in hilly areas. The deteriorated vehicular speeds, limited road network, less road width available for easy movement and very high volume of pedestrian traffic are some of the problems. The road geometrics are irregular, resulting into a traffic chaos.

Overall, the road network is able to take up the traffic load but some of the roads connecting to extended areas like Kabreytar and Dhamdara are in very bad shape and traffic jams occur due to poor traffic management and on street parking. The National Highway (Zhung Lam) passing through the heart of the city attracts a large volume of traffic. On other major roads like Norkhil Lam, Jorden Lam, Pelkhil Lam, Samdrup Lam, Thuen Lam, Namgyel Lam and Sherab Lam the traffic volume exceeds the road capacity. However, the Industrial Estate at Pasakha is connected through a well maintained road network except landslide in few patches. There is an immediate need to upgrade the entire road network in the city to match with the growing population and vehicles demand.

The performance and capacity of a particular stretch of road also depends on the traffic characteristics. In Phuentsholing, most of the roads are single lane and the traffic composition comprises of heavy vehicles, cars and jeeps. Taxis also form a substantial part of vehicular traffic on almost all important roads. The study of traffic volume shows that the share of fast vehicles is significant varying from 47% to 74% in the outer roads, whereas on the inner city roads the share of slow vehicles is much higher. The main reasons for traffic problems in Phuentsholing are mixed traffic, inadequacy of public transport, roadside encroachments and parking problems. Other factors include rapid urbanization, urban sprawl, mixed Land uses and phenomenal growth in the personalized modes of transport. The vehicle registration figures suggest that the total number of vehicles have increased more than three times during 2001 to 2011 and it will grow even rapidly in future. The effect of such tremendous increase in the number of vehicles on the road network of the city is already visible in terms of road congestion and increased journey time.

Table 4-6 Number of registered vehicles by type in Phuentsholing region

Year	Heavy	Medium	Light	2-wheeler	Taxi	Others	Total	% increase
2000	1,348	NA	1,971	1,894	210	633	6,056	-
2001	2,068	241	2,399	2,003	356	244	7,311	20.72%
2002	1,923	261	2,653	1,837	379	284	7,337	0.36%
2003	1,915	230	3,144	1,608	441	289	7,627	3.95%
2004	1,938	277	3,619	1,739	504	306	8,383	9.91%
2005	2,301	NA	4,179	1,982	583	292	9,337	11.38%
2006	2,061	351	4,875	2,056	538	331	10,212	9.37%
2007	2,174	409	5,531	2,120	569	367	11,170	9.38%
2008	2,273	498	6,985	2,242	656	465	13,119	17.45%
2009*	2,770	582	8,241	2,352	773	627	15,345	16.97%
2010	3,732	693	9,860	2,885	939	895	19,004	23.84%
2011	4,684	830	11,482	3,044	1,343	1,194	22,577	18.80%

Note: Above figures does not consist of vehicles under the ownership of Armed Forces

** Conflicts were found in the registered vehicle no. for the year 2009 in Statistical Year book 2010 & 2011*

Parking is also a concern in the city as it attracts high volume of private and commercial goods vehicles, being the economic capital of the country. It is one of the major concerns of PCC to develop parking lots for the city vehicles and free entry for vehicles entering from India because of porous border. The problem is somewhat eased with the construction of parking lots under the ADB funded project.

Issues:

- Heavy traffic jam can be found near Bhutan gate as it is the only entry/exit point for goods traffic and all the vehicles have to stop by for reporting to the Police Post, Customs and Revenue office located in the close vicinity of the gate. The stretch from Bhutan Gate to RICB office is congested throughout the day.
- The location of Weigh Bridge along the highway invites heavy traffic moving towards Gedu, Chhukha, Paro and Thimphu thereby creating congestion in the highway.
- The warehouses, godowns, repairing workshops located along Om Chhu, invite heavy traffic in Thuen Lam. In the absence of any exit point and narrow road width, trucks plying along this route have to travel through the core, creating noise and air pollution.
- Lower Market and Upper Market are concentrated with commercial and warehousing activities. This attracts a large volume of trips. One lane on either side of the road of Gaoten Lam, Deki Lam, Phuensum Lam, Tharpai Lam and Godoe Lam is used for parking, reducing the capacity of the road.

- Heavy vehicles plying along the residential areas through Pelkhil Lam and Gaki Lam (one way) taking a short cut for the highway.
- Acute noise and air pollution in the NPPF colony as trucks move along Sherab Lam for collection of building materials from Ammo Chhu and also for Orange depot (seasonal).
- Absence of loading and unloading areas for the vegetable market along Norkhil Lam creates traffic jam.
- The major issues related to parking are inadequate off-street parking for intercity and intra-city movements, inadequate measures to regulate parking and absence of public transport system.

It is important that the network for the road infrastructure is planned in coordination to the Landuse and an integrated system of natural hierarchy is maintained.

4.8.6 Telecommunication

Telecommunications is one of the most important conveniences the modern era has brought to Phuentsholing. The telephone system in Phuentsholing consists mainly of primary (UG & aerial) and secondary (aerial) networks with 5200 pairs of telephone line capacity. The primary or the UG network is laid underground. The capacity of the network is sufficient to meet the demand and is met as and when applied by the consumers.

Bhutan Telecom and T cell are the two companies providing communication facilities in Phuentsholing. Bhutan Telecom provides facilities like fixed line connection, mobile connection, broadband and lease line connection and T cell provides only mobile and internet connections. Bhutan Telecom has their main regional office located near the Children's park in the core area while their branch office is located in Changmari, Pasakha. T cell office is located in the Tashi Commercial head office building in the heart of the town.

Phuentsholing also has a well knit cable TV connection. These services are operated by various cable service operators.

4.8.7 Electricity Network

Bhutan Power Corporation is responsible for the power connection, supply, and maintenance in Phuentsholing city. The electrical infrastructure in the city was built in mid 1960s where the distribution system was dependent on 66 kV sub-station with an arrangement to receive two supplies, one from CHPC and the other as an emergency source through a substation in India via Singeygaon sub-station. In 2007, the up gradation of the existing 66 kV substation was done by addition of 10 MVA, 66/11 kV and 10 MVA, 66/33 kV transformers to cater to the future load growth of the city. In this Project, SCADA DMS (Distribution Management System) was used for the first time in Bhutan. The SCADA DMS system addresses fault detection, isolation and restoration, work order management; trouble call management and network analysis function in addition to the monitoring and control. The total load is approximately 11.0 MVA.

Given the status of Phuentsholing as the Gateway and Commercial Capital of Bhutan, the Bhutan Power Corporation has been recommending adoption of UG cable network for the entire city, irrespective of higher costs. It should be considered mainly from the safety view-point and at times due to aesthetical requirement.

Issues:

- The UG cable network is available only in some areas; remaining of the PUA areas still have the old overhead cable network.
- The electrical infrastructure in the city was first built in mid 1960s and then upgraded in stages just to meet the demand of that time. This has resulted in haphazard network growth with pocket of inadequacies.
- As regards the condition of distribution substations, significant number of them, apart from being old, poses safety hazards.
- The local distribution system consisting of the LV lines are close to the buildings making it susceptible to faults.
- The non-uniformity in the voltage of the distribution transformers creates voltage variations at the consumer level.

4.9 SOCIAL AMENITIES

4.9.1 Health Services

The new Phuentsholing General Hospital (PGH) completed in 2005 is a 40 bedded hospital, with specialist services like General Surgery, Obstetrics and Gynecology besides the general patient care. The hospital provides health care services to people residing in Phuentsholing and other sub-districts like Sampheling, Lochina and Dungna.

The average number of OPD patients per day is about 300 during winter and it almost doubles in summer season. The Out Patient Department of Phuentsholing General Hospital has been recording an annual increase of 25% of patients visiting the hospital since last three years. In addition, there are a large number of expatriate workers who visit for medical checkup & certificates as part of the procedure to obtain work permit. In order to decongest the routine, an after hour clinic service is started for people coming for medical certificate.

Beside the general hospital there is a dispensary at BFAL colony in Pasakha & infirmary at the College of Science & Technology in Rinchending. As per the prevailing standards of Bhutan health service, the existing facility in Phuentsholing is sufficient to cater to its population.

Table 4-7 Standards for Health facilities in Bhutan

Type of Facility	Population served	No. of beds	Personnel	Duties
Hospital	More than 15,000	10+	Doctor and Surgeon	Operation, minor surgery & general practice
Basic Health Unit (BHU)- Grade I	10,000-15,000	10	1 Doctor	Minor surgery & general practice
Basic Health Unit	Up to 10,000	none	1 medical	Emergency treatment

(BHU)- Grade II			assistant	

Note: 1 Doctor and 1 ANM for every 5000 people

Source: Urban Development Plan Phuentsholing (2002-2017)

4.9.2 Educational Facilities

The introduction of comprehensive education system in Bhutan came along with the economic development initiated in 1961. Prior to that time there were virtually no modern education facilities in Bhutan. However, the monastic form of education existed and it continues even today. Now, there is an extensive network of schools and other educational institutions spread throughout the country. Chhukha Dzongkhag is said to have 20 Community Primary Schools, 6 Primary Schools, 7 Lower Secondary Schools, 5 Middle Secondary Schools, 5 Higher Secondary Schools, 5 Private Schools with a total of 47 schools in the Dzongkhag and a student population of 17,060 in the year 2012.

Phuentsholing city has three day care facilities (2 in Kabreytar and 1 in Dasho Tshering Wangda's building). There are two lower secondary Schools, two middle secondary schools and two higher secondary schools. There are more than 5,036 students (as of august 2012) studying in these schools. Due to too much student population in the Phuentsholing lower secondary school, the school has two shift systems of classes per day. A new Middle secondary school construction is completed near the general hospital and it is expected to start its first session after the midterm examinations of 2013 session.

The city also houses the only engineering college of the country at Rinchending. Apart from that, there are two private computer and management training institutes in the city. The two Shedras (one at Dratshang and one at Pasakha) provide monastic education facilities to children.

4.9.3 Religious and Cultural Facility

The Dratshang complex at CHPC upper terrace provides religious facilities and hostels for monks. A big Lhakhang building is under construction, which could host Tshechus and other religious festivals in future. The Zangthopelri Lhakhang, Rinchending Goemba and Rani Choni Wangmo Lhakhang in Pasakha are places where people go for religious activities.

4.9.4 Recreational Facility

The PSA mini stadium, the tennis court and the archery ground are the main outdoor active recreational spaces. The municipality has plans to build an indoor stadium with additional recreational facilities adjacent to the PSA mini stadium. In addition, the city also has two parks; the children's park next to the PSA ground and the Zangthopelri Park in the city core which are widely used by the people.

The BFAL colony in Pasakha has its football field and archery range. The crocodile farm located near the Norgay area and the Rinchending Goemba also attracts lots of regional and local tourists visiting Phuentsholing. Phuentsholing lacks a well designed cinema hall. The only cinema hall in use is in the core area, which is in a dilapidated condition. The famous Norgay cinema hall has been converted to a warehouse considering the market demand.

4.9.5 Convenient Shopping

Although all the lower market area and the city core are engaged in commercial activities, the Tashi Commercial Corporation and the Dratshang Shopping Complex located near the Zangthopelri Park are the only convenient shopping facilities. In absence of many proper convenient shopping facilities in the city, most of the Bhutanese are seen shopping in Jaigaon that offers a variety of shopping and bargaining options. The opening of branded company outlets like Reebok and Sony has made shopping more attractive in Jaigaon than in Phuentsholing.

4.9.6 Postal Service

Bhutan post is the only organization providing postal services in the city. Their main office is located near the Children's Park in the heart of the town, whereas, the branch office is located in the round building near the Bhutan gate. Their present day services include postal services, financial services and courier services.

Apart from these, they also operate the community centers in areas outside the city, bus services between Phuentsholing-Thimphu and Phuentsholing-Kolkata and the city bus services within the city. At present, the city bus services operate along the Phuentsholing - Pasakha route providing the much needed public transport facilities for the industry workers.

4.9.7 Fire Fighting Service

The Royal Bhutan Police is the sole agency responsible for firefighting services in the town. Their office is located in the police colony in the core area of the town.

4.10 HOUSING

Housing is in shortage in Phuentsholing and must be addressed. Higher rentals and space crunch has driven hundreds of Bhutanese families to live in Indian town Jaigaon and commute to work in Phuentsholing on daily basis. On the other side, there are also pockets of underutilized or low density structures in some of the prime locations. The existing land use data suggest that about 20% of the total area is occupied under residential use and the same amount of land area is occupied by warehouses and industries.

The skyline of Phuentsholing is dominated by the presence of high rise buildings. The fast rate of building activity in the city has resulted in haphazard development with no attention given to urban design guidelines and the capacity of municipal services. The housing stock is a mixture with various architectural styles where the Bhutanese architecture is least prominent because of RCC high rise structures. The four broad categories of housing structures are permanent apartments (RCC framed construction), bungalows, Ekra and hutments. As a result of increasing land prices, sub division of plots and transfer of ownership to build more houses in a given area are on the increase, resulting into higher densities. The following table shows that there is no uniformity in the dwelling unit density and it varies from 15-100 dwelling units per hectare.

Table 4-8 Existing Residential Density

Name of the area	Area (Ha)	Existing residential density	
		Dwelling unit/Ha	Population/Ha
PWD Colony	12.5	40	200
NPPF Colony (Old + New)	3.3	90	450
CHPC (Lower Terrace)	3.0	30	140
TALA Housing	3.0	15	60
Pemaling	1.0	60	350
Forest Colony	0.5	25	120
Drungkhag Colony	0.4	30	140
Bhutan Telecommunications	0.8	30	125
NDTI Campus	1.0	30	150
Core (Lower & Upper Market)	12.0	100	500

Source: Urban Development Plan Phuentsholing (2002 - 2017)

The existing housing condition is studied through a household survey to understand the demand. The survey indicates that approx 69% of the existing houses are permanent while the balance 31% is temporary and semi-permanent. Only 16% of the surveyed households have self owned houses, while more than 58% households stay in rental housing. Almost 26% of the surveyed households (civil servants) reside in government provided housing. While comparing this data with the employment scenario, it was noticed that almost 50% of the civil servants are residing in rental housing that takes a bigger share from their monthly expenses.

About 92% of the self owned housing is constructed by the owners who have permanently migrated to Phuentsholing and a very small number (5.56%) of houses are readily purchased. Almost about 25-30% of the total housing units in the city are provided by various government departments and the remaining are private houses.

Building conditions are good for majority of the residential building (59.6%), while 36% are in average condition and a very low of 4.4 % in a dilapidated condition. The buildings that are in average and bad conditions are mostly semi-permanent and temporary structures. About 60% of the plots have paved access roads and the remaining 40% of the residents have earthen road accessibility. There are also some unauthorized units or slums that are either squatter settlements or temporary hutments occupied by the construction workers.

It is important that we address the issue of shelter for the residents, especially the lower income groups. From an urban planning point of view, housing for the lower income group is where the public sector should be focusing its limited skills, while the private sector can provide housing for the middle and upper income groups. There can be various methods by

which affordable housing can be provided. For example, each detached bungalow to provide a "servant's quarter" within their own compound. Another strategy would be to lay out Site and Services schemes of not more than fifty houses each, where plots with basic services like water, storm drains, sewerage, paved roads, street lights and electricity are provided. The inhabitants would buy these serviced plots and construct their own modest shelters. Plots could be as small as five hundred square feet each and partition walls should be allowed. It may also be possible to provide the plinths and party walls in some schemes. The Structure Plan should make provision for sufficient government housing for its staff and densification mechanism with supporting infrastructure should be looked into as one of the options.

Table 4-9 Planning Standards for Public Amenities

S. No.	Type of Amenities / Facilities	U.D.P.F.I Guidelines	RGoB Standards 1999	Required as per RGoB Standards (Population– 24,000) Year 2013	Existing Scenario Phuentsholing (Population– 24,000) Year 2013	Total Future Requirement (Population– 40,000) Year 2028	Difference to be met (Population– 40,000) Year 2028
1	**Education**						
	Nursery (Private)	-	-	**5**	**3**	**8**	**5**
	Population Served	1 per 2,500	1 per 2,500 to 5,000		-		
	Student Capacity	-	100 (max.)		-		
	Plot Area (sq.m.)	800	400 (min.)		-		
	Built-up Area (sq.m.)	-	-		-		
	Primary School (Lower Secondary)			**4**	**2**	**7**	**5**
	Population Served	1 per 5,000	1 per 2,500 to 6000		24000		
	Student Capacity	500 per school	350-600		2351		
	Plot Area (sq.m.)	4,000	10,000-15,000		-		
	Built-up Area (sq.m.)	2,000	-		-		
	Secondary School (Middle Secondary)			**3**	**3**	**5**	**2**
	Population Served	1 per 7,500	1 per 7500		24,000		
	Student Capacity	1,000	350-600		3306		
	Plot Area (sq.m.)	16,000	20,000-30,000				
	Built-up Area (sq.m.)	6,000	-				
	Access (km)	-	Upto 5.0 km		-		
	High School (Higher Secondary)			**1**	**2**	**1**	**Nil**

S. No.	Type of Amenities / Facilities	U.D.P.F.I Guidelines	RGoB Standards 1999	Required as per RGoB Standards (Population– 24,000) Year 2013	Existing Scenario Phuentsholing (Population– 24,000) Year 2013	Total Future Requirement (Population– 40,000) Year 2028	Difference to be met (Population– 40,000) Year 2028
	Population Served (residential school)	-	1 per 30,000 and more		24000		
	Student Capacity	-	350		1699		
	Plot Area (sq.m.)	-	20,000-30,000		-		
	Built-up Area (sq.m.)	-	-		-		
	Higher Education (College)				**1**	**1**	**Nil**
	Population Served	1 per 1,25,000	1 per Region		24000		
	Student Capacity	1000 – 1500	350 – 600		-		
	Plot Area (sq.m.)	40,000	60,000		-		
	Built-up Area (sq.m.)	18,000	-		-		
	Residential including hostel Area (sq.m.)	4,000	-		-		
2	**Health**						
	Clinic		For larger towns only		**Nil**	**8**	**8**
	Population Served	-	1 per 2500 – 5000				
	Plot Area (sq.m.)	-	200-800				
	Access Distance (km)	-	30 minutes walking Distance		-		
	Dispensary		Basic Health Unit		**Nil**	**4**	**4**
	Population Served	1 per 15000	1 per 10,000		-		
	Plot Area (sq.m.)	800 – 1200	3000-10,000		-		
	Access Distance (km)	-	30 minutes walking Distance		-		
	Hospital	Intermediate level	Regional Level	**1 (100 Bed)**	**1 (60 Bed)**	**1**	**Upgradation Required**

S. No.	Type of Amenities / Facilities	U.D.P.F.I Guidelines	RGoB Standards 1999	Required as per RGoB Standards (Population– 24,000) Year 2013	Existing Scenario Phuentsholing (Population– 24,000) Year 2013	Total Future Requirement (Population– 40,000) Year 2028	Difference to be met (Population– 40,000) Year 2028
	Population Served	1 per 1,00,000	1 per 30,000		24000		
	Plot Area (sq.m.)	10,000	5000 – 20,000		-		
	Access Distance (km)	-	Max. 1 hour drive within region		-		
3	**Open Spaces**						
	Group Open Space	-	Children's Playground		**Nil**	**10**	10
	Population Served	-	1 per 2,500 - 4,000		-		
	Total Area (sq.m)	-	100 (min)		-		
	Per Capita space (sq.m)	-	-		-		
	Access Distance (km)	-	10 min walking from most houses		-		
	Central Plaza	-	-		**Nil**	**2**	**2**
	Population Served	-	1 per 25,000		-		
	Total Area (sq.m)	-	2,000-5,000				
	Park / Playground	-	Local Field Sport facility		**4**	**8**	**4**
	Population Served	-	1 per 5,000		24,000		
	Total Area (sq.m)	-	20,000 – 25,000				
	Per Capita space (sq.m)	-	0.50 ha per 1,000 people				
	Access Distance (km)	-	-				
	Major Public Park / Open Space	-	-		**2**	**2**	**Nil**
	Population Served	Medium Town	1 per 2,500-20,000		24000		
	Total Area (sq.m)		Min. 0.5 ha per 1000 person or not less than 10% of a				
	Per Capita space (sq.m)	1.4 - 1.6 ha. Per 1,000 persons					

S. No.	Type of Amenities / Facilities	U.D.P.F.I Guidelines	RGoB Standards 1999	Required as per RGoB Standards (Population– 24,000) Year 2013	Existing Scenario Phuentsholing (Population– 24,000) Year 2013	Total Future Requirement (Population– 40,000) Year 2028	Difference to be met (Population– 40,000) Year 2028
	Access Distance (km)		developed area with a centrally accessible location.				
4	**Recreation Facilities**						
	Recreational Club		Sports based activities		**Nil**	**1**	**1**
	Population Served	1 per 50, 000	1 per 5,000-30,000				
	Total Area (sq.m.)	5,000	15,000 – 25,000				
	Performing Art Centre		-				
	Population Served	1 per 50,000	-				
	Total Area (sq.m.)	1,000	-				
	Meditation & Spiritual Centre		-				
	Population Served	1 per 50,000	-				
	Total Area (sq.m.)	2,500	-		-		
5	**Commercial Establishments**						
	Convenience Shopping	-	-				
	Population Served	1 per 4,000	1 per 2,500				
	Number of shops	24 formal & 13 informal	-				
	Area per shop (sq.m.)	-	-				
	Total Area (sq.m)	-	min. 100 Built up				
	Access Distance (km)	-	Within neighborhood area				
	Local Shopping		-				
	Population Served	1 per 5,000-20,000	1 per 2,500 – 5,000				
	Number of shops	55 formal & 20 informal	-				

S. No.	Type of Amenities / Facilities	U.D.P.F.I Guidelines	RGoB Standards 1999	Required as per RGoB Standards (Population– 24,000) Year 2013	Existing Scenario Phuentsholing (Population– 24,000) Year 2013	Total Future Requirement (Population– 40,000) Year 2028	Difference to be met (Population– 40,000) Year 2028
	Area per shop (sq.m.)	-	-				
	Total Area (sq.m)	-	min. 240 Built up				
	Access Distance (km)	-	-				
	Community Shopping	-	-				
	Population Served	1 per 25,000-1,00,000	-				
	Number of shops	365 formal & 110 informal	-				
	Area per shop (sq.m.)	-	-				
	Total Area (sq.m)	-	-				
	Weekly Market	-	-		**1**		
	Population Served	-	1 per 30,000		**24000**		
	Total Area (sq.m)	-	2,000 with additional 20% to 50% parking space				
6	**Social Infrastructure**						
	Community Room	-	-				
	Population Served	1 per 5,000	-				
	Total Area (sq.m)	660	-				
	Community Hall	1 per 15,000	-		**1 proposed**	Nil	Nil
	Population Served	2,000	-				
	Total Area (sq.m)	-	-				
7	**Other Amenities & Services**						
	Veterinary Hospital	-	1 per Region		**1**		
	Fire Fighting	-	-		**1**	**3**	**2**
	Population Served	1 per 200,000	1 per 15000		-		

S. No.	Type of Amenities / Facilities	U.D.P.F.I Guidelines	RGoB Standards 1999	Required as per RGoB Standards (Population– 24,000) Year 2013	Existing Scenario Phuentsholing (Population– 24,000) Year 2013	Total Future Requirement (Population– 40,000) Year 2028	Difference to be met (Population– 40,000) Year 2028
	Plot Area (sq.m)	6,000	250 (for 3 vehicles)		-		
	Access Distance (km)	1 to 3	-		-		
	Fire Hydrants	-	At interval of 120 m along main roads		-		
	Petrol Pump	-	-		**3**	3	Nil
	Population Served	1 petrol pump for 150 ha of gross residential area in residential zone	1 per 2,500 – 15,000		24000		
	Plot Area (sq.m)	One petrol pump in each community centre	Min. 500 sq.m				
		Two Petrol Pump in district center					
	Vehicle Service Centers	-	-		**2**	3	1
	Population Served	-	1 per 2,500 – 15,000		24000		
	Plot Area (sq.m)	-	Min. 500 sq.m				
	Postal Office	1 post office per 10,000 - 15,000 population	1 post office for 15,000 persons with site area 4000sq.m		**1**	**3**	**2**
	Postal Agency (Neighborhood)	-	1 post office for 4,500 persons with minimum built area 25sq.m		**Nil**	**9**	**9**
	Taxi Stand	not more than 0.5 km from farthest point in any residential area	1000sq.m for 50 taxis in central town. Site for 10 taxis near neighborhood centre		**1**	**2**	**1**
	Bus Terminal	-	500 sq.m for small town		**1**		
			2000sq.m for larger towns				

S. No.	Type of Amenities / Facilities	U.D.P.F.I Guidelines	RGoB Standards 1999	Required as per RGoB Standards (Population– 24,000) Year 2013	Existing Scenario Phuentsholing (Population– 24,000) Year 2013	Total Future Requirement (Population– 40,000) Year 2028	Difference to be met (Population– 40,000) Year 2028
	Crematorium	-	1 per town, plot area =2,000 sq.m		**1**		
	Police Post (Neighborhood)	1 per 40,000 persons with site area 1,600sq.m	1 per 2500-4500 person, with site area of 200 sq.m		**3**	**9**	**6**
	Local Police Station	1 per 90,000 persons with site area 15,000sq.m	1 per 15,000 person, with site area of 500 sq.m		**2**	**3**	1
	Regional Police Station	I for 10,00,000 with site area 48,000 sq.m	1 per 30,000 person, with site area of 10000 sq.m		**1**	1	**0**

5.0 POPULATION PROJECTION

Located in the South-Western part of Bhutan adjoining the Indian border state of West Bengal, Phuentsholing forms an Important Gateway to the Central and Western territories of Bhutan. It is also the second largest city in the country after Thimphu in terms of population and urban growth.

The population for Phuentsholing will have to be estimated based on the past trend as well as the future growth potential. Availability of basic infrastructure, economic opportunities and its location advantage will be the key factors to consider while assuming the future growth potential. The factors causing sudden immigration or influx of population should also be foreseen to the extent possible.

The population projection of Phuentsholing is based on the Trend Analysis Method. This method would help in projecting the population based on the current rate of growth.

5.1 BASE DATA AND GUIDING FACTORS FOR POPULATION PROJECTION

The population data from Statistical Yearbook of Bhutan, 2006 is considered as the base for all population studies including future population projections for Phuentsholing. The population of Phuentsholing urban area is calculated as 20,537 persons during this survey.

Following are some of the guiding principles or basic assumptions that will have a bearing on the population forecast for Phuentsholing:

- There is no time series data available for Phuentsholing population, including data on floating population and migration. So, it is difficult to get the accurate growth trend and any forecast will be based on certain assumptions.
- There are several studies and reports where Phuentsholing population is cited and also future projections are made. The Urban Development Plan Phuentsholing (2002-2017) published in 2004 is considered as the most reliable source for population projection here because that is the most recent and comprehensive database.
- Phuentsholing had a population of around 20,537 by the year 2005 (Source: Statistical Yearbook of Bhutan, 2006) and 23,915 in the year 2012. (Source: http://world-gazetteer.com & http://www.countrywatch.com). The figures suggest that the city witnessed a slow population growth of 2.2% per annum during 2005 to 2012.
- Another unknown is the proportion of the migrant laborers. Immigration, in Phuentsholing is a major problem; with large-scale migration taking place from across the international border. The major causes of immigration to the city are: migration due to economic considerations, migration of the laborer's, the bringing of Indian officers to for administration
- The Census Survey indicates that approximately 19% of the total population is male migrant workers and that most of them will bring their families to join them. Equally probable is that they will return from whence they came, and major may not be replaced. The combined effect of the above is an unstable population that is likely to change from one month to another according to factors which are impossible to predict.

- There is floating population i.e. the daily commuting work force from Jaigaon, which constitute the major portion of total population of Phuentsholing. With Phuentsholing being the main entry point to Bhutan the floating population includes the daily workforce from Jaigaon and surrounding areas, business and tourist travelers to other parts of the country. As migration data is limited, it will be completely misguiding to forecast the future floating population.

- A further complication is the practice of persons to live in Phuentsholing on a seasonal basis. It is common for Bhutanese to live in Phuentsholing during the winter season and return to their primary (or secondary) homes in the summer.

- It is assumed that Phuentsholing being the industrial and economic hub, it has been inviting a considerable amount of floating population over the past decade and the same will continue in future.

- The proposal for connecting the western and eastern regions of Bhutan through Phuentsholing will create new avenues for the economic development of the region. The western highway connectivity in between Phuentsholing and Samtse is already in progress and extensive studies are being carried out to connect Phuentsholing to Sarpang and Gelephu through the in-country eastern highway.

- The government's initiatives and policies on incentives and investments for the city and the region will play a crucial role towards determining the proposed development scenario.

5.2 POPULATION PROJECTION AS PER TREND ANALYSIS METHOD

While projecting the population as per trend analysis method, understanding the past population growth trend becomes very crucial as this data will act as the base for future projection. But, due to the non-availability of any established population data for Phuentsholing city for over past one and half decades, the population data provided in the Urban Development Plan Phuentsholing (2002-2017) published in 2004 has been considered as the base datum. As per this study, the population of Phuentsholing city in the year 2004 was calculated as 19,700 persons and it was proposed to reach 25,200 persons in the year 2012 considering a growth rate of 3.0 % per annum.

As a second alternative, Thimphu can be considered as an important and relevant reference here. Some of the facts like Phuentsholing being the second largest urban center in the country after Thimphu, strategically located near the international boarder and the proposals for road and other infrastructure development suggest that it can grow at the same pace as Thimphu. The population growth rate of 5.0% per annum is considered for Thimphu as per Thimphu Structure Plan published in 2002 and the same is taken as a second alternative for Phuentsholing population projection.

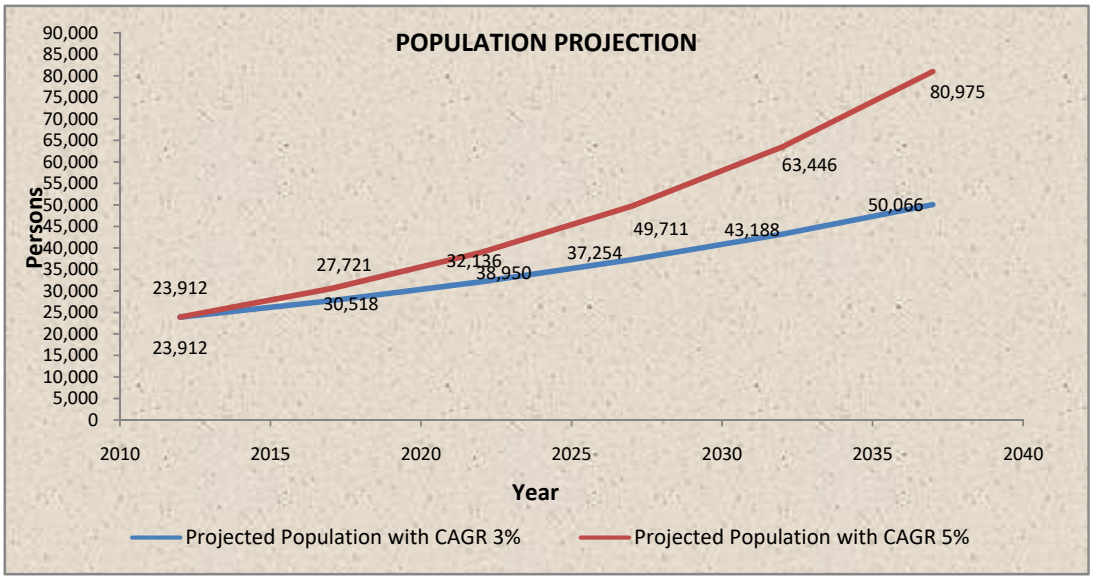
The projected population for Phuentsholing is calculated as per the Geometric Projection method, with the base population as 23,912 for the year 2012 and growth rate assumptions as explained above.

Table 5-1: Population Growth as per Geometric Projection Method

Year	Population Projection with 3.0 % * Compound Annual Growth Rate	Population Projection with 5.0% ** Compound Annual Growth Rate
2012	23,912	23,912
2017	27,721	30,518
2022	32,136	38,950
2027	37,254	49,711
2032	43,188	63,446
2037	50,066	80,975

* Source: Urban Development Plan Phuentsholing (2002-2017), December 2004

** Source: Thimphu Structure Plan, December 2002



It is estimated that the population in Phuentsholing will reach to 50,066 persons in the year 2037 at a compound growth rate of 3.0% per annum.

6.0 PROPOSED PLAN FOR ACTION

The basic planning principles and the existing scenario have been laid out in the previous sections. This section discusses detailed proposals for action to make the plan operational. The issues, methods and means are presented here which would help in the manifestation of the earlier 'Smart Growth Principles.' It gives a clear idea of the assumptions, considerations, opportunities and constraints, which gave a shape to the Structure Plan along with appropriate evaluations and possible alternatives.

The Proposals for Action gives an idea of 'Precincts' which specifies zones, restricted for various functions. The Structure Plan promotes mixed-use development relating it to the 'Dharma' of Bhutanese life where different phases of life and occupational callings demand their own Precincts. These Precincts facilitate various activities and are sanctified as auspicious places for these necessary activities that make up city life. The Precincts assure that the religious functions and the residential activities will not be disturbed either by any industrial function or by intensive retailing and wholesaling commercial activities.

The proposal follows the natural setting and breaks the scale of the town into designated Urban Villages. These Urban Villages form the basic planning unit of the town, with each focusing on a Neighborhood Node/ Commercial. The present core area shall be retained and urban design proposals be developed to shape up the old town area. The neighborhood node proposed at Pekarshing (Toribari) shall act as an extension to the present core area and as a result shall help reducing the load on the present commercial center. These Neighborhood Nodes are surrounded by adequate population density to generate the population thresholds needed to support public transit, social amenities, basic services and retail outlets. Moreover, this town shall surely grow into a city that shall require a modern retailing, an institutional infrastructure, industrial and business hub.

The proposals for action include creation of Environmental Enhancement Precincts, which respond to the present environmental issues. The plan proposes enhancement proposals for the forest and eco-fragile areas of the town and attempts to preserve these areas for future generations. River training and flood protection are essential for the survival and extension of Phuentsholing and are seen as an inseparable element of future development. These proposals for action are supported by an Open Space Network, natural environment zones and their appropriate uses like pedestrian walkways and bicycle tracks linking important destinations across the Ammo Chhu, passive and active recreation areas etc. The Structure Plan proposes tourism related and low density development along the river and hill edges of Kailashwar Dangra.

The most compelling structural aspect of the plan will be the proposed traffic and circulation system. This proposal lays out a set of movement possibilities including an Urban Corridor, Arterial Roads and Connector Roads with the least possible damage to the existing natural environment. The present bus station shall act as a multi-modal transit station integrating road networks and various transport facilities along the proposed 4-lane by-pass.

The Structure Plan also sets aside space for social services and amenities, so that future generations will have access to basic health care and educational facilities. It facilitates the

basic services like distribution of potable water, electricity and communications networks and collection and disposal of storm water drainage, sewage and solid waste.

The Local Area Plans, which details out parts of the Structure Plan, are where participation becomes relevant, as this is where the public sector facilitates private initiatives for urban development. The Local Area Plans will be the outcome of fitting detailed participatory decisions within more rigid technical "structural plans."

These proposals are the structured aspects of the plan and non-negotiable. They have been proposed based on public consultations and technical consultations with system managers and engineers in order to be appropriate for the context.

6.1 PROPOSED PRECINCTS PLAN

This section is divided into three sections, viz. the determinants or reasoning for the planning process, the adopted approach and then proposed precincts.

6.1.1 Planning determinants or generators

In case of Phuentsholing town, the planning determinants/ generators could be seen at two levels as follow:

1. **In-Town design determinants:**

    - Topographical advantage - A mix of relatively flat and sloping terrain surrounded by steep mountains;
    - Existing town core - Congested hence a need to decentralize commercial activity;
    - Strong business and economic activity due to age old trading across the border;
    - Strong Industrial Base;
    - Initiation of setting up Dry Port Estate;
    - Potential Tourist Destination due to Ammo Chhu reclamation work and the construction of dam for power generation
    - Natural hazards;
    - Good natural drainage system;
    - Surrounding areas have a dense forest cover;

2. **Regional level design determinants:**

    - International Boundary;
    - An important Gateway to the Kingdom of Bhutan;
    - Fragile ecology of the region;
    - Ongoing Phuentsholing-Samtse road linkage from within the country;

- Future possible Phuentsholing-Phuentsholing and Gelephu road linkage from within the country;
- Proposed Ammo Chhu Hydropower Project and Ammo Chhu Land Reclamation Project will have substantial impact on the economy and population of the region;
- Proposed Special Economic Zones (SEZ), earmarked under the 10th Five Year Plan of RGoB are located under Samtse, Sarpang and Samdrup Jongkhar Dzonkhags. Phuentsholing is strategically located in the centre of these three SEZ sites and well connected with India;
- Potential Special Economic Development Zone identification as an extension to Pasakha Industrial Estate;
- Nearness to the service centers of Chhukha and Samtse;
- Advantages of having major linkages to the central Bhutan

6.1.2 Planning approach and objectives

This section lists down various planning objectives and approach which guided the process of preparing the structure plan for Phuentsholing. These include:

- An attempt to create a strong Industrial and Economic base of the country;
- Re-densify the present town area with higher densities and relatively medium and lower densities towards the periphery and along the Ammo Chhu;
- Channelizing river bed and reclaiming excess land for recreational and high end low density housing purpose;
- An attempt to create check dams on major streams that will act as a water sources for local consumption;
- Advocating the crucial and vital need of flood protection measures and water-shed management in the region for stabilizing Phuentsholing town and attempting to provide solutions within the planning perspective;
- Conserving and enhancing the traditional and cultural values of the society;
- Demarcating buffer zones along the international border in the newly added areas, considering its close location with respect to the settlement and its related security concerns;
- Demarcating approximately a 1,000 meters wide urban peripheral development control zone around the existing municipal limit to control the future development on the periphery of the town. This is intended to deter urban sprawl and to ensure higher densities where infrastructure investments are made;
- Conserving the existing natural storm water drainage patterns and river of the town by integrating them with the open spaces proposed in the structure plan and thus creating a pedestrian friendly, green space dominated urban environment;

- Facilitating the proper and efficient functioning of various urban systems by establishing a hierarchical system of networking;
- Breaking down the vast scale of the town into a series of self-sustainable, self-contained Urban Villages of conceivable and manageable scale, as a basic planning unit and a tool for achieving balanced growth in an urban area;
- Attempting to segregate various tiers of activities with respect to its scale to allow for the smooth functioning of the town, without disturbing the webs created between them, thus leaving provision for future development in a flexible manner;
- Establishing a strong and well defined hierarchical organization of road networks within the town, toward achieving efficient and smooth traffic movement;
- Organizing the road network to deter unnecessary vehicular "through traffic" within the urban villages and in the residential sectors;
- To advocate Transit Oriented Development within the town.

Phuentsholing Structure Plan is organized into several precincts, the section below lays out how these Precincts will be defined, and what activities are sanctioned under them. These are treated as a set of rules and regulations.

6.1.3 Proposed Precincts for Phuentsholing Structure Plan

The following is a list of Precincts designated in the Phuentsholing Structure Plan:

1. **Urban Village Precinct:**

   UV-1 **Urban Village Core**

   High density, mixed use precinct

   UV-2 (HD) **Urban Village Periphery** (and its sub-category)

   High density, mixed use precinct

   UV-2 (LD) **Low Density**

   Low density residential precinct

2. **Urban Hub and Neighborhood Node Precinct:**

   UC **Urban Core**

   The present Phuentsholing Town Centre, a precinct of trade and commerce

   NN **Neighborhood Nodes**

   Convenience shopping, basic services and amenities precincts for the urban villages

3. **Institutional Precinct:**

   I **Institutional**

   Local, National and International Institutions

4. **Heritage Precinct:**

H **Heritage Precincts**

Precincts for sacred activities and places of historical importance

5. **Environmental Precincts:**

E-1 **Environmental Conservation Precinct**

Enhancement and protection of Phuentsholing's fragile ecological legacy

E-4 **Agri-based Environments**

Precincts with 30% and above slopes characterized by orchards, green houses, on-farm food processing and research

6. **Green Open Spaces Precincts:**

G-1 **National Open Green Spaces**

Precincts of national importance such as a national sports complex, archery ranges, and exhibition areas, etc.

G-2 **Green Space System**

Precincts of public assets like parks, gardens, sport facilities and recreation areas

7. **Special Economic Zone Precincts:**

SE-2 **Multi-Modal Transit Hub**

Precincts characterized by Multi-Modal transit Terminus location.

SE-3 **Dry Port**

Precincts characterized by warehousing and transportation of heavy cargo.

SE-4 **Service Centers and Industries (Polluting)**

Precincts characterized by industrial, heavy maintenance, wholesaling and warehousing.

SE-4 **Service Centers and Industries (Non-polluting)**

Precincts characterized by non-polluting industrial, heavy maintenance, wholesaling and warehousing.

8. **Royal Precinct:**

R **Royal Uses**

Precincts related to Royal uses

It is to be understood that every Precinct has a dominant activity and the other activities are supportive to it. So the supportive activities are governed by the main activity and within a Precinct only a limited number of supportive activities are allowed. Thus, if an activity though secondary in nature is not compatible to the main activity they should not be allowed. The proposed Precincts have been marked and defined with a scientific temperament and rational logistics with due consideration to the Bhutanese lifestyle, however if need arises in future to change the Precinct definition the local authority after consultation with Town Committee, and the DHS, MoW&HS, can make the necessary modifications.

Table 6-1: Precincts schedule showing uses permissible in designated precincts

Sl. No	DESIGNATED URBAN PRECINCT	USES PERMISSIBLE	SPECIAL CONDITIONS AND RESTRICTIONS
01	**URBAN VILLAGE PRECINCT** This Precinct takes into cognizance the residential use and its immediate needs		
1.1	**UV –1** Urban Village Core	High Density, Mixed use Precinct Apartments and group housing are permitted. Residential, local level retail shops and services, household economic activity and cottage industries not involving use of, or installation of, a machinery driven by more than 1 KW power and which do not create noise, vibrations, fumes, dust, etc. only in independent dwelling units (not in tenement dwellings or flats). Bagos Improvement Schemes All types of residential dwellings including apartments and group housing, professional services, commercial, Institutions etc a. Household economic activity, light home workshops, and cottage industries not involving use of, or installation of, any machinery driven by more than 10 KW power and which do not create noise, vibrations, fumes, dust, etc., only in independent dwelling units (not in tenement dwellings or flats). b. b. Play fields, gardens, gymnasium, swimming pool, public facilities and utilities, club house, local community hall, etc. c. L.P.G., Cylinder delivery center for the domestic consumption only if on a separate plot of at least 1,000sq.m. with no other use on the premises. Allow the Fuel(Petrol Pumps) refilling area with a minimum plot size of 2000sq.m. d. All uses permitted in neighborhood nodes precinct shall be permitted; recreational uses like bars, discothèque, pool rooms, karaoke and any other night time recreational centers shall not be permitted in buildings accommodating any residential uses.	The Petrol Pumps should be along the main/secondary roads.

Sl. No	DESIGNATED URBAN PRECINCT	USES PERMISSIBLE	SPECIAL CONDITIONS AND RESTRICTIONS
1.2	**UV – 2** (HD) High Density Urban Village Periphery	High Density Mixed Use Precinct Apartments and group housing are permitted. Residential, local level retail shops and services, household economic activity and cottage industries not involving use of, or installation of, a machinery driven by more than 1 KW power and which do not create noise, vibrations, fumes, dust, etc. only in independent dwelling units (not in tenement dwellings or flats). Bagos Improvement Schemes. Commercial uses like local level retail shops with floor area less than 40sq.m or internet browsing centre, fast food outlets, canteens, snack bars not exceeding floor area of 30sq.m area will be permitted only on the ground floor per plot. Educational institutional buildings, day-care centers, dispensaries, clinics, public facilities and utilities, local community halls are allowed. Bars, discotheque, pool rooms, karaoke and any other night time recreational centers and activities contradicting with residential uses would not be permitted.	Institutional uses in a minimum of 1,000sq.m plot may be permitted. Resorts, Hotels with boarding and lodging facilities in a minimum of 2,000sq.m plot may be permitted.
1.3	**UV – 2** (LD) Low Density Urban Village Periphery	Low Density Residential Precinct Maximum plot coverage should be 30%. Only residential uses, resorts, professional services, office spaces, and educational institutes shall be permitted. Any commercial use including retail outlets, shops, ware house and recreational centers shall not be permitted.	a. Minimum plot size for uses like, educational institutions and office buildings shall be 1,000sq.m. b. Resorts, Hotels with boarding and lodging facilities in a minimum of 2,000sq.m plot may be permitted.
2.0	**URBAN CORE & NEIGHBORHOOD NODE PRECINCT** This Precinct takes into cognizance the commercial, institutional and recreational uses and their immediate needs at town and neighborhood level		
2.1	**UC** Urban Core	Town Center All uses allowed in NH Large commercial uses such as shopping complexes and centers, retail shops, departmental stores, restaurants, cinema halls, multiplexes, shopping centers, food courts, bowling alleys, pool and billiard halls, lodging and boarding houses, hotels, tourism and recreation based	Small printing press, Residential, incidental to and limited to 20% of the area occupied by the educational/ training/ research institutions permissible in this precinct shall be permitted only on plots > 4,000 sq.m.

Sl. No	DESIGNATED URBAN PRECINCT	USES PERMISSIBLE	SPECIAL CONDITIONS AND RESTRICTIONS
		facilities are allowed. Commercial centers, public buildings, auditoria, petrol pumps, transport terminals, nursing homes, hospitals, office buildings, public facilities, public utilities, banks, professional offices, schools, colleges, educational buildings, training institutes, government and semi-government buildings and their activities, autonomous bodies and public sector undertaking buildings and activities, non-governmental organization buildings, registered charitable trust buildings and educational, medical, health, religious and public welfare activities, tourist units as recommended by the tourism council, will be allowed. Other permitted activities include Institutions, hostels, boarding houses, staff quarters, canteens, sports complexes, gymnasium, libraries, assembly buildings including swimming pools, club, stadium, theatre, and open spaces proposed for party and marriage ceremonies and amusement and recreation activities, art galleries, exhibition halls, discotheques, karaoke and bars.	
2.2	**NN** Neighborhood Node	Convenience Shopping / Basic Amenities Retail commercial use such as Retail shops, Restaurants, Hostels, Hotels, Clinics, Convenience Shopping, professional offices and establishments (of less than 15 employees), ATMs, Crèche / Children's day care center, pre-primary educational facilities, dispensaries, clinics, Public facilities, Public Utilities, Public Transportation Stops, Gardens, etc, bakeries, local libraries, club houses, community halls , service stations with or without petrol pumps, Kiosks, taxi stands, vegetable vendors, display areas, Neighborhood Pub, bars, Discotheques, Pool rooms, Outdoor cafes and Indoor games parlor.	LPG delivery centers and Fuel station can be permitted under the fulfillment of all relevant safety norms.

Sl. No	DESIGNATED URBAN PRECINCT	USES PERMISSIBLE	SPECIAL CONDITIONS AND RESTRICTIONS
3.0	**INSTITUTIONAL PRECINCT** This Precinct takes into cognizance the institutional use and its immediate needs		
3.1	**I** Institutional	Local, National and International Institutions Educational, training, cultural and government institutions, public libraries, Museums, Art galleries, Diplomatic Enclave, government offices including the RBP, RBG, RBA, GREF and DANTAK	Residential and other activities incidental to the main institutional use, provided not more than 10% of the site shall be used for such activities.
4.0	**HERITAGE PRECINCT** This Precinct takes into cognizance the historic, religious and spiritual uses and their immediate needs		
4.1	**H** Heritage Precincts	Cultural and Religious Heritage Spiritual and religious artifacts and places, Chortens, Mani Walls, Lhakhangs, prayer wheels, statues, monasteries and activities related to enhancement / protection / conservation of the heritage structures and/or precincts and permitted/ undertaken by or on behalf of the National Commission for Cultural Affairs.	NOC to be obtained from the National Commission for Cultural Affairs, RGoB
5.0	**ENVIRONMENTAL PRECINCT** This Precinct takes into cognizance the environmental aspects related to a town at various levels and related concerns		
5.1	**E-1** Environmental Conservation Precincts	Natural reserve and sanctuary, the River Basin, Streams, Rivulets, avi-fauna, fauna breeding places, unique flora and bio-mass preserves. Activities related to environmental enhancement / protection and permitted / undertaken by or on behalf of the National Environment Commission Existing structures with an approval may be retained, but new development and extension to the old structure (except the above mentioned) 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 beyond fifteen meters of the edge of the Ammo Chhu and major	NOC to be obtained from the NEC 1. No development or construction shall be permitted within thirty meters of the edge of the watercourse or the edge of the gullies of Ammo Chhu and major stream or such distance as may be prescribed under any other general or specific orders of Royal government or any other authority. 2. No development or building construction shall be permitted within fifteen meters of the edge of all natural rivulets and natural drainage channels or such distance as may be prescribed under any other general or specific orders of

Sl. No	DESIGNATED URBAN PRECINCT	USES PERMISSIBLE	SPECIAL CONDITIONS AND RESTRICTIONS
		streams. Footpaths shall be permitted along the fifteen meters boundary of the rivulets and other streams protection zone. Edge/Bank protection works for river and major streams shall be permitted under the clearance from the National Environment Commission and the Nature Conservation Division. Certain stretches, which are identified, as not ecologically sensitive will have recreational open spaces like parks, sports facilities and riverfronts, under the clearance from the National Environment Commission and the Nature Conservation Division.	Royal Government or any other authority. 3. Natural landscape features of the river, major streams and rivulets, which includes the natural course of the water feature, banks/ edges, soil, vegetation (Trees, shrubs and ground covers), 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. Construction of roads, laying of underground cables and other service networks, other structures like high - tension cable pylons, transmission towers and installations of electric substations shall permitted upon proper geological study and environmental clearance. 5. Dumping of solid wastes, sewage disposal, washing of vehicles/automobiles or any action considered being as an action of polluting this zone shall not be permitted 6. Existing structure can be retained and further development shall not be permitted 7. Existing land use, which is considered not to cause impact on the ecosystem, can be retained under the clearance/No Objection Certificate from National Environment Commission.
5.2	**E-4** Agri-based Environments	Allied Agricultural Activities Activities related to and permitted / undertaken by or on behalf of the Forest Department. Agriculture, Horticulture and Forestry	(1) Agro based Industry, garage and workshop, (2) Abattoir, drive-in-cinema, storage of inflammable materials and explosive goods subject to NOC/ Approval and conditions laid down by concerned department/

Sl. No	DESIGNATED URBAN PRECINCT	USES PERMISSIBLE	SPECIAL CONDITIONS AND RESTRICTIONS
		Agriculture, Horticulture, Orchards, Floriculture, Vegetable Gardens, Facilities for Plant Tissue-culture, Mushroom Culture, Green Houses, Cold Storage incidental to Agriculture and related uses, Agro- based research Labs, Herbal Extraction Units, Diary Farms, Poultry Farms, Herbal based health centers, afforestation. Light home workshops, workshops related to agricultural activity, repair of tools and implements of agricultural use, timber depots, uses pertaining to processing of agro/farm/milk products, institutional uses, vocational training center, ice factory and cold storage, go-downs and warehouses subject to N.O.C./approval and conditions laid down by warehousing corporation/ FCB/ Appropriate Govt./ Semi Govt. Department, Studio, cemetery and burial ground, jail, hospital for infectious and contiguous diseases, mental hospital and sanatorium (subject to NOC/Approval and conditions laid down by Civil Surgeon) A detailed soil stability report shall be accompanied with the submission for development proposals on slopes ranging from 30% to 50%. No development shall be allowed on slopes greater than 50%.	authority dealing with such work. a) Percentage of ground coverage shall not exceed 25% of the land area. b) Height shall be allowed up to ground plus one floor only.
6.0	**GREEN OPEN SPACES**		
6.1	**G– 1** National Open Green Spaces	Precincts of National Importance Open Space Precincts of national importance such as National Sports Complexes, Archery Ranges, National Botanical Gardens, national Zoological Parks, Memorial Parks/Gardens, and National Level Open Exhibition Areas etc.	NOC to be obtained from the NEC and the Council of Ministers.
6.2	**G-2** Green Space System	Public Assets Open Space Precincts of Public assets like Parks, gardens, Community Level/ Local Recreational and Sports Facilities etc.	

Sl. No	DESIGNATED URBAN PRECINCT	USES PERMISSIBLE	SPECIAL CONDITIONS AND RESTRICTIONS
7.0	**SPECIAL ECONOMIC PRECINCT** This Precinct takes into cognizance the various aspects related to the economy generation at regional and national level		
7.1	**SE-2:** Multi-Mode Transit Hub	**Zones characterized by Multi-Modal transit Terminus location** Multi Mode Transit Terminus, Transit Stops, Visitor Centre, Parks, Gardens, Passengers Stay area, Hospitality Hub, Tourist Information Centre, ATM, Cafes, Phone Kiosks, Convenience and Souvenir shops, Toilets and Showers, Luggage Storage, Petrol pump with minor repairs shop, Transit Hotel, Rest areas, Taxi Parking, Visitors Parking, Security Post, Check Posts, Pedestrian cross-overs.	Any road (public or private) entering this precinct must first be approved by the GMC elected Members and then sent to the DHS for final approval. Could be read as CP (Urban Corridor) as in Thimphu Structure Plan.
7.2	**SE-3:** Dry Port and Warehousing	**Precincts characterized by warehousing and transportation of heavy cargo** Ware houses, Transshipment yards, Cold Storage, Go-downs, Transport terminals for Goods, Stock Yard, Storage Yards, Amenities for Workers, Check Posts, Security Posts, Packing Units.	Residential dwelling only for Dry Port workers and other public utility service staff, working within the Dry Port premises, Storage of inflammable goods, Dumping of solid industrial wastes (subject to N.O.C. from authorities such as the National Environment Commission (NEC) / Dept. of Trade and Industry).
7.3	**SE-4:** Service Centers and Industry (Polluting)	**Service Centers, Industries and Workshops** All uses permitted in SE-4 (non-polluting) All polluting Industries based on the norms with respect to minimum plot sizes, setbacks, building height, permissible pollution levels, etc set by National Environment Commission and the Department of Trade and Industry.	
7.4	**SE-4:** Service Centers and Industry (Non-polluting)	**Service Centers, Industries and Workshops** Wholesale markets and their ancillary uses, Ice factory and Cold storage, Ware Houses, Go-downs, Transport terminal for goods and passengers, Restaurants, Lodges, Hospitality centers, Dormitory, Oil depot, Steel stock yard, Timber stock yard, Junk yard, Saw mill, LPG Cylinder storage depot, Storage of permissible goods, Vehicle	Storage of inflammable goods, Dumping of solid industrial wastes (Subject to N.O.C. from authorities such as the National Environment Commission (NEC)/ Dept. of Trade and Industry). Could be read as SSIC (Service Centers and

Sl. No	DESIGNATED URBAN PRECINCT	USES PERMISSIBLE	SPECIAL CONDITIONS AND RESTRICTIONS
		workshops. Service industries – to serve residential activities, Commercial and Industrial establishments, as also the daily needs of the people. Pasteurizing and Milk processing, Printing press, Binding, Packaging, Sealing, Paper box manufacturing, Battery charging, Bakeries and Confectionaries, Cleaning and pressing establishments for clothes, Small cold storage units, etc. Light industry, Non–polluting industrial activity, Waste recycling plant. Banks, canteens, etc. Amenities for workers. All uses allowed in UV-2 (LD) precincts.	Industries) as in Thimphu Structure Plan. UV-2 (LD) precinct regulations to be followed in the event of residential constructions/development.
8.0	**ROYAL PRECINCT**		
8.1	R Royal Uses	Precincts related to Royal uses Royal Uses	To be cleared by Royal Secretariat

Notes:

- The proposed Precinct Schedule should be read in comparison with the Development Control Regulations proposed for the respective precinct, which will be primary determinant and will rule the entire development dynamics in the town.
- Public utility, public facility, services buildings shall include buildings or works developed or undertaken by the Government / Semi-Government or Public Undertaking only, such as sub-station, and receiving station of the Electricity Department, building for infrastructural facilities like bus service, water supply, drainage, sanitation, domestic garbage disposal, pumping station, electricity, purification plant, police building, post and telegraph and telecommunication, public urinals, milk supply, and public telephone booth, fire brigade station, ward and zonal offices of Competent Authority, taxies, scooter and cycle stand and parking lot, garden, nursery, playground and open spaces, canal, communication network, first aid medical center, primary health center, dispensary, library, reading room and religious buildings / places of public worship.
- Shops, commercial establishments and professional uses (up to fifteen employees) shall be permitted in all Precincts (except environmental precinct) by charging license for these value added uses, which are not detrimental to development in the surrounding zone, with specific conditions. This value added license shall be a one-time fee and shall be decided by the Competent Authority from time to time. The Competent Authority shall regularize existing shops and commercial establishments not approved earlier by charging additional fees, as per the above stated provision. The shortfall of

parking and other requirements shall not be condoned, but the Competent Authority may consider the case if equivalent facility in any manner is offered by the owner /occupants of the premises. In no case, regularization of built-up area shall be considered by the Competent Authority.

- In case of the 'Uses permissible on appeal to the Competent Authority' it shall be mandatory to apply for and revalidate the permission after five years. The Competent Authority shall revalidate the permission only based on an Environmental Assessment Report submitted by the National Environment Commission (NEC) and accepted by Town Committee after inspection of the site and the activities on the site. If so deemed, the National Environment Commission (NEC) may require further revalidation after a period it deems necessary.
- Where uses are permitted in Environmental Land use and under special conditions based on appeal to the competent authorities, it is mandatory that the Phuentsholing Thromde certify to the Town Committee Members, after every three years, and not later than five years, that the uses in fact conform to the application and the sanction, and conditions of successful spatial appeals for uses.
- In any case, no development shall be allowed in the form of a single leveled block, which involves cutting the natural terrain of the plot by more than 1.5 meters (one and half meters) height, resulting in forming the ground level of the proposed development at any given point.

Table 6-2: Proposed Precincts area breakup

Sl. No.	Precincts	Area		
		Sq.m	Ha.	%
1	E1: Environmental Conservation Precinct	3,497,973	349.80	20.56%
2	E4: Agri-based Environments	1,620,119	162.01	9.52%
3	G1: National Importance Open Space	792,781	79.28	4.66%
4	G2: Local Green Space System	345,262	34.53	2.03%
5	H: Heritage	28,519	2.85	0.17%
6	High Tension Buffer	270,213	27.02	1.59%
7	I: Institutional	404,038	40.40	2.37%
8	International Boundary Buffer	155,249	15.52	0.91%
9	UC: Urban Core	102,133	10.21	0.60%
10	NN: Neighborhood Node	127,151	12.72	0.75%
11	Parking	21,280	2.13	0.13%
12	SE3: Dry Port and Warehousing	273,283	27.33	1.61%
13	SE4: Service Centers and Industries	854,787	85.48	5.02%
14	SE4-NP: : Service Centers and Industries (non-polluting)	633,829	63.38	3.72%
15	Utility	221,979	22.20	1.30%
16	UV1: Urban Village Core	768914	76.89	2.90%
17	UV2: Urban Village Periphery (high density)	1,619,824	161.98	9.52%
18	UV2-LD: Urban Village Periphery (low density)	598,436	59.84	3.52%
19	Water-body	3,982,539	398.25	23.40%
20	Roads	765,094	76.51	4.50%
		17,016,539	**1,701.65**	**100%**

Source: Proposed Precincts Plan

Development Compatibility Matrix

The Compatibility Matrix is a comprehensive chart, which determines the levels of inter-compatibility between proposed precincts, the natural / environmental determinants and the other external determinants which will have profound effects on the future development of Phuentsholing. This matrix is an attempt to seek multiple compatible precincts, rather than a single optimum precinct. For example, a Flood Prone precinct could support agriculture activities, orchards, recreational precincts and other recreational activities, but not be suitable for settlement development and industries, thus determining the compatible and incompatible uses of the same area.

The compatibility matrix with respect to the environmental determinants for Phuentsholing becomes crucial to explain;

- The potential of the region for urban development, with respect to its predominant topographical condition, which is between the slope category of 00-100,
- High flood risk for the future urban development, with respect to the location
- Compatible uses, which could be accommodated in the eco-fragile and eco-sensitive areas of the town.

A part matrix compares the precincts with the crucial in-town determinants which will have profound effects on the precinct schedules distribution within the town. For example, the dominant government land holding pattern existing in some parts of the town can be advantageously used to accommodate the future population growth and other economic activities. This matrix allows the decision makers to plan, utilize and manage the town area with an understanding of environment and other determinants and how one can live in harmony with the environment.

Table 6-3: Development Compatibility Matrix

DEGREE OF COMPATIBILITY			INTER-COMPATIBILITY OF PRECINCTS																NATURAL DETERMINANTS												IN-TOWN DETERMINANTS				
			URBAN VILLAGE PRECINCT			URBAN CORE PRECINCT		INSTITUTIONAL PRECINCT	ENVIRONMENTAL PRECINCT				HERITAGE PRECINCT	SPECIAL ECONOMIC PRECINCT			ROYAL PRECINCT	SLOPES				WATERBODIES	VEGETATION		FLOOD RISKS					LAND HOLDING				
			UV-1 (Urban Village Core)	UV-2 (UrbanVillage Periphery-HD)	UV-2 (UrbanVillage Periphery-LD)	UC (Urban Core)	NN (Neighborhood Node)	I (Institutional)	E-1 (Environmental Conservation)	E-4 (Flood Prone Zone)	G-1 (National Importance Open Spaces)	G-2 (Local Green Open Spaces)	E-7 (International Boundary Buffer Zone	H (Heritage)	SE-2 (Multi-modal Transit Hub)	SE-3 (Dry Port)	SE-4 (Service Centers & Industries)	R (Royal)	> 30% (very steep)	20 - 30% (steep)	10 - 20% (moderate)	0 -10% (low/ gradual) predominant slope category of Sarpang	Rivers	Natural Storm Water Drains	Forest Cover	Agricultural Lands	Very High	High	Intermediate	Low	Scenic Locations	Government	Private	Army/ Police occupied lands	Existing Industrial Area	International Boundary (Buffer Zone)
URBAN PRECINCTS	Urban Village Core	UV-1	●																●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Urban Village Periphery (HD)	UV-2	●	●															●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Urban Village Periphery (LD)	UV-2	●	●	●														●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Urban Core	UC	●	●	●	●													●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Neighborhood Node	NN	●	●	●	●	●												●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Institutional	I	●	●	●	●	●	●											●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Environmental Conservation	E-1	●	●	●	●	●	●	●										●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Flood Prone Zone	E-4	●	●	●	●	●	●	●	●																					●	●	●	●	●
	National Importance Open Spaces	G-1	●	●	●	●	●	●	●	●	●								●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Local Green Open Spaces	G-2	●	●	●	●	●	●	●	●	●	●							●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	International Boundary Buffer Zone	E-7	●	●	●	●	●	●	●	●	●	●	●						●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Heritage	H	●	●	●	●	●	●	●	●	●	●	●	●					●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Multi-modal Transit Hub	SE-2	●	●	●	●	●	●	●	●	●	●	●	●	●				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Dry Port	SE-3	●	●	●	●	●	●	●	●	●	●	●	●	●	●			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Service Centers & Industries	SE-4	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Royal	R	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
INRASTRUCTURE	Roads		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Pedestrian Paths		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Water Supply		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Electricity		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Solid Waste Disposal		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Sewerage Disposal		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Storm Water Drainage		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Telecommunication		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Fire Fighting		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

● High Compatibility
● Moderate Compatibility
● Low-Compatibility
● In-Compatibility

● High Compatibility
● Moderate Compatibility
● In-compatibility

● High Compatibility
● Moderate Compatibility
● In-compatibility

6.1.4 Proposed International Boundary precinct

The security of a nation cannot be compromised and hence one of the prime agenda in planning the border towns is to reserve adequate spaces for security measures in the future. Phuentsholing being a border town is no exception to this situation. The porous nature of Bhutan-India border at Phuentsholing raises certain security concerns and Phuentsholing being a major industrial, commercial and recreational Hub; the border issue needs timely attention. The increased rate of urbanization in the country and the recent government initiatives toward strengthening the connectivity in the south-western parts of Bhutan through the on-going Phuentsholing-Samtse National Highway and the proposed link between Phuentsholing-Sarpang-Gelephu, demands for policy level decisions at national level.

Phuentsholing Structure Plan proposes a non-habitable green buffer zone along the Bhutan-India International Boundary. Ideally, the wider this non-habitable zone the better will be the security situation. However, the physiographical condition of the areas, being the only available flat and easily developable land along the international boundary within the city; their implications need attention and understanding in deciding the width of the buffer zone and the degree of control over the developments. There are many pockets of the limited public lands which would be lost in a kilometer, or even five hundred meter security zone.

Though the recommendations address the political sensitivity of the issue, there remains a need for policy level decision involving various disciplines. The aim of the proposal is to initiate the discussion and to put forth the arguments from the planning perspective. We maintain that the recommendations mentioned here are discussed purely from the planning and land economics point of view and we strongly suggest that a detailed discussion should be initiated before deciding on the width of the International Buffer Zone. We must also respect the local stakeholder's views, regarding their precious land.

In case of Phuentsholing the planners have proposed this belt to be 15m width in the extended municipal area along southern belt running from east to west based on the prominent change in natural terrain and 6m wide in the old municipal limit where there already exist structures that cannot be dismantled or relocated. The width of this proposed non-habitable green buffer zone should be maintained at a minimum of 15 meters in the extended municipal area from the International Boundary and should be demarcated as a separate precinct managed by the competent authorities, like Royal Bhutan Army. High elevation points along this buffer zone are best suitable for monitoring of activities along the international border.

Though no development would be allowed either permanent or temporary, in the areas proposed under the non-habitable green buffer zone, development related to security facilities including immigration and customs could be allowed, under special approval from competent authorities and Royal Bhutan Army. Some functions which demand high security measures like air strips, helipads, gateways, other security and defense activities could be allowed in this proposed zone under special circumstances. Agriculture practice would also be allowed in this proposed zone provided that the type of crops cultivated would not restrict the vision and the accessibility when needed. This zone would be primarily a low-density development area, strictly complying with the Special Development Control Regulations

approved by the Royal Bhutan Army. Apart from agriculture practices and development related to security facilities, construction of farm houses and other low-density housing typologies which are not urban intensive would be allowed in plots with an area of more than one acre, with one such structure allowed per one acre of land area. This buffer zone could also house all kinds of utility plots such as transformers, sewage treatment plants, water reservoirs, treatment plans and garbage disposal bins. Such buffers are proposed to allow construction of roads and railway track feeding the proposed dry port estate running parallel to the international boundary at places where it is possible and is felt necessary.

As a policy, the buffer zones could be demarcated by natural features like rivers, streams, land reliefs etc or by manmade features like roads, irrigation canals etc which would facilitate accessibility upon necessities. Further, in the long run the government and local administration should take appropriate measures to resettle the existing houses and other developments in the international border precinct to a safer place, outside and make the precinct free of any type of habitat and urban development.

6.1.5 Proposed Urban Villages and Neighborhood Nodes

The topographical conditions, concentration of population, environmental assets and geographical features of Phuentsholing evoke a need to re-conceptualize the conventional planning, which advocates a system of administrative wards or zones for managing urban settlements. There is a crucial need that the future development envisioned for the town brings a balanced urban development within the municipal limit rather than concentrating facilities and amenities at a few locations. The future development pattern should facilitate the distribution of urban facilities and services equally over the entire town's landscape, which would also act as development magnets. There should be a hierarchical arrangement of facilities and adequate population concentration towards achieving self-sustainable development strategy.

Considering these factors a system of urban development composed of self-sustainable urban villages would prove to be an appropriate unit for planning Phuentsholing. These are called as Urban Villages in the Phuentsholing Structure Plan with respect to the envisioned morphology of future development. The natural setting of Phuentsholing town allows the division into such Urban Villages in a very convenient manner. The natural features like the river, streams and change in elevation of various pockets of the town define the Urban Village boundaries.

Conceptually, Urban Villages identified in the Structure Plan will have amenities, basic services and convenience shopping called Neighborhood Nodes within Phuentsholing town area. The Neighborhood Nodes proposed along the banks of Ammo Chhu and that proposed within Pekarshing (Toribari) are relatively on a larger scale and are envisioned to act as extension to the present city core area. These are then surrounded with a ring of mixed use/ high density residential precinct termed as Urban Village 01 (UV1). As a basic unit of planning in the Phuentsholing Structure Plan, eleven such Urban Villages have been identified within the extended municipal limits. One of the major determinants in identifying the boundaries of proposed Urban Village is the comfortable walking distance for an average human and the proximity to the facilities available within given settlement.

These proposed Neighborhood Nodes would have amenities and facilities to make it self-sustainable. There will be convenience shops, a restaurant cum bar, cafes, barber shop, beauty salon, basic health unit, post-box, minor repair shop for automobiles, a taxi stand, news stand kiosk, neighborhood pub, bakery, cyber café, laundry and other amenities. Apart from these, the Neighborhood Node could also be business centers with office space, laundries, book stores, community halls crèches, ATMs and other ancillary facilities. These Neighborhood Nodes will be linked with the present core area through well-established transit corridors and express buses.

The present Core Area caters to the entire town and region's population and has more or less all the facilities proposed within the Neighborhood Nodes. The Neighborhood Nodes along the banks of Ammo Chhu and that proposed at Pekarshing (Toribari) will be the setting for upscale shopping in branded stores. In addition, it would have entertainment facilities, such as cinema halls, bowling alleys, restaurants, bars, discos, etc. It would have a space for a town level library, banks, post office, town hall, police station, fire station, banks and hotels as well. These Neighborhood Nodes along Ammo Chhu and Pekarshing (Toribari) will not only take off the load of the present core area but would also cater to the need of surrounding villages.

Table 6-4: Proposed land area breakup for various Places

Sr. No.	Various Places	Land Areas		
		Sq.m	Ha.	%
1	Toorsa Tar	2,610,080	261	15.34%
2	Ammo Chhu-01	4,786,375	479	28.12%
3	Ammo Chhu-02	1,800,656	180	10.58%
4	Pipaldara	217,596	22	1.28%
5	Kharaley	454,893	45	2.67%
6	Rinchending	985,950	99	5.79%
7	Ahlay	1,035,254	104	6.08%
8	Pekarshing (Toribari)	1,284,268	128	7.55%
9	Chengmari	1,956,860	196	11.50%
10	Malbase	801,283	80	4.71%
11	Pasakha	1,083,325	108	6.37%
		1,70,16,540	**1,702**	**100.00%**

Table 6-5: Characteristics of the proposed Urban Villages within Phuentsholing Thromde

Urban Village	Location	Identity
01	Toorsa Tar	Commercial, mixed use, supportive institutional and predominant residential precincts.
02	Banks of Ammo Chhu- 01 Along the proposed Phuentsholing-Samtse highway (4-lane)	Predominant mixed use commercial (an extension to the core commercial) and residential precincts along with mixed use and supportive institutional precincts.
03	Banks of Ammo Chhu- 02	Predominant recreational and institutional precincts. Also has space allocated for relocation of warehouses and workshop areas along the International Boundary.
04	Area between Pipaldara & Kabreytar	Predominantly under steep slopes with small area carved out for low density residential.
05	Dokhiya, Khareyphu & Kharaley	Neighborhood level commercial and low density residential precincts. Mostly this urban village has areas that fall under steep slopes and high hazard zones along the Ammo Chhu
06	Lower Rinchending	Predominant low density housing development based on the steep terrains
07	Ahlay	Predominant low density housing development based on the steep terrains
08	Pekarshing (Toribari) and Khogla	Higher level Neighborhood Node surrounded with high density residential and non-polluting industrial precinct on higher terraces supported by institutional precinct.
09	Malbase	Lower hierarchy Neighborhood Node surrounded by high density residential and supportive institutional precinct.
10	Chengmari and Gurungdangra	Predominant low density housing on higher terraces, high density residential on the lower terraces with supportive commercial and institutional precincts.
11	Pasakha	Existing planned Socio-economic zone constituting predominantly of polluting industries.

Table 6-6: Proposed Neighborhood Node at Pekarshing (Toribari) & Banks of Ammo Chhu 01

Facility	Nature of Facility	Plot Area (sq. m)	Built up Area (sq. m)
Neighborhood Clinic	Diagnostic, Casualty, Emergency	500	100
Nursery School / Crèche	of Age Group of 3 - 6 years adjacent to open space	450	150
Commercial Center	Convenience Shopping Fuel Station, Auto Repair Shop Café, Neighborhood Bar/ Pub Internet Café, Laundry, Kiosks	300 500 each 200	200 150 150
Transportation	Bus Stop, Taxi Stand	500	-
Neighborhood Commercial Open Space	Children's Park, Chortens	200	-
Parking/ Cycle Stands	Park and Ride for Express Buses	400	-
Public Conveniences	Phone Booth, News Stand Public Toilets, ATM, Medical Shop	25	25
Infrastructure Maintenance	Electrical Sub-station Water Supply Monitoring Cell Multi-agency, Complaints and Bill Receipt Cell	50	25
Social Infrastructure	Postal Agency/ Collection Center, Community hall, Temple, Lhakhang	100	25
Solid Waste Disposal	Store for Recyclable Wastes	75	25

6.1.6 Population accommodation and urban growth strategies

The strategies for future urban growth, accommodating future population and its density distribution within the town is crucial, given the geographical and location potential for the future growth of Phuentsholing. The strategy is to achieve a sustainable and balanced density distribution, which will accommodate the future population without disturbing the ecological balance of the region. A pattern of urban settlement, where development is concentrated in pockets called "Urban Villages" is adopted as described in the earlier section. Re-densification and re-development activities are envisioned in the identified Urban Villages to accommodate future population and urban facilities.

Urban Villages envisioned in the Structure Plan will consist of four major components. They are the Neighborhood Nodes (NN) in the form of Core areas, high density mixed use (Urban Village Core- UV1), high density residential surrounding (Urban Village Periphery- high density- UV2-HD), and low density residential (Urban Village Periphery- low density- UV2-LD) at the periphery. These four components vary from each other in terms of their population density (person per hector) and land-use distribution.

In case of Phuentsholing, the densification criteria vary from any other urban areas in the country. Generally, the Neighborhood Nodes holds high density residential development while the low density residential at the periphery holds a medium and low density development. This is totally dependent on the population projected and the accommodation capacity of the municipal area. Here the Neighborhood Node is proposed to have predominant commercial

activities and minimal residential development. The adjoining Urban Village Core (UV1), a mixed use development, is proposed to have higher commercial and institutional use and low residential density less than 125pph. The Urban Village Core is surrounded with Urban Village Periphery- high density (UV2-HD), a high density residential development, with residential densities higher than 350pph. On higher slopes, where the development is possible only in isolation or in pockets, a low density residential development that consists of only terraced housing is proposed, Urban Village Periphery- low density (UV2-LD). This is due to difficulties in laying the supportive infrastructure on sloppy terrains and accessibility issues. Within such areas, the proposed residential density will be less than 125pph.

The Neighborhood Node, apart from accommodating amenities and services, will also function as magnet to initiate and sustain the process of urbanization and settlement development in respective Urban Villages. Though the argument put forth in this discussion, about the establishment of Neighborhood Nodes, preceding the development of urban settlements, could be debated and counter-debated, it is a historical trend that any major development in a planned manner follows and depends on the availability of amenities and services at any particular place. This could be well understood by looking at the history of urban development in the global context. Thus, establishing a Neighborhood Node of respective Urban Village, together with basic infrastructure provision would be the priority for any urban development and it is the urban growth strategy advocated in the Structure Plan for Phuentsholing.

With due consideration to the present context, the Structure Plan advocates medium-rise development with built structures not more than six floors high in Core areas and two floors in the peripheral areas. This, apart from maintaining the vertical scale of the town, will also help in preserving the views and vistas of the town and its immediate surroundings. The low density development also takes into account the hot and humid weather conditions and the natural setting of Phuentsholing town.

Table 6-7: Population accommodation within proposed Urban villages

Urban Village	Area for Development and Population accommodated										
	UV-01		UV-02 (High Density)		UV-02 (Low Density)		SE-04 (Non-polluting)		E-4		Total Popln.
	Area (Ha)	Popln.	Area (Ha)	Popln.	Area (Ha)	Popln.	Area (Ha)	Popln.	Area (Ha)	Popln.	
Toorsa Tar	4.76	430	41.20	14,900	0.00	0	0.00	0	4.75	290	**15620**
Ammo Chhu- 01	58.73	5,310	51.60	18,661	5.34	543	0.00	0	18.96	1157	**25671**
Ammo Chhu- 02	6.51	588	0.00	0	0.00	0	24.09	2168	30.46	1858	**4614**
Pipaldara	0.00	0	1.05	379	0.00	0	0.00	0	6.57	401	**780**
Kharaley, Khareyphu, Dokhiya	0.00	0	4.33	1,566	3.44	350	0.00	0	13.76	839	**2755**
Rinchending	0.00	0	10.52	3797	15.35	1,561	0.00	0	36.21	2209	**7567**
Ahlay	0.00	0	0.00	0	5.70	579	9.07	816	17.49	1067	**2462**
Pekarshing (Toribari)	6.89	623	21.25	7,685	4.54	461	20.54	1,849	15.71	958	**11583**
Changmari and Gurungdangra	0.00	0	19.90	7,197	22.34	2,272	0.00	0	14.67	895	**10364**
Malbase	0.00	0	6.71	2,427	1.37	139	9.68	871	1.12	68	**3505**
Pasakha	0.00	0	1.94	703	1.79	182	0.00	0	2.31	141	**1026**
Total	**76.89**	**6951**	**158.50**	**57315**	**59.87**	**6087**	**63.38**	**5704**	**162.01**	**9883**	**85947**
Total Area (Hectares)	**520.65**										
Total Popln Accommodated	**85947**										

6.2 PROPOSED NATURAL ENVIRONMENT PROTECTION & ENHANCEMENT ZONE

Development is inevitable and must be accommodated. However, uncontrolled growth is destructive. Any development, which does not address the environmental factors of the place for which it is designed, will lead to degradation and destruction. Conservation principles can avert destruction and ensure protection and enhancement.

Environmentally, Phuentsholing region can be defined as the catchment area of the mountain slopes, watersheds of the rivers flowing into and adjacent to the town. Disturbance to ecological balance could lead to destruction of the entire town. The aim of the proposed natural environment protection and enhancement zone is to conserve the valuable environment assets of the town and the entire region for future generations.

Environment Conservation is adopted through Natural Environment Protection and Enhancement Zones in the Structure Plan, devised to protect and conserve the ecologically fragile areas of the town. The proposed Natural Environment Protection and Enhancement Zones are classified into:

A. Riparian Protection Zones (E1: Environmental Conservation Precinct) and

B. Slope and Soil Stabilization Zones (E4: Agri-based Environments)

These Environment protection and Enhancement Zones will be an integrated part of the respective Environmental Precinct proposed for the town.

A detailed Environmental Impact Assessment report for Phuentsholing Municipal area is proposed to be carried out under the NAPA project. This will create a base for future detailed planning exercises within Phuentsholing Thromde.

6.2.1 Riparian Protection Zone (E1: Environmental Conservation Precinct)

The land and the ecosystem supported by the river, streams, rivulets and their immediate surroundings form the Riparian Zone. The ecosystem supported various rivers, streams, and rivulets includes the existing natural watercourses, banks of the watercourses, flora and fauna habitats supported by them, terraces and marshlands associated with the watercourses. This ecosystem plays a significant role in protecting the edges and banks of the watercourses and also helps in filtering and purifying the water of the river and streams.

The objective of this proposed zone is to protect and conserve the ecology of the Riparian Zone, to control pollution along the river, streams and rivulets and to establish a greenbelt within the valley along the watercourses. The Riparian Protection Zone is to be classified into:

a) River and Stream Side Protection Zone
b) Ground Water Protection and Management Zone

a. River and Stream Side Protection Zone

The Proposed River and Stream Protection Zone includes, various dominant and primary storm-water drainage courses identified within the Municipal Boundary. This surface storm-water drainage pattern existing in the town is identified by studying the existing reliefs and topography. The edges of these drains are highly eco-fragile in nature and need immediate attention towards effective soil-stabilization and protection measures along its course. Moreover, the phenomenon of swelling width of the water course during peak rainy seasons also poses a threat to any kind of development adjoining its edges. Considering that, it is proposed to define a green buffer zone of fifteen meters wide right-of-way along the dominant and primary natural surface drain course identified in the structure plan. Upon training of the edges of all the major rivers and streams, the right-of-way width of the proposed green buffer shall not be less than as mentioned below:

1. Ammo Chhu: 30 meters on both the sides
2. Om Chhu: 15 meters on both the sides
3. Bhalu Jhora Chhu: 15 meters on both the sides
4. Padsekha Chhu: 15 meters on both the sides
5. Singye Chhu: 15 meters on both the sides
6. Major streams: 9 meters on both the sides *(at Pekarshing (Toribari) and Ahlay)*
7. All other minor streams: 5 meters on both the sides

The above width at specific location shall be maintained throughout along the natural drainage channel, which could be approved by the competent authorities based on the specific ground condition, land form and volume of the storm water discharge.

While it is imperative that the courses of these natural surface drains, identified in the Phuentsholing Structure Plan, cannot be blocked by any future development, and the

protection zone along the course of the drains should be treated as a non-negotiable part of the Structure Plan, flexibilities towards redefining and realigning the course of these drains could be approved considering the crucial needs of urbanization provided that any such activity should strictly follow the topographical and land form characters of the specific area and should strictly follow the underlined guidelines. Any such activity should be approved from the competent authority.

Proposed restrictions within the River and Stream Side Protection Zone

- No habitable development or construction shall be permitted within five meters from the defined edge of the natural drain course, or such distance as may be prescribed under any other general or specific orders of the Royal Government, or any other competent authority.
- Natural landscape features of the surface drains, edges, soil, vegetation (trees, shrubs and ground covers), rocky outcrops, boulders and any other features that are considered to be of scenic value shall not be disturbed from its natural state of being.
- Construction of roads, laying underground cables and other service networks, other structures like high-tension cable pylons, transmission towers and installations of electric substations shall not be permitted within this zone.
- Dumping solid wastes, disposal of domestic wastewater and sewage, washing of automobiles or any other action considered as a cause of polluting or damaging this zone shall not be permitted.
- Existing structures within this zone can be retained, but their further development shall not be allowed and subsequent development should get clearance from the National Environment Commission or other competent authority.
- Existing land use, which is considered not to cause any impact on the natural drainage system, can be retained after a detailed assessment by any competent authorities and after obtaining their no - objection certification.
- Active and passive recreational open space development, which does not block the storm water flow, will be allowed in the proposed protection zone with permission from competent authorities.

Guidelines and Permitted Actions

- Passive open space development like horticulture, nurseries, forest vegetation cover and passive recreational activity spaces like unpaved walk ways, adventure trails could be allowed in the proposed protection zone.
- Stretches of the zones, which are not fragile in terms of their ecological character, shall be permitted to have active recreational open spaces like parks and sporting facilities, with the approval from the competent authorities.
- Footpaths, cycle tracks, vehicular bridges, footbridges, and other permanent landscape elements like lamp posts, benches, gazebos, children's play equipment and litter bins, in

normal condition shall be permitted only beyond five meters from the defined edge of the surface storm-water drain course. However, under the special approval from the competitive authorities like National Environment Commission, Nature Conservation Division and after carrying out a thorough study of the past flooding trends, the above mentioned landscape features could be allowed within the protected zone, where the flooding risks are comparatively less. Under any circumstances these developments should not be allowed blocking the natural flow of storm water in the drain and no permanent urban developments in terms of built structures should be allowed within the proposed protection zone.

- Footpaths shall be permitted along the boundary of the protection zone.
- The location and layout for the above mentioned developments should obtain the approval of the National Environment Commission, the Nature Conservation Division (MoA) or any other competent authorities.
- Actions related to protection, conservation and enhancement of the zone will be permitted under the guidance of the National Environment Commission, the Nature Conservation Division (MoA) or any other competent authorities.
- Actions related to changing, realigning and redefining the course of drainage pattern, edge protection works for the natural surface drains shall be permitted with the clearance from the National Environment Commission, the Nature Conservation Division (MoA) or any other competent authorities.
- The protection zones can be adopted and maintained by any institution or organization in the immediate surroundings of the zone and will be owned by the government or local governing authority.
- **Surface Run-off Purification Ponds**: The surface storm-water drainage system within Municipal limits is heavily polluted due to disposal of domestic waste water and solid wastes. The proposed storm water drain purification ponds will filter and purify the organic and suspended particles carried by the surface run-off before joining the river. These purification ponds will be natural water retention ponds located at the confluence of the drain and the river. These ponds will also act as recreational features along the riverside green belt.

b. Ground Water Protection and Management Zone

The objective of this zone is to protect, conserve and manage the potential ground water resources within the town and to prevent urban development and hard paving on these areas.

The potential ground water resource areas within the municipal limits will be demarcated as Ground Water Protection and Management Zone. Suitable measures towards identifying these areas in the future with the help of Department of Geology and Mines are crucial to protect the ground water resources of the town. Areas to be identified within the town as ground water aquifers or ground water recharge sites in the future would also be categorized under this zone.

Proposed restrictions and guidelines for Ground Water Protection and Management Zones

- Agriculture, floriculture and horticulture are the best suitable precincts for the zone.
- Existing vegetation cover, which is indigenous to the area, should be retained.
- Construction of buildings which are dominated by hard paving of ground surfaces shall not be permitted.
- The zone will be developed as a part of parks, nurseries or gardens without disturbing the characteristics of the soil and subsurface geology of the area.
- Parks, nurseries and gardens shall be permitted with minimum built-up areas and hard paved surface areas. The layout of the proposed park, location, ground coverage, construction material, technology and process of construction of the structures should obtain approval and clearance from the National Environment Commission, the Nature Conservation Division (MoA) or any other competent authorities.
- Out - door sports activities which do not require hard paved surfaces and built structures shall be permitted after approval by the National Environment Commission, the Nature Conservation Division (MoA) or any other competent authorities.

6.2.2 Slopes and Soil Stabilization Zones (E4: Agri-based Environments)

The objective of the Slopes and Soil Stabilization Zones is to protect and stabilize the slopes of the mountains adjoining Phuentsholing town from soil erosion and landslides, which causes heavy siltation on the river beds, thus making the river shallower. It will reduce the intensity of surface runoff and help in protecting the town from the risk of possible flooding. The mountain slopes (higher than 30%) in and around the town that are barren and prone to landslides and soil erosion are defined as steep slopes and high hazard zone of the region.

Proposed restrictions and guidelines for Slopes and Soil Stabilization Zone

This zone should be defined as Agri-based Environment Precinct (E4), since most of these lands are currently under agricultural use.

- Quarrying and mining activities in this zone, and in any part of the hill slopes, should not be permitted under any circumstance.
- All the barren areas of the slopes should be reserved as low density development zones and planting of trees should be given immediate priority.
- Building of bunds and check dams along the course of the rivers and streams should be encouraged to reduce the downstream surface runoffs in an environment friendly manner.
- Planting of trees in the slopes, community forestry and social forestry activities should be encouraged and supported by the government.
- Areas under Very Steep Slope category (above 30% slopes) and Steep Slope category (20% - 30%) that are barren and have already been provided with access roads and other infrastructure networks should be limited in order to have a very low density development and shall be planted with trees, shrubs and, ground covers of indigenous species.

- Grazing on the slopes should be restricted, strictly monitored and regularized. Only identified areas within the forest and slopes should be allowed for grazing.
- Any future development in these areas, under special circumstances, shall be permitted only after carrying out a thorough Environment Impact Assessment and with the clearance from the National Environment Commission and the Nature Conservation Division (MoA). Environment conservation, protection and enhancement should be made mandatory and as a prime aspect of such development with strict vigilance and monitoring.
- Areas on the Steep Slopes and Very Steep Slopes with existing roads and infrastructure networks, with appropriate vegetative cover should be developed in such a manner as to perpetuate their existing wooded aspect. The maximum density permitted for the development will be one house per one thousand square meters of land area. The most suitable precincts for these areas are large institutional campuses, eco-resorts and farm houses.
- All the above - mentioned development in the zone shall be permitted only after a thorough study and analysis of soil and the geological conditions of the area by authorized and registered individuals, firm or organizations and after obtaining clearance from the National Environment Commission and, the Nature Conservation Division (MoA).
- Road accessibility to individual plots in these zones might not be possible. In such scenarios it is found appropriate to have common parking lots and pedestrian accesses to be provided from there on to the individual plots.
- The development should not alter the existing natural surface drainage pattern and should take care of the surface runoff. The storm water drainage network should be well planned.
- De-forestation activities, cutting of trees and the slopes of the mountains of Phuentsholing region should be strictly prohibited under any circumstance.

Proposed Locations:

1. Areas along Ammo Chhu river bed
2. Areas along the Om Chhu
3. Areas along Om Chhu in the urban villages of Dokhiya, Khareyphu and Kharaley.
4. Areas below the Phuentsholing-Thimphu highway in Lower Rinchending
5. Areas adjoining the major streams in Ahlay and Pekarshing (Toribari)
6. Area along the stream near the proposed third gate
7. Area in between the municipal boundary and Bhalu Jhora Chhu

6.2.3 Proposed Watershed Management Zone

The areas defined as the Watershed Management Zone (outside the municipal area) are the areas which contribute to the drainage networks that form the stream or the river. A watershed management zone, taken as a planning unit, includes the source and the

catchment area from which water drains into a small gully, a small stream made of gullies, a small rivulet made of streams and small rivers made of rivulets, etc. An optimally functioning watershed holds a great deal of the rain water that falls over it within its micro-catchment area, minimizing the run-off into the next lower macro-watershed unit. When all of the watersheds begin to overflow into the lower units, flooding is inevitable! Thus, various measures need to be taken to stop this disastrous process, which is amplified by indiscriminant tree cutting and careless, irresponsible new development activities, roads and mining. The protection measures in these regions involve digging trenches along hill slope contours and planting trees within the small water catchers. Likewise even small gullies and streams can be bunded; to stop the fast running of rain water and trees can be planted in the gullies. Check dams in streams and their side lining is needed in the Phuentsholing region. Watersheds management to be effective must start with smaller works over larger areas, in the upper, micro-level watersheds. Focus must be on locations where mining, roads, indiscriminant tree cutting, natural landslides, or shifting cultivation has created major damage.

Most of the streams and the rivers flowing into the Phuentsholing region have their watershed areas in the mountains to the north (belts from east to west) of the town. The aim of the proposed Watershed Management Zones is to protect the environment of the natural drainage network and other natural sources of the river and the streams, which include the slopes, vegetation, soil and the ecology of the watershed area. The approach cannot be limited to the town, but must be part of a macro-watershed region approach.

Proposed restrictions and guidelines for Watershed Management Zones

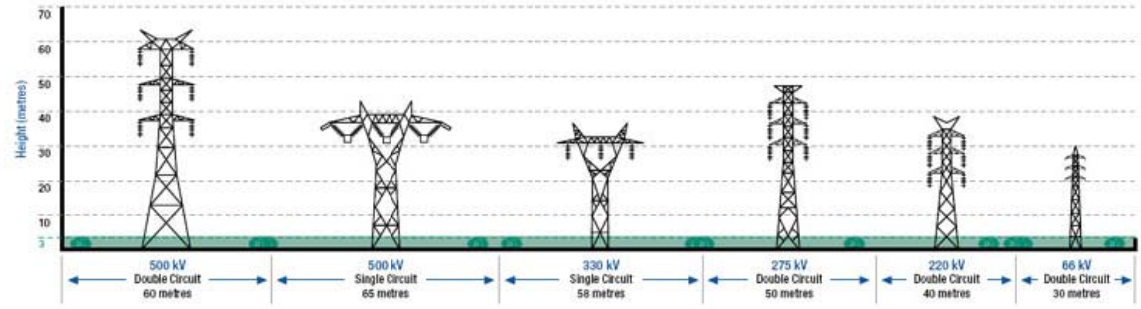
The primary requirement for protecting these watersheds is their detailed study and mapping to demarcate the areas.

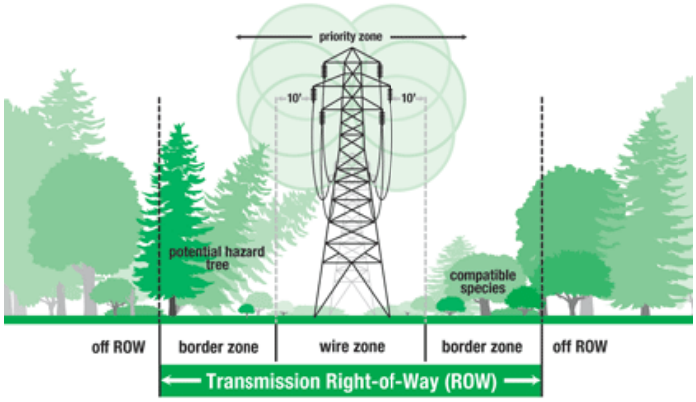
- Development on slopes, which are part of the watershed region, should be prohibited and permission for development under special circumstance shall be given only after detailed study and analysis of soil, geology, surface runoff and vegetation of the area. Environment conservation, protection and enhancement should be made mandatory and as a prime aspect of such development with strict vigilance and monitoring.
- The vegetative cover in the watershed region should be protected and intensified if necessary, with indigenous plants thus preventing the surface runoff and soil erosion.
- The natural drainage pattern, rivulets, and gullies in this zone should be protected and maintained.
- Grazing on the slopes, associated to the watershed area, should be restricted.
- As these areas mostly falls out of the municipal limits, the Dzongkhag Administration's forest division will hold the responsibility towards maintaining, protecting and conserving the water shed zones of the entire region under the guidance of National Environment Commission, the Nature conservation Division (MoA) or any other competent authority.

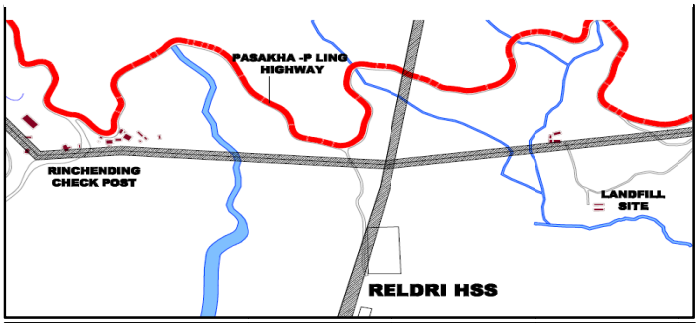
6.3 HIGH TENSION LINES RESERVATION

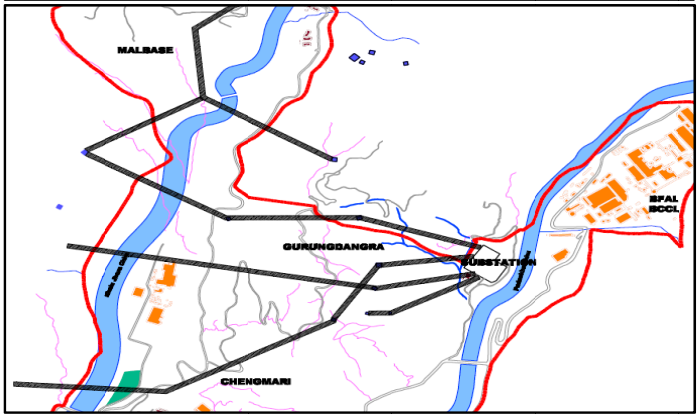
A dense network of high tension lines exists in the extended areas of Pekarshing (Toribari), Changmari, and Gurungdangra. This will have limitations on the land development due to buffer zones and reservations. Land adjoining the high tension lines will be kept almost idle, allowing only for some small temporary structures and permissible activities as per Bhutan Power Corporation Ltd. The following diagrams give an idea of the margin space to be left around different capacity of high tension lines.

Figure 01: High tension line corridor regulations









6.4 PROPOSED ROAD NETWORK AND TRANSPORTATION PLAN

Phuentsholing is envisioned to have a gradual urban growth-cycle, with the current population expected to rise to not more than forty thousand by the year 2028. As the town is developing within its boundaries, several economic sectors like tourism, industrial, institutional and commerce will develop in the surrounding region. The Industrial Estate at Pasakha is already planned and operational. Planning for the transportation of Phuentsholing has to start addressing the issues of integrating the regional centers with the town.

In any upcoming urban area it is important to connect the new urban patterns with previous development to evolve a cohesive land use distribution. The transportation linkages, at such a stage, need to form the connection. Current high rate of vehicle ownership in Bhutan is in a sharp contrast with the culture of "walking" which is an integral part of the Bhutanese lifestyle. Private vehicles are tormenting the narrow roads of the town, threatening the safety of pedestrians. Today the citizens give more priority to own a car than a house. The ratio of housing ownership to vehicular ownership is disproportionate in the country. People prefer having a car instead of a house as the rate of interest for the loan availability for the two is almost the same. While in other countries housing loans are much reasonable as compared to loans for vehicles.

The town requires a special set of guiding principles to develop an efficient transportation network. The fundamentals of transportation planning, like comfortable walking distances, design speeds and technical aspects of the road design have to be sensitive to the local conditions of the town. Taking into account the current trend and attitude of people toward transportation in Phuentsholing, the management aspects are equally important. The planning interventions should be supported by appropriate direct and indirect policy initiatives.

The proposed Transportation Plan attempts to be responsive to these issues while integrating the concepts of the Structure Plan like urban villages, neighborhood node, regional linkages and establishment of an urban corridor.

Strategies for Action

In present context, traffic and transportation planning are one of the most compelling and fundamental aspects of the town planning exercise. Desired goals in urban planning can be achieved through an efficient and well designed transportation network.

This plan aims to enhance connectivity within Phuentsholing Town, as well as with the economic activities in the region. While better connectivity facilitates smooth mobility of people and goods in an efficient way, it also lays down the structure, which locates various activities. Besides providing the connectivity, this Plan attempts to fulfill the following broad objectives:

- To utilize the road network as basic structuring elements of the town,
- To create a network of public rights-of-way through which public utilities and commonly used conduits can pass,
- To strengthen the intra- and inter-town linkages,

- To reduce the pollution emission levels in the town by promoting transit oriented development and by reducing the use of private vehicles,
- To encourage a pedestrian dominant transportation system, by enhancing safety and convenience,
- To complement the proposed precinct pattern with appropriate transportation and pedestrian linkages,
- To make the town a safer place to live in,
- To create suitable places to park vehicles, to stop mass transit vehicles and for people to change from one mode of transport to another,
- To facilitate emergency, security and utility vehicles movement in the towns.

Themes and Elements of the Transportation Plan

A Transportation Plan for a town is an integrated system of various elements pertaining to the movement of vehicles, pedestrians and the public transit system. The objective of this plan is to evolve a pedestrian oriented, environmentally responsive and efficient transportation system.

The traffic and transportation plan is mainly governed by two aspects:

- Movement and circulation Pattern
- Mode and type of transportation system

It addresses both these aspects and evolves from a set of basic themes listed below, which are meant to be synergetic. They comprehensively attempt to fulfill the set of above mentioned objectives.

The main themes of the Transportation Plan are:

- Road Classification
- Pedestrian and bicycle movements
- Public transit system
- Parking facilities
- Creating high land tax ratable values based on high accessibility; high utilities & service levels by allowing intense developments along the wider streets, supported by more floor area as a ratio to plot coverage.

6.4.1 Road Classification

A transportation plan for a town consists of roads of various hierarchies based on its location, population it serves on the density pattern, its linkages within the town and the surrounding precincts. These could be classified as the arterial roads, primary roads, secondary/ access roads.

The hierarchy of roads defines the right of way (ROW), that consist of drive ways, parking, buffer zones and the road side pathways or footpaths. The right of ways are decided based on the precincts sanctioned along it and the volume of traffic it would be carrying in the future. The number of lanes a right of way should possess is also based on the same factors. The underground trunk infrastructure also forms a part of the right of way. The Transportation Plan of Phuentsholing identifies a town level road network composed of the highways and by-passes, urban corridor and primary hierarchies of roads.

The following section lists down various classifications of roads identified in the Structure Plan and their main components with respect to the transportation pattern envisioned in the road plan, implications of implementation and corresponding guidelines.

Primary Roads

a. Urban Corridor: An urban corridor plays a vital role in easing the traffic movement within the town area with a larger vehicular load carrying capacity. The urban corridor is proposed at three different locations. The road starting from the urban village of Pekarshing (Toribari) connecting the Pasakha Industrial estate through the proposed third entry gate is termed as the urban corridor. The existing road from the Bhutan Gate to the roundabout below the present Phuentsholing Thromde office is also proposed to be upgraded as an urban corridor in order to ease the traffic movement at the entry and exit point of the Kingdom. This corridor is proposed to be of four lanes with footpaths on both the sides. The urban corridor would take care of the future traffic generated inside the high density development in Pekarshing (Toribari) and the heavy vehicular traffic to and from the Industrial Estate. Utmost care has been taken to reduce the number of intersections on this road in order to have a smooth traffic movement. The right of way of the urban corridor is proposed to be 18.60m wide that consist of 1.80m wide footpaths on both the sides, four driving lanes - 3.50m wide each (2 on either directions) and a 1.0m wide divider in between. No road side parking is proposed along the urban corridor in order to avoid hindrances to the traffic movement.

b. **By-pass Road:** A by-pass is proposed to ease the traffic within the old municipal area. The old town area is congested and unsafe due to the mixed heavy and light vehicular movement. The Phuentsholing Urban Development Plan 2002-2017 (PUDP) had proposed this by-pass road but due to delay in opening of the second entry gate to the Kingdom, the implementation process has not started. Hence, the Structure Plan emphasizes on the need to implement this important road link. The by-pass would help segregate the heavy vehicular traffic that leads to the existing dry port area, future highway leading to Samtse, highway leading to Thimphu and bifurcating to the Industrial Area at Pasakha. As a result, heavy vehicular movement within the existing town area will reduce and ease the pedestrian and light vehicular movement. The Right of Way of the by-pass is proposed to

be 18.0m wide that consist of 1.70m wide footpaths on both the sides, four driving lanes 3.50m wide each (2 on either directions) and a 0.60m wide divider in between.

c. The existing road link between proposed by-pass and existing Phuentsholing-Thimphu highway (at the roundabout below the Phuentsholing Thromde office) is proposed to be widened to 16.0m. This road link would have four lanes (3.0m wide each with a 0.60m wide divider in between and 1.70m wide footpaths on both the sides) that would help easy traffic movement.

Secondary Roads

The width of the secondary roads is mainly governed by the precincts pattern, the future population growth and the density distribution across the town area. As it is envisioned that Phuentsholing would grow at a relatively medium growth rate and most of the areas in the towns would be medium to high density zones, variety of two lane streets are proposed as a part of the Secondary Road Network.

In extended municipal areas within the low density development, the roads are proposed to have 2 lanes of driveway and 1.50m wide footpath on both sides. Thus, the secondary road is proposed to be 10m wide. In areas with relatively higher densities, the roads are proposed to have 2 lanes of driveway and 2.50m wide footpaths on both sides making the right-of-way 12.00m wide. These hierarchies of roads primarily act as links to the by-pass at some locations and also to the proposed urban corridor at other locations thus evenly distributing the traffic load.

All the road side footpath areas are proposed to have services running underneath. The water line, sewage lines, electrical distribution, telecommunication networks, water lines for fire fighting, etc. will form a part of the service that run underneath the parking and footpaths. For easy maintenance of these services the footpaths and parking bays are proposed to be paved with inter-locking tiles.

All the other attributes of the proposed secondary roads should comply with the specifications of the ‘secondary roads’ as mentioned in the ‘Urban Roads Standard 2002’ by the ‘Standards & Quality Control Authority’ of Bhutan.

Intersection Design

Since, the Road Network proposed in Phuentsholing is conceived as more than just a conduit for vehicles, the road intersections should be carefully designed and kept to a minimum. Intersections should be designed to slow down the speed of the traffic and to reduce pedestrian crossing distances. Unless absolutely necessary for facilitating safety, right and left turn lanes at intersections should be avoided. Reduced vehicular speeds improve pedestrian accessibility and safety, and can continue to accommodate safe vehicular movement. Minimum curb radius at the intersection will reduce the pedestrian crossing distance while reducing the speed of the car through the intersection.

6.4.2 Off-street Pedestrian Pathways

The Transportation Plan puts special emphasis on promoting pedestrian movement by making it safer and more convenient through several measures. Given the unique physical settings and scale of the town, walking is easier way to commute between destinations. A town-wide system of pathways, providing shorter routes to transit halts, residential areas, open space systems, important commercial zones and heritage sites is identified in the Structure Plan. It advocated the following pedestrian movement ways in the town, which are interwoven with the proposed road network.

a. Road-Side Walkways

Comfortable sidewalks along the roads reinforce pedestrian environments. The comfort and convenience of the pedestrian movement will reduce internal auto trips and reinforce the efficiency of Public Transit System by creating destinations that are attainable without a vehicle and origins, which do not depend solely on park-and-ride modes transfers.

A minimum of a 1.50 meter wide roadside walkway is comfortable for two people to walk abreast, but wider sidewalks are to be provided in the commercial areas where pedestrian activity is intense. However, the width of sidewalks is to be determined based on location, context and its role within the area.

b. Off-Street Walkways

The off-street walkway network should be complementary to the road network. This off-street pathway network often provides the shortest and easier connections between roads, residential sectors, commercial nodes and other destinations. Although the roadside walkway system will accommodate many destinations, these pathways will be primarily facilitating the commercial core, transit stop and major institutions. Off-street walkways will provide flexibility for pedestrian movement inside the town attracting various leisure activities along them. The pathways will run parallel to the rivers, natural storm water drains connecting the open space system and linking other major destinations of the town. These pathways will also act as the boundary line for the eco-fragile zones identified in the structure plan.

6.4.3 Public Transit System

At present, most of the population is concentrated in and around the Core Area so there is hardly any need for a public transit system in Phuentsholing. But considering the future growth and wide spread activities, it would be wise to have a provision for it along with a conceptual plan. With Phuentsholing conceptualized as a growth center at the regional level, an efficient public transit system connecting the surrounding regional centers is envisioned as an effective mean to achieve a rapid & comfortable mass movement, lower air pollution levels, enhanced safety & convenience and to revive conviviality amongst the citizens. Rationalization of routes and rates will play a major role in making the public transit successful. In addition, it is essential that buses in between the core area and Pasakha at one end and Core Area and Toorsa Tar on the other pick up passengers at intervals not more than ten minutes apart, even during slag periods of the day, increasing it to five minutes at rush hours.

A set of balancing measures on private vehicle utilization will have to come into force to support the public transit system. Young professionals, students, office personnel, servants and workers will all depend on public transport.

Presently, the RSTA inter-city bus terminal is not used efficiently. With an area of almost 2.50 acres it gives us an opportunity to explore the possibility of converting it into a transit terminus that could house a multi-storey parking for commuters to park their vehicles before getting on the public transport system. The entire plot could provide transit facilities for inter-city buses and local buses along with space allocations for private vehicular parking and taxi parking areas. The zones for inter-city and local buses could be physically segregated for a smooth traffic movement. People commuting to local destinations could avoid using their private vehicles for longer distances. Instead, they could park their vehicles at the multi-storey parking area proposed at the RSTA terminal and get on the local buses to reach their destinations/ work places in other corner of the town.

Public Transit Stop Locations in Urban Villages

Transit stops should provide an easy, pleasant and convenient access to residential and commercial areas. With the future population of Phuentsholing spreading over an area of 20sq.kms or travel distances across the city (from one end to another) to be almost 23 kms, there will be heavy traffic of private vehicles owned by various industries transporting their staff from residences to their work places and people commuting using the local transport to work places away from their residences would need specific stop points in an Urban Village. Ideally, these Transit Stops should be located centrally within the Neighborhood Nodes and high density residential developments. The Neighborhood Node should be located along the arterial transit route, directly accessible from the Transit Stop via sidewalks and clear pedestrian connections.

Transit Oriented Development advocated in the Phuentsholing Structure Plan will integrate transit stops in Neighborhood Nodes with compact, walkable urban villages. Eventually, the entire town will be linked into a “ride and walk” system bringing access to the Industrial Estate, the Town Core and Neighborhood Nodes to every resident.

Transit passengers are likely to make frequent street crossings, some at mid-block, depending on the location and design of the transit stop. The street design must recognize the need for easy, safe and fast pedestrian access, by providing sufficient auto and pedestrian visibility distances, stop signs, access for the physically challenged and clearly marked pedestrian crossings at signalized intersections. Bus stops must be located along primary roads and there should be provision for sidewalks and cross walks to facilitate frequent pedestrian movements. Wherever possible, bus routes should follow parallel connector streets that feed directly into the core commercial area, thus helping to separate out the through traffic and transit operations.

Most people will use public transit only if it is fast, safe, dependable and convenient. Buses must be frequent and regular. Accessibility to transit stops must be given high priority in the design of streets in order to promote transit rider-ship. Street crossing placements, design, and markings should recognize the need for fast and flexible access to the stop.

6.4.4 Parking Facilities

In the modern context, vehicles have become an important component of an individual's life hence it is necessary to accommodating them within the urban area. It is crucial in the sense that, though it helps to overcome the separations created by distance, it has created contradictions for human needs at various occasions. At these situations parking spaces form a vital negotiating entity. Phuentsholing Structure Plan while understanding the needs of an urban life provides various parking options for the vehicles in the town.

On-street Parking

On-street parking helps to create street activity, as well as provide functional spaces. Parallel parking should be used most often; however, angled on-street parking is encouraged along shopping streets within the Town Core commercial areas on the internal roads (secondary roads), where slow drive-by traffic is desired. To maintain travel speeds and emergency vehicle access, on-street parking should be discouraged on arterial or primary Roads. On-street parking helps "civilize" the street for pedestrians by creating a buffer between moving cars and the sidewalk. The additional parking helps to replace areas devoted to large off-street parking lots and places the parking near the desired street-side building entries. On-street parking tends to slow down the flow of through traffic and helps to develop a pedestrian environment where walking is desired. Hence while preparing the Local Area Plans for individual urban villages consideration should be given to on-street parking on the secondary roads.

Park-and-Ride Lots

Park-and-Ride facilitates the interface between public transit and private transit systems, where one can park private vehicles in a parking lot and catch a public transit system to reach the destination. While Park-and-Ride lots are extremely important components towards building the rider-ship of the overall Public Transit System, they do not necessarily augment the uses, activities, and densities of a mixed use, transit-oriented urban village. The location and type of Park-and-Ride lots should be considered in terms of the goals and functions of the entire transit system. Park-and-Ride lots are best located adjacent to the Transit Stops and the Transit Hubs. One such Park and Ride lot is proposed to be developed as part of the public transit system in the existing RSTA bus terminus with ample land area available for development.

Off-street Parking

In a pedestrian oriented Structure Plan, like the one for Phuentsholing, off-street parking in small pods, will allow vehicles to penetrate into the Town Core and neighborhood nodes, from peripheral access streets, while maintaining the pedestrian friendly nature of the urban areas.

Table 6-8: Lists of projects proposed in Phuentsholing Structure Plan for transportation Sector

Project No.	Project Description	Location / Area of Influence	Objective	Remarks	Required Studies / Surveys / Data	Actions
T1	Construction of new **Transit Hub (Bus Terminus)**	Existing RSTA Bus Terminus	• To provide convenience for the transit travelers. • To encourage the use of Public Transit Systems in the region. • As a growth inducing element for the Phuentsholing town. • To add efficiency.	• The Transit Hub is to be adequately connected with enough parking facilities for Taxi and private vehicles. • Also Its Connected with Pedestrian Path	• Detailed survey and study of the area towards identifying necessary flood protection measures and to finalize the area requirement. • To estimate the passenger load. • To formulate trip routes and frequencies of bus service.	
T2	Construction and development of the Taxi Stands at various Places in the Phuentsholing Town	(As per the Structure Plan) Near Proposed Bus Terminus, Near New Neighborhood Node in the proposed Urban Villages and Near the Hospital	• To provide convenience for the transit travelers. • To facilitate proper parking area for taxis and ensure smooth traffic flow			• Device suitable mechanism to pool the land for developing parking lots. • Compulsorily allocate space for Taxi Parking in every Urban Village.
T3	Up gradation and development the Existing Roads according to the assigned hierarchy	As per the Structure Plan	• To complete the town level road network by constructing the missing links. • To provide connectivity to the major activity centers with residential areas. • To facilitate the establishment of an efficient Transportation System towards achieving the compactness, and pedestrian friendly environment in the town.	• An appropriate road section is to be selected based on the ground condition, available land to develop the ROW and gradient.	Detailed survey • to finalize the alignment • to examine the availability of land • to arrive at the land pooling and acquisition requirements	• Device suitable mechanism to pool the land for the construction of the new road

Project No.	Project Description	Location / Area of Influence	Objective	Remarks	Required Studies / Surveys / Data	Actions
T4	Construction of New Roads	As per the Structure Plan	• To establish a network of different hierarchies of roads. • To efficiently connect all the major activity centers of the town and residential areas. • To facilitate the establishment of an efficient Transportation System towards achieving the compactness, and pedestrian friendly environment in the town.	• An appropriate road section is to be selected based on the ground condition, available land to develop the ROW and gradient.	Detailed survey • to finalize the alignment • to examine the availability of land • to arrive at the land pooling and acquisition requirements	• Device suitable mechanism to pool the land for the construction of the new road
T5	Construction of Bus-stops with adequate street furniture	As per the Structure Plan As a part of or in close proximity to the Neighborhood Node and settlements as per site conditions	• Allot a fix identified place where buses can stop for passengers rather than stopping anywhere as per individual passenger's convenience.	• Bus stops at the identified locations along the Public Transportation lines with lay-bays and adequate street furniture with proper signage.		• Device suitable mechanism to pool the land for developing parking lots. • Compulsorily allocate space for bus shelter in every Urban Village and in Urban Corridor.
T6	Constructing and developing both On-Street and Off-Street Pedestrian Pathways	As per the Structure Plan	• To promote the pedestrian movements in the town. • To ensure the safety of Pedestrians. • To ensure smooth traffic flow by segregating the slow moving traffic. • To create Pedestrian friendly developments in the town.	• Adequate safety measures to be provided along the Pathways.		Device suitable mechanism to pool the land for the construction of the off street pathways.
T7	Constructing new Pedestrian Bridges across Ammo Chhu, Om Chhu, Bhalu Jhora Chhu, Padsekha Chhu and other major streams in	As per the Structure Plan	• To establish pedestrian connection between adjoining urban villages • To facilitate easier connections between the areas separated by river / stream • To shorten the travel distances • Encouraging Walking and Cycling	• The option of constructing the new bridges needs to be explored with considerations to the available construction technology and financial viability.	• Detailed survey to finalize the location and alignment of the bridge • Detailed feasibility study to decide on the technology	

Project No.	Project Description	Location / Area of Influence	Objective	Remarks	Required Studies / Surveys / Data	Actions
	Pekarshing (Toribari) and Ahlay					
T8	Constructing a new Truck Parking	As per the Structure Plan	• To provide convenience for the transit travelers. • To facilitate proper parking area for trucks and ensure smooth traffic flow	• The Up-Gradation of Existing PWD Store Plot into a Auto-Workshop and for Truck Parking		
T9	Upgradation of Existing Bridges and culverts and construction of new bridges	As per the Structure Plan	• To cater to the future population • To improvise the highway connectivity and smooth traffic movement	• The Present bridges most of the locations are not adequate to cater to the future traffic conditions	• Studies to estimate the water discharge levels during peak seasons in order to delineate the height	

6.5 PROPOSED OPEN SPACE NETWORK AND PATHWAY SYSTEM

Open space systems have become an integral part of town planning as a result of the intense demand for outdoor recreation and a growing concern for conservation. Open spaces act as breathing spaces in the dense urban fabric or a place for recreation and retreat for the urban population. Open space systems not only act as recreation spaces but also vitalize the social and cultural activities of the town. They play a major role in the quality of life in an urban environment, health and climate. Hiking, picnicking, camping, fishing and pleasure driving are amongst the most popular recreational activities in Bhutan in addition to the regular sports like archery, khuru and soccer. Providing the spaces needed for these activities in close proximity to urban communities is one of the objectives of this plan.

6.5.1 Existing Open Space Network

Phuentsholing, because of its small scale and low intensity activities, currently does not have much defined open space reserved for specific recreation purposes. The Zangtopelri within the Core Area, the archery ground along the southern banks of Om Chhu, pedestrian walkways along banks of Om Chhu, the play ground along the Phuentsholing-Thimphu highway and the children's park opposite to BIFA are the open spaces and recreational areas that Phuentsholing town has at present. Other than these, the school playgrounds are used by students during the school hours and are accessible to the public during off-school hours. Phuentsholing middle secondary school has a tennis court as a part of the only sports complex that the town has. A crocodile park near the old Norgay Cinema is an attraction to the locals as well for those visiting the town. In all Phuentsholing town lacks in the presence of green open spaces that could serve to all age groups.

6.5.2 Proposed Open Space Network

As a growing town, Phuentsholing requires an organized open space system. A town has to provide a variety of open spaces, which satisfy the recreational demands of different groups of the society. The open space system in an urban area should therefore contain a great variety of facilities, suitable for all kinds of special interest groups: challenging and autonomous places for the teens, serene rural and quiet for older people, or crowded and active areas for those who want stimulus and companionship. Another important factor is the even distribution of these open spaces in the urban landscape. These recreational spaces should be distributed and located in close proximity to urban communities. Its implementation will require innovative ways of planning and managing the public open space system. The proposed open space system in Phuentsholing aims at:

- Managing and enhancing the natural landscape to fulfill the recreational requirements
- Rejuvenation of the existing open spaces

Considering the necessity for an open space system and the above mentioned factors, the proposed system provides different categories of open spaces as below:

a. Recreational Open Spaces

b. River and Natural Drains Protection Green Belt

c. Riverfront development

d. Heritage Open Spaces

a. Recreational Open Spaces (G2)

Recreational open spaces will provide facilities and atmosphere for active public recreation like outdoor sports, social gatherings, busy and active areas for those who want stimulus and competition. Following are some of the examples of recreational open spaces:

Community Parks (G2): This will be a local level recreation space, part of each urban village and it will have a variety of children's play equipments and amusement facilities. These are located at a convenient walking distance keeping in mind the safety of children and old people.

Sports Complex (G2): Phuentsholing has a higher percentage of migrants who come to Phuentsholing looking for job and business opportunities. These people come along with their families where the younger generation feels the necessity of a variety of sports facilities. To cater to such needs a sports complexes are proposed in the urban villages of Toorsa Tar, development along the Ammo Chhu and lower terraces of Chengmari. These complexes would have both indoor and outdoor sports facilities. The indoor sports facilities would include the basket ball court, squash court, a badminton court, table tennis and a swimming pool while volleyball and lawn tennis are proposed to be in the outdoors.

Archery Field (G2): Archery being the National Game of Bhutan is considered on a high priority. The existing small archery field along the banks of Om Chhu that is accessible both through vehicular road and through the river sidewalk. The same area could be developed with an additional area acquired to accommodate seating facility for the spectators. Archery requires fields that are away from the crowded areas for safety reasons and the present location is found appropriate for such uses. Tournaments could be held at the same location with enough seating facility.

Rinchending Wildlife Sanctuary (G2): Wildlife has always been an attraction for the tourist and children and is popular globally. The present crocodile park located in the heart of the town is found very congested due to the growing crocodile population and a limited accessibility. An area along the Phuentsholing-Thimphu highway is been identified on higher slopes that could accommodate the crocodile park (relocation) along with space allocations made for bird habitats and other animals.

The proposed open spaces, apart from accommodating facilities for active recreational use, will also reserve spaces for accommodating traditional and religious iconography like small temples, prayer flags, chortens, and prayer wheels in the town's landscape. All the existing and proposed open spaces will be linked with each other through green belts and pathways.

b. River and Natural Storm Water Drains Protection Green Belt (E1)

River and natural drains protection green belts are the environmental green corridor defined by the flood risk areas in proposed Environmental Enhancement Precincts plan. This green belt networks acts as spine of the town with the open space system running longitudinally along the river and transversely up along the natural drains. This green belt would be served by a major pedestrian movement system, which connects the urban villages and different precincts.

Though the purpose of this green belt network is to protect and manage the natural drainage patterns and its environments, the serene atmosphere of the green belt would act as a place of recreation and retreat from the crowded city life. This green belt would house jogging tracks, seating areas, meeting places, community parks, toddler play area, local level play areas and nurseries at specific locations along its course. All of these activities would strictly follow the Development Control Regulations proposed for this precinct.

c. Riverfronts (E1)

The Ammo Chhu poses flood threats to the Phuentsholing town. Ammo Chhu has a past history of heavy flooding because of which the adjoining private land parcels could not be developed. Ammo Chhu is hence proposed to be realigned with major river training project along its sides. On the other hand, river fronts are major assets to any settlement as they provide open places for both active and passive recreational activities. Considering the dual nature of these spaces and for safety purpose, this zone is marked as a restricted and highly controlled development precinct in the structure plan.

Apart from agricultural usage, the river waterfronts can be characterized by open spaces and activities which are temporary in nature and different from other parks and gardens proposed in the Phuentsholing town. In later stages while river protection work is carried out, parts of land can be reclaimed and developed into tourist attractions such as water parks, outdoor restaurants, golf courses, outdoor recreation and play grounds, drive in theatres, children roller skating strips, cycle tracks, mela and exhibition grounds etc.

National Level Open Space with Exhibition Grounds (G1): A linear open space on the opposite banks of Ammo Chhu is proposed that could be an attraction for the local residents, visitors and tourists. This space could only be developed upon successful implementation of the river reclamation works. It is proposed to house exhibition grounds, open air theatres suitable to local climate for traditional performances, low density iconic resorts for tourist attraction, theme parks for kids and older generation and water sport facilities. This linear open space shall also have river side walkways, jogging tracks and bicycle tracks with a length of more than 3 kms.

Water Sports: A dam is proposed towards the extreme north-western end that will cater to the proposed Ammo Chhu Hydropower project and also provide drinking water facility to the growing town. Construction of this dam shall lead to constant and maintained water levels within the municipal area. It is proposed to have bunds been constructed at various locations making sure that water becomes a permanent feature in the town area all throughout the year. The presence of ample water will create an opportunity to introduce water sports

activity at regional level. Boating and water scooters are some of the proposed attractions here for tourists visiting the south-western belt of Bhutan.

d. Heritage Open Spaces

Heritage open spaces are the open spaces associated with cultural and heritage structures, national monuments and important religious buildings. The proposal will develop these spaces to enhance the heritage structures and their precinct, which will also act as public open space.

Many of the Heritage Open Spaces proposed in the Phuentsholing Urban Development Plan 2002-2017 have been implemented. A few by them are developed by private owners while a few by the government. These consist of prayer wheels, mani walls and monasteries. The key religious heritage places within the municipal limits are the Zangtopelri within the core area, Dratshang complex on the higher terraces of CHPC at Dhamdara, Kharbandi Gompha and the Rani Choni Wangmo Lhakhang at Pasakha. A religious site is been proposed on the higher terraces at Pekarshing (Toribari) along the stream while another within the Ammo Chhu river bed. These open spaces will reserve spaces for accommodating religious features like prayer flags, chortens, prayer wheels and mani walls.

6.5.3 Proposed pathway system

The proposed open space systems are interlinked to other precincts by “pedestrian movement system”. These pedestrian pathway systems will be an inseparable part of the proposed open space system. In fact, the pedestrian paths are also a type of open space as a lot of social interaction happens on the pathways, instead of public places. The proposed pathway system in Phuentsholing is classified into two levels:

- Riverside and natural drain side pathway,
- Transverse links

In case of Phuentsholing, the river side pathway and natural storm water drainage channel pathways will act as the interconnecting pathway system joining various urban villages. Most of the roads emerge through neighborhood nodes. Hence, the road side footpaths give easy and shorter access to proposed amenities and respective urban villages. The intense network of pathway system throughout all the urban villages will play the role of transverse pathways.

The natural storm drainage channel pathways will act as a boundary line for the natural drain side green belt system. The entire system of pathways is linked to serve the open space system, major institutions, schools, urban nodes, urban village settlements, heritage sites and other wilderness areas. The proposed pathway system will also consist of jogging tracks. Pathways across the river bring the extended area along Ammo Chhu much closer to the existing core. Pedestrian bridges are proposed across the river through the green recreational open spaces. The purpose is to make the walk interesting and as a result minimize the traffic movements between the adjoining urban villages.

Roads along the municipal boundary, highway leading to Samtse and the existing road that connects Phuentsholing town and eastern urban villages, take care of the town peripheral footpaths in the form of road side pedestrian walks.

Urban Greenery: It is proposed that planting and maintaining indigenous tree species of the region within the municipal limit should be made compulsory. As a thumb rule, one tree space per every hundred square meter of plot area could be considered. Apart from maintaining urban greenery in the town's landscape, it will also help in creating a micro-climatic region within the town. It is also proposed that strict penalties both in terms of monetary and legal aspects should be imposed on development which does not comply with this proposal.

6.6 PROPOSED INFRASTRUCTURE AND AMENITIES

Amenities and services are essential to the establishment and smooth functioning of any settlement. These amenities, primarily in the form of educational, health and community facilities are essential services that an urban area is obliged to extend to its population, for an improved basic standard of living. One of the main objectives of Phuentsholing Structure Plan is the sequential allocation and development of amenities and services to prioritize potential growth areas within the town. Other objectives include the provision of basic amenities and services in all the identified urban villages to allow the town to function effectively as a network of self-contained urban units and to enable phased prioritization of services in these urban villages. Provision of these facilities is eventually done by the competent departments in the required hierarchies, to encourage people's participation and ownership of the common amenities. The other factors affecting "social existence" of any population are health amenities and the law and order in the society.

The education, health and social amenities Phuentsholing will include are as follow:

Education

- Crèches/Play centers
- Nursery school
- Lower secondary schools
- Middle secondary schools

Health

- Specialized Hospital (banks of Ammo Chhu)
- Medical Shops
- Public Hygiene Facilities for both men and women
- Crematorium (existing)
- Basic health units (03 BHU's)
- Hospital (up-gradation of existing hospital to 100 beds)
- Veterinary Hospital (Existing)

Sports and Recreation

- Parks
- Sports complex (outdoor and indoor games)
- Walking trails
- Running/ Jogging tracks
- Nature trails
- Archery ranges (up-gradation of existing)
- Riverfront development
- Exhibition center
- Picnic areas
- Urban gardens
- Arts and crafts development centre
- Community halls and Meeting places (like Cinema halls, Libraries, Religious places)
- Water sports

Economic Amenities

- Phuentsholing Thromde (up-gradation and local branch offices)
- ATM's / Commercial Banks
- Collection Centers/ Market Yards
- Vegetable Market
- Transport Centers (Parking / Repairs/ Weighing Scales/ Spares)
- Offices for electric, telecommunication, transportation department
- Offices of various government and non-government organizations
- Retail market at Food Corporation of Bhutan (FCB)

Security, Law and Order

- Police
- High Court Campus
- Women and Child Refuge
- Customs and Immigration checks

- Crises Management Center / Counseling
- Fire Fighting / Ambulance / Rescue
- Public Housing

6.6.1 Determinants and factors governing the amenities distribution

Though the distribution of amenities and services within Phuentsholing town is based on population characteristics, the spatial organization of the town's landscape has a crucial role to play in determining the distribution character of the proposal. The determinants and factors which govern the distribution of amenities and services in Phuentsholing town are summarized below.

Population Characteristics

The population of Phuentsholing is currently concentrated around the core area. The existing facilities in the town have been created considering their utilization as the commercial capital of the country that attracts people from all over country and residing in the nearby/ adjoining villages and Dzongkhags.

The proposal adopts the growth strategy formulated for the Structure Plan and bases its proposed locations of amenities on the "population holding capacities" of the Urban Village areas put forth in the Structure Plan. For each public service there are a minimum number of users to make it "viable." For example, a primary school with three students in it will never cover the operational costs.

Thus, there are "threshold populations" for services like education and health to become viable. Accordingly, the actions have been broken into sets of establishment, considering the current or anticipated population characteristics of each urban village.

Existing Spatial Organization of the Phuentsholing Town

The spatial organization of the town emerged as a result of the past development activities, location of existing amenities and services, integration of local area plans prepared in the past as a step forward to the PUDP 2002-2017 and the government land holdings within the town and immediate surroundings. These factors have a strong influence on the proposal. Though integrating various fragmented parts of the urban fabric is conceptualized as an integral part of the Structure Plan, the location of amenities and services within the town is greatly influenced by these circumstances.

Creating Self Sustainable Urban Communities

One of the main objectives of the Phuentsholing Structure Plan is the establishment of self sustainable urban communities within the town. The distribution pattern of the amenities and services proposed in the Structure Plan will be used as a guiding factor towards achieving this goal. Some of the development strategies adopted include,

- Establishing basic amenities and facilities at urban village level will cater to all the primary needs of each urban village, including health, education, convenience shopping, transportation, recreation and sports.

- Using the proposed framework of the urban village as being made up of a neighborhood node, high density residential zone and low density terrace housing at the periphery, to locate different grades of facilities appropriately, within each urban village.
- Making the higher order facilities serving more than one urban village or the entire town, accessible through adequate transport possibility.

6.6.2 Amenities and services located within an Urban Village

A pattern of basic amenities and services located in the urban villages towards making them self-sustainable units will form the first hierarchy in the Phuentsholing Structure Plan. These would be the amenities and services that are essential for the establishment and functioning of any residential community and would be of smaller scale that will serve the daily needs of adjoining community.

These facilities will include basic health, education, commerce, transportation, recreation and sports and will be the essential components of a proposed neighborhood node. The neighborhood node will be surrounded by high density residential development, which will give the needed population thresholds for things to function properly. The neighborhood node will function as a center, gathering social activities and interactions between the residents. Starting from toddlers in the nurseries and crèches, located in the neighborhood node, to adults who come to pick up their children, or those who come to collect their post, or to shop, or to just sit in the garden, the neighborhood node will act as a social gathering place. The amenities and services that a neighborhood node can house are categorized under the following heads:

Table 6-9: Proposed Amenities and Services in an Urban Village

Sr. No.	Category	Nature of Facility	Benefit and Social Purpose Served
01.	Health	Neighborhood clinic	Elementary treatment and medication
02.	Education	Nursery school and crèche	Elementary education and play facilities
03.	Recreation	Toddlers park, garden	Place for recreation and play for the young people, which will act as a place for chance meetings if coupled successfully with the commercial facility.
04.	Essential Commerce	Convenience shopping	For easy access to basic daily needs of grocery, medicines, vegetables etc.
05.	Public Conveniences	Post office, phone booth, library, news paper stand, ATM centre, community hall, Lhakhang, internet café, notice board, space for community welfare organizations	These would more importantly serve as popular meeting places for all age groups and would catalyze and spur chance interactions.
06.	Utilities	Public toilets, water storage reservoirs and back-up supply pumping facilities, solid waste collection bin etc	Provision of essential public utilities to support and serve community areas like the shopping area, public garden etc.
07.	Transportation	Taxi stand, parking lot, transit stop	These facilities will cater to the transportation needs of the urban village.

Sr. No.	Category	Nature of Facility	Benefit and Social Purpose Served
08.	Public Management	Police post, Fire service	Establishment of a governing authority at the lowest possible level of the town structure.

The purpose behind the establishment of neighborhood node and defining their composition as a conglomeration of these essential amenities is to create activity nodes in each urban village.

6.6.3 Amenities and services located in the neighborhood nodes at Pekarshing (Toribari) and along the banks of Ammo Chhu

The primary idea of establishing higher hierarchy commercials at Pekarshing (Toribari) and along the banks of Ammo Chhu is to create a commercial center with all the public facilities. These neighborhood nodes will not only serve the population of the urban villages but also the population of the town and the entire region. The present Phuentsholing core has limitations in order to expand due to unavailability of suitable land. Hence, the neighborhood nodes at Pekarshing (Toribari) and along the banks of Ammo Chhu will act as an extension to it.

These two neighborhood nodes will act as a destination or a facility hub, with facilities for 'modal split' within the transport framework suggested for Phuentsholing town in the Structure Plan. Transport facilities like a local level public transport and a large taxi stand will connect these two neighborhood nodes with the rest of the town and the region, in the future. Public parking will be accommodated within these commercial zones. People in other parts of the town, can drive to these neighborhood nodes acting as a workplace and as a center for commercial, recreational facilities. They can also enjoy the pedestrian oriented environment proposed within these neighborhood nodes.

Components of neighborhood nodes at Pekarshing (Toribari) and along the banks of Ammo Chhu

The neighborhood nodes can be split into the following three components:

1. Commercial component
2. Recreational component and
3. Public conveniences component

Commercial Component:

This will include the town and local level commercial activities like shopping arcades, departmental stores, bookshops, net cafés, bars, restaurants and cafeterias. It would also house private and public office spaces required for the growing business community in the town. Based upon the development control regulations, there will be separate guidelines to control the ground coverage and height of these commercial buildings. There will be urban design controls for the massing and facades of these buildings. There will be provisions to accommodate plot level parking either in basements or under stilts. In addition, every commercial building will have off-street parking in fronts to accommodate the visitors.

Recreational Component:

This will include town level recreational facilities like cinema theatre, auditorium, bowling alleys, which can be under private ownership. It will also include town level sports facilities like the existing football ground, indoor sporting facilities, tennis and basketball courts, archery field, etc. A system of open spaces connecting all the sporting facilities is also proposed within the urban village as part of the environmental conservation precinct.

Public conveniences component:

This will include the public facilities provided by the government like hospital, post office, banks, fire station, fuel services, etc. The existing vegetable market along the RSTA bus terminal is proposed to be relocated within the core commercial area. It is proposed that the vegetable market is upgraded with additional facilities for cold storage and parking. A new town hall is proposed within the existing PWD housing colony along the Gaki Lam. Hence, a need to have another town hall in the extended area is not felt to be a must. Most of the public conveniences at present are provided and maintained by the government and are proposed to be up-graded considering the future needs.

These two higher hierarchy neighborhood nodes will provide the following amenities:

Table 6-10: Amenities & facilities proposed in the neighborhood nodes at Pekarshing (Toribari) & along the banks of Ammo Chhu

Sr. No.	Amenity	Details
01.	Phuentsholing Thromde branch office	A Municipal Authority for the implementation of the Structure Plan, providing building permissions, taking care of the infrastructural works, etc
02.	Commercial Plots (private ownership)	Department stores, clinics, crèches, private hospitals, general merchandise, hardware stores, variety of shops, restaurants, bars, discos, libraries, bowling alleys, net cafés, ATM centre, etc
03.	Offices	Corporate offices, professional suites, studios, agencies
04.	Inter-town Bus Stop (in future)	Bus parking, Waiting area for passengers, Refreshment facilities, Public toilets, parking facilities
05.	Hospital & neighborhood clinic	Up-gradation of the existing Phuentsholing Hospital with additional facilities
06.	Vegetable Market	Upon relocation, provision of the facilities of Vegetable Market like, Parking area, Vegetable stalls, cold storage facilities, other storage facilities, waste disposal and public toilet facilities.
07.	Taxi Stand	To accommodate about 30 taxis
08.	Police Station	Allocation of appropriate plots for Royal Bhutan Police with adequate parking space for vehicles and a temporary jail
09.	Post office & Telecommunications Center	Allocation of appropriate plots for post office and telecommunication centre with facilities like, post boxes, telephone booths, telephone billing center, internet facilities, parking facilities.
10.	Cinema Hall	A Multiplex with seating area for 200 people, parking, lounges, refreshment facilities, entertainment facilities, public toilets, etc.
11.	Sports Complex	A complex to have sports facilities like tennis, basket ball, volley ball, etc. These Sports Complexes shall house both indoor and outdoor sports facilities.
12.	Recreation	Facilities for pool tables, caroms, cards, bowling alley, wedding hall, clubs, etc. which could be developed as a part of the commercial plots.

Sr. No.	Amenity	Details
13.	Fire Station	A fire station is proposed at Pasakha Industrial Estate and another one could form a part of the existing RSTA bus terminal campus.
14.	Service and fuel station	Provision of a fuel station along the neighborhood node along the banks of Ammo Chhu with additional storage facilities for petroleum products, basic service facilities, telephone and fire fighting facilities and automobile workshops, recyclable waste store room. The existing BOD near the Bhutan Gate could be appropriately relocated over here.
15.	Parking	Parking lots at strategic locations, road side parking facilities and plot level parking.
16.	Public & Government Institutions	Plots for the establishment of future government and public institutions.
17.	Spiritual and Heritage	Establishment of heritage structures like the monasteries and temples
18.	Green Areas	Includes open spaces, plazas, green areas

6.6.4 Town Level Amenities and Services

The second hierarchy of amenities and services proposed in the Structure Plan will cater to the needs of the town. An efficient structure of these facilities within the town mainly depends on the level of facilities provided and its accessibility by the town population. The essential character that differentiates these town level amenities from the urban village level amenities is that these amenities have to be planned considering the whole town as the elementary unit, with the assumption that these amenities will be mutually shared between adjoining urban villages or over the whole town population.

As a step further towards identifying the kind of amenities and facilities needed for the town population in coming decades, with respect to the demographic projection, a detailed study of standards was carried out and elaborated earlier in the report. The attempt in the Structure Plan is to facilitate and enable easy access to all the grades of facilities provided in Phuentsholing for the entire town population. These will include facilities like a central town hall, town level library and open spaces requirement for the future population.

6.6.5 Strategies for amenities and services provision within the town

The strategies for provision of recommended amenities and services within the town has been outlined according to the estimated population accommodation in each of the urban village, as per the designated density characteristics, as explained in the earlier chapter. Hence, a phased scenario of population has not been projected for the whole town.

Accordingly, in case of the amenities also the maximum population that could be accommodated has been considered for decisions on the required grade of facilities. But, it would not be accompanied with phasing scenarios, as it would be unrealistic for the adopted growth strategy. Instead, it would be appropriate to set standards of population thresholds after which, any facility will be up-graded to the next higher level. As discussed earlier, the whole growth strategy of the town has been structured into a set of urban villages, each one of which would be self-contained with regards to basic social amenities and facilities. Areas such as lower Rinchending and Ahlay have difficult terrains and are found suitable only for a very low density residential development. Hence, no large scale amenities are proposed in

such urban villages but they would rely on the adjoining urban villages for larger level amenities such as commercial, educational and health facilities.

Thus, arriving at a series of self-contained urban villages, and in the process, decentralizing and distributing the amenities in a balanced manner in the town's landscape would be the main strategy advocated in the Structure Plan.

6.7 PROJECTS OF SPECIAL SIGNIFICANCE

The Structure Plan proposals are an outcome of the dreams and aspirations of the people of Phuentsholing. While the planning team believes that planning principles may be either global, or national, the solutions offered are respecting the local context. One must understand that certain projects may be sustainable and be successful, only in certain context. The list of projects mentioned below are specific projects considering Phuentsholing's potentials and constraints that are categorized under various developmental heads. Successful implementation of these projects over the next fifteen years, which is the plan time horizon, means the success of our Structure Plan.

6.7.1 Gateway to the Kingdom:

a. Opening of the proposed second and third Gateway to the Kingdom

The PUDP 2003-2017 had proposed to open up the 2nd Gate leading to the bypass in order to ease the traffic movement at the entry point by segregating the heavy and light vehicular traffic. After almost a decade where in Phuentsholing town is rapidly growing this project should be initiated on a high priority basis.

The proposed Third Gateway to the Kingdom near Pekarshing (Toribari) shall specifically cater as an access point for heavy vehicles leading to the proposed Dry Port, Pasakha Industrial Estate and to other parts of the country. This shall minimize the traffic congestion at the existing Gateway, the proposed 2nd Gate and the existing Phuentsholing-Thimphu highway.

b. Redevelopment of the "GoI" Building premises

The "GoI" building is so prominently located that it catches one's attention while approaching the Gateway to the Kingdom. The Gateway should be such that it should depict the rich traditional architecture and culture that Bhutan has conserved for centuries. Over the past, several proposals were made in order to redevelop the "GoI" building and its surrounding premises in order to elevate the rich traditional architecture, but have been weak in implementation.

The structure plan proposes to prioritize the "GoI" building and its immediate surroundings as a redevelopment project. Local experienced architects should be invited to participate in the designing of such prominent land mark structures by holding architectural and urban design level competitions. The concepts prepared should be displayed to all and the shortlisted concept should be developed and implemented. The "GoI" building and its surrounding premises are ideally suitable to house facilities such as

a Tourist Information Center, a display center for traditional handicrafts, a Museum, a tourist visa center and open cafeterias for visitors.

6.7.2 Economic and Tourism Base:

a. Prioritizing the relocation of the industries and warehouses within the existing Core Area

It has been identified that the industrial and warehousing activities in the present city core are a mismatch to the adjoining precincts and attract large amount of heavy vehicular traffic that makes the pedestrian movement difficult and unsafe and also leads to air pollution. Relocation of such land uses and relative activities needs to be prioritized.

b. Ammo Chhu Hydro Power Plant

A Hydro Power Plant is planned to be built over Ammo Chhu with backwaters stretching to almost 24kms. It shall generate employment during the construction stage and upon completion it will turn into an economy generator with the export of power to India. Construction of the dam shall eliminate the risk of flooding in the town area.

c. Ammo Chhu River front development (G1)

Ammo Chhu banks have a high potential to be developed as a major tourist attraction. Upon carrying out the river training works the river bank shall be appropriately available for such developments. The river banks could house:

i. River side walkway and bicycle tracks

ii. Ropeway across the river linking the Kailashwar Drangra

iii. Amphitheatres and open air theatres

iv. Drive in cinemas

v. Light and sound show with musical foundations

vi. Children’s play areas

vii. Themed parks

viii. Senior Citizen’s park

ix. Water sport activities

x. Iconic star hotels

xi. Sports complexes

xii. Exhibition grounds

xiii. Adventure trails

xiv. Hiking and rock climbing parks with camping facilities, etc.

d. Establishment of the Dry Port

A Dry Port is an inland intermodal terminal directly connected by road or rail to a seaport and operating as a centre for transshipment of sea cargo to inland destinations. In addition a dry port shall also include facilities for storage and consolidation of goods, maintenance of road or rail cargo carriers and custom clearance services. The location of these facilities at a dry port relieves competition for storage and customs space at the seaport itself. The earlier Dry Port was proposed to be on the lower terraces of Pekarshing (Toribari). Upon analysis, the earlier location was felt unsuitable for the establishment of the dry port as it would consume a prime land suitable for high density residential development and shall attract high amount of heavy vehicular movement making the urban villages unsafe. The Structure Plan proposes the Dry Port to be close to the proposed 3rd gate as it would be easily accessible by heavy vehicles entering the Kingdom.

e. Wild Life Sanctuary:

The existing crocodile park is one of the attractions within the Phuentsholing town area. With a marginal space available for expansion it is proposed that it could be moved to the proposed Wild Life Sanctuary along the Phuentsholing-Thimphu highway. The proposed sanctuary shall have reserves for rear species of bird. Upon development it shall attract high amount of local and international tourists. A relocation of the Crocodile Park from the Norgay Cinema Hall location is proposed to the Wild Life Sanctuary.

6.7.3 Infrastructural Enhancement:

a. Prioritization of Phuentsholing-Samtse highway construction

Phuentsholing, the commercial capital of Bhutan, has prospects of developing as a business and industrial town. The growth of Phuentsholing is also dependant on its connectivity with the adjoining Dzongkhags and towns. The construction of the bridge connecting the two Dzongkhags of Chhukha and Samtse is one such initiative that the Royal Government has taken. Construction of the Phuentsholing-Samtse highway shall help elevate the business development in Phuentsholing.

b. The by-pass and the urban corridor

Construction of the by-pass shall result in minimizing the traffic congestion in the core area by segregating the heavy and light vehicular movement. Development of the Ammo Chhu Hydro Power plant will attract heavy vehicular transport vehicles. The by-pass will ease out the movement of the heavy construction vehicles.

The structure plan proposes to have a four lane urban corridor to be built linking Pekarshing (Toribari) and Pasakha industrial estate. As Pekarshing (Toribari) is proposed to have a higher residential density while Pasakha will have an increased number of heavy vehicular movement in the future, this four lanes urban corridor will help managing the traffic movement.

c. Realigning of the high tension power lines from the prime developable lands

Phuentsholing has a higher potential of providing future employment to its residents. On the other hand it has a very limited area for development and population accommodation. The dense network of high tension lines further reduces the areas of development in the urban villages of Gurungdangra and Chengmari. Hence, the structure plan proposes to have one of the options of the following:

i. The high tension lines should be made underground in order to reduce down the buffer zones and as a result increase the developable area component.

ii. If the high tension lines cannot be made underground, the land parcels being a part of the urban area be compensated equivalently. In such a scenario the land owners shall be restricted to develop the land as prescribed in the development control regulations. They could still continue to use the land for agricultural purposes and should be taxed lowest based on the taxation system.

iii. Re-aligning of the high tension lines could benefit both the land owners and the Bhutan Power Corporation on a longer run.

6.7.4 Sustainable Environment and Community Development:

a. River training works and land reclamation works

River training and land reclamation works form a part of both infrastructural and sustainable environmental development. Training the river and stream edges shall safeguard the adjoining areas from flooding and as a result shall also help recharging the ground water levels. While Phuentsholing has a shortage of land for future population accommodation, the river and stream training works shall generate additional land for development.

b. Strengthening of Phuentsholing Thromde and setting up of their branch offices

Proper implementation of the structure plan shall require constant monitoring and assistance. In such a scenario the structure plan proposed to have Phuentsholing Thromde's branch offices within the Urban Villages of Pekarshing (Toribari) and Chengmari.

c. Sports complexes at proposed locations

With the increasing population along with the business development of a growing town, local level recreational and fitness amenities cannot be ignored or overlooked. The structure plan hence proposes to have such sports complexes that shall cater to the future population residing in the various urban villages. With developmental activities taking place in the extended municipal area, construction and development of sports and health facilities should be prioritized at proposed locations.

6.8 PROPOSED TOWN SANITATION AND UTILITY SYSTEM

Planning for utilities and services is a basic need to ensure good living conditions in the town. This section takes into account various projects proposed related to basic infrastructure. The proposals are related to the population accommodation capacity and the proposed urban villages. One of the important aspects of these services is to encourage community participation at all relevant areas and at all relevant levels, which will ease the maintenance and management of the amenities.

It must be noted that selection of appropriate utilities mechanism and their design should be done by qualified public health engineers. In this section a conceptual network and broad goals are discussed, which will help the public engineers in detailing out the system in future. The Structure Plan aim is to reserve the network rights-of-way and to facilitate preliminary cost estimation process. The actual designs and costs estimation will be carried out by public health engineers engaged for the specific task, who shall interact with the stake holders of Phuentsholing.

6.8.1 Water Supply

Phuentsholing town presently accommodates a population of 23,912 persons. The population is spread out over an extended municipal area of approximately 16.8 sq km.

Water Requirement Forecast

The water requirement for future development is calculated based on an assessment of the total population that could be accommodated within each of the proposed urban villages as per the appropriate density levels established for each precinct.

The population accommodation of each urban village is calculated by considering the total area of the proposed precincts allowed for residential use multiplied with their respective residential developable area co-efficient assumed for each precinct. The net residential developable area thus calculated within each precinct in terms of percentile proportion, which is directly proportional to the percentage population accommodation in that precinct. Thus, the population accommodation in each urban village is calculated.

The consumption pattern in each of the proposed precinct will vary based on the allowable uses and the population density. But, for the purpose of arriving at standard parameters for calculating the demand in all the urban village areas, the domestic to non-domestic water consumption proportion of 70% - 30% has been considered, with an addition of 25-30% to the total requirement as possible network losses. To forecast the future water requirement of the town, following standards are adopted:

Table 6-11: Water requirement standards

Category	Water Requirement in Liters Per Person Per Day	
Domestic Needs	Absolute Minimum	70-100lpcd
	Desirable	135-150lpcd
Offices/ Corporate Institutions		45lpcd
Schools/ Educational Institutions	With Boarding Facilities	135lpcd
	Without Boarding	45lpcd

Category	Water Requirement in Liters Per Person Per Day	
Commercial	15% of the domestic demand or 20lpcd	
Hospital	More than 100 beds	450lpcd
	Less than 100 beds	340lpcd
Fire Fighting	15% of the domestic demand or 20lpcd, based on the population	
Terminal Stations		45lpcd
Cinema/ Concert hall/ Open Spaces		15-20lpcd
Factories	45lpcd (30lpcd with no bathing facilities	

Source: Urban Development Plan Formulation and Implementation (UDPFI) Guidelines, Institute of Town Planners, India and report on pre-feasibility study conducted by the Department of Urban Development and Housing during January, 2003

The primary objective of the proposed water supply system is to ensure an efficient and regular supply of potable water for all the areas within the municipal limits. Other objectives include:

- To establish the urban villages as a basic unit of future water supply system of the town, which will facilitate the provision of different and varying supply patterns as per the characteristics and need of the urban village and devise different pricing patterns for different segments as per the infrastructure and establishment costs of each area.
- To reduce present network losses to a minimum possible extent by decentralizing the water supply distribution network pattern and ease the maintenance by focusing on each urban village.
- To establish a water supply charging system in relation to the consumption pattern of the area, the density of population served and the type of supply system.
- To establish a cost efficient network that is based on the gravity flow system.

Strategies for Action

Water Supply demand for the residential population of Phuentsholing town is estimated to be 7000 m3 per day, considering an average of 133 liters per person per day.

As present, 60% of the total water is supplied through underground sources and only 40% is through surface water source. It should be considered to reduce the dependency on ground water source and a complete revitalization of the damaged surface water intake from Ammo Chhu and Om Chhu should be considered as a long term strategy. Also, the present intermittent supply should be upgraded for continuous water supply within the extended municipal limit. The detailed design of new water supply scheme and its distribution system has to be done by experts. However, it is assumed that a gravity based water supply distribution system should be adopted.

As a basic unit of planning in the Phuentsholing Structure Plan, eleven urban villages are identified comprising of different precincts. Considering this framework, it is proposed that each urban village is equipped with a storage reservoir, to enable a pressure driven water supply system in these areas. A network of trunk infrastructure is proposed to be laid out covering the key areas of the periphery, from where branch lines would be let out as and when required. Hence the trunk infrastructure from the main reservoir to the respective

urban villages would have to be established properly to facilitate easy operation and maintenance. The actual network for each urban village, as per the different systems of supply proposed would have to be worked out in detail at local area plan level.

The broad proposals for action are as follows:

- All planning of networks henceforth would have to be done for each of the proposed urban village, considering them as independent planning areas. For example:

    a. A common ground water source along the stream adjoining international boundary can be tapped for lower Rinchending, Ahlay, Pekarshing (Toribari) and Khogla urban villages. Water will be pumped from there to a raw water reservoir located at a higher elevation, just outside the municipal boundary. After treatment, it should be stored in the main reservoir and then supplied to the respective urban villages through gravity.

    b. A ground water source is already been identified at lower terraces of Chengmari for the urban villages of Chengmari, Gurungdangra and Malbase. From there, water would be pumped to an intermediated raw water storage tank on higher terraces of Chengmari and then pumped to another higher location in Gurungdangra where a raw water storage tank, treatment plant and main reservoir are proposed.

    c. A similar mechanism as above shall be implemented for Toorsa Tar as well.

    d. urban villages of banks of Ammo Chhu, area above Kabreytar, Kharaley, Khareyphu and Dokhiya shall be connected to the existing water supply networks available within Phuentsholing town.

    e. The above mentioned water supply networks should be planned considering the fact that upon completion of dam construction, the primary source for water supply to the entire municipal area for domestic purposes will be the dam. However, the proposed storage, treatment plant and the distribution system can be utilized in future as well.

- Pricing for water consumption would be as per the metered consumption for each connection, and would vary according to the precinct it is located in.

- Differential pricing mechanisms could be evolved for different grades of development, precincts, and income groups as per the density of development, consumption pattern and type of supply system.

- The manpower capacities required to be engaged in the management and maintenance of the urban water supply network should be established, to cover and manage the future developments.

- The planning and development of basic infrastructure, like water supply, sewerage and roads would have to be done in coordination with each other to facilitate easy implementation and maintenance.

Table 6-12: Water requirement for the extended municipal area

Urban Village	Resident Population	Water Requirement per day						Total requirement	
		A	B	C	D	Wastage***	E		
		Domestic (Resi.)	Commercial	Institutional *	Industrial**		Fire	(Ltrs)	(Million Ltrs.)
		(140lpcd)	(15% of Resi)	(45lpcd)	(35lpcd)	30% (A+B+C+D)	(15% of Resi)		
Toorsa Tar	15,620	2,186,800	321,940	103,500	0	771,512	321,940	3,721,312	3.72
Ammo Chhu	30,285	4,239,900	635,985	153,000	14,000	1,234,135	514,798	6,822,103	6.82
above Kabreytar	780	109,200	0	0	0	15,934	7,967	133,881	0.13
Kharaley, Khareyphu, Dokhiya	2,755	385,700	0	0	0	92,553	40,241	521,249	0.52
Lower Rinchending	7,567	1,059,380	0	0	0	66,336	33,168	1,166,451	1.17
Ahlay	2,462	344,680	0	22,500	0	142,486	67,868	579,996	0.58
Pekarshing (Toribari)	11,583	1,621,620	243,243	49,500	0	515,305	217,589	2,658,840	2.66
Changmari and Gurungdangra	10,364	1,450,960	217,644	9,000	10,500	463,240	198,865	2,360,573	2.36
Malbase	3,505	490,700	73,605	103,500	0	185,499	67,152	923,961	0.92
Pasakha (Industrial)	1026	143,640	0	0	70,000	58,141	18,571	291,378	0.29
Total Water Requirement/day	**85,947**	**12,032,580**	**1,492,417**	**441,000**	**94,500**	**3,545,141**	**1,488,159**	**19,179,744**	**19.18**

Notes and assumptions:

** Avg. Student Population & Staff Considered for:*

Middle Secondary 1100

Lower Secondary 2300

Reldri High School 500

***Industrial, Warehousing and Workshops water requirements are only for workers and not for any specific manufacturing purpose.*

***Warehousing and Workshops along Ammo Chhu bank is considered to have a worker population of 400.*

***Industries in Changmari is considered to have a worker population of 300.*

***Industries in Pasakha is considered to have a worker population of 2,000.*

****Water wastage is considered as 30% of total daily water demand (15%- UFW, 5%- loss in the trunk main and 10%- loss in long transmission mains).*

6.8.2 Storm Water Drainage

Phuentsholing's drainage system was constructed in 1990's, which is a combined system with mostly open drains that conveys both storm water runoff and household wastewater. The system lacks a comprehensive planning and engineering standards, creating a hindrance in the repair and maintenance.

It is proposed that the present system should be upgraded to a comprehensive storm water management system. The natural surface storm water drainage pattern existing in the town's landscape (created as a result of its topographical conditions) will form the primary storm drainage network. It should be protected to allow for a smooth out-flow of the storm water from the town. The secondary storm-water drainage network will run underneath the on-street footpaths. A typical drain laid under the footpath, will have vertical grills, at appropriate intervals, as part of the level-difference between the footpath and the carriageway. This arrangement is suitable to prevent blocking of the drains due to garbage and other waste being accumulated on the horizontal grills. The secondary drains will open out into the natural storm water drains. The confluent part of the natural storm water drain and the river will be provided with storm water drain purification ponds. These storm water drain purification ponds will filter and purify the organic and suspended particles, carried by the surface run-off, before joining the natural water bodies.

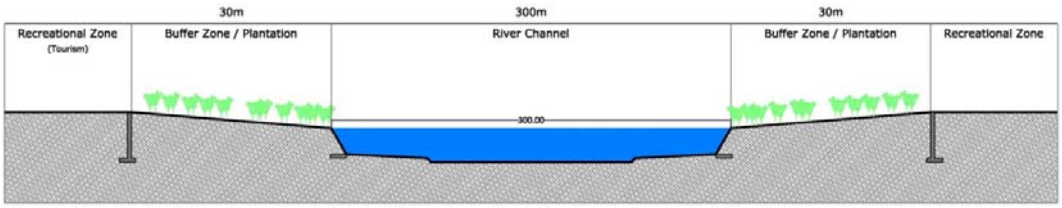
There was a devastating flood in the year 2000 that caused severe damage to the life and properties of residents in the lower market area. After that, huge investments have been made by RGoB for river protection works, which is considered as a landmark by the Phuentsholing residents and the city has become much safer from flood than it was before.

Strategies for Action

- To plan for a repair and maintenance action plan for all the existing storm water drains at regular intervals.
- To prohibit disposal of oil and other industrial waste, building material waste and household refuse into the storm drainage channels.
- To provide a river channel of trapezoidal shape with about 300 meters width as shown in the cross section and to align it with proper slope.
- To provide proper retaining wall either of stone masonry or RCC or ABS system on both banks of appropriate designed width and height to enable it to contain water during monsoons on one side and to retain earth filling of buffer zone/ plantation of 30 meters width on both banks.
- To provide a reclaimed buffer zone/ plantation of 30 meters width sloping towards river channel to 1 in 12.5 meters slope on both sides of the bank with designed landscaping.
- To provide a protective retaining wall of masonry or RCC of appropriate designed width and height in between the recreational zone and the buffer zone. This will give additional protection to land in the recreational zone from erosion of any kind.

A detailed site survey and data collection should be carried out by the experts and projects should be implemented based on detailed engineering proposals. The river front development and land reclamation work will be possible only after implementation of the flood protection and river training works.

Figure 02: Proposed Ammo Chhu (River) channel cross-section



6.8.3 Sewerage Management

The current population of Phuentsholing town is expected to rise to not more than sixty five thousand people (accommodation capacity) by 2037. The sewerage system in Phuentsholing is more than 15 years old and not able to cope up with the present load. Areas like Dhamdara, Kabreytar, Karma Steel, Dry Port area, Rinchending and Pasakha Industrial Estate are still using septic tanks. In addition, the existing sewage network and treatment facility have to be extended to accommodate the collected from additional areas like banks of Ammo Chhu, area above Kabreytar, Kharaley, Khareyphu and Dokhiya. It is also proposed that the treated wastewater should be used for horticultural and other such purpose. The detail design and engineering of the sewerage network will have to be done by competent authority.

Strategies for Action

An efficient sewerage and wastewater disposal system is important for maintaining high standards of health and hygiene in the town. The sewerage system proposed for Phuentsholing town aims at the provision of such a facility in a cost effective and organized manner, by establishing a hierarchical distribution of sewer networks. The existing topographical condition of the town could be advantageously used for the same. The proposed sewer network will consist of following hierarchy:

- Tertiary/secondary local area sewers: Collect wastewater from private sewers, leading it to primary local area sewer;
- Primary local area sewers: Collect wastewater from a number of secondary local area sewers connecting it to the trunk sewer;
- Trunk Sewers: Collects wastewater from primary local area sewers and leads it to the respective neighborhood treatment plants, thus serving a number of catchment areas.

The proposed trunk sewers would primarily run along proposed green buffers of the natural storm water drains, steep slope areas and at unavoidable conditions along the primary roads with respect to the topographic conditions, collecting the wastewater and sewerage to the mechanized treatment plants located in urban villages as shown in the drawing below. No sewer will run under the road carriageway, which hinders traffic flow during maintenance.

6.8.4 Solid waste collection and disposal system

The study suggests that currently Phuentsholing generates about 15-18 tons of solid waste per day, which is collected and dumped at Pekarshing (Toribari) disposal site. All the bins are open to sky and littering is quite common where no bins are placed or proper emptying arrangement is not practiced. If the same practice continues, the open spaces will act as garbage sites. To avoid such a situation it is necessary to collect, dispose and treat the solid waste with 100% efficiency.

Strategies for Action

The primary objective of the proposed solid waste collection and disposal system is to minimize the volume of solid waste carried to the disposal site by the following methods:

- Managing the solid waste at the source by segregating the wastes into recyclable and reusable wastes, organic wastes and other rubbish.
- Incineration of major fraction of the rubbish.
- A compost plant should be set up for the waste treatment at the landfill site.
- Recycling of paper, plastics and metal products.
- Introducing public participation in solid waste management by decentralizing the collection and disposal process, thus promoting public awareness.

It is proposed that the high and medium-density urban villages be served by a door-to-door solid waste collection system. The low density residential development areas can be provided with separate community bins at regular intervals and at strategic points, where each household will dispose its waste into recyclable and non-recyclable bins. The Thromde workers will then dump the non-recyclable wastes in the main garbage bins located along the primary roads at regular intervals. Disposal of this waste from bins will be carried out by Thromde on a regular basis, by taking it to Pekarshing (Toribari) disposal site. The present solid waste disposal site at Pekarshing (Toribari) will have to be expanded at the same location in order to accommodate the future waste disposals of the increased population. Special treatment arrangement should be also made for the industrial waste from Pasakha Industrial Estate and the medical waste collected from hospitals.

6.8.5 Street Lighting Facilities

Phuentsholing Thromde provides the street lighting facilities and looks after the maintenance. Mainly due to the lack of finances and inadequate human resources, not all the roads of Phuentsholing have street lighting facility currently.

The primary objective of proposals devised for the street lighting system in the town is to facilitate the provision of lighting on all the roads of the transportation network, as well as access roads serving to the residential quarters in the future.

Towards achieving the objective, Phuentsholing Thromde could explore alternative options, which facilitate service provision through community participation. As an example for this method, citizens of one locality can contribute towards installation of streetlights in their area

and the corporation can provide incentives by waiving the water charges for a stipulated time period. Other similar schemes can be designed, which essentially encourage the citizens to contribute towards the installation of facilities of immediate help to them, by extending certain incentives to create win-win scenarios. This approach will effectively bypass the resource constraints issue and facilitate rapid provision of infrastructure. This method will well suit for providing facilities to the roads leading to residential quarters and to the ones running through housing colonies.

Implementation of the Local Area Plans will also facilitate provision of street lighting as well as other services in an equitable way. Tackling the issue of infrastructure provision at the local level, through local area planning, ensures rapid implementation also. All the roads being newly constructed or developed will have provision for adequate street lighting. It is proposed to install street lighting facilities on the major roads (primary and secondary) of extended areas on the priority basis. Road hierarchy proposed in the transportation plan can be used for prioritization of this work.

Table 6-13: Proposed street lighting system

Road Hierarchy	Location	C/C Distance	Type
18.6 m wide Primary road	Along the Footpaths in a staggered manner	30M	400W Mercury/ Sodium Vapor
18.0 m wide Primary road		30M	
16.0 m wide Primary road		20M	
12.0 m wide Secondary road	Along the Footpaths in a staggered manner	20M	150W Mercury/ Sodium Vapor
10.0 m wide Secondary road			
Off Streets Footpath	On Either side of the Path in a staggered manner	10M	150W Decorative Lamps / 75W Sodium Vapor / 125W mercury Vapor
Promenade			

6.8.6 Fire Fighting Facilities

To satisfy and safeguard the fire fighting requirements of the town, it is proposed that each of the neighborhood areas be equipped with a reservoir capacity of approximately 15% of the domestic demand or 20 lpcd based on total urban village population.

It is proposed that this reservoir be established within the neighborhood node to satisfy the fire safety requirements. From the storage reservoir, a pressurized network of water supply should be established to enable the setting up of on-street “Fire-Hydrants” within the urban villages at an interval of 120 meters.

At present, the Royal Bhutan Police is the sole agency responsible for the fire fighting system in Phuentsholing. It is proposed that a “local area volunteer fire-fighting force” should be created within each urban village, which will carry out preventive inspections of each house annually, run community awareness classes on fire prevention.

6.8.7 Sustainable Development

This section presents common goals and outlines design ideas to promote sustainable development that balances community, environment and economy.

"Sustainability means using, developing and protecting resources at a rate and manner that enables people to meet their current needs and also provides that future generations can meet their own needs".

Sustainable design principles will include but not limited to the following:

1. Infrastructure – minimize infrastructure costs
2. Water Cycle Management – reduce freshwater consumption and wastage while maintaining quality
3. Transportation – provide safe, efficient and convenient transportation choices
4. Open Space – maintain bio-diversity and maximize recreational opportunities
5. Waste Management – reduce waste and waste volume to be disposed of
6. Energy Conservation – minimize energy consumption
7. Employment/Economic Development – maximize local employment and economic growth

Sustainability demands many skills of its practitioners. In addition to specific technical expertise required for undertaking familiar tasks in innovative ways, we also need to acquire the basic knowledge of other practices to ensure we can actively and meaningfully engage in multi-disciplinary problem solving. Sustainable best management practices consist of:

- Develop and maintain a level of understanding of the goals and issues relating to sustainability
- Take into account the individual and cumulative social, environmental and economic implications
- Take into account the short & long term as well as direct & indirect consequences
- Assess reasonable alternative concepts, designs or methods
- Seek expert advice, when necessary
- Cooperate with colleagues, clients, employers, decision-makers and the public in the pursuit of sustainability

Green Buildings

A "green" building places high priority on health, environmental and resource conservation performance over its life-cycle. Green design emphasizes on a number of new environmental, resources and occupant's health concerns by way of:

- Reducing human exposure to noxious materials
- Conserving non-renewable energy and scarce materials
- Minimizing life-cycle ecological impact of energy and materials used
- Using renewable energy and materials that are sustainably harvested
- Protecting and restore local air, water, soils, flora and fauna
- Supporting pedestrians, bicycles, mass transit and other alternatives to fossil-fueled vehicles

Most of the green buildings are high-quality buildings, which last longer, cost less to operate and maintain and provide greater occupant satisfaction than standard developments. Sophisticated buyers prefer them, and are often willing to pay a premium for their advantages.

What surprises many people are the facts that good green buildings often cost little extra or similar to build conventional designs. Commitment to better performance, close teamwork throughout the design process, openness to new approaches and information on how these are best applied are more important than a large construction budget.

a. Green Building Design Process

Envelope and space planning

On urban sites where optimal orientation and massing are difficult, the building envelope provides the greatest opportunity to conserve energy. In Phuentsholing, the envelope should maximize daylight, natural ventilation and views to the exterior and control solar heat gain and traffic noise. The building envelope may also be designed to integrate systems for collecting solar energy and rainwater.

Day lighting design

Daylight offers the twin advantages of creating a high-quality work environment while reducing energy use for lighting. While building form establishes the day lighting potential of interior spaces, the distribution of windows and their light transmission characteristics determines the amount of daylight entering into a building.

Solar Control

Effective solar control is an essential part of window design. For commercial buildings with high internal electrical loads, such as offices or retail occupancies, reducing cooling loads and glare problems from windows, skylights and roof monitors is a very effective energy conservation strategy. For buildings and spaces with low internal electrical loads, passive solar

heating by admitting sun when heat is required must be balanced with blocking mid-day summer sun. Solar control is best accomplished with high-performance glazing or exterior solar controls such as overhangs or awnings, rather than with internal blinds. The design issue is to control solar gain without compromising day lighting or exterior views.

Natural Ventilation

Natural ventilation can reduce the energy required to cool buildings by reducing or eliminating the need for chillers, fans and pumps. The type and placement of openable windows or dedicated air inlets and outlets is critical in directing air in and out of the building so they provide both ventilation and cooling of interior surfaces.

Noise Control

Open windows that admit air into the building also admit exterior noise and pollutants. Natural ventilation relies on continuous air paths within ventilated spaces and can also conflict with acoustic requirements. Interior acoustic conditions can be improved by controlling excess internally generated noise at its source and minimizing noise from outdoors.

Space Planning and Interior Finishes

Interior space planning and finish materials significantly affect the distribution and effectiveness of day lighting, natural ventilation and passive solar gains. The design of the interior must ensure that light and air reach the largest area possible, requiring careful design of interior spaces and partitioning. The color and shape of interior surfaces has a major impact on the distribution and quality of daylight.

Thermal Mass

Thermal mass can moderate indoor temperatures by dampening temperature swings. This minimizes the need for mechanical cooling and also stores solar heat to reduce winter heating needs. Moderate surrounding surface temperatures also contribute to the comfort of occupants. The amount and distribution of thermal mass and its exposure to sunlight and airflow dictates its effectiveness in moderating internal temperatures.

Recycling Facilities

Providing a recycling area is globally advisable. Making the recycling area convenient, keeping it clean and well managed, and providing on-site education for users about waste separation and recycling can make the difference in having a successful recycling effort

b. Siting and Form

The building orientation and massing decisions made in the early stages of design have a profound effect on the energy and environmental impacts of the building. This is particularly the case for solar-responsive, day lighting and natural cooling design, where early decisions establish the potential for passive renewable energy use. Other environmental strategies, such as storm water management are also greatly influenced by site planning.

c. Water Systems

Conservation of potable water reduces the need for new supplies and treatment plants, avoiding large capital and operating costs - and their associated taxes. Environmental benefits of water conservation in urban areas are - less pollution from water and sewage treatment and improved habitat quality, as well as avoiding the negative impacts of new sources and pipeline construction.

Design Considerations

The easiest and most inexpensive method is to use state-of-the-art water conserving fixtures, fittings and appliances. After water-conserving plumbing fixtures, installation of a gray water system for irrigation allows secondary use of water drained from baths, showers, bathroom sinks and washing machines. This is an effective way to reduce the use of treated potable water. Gray water collection and irrigation systems must be considered early in the design process, since they will affect landscape design and the size and placement of mechanical spaces. This is especially true for gravity-flow gray water systems, since they must be higher than the irrigation systems they serve.

Designs incorporating efficient conventional and solar water heaters or gray water systems should be followed up with testing and commissioning before occupancy, to ensure that they operate as intended and that building operators are well trained in their use and maintenance. Lack of proper testing, commissioning and training is one of the most common reasons for unsatisfactory performance.

Rain Water Harvesting

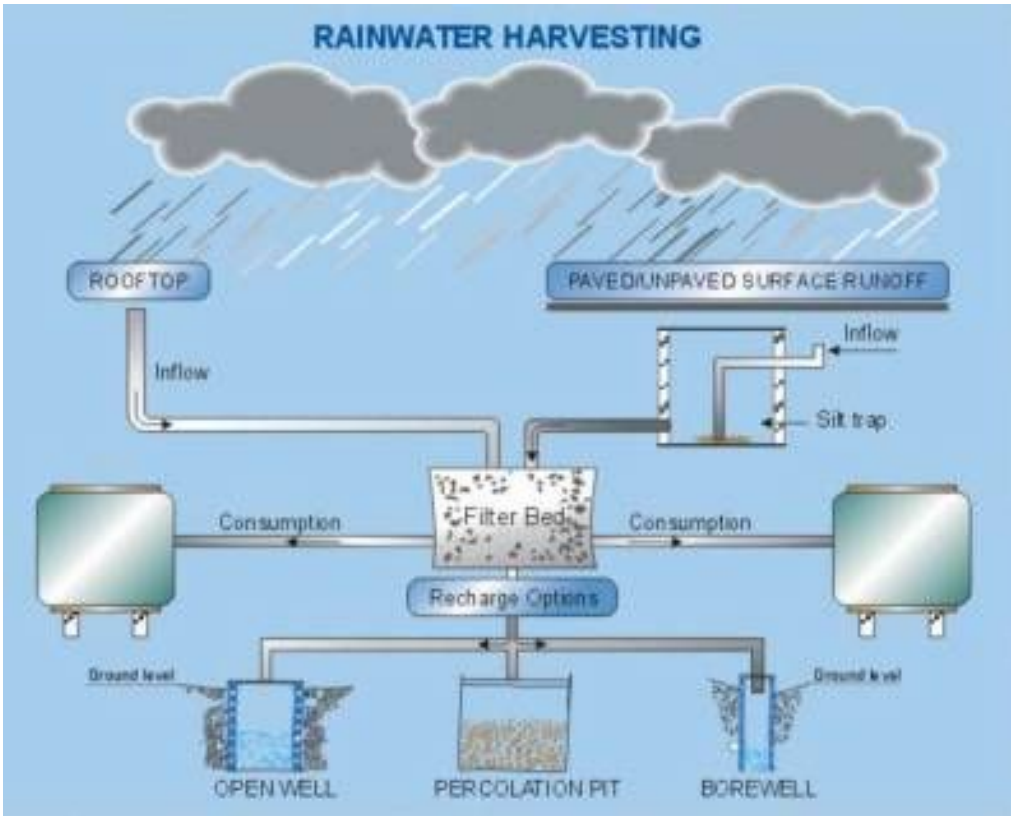
An efficient management of rain water needs clear guidelines and immediate attention in the town. Rain water harvesting should be encouraged and given high priority in the region. Appropriate methods oriented towards harvesting the rain water need to be studied further and implemented. Public awareness and participation should be sought in this aspect. Rain water harvesting should be made mandatory both at plot level, by means of rain water harvesting ponds and at town level, by means of percolation wells. This, apart from reducing the surface runoff, to a maximum extent, will also help in increasing the ground water table of the town, thus reducing the demand for potable water within the town.

The proportion of rainwater percolated into the ground, depends primarily on the factors of soil retention, tree cover and disturbance to natural drainage pattern in the areas of the town. To reduce the surface water runoff, mountain slopes surrounding the town should be protected from deforestation and soil erosion. Measures proposed as a part of the Proposed Natural Environment Protection and Enhancement Zone described in the earlier part of the chapter should be followed strictly.

Developmental Control Regulations is an effective tool to reduce the extent of paved areas and ground coverage in a plot. Care has been taken in the proposed Developmental Control Regulations to ensure such control, which will help in percolation of water into the ground at plot level.

However, to address the problem of excessive surface water runoff, conservation measures should be taken up in "Watershed Regions" of the river, streams and springs in the Phuentsholing region. Necessary measures towards achieving such a control would include formulation of a legislation to protect the bio-diversity, ensuring prohibitive measures for activities affecting bio-diversity in the watershed areas and ensuring EIA (Environmental Impact Assessment) mandatory for all proposed activities in this region. These measures would lead to the conservation of bio-diversity. Sustainable use of resources would ensure resource availability for the future and would reduce chances of environmental hazards.

Figure 03: Typical Rain Water Harvesting Layout



d. Electrical Systems

In a typical commercial building, electricity accounts for 60% to 95% of the total energy consumption. The use of electricity has few ecological drawbacks on the building site.

Relying solely on efficient equipment and lighting technologies without these architectural strategies typically costs more to build and to operate over the lifetime of the building. Designing a building that needs smaller transformers, little or no mechanical cooling and less electric lighting power, is the best way to reduce energy demand, consumption and capital and operating costs.

Efficient Equipment and Life-Cycle Cost Assessment

Climate-responsive design can reduce the size and amount of electrical lighting, heating and cooling equipment. The capital savings can then be applied to purchasing more efficient electrical equipment, such as transformers and motors. Life-cycle cost assessment is especially valuable when selecting equipment with large capital costs and long operational lives. New computer tools make it easy for designers to optimize equipment choices with life-cycle cost assessment, for both initial and long-term savings.

Integrating Day-lighting with Electric Lighting

The best quality and efficient light source is daylight, which offers the most accurate color rendering and is welcomed as the best light source by most people.

During lighting hours, good lighting design looks first to natural lighting and then to electric lighting as a supplement. Indirect, efficient electric lighting design uses the same surfaces to distribute light as does day-lighting and aims to make their lighting quality indistinguishable. Even the best lighting design can fail unless controls are considered and located with the final space use and furniture placement in mind, and carefully commissioned.

e. Landscape

Controlling Solar Gain and Improving Ventilation

Controlling solar gain in a building through planting on south, southwest and southeast sides of buildings is a very effective way to reduce cooling loads. Planting shade trees regulates heat gain and reduces air-conditioning needs. Trees and other vegetation can also shade paved areas and provide a canopy for pedestrians.

In addition to controlling solar gain, landscaping and landscape structures can enhance a building's natural ventilation and cooling by influencing wind flow. This requires the landscape design to respond to prevailing wind patterns and local wind flow variations, strategically locating trees, hedges and shrubs to direct winds toward ventilation inlets and create low-pressure areas at outlets. Dissipating turbulent, higher velocity winds in circulation areas around buildings can also be achieved by placing a multilayered planting of large trees and shrubs with dense foliage at the base and corners of buildings.

Air Quality

Ecologically based landscape design can improve local air quality by absorbing carbon dioxide, producing oxygen and filtering particulates. Landscaped parks and streets provide a "green lung" for the community. Building roofs and balconies can be deliberately designed to accommodate vegetation. Conventional roofs degrade air quality by replacing a site's original vegetative cover with an impervious surface that absorbs solar energy and contributes to the urban heat island effect. Planted roofs provide a living surface that cools and insulates the building, improves air quality and protects roof membranes from ultraviolet breakdown.

f. Transportation

Transportation affects almost every aspect of resource use, air and water quality and urban livability. Reducing the need for automobiles has major environmental benefits and is one of the most important urban planning strategies. Building designers and planners can help reduce automobile use in three ways:

- Integrate complementary occupancies within building projects.
- Encourage pedestrian, bicycle and transit use.
- Reduce the environmental impacts of parking facilities.

Complementary Building Occupancies

Separation of commercial, retail and residential areas; availability of efficient and reliable public transit and the dangers of cycling and other human-powered transportation all affect the need for automobile commuting and storage. Parking spaces in mixed-use buildings and developments can often be shared between occupancies.

Pedestrian and Bicycle Amenities

Making streets safer and more attractive to pedestrians, providing bicycle facilities at destinations and creating safe, continuous bicycle paths reduces the need for automobiles.

Encouraging pedestrian activity is not only a way to decrease automobile use, with its fossil fuel dependence, air and water pollution, it is also a way of bringing life to the streets and increasing the safety of the community. If people feel safe on the sidewalks, they also feel safe in the city. Buildings can improve the comfort and safety of pedestrians with appropriately scaled and detailed facades and views of the street for building occupants. If pedestrians are also provided with a choice of sun or shade, they are more likely to use these outdoor spaces. An attractive street generates places for social interaction, increasing the vitality of the urban village and providing improved commercial opportunities.

Reduce the environmental impacts of Parking Facilities

Urban runoff from paved surfaces carries with it pollutants such as fuel, oil, paint, heavy metals, pesticides, human and animal wastes and trash. By reducing surface car parking areas, increasing the permeability of surfaces not used for car movement and integrating natural landscaping into car parking areas; urban runoff can be naturally treated, groundwater supplies replenished and pollution entering the storm water system can be reduced.

g. Materials

Building materials form a large part of the overall environmental burden of buildings:

- Raw materials extraction damages ecosystems, consumes energy and degrades water quality
- Manufacturing produces waste and pollution, including toxic waste
- Any material, once installed, release toxic gases, affecting occupant health

- Material cleaning and maintenance often causes health risks and toxic waste
- Eventual disposal wastes recoverable resources, consumes landfill space and often degrades groundwater.

However, not all materials are equal. "Green materials" used in building are carefully selected for low consumption of scarce raw materials; low pollution in their production, delivery, use and disposal; long life; low maintenance; and their suitability for salvage or recycling.

Materials Life Cycle Assessment

A complete life-cycle assessment of a material includes consideration of:

- resource extraction
- manufacturing and transportation
- installation
- operation and maintenance
- salvage, recycling and disposal

Healthy Products

Many building products contain chemicals that evaporate or "off-gas" for several days or weeks after installation. If large quantities of these products are used inside a building, or products with particularly strong emissions are used, they pollute the indoor air. Other products readily trap dust and odors and release them over time. Building materials can also support growth of molds and bacteria, particularly if they become damp, potentially causing allergic reactions, respiratory problems and persistent odors symptoms of "sick-building syndrome".

Healthier materials have minimal chemical emissions, dust release and cleaning or maintenance procedures requiring toxic chemicals. They help to make healthy buildings and are better for the environment and the safety of those who make and install them.

Healthy building practice extends well beyond the building design; it requires building occupants to select and use safe maintenance chemicals, restrict smoking and other pollution sources, and reduce waste.

h. Local Economy

A healthy community has a healthy local economy; building construction can aid by using local products and services where they are available. A locally based economy can be more sustainably managed than one based on imported materials and exported goods and services.

i. Construction Management

Reducing the environmental impact of the construction process begins with managing necessary demolition responsibly. Many materials can be salvaged for reuse or collected for recycling, often by specialized waste receivers. These services can actually save money for the contractor or owner, because transportation costs and dumping fees are reduced and some items are worth cash.

Protecting the site from undue damage to soils, vegetation and air quality and preventing storm water contamination during excavation and construction is the second part of responsible construction.

The third part is ensuring that construction waste is minimized, recyclables are recovered and toxic releases on site are minimized.

The final part is ensuring that building occupants are protected from construction-related health hazards during renovations or during first occupancy after completion.

Reducing and Recycling Construction Waste

Unlike demolition waste, as much as 80% of waste generated during construction is reusable or recyclable since it is relatively clean and therefore marketable. Recyclers purchase metal scrap from structural steel. Piping, concrete reinforcement and sheet metal work. Corrugated cardboard and gypsum are highly recyclable if uncontaminated, and will also be picked up by buyers. A great deal of wood scrap can be reused on site, while excess is accepted as fuel or fiber by many businesses. The main wastes that are difficult to recycle are plastics, mineral and glass fiber insulation, roofing and containers for paints adhesives and caulking.

Construction and demolition waste recycling is most effective if it is included in the construction contract specifications, because many key steps in successful recycling programs such as separation occur on the construction site.

Minimizing the release of Toxics on the Construction Site

Construction sites are sources of many toxic substances, such as paints, solvents, wood preservatives, pesticides, adhesives and sealants. Even with careful management some of these substances are released into air soil and water, and many are hazardous to workers. For these reasons the best choice is to avoid their use as much as possible by using low-toxicity substitutes and low VOC (volatile organic compound) materials. Many new materials and methods are now available that are less toxic and safer for workers.

Minimizing Energy and Water Use during Construction

Energy-efficiency and water-conservation measures are generally applied only to finished buildings, but some steps can also be taken during construction. Using high-efficiency sources and automatic controls can reduce electricity used for temporary and security lighting. Water use for washing, irrigation and dust control on site can also be reduced by conservation and recycling.

Minimizing Storm Water Pollution and Protecting Soils and Vegetation during Demolition and Construction

The construction period is particularly important because disturbed soil, concrete fines, fertilizer, oils and other wastes from construction are produced. Onsite collection and settling of storm water, prohibition of equipment wash-downs and prevention of soil loss and toxics release from the construction site are necessary to minimize water pollution.

Protecting Building Occupants from Health Risks during Early Occupancy

Indoor air quality is often poorest in buildings immediately after construction is complete; however few regulations exist to protect building occupants during this period. Liquid finishes such as paints, sealants and adhesives release volatile gases during curing that cling to gypsum board and other porous surfaces and are then released over time. Dusty operations, such as finishing gypsum board, installing insulation and ceiling tile and sanding or grinding hard floor surfaces leave large residues of nuisance or hazardous dust that accumulate on interior finishes, in ceiling cavities and ducts to be released later into the occupied zone.

A proactive approach that minimizes occupant exposure to health hazards through careful construction procedures will go far toward reducing complaints and limiting owner and contractor liability.

Building Commissioning

Any building project is complex, from the first design concept through to the final stages of construction and occupancy. Some buildings, such as those with unusual electrical or air-conditioning systems, or those with special "green features", may require extra attention to be sure that they operate as designed. Ensuring that all features and systems are built and function as intended is called building commissioning.

Commissioning buildings usually covers air conditioning, electrical, communications, security and fire management systems and their controls. Commissioning begins by documenting design intent for future reference. This is followed by testing components when they arrive on the job site, and again after they are fully installed. Adjusting (balancing) of air and water distribution systems to deliver services as designed, checking and adjusting controls systems to ensure energy savings and environmental conditions is the next phase. Providing maintenance training and manuals for building staff is usually the last step of commissioning. A complete commissioning report contains all records of the commissioning procedures, testing results, deficiency notices and records of satisfactory corrections of deficiencies. In rare cases, commissioning may also extend to testing the building and systems several months or a year after occupancy.

Commissioning has been found to be very valuable, particularly with complex mechanical and electrical systems, to ensure that they operate as intended, to realize energy savings and a quality building environment - which are often the reasons more complex systems are installed. When special building features are installed to generate renewable energy generation, recycle waste or reduce other environmental impacts, commissioning is often necessary to ensure optimum performance.

7.0 HOUSING STRATEGY

The housing strategies for future development are discussed in this chapter, which will provide the framework to implement proposals for actions stated in this Structure Plan. These are established rules and regulations which form the non-negotiable components of a Structure Plan, formulated to guide the town managers and local authorities during the implementation of the Structure Plan[1].

His Majesty the Fourth King has defined the goal of Bhutan as Gross National Happiness. Nothing brings happiness to the people like owning their own home. A major element of Phuentsholing Structure Plan is to bring housing within the reach of common people, moving this from the realm of dreams to reality.

The housing and land shortage in Phuentsholing is on account of underutilization of land and delayed construction activity, in the absence of a proper Structure Plan for the town. The housing shortage will grow even more in the coming decades. Hence it is the prime responsibility of the planners to formulate a shelter strategy for the people of Phuentsholing. The proposed Shelter Strategy can be understood in two main parts:

1. Designing and Physical planning aspects
2. Finance, management and administration

7.1 DESIGNING AND PHYSICAL PLANNING ASPECTS

As discussed in previous chapter, population projections and carrying capacity of a place are two inseparable aspects that will have an impact on the density pattern and hence the shelter strategy. The main physical determinants of the Shelter Strategy, which would determine the carrying capacity and the population density pattern in Phuentsholing, would be:

- Topographical condition
- Future development opportunities
- Eco-fragileness of the region
- The existing land cover

The land condition directly relates to the physical capacity of the land in terms of accessibility, the ease of construction, stability of the structure, laying of infrastructure and related costing. The higher the slope, the lower should be the associated population density. Phuentsholing is located on relatively flat terrain, which is a golden opportunity to accommodate larger population density, in comparison to other urban settlements of the Kingdom. There is already an acute shortage of affordable housing in the town, demanding for optimal utilization of land as a resource for accommodating future population in the town. The nature and pattern of precinct and hence the activity associated with a place has an impact on the amount of population it attracts. Though, Phuentsholing has potential to accommodate more

[1] Reference: Gelephu Structure Plan, 2004

population, the proposed precinct and activity pattern should be eco-responsive and eco-friendly in nature.

Taking into consideration the above factors and their implications, the Structure Plan advocates 'medium-rise, high-density' development as a development strategy. 'Medium-rise, high-density' means the maximum height allowed in Phuentsholing Town and its peripheral zone would be ground plus three floors at the maximum. But to accommodate higher density of population the allowable ground coverage of buildings would be relatively high, within the building setbacks rules proposed by the Development Control Regulations. The details of the same are elaborately discussed in the later part of the chapter.

7.2 FINANCE, MANAGEMENT AND ADMINISTRATION

The solution to this "housing shortage" lies as much in the financial mechanisms we evolve and in the institutional modalities, as it does in the physical plans we prepare. It is important that we facilitate the private sector to become active in the provision of housing, in addition to the public sector agencies involved now. The idea is to get small and medium sized builders into the shelter provision business, which would also provide employment in the construction industry. Also, long-term loan schemes can be evolved for the buyers of housing units.

For achieving the above said goal two strategies seem to be required. First, the problem needs to be re-conceptualized from that of a "housing shortage" to one of "facilitating a shelter process." Next, the problem has to be seen as promoting private sector initiatives. Thus, we are moving from the government provided minimum standard housing units to facilitating and promoting the private developers to create a range of shelters for all income groups.

The following strategies are proposed to address current housing shortage:

1. Access to land,
2. Access to housing finance,
3. Access to materials and technology,
4. Access to design, planning and management.

The landowners, contractors, potential buyers, material suppliers, skilled labor, promoters, designers and financial institutions will be the main stakeholders in the entire process. The proposed housing strategy shall facilitate all of these stakeholders, and actions must be taken to address the issues faced by each one of them.

In addition to generating more shelter options, the goal is to maximize the utilization of Bhutanese resources. This involves evolution of more sophisticated financial mechanisms; training Bhutanese youth into skilled blue collar workers, promoting small electrical, plumbing and other specialized contractors and facilitating medium and large contractors.

7.3 OPPORTUNITY FOR ACCESS TO SHELTER

The shelter strategy for Phuentsholing envisions a variety of needs on the part of end users. For some households, the dwelling unit may act as a basic functional devise, providing shelter and security, while for others it may be a major source of social status. There will be those

who will walk to work or who will depend on a public transport system and others who will drive and location may not be so severe a criteria. People's willingness to pay for shelter may not be a direct function of their earning power, as they may prioritize other investments like the education of their children. In the actual design of locations, sizes and potential development of dwelling units in plotted areas and in medium to high-density residential schemes; the government must aim for a wide diversity of housing packages. The Local Area Plans will provide the mechanism within which the goal could be achieved.

Landowners require a Local Area Plan under which they can market their land. They need to know the layout and subdivision rules which will determine the density, precinct and nearby amenities which will set a value and define potential buyers. Individual owners may not have the management skills to develop their land, so a strategy must be laid down.

Promoters can bring together the other stakeholders and manage a physical product within the boundaries of an investment package. Promoters also need to know the prices, the rules and prospects governing each site. A good plan removes the element of the unknown, tying down all the facts about each parcel of land.

One of the most facilitative processes the government could initiate would be "packaging projects" such that a team of professionals could "bid" a turnkey price to construct and sell entire urban villages. For example, the government may provide the bidders with a site plan, a detailed building program, comprehensive specifications, the public facilities required, including housing units, site development, access roads, walk ways and landscaping.

The National Housing Development Corporation (NHDC) could initiate this process by inviting teams including an Architect, Landscape Designer, land owner, Contractor and a financial Promoter; to submit a comprehensive proposal to build houses and the infrastructure and amenities. These bids would be proposals for everything from the design, layout and selling prices of the houses, shops and offices within the project.

The Government could further facilitate this process by assisting in the access to land for Group Housing, private sector projects. The proposed local area plans must designate plots for lower middle class group units, in the layouts. Row Houses must be introduced as a housing typology for higher density locations.

For such a scheme to work the government needs rolling capital for accumulating lands and its overheads. It would recuperate these from the promoter whose responsibility would be to pay all of the stakeholders, maintain a schedule and to sell the units in the open market. For this the promoter would need short-term capital investment of a substantial level. Thus, financial planning and the role of financial institutions like the Royal Insurance Corporation of Bhutan, the Bank of Bhutan, Bhutan National Bank and the Royal Pension Fund are very crucial in increasing the housing stock. An independent "Royal Insurance Corporation" (RIC) a Housing Finance Corporation needs to be formed dealing with only housing activity. This will make the process easier and smoother.

7.3.1 Facilitative Finance

Finance is another facilitative element of the housing strategy. Until now, housing finance has been for the end users to buy their homes over some period of amortization and rate of interest. This concept of finance needs to be broadened.

At the national level Bhutan will have to evolve housing policy measures to create urban and housing financial institutions. In doing so the scale of modest operations and limited human resources available must be formative parameters. On the other hand organizations that are repositories of surplus capital, such as banks, the pension fund and the Insurance Corporation must not act in the shelter sector in an ad hoc and independent manner, skewing the sector toward the internal needs of those organizations. The Shelter Strategy for Phuentsholing cannot await the emergence of this mechanism. At the same time two forms of development finance are urgently needed and the Bank of Bhutan may be entrusted to initiate these. The resources for these may come from a requirement that the insurance and pension institutions invest a fixed percentage of their reserves annually into the Bank of Bhutan's shelter fund. The interest rate paid to these investors would be half a percent less than reaped from current market wholesale investments. The finances required are for seed capital for developers/ promoters and long-term mortgage finance for homeowners.

7.3.2 Seed Capital

The promoters need seed capital to construct houses, from the time the land is bought, until the time the dwelling units are sold to end users. They need medium term to long term loans to buy heavy equipments, to buy materials and to pay the workers.

Financial planning and facilitation through Seed Capital is an essential element of the Shelter Strategy for Phuentsholing. It makes good sense that such an activity be initiated within the organization of an existing financial institution, than within the structure of a new and inexperienced development finance institution, specialized in the housing sector. Such Seed Capital loans should cover a medium quantity of construction. Performance with the first Seed Capital loan should be the criteria for advancement into further support. A gestation period of three to five years would be the credit period, with amortization running not more than four to seven years. Interest rates for Seed Capital should be considerably higher than the rates charged to homeowners for long term finance of individually owned dwelling units.

7.3.3 Long Term Mortgage Finance

There are a limited number of prospective homeowners who can afford to make a one-time payment for their homes. The vast majority of potential buyers will be able to muster a maximum of twenty to thirty percent of the total dwelling unit cost as their initial equity share in the project. The Bank of Bhutan may initiate a savings scheme for future home owners; where in youngsters begin to make monthly deposits toward the time when they have accumulated the needed equity to apply for a housing loan. What is needed is to initiate a culture of savings and borrowing amongst the populace. In mortgage finance the dwelling unit itself becomes the asset held by the bank as surety against potential defaults. It is also essential in this kind of a system that the judicial system favors the banking system when the issue of repossession of property arises, due to defaults in loan payments by borrowers.

A housing mortgage finance system cannot function where the potential of eviction and repossession does not exist. It is clear that a mix of buyers will emerge. Some will be in a position to make an outright purchase, extending payments to the developer in accordance with stages of construction. Others will require smaller portions of the total equity in the form of loans. But the majority of homebuyers will require around seventy-five percent of the equity in the form of a loan, and an amortization horizon of between fifteen to twenty years. Monthly payments will have to be profiled against the buyers estimated ability to pay over the amortization period. That ability would rise over time. Therefore a "telescoped" repayment schedule may make more sense in Bhutan than a simple system of equated monthly installments, which equalize the capital and interest over a long period of time, into a static monthly loan repayment, called an EMI in the banking industry. While these modalities must be worked out, there is no doubt that a mortgage finance system must be created urgently, using a rolling fund concept to initiate more and more loan opportunities with a given base of capital and annual investment from other pension and insurance institutions.

7.3.4 Promotion of Construction of Individual Houses

The government may promote such an effort by providing land owners with layouts for small plots and giving them support in planning site and services schemes on their land. Potential house owners may then buy these and build their own houses. By adjusting the building controls such that small houses do not need any permission, access to shelter becomes that much simpler. The advantage of this approach is that it off-loads the actual management of house building to the private sector; it facilitates the realization of the Structure Plan in terms of creating high density, compact, mixed-use communities.

Another alternative is a system of land development known as land pooling. In this system, undeveloped land plots are temporarily acquired and reconfigured in a manner that includes minimum standard roads, utilities, open spaces and urban services. In order to realize this level of improvement, about thirty percent of the land will have to be shifted into the public domain. The result is a modern layout of regularly shaped plots, all with road and utilities access and within a local area plan that includes all basic public services. The portion of land surrendered becomes a Development Cess or Tax that forms part of the development capital of the area. Where it is not possible to acquire an equitable portion of a particular plot, a development tax will be charged.

7.3.5 Low Income Group Housing

It is important that the shelter strategy proposed as a part of the Phuentsholing Structure Plan address the issue of shelter for the lower income groups. Presently, so many of the lower income Bhutanese families live in the nearby town Jaigaon with poor infrastructure facilities or in illegal sacks. These will grow at a much faster rate than the better off segments of the society as the town grows. One way to address this issue is to formalize the occupations of these people making it mandatory to register domestic and construction workers, to pay reasonable and minimum wages, and to see that these people have adequate housing. What seems most reasonable is that the Development Briefs for medium and high-density housing complexes in the Local Area Plans include small housing units, whose market values and selling prices will be within the reach of a large group of users. The creation of urban villages with economic diversity, yet cultural homogeneity, would aid bringing new urban immigrants

into the mainstream of national life. From an urban design point of view, this is the sector that the public sector should be focusing its limited skills on, while the private sector should be facilitating in the middle and upper income groups.

In every Local Area Plan, a small high-density village of low-income units could be constructed for domestic servants who will work in the area. Another strategy would be to propose Site and Services schemes of not more than fifty houses each where plots with basic services like water, sewerage, storm drains, paved foot paths, street lights, solid waste collection and electricity is provided and the inhabitants would buy these little plots and construct their own modest shelters. Plots could be as small as fifty square meters each and it may also be possible to provide the plinths and party walls in some schemes. There could also be provision of loans at very low interest rate or building materials under self help housing schemes.

7.3.6 Reception Accommodation

Cities and towns are growing rapidly in Bhutan. Educated youth with tenth and twelfth standard "pass" are flocking to towns in search of employment, which they are finding in the service sector, in retailing, in the hospitality sector and in blue collar jobs. Mostly, these are single, young male bachelors who team up with relatives or village friends and rent shanty rooms in illegal shacks. The shelter strategy sees a viable investment market in the construction of working women's and working men's Hostels in Phuentsholing, as entry point housing. These would be walk-up structures having "triple seated" rooms with a small cooking niche, common toilets and baths and drying balconies. There may be a common mess and T.V. lounge on the ground floor.

Another issue of concern is the need for improving the skills of the Bhutanese workers in the construction industry. An expanded skill development and construction management training program is needed. There must be a guaranteed minimum wage to attract Bhutanese youth into the construction industry, and to build up the national capability. The construction industry has the potential to be the country's largest employer. Any public policy and related program must include components on regulation of foreign labor, upgrading the skills and working conditions of Bhutanese labors and to provide a range of housing options to them. In Phuentsholing an Industrial Training Institution can be created which imparts practical training to youngsters in carpentry, masonry, concrete work, plastering, interior finishes, plumbing, wiremen, electrician, pipe fitters, blacksmiths, as well as in different branches of engineering.

7.4 LOCATIONS FOR HOUSING IN URBAN VILLAGES

The Structure Plan of Phuentsholing will fulfill the future housing demand of the town through designating Medium and High-density Housing in each self-contained urban village identified in the town, further amplified by the preparation of Local Area Plans. The Urban villages forming the basic planning unit of the Phuentsholing Structure Plan will be dominated by residential areas with varied density patterns to optimize the provision of essential urban services. Conceptually, these units will have amenities, basic services and a convenience shopping core in their center called Neighborhood Node, surrounded by medium- to high-density walk-up apartments, then with a ring of medium density housing units towards the periphery. The Neighborhood Node, surrounded by housing urban villages will be basically a convenience center containing social amenities like health unit, police stand, taxi stand, post

boxes, convenience shopping, vegetable shop, general store, pub, kindergarten, crèche, garden and public transit stop and will play a instrumental role in attracting and serving the population. The facilitation of the private sector by the government to create these housing stocks in the designated urban villages will be an incentive to the entrepreneurs of the town and will generate employment in the construction industry. It is proposed to use students of the National Technical Training Authority, through a local "Building Centre" in the process, in order to create more skilled labor in the nation.

In addition to the medium and high-density housing schemes, which will be identified in the Local Area Plan for the development of compact residential neighborhoods, promoted and facilitated by the government, large plots, of about 1000 square meters will also be created to accommodate private parties who wish to construct ground plus three storied apartment buildings. In addition, a variety of plot sizes will be created to accommodate cottages, bungalows or smaller apartment blocks. Such structures will accommodate one or two households each, plus attached servant's quarters with adequate parking space.

7.4.1 Incremental Development

After preparation of the Local Area Plans, roads will be demarcated on the sites indicating all plots. Even before the roads are paved, or before any utilities are laid, the owners shall be entitled to begin their construction. Housing construction and the creation of utilities and services will go hand-in-hand. The next priority is to provide potable drinking water, first in raw form and later in a processed form. Electricity, telecommunications and storm drainage will immediately follow. Finally, sewerage systems will be laid, roads will be surfaced, footpaths and streetlights will be placed, and solid waste collection bins positioned and other amenities will emerge.

7.5 ROLE OF NATIONAL HOUSING DEVELOPMENT CORPORATION (NHDC)

The National Housing Development Corporation (NHDC) should take a lead role in facilitating the private sector to create housing stock in Phuentsholing. Instead of being a provider of housing, the NHDC can become a facilitator of the housing process.

In each Local Area Plan an area will be designated for the compact residential neighborhood as noted above. The NHDC can identify and prioritize projects according to the market demand, with respect to location, need etc. Housing process in the identified locations will then be facilitated by "banking" all the private land parcels of the designated area in the form of a common account. As opposed to Land Acquisition, where the owners are losers, their land will be held in agreement for them, and they will de facto become participants in the free market production of housing. Should they decline such participation, acquisition procedure shall begin. Should they join they will have "equity" in the project with the value set as the market value, and they will also accordingly get a proportionate share of the profit. NHDC will prepare a project brief for each Urban village. This will include the gross and net residential densities to be achieved; the amount of open space to be created; the service and utility levels to be provided and the types, numbers and areas of the apartments, row houses and duplexes to be created. The project brief will also include the envisioned specifications and a reference to the Development Control Rules and the Bhutan Building Rules, which must be followed. The Brief will include an investment plan stating all costs and projected profits.

7.5.1 The Promotion of Construction Professionals

In the next phase, NHDC will invite architects to compete in the preparation of designs for the over-all layout; buildings; apartment plans; internal roads parking and footpaths; landscaping; and utilities layouts. Architects from nearby countries may also participate, on the understanding that they will have to enter into collaborations with Bhutanese firms, should their designs be selected. Architects must follow the specifications in the brief, but may propose improved specifications, if they desire. A technical committee will select the best design and commission the architect as the designer and project manager.

7.5.2 The Promotion of Promoters

NHDC will make the selected design public and invite prospective developers to bid for the role as Promoter for the project. In the bids the participants will have to agree to work under the supervision and control of the selected architect and agree that the fees will be included in the total project cost. The fees they will assign for the architect and for NHDC overheads will be standardized and a "given" in the package. The amount to be paid to the landowners will also be a "given" in the package. The base amount to be charged per square meter of built-up saleable area to the buyers will be the bid parameter for the competitors. Their project risk lies in the time they take to produce the dwelling units and on the market demand for the units.

A technical committee composed of the architect and representatives of the NHDC will analyze and select the promoter for the project. The promoter takes on the financial responsibility and liability of the project, until it is handed over to the end users. He negotiates with financial institutions, maintains accounts, operates bank accounts, and pays the overheads and architect's fees to the NHDC. The NHDC pays the architect who also acts as the NHDC's project manager.

7.5.3 Transfer of project ownership to the promoters

At this stage the facilitative role of the NHDC becomes one of over-all Supervisor and Auditor, on behalf of the future clients. The selected architect and promoter now act as project managers, carrying out the preparation of construction documents, tendering documents and standard contracts between the contractors and promoters. NHDC will certify the final selected contractor, but the architect and the promoter will jointly select a contractor based on criteria given by the NHDC. If all the contractors bid over the estimate based on the Bhutan Schedule of Rates, the lowest bidder must be awarded the work. Wherein contractors bid under the Bhutan Schedule of Rates, the architect and promoter will not be bound to select the lowest bidder, but may use criteria like track record, compatibility as a team member and other discretionary parameters, which they believe will result in the best final product for the end users.

7.5.4 Transfer of housing stock into the market

After the completion of a project, the promoter, under the direct guidance of NHDC could either sell the housing stock at the market price and distribute the profit among the private land owners according to their respective share or could distribute the housing stock itself to the private land owners, retaining the share of the promoter as initially agreed. In both the

cases the involvement of the NHDC, towards making the housing stock available in the market is very crucial considering the larger implications of such a nature of project in Phuentsholing. The promoter, and the private land owners, could pay overheads to the NHDC towards the maintenance of the project for a specified period time. Alternatively, each buyer will be required to pay a maintenance fee which goes into a general fund for property management.

7.6 VACANT LAND TAX

There is an apparent, though not necessarily fundamental conflict between the regime of planning and the regime of property, especially when a new plan is overlaid upon an existing land ownership system. The structure plan sets down a new rationale. It promotes equal access to shelter and to land for shelter. It alters the value of land upward at the same time. Due to its inherent restrictions, it also limits development options. It disrupts the immediate plans of landowners at least until they understand and readjust to the new terms of the new plan.

In most societies land is held in the hands of a few longer-term residents of the city. Newcomers to the city and persons with more modest means may find entry into the housing market blocked by artificially high values of land. Unfortunately, in most of the situations the regime of property dominates the land system and most of the time access to land for shelter has virtually been blocked. The Structure Plan attempts to reverse that trend and opens more opportunities. It suggests that methods towards equitably distributing land must emerge in Phuentsholing. The Local Area Plans and the access to dwelling units created under the medium and high-density residential projects go a long way to guaranteeing each household access to shelter. Guided development through the mechanism of the Development Control Rules adds another dimension to the system's operation. But in the end there must be some mechanism which limits the quantity of land held ineffectively and merely for investment.

There are limited options to control land accumulation. One of them is an effective land ceiling. But the legislation and implementation are cumbersome, means of concealing property ownership are many and the entire process takes land effectively out of the market, driving up the remaining prices of lands that fall outside of the ceiling still higher. Land banking involves extensive data maintenance, sophisticated financial management and complicated accounting, which will not appear as transparent to the concerned public. It may only work where the highly developed financial institutions exist. One possible mechanism is a Vacant Lands Tax. The concept would be to treat vacant land as an unused wealth of the nation and to use a system of taxation to catalyze it into the market.

There has to be a Register of Land Values maintained wherein the value of land in each area of the town is documented based on the actual registered transactions in the area. To assure that the values stated at the time of transaction are correct the Royal Government has a first option to buy lands where the registration is declared for a value less than twenty five per cent of the Registered Value in that area of the town. Using the Register of Land Values, each area of the town would have a different ratable value, based upon which the town's land tax would be charged to users and also upon which the Vacant Land Tax would be charged. Generally, land values and the services and infrastructure provided by the local authority are high at some locations and low at some locations. So the ratable values also reflect the levels of services provided. Where there are vacant lands, a Vacant Land tax of say five to ten per

cent of the land value should be charged annually. The tax would tend to move land into the market, and curb the holding of land for investment purposes. When a property is purchased, there should be a Vacant Land Tax Holiday for three years, allowing time for the owner to initiate construction. There must also be a Land Transfer Tax, of about five to ten percent of the registered property value. Acquisition of excess lands must always be with the Royal Government as a last means to equalize the land holdings.

ANNEXURE I- Proposed Questionnaire for Socio-Economic Survey

Form No. _____

Date: _____

Location: Ward/Area _____

Family Data:

1. Name of the head of family:
2. Duration of stay:
3. Native / Migrated

a) If migrated, from where:

b) If migrated, reasons of migration:

4. Number of members in the household:
5. Details of the members:

No.	Relation with the head	Age	Sex	Marital Status	Education	Occupation	Monthly Income (in Nu.)

6. Details of vehicle ownership

Number of vehicles	Type of vehicle	Use of vehicle

7. Monthly expenditure

Accommodation	Food	Education	Health	Transport
Recreation	**Cooking / Fuel**	**Water**	**Electricity**	**Others**

Housing Data:

8. Tenure status: owner / Rental / Provided by govt. or institute / Leased / Illegal or encroached
   a) If owner, the house is: Constructed by own / Purchased / Inherited

      1. If constructed or Purchased, mode of finance: Savings / Loans / Other Sources

         1.1 If loan, the agency from loan was availed: Bank / Government / Private / Semi-government / Other sources

   b) If tenant, the monthly rent:
9. Type of house: Temporary / Permanent / semi-permanent
10. Access to the house: earthen / paved way
11. Size of the plinth area (in square meters):
12. Size of the plot (in square meters):
13. Number of rooms in the dwelling unit:
14. Age of the building structure:
15. Condition of the building structure: Good / Average / Bad

Land, Crop and Livestock Data:

16. Details of the land owned (in hectare):

Land holding type	**Agricultural**		**Non-agricultural**	**Total**
	Irrigated	**Non-irrigated**		

Land holding types: Owned, Leased in, Leased out, Operated

17. Details of crop pattern and productivity:

Crop	**Area (in hectares)**	**Yield per hectare**	
		Main product	**By product**

18. Livestock details:

Type	**Numbers**	**Breed**	**Age**

Services and Amenities Data:

a) Source of water: Govt. tap / Tube well / Hand pump / well / Community tap / Tanker
b) If water is not available at the house, distance of water source in meters:
c) If water supply available, duration of the supply per day:
d) Water storage facility in the house in Liters:
e) Quality of water: Normal / Salty / Turbid / Odor / Requires boiling and filtration
f) Sewerage disposal facility: Septic tank / Sewer line/ Open drains / Leaching pit / Open field
g) Waste water disposal facility: Open drain / Underground drain / With sewerage / None
h) Solid waste disposal facility: Door to door / Road side / Community dump / None
i) Solid waste collection frequency: Daily / Twice a week / Weekly / Twice a month / Monthly / None
j) Electricity connection: yes / no
k) Hours of power supply per day:
l) Quality of electric supply: Voltage fluctuations / Frequent power-cuts / Normal
m) Fuel used for cooking: LPG / Kerosene / Electricity / Coal / wood / Gobar gas / Cow dung

Community Facilities Data:

Location: Within neighborhood / Outside neighborhood / within city

Distance: less than 1 km / 2-3 km / 3-5 km / more than 5 km

Quality of service: Good / Fair / Satisfactory / Poor

Mode of travel: Walk / Cycle / Two-wheeler / Taxi / City bus / Private four wheeler

19. Educational facilities:

a) Details

Type	Location	Distance	Quality of service	Mode of travel
Crèche				
Nursery				
Primary school				
Secondary school				
Higher studies				
College				
Technical / Vocational training schools				

b) Preferences for facilities: Government / Private
c) Reasons: Better services / Accessibility / Affordable

20. Health facilities:

a) Details

Type	Location	Distance	Quality of service	Mode of travel
Dispensary				

General hospital				
Specialized hospitals				
Private clinics / nursing homes				

b) Preferences for facilities: Government / Private

c) Reasons: Better services / Accessibility / Affordable

21. Shopping facilities:

a) Details

Type	Location	Distance	Quality of service	Mode of travel
Convenient shopping				
Weekend market				
City center				

22. Recreational facilities:

a) Details:

Type	Location	Distance	Quality of service	Mode of travel
Tot-lots				
Neighborhood open spaces				
Parks & Playgrounds				
Theatre / Cinema				
Clubs				
Library				
Community center				

b) Preferred mode of recreation: outdoor / Indoor

c) If indoor: Cinema / Clubs / Library / Socializing / Sports / Bar

23. Other facilities:

Type	Location	Distance	Quality of service	Mode of travel
Post office				
Bank				
Police station				
Telephone exchange				
Fire station				
STD ISD PCO				

Milk booth				
Petrol pump				
LPG Outlet				

Perception of Living Environment

Mark and for each factor

Environmental aspects	**Facilities and employment**	**Social aspects**
Air borne diseases	Good housing facilities	Good social infrastructure
Water borne diseases	Good water supply facilities	Caste problems
Other diseases	Good sanitation facilities	Problems of theft / robbery
Fly problems	Good power supply	Problem of other crimes
Mosquito problems	Easy availability of cooking fuel	Alcoholism
Rodent problems	Good health care facilities	Feudalism / bonded labor
Dog menace	Good educational facilities	Community participation in local issues
Pig problems	Good shopping facilities	Prostitution
Water contamination	Good recreational facilities	Gambling
Accumulation of wastewater	Good transportation facilities	Drug abuse
Air pollution / foul smell	Good employment opportunities	AIDS
Dust problem	Proper maintenance of services	
Noise nuisance	Good city administration	
Flooding and drainage overflow		

General Opinion

24. Opinion about the priority areas for Phuentsholing's future growth.

Give order of preference:

Provision of:

housing infrastructure

roads and public transportation services

improved electrical supply

commercial locations

physical and social infrastructure

more consistent water supply

parking areas

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